Ben Lomond Water
Report for Deloraine Wastewater Treatment Plant Upgrade
Development Proposal and Environmental Management Plan
August 2011
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreword</td>
<td>1</td>
</tr>
<tr>
<td>Abbreviations</td>
<td>2</td>
</tr>
<tr>
<td>Executive Summary</td>
<td>4</td>
</tr>
<tr>
<td>1. Introduction</td>
<td>10</td>
</tr>
<tr>
<td>1.1 Proposal Title and Summary</td>
<td>10</td>
</tr>
<tr>
<td>1.2 Proponent</td>
<td>12</td>
</tr>
<tr>
<td>1.3 Legislative Context</td>
<td>12</td>
</tr>
<tr>
<td>2. Proposal Description</td>
<td>13</td>
</tr>
<tr>
<td>2.1 Proposal Overview</td>
<td>13</td>
</tr>
<tr>
<td>2.2 Site Locality</td>
<td>17</td>
</tr>
<tr>
<td>2.3 Existing Wastewater Treatment Plant</td>
<td>20</td>
</tr>
<tr>
<td>2.4 Proposed Development – Stage 1</td>
<td>24</td>
</tr>
<tr>
<td>2.5 Proposed Development – Stage 2 Provisional Items</td>
<td>25</td>
</tr>
<tr>
<td>2.6 Operation of Proposed Works</td>
<td>28</td>
</tr>
<tr>
<td>2.7 Construction and Commissioning</td>
<td>29</td>
</tr>
<tr>
<td>2.8 Off-site Infrastructure</td>
<td>34</td>
</tr>
<tr>
<td>2.9 Technical/Management Alternatives</td>
<td>34</td>
</tr>
<tr>
<td>3. The Existing Environment</td>
<td>38</td>
</tr>
<tr>
<td>3.1 Planning Aspects</td>
<td>38</td>
</tr>
<tr>
<td>3.2 Environmental Aspects</td>
<td>42</td>
</tr>
<tr>
<td>3.3 Socio-Economic Aspects</td>
<td>60</td>
</tr>
<tr>
<td>3.4 Alternative Sites</td>
<td>61</td>
</tr>
<tr>
<td>4. Potential Effects and Their Management</td>
<td>62</td>
</tr>
<tr>
<td>4.1 Air Emissions</td>
<td>62</td>
</tr>
<tr>
<td>4.2 Liquid Waste</td>
<td>65</td>
</tr>
<tr>
<td>4.3 Groundwater</td>
<td>74</td>
</tr>
<tr>
<td>4.4 Noise Emissions</td>
<td>78</td>
</tr>
<tr>
<td>4.5 Solid and Controlled Waste</td>
<td>79</td>
</tr>
<tr>
<td>4.6 Dangerous Goods and Environmentally Hazardous Materials</td>
<td>82</td>
</tr>
<tr>
<td>4.7 Biodiversity and Nature Conservation Values</td>
<td>83</td>
</tr>
<tr>
<td>4.8 Marine and Coastal</td>
<td>84</td>
</tr>
</tbody>
</table>
4.9 Greenhouse Gases and Ozone Depleting Substances 85
4.10 Heritage 86
4.11 Land Use and Development 87
4.12 Visual Effects 89
4.13 Socio Economic Issues 94
4.14 Health and Safety Issues 95
4.15 Hazard Analysis and Risk Assessment 96
4.16 Fire Risk 101
4.17 Infrastructure and Off-Site Ancillary Facilities 101
4.18 Environmental Management Systems 103
4.19 Cumulative and Interactive Effects 105
4.20 Monitoring and Review 105
4.21 Decommissioning and Rehabilitation 110

5. Commitments 111

6. Conclusion 115

7. References 116

Table Index

Table 1 Key Process Unit Details (Deloraine WWTP Upgrade – Process Design Review GHD December 2008, refer Appendix B) 14
Table 2 Deloraine WWTP Current Permit Limits and Proposed Discharge Quality 16
Table 3 Existing and Predicted Discharge Mass Loads 17
Table 4 Deloraine WWTP Influent Flow 22
Table 5 Current Deloraine WWTP Permit Limits compared against measured effluent quality (August 2004 to January 2008) 22
Table 6 Raw Wastewater Results for Deloraine WWTP – March 2009 23
Table 7 Future Design of the Deloraine WWTP Influent Flow 24
Table 8 Proposed Construction Activities 29
Table 9 Proposed Construction Timeline 33
Table 10 Climate Data for Deloraine 44
Table 11 Summary of Current Groundwater Monitoring Network 47
Table 12 Current (2002) ELMS Groundwater Monitoring Parameters and Frequency 47
Table 13 Meander River at Deloraine Daily Flow Statistics – 1995-2008 (m$^3$/sec) 48
Table 14 Upstream Water Quality of Meander River 49
Table 15  Downstream Water Quality of Meander River  50
Table 16  WQOs for Identified PEVs of the Meander River  52
Table 17  Seismic Records of Deloraine Area  59
Table 18  Treatment Plant Performance  66
Table 19  Proposed Discharge Qualities at the Completion of Stage 1  69
Table 21  Assessments of Beneficial Uses of Groundwater Requiring Protection  75
Table 22  Groundwater Monitoring Summary  77
Table 23  Sustainability Risk Assessment Summary After Mitigation  97
Table 24  Potential Aspects and Impacts Register  99
Table 25  Contact Details of Relevant Emergency Authorities  100
Table 26  Treated Effluent Quality Monitoring  105
Table 27  Receiving Water Monitoring Points  107
Table 28  Groundwater Monitoring Summary  108
Table 29  Commitments  111

Figure Index
Figure 1  Site Location  19
Figure 2  Schematic layout of the Deloraine WWTP Upgrade Proposed Works  27
Figure 3  Potential Irrigation Areas  37
Figure 4  Land Owned by BLW  39
Figure 5  Planning Zones  41
Figure 6  Surface Geology and Monitoring Well Location  43
Figure 7  Mean Maximum Temperatures for Deloraine (1901-1950)  45
Figure 8  Mean Minimum Temperatures for the Deloraine Weather Station (1901-1950)  45
Figure 9  Rainfall Averages from Deloraine Weather Station (1891-2009)  46
Figure 10  Macroinvertebrate Sample Sites  56
Figure 11  Illustration of the Mixing Zone  71
Figure 12  Mixing Zone Extent – Discharge 1 metre From Bank  72
Figure 13  Mixing Zone Extent – Discharge 5 metres From Bank  72
Figure 14  Mixing Zone Extent – Discharge 10 m From Bank  73
Figure 15  Staged Approach for Implementing Contingency Plans  98
Figure 16  Existing and Proposed Surface Water Monitoring Sites  106
Appendices

A Project Specific Guidelines
C Site Layout Plan
D Planning Assessment Report
E Groundwater Monitoring Results
F Aquatic Biology Report
G Mixing Zone Report
H Meander Valley Council ELMS
I Sustainability Risk Assessment Tool
J Heritage Impact Assessment Report
K Landscape Character Assessment and Schematic Landscape Plan Report
Foreword

The overall objective of the Environmental Management and Pollution Control Act 1994 (EMPCA) is to provide for the management of the environment and the control of pollution in Tasmania.

As outlined in the Guide to the Resource Management and Planning System (RPDC 2003), EMPCA defines and deals with three main activity classifications that may cause environmental harm. These are:

- Level 1: An activity/development/use which requires a permit under the Land Use Planning and Approvals Act 1993 (LUPAA) and which may cause environmental harm (but does not include a Level 2 or 3 Activity).
- Level 2: An activity listed in Schedule 2 of LUPAA (the activity often has a stated minimum production threshold). Most Level 2 Activities require a permit under LUPAA, although there are some that do not.
- Level 3: An activity declared to be a Project of State Significance under the State Policies and Projects Act 1993.

In accordance with Schedule 2 Subsection 3(a) of EMPCA, the Director of the Environment Protection Authority has considered the proposed development and identified it as a Level 2 Activity.

This Development Proposal and Environmental Management Plan (DPEMP) has been prepared for Ben Lomond Water (BLW) for submission to Meander Valley Council (MVC), and subsequent referral to the Environment Protection Authority (EPA) Board (the Board). As part of this assessment process the DPEMP will be provided for public display and comment as well as reviewed by other relevant government agencies, key stakeholders and MVC. The function of the DPEMP is to provide the Board with relevant information in support of the Development Application in order to assess the project. Such information includes providing details of the project, an assessment of the existing environment in, and surrounding, the Deloraine Wastewater Treatment Plant (WWTP) and proposed Stage 1 plant upgrade, identification of significant environmental, social and economic and planning effects of the project; and proposed measures to mitigate or avoid potential adverse environmental impacts. The Board and MVC will make their determinations in relation to the project on the basis of an assessment of this information and any representations received.

The State Government has provided Project Specific Guidelines for the development of the DPEMP to ensure the relevant potential impacts are considered and addressed. These guidelines are attached in Appendix A of this document and are used in conjunction with the DPEMP General Guidelines, also provided by the EPA.
## Abbreviations

<table>
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<tr>
<th>Abbreviation</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADWF</td>
<td>Average Dry Weather Flow</td>
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<tr>
<td>AHD</td>
<td>Australian Height Datum</td>
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<tr>
<td>ANZECC</td>
<td>Australia and New Zealand Environment and Conservation Council</td>
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<td>AUSRIVAS</td>
<td>Australian Rivers Assessment</td>
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<td>BLW</td>
<td>Ben Lomond Water</td>
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<td>BWL</td>
<td>Bottom Water Level</td>
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<td>BOD</td>
<td>Biochemical Oxygen Demand</td>
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<td>BNR</td>
<td>Biological Nutrient Removal</td>
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<tr>
<td>CEMP</td>
<td>Construction Environmental Management Plan</td>
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<tr>
<td>CFEV</td>
<td>Conservation of Freshwater Ecosystem Values</td>
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<tr>
<td>COD</td>
<td>Chemical Oxygen Demand</td>
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<tr>
<td>DEPHA</td>
<td>Department of Environment, Parks, Heritage and the Arts</td>
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<tr>
<td>DIER</td>
<td>Department of Infrastructure, Energy and Resources</td>
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<td>DPEMP</td>
<td>Development Proposal and Environmental Management Plan</td>
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<tr>
<td>DPIW</td>
<td>Department of Primary Industries and Water</td>
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<td>DPIWE</td>
<td>Department of Primary Industries, Water and Environment</td>
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<tr>
<td>DTAE</td>
<td>Department of Tourism, Arts, and Environment</td>
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<tr>
<td>ELMS</td>
<td>Environmental Land Management System</td>
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<td>EMP</td>
<td>Environmental Management Plan</td>
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<td>EMPCA</td>
<td>Environmental Management and Pollution Control Act 1994</td>
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<tr>
<td>EPA</td>
<td>Environment Protection Authority</td>
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<tr>
<td>EPBC Act</td>
<td>Commonwealth <em>Environment Protection and Biodiversity Conservation Act 1999</em></td>
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<tr>
<td>EPN</td>
<td>Environment Protection Notice</td>
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<tr>
<td>EPT</td>
<td>Ephemeroptera, Plecopteran and Tricoptera</td>
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<td>IDEAL</td>
<td>Intermittent Decanted Extended Aeration Lagoon</td>
</tr>
</tbody>
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ADWF  Average Dry Weather Flow
LUPAA  Land Use Planning and Approvals Act 1993
MVC  Meander Valley Council
NEPM  National Environmental Protection Measure
NGS  National Greenhouse Strategy
NOI  Notice of Intent
OEMP  Operational Environmental Management Plan
OU  Odour Dilution Units
PEV  Protected Environmental Value
PS  Pumping Station
RMPS  Resource Management and Planning System
SDP  Sludge Drying Pan
SPWQM  State Policy on Water Quality Management 1997
TDS  Total Dissolved Solids
TGD  Tasmania Geoconservation Database
TSP Act  Tasmanian Threatened Species Protection Act 1995
UPS  Uninterruptable Power Supply
UV  Ultraviolet
WQOs  Water Quality Objectives
WWTP  Deloraine Wastewater Treatment Plant
Executive Summary

Introduction

This document outlines the key issues regarding Ben Lomond Water’s (BLW’s) proposed upgrades to the Deloraine Wastewater Treatment Plant (WWTP). This Development Proposal and Environmental Management Plan (DPEMP) addresses BLW’s intention to expand the WWTP to successfully maintain design effluent quality objectives and to meet projected influent flows and loads. BLW intend to undertake the upgrade works in two stages, and this DPEMP seeks approval for Stage 1 of the works.

The following is a summary of the salient points of this DPEMP, outlined under headings corresponding to the main DPEMP sections. For further information or clarification on the issues raised below, please refer to the relevant sections of the DPEMP and any associated figures and appendices.

Proposed Approach

BLW propose the following approach to progressing the improvement works at the Deloraine WWTP:

- Implementation of Stage 1 works.
- Assessment of Stage 1 improvements.
- Delivery of Stage 2 conditional approval requirements (e.g. Reuse Feasibility Study) and any additional regulatory requirements. Stage 2 of the project would not be commenced until satisfactory completion of conditions precedent to Stage 2.
- Implementation of Stage 2.
- Monitoring and review of WWTP performance.

This proposed two stage approach provides a number of project benefits including:

1. Improved timeframes to implement necessary WWTP process upgrading works.
2. Improved discharge effluent quality and enable additional sewer connections to the WWTP.
3. Enables detailed assessment of the works implemented in Stage 1. Following completion of Stage 1 works the necessity and/or requirement for implementing proposed Stage 2 upgrades can then be determined.
4. Provides sufficient time for appropriate studies to be developed and assessed. Studies would include effluent reuse feasibility and an inflow and infiltration study.

Proposal Description

Currently, the WWTP is operating very close to its design population of 2,400 equivalent persons and its design capacity of 600 kL per day average dry weather flow (ADWF). Plant performance has been variable since the last process upgrade of the biological nutrient plant (2002) and the recent upgrade (April 2007) of the West Deloraine Wastewater Pump Station, which increased the influent flow rate to the WWTP. These factors have created additional stress on the plant and subsequently reduced plant performance.

Expansion and upgrading of the WWTP is required to address the increase in influent flows and current poor effluent discharge quality. To progress the required assessment processes Meander Valley Council (MVC) submitted a Notice of Intent (NOI) to the Environment Protection Authority (EPA) in December 2008. The EPA responded to the NOI with a set of Project Specific Guidelines issued on 10 February 2009.
This DPEMP addresses BLW's intention to upgrade and expand the infrastructure at the WWTP to meet its permit requirements and minimise its impact on the receiving environment.

**Stage 1 Works**

A staged approach to the upgrades has been proposed so that following completion of Stage 1 works, the necessity and/or requirement for implementing proposed Stage 2 upgrades can be determined. The proposed stage 1 upgrade works relevant to this DPEMP consist of installation of:

- A flow splitter
- A 1.5 ML overflow storage basin
- Associated pump stations
- A 300 kL anaerobic tank
- A new decanter to be installed in intermittent decant extended aerobic lagoon (IDEAL) 2
- One sludge drying pan
- Increase length of outfall pipe and diffuser

These works will increase plant capacity and provide scope for further development in Deloraine.

The purpose of the Stage 1 upgrade is to:

- Comply with current and projected permit conditions for effluent quality.
- Cater for an increase in inflow, due to 30% population growth of the town, from ADWF= 600 kL/day (Population of 2,400) to ADWF=740 kL/day (Population of 3,120).
- Reduce the extent of short circuiting in the WWTP in wet weather by providing storage capacity for peak inflows.
- Overcome some operational problems.

Following completion of the Stage 1 upgrade, discharge monitoring will be undertaken to confirm that the WWTP performance with regard to current and potential discharge permit conditions. BLW would undertake an extended period of monitoring prior to undertaking the proposed Stage 2 upgrades so that a number of assessments can be carried out which may influence requirements for the Stage 2 upgrades.

**Stage 2 Works**

Prior to works beginning on Stage 2 upgrades, BLW will undertake an effluent reuse feasibility assessment. The outcomes of this reuse assessment may then impact directly on which of the proposed Stage 2 upgrade works will be required. BLW also intend to continue its current Inflow and Infiltration Study and progressively undertake any associated priority works.

Based on the discharge monitoring results and the findings of the Inflow and Infiltration Study and the Effluent Reuse Feasibility Study, BLW will then contact the EPA with the findings so that an agreement can then be reached as to the requirements for Stage 2 upgrades. Currently the scope of the Stage 2 upgrade to cater for an increase in inflow to ADWF=860 kL/day (Population of 3,500) includes:

- Phosphorus removal via automatic dosing of Aluminium Sulphate (Alum)/Ferric Chloride/Sulphate (Ferric).
- Installation of a UV disinfection unit to decrease bacteria (thermotolerant coliform) levels in the effluent and associated pipeline from disinfection unit to Meander River outfall and decommissioning of lagoons if required. The requirement for a bypass of the lagoons will be assessed following implementation of Stage 2 works and the Effluent Reuse Feasibility Study, as lagoons may be required for storage of effluent for reuse.
Installation of balance tank, which will provide a uniform flow of effluent prior to passing through the UV unit (size to be confirmed prior to Stage 2).

Installation of a dual media filter to remove suspended solids and improve transmissivity levels.

Carbon dosing to improve denitrification and biological phosphorus removal.

One additional sludge drying pan to cater for future sludge loading.

Installation of a cover for the anaerobic tank and a two stage bio-scrubber and biofilter for odour control if unpleasant odours are detected upon completion of stage 1.

Further details on the proposal description can be found in Section 2.

Existing Environment

The existing WWTP and associated lagoons are located on a relatively flat section of cleared land within the Meander River floodplain. The river lies approximately 150 metres to the west. The outfall for the WWTP discharges to the Meander River underneath the overpass of the Bass Highway, 300 metres north of the tertiary treatment plant.

The WWTP is located within an area comprising surface geology of Quaternary sands, gravel and muds of alluvial origin. The Quaternary floodplain area extends to the east abutting Jurassic dolerite and/or Tertiary basalt ridges. Groundwater flow is primarily through intergranular flow where gravels and sand exist. Groundwater flow is expected to be a subdued version of the topography, generally moving from east to west across the floodplain and discharging to the Meander River. Recharge is expected to be from multiple sources, including irrigation, open drains, rainfall, and WWTP seepage. Locally, the groundwater is used for domestic and agricultural purposes, and serves as an important resource.

The nearest meteorological station with long term records for temperature and rainfall is located in Deloraine on the Railway bridge, which is approximately 1 kilometre south of the WWTP. The average annual rainfall for Deloraine is 949.4 mm. Average monthly rainfall is variable between seasons, with February and March being the driest months of the year.

The most outstanding geomorphic feature in the vicinity of the WWTP is the Meander River. The river at Deloraine has a meandering channel form, with the majority of the surrounding land likely to have originally been floodplain. The channel is relatively shallow and is generally around 1 metre deep. The banks of the river have been colonised by willows and as a result channel capacity has possibly reduced from the river's original (pre-willow) condition. Some gravel point bars are present, however these are also vegetated and do not appear to be currently mobile.

As a major sub-catchment of the South Esk River, the Meander River catchment covers an area of approximately 1,600 square kilometres in northern Tasmania. The Liffey River, Quamby Brook and Western Creek are the major contributing waterways within the catchment. Stream flow within the Meander River is highly variable, both between years and between months. However, minimum environmental flows are regulated by the upstream Meander Dam. Winter is the period of highest average flows. Water drawn off for irrigation between November and March significantly reduces stream flow during these months.

From Deloraine, the meandering alluvial river floodplains increasingly widen. These floodplains have been extensively developed for agricultural purposes, and the river has been significantly altered as a result of land use practices. Flood mitigation works in the 1960s and 1970s resulted in numerous channel diversions and meander cut-offs, and the construction of levees along several sections of the river. The Bass Highway embankment constitutes a further modification of the floodplain.
The proposed upgrades will be incorporated into raised land (RL 230 metres which has been determined by Council’s flood modelling to be above the 1 in 100 year flood level) on the Meander floodplain; as such the surrounding area will be subjected to varying degrees of flooding.

Under ANZECC water quality guidelines (ANZECC and ARMCANZ 2000) the Meander River at Deloraine is characterised as an upland river (altitude >150 metres) and as a slightly disturbed ecosystem. The Conservation of Freshwater Ecosystems Values (CFEV) database identified the Meander River receiving environment as a highly modified system, with low naturalness and a significantly to severely impaired biological condition for the river section. Overall the site within the CFEV database is listed as a Low Conservation Management Priority (CMPI2). The river section is part of a river cluster for which the improvement of current conservation management is a low priority.

Consistent with the findings of the desktop analysis of the study area, no species listed under the Tasmanian Threatened Species Protection Act 1995 (TSP Act) or the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) were identified during the assessment.

The WWTP is located within the Deloraine Racecourse and is zoned Community Purposes under the Meander Valley Planning Scheme 1995 (the Planning Scheme). The treatment plant occupies an area of approximately 5 ha within the northern portion of the land. The Deloraine Racecourse contains a variety of existing uses and developments including: the racetrack and buildings associated with the Deloraine Racecourse; horse yards and stables associated with the racetrack; Recreation ground and football club to the south of the tertiary treatment, also within the racetrack; MVC works depot for Deloraine; Tennis courts opposite the works depot; and overnight parking area for motor homes east of the tennis courts.

The Deloraine Racecourse is a listed Heritage Site. To assess the impacts on the site, the following reports have been prepared:

- Landscape Character Assessment and Schematic Landscape Plan Report (refer Appendix K).

Further information on the existing environment of the WWTP can be found in Section 3.

Potential Effects and their Management

The proposed upgrades have the potential to impact upon a range of environmental, cultural and socio-economic values through both construction and operation. The following information summarises the salient points from the assessment of potential impacts. Further information on potential impacts and mitigation can be found in Section 4.

Based on historical monitoring data and predicted discharge quality and quantity the plant upgrade will result in a decrease in mass load discharge to the Meander River. Nevertheless, the discharge of effluent from the outfall has potential implications for water quality, aquatic biota and human health. These issues have been discussed in detail in Section 4.2. In summary, it is proposed that the level of treatment will be consistent with DPIWE’s Emission Limit Guidelines for New and Upgraded Treatment Plants (DPIWE 2001). Based on the requirement of a minimum environmental flow of 1.1 cumecs (from Meander Dam) and the mixing zone modelling outlined in Section 4.2.6.7, the flows in the Meander River are considered suitable to allow for continuous discharge from the WWTP without compromising the PEVs and background water quality of the river.
The size of the mixing zone is predicted to decrease as the point of discharge approaches the middle of the river, with a mixing zone of between 5 and 25 metres resulting from a discharge 10 metres from the bank. As such BLW will extend the existing outfall to the centre of the river and install a diffuser. This will maximise dilution and mixing and minimise the impact of discharge on the receiving environment. An intensive monitoring regime is proposed to confirm the extent of this mixing zone, measure the success of mitigation measures, and identify potential impacts.

- Impacts on water quality during the construction phase of the project are associated with hazardous materials spills and sediment mobilisation associated with extension of the outfall. Sediment mobilisation has the potential to occur from disturbed ground during high rainfall events and due to construction adjacent to the Meander River. A Construction Environmental Management Plan (CEMP) will be prepared prior to construction and will detail erosion and sediment control measures that will be implemented during construction.

- During the construction works there is limited potential for odour escape. There will be no requirement for diversion from the current treatment process as construction takes place (refer Section 4.1). Once operational, odour emissions are not expected to be significantly greater than the current odour potential of the site. The overflow storage basin may generate some additional odour whilst in use, however as the basin is only expected to be utilised sporadically based on rain events, influent is only expected to remain in the basin until the pump stations have returned to pre-event levels, thereby minimising time in the storage basin. Whilst some short term odour impacts may be experienced this will be for a very limited duration and is within the confines of the existing operational WWTP. In relation to odours associated with the anaerobic tank, some odours may be produced due to the anoxic conditions. At the completion of Stage 1 works, site operators will undertake regular assessments of odour levels on site, particularly in relation to the anaerobic tank. If the tank produces a noticeable unpleasant odour, then the odour control unit proposed for Stage 2 works will be implemented immediately.
  - Small quantities of fuel, lubricants and other chemicals may be stored on site during the construction phase of the project. The transport and storage of these dangerous goods will be in accordance with the relevant standards and legislative requirements. Dangerous goods associated with the operational phase of the upgrades include the proposed use and storage of carbon and aluminium sulphate (alum)/ferric sulphate (ferric). These chemicals will be provided in 1000 litre bulk boxes, which will be stored in bunded storage areas in accordance with Australian Standards. These facilities will be housed in a small Colourbond type shed.
  - There are no anticipated impacts to native terrestrial flora and fauna during construction due to the lack of native vegetation and highly disturbed nature of the site. There is the potential to introduce weeds into the site, or spread weeds from the site to other areas during construction. There will be minimal impact to the physical integrity of the Meander River through the extension of the outfall pipeline. All works will be undertaken in accordance with the DPIW’s Manual for Works in Waterways and Wetlands.

- No Aboriginal relics have been identified at the site, however if relics are identified during site works all site work will cease and Aboriginal Heritage Tasmania will be notified.

- The Racecourse is included on the Register of the National Trust, and as such the use and development of this site will require the approval of the MVC. Considerations of the potential effects of the proposal on the Racecourse are addressed in Appendix J.
The proposal is classified as part of the existing Utility Services (Major) use and development class, which applies to the WWTP and is compliant with all relevant Planning Scheme provisions for planning purposes. The proposed upgrade to the WWTP is sited to minimise the visual impact as viewed from the site and surrounds. In particular, it will mostly be positioned beyond the existing WWTP when viewed from the Bass Highway. The proposal provides for adequate separation to the nearest residences and minimal landscaping given that the land surrounding the WWTP is characterised by cleared grazing land.

Access for construction of the sludge drying pans and delivery of the new tanks will be via the existing roadway system, along East Westbury Place. It is not expected the upgrading works will impact any other road users in the area. In the context of existing regional road usage, transportation of material such as pipes, pump and equipment is considered to be minor.

The potential for effluent reuse from the WWTP has been investigated at a conceptual design level to indicate the likely areas involved for effluent reuse. Potentially suitable effluent reuse areas were identified in relative close proximity to the WWTP. The largest reuse areas are located south of the Old Bass Highway and lie above the low lying floodplain for the Meander River. BLW has committed to provide a full Effluent Reuse Feasibility Study to be completed by the commissioning of the Stage 1 works.

**Monitoring and Review**

In order to monitor the ongoing performance of the WWTP upgrades, the following monitoring is required:

- Treated effluent monitoring – flows and water quality;
- Receiving waters monitoring – flows and water quality;
- Groundwater monitoring;
- Macroinvertebrate monitoring;
- Complaints, incidents and notification; and
- Annual reporting for compliance detailing outcomes from the above monitoring programs.

**Decommissioning and Rehabilitation**

It is not anticipated that detailed site closure and rehabilitation plans will be required for some time. In the event that the WWTP becomes redundant, a detailed decommissioning and rehabilitation plan will be prepared prior to closure.

**Conclusions**

The proposed upgrades and expansion of infrastructure will enable the WWTP to comply with current and projected permit conditions for effluent quality, will cater for an increase in inflow due to growth of the town, and will reduce the extent of short circuiting in the WWTP in wet weather by providing storage capacity for peak inflows. The upgrades will minimise the treatment plants’ impact on the receiving environment both in terms of improved discharge water quality and also with the extension of the outfall pipeline to mid-channel to minimise the extent of the mixing zone.

The upgrading works will significantly benefit the community by providing the infrastructure necessary for the continued growth and expansion of the area.
1. Introduction

1.1 Proposal Title and Summary

This document outlines the key issues regarding Ben Lomond Water’s (BLW’s) proposed Stage 1 upgrade of the Deloraine Wastewater Treatment Plant (WWTP) at the Deloraine Racecourse, East Westbury Place, Deloraine in Northern Tasmania. It is noted that this project originally resided with Meander Valley Council (MVC) but was transferred to BLW when the new water authorities were created on 1 July 2009.

Currently, the WWTP is operating very close to its design population of 2,400 equivalent persons and its design capacity of 600 kL per day Average Dry Weather Flow (ADWF) (Howard 2008). Plant performance has been variable since the last process upgrade of the biological nutrient plant (2002) and the recent upgrade (April 2007) of the West Deloraine Wastewater Pump Station increasing the influent flow rate to the WWTP. These factors have created additional stress on the plant and have reduced the plant performance. The plant is currently not meeting its treated effluent discharge emission limits and upgrades are needed to improve plant performance as well as providing increased capacity.

In late 2006, MVC engaged Hunter Water Australia to conduct an operational review of its main wastewater treatment plants, including the Deloraine Plant. The review report (January 2007) recommended a number of issues to be rectified or investigated to resolve design inadequacies.

In early 2007, CEE Consultants Pty Ltd undertook a preliminary audit of the capacity and performance of the WWTP\(^1\). CEE’s report (March 2007) detailed a preliminary action plan to address issues, including identifying the need to increase plant capacity. CEE Consultants Pty Ltd was subsequently appointed by MVC to review upgrading options resulting in the preparation of its Options Study and Functional Design Report (May 2008). Refer to Appendix B of this report.

A range of upgrade options were identified by CEE and the preferred option (Option 3) was chosen due to a combination of financial and performance factors (refer 2.9). GHD was engaged by MVC to undertake a process design review of option 3 of the CEE report. Details of that review were reported to the MVC in December 2008 and the MVC determined to develop the proposed upgrading works on the basis of the GHD recommendations for a modified design. The modified design option involves two stages, namely:

- Stage 1 – This stage is the core of the development upgrade and is designed to address current performance issues as well as increasing the capacity of the WWTP.

- Stage 2 – This stage includes a range of provisional items to be applied after the completion of Stage 1, if required. The WWTP will be monitored at the completion of Stage 1 and if any of the discharge parameters are not consistently meeting the proposed discharge quality, the provisional items included in Stage 2 will be implemented to address any inconsistency in discharge quality being met.

The two staged development allows for potential cost savings in the event that provisional items in Stage 2 are not required. This staged approach however, also provides full certainty from a performance perspective as, any issues with plant performance at the end of Stage 1 will be addressed through the implementation of the provisional Stage 2 items.

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The two staged approach will also result in two commissioning periods with an initial commissioning and testing period of approximately 7 weeks at the completion of Stage 1 followed by detailed design and implementation of Stage 2 works if required (including obtaining relevant approvals), and a second commissioning period at the completion of any Stage 2 works implemented.

BLW will undertake an inflow and infiltration study for Deloraine and will develop an implementation plan for this region.

The main components of the proposed upgrade include:

**Stage 1 – Core Development Upgrade**

- Increase plant capacity to design median flow of 740 kL/d (i.e. population served 3,120 persons).
- A 300 kL anaerobic tank with nominal total 12 hour storage capacity at design median flow (4 hour flow attenuation and 8 hour anaerobic storage). Mixers provided to blend influent with return sludge to optimise phosphorus uptake and maintain homogeneous contents.
- A 1.5 ML overflow storage basin to temporarily store inflows in excess of the treatment plant capacity.
- A flow splitter to divert flows greater than 3 ADWF to the wet weather storage basin.
- Two new pump stations. One pump station will return mixed liquor to the new anaerobic tank and the second pump station will pump overflow from the new overflow storage basin back into the inflow line just prior to the inlet screen.
- A new decanter to be installed in IDEAL 2.
- One sludge drying pan to dry sludge prior to transport offsite.
- Increase length of outfall pipe and diffuser to mid-channel in the Meander River.

**Stage 2 – Provisional Items**

- Installation of a UV disinfection unit to decrease bacteria (thermotolerant coliform) levels in the effluent and associated pipeline from disinfection unit to Meander River outfall and decommissioning of lagoons if required. The requirement for a bypass of the lagoons will be assessed following implementation of Stage 2 works and the Effluent Reuse Feasibility Study, as lagoons may be required for storage of effluent for reuse.
- Increase plant capacity to design median flow of 860 kL/d (i.e. population served 3,500 persons).
- Carbon (liquid sugar or molasses) dosing to improve denitrification and biological phosphorus removal. This is not expected to be required but provision will be made in the unlikely event denitrification is inadequate at completion of Stage 1.
- Phosphorus and nitrogen removal via automatic dosing of Aluminium Sulphate (Alum)/Ferric Chloride/Sulphate (Ferric).
- One additional sludge drying pan to cater for the future sludge loading.
- Two stage bio-scrubber and biofilter and a cover for the anaerobic tank for odour control if unpleasant odours are detected upon completion of Stage 1.

To progress the required assessment processes, MVC submitted a Notice of Intent (NOI) to the Environment Protection Authority (EPA) in December 2008. The purpose of the NOI was to establish the level of assessment and information required (documentation guidelines) for the project. The EPA responded to the NOI with a set of Project Specific Guidelines issued on 10 February 2009 (refer Appendix A).

No public and stakeholder consultation has been undertaken for the project to date.
1.2 Proponent
The proponent for Deloraine Wastewater Treatment Plant (WWTP) is currently Ben Lomond Water (BLW); previously the proponent was Meander Valley Council (MVC):

Ben Lomond Water (ABN: 13 133 655 062)
Ph: 13 6992
PO Box 745
Launceston TAS 7250
The contact for BLW is Andrew Truscott.

BLW was formed under the Water and Sewerage Corporations Act 2008 to serve the local government areas of Break O'Day, Dorset, Flinders, George Town, Launceston City, Meander Valley, Northern Midlands, and West Tamar Councils, and is responsible for providing water and wastewater services within these areas.

MVC constructed the WWTP in 1972, with the plant consisting of one lagoon, before a second lagoon was added in 1978 to take the area of the WWTP to 3.0 ha. In 2002 a further upgrade was carried out with the installation of biological nutrient removal facilities. The WWTP currently serves an equivalent population of 2,400 persons. Upgrading the WWTP is necessary to maintain design effluent quality objectives and to meet the projected future increase in influent flows and loads as of the 1 July 2009, BLW assumed operation of the Deloraine WWTP, which treats wastewater from the Deloraine Town, from MVC.

GHD Pty Ltd has provided environmental, planning and engineering assistance to BLW, in preparing this DPEMP, on behalf of the proponent. The GHD contact for this project is:

Dr Jill Woodworth (Senior Environmental Scientist)
GHD Pty Ltd
102 Cameron St
Launceston TAS 7250
Ph: 03 6332 5532

1.3 Legislative Context
This proposal was referred to the Environment Protection Authority (EPA) Board (formerly EMPCA Board) in the form of a Notice of Intent (NOI) in December 2008. The Director of Environmental Management responded to the NOI declaring the proposal to be a Level 2 Activity under the Environmental Management and Pollution Control Act 1994 (EMPCA).

As a Level 2 Activity, the proposal requires approval from the EPA Board (the Board) and MVC. The Board assessment is in accordance with the Environmental Impact Assessment Principles under EMPCA.

No matters of National Environmental Significance have been identified as relevant to this project and hence a Referral under the Commonwealth’s Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) is not considered to be required.

In addition to the standard approval process, the proposed development will also have to comply with a broad range of environmental and planning legislation, guidelines, standards and policies. The details of such documents are outlined through the relevant sections of this DPEMP.
2. Proposal Description

2.1 Proposal Overview

2.1.1 Background

This DPEMP addresses Ben Lomond Water’s (BLW’s) intention to upgrade the Deloraine Wastewater Treatment Plant (WWTP) to successfully maintain design effluent quality objectives and to meet the projected future increase in influent flows and loads in a two stage process.

Currently, the WWTP is operating very close to its design population of 2,400 equivalent persons and its design capacity of 600 kL per day average dry weather flow (ADWF) (Howard 2008). It presently serves approximately 1,020 residential lots, three schools, a nursing home, four hotels and many commercial shops. MVC predict growth of approximately 30% in population in the local area over the next 30 years as a minimum\(^2\). MVC advises that this population growth allowance should be used in planning the WWTP upgrade. The 30% population growth will be served by Stage 1 of development, with Stage 2 providing provisions to increase the capacity to serve 3,500 persons (50% population growth). Projected future flows for 30% and 50% growth indicate that median flow rates would rise to 740 kL/d and 860 kL/d ADWF respectively. The plant upgrades have been designed to increase plant capacity to meet these flow rates, hence providing sufficient capacity for the predicted growth in Deloraine.

The Deloraine WWTP upgrades will involve reconfiguration of the existing plant into an intermittently decanted biological nutrient removal plant with backup chemical phosphorus removal. The upgrades will increase the capacity of the plant to treat an ADWF of 860 kL/day. Following completion of Stage 1 works the treatment process will consist as follows:

- 5 mm fine screens (existing)
- Wet weather bypass screens (existing)
- A 1.5 ML overflow storage basin
- Flow splitter to divert flows greater than 3 ADWF to the wet weather storage basin
- 300 kL anaerobic tank
- Anoxic/Aerobic tank (IDEAL 1) (existing)
- Aerobic/Decant tank (IDEAL 2) (existing)
- Siphon or tilting trough decanting weir
- Internal recycle, Return Activated Sludge (RAS) and Waste Activated Sludge (WAS) pump stations
- Maturation lagoons (existing)
- Increase the length of the outfall pipe and diffuser
- Three sludge drying pans to dry sludge prior to transport off site (two existing, one additional).

\(^2\) Dwelling approvals in Deloraine over recent years indicates an annual growth rate of about 1.1% (Source: MVC)
Provision will be made for the following process units to be installed if required (Stage 2):

- Balancing tank, media filter and UV disinfection. These units would be installed if the existing maturation lagoons do not reliably achieve the disinfection for the future discharge limits. The existing maturation lagoons provide in excess of 30 days detention and it is expected that they will meet the future permit limits.
- Alum or Ferric dosing for backup chemical phosphorus removal.
- Carbon (liquid sugar or molasses) dosing to improve denitrification and biological phosphorus removal. This is not expected to be required but provision will be made in the unlikely event denitrification is inadequate.
- One additional sludge drying pan to cater for the future sludge loading.
- Two stage bio-scrubber and biofilter and a cover for the anaerobic tank for odour control.

2.1.2 Process Description

The process flow diagram for the plant is illustrated in Figure 2.

The key process unit details are summarised in Table 1 and a detailed outline and a description of the operation of the proposed plant is outlined in Section 2.4 and 2.5. The upgrade works are shown on the Upgrade Schematic Layout Plan and Cross Section (refer Figure 2) and Site Layout Plan/Cross Section provided in Appendix C.

<table>
<thead>
<tr>
<th>Process Unit</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inlet Screening</td>
<td>80 L/s Noggaroth 5 mm Fine screen (existing)</td>
</tr>
<tr>
<td></td>
<td>Wet weather bypass screen with 35 mm bar spacing (existing)</td>
</tr>
<tr>
<td>Biological Treatment</td>
<td>300 m$^3$ Anaerobic/ Balance Tank with one (1) 5.5 kW mixer (Stage 1)</td>
</tr>
<tr>
<td></td>
<td>930 m$^3$ Aerobic/ Anoxic Tank with 15 kW aerator (existing IDEAL 1)</td>
</tr>
<tr>
<td></td>
<td>930 m$^3$ Aerobic/ Decant Tank with 15 kW aerator (existing IDEAL 2)</td>
</tr>
<tr>
<td></td>
<td>1.5 ML Overflow Storage Basin (Stage 1)</td>
</tr>
<tr>
<td></td>
<td>• 30 day Sludge Age</td>
</tr>
<tr>
<td></td>
<td>• Mixed Liquor Suspended Solids (MLSS) ~ 2 500 mg/L</td>
</tr>
<tr>
<td></td>
<td>• Internal Recycled 6 x ADWF</td>
</tr>
<tr>
<td></td>
<td>• Return Activated Sludge ~1 x ADWF</td>
</tr>
<tr>
<td>Chemical Dosing</td>
<td>Bunded chemical storage area with capacity for four (4) 1 m$^3$ pallecons</td>
</tr>
<tr>
<td></td>
<td>Two (Duty/standby) 1 m$^3$ Aluminium Sulphate pallecons with associated</td>
</tr>
<tr>
<td></td>
<td>dosing pumps. (Stage 2)</td>
</tr>
<tr>
<td>Maturation Lagoons</td>
<td>Two (2) Maturation lagoons, 26 ML and 11 ML each (existing)</td>
</tr>
<tr>
<td></td>
<td>Greater than 30 days retention at ADWF</td>
</tr>
</tbody>
</table>
Process Unit | Details
--- | ---
Sludge Drying Pans | Two (2) 500 m² clay lined sludge drying pans: 2,700 kL/yr of waste sludge at 0.5% ds (existing)
One (1) 500 m² clay lined sludge drying pan :3,500 kL/yr of waste sludge at 0.5% ds (Stage 1)
One (1) 500 m² clay lined sludge drying pan 3,780 kL/yr of waste sludge at 0.5% ds (Stage 2)
Odour Control | Two stage bio-scrubber and biofilter (Stage 2)
UV disinfection | Balancing tank and media filter
| UV disinfection (Stage 2)

2.1.3 Proposed Discharge Quality

The State Policy on Water Quality Management, Clause 16, states that discharge limits must be set at a level which does not prejudice the WQOs. An assessment of background water quality in Section 3.2.6 illustrates that the existing Meander River upstream of the WWTP is already in excess of the WQOs. As a result the 80th percentile ambient water quality has been used in this report to model and assess potential impacts from the upgraded WWTP. Modelling suggests that the 80th percentile background levels are met at the edge of the mixing zone. Hence, whilst the proposed discharge quality may not achieve compliance with the WQOs they are consistent with the existing water quality and therefore does not prejudice the PEVs of the River. This is considered a suitable approach as considerable changes would be needed in the Meander River catchment for the ambient water quality to meet the WQOs.

Clause 16 also requires that pollutant discharges should be reduced to the maximum extent reasonable and practical through avoidance, recycling, re-use, treatment and finally disposal. Clause 17 requires that operators should aim, as far as reasonable and practical, to treat effluent to a standard as close as possible to those levels which can be achieved using accepted modern technology. Section 2.9 of this DPEMP outlines the alternative options considered for this development and Sections 2.4 and 2.5 outline the proposed design. These sections illustrate that the intention of Clause 16 and 17 have been met by applying the best available technology within the budgetary constraints and will incorporate the results of the Effluent Reuse Feasibility Study.

Table 2 illustrates the current permit limits and the designed discharge quality from the plant with the upgrades in place, which is based on DPIWE’s Emission Limit Guidelines: Sewage Treatment Plants (DPIWE 2001). It is noted that the DPIWE Emission Limit Guidelines are not directly applicable to plants treating greater than 500 kL per day. However, the mixing zone modelling outlined in Section 4.2.6.7 indicates that the proposed discharge quality is not expected to compromise the current PEVs and water quality in Meander River and will be within 80th percentile natural variation in the river at the edge of the mixing zone.
Table 2  Deloraine WWTP Current Permit Limits and Proposed Discharge Quality

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Current Permit Limit</th>
<th>Proposed Discharge Quality (Median Values)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Median</td>
<td>90% Percentile</td>
</tr>
<tr>
<td>Suspended Solids (mg/L)</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>BOD (mg/L)</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Grease and Oil (mg/L)</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Ammonia-N (mg/L)</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Total N (mg/L)</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Total P (mg/L)</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>PH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thermotolerant coliforms (orgs/100 mL)</td>
<td>200</td>
<td>(200)</td>
</tr>
</tbody>
</table>

The biological nutrient removal IDEAL and maturation lagoons proposed in Stage 1 are expected to achieve the proposed discharge limits outlined in Table 2. Detailed evaluations of intermittently decanted extended aeration (IDEA) and sequencing batch reactor (SBR) plants in Australia, USA and Canada have shown that they reliably achieve a median total nitrogen of < 5 mg/L and a total phosphorus of around 1 mg/L (without chemical phosphorus removal) (IWA, 2001). The Deloraine WWTP Stage 2 upgrade will include chemical phosphorus removal (if required), therefore, it is anticipated to be able to meet the proposed median total phosphorus level of 0.5 mg/L.

To provide flexibility in the design in the event the plant does not reliably meet the thermotolerant coliform or total nitrogen limits, provision has been made for UV disinfection and carbon dosing in Stage 2. As outlined previously a commissioning and testing phase will be conducted at the completion of Stage 1 works to determine if emission limits are met. If not, then Stage 2 works will be implemented.

2.1.4 Proposed Discharge Quantity
The proposed discharge volume is expected to increase to median volume of 740 kL/day ADWF at the completion of Stage 1 and 860 kL/day ADWF at the completion of Stage 2. These are increased from the existing permit limit of 600 kL/day ADWF.

2.1.5 Proposed Discharge Frequency
Based on the mixing zone modelling outlined in Section 4.2, the flows in the Meander River are considered suitable to allow for continuous discharge from the WWTP without compromising the Water Quality Objectives (WQOs). Hence there is no seasonal discharge regime proposed and the discharge will occur on a continuous basis.
2.1.6 Mass Loads

Although the discharge volume will increase as part of the proposed upgrade, the data indicates that the overall mass load discharged into the Meander River will be decreased as a result of the proposed plant upgrade (refer Table 3 below) and improved discharge quality.

The greatest reductions are predicted to be achieved with nutrient loads to the Meander River. Ammonia loads are expected to be reduced by 81% at the end of Stage 1 works with total phosphorus loads expected to be reduced 89% at the end of Stage 2 works. Total nitrogen is predicted to decrease by 40% as a result of the proposed Stage 1 upgrade.

Biochemical oxygen demand and suspended solids are expected to be reduced by 69% and 59% respectively at the end of Stage 1.

The data in Table 3 below has been calculated using existing average outflow quality (column 2) and predicted outflow quality with upgrades in place (columns 3 & 5). The existing discharge of 665 kL/day is the average flow from the WWTP based on measured flows from January 2007 to March 2009 and exceeds the current plant permit flow of 600 kL/day.5

Table 3 Existing and Predicted Discharge Mass Loads

<table>
<thead>
<tr>
<th>Licensed Parameters</th>
<th>Existing Mass Load @ 665 kL/day</th>
<th>Predicted Mass Loads @ 740 kL/day</th>
<th>Percent Reduction</th>
<th>Predicted Mass Loads @ 860 kL/day</th>
<th>Percent Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia as N (kg/day)</td>
<td>4.524</td>
<td>0.74</td>
<td>84%</td>
<td>0.86</td>
<td>81%</td>
</tr>
<tr>
<td>BOD (5 Day) (kg/day)</td>
<td>11.97</td>
<td>3.7</td>
<td>69%</td>
<td>4.3</td>
<td>65%</td>
</tr>
<tr>
<td>Total Nitrogen as N (kg/day)</td>
<td>8.57</td>
<td>5.18</td>
<td>40%</td>
<td>6.02</td>
<td>30%</td>
</tr>
<tr>
<td>Total Phosphorus (kg/day)</td>
<td>3.86</td>
<td>1.48</td>
<td>62%</td>
<td>0.43</td>
<td>89%</td>
</tr>
<tr>
<td>Suspended Solids (kg/day)</td>
<td>17.95</td>
<td>7.4</td>
<td>59%</td>
<td>8.6</td>
<td>53%</td>
</tr>
<tr>
<td>Grease and Oil</td>
<td>No data available</td>
<td>1.48</td>
<td>NA</td>
<td>1.72</td>
<td>NA</td>
</tr>
</tbody>
</table>

2.2 Site Locality

The WWTP is located within the confines of the Deloraine Racecourse, off East Westbury Place, approximately 400 metres north of the Deloraine Town, as shown in Figure 1. The Bass Highway lies approximately 300 metres to the north of the treatment plant and the Meander River lies approximately 150 metres to the west of the plant. The WWTP lies on relatively flat flood plains, with undulating hills rising on the western side of the river. The WWTP is elevated and was built up to be positioned above the flood level. The area is largely cleared and surrounding lowlands are subject to occasional flooding during winter months.

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5 Source: Daily Inflows to WWTP from January 2007 to March 2009 supplied by MVC
Surrounding land use is for recreational purposes and public space, with the Deloraine Racecourse, horse yards, recreation ground and football club to the south and agricultural land to the north, east and west. The closest residences to the WWTP are 31 River Road, on the western side of the Meander River, and 44 Grigg Street, to the south east of the site. Both these residences are approximately 300 metres from the WWTP boundary, with neighbouring residences on both roads as well as other residences along East Westbury Place, Railway Street, West Parade and Westbury Place occurring within approximately 500 to 600 metres of the WWTP (refer Figure 1).

The outfall for the WWTP enters the Meander River underneath the overpass of the Bass Highway, 300 metres north of the WWTP.

Access for the construction of the sludge drying pans, and for the delivery of the new balance tank, will be via the existing roadway system off East Westbury Place and past the recreation ground (refer Figure 16 for a broader scale location map).
Figure 1 Site Location
2.3 Existing Wastewater Treatment Plant

2.3.1 Summary
The key components of the existing WWTP include the following:

- Influent pump stations;
- Inlet flow meter;
- Inlet screens: removal of larger materials, sand and grit;
- IDEAL 1: anoxic reactor and aeration of the effluent;
- IDEAL 2: aeration of the effluent/solid separation and decanting;
- Lagoon No 1: This lagoon allows for settlement of any sludge carried over in the decant; reduction of bacteriological levels and removing organics and nutrients;
- Lagoon No 2: This lagoon further reduces the thermotolerant coliforms levels;
- Discharge via an effluent pipeline from Lagoon 2 to the Meander River;
- Sludge Drying Pans: provide storage and drying capacity for collected biosolids.

2.3.2 Influent Pump Stations
The existing WWTP is serviced by two pump stations, one collecting wastewater from the eastern side of the river and one collecting wastewater from the western side of the river. The East and West pump stations are automatically controlled and once the level of wastewater reaches a particular level, the pump engages and runs at 65 L/sec for the western pump station or 20 L/sec for the eastern pump station until the level of the wastewater has decreased sufficiently. MVC installed an interlock system to ensure only one station can pump at a time, thereby allowing a maximum flow of 65 L/sec at any one time to enter the plant. Each pump station has the capacity to store influent for several hours and is unlikely to produce any backup issues during peak flow conditions. Further, BLW has recently installed additional storage capacity at the east pump station. The western pump station has two installed pumps, a duty and a standby pump, each with a capacity in excess of the design peak wet weather flow. The design peak wet weather flow is six times the current ADWF and 4.5 x the future (20 year) ADWF.

2.3.3 Wastewater Treatment Plant (WWTP)
The wastewater treatment plant involves the following:

- Wastewater is pumped from the east and west pumping stations to the WWTP inlet screen, which screens out the coarse material. There is a flow meter on the inlet pipe at the treatment plant. The coarse material drops into a 140 L mobile bin, which generally fills within 10 to 14 days. Once four of the bins are full (about every eight weeks), the bins are collected for disposal by Environmental Services. It is expected that any change in solid waste generation would be proportional to the increase in flow into the plant.

- From the inlet screen, the raw sewage flows into IDEAL 1. The IDEAL system provides biological oxidation of organic matter, nitrification and significant denitrification as well as separating out the solid portion of the wastewater. At the first stage of IDEAL 1, the screened wastewater and recycled water from IDEAL 2 are continuously mixed in the anoxic/anaerobic part of IDEAL 1. The second stage in IDEAL 1 is aeration of the wastewater. The aerator operates automatically based on cycle timers, with cycle durations determined by levels of dissolved oxygen in IDEAL 1.
Following aeration in IDEAL 1, liquid waste flows into IDEAL 2 by gravity, in which an intermittent aeration/solids separation/decanting cycle occurs. These cycles operate automatically on time and level control. Decanting is controlled by a decant isolating valve installed on the outlet of IDEAL 2 which automatically opens at set times and discharges into Lagoon 1. The supernatant flows through the decant valve at a rate of approximately 120 L/sec. The timing of the decant period depends on the volume of wastewater entering the IDEAL system and ends when the liquid level reaches the low level switch at bottom water level (BWL) and then the switch closes. Aeration commences automatically following the decanting cycle and operates for approximately 2.5 hrs. The liquid level in IDEAL 2 rises during aeration due to the addition of screened wastewater entering. The settling period commences once aeration has ceased and varies in time based on flow.

Excess solids from IDEAL 2 are automatically removed each day via a valve on the sludge withdrawal pipeline, which functions on a timer. The timer opens the valve either after each cycle or at a certain time throughout each day. A recirculation pump returns the nitrified wastewater in IDEAL 2 to the anoxic/anaerobic chamber at the inlet to IDEAL 1 for denitrification. There are currently some technical issues associated with the decanting system in IDEAL 2, and this has resulted in much of the mixed liquor from IDEAL 2 being discharged into Lagoon 1, instead of settling out for transfer to the sludge pan. The decant system is to be modified as part of the proposed treatment plant upgrade. In 2005, approximately 300 tonnes of biosolids was removed from Lagoon 1 by Collex and disposed of at the Remount Road Disposal site in Launceston. IDEAL 1 and IDEAL 2 are built up structures (to be above the surrounding flood plain level) and they are not covered. They are made of compacted earth and are lined with 2 mm thick high density polyethylene (HDPE).

Lagoons 1 and 2 function as polishing ponds to reduce the bacteriological level and to remove organics and nutrients. The liquid from Lagoon 1 gravity feeds via underground pipe to Lagoon 2, which then gravity feeds via underground pipe to the outfall point into the Meander River.

There are two clay lined sludge basins that provide capacity for air-drying of the excess sludge, which has flowed under gravity from IDEAL 2. Excess water is removed from Sludge Drying Pan 1 via a drainage system, which flows to a sump and is pumped under level control automatically to the head of IDEAL 2. Sludge Drying Pan 1 contains a small amount of sludge and has not been desludged since its construction in 2002. Sludge Drying Pan 2 has not yet been utilised and remains as a back-up basin. During 2006, there was an odour issue with fresh sludge having been drained into Sludge Basin 1. There was no water covering the sludge and a complaint was received. Water was added to the basin to cover the sludge and that eliminated the odour problem. The sludge has since been generally kept submerged, and no odour complaint has since been received.

### 2.3.4 Design Loadings

The WWTP is currently licensed to discharge up to an average of 600 kL/day of treated wastewater to Meander River. Currently the plant discharges approximately 665 kL/day. This exceeds the current permit limit. The current influent flows to the WWTP are outlined in Table 4.
Table 4  Deloraine WWTP Influent Flow

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Current (2007)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median Flow</td>
<td>kL/d</td>
<td>570</td>
</tr>
<tr>
<td>PWWF to WWTP</td>
<td>kL/d</td>
<td>3 420</td>
</tr>
<tr>
<td>Peak Flow Through WWTP</td>
<td>kL/d</td>
<td>2 850</td>
</tr>
<tr>
<td>Peak Flow Bypassed to Lagoons</td>
<td>kL/d</td>
<td>570</td>
</tr>
</tbody>
</table>

In accordance with the current Environmental Land Management System (ELMS) No.6237 dated July 2002, Permit Condition E3, effluent quality limits must not exceed the ranges listed in Table 5 below. Current effluent quality from the WWTP is compared against the current permit limits in Table 5 below. The quality of the effluent is poor and does not fall within any of the permit criteria, supporting the need for the proposed upgrades to the WWTP.

Table 5  Current Deloraine WWTP Permit Limits compared against measured effluent quality (August 2004 to January 2008)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Existing Effluent Quality</th>
<th>Permit Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Median</td>
<td>90th Percentile</td>
</tr>
<tr>
<td>Flow</td>
<td>kL/d</td>
<td>570</td>
<td>950</td>
</tr>
<tr>
<td>BOD – total</td>
<td>mg/L</td>
<td>44</td>
<td>160</td>
</tr>
<tr>
<td>Suspended Solids (TSS)</td>
<td>mg/L</td>
<td>56</td>
<td>220</td>
</tr>
<tr>
<td>Ammonia-N</td>
<td>mg/L</td>
<td>7</td>
<td>20</td>
</tr>
<tr>
<td>Nitrate/Nitrite-N</td>
<td>mg/L</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Nitrogen – N (total)</td>
<td>mg/L</td>
<td>21</td>
<td>36</td>
</tr>
<tr>
<td>Phosphorus – P (total)</td>
<td>mg/L</td>
<td>4</td>
<td>15</td>
</tr>
<tr>
<td>Thermotolerant coliforms</td>
<td>Orgs/ 100 mL</td>
<td>60⁸</td>
<td>500⁸</td>
</tr>
<tr>
<td>Oil and Grease</td>
<td>mg/L</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>pH</td>
<td></td>
<td></td>
<td>6.5-8.5</td>
</tr>
</tbody>
</table>

* Average Dry Weather Flow,  # Data from measurements taken between August 2001 and June 2008

Note – Shaded boxes are those that exceed current permit limit.

---


The plant operator collected five samples of raw sewage over a period of several weeks to provide some background data on the typical chemical composition of domestic sewage entering the WWTP (refer Table 6). There is no trade waste generated in the catchment so all inflows to the WWTP are via stormwater and domestic sewage.

### Table 6: Raw Wastewater Results for Deloraine WWTP – March 2009

<table>
<thead>
<tr>
<th>Date Sampled</th>
<th>Flow (kL)</th>
<th>Rainfall (mm)</th>
<th>pH</th>
<th>Alkalinity (mg/L)</th>
<th>BOD (mg/L)</th>
<th>COD (mg O₂/L)</th>
<th>Total Solids (mg/L)</th>
<th>Volatile Solids (mg/L)</th>
<th>Ammonia (mg-N/L)</th>
<th>Nitrite &amp; Nitrate (mg-N/L)</th>
<th>Nitrate (mg-N/L)</th>
<th>Total Nitrogen (mg-N/L)</th>
<th>Total Phosphorus (mg-P/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>03/03/09</td>
<td>745</td>
<td>15</td>
<td>7.2</td>
<td>155</td>
<td>134.4</td>
<td>548</td>
<td>427</td>
<td>239</td>
<td>27</td>
<td>0.012</td>
<td></td>
<td>36</td>
<td>6.4</td>
</tr>
<tr>
<td>10/03/09</td>
<td>581</td>
<td>0</td>
<td>6.8</td>
<td>244</td>
<td>444</td>
<td>401</td>
<td>649</td>
<td>366</td>
<td>41.5</td>
<td>&lt;0.002</td>
<td>&lt;0.002</td>
<td>52</td>
<td>9.3</td>
</tr>
<tr>
<td>11/03/09</td>
<td>661</td>
<td>0</td>
<td>7.1</td>
<td>252</td>
<td>243.1</td>
<td>457</td>
<td>556</td>
<td>257</td>
<td>41.4</td>
<td>&lt;0.002</td>
<td>0.005</td>
<td>51</td>
<td>9.1</td>
</tr>
<tr>
<td>12/03/09</td>
<td>594</td>
<td>0</td>
<td>7.5</td>
<td>298</td>
<td>243.8</td>
<td>563</td>
<td>573</td>
<td>295</td>
<td>57.0</td>
<td>&lt;0.002</td>
<td>0.007</td>
<td>68</td>
<td>10</td>
</tr>
<tr>
<td>13/03/09</td>
<td>594</td>
<td>0</td>
<td>7.3</td>
<td>214</td>
<td>91.6</td>
<td>239</td>
<td>392</td>
<td>171</td>
<td>38.4</td>
<td>&lt;0.002</td>
<td></td>
<td>45</td>
<td>6.7</td>
</tr>
</tbody>
</table>
2.4 Proposed Development – Stage 1

Deloraine has been experiencing a steadily increasing population growth in recent years, and an increased plant capacity is required to handle the expected future increase in influent flows and loads. The projected influent flows to the WWTP are outlined in Table 7 below.

Table 7 Future Design of the Deloraine WWTP Influent Flow

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Current (2007)</th>
<th>Future Design (Stage 1)</th>
<th>Future Design (Stage 2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median Flow</td>
<td>kL/d</td>
<td>570</td>
<td>740</td>
<td>860</td>
</tr>
<tr>
<td>PWWF to WWTP</td>
<td>kL/d</td>
<td>3 420</td>
<td>4 440</td>
<td>5 160</td>
</tr>
<tr>
<td>Peak Flow Through WWTP</td>
<td>kL/d</td>
<td>2 850</td>
<td>2 220</td>
<td>2 580</td>
</tr>
</tbody>
</table>

2.4.1 Summary of Proposed Works – Stage 1

The following works are proposed for the WWTP to meet the existing and proposed future discharge limits:

- Installation of a flow splitter after the inlet screen: Instead of the overflow going into Lagoon 1 the overflow will gravity feed into the new wet weather Overflow Storage Basin (1.5 ML). This will occur when the flow is greater than 3 x ADWF.

- Two new pump stations are required with the proposed upgrade works: One pump station will return mixed liquor to the new 300 kL Anaerobic Tank. The second pump station will pump overflow from the wet weather Overflow Storage Basin back into the inflow line just prior to the inlet screen. Both pumps will be submersible pumps within wet wells. No off-site noise impacts are anticipated from the operation of these pumps. A control valve in the Anaerobic Tank will control the release of wastewater, which will gravity feed into IDEAL 1. No changes will be made to IDEAL 1.

- Installation of a 1.5 ML Overflow Storage Basin: This will temporarily store inflows in excess of the treatment plant capacity. All inflows shall be screened; with up to 3 x average dry weather flow (ADWF) directed to the new Anaerobic Tank. Flows in excess of 3 x ADWF will gravitate to the 1.5 ML Overflow Storage Basin. Wastewater stored in this basin will be pumped back to the Anaerobic Tank during periods of low inflow. The basin will be high density polyethylene (HDPE) lined to prevent leakage into the groundwater. The basin shall be an open structure housed within a securely fenced area. It is not anticipated that odour problems should develop given the limited time effluent will be stored (refer Section 4.1).

- Installation of a 300 kL Anaerobic Tank: The purpose of the anaerobic tank is to facilitate biological phosphorus removal by providing anaerobic conditions.

- A new siphon or tilting trough decanter will be installed in IDEAL 2 to minimise solids carry over into Lagoon 1. This will require IDEAL 2 to be out of service for approximately one week to allow the installation of the new decanter, refer Section 4.1.3. During this period plant flows will be diverted to the new Overflow Storage Basin and around IDEAL 2 into Lagoon 1.

Increase length of outfall pipe to mid-channel in the Meander River: Currently the discharge headwall has collapsed and discharge is occurring at the river’s edge. A pipe (with diffuser) extending 10 metres out into mid-channel is proposed to be installed to ensure mixing in the river.

Additional Sludge Drying Pan: One additional Sludge Drying Pan of similar size to the existing pans will be required for the increased loads and sludge generation expected with the plant upgrade. The sludge drying pan shall be constructed from earth fill with a clay liner.

Following completion of the Stage 1 upgrade, discharge monitoring will be undertaken to confirm that the WWTP performance with regard to current and potential discharge permit conditions. BLW would utilise an extended period of monitoring prior to seeking approval for and undertaking proposed Stage 2 upgrades so that a number of assessments can be carried out which may influence requirements for the Stage 2 upgrades.

2.5 Proposed Development – Stage 2 Provisional Items

Prior to works beginning on Stage 2 upgrades, BLW will undertake an effluent reuse feasibility assessment. The outcomes of this reuse assessment may then impact directly on which of the proposed Stage 2 upgrade works will be required. BLW also intend on continuing its current Inflow and Infiltration Study and progressively undertake any associated priority works.

Based on the discharge monitoring results and the findings of the Inflow and Infiltration Study and the Effluent Reuse Feasibility Study, BLW will then contact the EPA with the findings so that an agreement can then be reached as to the requirements for Stage 2 upgrades. Currently the scope of the Stage 2 upgrade includes:

Installation of a UV disinfection Unit: To consistently meet likely disinfection emission limits, it may be necessary to provide UV disinfection. This unit will provide additional disinfection prior to release to Lagoon 1. BLW will assess the impact of lagoon storage upon the level of disinfection of the effluent. If the flow through the lagoons is negating the effect of disinfection BLW will investigate bypassing the lagoons.

Depending on the level of solids carry over, a dual media filter may be required prior to the UV disinfection unit. The dual media filter will remove suspended solids and improve the transmissivity levels. The filters will be housed in a Colourbond type shed.

Installation of a Balance Tank (size to be determined prior to Stage 2): Following treatment of wastewater in IDEAL 2, the balance tank will provide a uniform flow before passing through the filter and UV disinfection unit. It is necessary to provide this balance tank downstream of IDEAL 2 in order to size the filters and UV equipment for average flows.

Aluminium Sulphate (Alum) or Ferric Chloride/Sulphate (Ferric) dosing in two duty/standby 1000 litre bulky boxes, stored in a bunded storage area and dosed with a small automated positive displacement type dosing pumps. The chemical dosing facility will be housed in a small Colourbond type shed. The chemical phosphorus dosing will provide backup phosphorus removal and ensure that the median phosphorus limit is reliably achieved.

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9 Engineered clay liner - liner construction shall be undertaken in an approach consistent with the Environment Division’s protocol Environmental Standards Applying to Liner Construction March 2006. This process will be managed through site investigation, engineering design, materials testing/quality controls and site supervision.
Provision will be made in Stage 2 of the upgrade to expand the chemical dosing to include liquid sugar (carbon) dosing for improved denitrification. The carbon will be provided in 1000 litre bulk boxes, which will be stored in a bunded storage area and dosed with small automated positive displacement type dosing pumps. These facilities will be housed the chemical dosing shed constructed in Stage 1. This will only be installed if operational improvements do not improve the effluent total nitrogen to a suitable level.

Two Stage Odour Removal Facility: Should odour control be required, initially odour will be controlled by a cover on the anaerobic tank. If this proves insufficient for odour control then a two stage odour scrubber/filter facility will be installed. Ventilated air will be continuously drawn from the covered anaerobic/flow attenuation tank under a negative pressure of up to 20 Pa and blown through a wet packed scrubber to remove hydrogen sulphide. Water will be sprayed down over the packed media, counter current to the ventilation air, to be recirculated intermittently. A portion of this water will be bled off periodically to ensure the pH is > 2. Ventilated air will then be passed up through biofilters to remove remaining hydrogen sulphide and other odours. An automatic top water sprinkling/drip irrigation system with moisture sensors will ensure the bed remains moist.

Additional Sludge Drying Pan: An additional (fourth) SDP of similar size to the existing pans may be required for the increased loads and sludge generation expected with the Stage 2 plant upgrade. The necessity for a fourth drying pan will be assessed following the installation of the third drying pan in Stage 1. The sludge drying pan will be constructed from earth fill with a clay liner. The above Stage 2 upgrade works are shown on the Upgrade Layout Plan below (refer Figure 2).

The proposed emission limits meet the current Meander River ambient water quality (and therefore protect the PEVs) however, if the quality of the Meander River improves over time, further upgrades to the WWTP may be required in future to improve effluent quality and ensure ongoing protection of improved ambient water quality of the river.

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10 Engineered clay liner - liner construction shall be undertaken in an approach consistent with the Environment Division’s protocol Environmental Standards Applying to Liner Construction March 2006 (DEPHA 2006). This process will be managed through site investigation, engineering design, materials testing/quality controls and site supervision.
Figure 2  Schematic layout of the Deloraine WWTP Upgrade Proposed Works

Interlock pumping stations to limit time pumping together

Legend:
- Proposed Stage 1 Deloraine WWTP Upgrade
- Proposed Stage 2 Deloraine WWTP Upgrade
- Existing Infrastructure

Schematic based on Figure 7-1 from Anderson, JL (2008): Deloraine WWTP Upgrade - Functional Design Report.
2.6 Operation of Proposed Works

The operation of the proposed works, as outlined in the Options Study and Functional Design Report (CEE, May 2008) is summarised below.

Influent Pumping

Wastewater will be automatically pumped to the WWTP on level control from either the East or West pumping stations (PSs). During normal operation, the PS controls are interlocked to prevent simultaneous pumping, and the wastewater flow to the plant will be intermittent and up to 65 L/s. In wet weather, simultaneous pumping from East and West PSs may occur if the high level alarm is initiated in the PS wet wells. The inflow may be continuous and up to 130 L/s with duty and standby pumps operating.

Influent Screening

All wastewater flow pumped to the plant will be measured and totalised, and screened through the mechanical fine screen with nominal 5 mm diameter apertures (capacity 80 L/s). Screenings from the mechanical screen are automatically removed from the screen via an inclined screw and dewatered then discharged into a bin for off-site disposal. Influent flows in excess of the mechanical screen capacity of 80 L/s will overflow a weir to the 20 mm aperture manual bar screen. Flows to the Biological Nutrient Removal Plant in excess of 30 L/s will overflow to the overflow storage basin.

Biological Nutrient Removal Plant

All screened wastewater will gravity flow to the Biological Nutrient Removal Plant. This plant will consist of an anaerobic and flow balancing tank, two aerobic/anoxic basins with surface aerators and internal recycling, waste activated sludge pumping to sludge drying pans and return activated sludge pumping to anaerobic tank.

The screened wastewater will be mixed in the 300 kL anaerobic and flow balancing tank with return activated sludge (RAS) from IDEAL 2. If the cover of the anaerobic tank is installed (in Stage 2, refer Section 2.5) the air space under the cover of the anaerobic/flow balancing tank will be ventilated and extracted by fan to the odour control unit. Under normal operation, the tank will operate approximately half full and provide a nominal hydraulic retention time of eight hours. The level in the anaerobic/flow tank will rise in wet weather and at high water level the nominal 15 L/s standby pump will also start pumping to the first aerobic/anoxic basin, giving a total pump rate of 30 L/s when combined with the duty pump which will be already pumping. Any screened flow in excess of 30 L/s will overflow by gravity to the 1.5 ML overflow storage basin when the anaerobic/flow attenuation tank is full (i.e. flow > 3 x median flow).

The mixed liquor will then be pumped with the duty pump on level control at up to 15 L/s to the first aerobic/anoxic basin. This tank will operate in series with the second aerobic/anoxic basin, providing a nominal hydraulic retention time of two days. The surface aerator in each basin will be operated on timers and dissolved oxygen (DO) will provide alternating aerobic and anoxic conditions to achieve complete biological oxidation of organic matter (BOD reduction), complete nitrification (ammonia oxidation) and significant denitrification (nitrogen removal). The DO concentration in the basins will be measured and recorded continuously, and DO output from the meter will be used to control the aerator operation together with the timers. Mixed liquor in the second basin will be recycled back to the first basin at up to 6 x median flow (i.e. a high rate) to optimise nitrogen removal. Excess sludge production (WAS) will be wasted each day to the sludge drying pans to maintain a steady biomass in the basins.
During the decant phase supernatant from the second aerobic/anoxic basin will flow by gravity into the polishing ponds (allows the effluent to be pumped through the filtration facility to the UV disinfection unit (if installed), refer Section 2.5). Settled sludge will be recycled back to the anaerobic tank at the head of the plant via the RAS pump station.

**Sludge Handling**

There are currently two 500 m$^2$ clay lined sludge drying (SDPs) pans provided for natural air drying of excess biological sludge. Excess sludge will be pumped under timer control from IDEAL 2 to the duty SDP. The duty SDP will be selected via manual isolating valves and operated with a water cap, which will be aerated to control odours. Excess water will be removed from the pans via a drainage system, flowing to a sump and being pumped automatically under level control to the anaerobic tank at the head of the plant. Sludge will be allowed to further stabilise and thicken in the bottom of the SDP. During summer, the duty SDP will be rotated and the water cap removed from the offline pans, therefore allowing the sludge to dewater and dry. Once dry, the remaining biosolids will be windrowed and then removed and trucked off-site for stockpiling for future beneficial reuse. An additional (third) SDP of similar size to the existing pans will be required for the increased loads and biosolids generation expected with the plant upgrade.

### 2.7 Construction and Commissioning

Table 8 below provides detail regarding significant construction activities and Table 9 provides a proposed timeline of construction activities.

#### Table 8 Proposed Construction Activities

<table>
<thead>
<tr>
<th>Item</th>
<th>Construction/Commissioning Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Stage 1 Works</strong></td>
<td></td>
</tr>
<tr>
<td>Site Preparation</td>
<td>The site will be brought up to existing WWTP level RL 230.0 metres. This level has been determined by MVC’s flood modelling to be above the 1 in 100 year flood level. It is prudent to note that this modelling was undertaken prior to the construction of the Meander Dam. The Dam’s location upstream on the Meander River theoretically provides additional flood protection by way of increased storage capacity within the catchment (providing the Dam is not at full water storage capacity prior to a flood event). Site levels for all new infrastructure will be increased by the placement and compaction of selected imported fill material. The source of the required fill material has not been determined at this stage. It will be selected to suit the purpose it will be used for and will include site investigations, testing, construction specifications and supervision. The source of materials will be selected to minimise environmental impacts. Once finished, ground level is established, the new infrastructure will be constructed. Management of earthworks during construction will be detailed in the Construction Environmental Management Plan (CEMP).</td>
</tr>
</tbody>
</table>
### Construction/Commissioning Activities

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Overflow Storage Basin</strong></td>
<td>Construction of a 1.5 ML overflow storage basin. Basin construction is comprised of an earthen basin with a HDPE liner to prevent leakage. Once completed, bypass pipework, pumping system and controls will be installed and commissioned.</td>
</tr>
<tr>
<td><strong>Anaerobic Tank</strong></td>
<td>Installation of Anaerobic Tank (300 kL). The Anaerobic Tank is likely to be a partially underground concrete tank. Pipework and pumping system for the Anaerobic Tank will be installed and commissioned following installation of the tank. There is provision for future odour control with a cover for the tank and a bio-scrubber and bio-filter adjacent to the Anaerobic Tank as part of Stage 2 works should any odour issues arise, however this is not anticipated.</td>
</tr>
<tr>
<td><strong>IDEAL 2 Decanter</strong></td>
<td>The installation of the new decanter will require IDEAL 2 to be taken off-line for an estimated period of one day to one week. During this period plant flows will be diverted around to the new overflow storage basin and around IDEAL 2 to the polishing lagoons.</td>
</tr>
<tr>
<td><strong>Extend Outfall Pipe</strong></td>
<td>The end of the existing outfall pipe in the Meander River will be replaced and the pipe will be extended approximately 10 metres out to be mid-channel in the Meander River. All construction works will be undertaken in accordance with DPIWE (2003) Waterways and Wetlands Works Manual: Environmental Best Practice Guidelines for Undertaking Works in Waterways and Wetlands in Tasmania.</td>
</tr>
<tr>
<td><strong>Sludge Drying Pan</strong></td>
<td>The proposed new Sludge Drying Pan 3 will be constructed adjacent to the proposed Overflow Storage Basin and the existing Sludge Drying Pan 1. The drying pan will be constructed within the built up area and incorporate an engineered clay liner.</td>
</tr>
<tr>
<td><strong>Stage 2 Works</strong></td>
<td>Following the implementation of Stage 1 works an assessment will be undertaken to determine the requirement for and nature of any additional works to improve plant performance. The results from the Effluent Reuse Feasibility Study will also be used to determine Stage 2 requirements. The following works are currently proposed.</td>
</tr>
<tr>
<td><strong>Chemical Dosing</strong></td>
<td>Automated carbon (liquid sugar or molassas) dosing system into the anaerobic or anoxic/aerobic tank for improved phosphorus and nitrogen removal.</td>
</tr>
</tbody>
</table>

---

12 Geomembrane liner – liner construction shall be undertaken in an approach consistent with the Environment Division’s protocol *Environmental Standards Applying to Liner Construction March 2006* (DEPHA 2006). This process will be managed through site investigation, engineering design, materials testing/quality controls and site supervision.

13 Engineered clay liner - liner construction shall be undertaken in an approach consistent with the Environment Division’s protocol *Environmental Standards Applying to Liner Construction March 2006* (DEPHA 2006). This process will be managed through site investigation, engineering design, materials testing/quality controls and site supervision.
### Item Construction/Commissioning Activities

<table>
<thead>
<tr>
<th>Item</th>
<th>Construction/Commissioning Activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical Phosphorus Removal</td>
<td>Automated chemical dosing system in the anoxic/aerobic tank for chemical phosphorus removal.</td>
</tr>
<tr>
<td>Install Balance Tank</td>
<td>The balance tank would be required to regulate flows through the UV disinfection unit.</td>
</tr>
<tr>
<td>Install Filtration and UV Disinfection Units</td>
<td>Media filtration and UV disinfection to remove solids and reduce thermostolerant coliform level in the effluent. A duel media filter may be required to remove suspended solids and improve transmissivity levels.</td>
</tr>
<tr>
<td>Anaerobic Tank Odour Control</td>
<td>Installation of a cover on the anaerobic tank and a two stage bio-scrubber and biofilter odour control system to vent foul air from the Anaerobic Tank. This will be installed if operational staff notice any odour.</td>
</tr>
<tr>
<td>Sludge Drying Pan</td>
<td>A second additional sludge drying pan of similar size to the existing pans may be required for the increased loads and sludge generation expected with the future flows and loads. The necessity for a fourth drying pan will be assessed following the installation of the third drying pan in Stage 1. The drying pan will be constructed within the built up area and incorporate an engineered clay liner.</td>
</tr>
</tbody>
</table>

Until Stage 1 works have been commissioned and assessed it is unknown if UV disinfection and odour control will be required. At the completion of Stage 1, a commissioning and assessment period will occur (approximately 7 weeks) during which time it will be determined whether the WWTP is consistently meeting the proposed emission limits. If full compliance is not achieved, approval for the Stage 2 works will be sought and a second commissioning and testing period will occur at the completion of Stage 2 works. A full Effluent Reuse Feasibility Study will also be completed prior to the commencement of Stage 2 works as per Commitment 7.

Appropriate environmental controls will be implemented for the construction and post-construction phases of this project. This will be detailed in the form of a Construction Environmental Management Plan (CEMP). Specific impact and mitigations measures are explained in further sections of this report.

The operational life of the upgrades will vary but the operator is obliged to ensure that regular maintenance of the plant occurs.

**Commitment 1**  
A Construction Environmental Management Plan will be prepared, prior to construction.

**Commitment 2**  
The 1.5 ML overflow storage basin will be HDPE lined. HDPE lining will be undertaken in an approach consistent with the Environment Division’s protocol Environmental Standards Applying to Liner Construction March 2006 (DEPHA 2006). This process will be managed through site investigation, engineering design, materials testing/quality controls and site supervision.

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14 Engineered clay liner - liner construction shall be undertaken in an approach consistent with the Environment Division’s protocol Environmental Standards Applying to Liner Construction March 2006 (DEPHA 2006). This process will be managed through site investigation, engineering design, materials testing/quality controls and site supervision.
Commitment 3  The sludge drying pans will be clay lined as the drying pans will be cleared using an excavator which has potential to damage other types of liners. The clay lining will be engineered to comply with the Environment Division’s protocol Environmental Standards Applying to Liner Construction March 2006 (DEPHA 2006). This process will be managed through site investigation, engineering design, materials testing/quality controls and site supervision.

Commitment 4  Install an Overflow Storage Basin prior to installing new decanter into IDEAL 2. As the plant may be out of service for up to a week whilst decanter is replaced, diverting wastewater to the new Overflow Storage Basin will ensure that untreated effluent is not released to Meander River.

Commitment 5  The operator will prepare an Operation and Maintenance Manual for the Deloraine WWTP.

Commitment 6  The existing outfall pipe will be replaced and extended to the mid-channel of the Meander River.
## Table 9  Proposed Construction Timeline

<table>
<thead>
<tr>
<th>Activity</th>
<th>Month (following project commencement)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Stage 1 Works</td>
<td></td>
</tr>
<tr>
<td>Detailed Design</td>
<td></td>
</tr>
<tr>
<td>Tendering</td>
<td></td>
</tr>
<tr>
<td>Site preparation/earthworks</td>
<td></td>
</tr>
<tr>
<td>Overflow storage basin</td>
<td></td>
</tr>
<tr>
<td>Pipework, pumps and controls</td>
<td></td>
</tr>
<tr>
<td>Anaerobic Tank</td>
<td></td>
</tr>
<tr>
<td>Chemical Dosing for P removal</td>
<td></td>
</tr>
<tr>
<td>IDEAL 2 decanter</td>
<td></td>
</tr>
<tr>
<td>Sludge drying pan</td>
<td></td>
</tr>
<tr>
<td>Commissioning</td>
<td></td>
</tr>
<tr>
<td>Stage 2 Works</td>
<td></td>
</tr>
<tr>
<td>Stage 1 assessment</td>
<td></td>
</tr>
<tr>
<td>Stage 2 design phase</td>
<td></td>
</tr>
<tr>
<td>Carbon dosing</td>
<td></td>
</tr>
<tr>
<td>Discharge balance tank</td>
<td></td>
</tr>
<tr>
<td>Filtration and disinfection</td>
<td></td>
</tr>
<tr>
<td>Odour control</td>
<td></td>
</tr>
<tr>
<td>Commissioning</td>
<td></td>
</tr>
</tbody>
</table>
2.8 Off-site Infrastructure

Sufficient electrical mains capacity is available at the existing plant to provide power for the proposed improvement works. The plant will require additional sub-mains power infrastructure for running the new pump stations and the chemical dosing pumps. The new decanter in IDEAL 2 is a replacement so should not require additional power than is already consumed by the current decanter. If Stage 2 works are necessary, additional sub-mains power will be required for the UV disinfection unit and if the odour control unit is required on the new Anaerobic Tank, then power will be required to run the extraction fans.

During times of power failure there is no installed back up power system for the treatment plant. There is a UPS system to support the alarms at time of power failure. The treatment plant operators have indicated that generators are readily available from Coates Hire or Carey Hire and are used when necessary. All inflow to the treatment plant is pumped from two pumping stations, hence for a wide area power failure there would be no inflow to the treatment plant until generators are deployed at the pumping stations. The West pumping station is reasonably new and has about four hours storage capacity at peak dry weather flow. The storage at the East pumping station has recently been increased to also provide four hours storage at peak dry weather flow. Four hours peak dry weather flow is equivalent to about 2.5 hours peak wet weather flow.

Water consumption at the treatment plant is minimal, with water being used mainly for domestic purposes, washing hands etc. There is no water added into the treatment process and this will not change with the upgrade.

2.9 Technical/Management Alternatives

Two key issues have been addressed in relation to alternative options, namely alternatives to the upgrade design and possibility for effluent reuse.

2.9.1 Alternative Upgrade Options

Three alternative upgrade options were considered in the CEE report, as outlined below.

Option 1 – Intermittent Decanters in IDEAL 1 and 2

This option involves the modification of both IDEAL 1 and 2 to intermittent decanting. The major components and features of this option are:

1. Increase plant capacity by 50% to design median flow of 860 kL/d (i.e. population served 3500 persons).
2. New 300 kL flow attenuation tank/anaerobic tank, with nominal total 12 hour storage capacity at design median flow (4 hour flow attenuation and 8 hour anaerobic storage). Mixers provided to blend influent with return sludge to optimise phosphorus uptake and maintain homogeneous contents.
3. Influent pumping to IDEAL 1 and 2 at up to 1.5 x design median flow, during normal operation and up to 3 x median flow bypassed to polishing lagoons.
4. Modify IDEAL 1 to intermittent decant basin, involving removing existing anaerobic chamber, providing larger 18.5 kW floating aerator, new effluent decanter with associated effluent discharge pipe to polishing lagoon, and sludge recycle and sludge waste pipework.
5. Upgrade IDEAL 2 involving providing a larger 18.5 kW floating aerator and a new effluent decanter.
6. Recycle sludge from IDEAL 1 and 2 to the anaerobic tank during the settling and decant periods to optimise phosphorus removal.

7. Two stage odour removal facility to treat odorous air from flow attenuation/anaerobic tank, involving wet scrubber and biofilter.

8. Upgrade sludge drying pans by raising embankments to RL 230.0 metres.

Option 2 – New IDEAL 3 and Intermittent Decanting in IDEAL 2 and 3

The major components and features of this option are:

1. Items 1 to 3 inclusive of Option 1.

2. Modify IDEAL 1 to aeration basin, involving retaining existing anoxic chamber and aerator and upgrading the interconnecting pipework to following tanks, including pit.

3. Upgrade IDEAL 2 involving retaining aerator and providing a standby aerator, a new baffle wall, effluent decanter and associated effluent and sludge pipework.

4. Modify Sludge Drying Pan 1 to IDEAL 3, including deepening and raising the basing and providing the following: high density polyethylene (HDPE) liner, walkway, baffle wall, mixer, aerator, decanter, and associated pipework.

5. Recycle sludge from IDEAL 2 and 3 to the anaerobic tank during the settling and decant periods to optimise phosphorus removal.

6. Two stage odour removal facility to treat odorous air from flow attenuation/anaerobic tank, involving wet scrubber and biofilter.

7. Upgrade sludge drying pan 2 by deepening and raising embankment to RL 230.0 metres.

Option 3 – Modify IDEAL 1 and 2 to aeration only, and new secondary sedimentation tank

The major components and features of this option are:

1. Items 1 to 3 inclusive of Option 1.

2. Modify IDEAL 1 and 2 to aeration basins, involving removing existing baffle wall in IDEAL 1 and decanter in IDEAL 2, providing a standby aerator and upgrading internal pipework and pump.

3. Providing 8.7 metres diameter sedimentation tank with associated sludge and scum scrapers with peripheral drive and associated sludge removal pit and valve.

4. Recycle sludge from IDEAL 1 and 2 to the anaerobic tank during the settling and decant periods to optimise phosphorus removal.

5. Two stage odour removal facility to treat odorous air from flow attenuation/anaerobic tank, involving wet scrubber and biofilter.

6. Upgrade sludge drying pans by raising embankment to RL 230.0 metres.

The Stage 2 works are common to each option and involve chemical dosing to trim effluent phosphorus, effluent filtration and effluent disinfection. These works include the installation of a UV disinfection unit, a balance tank, and additional nutrient removal in the anaerobic tank, as well as an additional sludge drying pan.
CEE’s report indicates that although Option 1 involves the simplest construction and lowest capital cost, these advantages do not outweigh the poor effluent quality achieved and the reduced process flexibility when compared with the other options. Option 2 has the disadvantages of high capital cost and lower suspended solids removal of decanters compared with sedimentation tank. Option 3 is of medium capital cost, yet has the advantages of: superior effluent quality and process control/flexibility; would be a best practice Biological Nutrient Removal Plant; and is well suited to future upgrade to tertiary treatment using effluent filter. On the basis of superior effluent quality and greater process flexibility, the report indicates that Option 3 is preferred to Option 1 and Option 2.

Therefore, Option 3 of that report was recommended as the preferred option and MVC accepted that recommendation. MVC then engaged GHD to undertake a process design review and modifications to Option 3 were recommended by GHD (Appendix B). The modified Option 3 is the proposed upgrading as detailed in Section 2.5 and as shown in Figure 2.

2.9.2 Effluent Reuse Feasibility Study

BLW have committed to complete an Effluent Reuse Feasibility Study to be completed by the end of the 7 week commissioning and assessment period for Stage 1. The scope of the Effluent Reuse Feasibility Study will be agreed by BLW and EPA and the results will be used to provide information for use in determining the scope of the Stage 2 works.

The potential for effluent reuse from the WWTP has been investigated by BLW at a conceptual design level to indicate the likely areas involved.

Potential Reuse Areas

Potentially suitable effluent reuse areas are located to the south east of the WWTP, east of Bonneys Creek and south of the Old Bass Highway (Figure 3). The largest reuse areas are located south of the Old Bass Highway. These areas are outside the low lying floodplain for the Meander River, being largely situated at around 250-300 metres AHD. The areas are cleared and slopes are typically less than 10%. The area is used for dry land grazing pasture, and is classified as largely Class 3 (prime agricultural land), with some Class 4 (marginal cropping land) adjacent to drainage lines (Figure 3). Groundwater has been located at a depth of approximately 3 metres in the proposed reuse area, which may potentially be suitable for drinking, irrigation or stock use.

Four properties identified could provide over 126 ha of Class 3 land for irrigation, allowing for suitable buffers from drainage lines, houses and boundaries. Three of these could provide around 100 ha of pasture, which would be sufficient for the future mean year (or current flow rates for a 1 in 10 year). It is assumed that travelling irrigators would be used so that spray drift and the required buffer zones could be minimised.

Commitment 7 An Effluent Reuse Feasibility Study will be prepared in parallel with Stage 1 and completed prior to the commencement of Stage 2 works. Reuse will be implemented where found to be feasible by the study.
Figure 3 Potential Irrigation Areas
3. The Existing Environment

3.1 Planning Aspects

3.1.1 Location and Associated Infrastructure
The WWTP is located within the confines of the Deloraine Racecourse, approximately 400 metres north of the Deloraine Town (Figure 1). It includes a tertiary treatment plant constructed in 2002 to augment the pre-existing wastewater lagoons. The plant is located immediately to the south of Lagoon 1 (Figure 1).

An overview of the operation of the existing WWTP is provided in Section 2.3. The existing facilities associated with the tertiary treatment plant have been built 300 mm above the level of the 1 in 100 year flood interval (229.7 metres AHD). The natural surface level at the site of the tertiary treatment plant is approximately 226 metres AHD.

The WWTP is accessed via a roadway extending from Racecourse Drive over the Racecourse and adjacent to other recreation areas within the property. The Bass Highway lies approximately 300 metres north of the plant, and approximately 50 metres north from Lagoon 2.

The WWTP and associated lagoons are located on a relatively flat section of cleared land within the Meander River floodplain. The river lies approximately 150 metres to the west. The outfall for the WWTP enters the Meander River underneath the overpass of the Bass Highway, 300 metres north of the tertiary treatment plant.

3.1.2 Land Tenure and Title Details
The Deloraine Racecourse at Racecourse Drive, Deloraine is formally described with Property Id (PID) 1951959. It occupies an area of 29.97 ha and is contained in two separate parcels, including:
- Conveyance 10/8969 (29.1 ha approximately);
- CT Vol. 54466 Fol. 1 (7938 m²) – the title is largely vacant.

Copies of the Title details are presented in the Planning Assessment Report (refer Appendix D).

The land is owned by MVC. It is generally bounded by the Bass Highway to the north, agricultural land to the east, the Meander River to the west and the Western (railway) Line to the south. The WWTP occupies an area of approximately 5 ha within the northern portion of the land within Conveyance 10/8969 and is operated by BLW. The land within CT Vol. 54466 Fol. 1 is unaffected by the proposed WWTP upgrade.

A portion of the land in Conveyance 10/8969 was transferred to BLW on 1 July 2009. The plan showing the limit of the land owned by BLW is shown in Figure 4.

An overview of the uses and developments located within the property is contained in Section 3.1.5 below.
Figure 4  Land Owned by BLW
3.1.3 Planning Controls
The site is subject to the provisions of the *Meander Valley Planning Scheme* 1995 (the Planning Scheme), both general and specific, and in particular Clause 2.2.2 ‘Permit Required in respect of Clause 31.5 of the *State Policy on Water Quality Management* 1997’, Clause 3.8 ‘Community Purposes Zone’ provisions, Clause 2.10 ‘Consideration of an Applications for a Permit’, Clause 4.4 ‘Probable Flood Areas’, Clause 4.5 ‘Watercourse Protection’, Clause 4.12 ‘Environmental Harm’ and Part 7 ‘Items of Cultural Significance’.

The site is zoned Community Use under the Planning Scheme (refer Figure 5).

3.1.4 Land Use History
As detailed in Section 1.2, MVC constructed the WWTP in 1972, with the plant consisting of one lagoon initially. A second lagoon was added in 1978. The facility was upgraded in 2002 to provide influent screening, biological nutrient removal treatment and two sludge drying pans followed by effluent polishing in the pre-existing lagoons. An overview of the operation of the existing WWTP is provided in Section 2.3. An upgrade of the West Deloraine Wastewater Pump Station was undertaken in 2007, which increased the influent flow rate to the WWTP.

There are a variety of other existing uses and developments established within the wider Deloraine Racecourse property. These are described in the following section.

3.1.5 Surrounding Land Uses
The Deloraine Racecourse contains a variety of existing uses and developments, including:

- The WWTP described above in Section 3.1.1.
- The racetrack and buildings associated with the Deloraine Racecourse. The tertiary treatment plant and Lagoon 1 associated with the WWTP are located inside the racetrack. Lagoon 2 is located immediately to the north of the racetrack.
- Horse yards and stables associated with the racetrack.
- Recreation ground and football club to the south of the tertiary treatment facilities, also within the racetrack.
- The MVC works depot for Deloraine.
- Tennis courts opposite the works depot.
- Overnight parking area for motor homes east of the tennis courts.

The majority of these uses are either wholly or partly within 500 metres of the proposed WWTP upgrade. The entire site is within the Community Purposes Zone under the Planning Scheme (Figure 5).

The land to the west, north and east of the property is agricultural land within the Rural Zone under the Planning Scheme (Figure 5). The land to the south is part of the Deloraine Town. The Impact Fertiliser Depot and former Elders Webster Site (rural merchandise supplier) are located immediately to the south, north of the Western (railway) Line on the eastern side of East Westbury Place.

The closest residences to the WWTP are on the western side of the Meander River along River Road and to the south east of the WWTP along Grigg Street, both within the Rural Zone and approximately 300 metres from the WWTP boundary. There are also other residences on both of these roads, and East Westbury Place, Railway Street, West Parade and Westbury Place, occurring within approximately 500 to 600 metres of the WWTP, within Residential, Business and Industrial Zones (Figure 1 and Figure 5).
Figure 5  Planning Zones
3.2 Environmental Aspects

3.2.1 Topography, Geology and Soils

Topography
The WWTP site is located approximately 400 metres north of the Deloraine Town (Figure 1). The site is approximately 226 metres Australian height datum (AHD), with the topography rising across the western side of the Meander River to approximately 250 metres AHD. The town of Deloraine is situated on the flood plain along both sides of the Meander River with the majority of residents based on the western side of Meander River where the elevation is higher.

The site is surrounded by grassed land on all sides with vegetation lining the banks of the Meander River on the western side of the site.

Soils
The WWTP is situated on the Meander River floodplain, which is composed of vertosol soil\(^{15}\). These are shrink and swell clay soils that are prone to cracking as the soil dries. Vertosols usually support grazing of native and improved pastures and extensive dry land agriculture where rainfall is adequate and in areas where irrigation occurs\(^{16}\).

Geology
The WWTP is located within an area comprising surface geology of Quaternary sands, gravel and muds of alluvial origin. The Quaternary floodplain area extends to the east abutting Jurassic dolerite and/or Tertiary basalt ridges to the west and south (Figure 6).

\(^{15}\) Reference: LIST (14/04/09).
\(^{16}\) Reference: CSIRO Australian Soil Classification (Isbell 1996).
Figure 6  Surface Geology and Monitoring Well Location
3.2.2 Geomorphology

The most outstanding geomorphic feature in the vicinity of the WWTP is the Meander River. The river at Deloraine has a meandering channel form, with the majority of the surrounding land likely to have originally been floodplain. The channel is relatively shallow and is generally 1 metres deep. The base of the channel is comprised principally of gravels up to 100 mm in diameter that are well consolidated.

The banks of the river have been colonised by willows and as a result channel capacity has possibly reduced from the river’s original (pre-willow) condition. Some gravel point bars are present, however these are also vegetated and do not appear to be currently mobile.

The Tasmania Geoconservation Database (TGD) lists geological and geomorphic features of conservation significance. One Geoconservation Area is the Deloraine Eocene Fossil Site located within 1 km of the WWTP. This site has a sensitivity of 8 (Values sensitive to major removal of geo-material, or large scale excavation or construction – e.g. values which may be degraded by quarries; sites of large dam construction), and is significant on a state-wide scale. The description of the site provided in the TGD states that Early Eocene ironstones have been exposed in road cutting, and fossils include impressions of *Nothofagus* species and other broad leaved angiosperms.

3.2.3 Meteorology

The nearest meteorological station with long term records for temperature and rainfall is located in Deloraine on the Railway bridge, which is approximately 1 km from the WWTP. Rainfall has been recorded from 1891 to the present, however, temperature records have only been recorded from 1901 to 1950. These are displayed in Table 10 and represented in Figure 7, Figure 8 and Figure 9.

<table>
<thead>
<tr>
<th>Climate Parameter</th>
<th>Climate Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean Maximum Temperature (hottest month)</td>
<td>22.5°C (February)</td>
</tr>
<tr>
<td>Annual Mean Temperature</td>
<td>16.0°C</td>
</tr>
<tr>
<td>Mean Minimum Temperature (coolest month)</td>
<td>0.9°C (July)</td>
</tr>
<tr>
<td>Annual Mean Minimum</td>
<td>4.4°C</td>
</tr>
<tr>
<td>Mean Annual Rainfall</td>
<td>949.4 mm</td>
</tr>
<tr>
<td>Mean Monthly Rainfall</td>
<td>79.1 mm</td>
</tr>
</tbody>
</table>
Figure 7  Mean Maximum Temperatures for Deloraine (1901-1950)\(^{17}\)

![Mean Maximum Temperatures for Deloraine (1901-1950)](chart)

Source: BOM (19/03/2009).

Figure 8  Mean Minimum Temperatures for the Deloraine Weather Station (1901-1950)\(^{18}\)

![Mean Minimum Temperatures for the Deloraine Weather Station (1901-1950)](chart)

Source: BOM (19/03/2009).

\(^{17}\) Source: BOM (19/03/2009).

\(^{18}\) Source: BOM (19/03/2009).
The average annual rainfall for Deloraine is 949.4 mm. Average monthly rainfall is variable between seasons, with February and March being the driest months of the year. The average rainfall in July (120.6 mm) is nearly three times that of February (46.0 mm).

There has been no wind speed data collected at the Deloraine Weather Station base.

### 3.2.4 Conservation Areas, Wilderness and Reserves

A search of the LIST database has revealed several public reserve areas to the south of the WWTP. These reserves generally cover both banks of the Meander River and the eastern shore along the railway line. No areas of high quality wilderness are located within 5 kilometres of the WWTP.

### 3.2.5 Groundwater

The WWTP is located within an area comprising surface geology of Quaternary sands, gravel and muds of alluvial origin. The Quaternary floodplain area extends to the east abutting Jurassic dolerite and/or Tertiary basalt ridges to the west and south (Figure 6). Groundwater flow is primarily through intergranular flow where gravels and sand exist. The shallow Quaternary aquifer is considered here due to the shallow nature of the proposed WWTP workings. Fractured rock has not been discussed.

Groundwater flow is expected to be a subdued version of the topography, generally moving from east to west across the floodplain and discharging to the Meander River. Recharge is expected to be from multiple sources, including irrigation, open drains, rainfall, and WWTP seepage. Locally, the groundwater is used for domestic and agricultural purposes, and serves as an important resource. DPIW (2004) described the groundwater in this area as a significant resource, which, to date, is predominantly untapped.

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19 Source: BOM (19/03/2009).
Local geotechnical work carried out has provided anecdotal evidence around the site area. However, there are deficiencies regarding the current monitoring network and hydrogeological understanding. Geotechnical drilling logs (BFP Consultants 2001) show groundwater rising in well holes to within 1 metre of the surface. This indicates that semi-confined to confined conditions are likely to exist at the site. The geotechnical wells were drilled to approximately 3 to 4 metres below the surface.

The current groundwater monitoring network consists of three wells. The location of these wells is shown in Figure 6. Construction details were not available at the time of writing, however a GHD environmental scientist measured total depth and water levels during site investigation (7 April 2009), the results of which are listed below in Table 11.

Table 11 Summary of Current Groundwater Monitoring Network

<table>
<thead>
<tr>
<th>Bore ID</th>
<th>Other ID</th>
<th>Easting (GDA94)</th>
<th>Northing (GDA94)</th>
<th>Reference Point</th>
<th>Total Well Depth (mBREF*)</th>
<th>Standing Water Level (mBREF*)</th>
<th>Stick up (m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D10</td>
<td>4</td>
<td>472118</td>
<td>5403588</td>
<td>Top of PVC casing</td>
<td>3.88</td>
<td>0.87</td>
<td>0.09</td>
</tr>
<tr>
<td>D11</td>
<td>3</td>
<td>472057</td>
<td>5403624</td>
<td>Top of PVC casing</td>
<td>4.36</td>
<td>1.46</td>
<td>0.06</td>
</tr>
<tr>
<td>D12</td>
<td>5</td>
<td>472239</td>
<td>5403630</td>
<td>Top of PVC casing</td>
<td>3.23</td>
<td>0.90</td>
<td>0.07</td>
</tr>
</tbody>
</table>

*mBREF refers to metres below reference point. The reference point is provided in the column prior.

Table 12 summarises the monitoring parameters, method and frequency of testing required.

Table 12 Current (2002) ELMS Groundwater Monitoring Parameters and Frequency

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Sampling Method</th>
<th>Sampling Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>mg/L</td>
<td>Sample site test</td>
<td>Annually</td>
</tr>
<tr>
<td>Conductivity</td>
<td>µS/cm</td>
<td>Sample site test</td>
<td>Annually</td>
</tr>
<tr>
<td>Total Dissolved Solids (TDS)</td>
<td>mg/L</td>
<td>Grab</td>
<td>Annually</td>
</tr>
<tr>
<td>Ammonia Nitrogen</td>
<td>mg/L</td>
<td>Grab</td>
<td>Annually</td>
</tr>
<tr>
<td>Nitrate Nitrogen</td>
<td>mg/L</td>
<td>Grab</td>
<td>Annually</td>
</tr>
<tr>
<td>Nitrite Nitrogen</td>
<td>mg/L</td>
<td>Grab</td>
<td>Annually</td>
</tr>
<tr>
<td>Total Nitrogen</td>
<td>mg/L</td>
<td>Grab</td>
<td>Annually</td>
</tr>
<tr>
<td>Total Phosphorus</td>
<td>mg/L</td>
<td>Grab</td>
<td>Annually</td>
</tr>
<tr>
<td>Thermotolerant coliforms</td>
<td>Orgs/100 ml</td>
<td>Grab</td>
<td>Annually</td>
</tr>
</tbody>
</table>
Results from the current monitoring network are presented in Appendix E. These results show an increasing trend in total nitrogen and decreasing trend for total phosphorus. It should be noted that only three monitoring events appear to have occurred over the previous four years and that each of the current monitoring wells appear to be located up gradient of the existing WWTP. As such, levels of nutrients may be linked to background levels rather than site specific influences. There is no survey data to confirm flow directions and therefore it is not possible to assess the source of the increased levels of nutrients.

3.2.6 Surface Water

As a major sub-catchment of the South Esk River, the Meander River catchment covers an area of approximately 1,600 square kilometres in northern Tasmania. The Liffey River, Quamby Brook and Western Creek are the major contributing waterways within the catchment. The headwaters of the Meander River rise within the high rainfall areas of the Great Western Tiers before flowing north and east to join the South Esk River below Hadspen (DPIW 2004).

The Great Western Tiers have a considerable impact upon regional climatic conditions. Because of its higher altitude (over 1,000 metres), the escarpment is characterised by greater annual rainfall (2,200 mm average) and colder conditions with greater frequency of snow and frost. Conditions are less severe to the north and to the east with milder temperatures and lower rainfall (annual average around 700 mm in the east). However, some lower lying catchments such as the Meander and Liffey are prone to flooding due to high rainfall events along the escarpment (DPIW 2004).

3.2.6.1 Water Flows

Stream flow within the Meander River is highly variable, both between years and between months. Winter is the period of highest average flows. Water drawn off for irrigation between November and March significantly reduces stream flow during these months.

In order to assess the impacts from an upgraded WWTP discharge, periods of low flow in the Meander River at Deloraine must be considered. For this purpose the Project Specific Guidelines require the establishment of the 7Q10, which represents the 7-day minimum flow over a 10-year annual exceedence probability. However, it must be noted that this 7Q10 calculation does not take into account the Meander Dam that was commissioned in 2007. The Meander Dam’s operating licence requires that there is a minimum Environmental Flow Requirement of 1.1 cumecs, measurable at Strathbridge (downstream of the WWTP outfall) and also at another location upstream of the WWTP outfall. Therefore, the flow within the Meander River should never fall below this level during low flow periods. The mixing zone modelling discussed in Section 4.2 is based on this low flow scenario instead of the 7Q10 to provide an accurate assessment of dilution within the Meander River.

However, the 7Q10 flow was calculated using gauging data from the Meander River at Deloraine (sourced Hydro Tasmania) which was analysed using the hydraulic analysis package D-Flow. Daily flow data was collated from 28/10/1995 to 29/10/2008 to calculate this information.

The results of this analysis are provided in Table 13 and indicate a 7Q10 of 0.11 cubic metres per second.

<p>| Table 13 Meander River at Deloraine Daily Flow Statistics – 1995-2008 (m³/sec) |
|---------------------------------|--------|--------|--------|--------|--------|</p>
<table>
<thead>
<tr>
<th>Average</th>
<th>Median</th>
<th>Minimum</th>
<th>Max</th>
<th>7Q10</th>
<th>Min E-Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.7</td>
<td>4.2</td>
<td>0.03</td>
<td>302.9</td>
<td>0.11</td>
<td>1.1</td>
</tr>
</tbody>
</table>

3.2.6.2 Ambient Water Quality

Water quality information for the receiving waters of the Meander River has been sourced from the EPA. This data range is from 2001 to 2008; however, it must be noted that the monitoring frequency is irregular and caution needs to be asserted when interpreting this data. Upstream water samples are collected from the western side of Meander River just north of the railway bridge in Deloraine (Figure 16). This area is heavily disturbed by human activity and it is also just upstream of a weir. Downstream samples are collected approximately 200 metres north of the Bass Highway on the western edge of the Meander River.

**Upstream Water Quality**

Under ANZECC water quality guidelines (ANZECC & ARMCANZ 2000) the Meander River at Deloraine is characterised as an upland river (altitude >150 metres) and as a slightly disturbed ecosystem. Table 14 summarises the upstream water quality results and provides a comparison against the ANZECC 95% species protection trigger values.

**Table 14 Upstream Water Quality of Meander River**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Median</th>
<th>80th Percentile</th>
<th>Max</th>
<th>ANZECC 95% Species Protection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field Cond @ TRef 25 (µscm⁻¹)</td>
<td>65.1</td>
<td>79.00</td>
<td>108.5</td>
<td>152.3</td>
<td>2-250</td>
</tr>
<tr>
<td>pH field - sensor TC</td>
<td>6.8</td>
<td>7.45</td>
<td>7.60</td>
<td>7.94</td>
<td>6.0-7.5</td>
</tr>
<tr>
<td>Dissolved Oxygen- mg/L, (% saturation)</td>
<td>7.56</td>
<td>8.92</td>
<td>10.66</td>
<td>12.3</td>
<td></td>
</tr>
<tr>
<td>Total N (mg/L)</td>
<td>0.05</td>
<td>0.35</td>
<td>0.75</td>
<td>4.11</td>
<td>0.15</td>
</tr>
<tr>
<td>Total P (mg/L)</td>
<td>0.02</td>
<td>0.05</td>
<td>0.065</td>
<td>0.40</td>
<td>0.013</td>
</tr>
<tr>
<td>Ammonia (mg/L)</td>
<td>0.01</td>
<td>0.05*</td>
<td>0.13</td>
<td>0.74</td>
<td>0.013</td>
</tr>
<tr>
<td>Nitrate (mg/L)</td>
<td>0.03</td>
<td>0.06*</td>
<td>0.25</td>
<td>0.829</td>
<td>0.015</td>
</tr>
<tr>
<td>Nitrite (mg/L)</td>
<td>0.01</td>
<td>0.05</td>
<td>0.05</td>
<td>0.5</td>
<td>0.015</td>
</tr>
<tr>
<td>Thermotolerant coliforms</td>
<td>50</td>
<td>295</td>
<td>762</td>
<td>2000</td>
<td></td>
</tr>
<tr>
<td>Biochemical Oxygen Demand</td>
<td>1.60</td>
<td>3</td>
<td>6.2</td>
<td>11</td>
<td></td>
</tr>
</tbody>
</table>

* Bold denotes non-compliance with ANZECC 2000

* Median values for ammonia and nitrate largely reflect the limit of reporting from the laboratory rather than actual results.

Water quality results indicate that the Meander River at Deloraine does not comply with the ANZECC 95% trigger values for upland river systems with the median concentrations of total nitrogen, total phosphorus, ammonia, nitrate and nitrite all exceeding the trigger values. However it is important to note that the median values for ammonia and nitrate largely reflect the limit of the reporting from the laboratory rather than actual results.

The median pH and electrical conductivity are both within the range for upland river systems.
**Downstream Water Quality**

The results from the downstream site indicate that the ammonia, total phosphorus, total nitrogen and nitrate are above the ANZECC guidelines for upland river system (refer Table 15). Similar to the trend observed for the upstream site, the non-compliance may be attributed to the laboratory limit of reporting.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Min</th>
<th>Median</th>
<th>80th Percentile</th>
<th>Max</th>
<th>ANZECC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Field Cond @ TRef 25 (µscm⁻¹)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2-250</td>
</tr>
<tr>
<td>pH field – Sensor TC</td>
<td>6.8</td>
<td>7.55</td>
<td>7.60</td>
<td>7.71</td>
<td>6.0-7.5</td>
</tr>
<tr>
<td>Dissolved Oxygen-mg/L, (% saturation)</td>
<td>8.02</td>
<td>9.39</td>
<td>10.84</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Total N (mg/L)</td>
<td>0.05</td>
<td>0.13</td>
<td>0.51</td>
<td>1.13</td>
<td>0.15</td>
</tr>
<tr>
<td>Total P (mg/L)</td>
<td>0.02</td>
<td>0.05*</td>
<td>0.108</td>
<td>2.38</td>
<td>0.013</td>
</tr>
<tr>
<td>Ammonia (mg/L)</td>
<td>0.01</td>
<td>0.05*</td>
<td>0.06</td>
<td>0.12</td>
<td>0.013</td>
</tr>
<tr>
<td>Nitrate (mg/L)</td>
<td>0.04</td>
<td>0.1*</td>
<td>0.25</td>
<td>0.89</td>
<td>0.015</td>
</tr>
<tr>
<td>Nitrite (mg/L)</td>
<td>0.01</td>
<td>0.01</td>
<td>0.05</td>
<td>0.05</td>
<td>0.015</td>
</tr>
<tr>
<td>Thermotolerant coliforms</td>
<td>45</td>
<td>150</td>
<td>392</td>
<td>2700</td>
<td></td>
</tr>
<tr>
<td>Biochemical Oxygen Demand</td>
<td>2</td>
<td>2.7</td>
<td>5.6</td>
<td>12</td>
<td></td>
</tr>
</tbody>
</table>

* Bold denotes non-compliance with ANZECC 2000*

* Median values for ammonia, total phosphorus and nitrate largely reflect the limit of reporting from the laboratory rather than actual results

**3.2.6.3 Protected Environmental Values (PEVs)**

In order to comply with the *State Policy on Water Quality Management* 1997 (SPWQM), it is important that the proposed discharge does not compromise the PEVs of the receiving environment: the Meander River.

For all surface waters within private land (including forest on private land), the PEVs for the Meander River Catchment state that:

“...as a minimum, water quality management strategies should provide water of a physical and chemical nature to support a modified, but healthy aquatic ecosystem from which edible fish may be harvested; that is suitable to supply town drinking water (subject to coarse screening plus disinfection) at Westbury/Hagley, Exton, Bracknell and Deloraine; that is acceptable for irrigation and stock watering purposes; and which will allow people to safely engage in primary and secondary contact recreation activities such as swimming (Deloraine, Egmont and Bracknell), paddling or fishing in aesthetically pleasing waters; and is suitable for use by Pivot and (following impoundment) in the Trevallyn Power Scheme.” (DPIWE 2004).

Note: Pivot Nutrition extracts water from the Liffey River. Bracknell water is taken from the Liffey River. Deloraine water supply has its intake upstream of the WWTP.
Specifically, the PEVs relevant to this development include:

A Protection of Aquatic Ecosystems:
   (i) Protection of modified (not pristine) ecosystems from which edible fish are harvested

B Recreational Water Quality and Aesthetics:
   (i) Primary contact water quality (Deloraine, Egmont [Birralee Road] and Bracknell)
   (ii) Secondary contact water quality
   (iii) Aesthetic water quality

C Raw Water for Drinking Water Supply (Westbury/Hagley, Exton, Bracknell, and Deloraine)
   (i) Subject to coarse screening plus disinfection

D Agricultural Water Uses:
   (i) Irrigation
   (ii) Stock watering

E Industrial Water Supply (Hydro-Electric Power Generation, Pivot)

3.2.6.4 Water Quality Objectives (WQOs)

Part 3, Section 9 of the SPWQM states that WQOs for a specific body of water are to be the most stringent set of water quality guidelines which should be met to achieve all of the PEVs nominated for the body of water.

WQOs do not set regulatory limits. They are used as a measure of success required by part of the SPWQM for the management of point and diffuse source pollution.

The Board of Environmental Management and Pollution Control will determine the water quality guidelines for key indicators to achieve protected environmental values in accordance with Clauses 8.2 and 8.3.

The WQOs presented in Table 16 cover each PEV identified for the Meander River. As identified in Part 3 Section 8.3 of the SPWQM the ANZECC water quality guidelines (ANZECC & ARMCANZ 2000) have been used as the principal basis for identifying WQOs. However, there are no WQOs for Industrial users. The WQOs for raw drinking water for town and homestead supply is based on the parameters set by the Australian Drinking Water Guidelines (NHMRC & NRmmC 2004). It is noted that background water quality concentrations are in exceedence of numerous WQOs.
### Table 16  WQOs for Identified PEVs of the Meander River

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Ecosystem Health</th>
<th>Recreation (Primary)</th>
<th>Raw Drinking</th>
<th>Agriculture</th>
<th>Livestock</th>
<th>80th Percentile Background</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dissolved Oxygen (mg/L)</td>
<td>85%-110%</td>
<td>&gt; 85%*</td>
<td></td>
<td></td>
<td></td>
<td>10.84</td>
</tr>
<tr>
<td>pH</td>
<td>6.5-7.5</td>
<td>5-9</td>
<td>4.5-9.0</td>
<td></td>
<td></td>
<td>7.6</td>
</tr>
<tr>
<td>Salinity (μs/cm)</td>
<td>&lt; 2200</td>
<td>670 000</td>
<td>Variable</td>
<td></td>
<td></td>
<td>3350###</td>
</tr>
<tr>
<td>Algae (cells/ml)</td>
<td></td>
<td>15000-20000</td>
<td></td>
<td></td>
<td></td>
<td>11,500</td>
</tr>
<tr>
<td>Copper (mg/L)</td>
<td>0.002-0.005</td>
<td>1</td>
<td>2</td>
<td>0.2</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>Iron (mg/L)</td>
<td>0.3</td>
<td>0.3*</td>
<td>0.2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zinc (mg/L)</td>
<td>5</td>
<td>3*</td>
<td>2</td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Phosphorus (mg/L)</td>
<td>0.020</td>
<td>0.05</td>
<td>0.108</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ammonia (mg/L)</td>
<td>0.013</td>
<td>0.01</td>
<td>0.5*</td>
<td></td>
<td>0.06</td>
<td></td>
</tr>
<tr>
<td>Total Nitrogen (mg/L)</td>
<td>0.250</td>
<td>5</td>
<td>30</td>
<td>0.51</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrate (mg/L)</td>
<td>0.015</td>
<td>10</td>
<td>&lt;50</td>
<td>0.25</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nitrite (mg/L)</td>
<td>0.015</td>
<td>1</td>
<td>3</td>
<td>0.05</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chloride (mg/L)</td>
<td>400</td>
<td>250**</td>
<td>30-700</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Calcium (mg/L)</td>
<td></td>
<td></td>
<td></td>
<td>1000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sulphate (mg/L)</td>
<td>400</td>
<td>250***</td>
<td>1000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Faecal Coliforms (per 100 ml)</td>
<td>&lt;150^</td>
<td>0</td>
<td>1000^^</td>
<td>1000^</td>
<td>392</td>
<td></td>
</tr>
<tr>
<td>Enterococci (per 100 ml)</td>
<td></td>
<td></td>
<td></td>
<td>35###</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Table Notes:**

#  Median of at least five samples with four of the five having < 600
## Median of at least five samples with none > 100
### Based on requirement for sheep. This trigger value varies across each live commodity.
^  Median with no more than one in five samples > 4000
^^ Median with no more than one in five samples > 5000
^^^^ Downstream quality adopted as background as better quality reported at this site
*  Aesthetic value. Insufficient data to set guideline value based on health considerations.
** Aesthetic value. No health based guideline is considered necessary.
*** Aesthetic value as Aesthetic value is lower than Health value
3.2.6.5 Aquatic Biology

An aquatic biology assessment of the Meander River was undertaken in autumn 2009 to investigate the health and integrity of the receiving environment. Information provided in this Section is a summary of the outcomes from this assessment. The full aquatic biology report is presented in Appendix F.

The aims and objectives of the study were to:

- Provide a baseline assessment on the general ecosystem health of the Meander River so that compliance monitoring of the downstream environment can be undertaken in the future.
- Investigate the extent of impact that the existing discharge is having on the Meander River.
- Identify and survey for the presence of listed aquatic species.

The assessment was completed in two parts.

- An initial desktop study of the proposed receiving environment was completed to identify the freshwater dependent values.
- A field based aquatic survey that targeted both frog and macroinvertebrate communities.

Results of Desktop Assessment

The desktop assessment revealed that the EPBC Act listed green and gold frog (*Litoria reniformis*) has been historically recorded within 500 metres of the existing discharge. However, there is no date recorded for this observation. In conjunction with this, the EPBC Act Protected Matters Search Tool also identified an area within 500 metres of the proposed discharge as potential habitat for this species.

The EPBC Act Protected Matters Search Tool also identified the Meander River as potential habitat for the EPBC Act listed Australian grayling. It is important to note that, due to Trevallyn Dam blocking the critical migration path for this species and the abundance of introduced trout within this waterway, it is highly unlikely that the Australian grayling is present within the vicinity of the proposed discharge point. As such, no further investigation of this species was undertaken.

The Conservation of Freshwater Ecosystem Values (CFEV) database identified the Meander River receiving environment as a highly modified system, with low naturalness and a significantly-to-severely impaired biological condition for the river section. Overall, the site within the CFEV database is listed as a Low Conservation Management Priority (CMPI2). The river section is part of a river cluster for which the improvement of current conservation management is a low priority.

CFEV lists that the river section displays an extremely impaired biological condition with low vegetation occurring within the riparian zone and dense willow (*Salix* sp.) infestations.

The database lists the macroinvertebrate communities as low-to-very low total density, and severely altered assemblage composition of benthic macroinvertebrates for the river section. AUSRIVAS O/E ranked index falls within the BC impairment band region, O/E rank range approximately 0.3 to 0.7, with a mean of approximately 0.5; significantly-to-severely impaired.

The CFEV database identifies a moderate level of catchment disturbance affecting stream channel and sediments. The database attributes this to intensive agriculture and forest clearance within the catchment.
Results of Field Survey

The second stage of the assessment involved a field based aquatic survey that targeted both frog and macroinvertebrate communities.

The study area did not contain any off-channel water bodies and, therefore, all survey efforts concentrated on the main river channel and immediate riparian vegetation. The targeted frog call playback survey failed to identify the presence of the green and gold frog (*Litoria reniformis*). No green and gold frogs or tadpoles were detected during the visit to the study area. The only species that was encountered was the spotted marsh frog (*Lymnodynastes tasmaniensis*). This species was audible during call playback surveys.

Macroinvertebrate communities were sampled from eight sites within the vicinity of the proposed outfall. Four sites were located upstream of the proposed discharge point, with the remaining four sites located in the downstream receiving environment (Sites 3 and 4 within the expected current mixing zone and Sites 1 and 2 outside of the expected current mixing zone). Samples were taken using the Tasmanian AUSRIVAS sampling protocol. The macroinvertebrate data was analysed using a number of macroinvertebrate indices. This approach was taken to confirm the consistency of observed trends and to draw more rigorous conclusions from data. These analytical approaches included basic abundance and diversity analysis, Ephemeroptera, Plecopteran and Tricoptera (EPT) ratios, SIGNAL2 analysis, AUSRIVAS analysis and multivariate ordination and classification.

A total of 816 macroinvertebrate specimens from 34 taxa were identified from the eight samples. No listed macroinvertebrate species were identified as part of this project.

The Leptoceridae (caddis fly) was the dominant family sampled throughout this survey. This is one of the most commonly occurring taxa throughout temperate Australia that are somewhat sensitive to water pollutants and disturbance. In general, they prefer slow flowing waters where organic matter accumulates. Overall individuals from this family accounted for 34% of the total macroinvertebrates sampled.

The dipteran subfamily, Orthocladiinae, was the second most abundant taxa sampled from the survey. In total, this subfamily of Chironomidae only accounted for 10% of the total abundance. This taxa was particularly abundant at sites downstream of the existing discharge. Most Orthocladiinae are algal grazers, however some are parasites and others are woodborers.

Overall, diversity across the eight sites sampled was relatively consistent in terms of composition. However, Sites 3 and 4, immediately downstream of the discharge, contained the greatest diversity.

The EPT ratios across the eight sample sites were generally higher downstream of the existing discharge with an overall EPT ratio of 28.86. Site 2 displayed the maximum EPT ratio of 43.75, whereas the minimum EPT ratio was at Site 6, upstream of the existing discharge. All EPT ratios were within a similar range.

The AUSRIVAS model indicates that most sites sampled upstream of the existing outfall fall within band C (severely impaired) with one site falling within band B (significantly impaired), whereas sites located downstream of the existing outfall fall into bands B (significantly impaired) and A (reference condition).

Upon initial view, the EPT and AUSRIVAS analysis indicates that that the reach downstream of the discharge is in better condition than the upstream reach, however it is important to note that this observed difference is likely a reflection of habitat availability.
SIGNAL 2 values ranged between 3.43 and 4.38. When plotted on a SIGNAL 2 Bi-plot, all sites except for Sites 3 and 4 (sites located immediately downstream of the discharge) fell within Quadrant 4 (bottom left). This indicates that these sites were dominated by pollution/disturbance tolerant families in low abundance. Such sites are likely to be subject to urban, industrial or agricultural pollution or suffer downstream effects of dams or any combination of these factors.

Sites 3 and 4 fell into Quadrant 2 (bottom right). This quadrant represents lower SIGNAL 2 scores and a high diversity of macroinvertebrate taxa. Sites falling in this quadrant are likely to have higher levels of turbidity, salinity or nutrients than those in Quadrant 1 and are characteristic of sites impacted by either agricultural runoff or wastewater. Given the location of these sites in relation to the existing discharge it is likely that these results are directly attributed to the wastewater outfall.

The PRIMER multivariate analysis of the macroinvertebrate data indicates that there is not a distinct separation between the sites located upstream and downstream of the discharge. Despite this, it is important to recognise that the overall impacts from the existing discharge are largely masked by confounding factors such as the overall degraded nature of the river and the variation of habitat availability between sample sites (identified by the EPT ratios). Despite this, the results suggest that the macroinvertebrate communities at a distance of 300 metres downstream of the existing outfall show signs of nutrient enrichment.

There were no species identified during the assessment that are listed under the Tasmanian Threatened Species Protection Act 1995 (TSP Act) or the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act). This is consistent with the findings of the desktop analysis of the Study Area.
Figure 10  Macroinvertebrate Sample Sites
3.2.7 Flora and Fauna

The proposed overflow basin and third sludge drying pan in Stage 1 works are to be located within the current WWTP complex within the recreation and racecourse reserve, which is a highly disturbed environment. The following information is based on desktop searches of the Natural Values Atlas and the EPBC Act Protected Matters Search Tool.

Vegetation Communities

Six TASVEG communities are located within 1 km of the WWTP. These communities are:

- OAQ (Water, sea)
- FWU (Weed infestation)
- FAG (Agricultural land)
- NAD (Acacia dealbata forest)
- FUR (Urban areas)

None of these vegetation communities are of conservation significance. The areas of FWU and NAD may provide some fauna habitat, however these vegetation communities are almost 1 km away from the site. The most common vegetation community surrounding the WWTP is FAG.

Flora Values

A number of threatened flora species listed under the Tasmanian Threatened Species Protection Act 1995 (TSP Act) have been previously recorded within 5 km of the study area. These species and their status are listed below:

- Epilobium pallidiflorum (showy willowherb), rare
- Glycine microphylla (small leaf glycine), vulnerable
- Juncus prismatocarpus (branching rush, rare)
- Lotus australis (australian trefoil), rare
- Pimelea curviflora var. gracilis (slender curved riceflower), rare
- Velleia paradoxa (spur velleia), vulnerable
- Viola caleyana (swamp violet), rare

The EPBC Act Protected Matters Search Tool identified the area as containing potential habitat for the following two federally listed flora species:

- Colobanthus curtisiae (grassland cupflower)
- Glycine latrobeana (clover glycine)

It is considered unlikely that any of the above species would occur within the study site, due to the highly disturbed and modified nature of the site. Areas of grassland are grazed by horses, and dominated by introduced pasture grasses.
Fauna Values

A number of threatened fauna species listed under the Tasmanian Threatened Species Protection Act 1995 (TSP Act) have been previously recorded within 5 kilometres of the study area. These species and their status (Tasmanian/Federal) are listed below:

- *Dasyurus maculatus maculatus* (spotted-tailed quoll), rare/vulnerable
- *Litoria raniformis* (green and gold frog), vulnerable/vulnerable
- *Perameles gunnii gunnii* (eastern barred bandicoot), not listed/vulnerable
- *Sarcophilus harrisii* (Tasmanian devil), endangered/vulnerable
- *Tyto novaehollandiae castanops* (masked owl), endangered/not listed

Six other threatened fauna species are also predicted to occur within the study area, based on their estimated geographic range and/or the presence of suitable habitat near the WWTP. These species are listed below:

- *Accipiter novaehollandiae* (grey goshawk), endangered/not listed
- *Aquila audax fleayi* (wedge-tailed eagle), endangered/endangered
- *Astacopsis gouldi* (giant freshwater crayfish), vulnerable/vulnerable
- *Lathamus discolor* (swift parrot), endangered/endangered
- *Prototroctes maraena* (Australian grayling), vulnerable/vulnerable

It is unlikely mammals such as the Tasmanian devil and spotted-tailed quoll would occur within the study area due to a lack of suitable habitat and overall disturbed and degraded nature of the site. It is possible the eastern barred bandicoot may forage in the open areas associated with the racecourse, however no evidence of bandicoot diggings was observed during a site visit and the site does not provide high quality habitat for this species.

Common bird species are likely to occur within the study area, particularly amongst riparian vegetation along the banks of the Meander River. However, species such as the wedge-tailed eagle, masked owl, swift parrot and grey goshawk are unlikely to utilise the area for foraging and nesting due to a lack of hollow-bearing and large trees, infestations of willows and other exotic species along the river banks, and a lack of *Eucalyptus ovata* and *Eucalyptus globulus*.

The green and gold frog, Australian grayling and giant freshwater crayfish are also predicted to occur within the study area, based on their estimated geographic range. As discussed in Section 3.2.6.5, a frog survey was conducted at the site in April 2009 and the green and gold frog was not recorded during this study (refer Appendix F for the full results of this survey). The Meander River is unlikely to provide habitat for the Australian grayling due to the presence of dams downstream of the study area and the abundance of trout. The river does provide some potential habitat for the giant freshwater crayfish, however this is not considered to be good quality habitat due to infestations of willows along the river banks, and the levels/quality of outfall from the existing WWTP.

Pests, Weeds and Diseases

As the site is highly disturbed and modified there is a possibility that declared, environmental and agricultural weeds may be present at the site. Infestations of willows were noted along the banks of the Meander River during the recent Aquatic Survey.
3.2.8 Natural Hazards and Processes

Flooding
The WWTP is built on rural land northeast of Deloraine. The predominant water course in the vicinity of the WWTP is the Meander River. The Meander River Catchment has a drainage area of approximately 1,600 km². Rainfall in the area is dominated by topography, particularly in the region of the Great Western Tiers that form the southern boundary of the catchment. Due to the higher altitude (over 1,000 metres) of the Tiers, the escarpment is characterised by greater annual rainfall (2,200 mm average). In comparison, the area around Deloraine has an average annual rainfall of 950 mm.

From Deloraine, the meandering alluvial river floodplains increasingly widen. These floodplains have been extensively developed for agricultural purposes, and the river has been significantly altered as a result of land use practices. Flood mitigation works in the 1960s and 1970s resulted in numerous channel diversions and meander cut-offs, and the construction of levees along several sections of the river. The Bass Highway embankment constitutes a further modification of the floodplain.

The proposed upgrades will be incorporated into raised land (RL 230 metres which has been determined by MVC’s flood modelling to be above the 1 in 100 year flood level) on the Meander floodplain; as such the surrounding area will be subjected to varying degrees of flooding.

Seismic Activity
A search of the Natural Hazards database supported by Geoscience Australia identified that the area surrounding the WWTP has experienced eight earthquakes between 1900 and 2008. The most recent of these earthquakes occurred on the 13 September 2006, measuring a magnitude of 3 on the Richter Scale. This was also the most powerful event recorded within a 20 kilometre radius of the site. All records are listed in Table 17 with corresponding latitudes and longitudes.

Table 17 Seismic Records of Deloraine Area

<table>
<thead>
<tr>
<th>Date</th>
<th>Time (UTC)</th>
<th>Latitude</th>
<th>Longitude</th>
<th>Magnitude</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>17/02/1978</td>
<td>23603.6</td>
<td>-41.52</td>
<td>146.43</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>12/05/1980</td>
<td>174439.3</td>
<td>-41.32</td>
<td>146.48</td>
<td>1.5</td>
<td>0</td>
</tr>
<tr>
<td>01/05/1984</td>
<td>135547.8</td>
<td>-41.65</td>
<td>146.73</td>
<td>1.7</td>
<td>NULL</td>
</tr>
<tr>
<td>11/06/1992</td>
<td>31549.6</td>
<td>-41.5</td>
<td>146.6</td>
<td>1.4</td>
<td>10</td>
</tr>
<tr>
<td>26/06/1993</td>
<td>185839.6</td>
<td>-41.43</td>
<td>146.8</td>
<td>1.8</td>
<td>10</td>
</tr>
<tr>
<td>10/12/1993</td>
<td>23228.3</td>
<td>-41.42</td>
<td>146.5</td>
<td>1.6</td>
<td>10</td>
</tr>
<tr>
<td>05/08/1994</td>
<td>10125.6</td>
<td>-41.53</td>
<td>146.8</td>
<td>0.9</td>
<td>10</td>
</tr>
<tr>
<td>13/09/2006</td>
<td>143959.8</td>
<td>-41.661</td>
<td>146.558</td>
<td>3</td>
<td>3.9</td>
</tr>
</tbody>
</table>

Fire
The general area surrounding the WWTP is agricultural land; hence, whilst fires may occur in the area, significant bushfires are unlikely. Therefore, impacts to the WWTP from fire are expected to be limited due to the nature of the development.
3.2.9 European Heritage

The site itself is permanently entered in the Tasmanian Heritage Register for its significant historical, representative and social values. The Racecourse is also included on the Register of the National Trust of Australia (Tasmania).

Heritage places in proximity to the site have also been previously identified. This includes 12 buildings, primarily housing, located on Grigg and Railway Street in the Meander Valley Heritage Study. The identified buildings are located to the south of the site and are primarily oriented towards the public roads. These places have been identified as having both State and Local heritage significance. These places vary in distance from the proposed development area, ranging from approximately 400 to 600 metres away.

The Railway Platforms and Weighbridge have been identified as having State level significance and are adjacent to the Deloraine Racecourse, approximately 550 metres to the south of the proposed development area.

None of the places identified in the Meander Valley Heritage Study have been included in the Tasmanian Heritage Register, the *Meander Valley Planning Scheme* 1995, or the draft *Meander Valley Planning Scheme* 2007.

3.2.10 Aboriginal Heritage

An Aboriginal Heritage Assessment was conducted in 2002 by Rocky Sainty. No Aboriginal Heritage Sites were located as part of this survey. Nonetheless, the provisions of the *Aboriginal Relics Act 1975* remain applicable if relics are identified during site works. Consultation has occurred with Aboriginal Heritage Tasmania who concur with this recommendation (see Section 4.10 for more details).

3.3 Socio-Economic Aspects

Deloraine is a regional centre within the MVC Municipal Area, which was first settled by Captain Roland in 1821 as he was searching for agricultural land. The land was granted to new settlers, and the town is now a major agricultural centre, with a variety of cropping, grazing and livestock farms across the area. The land surrounding Deloraine is rich pasture land, and agriculture is the main industry of the area, others being tourism, processing and retail.

In 2006, Deloraine had a population of 2,243 people, with an average age of 42 years. Adults aged between 25 to 54 constituted the largest age category with 752 people, while the smallest age category was children 0 to 4 years with 155 people. During 2006, 52% of persons in the labour force in the region were employed full time, 31.5% were employed part time, and 7.3% were unemployed. The most common industries of employment within the town of Deloraine were in Supermarkets, School Education, cafes and restaurants and Residential Care Services.

The area surrounding the WWTP and proposed outfall location is dominated by public land use (racecourse) and agricultural land. Many of these agricultural properties draw water from the Meander River.

3.3.1 Total Capital Investment

Total expected capital investment for works associated with both stages of the project is $2.54 million.

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22 Source: Australian Bureau of Statistics (20/03/2009).
3.3.2 Impacts on Local and State Labour Markets

The construction phase of the project will involve the engagement of a civil contractor. During operation, it is not expected any additional staff will be required as a result of the WWTP upgrades. The operation of the WWTP is likely to be undertaken by the existing operational staff.

3.4 Alternative Sites

As the project is a plant upgrade, no alternative sites were considered.

In regard to the plant outfall, discharge is currently released at the bank of the Meander River, not extending from the pipe out into the river. Site observation indicate that the concrete outfall structure supporting the pipe discharge into the Meander River has collapsed and that discharge is currently occurring directly from the pipe on the banks edge.

The Mixing Zone Report undertaken (refer Appendix G) modelled discharge at various distances from the river’s edge, including 0 metres, 5 metres and 10 metres. From the analysis, the mixing zone was found to decrease in size as the point of discharge approached the middle of the river. On this basis this proposal involves the extension of the outfall further out into the river, to improve mixing.
4. Potential Effects and Their Management

4.1 Air Emissions

4.1.1 Legislative, Policy and Performance Requirements
The Tasmanian Environment Protection Policy (Air Quality) 2004 provides a framework for the management and regulation of both point and diffuse sources of emission to air and for pollutants with the potential to cause environmental harm. This policy is made pursuant to the provisions of Section 96A-96O of EMPCA.

The environmental values to be protected under this policy are:

- The life, health and well-being of humans at present and in the future.
- The life, health and well-being of other forms of life, including the present and future health, well-being and integrity of ecosystems and ecological processes.
- Visual amenity.
- The useful life and aesthetic appearance of buildings, structures property; and materials.

The key performance requirements relate to maintenance of air quality during the construction and operational phases to minimise potential impacts to site workers, local residents and the environment.

In addition to these general requirements, the site is currently governed by ELMS 6237: (Odour Emission Conditions, O1 and O2) (refer to Appendix H). The ELMS states that odour emissions shall not be objectionable beyond the boundary of the land or at any other point (as specified by the Director) and that odour emissions at the boundary of the land shall not exceed ground level concentrations of 2 odour units, 1 hour average, 99.5 percentile, DAS modelled using Ausplume, or any other model approved in writing by the Director.

4.1.2 Existing Conditions
There is no known air quality data previously or currently collected at the WWTP. There has been one previous odour complaint associated with the WWTP, made during 2006 (refer Section 2.3). Fresh sludge was drained into Sludge Basin 1 and there was no covering layer of water. The odour was detected at a nearby residence and water was added to the basin to cover the sludge. This eliminated the odour problem and the sludge has since been generally kept submerged. The upgraded plant is expected to have similar odour emissions as the current plant.

The proposed addition of the Anaerobic Tank in Stage 1 may be a source of odours and a tank cover and an odour control unit have been factored into the proposed Stage 2 design if odour control is required. These will be added prior to the commencement of Stage 2 if deemed necessary following commissioning of the Anaerobic Tank. There are no expected air quality issues in relation to odour from the site as the general area around the proposed upgrade is used for horse training activities and grazing.

4.1.3 Construction Impacts and Mitigation Measures
During construction, the potential air emissions relate to dust generation, vehicle and machinery emissions and odour release.
Vehicle Emissions
Vehicle emissions relating to construction activities are considered to be minor. All vehicles used during construction will be appropriately maintained such that vehicular emissions are kept to a minimum. Given the vehicle emissions relating to existing traffic both on the site and beyond, the increase in vehicle emissions during construction is considered to be minimal and of little impact.

Dust Emissions
Sources of dust relate to the construction phase of the project and include:

- Heavy vehicles travelling to and from the site, as well as excavation and construction activities.
- Wind disturbance of stockpiled material.
- Excavation works associated with the construction of the sludge drying pans and overflow storage basin.

Measures to control dust release will be implemented during construction, and will be contained in the CEMP as a Dust Control Management Plan. This plan will include dampening of surfaces, covering of soil stockpiles, and postponement of work during excessively windy conditions.

**Commitment 8 **BLW will prepare a Dust Control Management Plan.

With appropriate control measures in place during the construction phase, air impacts are considered to be limited.

Odour Emissions
During the construction works of the proposed upgrades, there is limited potential for odour escape. There will be no requirement for diversion from the current treatment process as construction takes place. Once the new overflow storage basin, tanks and storage basins are ready to be commissioned, all that will be required is the flick of a switch. During the replacement of the decanter in IDEAL 2, it is expected that a limited plant shutdown would occur. This is not anticipated to create any problems due to the four hours storage capacity of the inflow pumping stations. If an extended time frame (beyond four hours) is required for replacement of the decanter, then the influent can be diverted to the overflow storage basin. This may create short term odour impacts, however these will be limited in duration as the nearest residence is 300 metres from the WWTP.

Odour Modelling
No odour modelling was undertaken during preparation of this DPEMP. Odour modelling was undertaken previously as part of the 2002 DPEMP and the modelling and results are summarised below.

The Ausplume model 5.3 was used for odour and dispersion modelling. Odour emission rates used in the modelling were based on extensive monitoring at similar sludge drying pans at wastewater treatment plants in southeast Australia operating over a similar range of operational activities. Odour levels are measured by odour dilution units (OU). An odorous gas has an odour level of “N” OU if each litre of gas must be diluted with “N” litres of clean air to dilute the odour to the level that only 50% of a sensitive panel can just detect under laboratory conditions. Generally, odour complaints arise when odour levels are between 3 to 7 OU, although some individuals can detect down to 2 OU.

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The **average** emissions used for modelling were based on the following assumptions:

- normal operations of IDEAL lagoons
- filling of one sludge drying pan at average emission rate
- draining of second sludge drying pan at average emission rate
- normal operation of polishing ponds

The **peak** emissions used for modelling were based on the following assumptions:

- abnormal operations of IDEAL lagoons
- filling of one sludge drying pan at peak emission rate
- draining of second sludge drying pan at peak emission rate
- abnormal operation of the polishing ponds

Results of the odour model indicate that even with predicted peak odour emissions and worst case meteorological conditions, there is unlikely to be an odour nuisance in residential or recreational areas. It was determined that the maximum predicted odour concentration at the western boundary (Meander River) is 1 OU and less than 1 OU at the nearest sensitive receptors (residence and farmhouse 400 metres from WWTP)\(^{24}\). Odour usually creates a problem when the level reaches 5 OU. The odour modelling concluded that odours produced by the WWTP would not create an odour issue.

### 4.1.4 Operational Impacts and Mitigation

Once operational, the daily vehicle movements at the site will remain consistent with current practices so there are no expected increases in dust or vehicular emissions.

Whilst odour emissions are possible, these are not expected to be significantly greater than the current odour potential of the site, as follows:

- **Overflow Storage Basin:** An open basin for emergency overflow that may generate some odour whilst in use. As the basin is expected to be utilised sporadically based on rain events, influent is only expected to remain in the basin until the pump stations have returned to pre-event levels, thereby minimising time in the storage basin. Once the plant is able to accept the additional inflow loading, the contents of the overflow basin will be re-directed to the plant and the basin will be cleaned (with resulting material flushed back into the treatment system). The basin will therefore be in a clean condition for the majority of the time with only short-term use in emergency situations. Hence, whilst some short term odour impacts may be experienced, this will be for a very limited duration and is within the confines of the existing operational WWTP.

- **Anaerobic Tank:** This tank will be an open tank that may produce an odour associated with the anoxic conditions. At the completion of Stage 1 works, site operators will undertake regular assessments of odour levels on site, particularly in relation to the Anaerobic Tank. If the tank produces a noticeable unpleasant odour, then a cover and the odour control unit proposed for Stage 2 works will be implemented as soon a practicable.

- **Balance Tank:** An enclosed tank following treatment in IDEAL 2 to be incorporated as part of Stage 2 upgrade works that will produce little or no odour.

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Sludge Drying Pans: These are open pans that may produce an odour. To ensure the sludge drying pans do not create an odour problem, they will be saturated by water during winter. Aside from one event (involving a lack of water cover over the sludge pans) there have been no other odour issues associated with the existing sludge pan system.

With these facts taken into consideration, it is unlikely that the upgrades to the WWTP would be associated with any additional detectable odours above odours already existing at the plant. The existing complaints register will be maintained.

Commitment 9 An odour assessment will be undertaken by a suitably qualified person and submitted to the EPA Division. Mitigation measures will be undertaken if recommended by the assessment.

4.2 Liquid Waste

4.2.1 Legislative, Policy and Performance Requirements

The key policy surrounding the management of liquid waste is the State Policy on Water Quality Management 1997 (SPWQM). The proposed discharge quality for Stages 1 and 2 (Table 2) is consistent with Clause 17.2 of the Policy to reduce the discharge levels equivalent to that achieved using accepted modern technology. The timeframe for reducing the discharge levels is found in Table 9.

4.2.2 Performance Requirements

There are two key aspects of performance requirements related to the proposed discharge, namely:

- Improvement in all parameters of the quality and mass loads of treated effluent to discharge to Meander River.
- WQOs to be met in the Meander River, such that the Protected Environmental Values (PEVs) are not compromised.

Criteria for protection of water quality in the receiving environment are determined through the PEVs and WQOs established for the Meander River. An outline of this process and the WQOs, is provided in Section 3.2.6. In some instances the background water quality 80th percentile already exceeds the water quality objectives (refer Table 16). As such, site specific water quality data has been used in the following assessments to supplement the latest edition of the Australian Water Quality Guidelines (ANZECC & ARMCANZ 2000). It is considered appropriate to use the existing water quality in the Meander River upstream of the WWTP, as a proxy to the WQOs, for identifying the extent of the mixing zone as the existing environment is already shown to be different from the ANZECC levels. Whilst this is not specifically noted in the Water Policy, the Policy does state that WQOs are to be used as a measure of success of strategies and actions and they do not set regulatory limits. However it is noted that if broad scale changes were seen in the ambient water quality of Meander River then the WWTP may need to be upgraded further in the future to continue to ensure no negative effect on the receiving environments.

4.2.3 Existing Conditions

As outlined in Section 3.2.6, the receiving water body for the proposed discharge is the Meander River. The existing quality, flow and aquatic ecology characteristics of the receiving waters are outlined in Section 3.2.6 and indicate that the site of the proposed outfall is a moderate to highly disturbed system, with background water quality exceeding WQOs and macroinvertebrate communities representative of polluted and/or highly altered waterways.
**Existing Discharge Quantity**

Ben Lomond Water (BLW) is licensed to discharge into the Meander River at an average rate of 600 kL/day. Currently the outfall to the Meander River is not metered, therefore estimations of discharge volumes are based on the direct displacement of wastewater within the plant where, 1 ML inflow = 1 ML outfall. This calculation does not take into account water loss through evaporation or seepage.

Between January 2007 and January 2009, the overall average daily discharge from the plant was 665 kL/day with the peak discharge period occurring in the months of August (1083 kL/day), September (862 kL/day) and October (718 kL/day). It is expected that there is considerable inflow/infiltration in the Deloraine sewerage catchment, resulting in these increased sewerage flows during the winter months.

**Existing Discharge Quality and Compliance**

Discharge water quality from the WWTP has been monitored on a monthly basis since it was first commissioned in 2002. The data presented in Table 18 is a summary of this monthly monitoring between 2002 and January 2009.

<table>
<thead>
<tr>
<th>Table 18</th>
<th>Treatment Plant Performance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2002-2009 Results Summary</td>
</tr>
<tr>
<td></td>
<td>90th Percentile</td>
</tr>
<tr>
<td>Ammonia as N mg/l</td>
<td>20</td>
</tr>
<tr>
<td>BOD (5 Day) mg/L</td>
<td>35</td>
</tr>
<tr>
<td>Blue green algae 1/ml count</td>
<td>1000</td>
</tr>
<tr>
<td>Chlorophyll a mg/l</td>
<td>0.06</td>
</tr>
<tr>
<td>Chlorophyll a (Lab) µg/L</td>
<td>2.18</td>
</tr>
<tr>
<td>Chromium (Total) as Cr mg/L</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Conductivity Lab µS/cm µS/cm</td>
<td>588</td>
</tr>
<tr>
<td>Copper (Total) as Cu mg/L</td>
<td>0.018</td>
</tr>
<tr>
<td>Dissolved Oxygen mg/L</td>
<td>12.2</td>
</tr>
<tr>
<td>Enterococci Confirmed CFU/100 ml</td>
<td>21,786</td>
</tr>
<tr>
<td>Nickel (Total) as Ni mg/L</td>
<td>&lt;0.02</td>
</tr>
<tr>
<td>Nitrate as N mg/l</td>
<td>1.07</td>
</tr>
<tr>
<td>Nitrite as N mg/l</td>
<td>0.29</td>
</tr>
<tr>
<td>pH field - sensor TC</td>
<td>8.9</td>
</tr>
<tr>
<td>Salts Total Soluble (Calc) mg/L</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td>2002-2009 Results Summary</td>
</tr>
<tr>
<td>--------------------------</td>
<td>---------------------------</td>
</tr>
<tr>
<td></td>
<td>90th Percentile</td>
</tr>
<tr>
<td>Thermotolerant coliforms presumptive cfu/100 ml</td>
<td>500</td>
</tr>
<tr>
<td>Total Nitrogen as N mg/l</td>
<td>26</td>
</tr>
<tr>
<td>Total Phosphorus mg/l</td>
<td>8.0</td>
</tr>
<tr>
<td>Total suspended solids (0.45 µm) mg/L</td>
<td>90</td>
</tr>
<tr>
<td>Zinc (Total) as Zn mg/L</td>
<td>0.033</td>
</tr>
</tbody>
</table>

Bold denotes non-compliance with permit parameters

As highlighted above, the WWTP has historically failed to comply with a number of its existing permit conditions, hence the reason for the proposed plant upgrade. With this in mind it is important to note that the pH median of 8.0 is within the licensed range of 6.5-8.5. Nutrient concentrations in the form of ammonia, total nitrogen and total phosphorus are the specific areas where the existing treatment plant has had difficulty in maintaining permit conditions.

### 4.2.4 Construction Impacts and Mitigation

Impacts during the construction phase of the project are associated with hazardous materials spills and sediment mobilisation associated with extension of the outfall.

Hazardous materials management is discussed in Section 4.6.

Sediment mobilisation has the potential to occur from disturbed ground during high rainfall events and due to construction adjacent to the Meander River. A CEMP will be prepared prior to construction and will detail erosion and sediment control measures that will be implemented during construction.

A number of methods are available for the construction of the extended outfall pipeline. Risk associated with the construction of the extended outfall pipeline will be managed in accordance with the **Waterways and Wetlands Works Manual 2003: Environmental Best Practice Guidelines 2. Construction Practices in Waterways and Wetlands**.

### 4.2.5 Extended Outfall Pipeline Construction Impacts and Mitigation

The following is a summary of the materials and construction techniques BLW propose to utilise for pipeline construction, to minimise impacts to the river from the pipeline extension:

- The extension will comprise of a DN200 PE100 PN12 pipe with a flanged joint about 3 metres clear of the top of the riverbank to aid installation and also to provide a simple means to replace the river section of the outfall if necessary in the future.
- The pipeline will extend to the centre of the river, a distance of about 10 metres. The outfall would be approximately 90 degrees to the river flow.
- The pipeline will have 2 or 3 diffuser ports.
The outfall will be anchored to the river bed with prefabricated concrete anchor blocks placed onto the bed of the river at about 2.5 metre centres. The bed of the river is cobbles/pebbles/gravel and the river bed will be prepared/levelled to accommodate the anchors by hand (at low river level). The anchors are likely to be about 1 metre X 1 metre base and would be lifted into position via a crane mounted on the river bank. The prefabricated HDPE pipe would be fixed to the anchor blocks with stainless steel staps.

The invert of the outfall pipe would be located about 300 mm above the riverbed. Assuming a minimum summer water depth of about 1 metre, the outfall pipe will have a minimum submergence of about 0.5 metres.

The riverbank outfall pipe would have about 1 metre cover and be curved to match the river outfall section in accordance with the allowable HDPE pipe bending radius. This is about 10 metres radius for the above specified pipe (DN200 PE100 PN12). Excavation of the outfall trench (about 0.8 metres wide) on the riverbank will be undertaken via a riverbank mounted excavator which will place excavated material in a bunded area on the riverbank, and all work would be undertaken at low river level. Straw bales will be used to minimise the risk of soil and sediment entering the river. Thus minimising sediment release into the river.

The anchors and river outfall section of HDPE pipe will be prefabricated. Reinforced anchors would be placed on pre-prepared riverbed "footings" and all installation would be carried out using a long reach crane mounted on the riverbank. It is expected the actual in-river installation would be completed within one working day.

The above arrangement will minimise the following potential risks:
- Scouring of the riverbed beneath the outfall pipe
- Outfall exposure during low flows
- Damage to the outfall during high flows/floods
- Environmental impacts to the river during construction
- Future outfall replacement.

Fish migration and spawning seasons will be taken into account when installing the pipeline extension. The outfall site will be monitored on a monthly basis to ensure that the extended outfall is not having an adverse impact on erosion as evidenced by suspended solids at the site. Suspended solids data from the SW3 sampling site will be assessed to determine if the solids can be attributed to erosion.

**Commitment 10  All works to extend the outfall pipe in the river will be undertaken in accordance with the Waterways and Wetlands Works Manual 2003: Environmental Best Practice Guidelines 2. Construction Practices in Waterways and Wetlands.**

4.2.6 Operational Impacts and Mitigation

The SPWQM encourages the recycling and re-use of wastewater, and where appropriate, the irrigation of wastewater to land to maximise its beneficial use, while protecting the quality of surface waters. As discussed in Section 2.9, in this instance a continued discharge to the Meander River is the most practical option and as such BLW is proposing to treat the wastewater to appropriate levels so as not to prejudice the PEVs of the receiving environment. This will be achieved by ensuring the mixing zone does not encroach on any sensitive users and that the water quality at the edge of the mixing zone is within the 80th percentile background levels, thereby remaining within natural fluctuation of the river.
The following sections discuss the potential impacts of discharge on both the water quality and the biological communities within the receiving environment.

**4.2.6.1 Proposed Discharge Quantity**

The proposed discharge volume is expected to increase to median volume of 860 kL/day ADWF in 30 years. This is an increase from the existing permit limit of 600 kL/day ADWF. This increase in volume has been estimated based on the MVC’s prediction of growth in the local area in the coming 30 years.

**4.2.6.2 Seasonal Discharge Management**

Based on the requirement of a minimum environmental flow of 1.1 cumecs in the Meander River and the mixing zone modelling outlined in the following sections, the flows in the Meander River are considered suitable to allow for continuous discharge from the WWTP.

As discussed in Section 2.1, storage during wet weather has historically been problematic, resulting in wet weather flows overloading the plant for prolonged periods. To address this, a 1.5 ML overflow storage basin will be installed to allow sufficient storage during these events.

**4.2.6.3 Proposed Discharge Quality**

The proposed discharge quality has been adopted from DPIWE’s Emission Limit Guidelines for New and Upgraded Treatment Plants (DPIWE 2001) as presented in Table 19. Whilst it is recognised that the DPIWE guidelines are designed for plants less than 500 kL, the proposed discharge quality allows for protection of the PEVs and represent a considerable improvement on current plant performance and also an improvement in comparison to existing permit limits. Further information on the proposed discharge quality is provided in Section 2.1.3.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Proposed Discharge Quality (Adopted from Emission Limit Guidelines: Sewage Treatment Plants. DPIWE 2001)</th>
<th>Median</th>
<th>90th Percentile</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Suspended Solids (mg/L)</td>
<td></td>
<td>10</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>BOD (mg/L)</td>
<td></td>
<td>5</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Grease and Oil (mg/L)</td>
<td></td>
<td>2</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>Ammonia-N (mg/L)</td>
<td></td>
<td>1</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Total N (mg/L)</td>
<td></td>
<td>7</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Total P (mg/L)</td>
<td></td>
<td>2</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>pH</td>
<td></td>
<td></td>
<td></td>
<td>6.5-8.5</td>
</tr>
<tr>
<td>Thermotolerant coliforms (orgs/100 mL)</td>
<td></td>
<td></td>
<td></td>
<td>200</td>
</tr>
</tbody>
</table>
The current design aims to achieve the parameters outlined above at the completion of the Stage 1 upgrades. Following the commissioning monitoring, ambient river monitoring, the reuse study and the development of an inflow and infiltration plan the emission limits will be reviewed and stage 2 works will be developed to achieve sustainable emission limits in accordance with the State Policy on Water Quality Management.

**Commitment 11** Commissioning monitoring will be undertaken at the completion of Stage 1 and to optimise plant performance and assist in the design of Stage 2 works.

4.2.6.4 Blue-Green Algae

As shown in Table 2 the nutrient levels decrease significantly in the lagoons which will reduce the risk of blue-green algal blooms in the system. The implementation of the Stage 2 works and a reuse system will further reduce this risk. BLW has developed a Blue-Green Algae Management Strategy addressing all BLW WWTP sites and actions to mitigate impacts have commenced. Items within the BLW Blue-Green Algae Management Strategy relevant to the Deloraine WWTP include:

- On-going monitoring and assessment.
- Trialling of bacterial fermentation additive to reduce blue-green algal bloom potential.
- Evaluation of requirement to remove sludge from Lagoon 2.
- Contingency plans for higher risk ranked WWTPs.

Identification of downstream users and activities will be undertaken as part of the development of Emergency Management Plan.

4.2.6.5 Downstream Off-takes and Health Risks

The Sustainability Risk Assessment (Appendix I) performed for this upgrade identified that there was a medium risk to downstream water users if there was insufficient treatment of effluent leading to poor quality discharge. The commissioning of the 1.5 ML Overflow Storage Tank will mitigate this issue in wet weather situations and prevent untreated effluent from entering the Meander River. Further, there will be an ongoing monitoring program to assess the quality and quantity of the treated effluent, the quality of the ambient receiving water and aquatic ecology monitoring. The nearest known user drawing water from the river is 200 metres downstream of the outfall. This is approximately 160 metres outside the anticipated mixing zone. The Emergency Management Plan will provide procedures for notification of downstream users in the unlikely event of poor river water quality from untreated effluent or algal blooms.

4.2.6.6 Mass Loads

As discussed in Section 2.1.6, although the discharge volume will increase as part of the proposed upgrade, the data indicates that the overall mass loads of pollutants discharged into the Meander River are predicted to decrease as a result of the proposed Stage 1 plant upgrades (refer Table 3). This reduction in mass load is due to the improved treatment performance of the WWTP.

The greatest reductions in mass load will be achieved with nutrient loads to the Meander River. Total phosphorus loads are expected to be reduced by 62% with ammonia loads being reduced by 84% at the completion of Stage 1 works. Total nitrogen is expected to decrease by 40% as a result of the proposed Stage 1 upgrade. Biochemical oxygen demand and suspended solids are predicted to be reduced by 69% and 59% respectively at the completion of Stage 1 works.
4.2.6.7 Mixing Zone Assessment

As the treatment of effluent to levels that will meet WQOs (or background levels) at the point of discharge is not practical, a mixing zone is required. A mixing zone is an area with water quality outside of the range normally experienced in the river. In accordance with Clause 20.2 of the SPWQM emission levels must be set at levels that will not prejudice the achievement of WQOs at or beyond the edge of the mixing zone. As the existing water quality in the Meander River is not consistent with the WQOs, an alternative 80th percentile background water quality trigger has been used for this mixing zone assessment. This is consistent with the Water Policy and ANZECC which outlines processes for establishment of site specific triggers in the event that ANZECC values are not suitable for a particular water course. Outside of the mixing zone pollutant levels may be elevated, but only to levels that are experienced in the river under normal conditions. This definition of the mixing zone is illustrated in Figure 11.

In order to assess the spatial extent of the mixing zone a Mixing Zone Study was undertaken (refer Appendix G).

Flow Data

A low flow scenario of 1.1 cubic metres per second was used for the purposes of the Mixing Zone Assessment as this represents the minimum environmental flows allowable for the Meander Dam. This low flow scenario was used in preference to the 7Q10 (as requested in the EPA’s DPEMP Project Specific Guidelines) as it is part of the Meander Dam’s operating licence and is based on site specific and biological considerations.

Mixing Zone Edge Criteria

The State Policy on Water Quality Management 1997 (SPWQM) states that wherever practical and appropriate, water quality guidelines should be based on site-specific information which should be used to supplement the latest edition of Australian Water Quality Guidelines (ANZECC & ARMCANZ, 2000). This is particularly relevant in this instance as a significant amount of background data exists, which indicates elevated background levels of several contaminants.

ANZECC and ARMCANZ (2000) discusses methods for the determination of mixing zone trigger values based on background monitoring data. According to this methodology, a ‘moderate’ level of ecosystem protection is achieved by adopting the 95th percentile of background and a ‘high’ level of protection is achieved by adopting the 80th percentile of background.
In this instance a ‘high’ level of protection is considered appropriate, resulting in the adoption of the 80th percentile of background as the mixing zone edge criteria. The downstream monitoring site (refer Section 3.2.6 and Table 15) was selected as representative of background conditions as this site displayed a better water quality than the upstream site and hence provides a higher level of protection.

**Mixing Zone Model**

The Mixing Zone Assessment modelled the upgraded WWTP discharge at the existing outfall location (0 metres) and for discharge 5 metres and 10 metres from the bank and found that there was a considerable difference in mixing zone extent for each case. Figure 12, Figure 13 and Figure 14 illustrates the spatial extent of the mixing zones for each discharge location.

The modelling shows that a discharge at the bank of the river (0 metres) will result in a mixing zone of between 30 metres and 90 metres downstream. The size of the mixing zone decreases as the point of discharge approaches the middle of the river, with a mixing zone of between 5 and 25 metres (depending on diffusivity) resulting from a discharge 10 metres from the bank. In each scenario the mixing zone does not extend to both banks of the river, hence maintaining an environmental corridor for fish and other aquatic organisms.

**Figure 12  Mixing Zone Extent – Discharge 1 metre From Bank**

**Figure 13  Mixing Zone Extent – Discharge 5 metres From Bank**
In accordance with Clause 20.3 of the SPWQM, BLW will reduce the spatial extent of the mixing zone as far as is practical by extending the current outfall to the centre of the river. This will result in a mixing zone of between 5 and 25 metres downstream of the outfall. Outside of this mixing zone, pollutant levels are expected to be within levels that are experienced in the river under normal conditions. The mixing zone will not cross both sides of the river, will not detract from the values of the surrounding waters, is not within an area used by sensitive users, will not create a significant barrier to migration and has been set having regard to the low flow conditions. In addition given the quality of treated effluent entering the mixing zone and the degree of mixing, the mixing zone is not anticipated to generate odours, discolouration, visible objectionable matter, create fish or other vertebrate mortality or impact on aquatic organisms to be consumed by humans. On this basis the proposed mixing zone is considered to be consistent with Clause 20 of the Water Policy.

The approximate location of the extended outfall is shown in Figure 1.

Full discussion on the mixing zone study, including methodology and assumptions is presented in Appendix G.

In order to validate this modelling, a receiving water quality monitoring program will be undertaken. The receiving water quality monitoring program, including discussion on monitoring site location, is presented in Section 4.20.2.

4.2.7 Aquatic Ecology

An aquatic ecology assessment undertaken in autumn 2009 (refer Section 3.2.6) did not identify any threatened invertebrate or vertebrates (including fish and frogs) species up or downstream of the discharge location.

The assessment found that macroinvertebrate communities at a distance of 300 metres downstream of the existing outfall show some signs of nutrient enrichment, which may be attributed to the existing discharge.

It is anticipated that some localised change in aquatic ecology will be experienced within the mixing zone. However, based on the modelling it is not anticipated that the aquatic ecology of Meander River will be significantly impacted in the long term as a result of the new outfall. In fact, it is likely that the extent of the existing impact associated with the current outfall will be reduced due to a decrease in mass load inputs and the increased mixing associated with relocating the outfall to the centre of the river.
In order to monitor and assess any effects on aquatic species, Section 4.20.4 discusses an aquatic ecology sampling program that will be conducted post commissioning to monitor the condition of the river both up and downstream of the outfall.

**Commitment 12** A macroinvertebrate sampling program in accordance with the AUSRIVAS sampling protocol will be conducted 1 year after completion of the Stage 1 works. The data collected will be compared against sampling conducted prior to commencement of works.

### 4.3 Groundwater

#### 4.3.1 Legislative, Policy and Performance Requirements

The key legislation of relevance to groundwater management in Tasmania is the *State Policy on Water Quality Management* 1997 (SPWQM). In this framework groundwater salinity (measured as Total Dissolved Solids – TDS) is used to assess the Protected Environmental Values – PEVs (or beneficial uses) of a groundwater.

Table 20 provides a summary of the PEVs associated with groundwater resources of varying salinity.

<table>
<thead>
<tr>
<th>Protected Environmental Value</th>
<th>A1 (0-500)</th>
<th>A2 (501-1,000)</th>
<th>B (1,001-3,500)</th>
<th>C (3,501-13,000)</th>
<th>D (greater than 13,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance of ecosystems</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Potable Water Supply</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Desirable</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Acceptable</td>
<td>✔</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potable Mineral Water Supply</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agriculture, parks &amp; gardens</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stock watering</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Industrial water use</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
</tr>
<tr>
<td>Primary contact recreation (e.g. bathing, swimming)</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
</tr>
<tr>
<td>Buildings and structures</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td>✔</td>
<td></td>
</tr>
</tbody>
</table>

Results from the current groundwater monitoring network show total TDS values below 500 mg/L. This places the groundwater in Category A1 of Table 20, resulting in the PEVs presented in Table 21.
Table 21  Assessments of Beneficial Uses of Groundwater Requiring Protection

<table>
<thead>
<tr>
<th>Beneficial Use</th>
<th>Existing</th>
<th>Potential for Use</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance of Ecosystems</td>
<td>Yes</td>
<td>Likely</td>
<td>Site groundwater potentiometry has not been confirmed, but suspected as being towards Meander River.</td>
</tr>
<tr>
<td>Potable</td>
<td>Unknown</td>
<td>Unlikely</td>
<td>Groundwater is not used on site.</td>
</tr>
<tr>
<td>Potable Mineral Water</td>
<td>Unknown</td>
<td>Unlikely</td>
<td>Groundwater is unlikely to be used as a source for drinking water.</td>
</tr>
<tr>
<td>Agriculture, Parks and Gardens</td>
<td>Unknown</td>
<td>Likely</td>
<td>The low salinity of the groundwater makes it suitable for irrigation use.</td>
</tr>
<tr>
<td>Stock Watering</td>
<td>Unknown</td>
<td>Likely</td>
<td>The low salinity of the groundwater makes it suitable for irrigation use, and has previously been targeted by local farmers as a water source.</td>
</tr>
<tr>
<td>Industrial Water Use</td>
<td>Unknown</td>
<td>Likely</td>
<td>Industrial uses (ANZECC 1992) are generically defined as heating and cooling process, hydro-electric power generation, textile industry, chemical and allied industry, pulp and paper industry and petroleum industry. The salinity of groundwater is likely to not limit the use of groundwater for industrial purposes. Groundwater has been targeted in this area for use at a vegetable factory.</td>
</tr>
<tr>
<td>Primary Contact Recreation</td>
<td>Unknown</td>
<td>Likely</td>
<td>Primary Contact Recreation relates to the use of groundwater to fill pools, or where a water body may receive groundwater discharge and be used for swimming.</td>
</tr>
<tr>
<td>Buildings and Structures</td>
<td>Unknown</td>
<td>Unlikely</td>
<td>The depth to groundwater is generally too deep to interact with most basements, cellars, and buried underground services.</td>
</tr>
</tbody>
</table>

4.3.2  Existing Conditions

As discussed in Section 3.2.5, groundwater monitoring is currently undertaken at three wells in accordance with the current site Environmental Protection Notice (EPN). Despite this monitoring, the local hydrogeological conditions are not well understood, due to the lack of site-specific information. Further discussion is presented in Section 3.2.5.
4.3.3 Construction Impacts and Mitigation

The proposed works at the WWTP will result in the loss of two of three existing monitoring wells (D10 and D11). Figure 6 shows the location of current wells, and location of the proposed works.

Prior to construction, the existing wells will be surveyed to ascertain groundwater flow direction and additional wells will be installed in order to establish baseline conditions and monitor potential impacts of the proposed works. The well locations and monitoring program is discussed further in Section 3.2.5.

Where construction intersects a confining layer (described as 3 to 4 metres below the surface), groundwater may rise to within a shallow distance from the surface. This should not be an issue with the proposed upgrades as the sludge drying pans and overflow storage basin will be raised and only the topsoil will be removed during construction works. However, if groundwater is intersected during construction and the groundwater level rises to within the construction works, either dewatering will be required or the works will need to be grouted/sealed-off from the groundwater to reduce the likelihood of directly contaminating the aquifer.

4.3.4 Operational Impacts and Mitigation

Potential groundwater impacts during the operational phase of the project are associated with:

- seepage from the sludge drying pans
- seepage from overflow storage lagoons
- hazardous materials spill infiltration

The principle mitigation measure with respect to potential groundwater infiltration from the sludge drying pans and overflow storage lagoons is the provision of low permeability liners. As discussed in Section 2.6 the sludge drying pans will be clay lined and the overflow storage lagoons will be lined with 2 mm thickness high density polyethylene (HDPE). Geomembranes will not be used. The source of the clay material to be used has not been determined at this time, however, it will be selected and placed strictly in accordance with the Environment Division’s protocol “Environmental Standards Applying to Liner Construction” March 2006 (DEPHA). This process will be managed through site/materials investigation and testing, engineering design, materials testing/quality control and construction supervision.

In order to monitor the performance of the clay/HDPE liners and assess any potential impacts to groundwater, an ongoing monitoring program will be undertaken. The monitoring program will utilise the wells installed prior to construction and is discussed further in Section 3.2.5. This monitoring network will also assist in determining the groundwater flow direction and whether there are any impacts associated with the existing facility.

As discussed in Section 4.6.4 small amounts of hazardous materials will be stored on site. The infiltration of leaks and spills to groundwater is considered a relatively low risk and is discussed in Section 4.6.

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25 Engineered Clay liner construction shall be undertaken in an approach consistent with the Environment Division’s protocol Environmental Standards Applying to Liner Construction March 2006. Geomembrane liner – liner construction shall be undertaken in an approach consistent with the Environment Division’s protocol Environmental Standards Applying to Liner Construction March 2006.
4.3.5 Groundwater Monitoring

As discussed in Section 4.3.3 the upgrade of the WWTP will result in the loss of two of the existing groundwater monitoring wells. The remaining well (D12) is considered to be a background monitoring well. In order to monitor potential groundwater contamination three new groundwater wells will be installed. The location of these wells will be confirmed following further assessments of the existing wells and desktop information (i.e. confirmation of the groundwater flow direction) but will generally be positioned to target higher risk locations such as the sludge drying pans and the overflow storage lagoon.

Indicative well locations are presented in Figure 6 and the sampling program and rationale is summarised in Table 22.

Table 22 Groundwater Monitoring Summary

<table>
<thead>
<tr>
<th>Monitoring Well</th>
<th>Parameters</th>
<th>Monitoring Frequency</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>D12</td>
<td>• Standing Water Level</td>
<td>Quarterly</td>
<td>Monitor background conditions</td>
</tr>
<tr>
<td></td>
<td>• In field (EC, pH, T, ORP, DO)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MW1</td>
<td>• Ca, Mg, Na, K</td>
<td>Quarterly</td>
<td>Monitor impacts associated with the sludge drying pans</td>
</tr>
<tr>
<td></td>
<td>• Nitrate, Nitrite</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MW2</td>
<td>• Sulphate</td>
<td>Quarterly</td>
<td>Monitor impacts associated with the overflow basin</td>
</tr>
<tr>
<td></td>
<td>• Bicarbonate/cCarbonate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>MW3</td>
<td>• TDS</td>
<td>Quarterly</td>
<td>Monitor groundwater quality immediately prior to discharge to Meander River</td>
</tr>
<tr>
<td></td>
<td>• BOD/COD</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Total P, Total N, Ammonia</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• TOC</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

It is anticipated that the new wells will be installed a minimum of six months prior to construction works to upgrade the WWTP, to provide some background water quality data.

Following commissioning, groundwater monitoring will be undertaken on a quarterly basis for a 24-month period. After this time the program will be reassessed with the view to reducing the analytical suite to target key contaminants of concern.

**Commitment 13** Three new groundwater wells will be established and monitored for a minimum of six months prior to commissioning of the Stage 1 upgrade works.
4.4 Noise Emissions

4.4.1 Legislative, Policy and Performance Requirements
The key legislation controlling environmental noise in Tasmania is the *Environmental Management and Pollution Control Act 1994* (EMPCA), particularly Section 53, which deals with environmental nuisance. EMPCA contains some minor provision for the management of environmental noise in accordance with National Environmental Protection Measures.

Also of relevance to noise management is the draft *Environment Protection Policy (Noise)* 2006.

Noise impacts to people working on the construction or operation of the WWTP upgrades must be managed in accordance with the *Workplace Health and Safety Act 1995* and associated regulations.

4.4.2 Existing Conditions
The WWTP ELMS Conditions state that noise emissions from the Activity on the land must not cause the ambient noise normally existent in the area to be increased by more than 5 dB (A). Noise emissions from the land should not exceed 40 dB (A) at the surrounding domestic premises. Current sources of noise generated on site are primarily from pumps and aerators activated and running for small periods of time (approximately 30 minute intervals). The Council has not received any noise complaints and have not previously had any noise assessments carried out.

4.4.3 Construction Impacts and Mitigation
There is likely to be noise generated during construction from vehicles and machinery, which will occur during daylight hours only. As the surrounding area is predominantly used for horse training facilities, the likely impact of noise generation is considered low. The nearest residence is approximately 400 metres to the west of the WWTP, and the impact of construction noise generated is not expected to extend to this distance. It is expected that the most noise generated will be during site preparation and earthworks which is expected to take around two to four months duration. During this time, heavy machinery will frequent the site; however, no blasting activities will be required.

*Commitment 14* Construction equipment will be muffled and construction will occur six days a week during daylight hours only.

4.4.4 Operational Impacts and Mitigation
During the operational phase, noise impacts will be limited to vehicle movements to and from the WWTP site, pumps and other operational equipment (extraction fans, etc). Given the isolated nature of the WWTP site, the distance to nearest sensitive receptors, the existing noise levels at the site and the very low overall noise capacity of the proposed developments, potential for ongoing noise impacts is considered to be low. New equipment installed during the upgrades will include electric motors (on pumps) and they will generate some noise. The noise levels will be low and the equipment is similar to that already positioned on site. There is not expected to be any significant increase in noise generated on site.
4.5 Solid and Controlled Waste

4.5.1 Legislative, Policy and Performance Requirements
The construction and operation of the WWTP must fulfil the requirements of the following legislative and policy requirements in relation to solid and controlled waste:

- *Environmental Management and Pollution Control Act 1994*
- *Environmental Management and Pollution Control (Waste Management) Regulations 2010*
- *Environmental Management and Pollution Control (Controlled Waste Tracking) Regulations 2010*
- *Movement of Controlled Waste Between States and Territories National Environment Protection Measure (NEPM)*
- *Used Packaging Materials NEPM*

The key performance requirements, as related to the legislation outlined above are:

- Approval must be sought prior to controlled wastes being transported from the site.
- Controlled wastes must be removed from the site by an approved controlled waste transporter.
- Controlled wastes must be disposed of at an approved disposal facility.

Waste management during construction and operation will generally be in line with the principles of the waste hierarchy.

4.5.2 Existing Conditions
There are currently two sludge drying pans on site to handle the production of sludge from the operation of the treatment plant. Following the WWTP upgrade there will be three, potentially four, sludge drying pans to cope with the increase in plant capacity and throughput.

Section 2.3 describes the wastewater process in detail.

4.5.3 Construction Impacts and Mitigation
During construction, potential solid waste generation is restricted to packaging waste and small quantities of waste generated by contractors.

*Commitment 15* Waste materials will be stored in a designated laydown zone or in covered bins located in convenient areas and disposed of regularly to a recycling facility or an approved disposal facility as appropriate.

*Commitment 16* Waste minimisation and recycling will be undertaken where possible.

4.5.4 Operational Impact and Mitigation
There are no expected increases in generation of general solid wastes (such as packaging and domestic waste) during the operational phase of the project. The only solid waste stream will be the biosolids associated with increased capacity and additional sludge drying pans. The following information outlines the proposed approach to biosolids handling and management and will be incorporated into a formal Biosolids Management Plan by the plant operator prior to removal of any biosolids from the site.
Biosolids Generation
During the operational phase of the WWTP, solid waste in the form of biosolids will be produced. Biosolids are the by-product of the wastewater treatment process. The WWTP currently generates in the order of 2,700 kL/year of biosolids at 0.5% solids content (Stage 1: 3,500 kL/year and Stage 2: 3,780 kL/year\textsuperscript{26}).

Biosolids Storage
Excess sludge from the IDEAL basins is transferred under timer control to the sludge drying pans. The WWTP has two existing 500 m\textsuperscript{2} sludge drying pans. The drying pans are operated on an on-line/off-line rotational basis, with one pan on-line receiving sludge and the other pan off-line in a drying cycle. The on-line pan is operated with a water cap to control odours.

An additional drying pan of similar size is proposed as part of the Stage 1 works to provide additional storage capacity and to extend offline pan drying periods. Assessment of the requirement of a fourth drying pan is to be undertaken following the implementation of the Stage 1 works.

Drying Pan Dewatering
The proposed approach for dewatering the drying pans is as follows:

- Rotation of on-line/off-line – With one pan on-line receiving sludge and the other pans offline drying/being de-watered.
- Decanting – A shallow water cap is maintained on the on-line pan to control odours. Excess water is removed from the off-line pans by a drainage system and returned to the head of the plant during the drying cycle.
- Evaporation – With excess water removed the biosolids are dried through wind and evaporation.
- Solids removal – Once dry enough (minimum >10% solids content, optimally >20% solids content) the biosolids are mechanically removed (excavators). Should effective drying not be achieved or a faster removal is required alternative dewatering techniques will be investigated (e.g. centrifuges, vacuum filters, belt-press and/or filter press).
- Liquid removal – Should a more liquid biosolids be preferred for reuse, options such as land spreading the biosolids will be undertaken, dredging/pumping them in a liquid state to storage or directly to a transportation tanker.
- Monitoring – Ongoing monitoring of biosolids moisture content will be undertaken to effectively manage the dewatering process.

Biosolids Disposal
Assessment of biosolids quality is required in order to determine potential reuse opportunities. The \textit{Tasmanian Biosolids Reuse Guidelines} (DPIWE, 1999) provides criteria for the classification of biosolids. These guidelines will be utilised to:

- Determine the class of biosolids and suitable reuse options.
- Provide the best management practices required to implement a sustainable reuse system.
- Guide required monitoring, reporting and auditing systems.

Depending upon biosolids classification possible reuse opportunities include:

- Land application
- Composting/soil conditioner
- Landfill cover material

The beneficial reuse of dewatered sludge on land must comply with the *Tasmanian Biosolid Reuse Guidelines* (Dettrick & McPhee 1999).

Alternatively biosolids can be disposed of at approved disposal sites. Details from the biosolids quality analysis and moisture content of the dewatered biosolids will assist in determining whether these biosolids could be defined as Fill Material, Low Level Contaminated Soil or Controlled Waste.

Biosolids classified as controlled waste will have to be disposed of in a landfill permitted to receive hazardous waste. Disposal of contaminated biosolids to landfill may only take place with DEPHA approval. Further details are provided in DTAE’s *Information Bulletin No. 105, Classification and Management of Contaminated Soil for Disposal, August 2006* (DTAE 2006).

**Transportation**

Biosolids are not permitted to be removed from the site at which they have been produced unless they have been classified and tested.

Transportation of controlled waste must be undertaken by a registered transport business and must be transported in accordance with controlled waste tracking legislation.

Biosolids products must be transported and applied to land in ways that avoid public nuisance, particularly with respect to odour. Transport routes and site access should be chosen to minimise public nuisance, in both rural and urban areas. To minimise the risk of spillage, vehicles used to transport dewatered and alkaline biosolids products, which have a solids content of 15% or greater should:

- Be fitted with locks
- Have water tight seals on rear tailgates
- Have the load covered with a waterproof cover (e.g. tarpaulin)
- Liquid biosolids should be transported in fully enclosed tankers

**Review and Assessment**

Ongoing review, assessment and improvements are an essential element to the implementation of an effective biosolids management programme and will be undertaken by the plant operator.

**Commitment 17** A Biosolids Management Plan will be prepared six months prior to the removal of sludge from the site, consistent with the *Tasmanian Biosolids Reuse Guidelines* (DPIWE 1999).
4.6 Dangerous Goods and Environmentally Hazardous Materials

4.6.1 Legislative, Policy and Performance Requirements

The construction and operation of the site must fulfill the requirements of the following legislation and policy in relation to dangerous goods:

- **Australian Code for the Transport of Dangerous Goods by Road and Rail**
- **Dangerous Goods Act 1998** and associated regulations
- **Australian Standards, AS 1940 and AS 3780**

Dangerous goods legislation is prescriptive, as opposed to many other forms of environmental legislation which are performance based. As a result, all aspects of dangerous goods handling and storage will be undertaken in accordance with the above-mentioned legislation.

4.6.2 Existing Conditions

There are no dangerous goods currently used in the treatment process at the WWTP. Small quantities of cleaners and disinfectants are kept in the storage shed on site for hand washing and cleaning purposes only.

4.6.3 Construction Impacts and Mitigation

Small quantities of fuel, lubricants and other chemicals may be stored on site during the construction phase of the project. The transport and storage of these dangerous goods will be in accordance with the relevant standards and legislative requirements.

The Construction Environmental Management Plan (CEMP), to be developed prior to construction, will detail the dangerous goods to be transported, stored and used during construction and the appropriate storage and handling procedures. The plan will also dictate procedures in the event of a leak or spill at the site to prevent impacts to the environment and to human health.

4.6.4 Operational Impacts and Mitigation

Dangerous goods associated with the Stage 2 operational phase of the upgrade include the proposed use and storage of carbon and aluminium sulphate (alum)/ferric sulphate (ferric). Due to the installation of the UV disinfection unit, alum is the preferred chemical of choice as ferric can foul UV lamps. Alum is also easier to handle than ferric.

Dosing quantities will be highly dependent on the final phosphorus limit (as the phosphorus limit gets lower, the alum dose gets exponentially larger due to side reactions). Based on the expected effluent phosphorus limit of 0.5 mg/L, required dosing would be 150 L/day (110 mg/L as dry alum) for an 860 kL/day plant designed with biological phosphorus removal down to 3 mg/L. The alum would be automatically dosed into the Anaerobic Tank or into the Balance Tank just prior to the filter before UV treatment. It may be necessary to have multiple dosing points to monitor and enable flexibility to determine the best dosing path.

Until Stage 1 works are completed, the requirement for carbon and alum/ferric will be unknown. Methanol, molasses, sugar and acetate are commonly used as a source of carbon, but which is used will depend on what is available in the local area. The concentrations of each will obviously affect the amount in L/d that will need to be dosed.
As outlined previously, if these chemicals are required they will be provided in 1000 litre bulk boxes, which would be stored in bunded storage areas in accordance with Australian Standards. These facilities would be housed in a small Colourbond type shed.

**Commitment 18** Dangerous goods will be managed in accordance with the Dangerous Goods Act and associated regulations.

**Commitment 19** Dangerous goods will be stored in areas bunded in compliance with Australian standards.

### 4.7 Biodiversity and Nature Conservation Values

#### 4.7.1 Legislative, Policy and Performance Requirements

A range of legislation and policies protect biodiversity and nature conservation values in Tasmania. The key documents relevant to this project include:

- *Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)*
- *Tasmanian Threatened Species Protection Act 1995*
- *Weed Management Act 1999*
- *Nature Conservation Act 2002*

Biodiversity and nature conservation requirements for the proposed WWTP upgrades are not extensive; however, some consideration must be given to the presence of listed threatened biota.

#### 4.7.2 Existing Conditions

As the WWTP occurs in an extensively disturbed area, desktop research was considered sufficient to evaluate the natural values of the area. However, to confirm the findings of the desktop study, the site was visited by an experienced flora/fauna scientist. These natural values are detailed in Section 3.2.7.

Key findings included:

- No threatened flora records were located either in or within 500 metres of the WWTP.
- Records for seven threatened flora species were identified within 5 kilometres of the WWTP.
- No threatened fauna records were located either in or within 500 metres of the WWTP; however, six fauna species are predicted to occur within this area based on their estimated geographic range.
- Records for five threatened fauna species were identified within 5 kilometres of the WWTP.

It is considered unlikely that the study area would support the threatened species detailed above and in Section 3.2.7, due to the highly disturbed and modified nature of the site. The site is dominated by introduced pasture grasses and does not provide a suitable habitat for the threatened species.

The key geomorphic feature within the study site is the Meander River.
4.7.3 Construction Impacts and Mitigation

There are no anticipated impacts to native terrestrial flora and fauna during construction due to the lack of native vegetation and highly disturbed nature of the site.

There is the potential to introduce weeds into the site, or spread weeds from the site to other areas during construction. Diseases including the Amphibian Chytrid Fungus and Phytophthora cinnamomi could also be spread by construction works. The commitments below reduce the chance of the spread or introduction of weeds or diseases.

**Commitment 20** Control weeds in accordance with the DPIW Weed Control Fact Sheets. Any declared weeds that are currently present, or establish following works, will be controlled as a matter of priority.

**Commitment 21** Disturbance to wetlands, riparian zones and wetland vegetation will be minimized wherever possible. The disposal of water and damp muddy soils at the work site will be minimized or undertaken as far away as possible from waterways or ponds and wetlands. Any water and construction materials that are used at the work site will be sourced from environments free from Amphibian Chytrid Fungus.

**Commitment 22** All machinery and equipment will be managed to control the spread of Amphibian Chytrid Fungus and Phytophthora cinnamomi by adhering to the Tasmanian Washdown Guidelines for Weed and Disease Control: Machinery Vehicles and Equipment, Edition 1 (DPIWE, FT & ACAT 2004). Controls will include thorough washing and cleaning of equipment, footwear and vehicles before entering and leaving the area and between sites. All equipment will be dry and clean before entering the work site and where drying is not possible, equipment should be disinfected.

There will be minimal impact to the physical integrity of the Meander River through the extension of the outfall pipeline. All works will be undertaken in accordance with the DPIW Manual for Works in Waterways and Wetlands. The extension of the outfall will take it further from the bank and, therefore, is expected to decrease the potential for sourcing or bank erosion. Hence, whilst there may be minor localised impacts to the Meander River during construction, the overall impacts are considered to be minor.

Potential impacts to aquatic flora and fauna are addressed in Section 4.2.

4.7.4 Operational Impacts and Mitigation

Once the upgrades to the WWTP are completed, it is anticipated that there will be no ongoing impacts to terrestrial flora and fauna. Potential impacts to aquatic species are addressed under Section 4.2.

4.8 Marine and Coastal

The project location is a considerable distance away from the marine and coastal environment (approximately 60 km). There is no access to the coastal environment, although the Meander River flows into the South Esk River, which flows into the Tamar estuary. The impacts of the project on the Meander River are addressed under Section 4.2.
4.9 Greenhouse Gases and Ozone Depleting Substances

4.9.1 Legislative, Policy and Performance Requirements
The National Greenhouse Strategy (NGS) provides Australia with the strategic framework for an effective greenhouse response and for meeting current and future international commitments. The goals of the NGS are:

- To limit net Greenhouse Gas (GHG) emissions, in particular, to meet our international commitments.
- To foster knowledge and understanding of greenhouse issues.
- To lay the foundations for adaptation to climate change.

At a State level the Tasmanian Greenhouse Statement 1999 aims to further the understanding of Tasmania’s GHG emissions status and highlight opportunities for contributing to reducing Australia’s emissions.

4.9.2 Construction Impacts and Mitigation
GHG impacts associated with the construction phase include machinery and vehicle emissions and energy use.

The construction phase is anticipated to last in the order of 12 months for Stage 1, during which time GHG emission from these sources is unavoidable. To minimise GHG emissions, all machinery and vehicles will be well maintained and energy use will be minimised.

4.9.3 Operational Impacts and Mitigation
With the installation of the Anaerobic Tank, anaerobic processes may produce GHG; however, these are expected to be minor and will be managed with an odour control unit if necessary.

During times when the sludge drying pans are allowed to dry out prior to disposal, the sludge becomes exposed to the atmosphere and there is potential for methane and carbon dioxide generation. This process will be managed and minimised through the maintenance of moist pans until summer when the sludge can rapidly dry. With suitable management practices in place, the potential for methane and carbon dioxide generation is minimised.

The minimal use of vehicles on site and the ongoing electricity consumption in operating the WWTP has the potential for generation of some GHG, albeit minor in nature.

Commitment 23 A comparison will be made of potential GHG emissions associated with the proposed nutrient removal processes against discharge of treated effluent to reuse as part of the Effluent Reuse Feasibility Study.
4.10 Heritage

4.10.1 Legislative and Policy Requirements

The key legislation and policy relating to heritage and of relevance to the site are:

- The Aboriginal Relics Act 1975 – which governs the treatment of Aboriginal relics and protected sites in Tasmania. It is an offence to destroy, damage, deface, conceal or otherwise interfere with a relic. If any Aboriginal Heritage sites, relics or features are identified during the construction phase, works shall cease and advice will be sought from Aboriginal Heritage Tasmania prior to re-commencement of works.

- The Historic Cultural Heritage Act 1995 – which establishes the Tasmanian Heritage Council, the Tasmanian Heritage Register and the processes for considering works to heritage listed places.

- Part 7: Meander Valley Planning Scheme 1995 – which applies to the use and development of places of cultural significance that are on the Register of the National Trust of Australia (Tasmania), or Register of the National Estate.

- The DPEMP General Guidelines – which refer to identifying potential effects of the proposal on Heritage Sites and Areas.

4.10.2 Performance Requirements

As highlighted above, under the Aboriginal Relics Act 1975, a permit is required for the destruction, damage, defacement, concealment or otherwise interference of a relic. Although no relics have been located at the site, the provisions of the Aboriginal Relics Act 1975 remain applicable if relics are identified during site works.

Under the Historic Cultural Heritage Act 1995, a person must not carry out any works in relation to a registered place or a place within a Heritage Area which may affect the historic cultural significance of the place unless the works are approved by the Heritage Council. As the Racecourse site is permanently entered in the Heritage Register, the proposed development will require the approval of the Heritage Council.

The Racecourse is also included on the Register of the National Trust, and as such the use and development of this place will require the approval of the MVC. Consideration of the potential effects of the proposal on the racecourse will be separately reported and subject to approval from the Tasmanian Heritage Council and MVC.

Neither the Historic Cultural Heritage Act 1995 nor the Meander Valley Planning Scheme 1995 creates provisions for consideration of potential impacts from development adjacent to a Heritage place.

4.10.3 Background Heritage Values

No Aboriginal Heritage Sites were located at the development site in the 2002 survey.

The site itself is permanently included in the Tasmanian Heritage Register and on the Register of the National Trust.

Numerous built heritage places were identified in the Meander Valley Heritage Study, varying in distance from the proposed development area, from approximately 400 to 600 metres away.
4.10.4 Construction Impacts and Mitigation

As already indicated, if any Aboriginal Heritage sites, relics or features are identified during the construction phase, works shall cease and advice will be sought from Aboriginal Heritage Tasmania prior to re-commencement of works.

As the Deloraine Racecourse is a heritage area and the development includes a change to the natural or existing condition or topography of land, it requires approval by the Tasmanian Heritage Council under Part 6 of the Historic Cultural Heritage Act 1995. The potential construction impacts on the historical significant racecourse site have been considered with the findings being presented in the Heritage Impact Assessment Report (Appendix J).

The Heritage Council assessing the Deloraine Wastewater Treatment Plant has also recommended that a Landscape Plan be prepared for the affected area which minimises the visual impact on the heritage site and existing landscape character to assist in assessing the impact of the development. A Landscape Character Assessment and Schematic Landscape Plan Report (Appendix K) has been prepared to assist in mitigating the visual impact on the heritage site and existing landscape character from the development.

4.10.5 Operational Impacts and Mitigation

No adverse impacts are anticipated from the operations of the proposed development on either Aboriginal or historic heritage. Accordingly, no specific mitigation measures are necessary.

Consideration of potential operational impacts on the historic cultural heritage significance of the Racecourse will be separately reported.

4.11 Land Use and Development

4.11.1 Legislative and Policy Requirements

The Land Use Planning and Approvals Act 1993 (LUPAA) and Environmental Management and Pollution Control Act 1994 (EMPCA) are the primary land use planning and environmental legislative instruments under the Resource Management and Planning System (RMPS) of Tasmania. The aim of the RMPS is to achieve sustainable outcomes from the use and development of the State’s natural and physical resources.

The regulation of land use and development at the local level occurs through planning schemes. The site is subject to the provisions of the Meander Valley Planning Scheme 1995 (the Planning Scheme). It is within the Community Purposes Zone under the Planning Scheme. The proposal is classified as Utility Services (Major) which is a generally discretionary use and development class in the Zone.

The Planning Scheme embodies the objectives of the RMPS set out in Schedule 1 of LUPAA.

The proposal constitutes a Level 2 Activity under Schedule 2 of EMPCA. The development application is also generally discretionary pursuant to Section 25(1) (a) of EMPCA.

4.11.2 Performance Requirements

The proposal is classified as part of the existing Utility Services (Major) use and development class, which applies to the WWTP. The use and development is listed as discretionary in the Community Purposes Zone under the table to Clause 8.1.2 of the Planning Scheme. The proposed use and development is subject to the provisions contained under the following sections of the Planning Scheme:
The proposal is assessed as being compliant with these Planning Scheme provisions in the attached planning report in Appendix D. The objectives of the RMPS set out in Schedule 1 of LUPAA are also addressed in the attached report.

The State Policy on Water Quality Management 1997 (SPWQM), also enacted under the RMPS, is also relevant to the proposal. It has been considered fully in relation to the liquid waste and groundwater aspects of the proposal under Sections 4.2 and 4.3 respectively. In this way, the provisions of Clause 2.2.2 - ‘Permit Required in respect of Clause 31.5 of the State Policy on Water Quality Management 1997’ in the Planning Scheme have also been addressed.

4.11.3 Potential Impacts and Mitigation

This Section considers any potential effects of the proposal in terms of constraints and/or benefits on current or future use of land within the proposed site and surrounding area. In particular, the effect on the following proposed or current activities, as appropriate, has been considered:

- Tourist or recreation activities
- Residential activities
- Industrial activities
- Agricultural activities
- Commercial activities
- Local and regional tourism
- Other commercial activities

The land within and surrounding the Deloraine Racecourse property contains a variety of land uses and developments. These have been identified and described in Section 3.1.5. This illustrates that the WWTP is in a fairly isolated location inside the racetrack at the Deloraine Racecourse. The proposed upgrade is based on the existing WWTP, involving an extension to the tertiary treatment plant constructed in 2002. There are some sensitive uses, particularly residences, within 400 metres of the proposed upgrade, however the general area around the proposed upgrade is used for horse training activities and grazing.

Taking the above factors into account, and the mitigation measures and commitments set out within this DPEEMP, the operation of the proposed use and development will therefore have limited impact on the use of adjoining land. Further mitigation measures are not considered necessary.
The likelihood of additional odours associated with the WWTP as a result of the upgrade is remote (see Section 4.1). An odour unit associated with the Anaerobic Tank and chemical treatment of wastewater will be incorporated in Stage 2 if required. As discussed in Section 4.4, noise impacts resulting from the operation of the WWTP are considered minimal. Temporary impacts on surrounding uses during the construction phase, including noise, dust and increased traffic in particular, will be managed in accordance with the CEMP (see Section 4.18).

Taking into account the fact that additional odours associated with the upgrades are unlikely, with the improvement in effluent quality discharged to Meander River, it is considered that the existing attenuation distance area around the plant does not require modification. The attenuation distance defines an area where a use or development may be adversely affected by pollution or nuisance. Impacts of the upgrades will not increase pollution or nuisance to the area and therefore the attenuation distance does not need to be extended. The proposed WWTP upgrades will only marginally reduce the setback between the WWTP and the edge of the buffer area.

4.12 Visual Effects

4.12.1 Legislative and Policy Requirements

The key legislative document addressing visual impacts in the area are the:

- Meander Valley Planning Scheme 1995 (the Planning Scheme)
- The objectives of the RMPS as set out in Schedule 1 of LUPAA

These two documents deal with the broader issues of maintaining the environmental and social values of the area (of which the visual landscape is a relevant factor).

The provisions of Clause 3.6.3(4) (h) of the Planning Scheme are relevant to the assessment since the property is surrounded by land in the Rural Zone on three sides. This Clause seeks to ensure that buildings, structures and works aim to achieve minimal alteration of the rural landscape. It is addressed fully in the planning assessment in Appendix D. Consideration of the relevant matters listed under this Clause is also embodied within the following discussion.

4.12.2 Visual Impact Objectives

Tasmania’s landscape is an important consideration in any land use planning exercise because of its cultural, ecological and/or scenic qualities. The proposed development will be sited directly adjacent to the WWTP. As the WWTP is visible from the Bass Highway, it is important that this development or any other development minimise negative effects on the landscape and visual qualities of the area.

The Resource Planning and Development Commission (RPDC), in their State of Environment Reports and in the preparation of other studies and documents, has recognised the importance of maintaining landscape values within Tasmania, in particular for the following reasons:

- Protecting landscape values can sometimes help to protect a range of other environmental services. Landscape values often have an association with environmental and natural resource quality; the values that people appreciate in a landscape are often also important ecologically.
- The landscape values of the State remain a major draw card for the tourism industry and these landscapes should be managed as a key component of tourism infrastructure.
The proposed upgrade to the WWTP is sited to minimise the visual impact as viewed from the site and surrounds. In particular, it will mostly be positioned beyond the existing WWTP when viewed from the Bass Highway. The proposal provides for adequate separation to the nearest residences and landscaping is not considered necessary given that the land surrounding the WWTP is characterised by cleared grazing land.

### 4.12.3 Approach to Visual Impact Assessment (Methodology)

The visual assessment was conducted in the following manner:

- **Step 1** – Fieldwork – observation of the subject site and surrounding area.
- **Step 2** – Vantage point analysis from on site, the surrounding area and an observation from the Bass Highway and Meander Valley Road at the approach into Deloraine.
- **Step 3** – Analysis of visual values and a brief assessment of any potential impacts arising from the development.

### 4.12.4 Existing Visual Setting

#### Vantage Point Analysis

The WWTP lies on a relatively flat section of cleared land within the Meander River floodplain, surrounded by open pastures on adjoining properties to the east, north and west. The topography rises on the western side of the river. The Bass Highway lies approximately 300 metres to the north of the plant. The Deloraine Town, including the residential area surrounding Grigg Street in particular, is located 300 metres to the south east. The surrounding uses within and adjacent to the Deloraine Racecourse property are described in Section 3.1.5. Meander Valley Road, which is the main approach into Deloraine from the east, is located approximately 700 metres south east of the site.

The proposed upgrade will be located directly to the south of the main plant. The land is surrounded by the Deloraine Racetrack. The proposed development and works will be visible from local vantage points, surrounding uses and properties and the Bass Highway. However, given physical separation from these areas, topographical features and characteristics, in addition to which the proposed development will maintain a similar development profile to the existing plant, the upgrade will blend in with the surroundings.

The following provides a more detailed assessment of the likely visual impacts from key vantage points.

#### On site Observation and Existing Uses

The development site is currently used as a WWTP. The ground level was built up by approximately 4 metres as part of the previous upgrade to be above the 1 in 100 year flood interval. The main external infrastructure associated with the plant includes a 30 m² control building which is single-storey and constructed with face brick and a colour bond roof (muted colours), IDEAL 1 and IDEAL 2 (each approximately 750 m² in area) and two sludge drying pans (each 500 m²). Photograph 1 provides a view over the IDEALs to the existing control building within the WWTP.
The ground level for the proposed upgrade will be similarly built up through the placement and compaction of selected imported fill material. All works and new infrastructure involved will be confined to the development site. The Overflow Storage Basin, Anaerobic Tank and Sludge Drying Pans will all be constructed to the south of the existing infrastructure at the tertiary treatment plant. The Balance Tank and Colourbond equipment shed (housing the pump filters and UV disinfection system) will be constructed adjacent to the existing control building.

The WWTP is visible from most areas and uses within the Deloraine Racecourse property, however it is physically separated from most adjoining uses and activities and is accessed over the racetrack. Established vegetation in the south western corner of the property acts as a visual screen from uses in this area, including the overnight motor home rest area. The general area around the proposed upgrade is used for horse training activities and grazing.

The wider area is part of an open plain, although the topography becomes more undulating to the west (opposite side of the Meander River), north (opposite side of the Bass Highway) and south (within Deloraine). Therefore, the proposed development will generally blend into the surrounding landscape when viewed from existing uses within the property.
Photograph 2 is taken near the entry gate into the WWTP south of the access track and provides a view to the south and south east (see below). It shows grazing land within the racetrack in the foreground and the grandstand and buildings associated with the racetrack (with red roofs). The area visible immediately to the rear is residential development along Grigg Street and beyond. The photograph demonstrates the partial screening offered from the residential area by the racetrack buildings and existing vegetation.

**Photograph 2 – View from Deloraine WWTP towards the south**

- **Surrounding Area**
  Land in a 500 metre radius surrounding the development site, outside the Deloraine Racecourse property, is a combination of land used and/or zoned for agricultural, commercial, industrial, recreational and residential purposes. The WWTP and proposed upgrade is visible from a number of areas, however taking account of the topographical factors described above and physical separation, it will generally blend into the surrounding landscape when viewed from these areas. There are a number of instances where the WWTP is screened from view from these adjacent areas, and the Deloraine Town in general, by vegetation and built structures on adjacent properties (as illustrated in Photograph 2).

- **Bass Highway**
  The proposed development will be sited 300 metres south of the Bass Highway. The land surrounding the highway in the Deloraine area, east of the Meander River, is characterised by flat to undulating pastures. The highway is elevated directly to the north of the Deloraine Racecourse and therefore overlooks the property including the WWTP. Photograph 3 below provides an indication of the view of the WWTP from the Bass Highway. The brick control building is the most visible element within the tertiary treatment plant.

  Although the new plant will be similarly visible from the highway, it will fit in with the surrounding structures and built environment, and will not have any detrimental visual effect on passing traffic. It will mostly be viewed slightly beyond Lagoon 1 and the existing tertiary treatment plant, with Deloraine Town forming a backdrop.
Photograph 3 – View of existing Deloraine WWTP from Bass Highway

Meander Valley Highway

The old highway is aligned in an east-west direction and is the main approach into Deloraine from the east (providing a connection from the Bass Highway). It is located 700 metres south east of the site, where it is lined by a row of poplar trees. The trees act as a screen to the WWTP particularly during summer months. From this general area however, the WWTP and proposed upgrade will blend into the existing landscape, taking account of the factors discussed above.

By way of illustration, Photograph 4 below provides a view towards the WWTP from the Meander Valley Highway, taken beyond the row of poplar trees which exist in this area.

Photograph 4 – View of the existing Deloraine WWTP from Meander Valley
4.12.5 Construction Impacts and Mitigation Measures

Visual impacts are likely to arise from construction equipment, clearing, excavation and landfill works as well as construction signage. Taking account of the separation of the development site from adjoining uses and properties, the level of impact is not expected to be significant. Management of visual impacts, including dust mitigation in particular, will be addressed in the CEMP.

4.12.6 Operational Impacts and Mitigation Measures

To assess the potential visual impact of the proposed development, a desktop visual assessment and on site investigation was undertaken. As discussed in Section 4.12.4, the proposed development will not have a significant visual impact when viewed from surrounding areas. The key elements of the development applied to the assessment are discussed below.

- Scale and Appearance
  The proposed development involves raising of the ground level by approximately 4 metres to be above the 1 in 100 year flood interval. The majority of new infrastructure will be constructed within the imported fill material. The key components of external above-ground infrastructure include the Colourbond equipment shed, Anaerobic and Balance Tanks and new decanter for IDEAL 2. The Anaerobic and Balance Tanks will be constructed partially underground. The new development will therefore be of a similar profile to the existing infrastructure at the treatment plant. Furthermore, the development complies with the 8 metres height requirement for buildings, which applies to the adjacent Rural Zone under Clause 3.6.3(4) (a) of the Planning Scheme.

- Colour and Design
  The colour of external infrastructure has not yet been specified. It is recommended that where possible non-reflective materials and muted tones should be used.

- Separation and Setback
  The provisions of the adjoining Rural Zone, which have been taken into account in the planning assessment in Appendix C require development to be setback 50 metres from side and rear property boundaries. It is submitted that the proposed development complies with these setbacks.

- Vegetation Clearance
  The proposed development does not involve removal of existing stands of vegetation.

4.13 Socio Economic Issues

4.13.1 Total Capital Investment

See Section 3.3.1.

4.13.2 Impacts on Local and State Labour Markets

See Section 3.3.2.

4.13.3 Impacts on Upstream and Downstream Industries

The WWTP upgrade will provide an increased potential in development both upstream and downstream.
4.13.4 Local Raw Materials
Clay and soil will need to be sourced for some components of the upgrades and these will be sourced locally. Other materials, such as pipeworks and pumps will be sourced from off-site however the suppliers are not yet known.

4.13.5 Impacts on Land Values
It is expected that the value of vacant land may increase. This may also result in lifting value of surrounding property.

4.13.6 Community Impacts
BLW employs a small number of operational staff to routinely undertake maintenance operations at the WWTP and these jobs will remain following the upgrade of the WWTP. The upgrading works will significantly benefit the community providing the infrastructure necessary for the growth and expansion of the area. This will produce a very positive stimulus to the Deloraine community and will have many suspected flow-on effects into the local community.

4.14 Health and Safety Issues

4.14.1 Legislative, Policy and Performance Requirements
The proposed upgrade must comply with all relevant State and Commonwealth legislation with respect to the health and safety of staff, contractors, and the community. In particular, the construction and operation of the plant must comply with the Tasmanian Workplace Health and Safety Act 1995 and Regulations 1998 and AS 4804 Occupational Health and Safety Management Systems.

4.14.2 Construction Impacts and Mitigation
Construction contractors will be required to provide documentation outlining their systems for managing health and safety during construction. All contractors will be required to undertake all works in accordance with BLWs Occupational Health and Safety Policy.

4.14.3 Operational Impacts and Mitigation
Once constructed, operation of the upgraded WWTP will be undertaken in accordance with the requirements of the Tasmanian Workplace Health and Safety Act 1995 and Regulations 1998.

An Operational Environmental Management Plan (OEMP) will be prepared that incorporates the existing WWTP and will address Health and Safety issues such as:

- Identification of safety hazards and controls.
- Procedures for operational control of potentially hazardous equipment.
- Roles and responsibilities for specific management representatives who have a defined role for occupational health and safety management of the facility.
- Development of a competency, training and awareness program for employees associated with the facility.
- Development of an Emergency Response Plan.
- Development of an incident management system.
As a result of the proposed works there will be an overall reduction in mass load discharged to the Meander River compared to the existing discharge situation (refer to Section 4.2). In addition, Mixing Zone modelling (refer to Section 4.2) indicates that the proposed treated effluent quality and quantity will be assimilated to background levels under low flow conditions, such that the mixing zone is anticipated to be 5 metres to 25 metres in length.

As the proposed upgrades are expected to result in an improved outfall location (extension of the pipeline into the middle of the Meander River) and improved treated effluent quality, the overall public health and safety implications are considered to be positive. In particular, the extension of the outflow pipeline is expected to result in a mixing zone which does not extend to the banks of the Meander River, which is much more acceptable in terms of public health and recreational users than the existing outfall which mixes in a complex pattern at the very edge of the river.

**Commitment 24  Develop an Operational Environmental Management Plan that encompasses all of the Deloraine WWTP including the upgrades.**

### 4.15 Hazard Analysis and Risk Assessment

#### 4.15.1 Risk Assessment Summary

The analysis of hazards is central to the effective management of health, safety and environmental risks for the project. This section provides the hazard analysis and risk assessment that was conducted to identify and manage hazards during the concept development phase, while considering the construction and operational phases.

The Sustainability Risk Assessment was conducted to assess the potential risks associated with the upgrading of the WWTP. A Hazard Identification Workshop (HAZID) was conducted with key members of the DPEMP team in general accordance with AS/NZS 4360:1995 Risk Management and Environmental Risk Management HB 2003:2006.

The workshop considered hazards leading to potential risks, with evaluation of the likelihood and consequence of events being risk ranked according to a Sustainability Risk Assessment Tool (Appendix I). Risks were firstly evaluated without considering mitigation strategies and secondly including the strategies. In most cases there was a decrease in risk due to the mitigation. Summary results from the risk assessment are shown in Table 26, indicating that when mitigation strategies are employed there are no identified extreme or high risks.
Table 23  Sustainability Risk Assessment Summary After Mitigation

<table>
<thead>
<tr>
<th>Ranking</th>
<th>No.</th>
<th>Risk Summary</th>
<th>Effects and Mitigation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extreme</td>
<td>0</td>
<td>NA</td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>0</td>
<td>No high level risks were identified during construction or operation.</td>
<td></td>
</tr>
<tr>
<td>Medium</td>
<td>4</td>
<td>Medium level risks identified during construction predominantly relate to:</td>
<td>Refer to Section 2.4.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Effluent being diverted to proposed overflow storage basin whilst Decanter</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>is installed. However, if overflow basin fills, effluent will be diverted</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>straight to Lagoon 1.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Medium level risks identified during operation predominantly relate to:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Poor plant performance due to operator not being familiar with all upgrades of the WWTP.</td>
<td>Refer to Table 24</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Insufficient treatment of effluent leading to poor quality discharge creating algal blooms, odour and fish kills.</td>
<td>Refer to Section 4.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Insufficient treatment of effluent leading to poor quality discharge with the consequence of impacting the health of downstream water users.</td>
<td>Refer to Section 4.2</td>
</tr>
<tr>
<td>Low</td>
<td>18</td>
<td>Refer to Appendix I</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>22</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4.15.2 Contingency Planning

The following contingency plan framework provides a guide for BLW to develop a Contingency Management Plan for the WWTP.

The proposed process for initiating and implementing contingency plans is detailed below in Figure 15.
4.15.3 Identification and Assessment of Potential Aspects and Impacts

Table 24 outlines risk treatment action for potential aspects. Note that a risk assessment will be undertaken for each aspect. The risk can then be prioritised which will determine the type and urgency of action required.
### Table 24 Potential Aspects and Impacts Register

<table>
<thead>
<tr>
<th>Aspect</th>
<th>Impact</th>
<th>Risk Treatment Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Failures/Interruptions</td>
<td>Overflow of wastewater (leading to surface water pollution).</td>
<td>Provision of back-up fuel pump(s).</td>
</tr>
<tr>
<td></td>
<td>Lack of oxygen supply resulting in anaerobic conditions and odour generation.</td>
<td>Provision of power generator.</td>
</tr>
<tr>
<td>Floods and Storms</td>
<td>Inundation of wastewater storage by floodwaters leading to pollution of surface waters.</td>
<td>Installation and maintenance of stormwater management/diversion systems.</td>
</tr>
<tr>
<td></td>
<td>Peak flows received by WWTP – Treatment problems.</td>
<td>Wet weather overflow pond and infiltration improvements.</td>
</tr>
<tr>
<td>Damage to Lagoons or Tanks</td>
<td>Pollution of surface or groundwater.</td>
<td>Lagoon inspections.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bunding and spill management – bunding in accordance with appropriate guidelines.</td>
</tr>
<tr>
<td>Damage to Pumps, Pipes, Valves and Fittings</td>
<td>Pollution of surface or groundwater.</td>
<td>Development of critical spares register and stock for e.g. provision of back-up pump in case of pump failure.</td>
</tr>
<tr>
<td>Accidental Spillage of Hazardous Substance</td>
<td>Pollution of surface or groundwater.</td>
<td>Provision of spill kits and staff training.</td>
</tr>
<tr>
<td>Excessive nutrient levels in ponds, in conjunction with other factors such as high temperatures.</td>
<td>Blue green algal bloom.</td>
<td>If bloom observed, undertake monitoring to identify species, toxicity and cell count. If there is a health risk, consult with regulator and investigate potential treatment options for nutrient management.</td>
</tr>
<tr>
<td>Poor Plant Performance</td>
<td>Inefficient or ineffective processing of wastewater.</td>
<td>Replace/repair equipment.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Process improvements.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Operator training/knowledge sharing across back-up staff.</td>
</tr>
<tr>
<td>Septic Wastewater as a result of Anaerobic Bacterial Activity</td>
<td>Odour generation.</td>
<td>Improve screening and aeration systems.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consider using physical or chemical odour management systems.</td>
</tr>
<tr>
<td></td>
<td>Discharge of poor water quality.</td>
<td></td>
</tr>
</tbody>
</table>
Training and Implementation

It is critical that the roles and responsibilities within the contingency plan are formally documented and communicated to relevant staff. Any training requirements related to the contingency plan will be provided. Control/risk treatment activities identified for high risk aspects will be implemented as soon as practicable.

Review and Continual Improvement

The contingency plan will incorporate a process to regularly review the plan and implement improvements to the system wherever applicable.

Incident Notification and Emergency Communication

Incident notification and emergency communication requires the following:

- An internal protocol for reporting an incident to responsible council officers (including main and back-up staff names, titles and phone numbers).
- Reporting aspects and impacts to relevant emergency authorities.

Table 25 below provides contact details for relevant emergency authorities. Relevant contact details of downstream water users should also be incorporated into the Contingency Management Plan.

<table>
<thead>
<tr>
<th>Emergency Authority</th>
<th>Contact Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ben Lomond Water</td>
<td>13 6992</td>
</tr>
<tr>
<td>Meander Valley Council</td>
<td>03 6393 5300</td>
</tr>
<tr>
<td>Police, Fire, Ambulance</td>
<td>000. Mobiles can also use 112.</td>
</tr>
<tr>
<td>State Emergency Service (Storm and Flood Response)</td>
<td>132 500</td>
</tr>
<tr>
<td>Aurora (electricity)</td>
<td>13 2004</td>
</tr>
<tr>
<td>Powerco (gas)</td>
<td>180 2111</td>
</tr>
<tr>
<td>DIER (State roads and bridges)</td>
<td>1800 005 282</td>
</tr>
<tr>
<td>Environmental emergency</td>
<td>1800 005 171</td>
</tr>
<tr>
<td>Poisons Information Centre</td>
<td>131 126</td>
</tr>
</tbody>
</table>

Commitment 25  
A Contingency Management Plan for the Deloraine WWTP will be developed.
4.16 Fire Risk

4.16.1 Legislative, Policy and Performance Requirements
The construction and operation of the upgraded WWTP must fulfil the requirements of the following legislative and policy requirements in relation to fire risk:

- Fire Services Act 1979

Buildings and associated fire controls must be designed in accordance with the Building Code of Australia.

4.16.2 Construction Impacts and Mitigation
Ignition sources associated with the construction phase of the sludge basins are limited to the use of machinery, vehicles and fuels. All vehicles and machinery will be kept in good working order to minimise the potential for fires on site. Any fuels required during the construction phase will be limited in quantity and will be stored in appropriately bunded facilities.

Appropriate fire fighting equipment will be kept on site during the construction phase and site staff will be trained in emergency procedures and use of fire fighting equipment.

The full details of fire management during the construction phase will be outlined in the CEMP.

4.16.3 Operational Impacts and Mitigation
The two key aspects of fire prevention and control during operation of the WWTP relate to:

- Fires generated on the site, causing internal damage or migrating off the site into surrounding areas.
- The potential for wildfires to enter the site from surrounding areas.

The operation of the upgraded WWTP poses little new fire risk, as there are no ignition sources or significant fuel sources associated with the plant.

There is the potential for wildfire to encroach on the site due to the surrounding grassy plains. Potential fire sources include lightning strikes as well as spot fires from fires further afield. External fire is considered to pose a very low risk to the operation of the upgraded WWTP as all structures will be of concrete construction and the embankments will comprise bare earth and clay.

4.17 Infrastructure and Off-Site Ancillary Facilities

4.17.1 Construction Impacts and Mitigation
Construction based infrastructure impacts relate to road use for movement of machinery or materials to and from the site. Access for construction of the sludge drying pans and delivery of the new tanks will be via the existing roadway system, along East Westbury Place. It is not expected the upgrading works will impact any other road users in the area.

In the context of existing regional road usage, transportation of material such as pipes, pump and equipment is considered to be minor.

There are no other significant off-site infrastructure impacts associated with the WWTP upgrading.
4.17.2 Operational Impacts and Mitigation

Once the upgrades are complete, energy and water utilisation from existing site sources will remain similar and the upgrades are not anticipated to impact upon associated infrastructure.

As is currently the case, daily traffic movements from the site will continue, which will be via East Westbury Place.

There are no significant impacts to off-site infrastructure facilities anticipated as a result of the proposed plant upgrade.

4.17.3 Stormwater Inflow and Groundwater Infiltration Management Plan

Inflow and infiltration are terms used to describe the ways that groundwater and stormwater enter the sewerage system. Inflow is water that enters the sewerage system through improper connections, such as stormwater pipes incorrectly connected into sewerage mains. Infiltration is groundwater that enters the sewerage system through leaks in the pipe.

Stormwater inflow and groundwater infiltration studies undertaken by MVC to date indicate that there have been some minor inflows from houses and from illegal connections28. Increased wet weather flows are expected to have resulted in some groundwater infiltration, as well as manhole leaks in the collection system. Peak wet weather flow in 2007 was reported to be 3420 kL/day, which is equivalent to 6 x median flow29.

The level of inflow and infiltration within the Deloraine sewerage system is consistent with other similar sewerage systems. Storage during wet weather conditions has historically been problematic for the WWTP, with regular high wet weather flows overloading the plant for prolonged periods.

An Inflow and Infiltration Strategy for all BLW’s WWTPs is currently being developed. This strategy will identify the extent of inflow and infiltration issues and prioritise actions to implement improvements. Key aspects of this strategy will involve collation of previous studies and works, assessment of impact (e.g. overflows, WWTP capacity), regulatory requirements, assessment of priorities and scheduling of actions.

Due to commitments relating to this approval process and known inflow and infiltration issues, Deloraine will be ranked as a high priority for detailed assessment and associated works.

Stormwater Inflow Management

The proposed Stage 1 upgrade works include an initiative to minimise the impact of wet weather conditions on the WWTP:

- Installation of a flow splitter after the inlet screen and a wet weather overflow storage basin. Flows greater than 3 x ADWF will be diverted into the proposed wet weather storage basin (1.5 ML).
- Wastewater stored in this basin will be pumped back to the Anaerobic Tank/IDEAL Basins/WWTP during periods when volumes of wastewater entering the plant are low thus improving the plant’s capacity to manage peak flows.

BLW need to further investigate stormwater inflow to minimise the volume of peak flows. Investigation will include the identification of the sources of stormwater inflows and implementing improvements to prevent or reduce inflow/infiltration.

---


Aspects for consideration in an improvement programme include:

- Sewer inspections – including CCTV survey.
- Manhole and Pumping Station inspections.
- Asset management – maintenance, relining and replacement programmes based on condition assessments.
- Illegal connection identification – use of fogging/smoking and dye testing to identify and rectify incorrect stormwater connections to the sewerage systems.

Groundwater Infiltration Management

Groundwater infiltration will be managed by lining the overflow storage basin with high density polyethylene (HDPE) to prevent leakage into the groundwater.

**Commitment 26** BLW to undertake an investigation into stormwater inflow to minimise the volume of peak flows within 12 months of completing the Stage 1 works or prior to commencing Stage 2 works. This investigation will result in an Inflow and Infiltration Management Plan. Significant sources of inflow and infiltration will be prioritised and mitigation will be actioned.

4.18 Environmental Management Systems

4.18.1 Management System Description

International management system standards require that policies form the basis for managing environmental issues that are endorsed by the top-level management and conveyed to employees with an aim for continual improvement. The MVC DPEMP from 2002 has provided the basis for stating commitment to environmental performance and continuous improvement at the treatment plant.

4.18.2 Construction Environmental Management Plan (CEMP)

A CEMP will be prepared prior to construction and will include as a minimum, the following:

- Identification of environmental risk and controls (in line with Section 4.15).
- Development and implementation of documented procedures for operational control.
- Appointment of a specific management representative who has a defined role for environmental management of the site.
- Clear outline of competency and training (if required) for employees associated with the environmental performance of the site.
- Development and implementation of an environmental monitoring program with documented procedures (if required).
- Development and implementation of an incident management system.
- Development and implementation of an auditing program for both during and at the completion of the construction phase.

The relevant sections of International Standard Organisation (ISO) 14001 EMS will be used for guidance when these minimum requirements are addressed.
It will be the treatment plant operator’s responsibility to prepare and implement a CEMP prior to the construction phase of the project. The Contractor will be required to nominate an Environmental Representative, with responsibility for ensuring that the needs of the CEMP are met. It is expected that the CEMP will encompass the relevant issues identified in Section 4, and include, but not be limited to the following key elements:

- Site Management – A system will be developed to manage entry and exit from the site and to ensure that impacts from works do not occur outside the contract site.
- Erosion Control – The CEMP will include an erosion management system, which outlines procedures to ensure no significant erosion or runoff as a result of construction works.
- Dangerous Goods – A system will be established for managing the delivery, storage use and disposal of all dangerous goods required for construction.
- Air Quality – A visual monitoring program to identify unacceptable levels of dust during construction will be implemented. The CEMP will also outline mitigation measures to be employed in the instance that dust levels are elevated. Such measures may include the use of water carts, or ceasing work in certain weather conditions.
- Noise Management – The CEMP will outline measures for notifying the closest local residents and horse trainers of noise generating activities, as well as stipulating clear hours of operation. The CEMP will also outline any necessary controls to ensure noise levels at the construction site are in accordance with workplace standards, including measures such as the use of hearing protection if required.
- Traffic Management – The CEMP will outline clear procedures for traffic management, including signage, timing, safety and notification of local area users.
- Health and Safety – A system will be developed to manage health and safety on site during the works.
- Waste Management – Procedures for waste management during construction, including designated lay-down areas, and transport and disposal procedures will be developed.
- Weed and Disease Control – The CEMP will develop and implement procedures for wash-down of equipment before entering the site in order to avoid the introduction of weeds, pest and diseases. This section will also outline weed control measures to be implemented before and after construction to ensure the works do not increase the infestation of weeds presently located at the site.
- Incident Management – An incident reporting and follow up system will be established in order to respond effectively and efficiently in the unlikely event of an environmental incident.

4.18.3 Operational Environmental Management Plan (OEMP)

It will be the treatment plant operator’s responsibility to incorporate the proposed upgrades into an OEMP for the WWTP (as stated in Commitment 24). The plan will be reviewed and updated within two years of commissioning.
4.19  Cumulative and Interactive Effects

There are no cumulative impacts expected as a result of the proposed upgrade works. Whilst the outflow from the plant will increase, the improvements in wastewater treatment are expected to result in a decrease in overall mass loads to the Meander River. Hence, cumulative impacts from various discharges to the Meander River are not expected to occur to any greater extent than from current plant operations.

The plant upgrade may result in increased local development, changes in local property values and possibly additional infrastructure with the potential for environmental impact. These factors will need to be addressed as additional development is established, in accordance with normal BLW planning processes.

4.20  Monitoring and Review

In order to monitor the ongoing performance of the WWTP upgrade the following monitoring will be undertaken:

- Treated Effluent Monitoring
- Receiving Waters Monitoring
- Groundwater Monitoring
- Macroinvertebrate Monitoring

4.20.1  Treated Effluent Monitoring

There is a flow meter currently installed on site, which will continue to measure flow rate into the WWTP. Treated effluent will be sampled immediately prior to discharge. As is currently the case, grab samples will be taken and analysed for a range of parameters as summarised in Table 26.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sampling Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow Rate (Plant Inlet)</td>
<td>Continuous</td>
</tr>
<tr>
<td>Suspended Solids (mg/L)</td>
<td>Fortnightly</td>
</tr>
<tr>
<td>BOD (mg/L)</td>
<td>Fortnightly</td>
</tr>
<tr>
<td>Grease and Oil (mg/L)</td>
<td>Fortnightly</td>
</tr>
<tr>
<td>Ammonia –N (mg/L)</td>
<td>Fortnightly</td>
</tr>
<tr>
<td>Total N (mg/L)</td>
<td>Fortnightly</td>
</tr>
<tr>
<td>Total P (mg/L)</td>
<td>Fortnightly</td>
</tr>
<tr>
<td>pH</td>
<td>Fortnightly</td>
</tr>
<tr>
<td>Thermotolerant coliforms (orgs/100 mL)</td>
<td>Fortnightly</td>
</tr>
</tbody>
</table>

It is proposed that, following six months of favourable results (as compared to limits provided in Table 2) from the fortnightly analysis, the sampling frequency will revert to monthly events.
Figure 16  Existing and Proposed Surface Water Monitoring Sites
4.20.2 Receiving Water Quality Monitoring

In order to validate the modelling discussed in Section 4.2 and continually monitor the environmental performance of the WWTP upgrade, two new monitoring points are proposed to replace several of the current Meander River monitoring points. The new monitoring points are illustrated in Figure 16 and summarised in Table 27 below. A replacement sampling location has been suggested for the upstream sampling site because the existing sample is collected in an area disturbed frequently by human activity, and is just upstream of a weir (refer Figure 16). A replacement sampling location is recommended for monitoring point RW2 as it is currently located in an eddy and is bypassed by the main stream flow (information provided by EPA).

Table 27 Receiving Water Monitoring Points

<table>
<thead>
<tr>
<th>Monitoring Point</th>
<th>Parameters</th>
<th>Frequency</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>RW1</td>
<td>Suspended solids, BOD, Oil &amp; Grease, Ammonia, N, P, pH, Thermotolerant coliforms</td>
<td>Monthly – prior to commissioning, Fortnightly – six months post commissioning, Monthly – following six months of favourable performance</td>
<td>Monitor background water quality</td>
</tr>
<tr>
<td>RW2 (to be reviewed)</td>
<td>As above</td>
<td>As above</td>
<td>Monitor downstream extent of mixing zone</td>
</tr>
<tr>
<td>RW3</td>
<td>As above</td>
<td>As above</td>
<td>Monitor cross river extent of mixing zone</td>
</tr>
</tbody>
</table>

The monitoring of these three points will provide BLW with a thorough data set with which to assess and monitor the environmental performance of the discharge.

It is proposed that this monitoring commence four months prior to commissioning in order to gain an understanding of existing conditions at these sites. During the first six months of Stage 1 operation, BLW will undertake fortnightly sampling of these sites with the view to reverting back to monthly sampling following continual performance within the recommended limits.

Commitment 27  **BLW is currently developing an Ambient Monitoring Plan for Receiving Waters. This Plan will be used to design a monitoring program to provide information that can be used to confirm the mixing zone and validate impacts on the receiving water quality.**
4.20.3 Groundwater Monitoring

As discussed in Section 4.3.3 the upgrade of the WWTP will result in the loss of two of the existing groundwater monitoring wells, leaving only D12, which is considered to be a background monitoring well. In order to monitor potential groundwater contamination it is recommended that three new groundwater wells be installed. The location of these wells will be confirmed following further assessments of the existing wells and desktop information but will generally be positioned to target higher risk locations such as the sludge drying pans and the overflow basin.

Indicative well locations are presented in Figure 6 and the sampling program and rationale is summarised in Table 28.

Table 28 Groundwater Monitoring Summary

<table>
<thead>
<tr>
<th>Monitoring Well</th>
<th>Parameters</th>
<th>Monitoring Frequency</th>
<th>Rationale</th>
</tr>
</thead>
<tbody>
<tr>
<td>D12</td>
<td>◆ Standing Water Level ◆ In field (EC, pH, T, ORP, DO)</td>
<td>Quarterly</td>
<td>Monitor background conditions</td>
</tr>
<tr>
<td>MW1</td>
<td>◆ Ca, Mg, Na, K ◆ Nitrate, Nitrite ◆ Sulphate</td>
<td>Quarterly</td>
<td>Monitor impacts associated with the sludge drying pans</td>
</tr>
<tr>
<td>MW2</td>
<td>◆ Bicarbonate/carbonate ◆ TDS</td>
<td>Quarterly</td>
<td>Monitor impacts associated with the overflow basin</td>
</tr>
<tr>
<td>MW3</td>
<td>◆ BOD/COD ◆ Total P, Total N, Ammonia ◆ TOC</td>
<td>Quarterly</td>
<td>Monitor groundwater quality immediately prior to discharge to Meander River</td>
</tr>
</tbody>
</table>

It is recommended that the new wells be installed a minimum of six months prior to commissioning in order to provide some background water quality data.

Following commissioning, groundwater monitoring will be undertaken on a quarterly basis for a 24 month period. After this time the program will be reassessed with the view to reducing the analytical suite to target key contaminants of concern.

4.20.4 Macroinvertebrate Sampling

Macroinvertebrate sampling up and downstream of the proposed outfall site was conducted in Autumn 2009, and is considered suitable to form the baseline for this program. Refer to Figure 10 for sampling locations and Appendix F for details of the sampling program. Samples will be compared against the results obtained in the 2009 survey to determine any changes associated with the new outfall.

Macroinvertebrate sampling will be conducted in autumn, approximately one year after commissioning of the new outfall. The ongoing monitoring program will be determined based on the results of this initial assessment.
4.20.5 Complaints, Incidents and Notification

To address other potential impacts not considered suitable for on-going monitoring, a complaints and incidents register will be developed and maintained.

Any complaints received from neighbouring residents, motorists and any other members of the general public will be recorded in the register. This register will also include any incidents or complaints relating to issues included in regular monitoring program.

The complaints register will include details such as:

- Time complaint received or incident occurred
- Name of complainant
- Contact details of complainant
- Details of complaint
- Person responsible for addressing complaint
- Investigations undertaken
- Manner in which the complaint was resolved (including mitigation measures implemented)

Any accidents or incidents resulting in the potential for personal or environmental harm or nuisance will be reported to the appropriate authority as soon as practicable.

**Commitment 28** A complaints and incident register will be established.

4.20.6 Annual Reporting

Annual reports will be prepared to report on the sampling programs outlined in this Section. In particular annual reports will include summaries of:

- Treated effluent flows from the WWTP.
- Treated effluent quality, compared against the emission limits proposed in Section 2.
- Ambient water quality, up and downstream of the outfall, compared against the baseline upstream and downstream data and at the downstream extent of mixing zone.
- Groundwater monitoring.
- Aquatic ecology survey, outlining any changes from the baseline survey which may suggest an impact from the outfall.
- Outline of any incidents, complaints or notifications during the year.

Annual reports will be submitted to the Director within three months of the end of the reporting period. The first reporting period will commence upon commissioning of the outfall.

**Commitment 29** An annual report will be prepared and submitted to the Director.
4.21 Decommissioning and Rehabilitation

Throughout any further site improvement works, redundant equipment and infrastructure shall be removed from site. Options for reuse/recycling will be explored. The treatment plant operator will prepare a Decommissioning and Rehabilitation Plan within 12 months of the decision being made to close the WWTP.

Commitment 30 The treatment plant operator will prepare a Decommissioning and Rehabilitation Plan within 12 months of the decision being made to close the Deloraine WWTP.
5.  Commitments

These commitments relate to the relative sections through Sections 2.6, 2.7, 2.9, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7, 4.9, 4.14, 4.15, 4.17 and 4.21 of this document. BLW is responsible for the implementation of all commitments.

Table 29  Commitments

<table>
<thead>
<tr>
<th>Number</th>
<th>Commitment</th>
<th>Responsibility</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A Construction Environmental Management Plan will be prepared, prior to construction.</td>
<td>Contractor</td>
<td>Prior to Construction</td>
</tr>
<tr>
<td>2</td>
<td>The 1.5 ML overflow storage basin will be HDPE lined. HDPE lining will be undertaken in an approach consistent with the Environment Division's protocol Environmental Standards Applying to Liner Construction March 2006 (DEPHA 2006). This process will be managed through site investigation, engineering design, materials testing/quality controls and site supervision.</td>
<td>Contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>3</td>
<td>The sludge drying pans will be clay lined as the drying pans will be cleared using an excavator which would damage other types of liners. The clay lining will be engineered to comply with the Environment Division’s protocol Environmental Standards Applying to Liner Construction March 2006 (DEPHA 2006). This process will be managed through site investigation, engineering design, materials testing/quality controls and site supervision.</td>
<td>Contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>4</td>
<td>Install an Overflow Storage Basin prior to installing new decanter into IDEAL 2. As the plant may be out of service for up to a week whilst decanter is replaced, diverting wastewater to the new Overflow Storage to ensure that untreated effluent is not released to Meander River.</td>
<td>Contractor</td>
<td>Construction</td>
</tr>
<tr>
<td>5</td>
<td>The operator will prepare an Operation and Maintenance Manual for the Deloraine WWTP.</td>
<td>Operator</td>
<td>Operation</td>
</tr>
<tr>
<td>6</td>
<td>The existing outfall pipe will be replaced and extended to mid-channel of the Meander River.</td>
<td>Operator</td>
<td>Construction</td>
</tr>
<tr>
<td>7</td>
<td>An Effluent Reuse Feasibility Study will be prepared in parallel with Stage 1 and completed prior to the commencement of Stage 2 works. Reuse will be implemented where it is found to be feasible by the study.</td>
<td>Operator</td>
<td>Operation</td>
</tr>
<tr>
<td>8</td>
<td>BLW will prepare a Dust Control Management Plan.</td>
<td>Operator</td>
<td>Construction</td>
</tr>
<tr>
<td>Number</td>
<td>Commitment</td>
<td>Responsibility</td>
<td>Schedule</td>
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<td>----------------</td>
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</tr>
<tr>
<td>9</td>
<td>An odour assessment will be undertaken by a suitably qualified person and submitted to the EPA Division. Mitigation measures will be undertaken if recommended by the assessment.</td>
<td>Operator</td>
<td>Operation</td>
</tr>
<tr>
<td>10</td>
<td>All works to extend the outfall pipe in the Meander River will be undertaken in accordance with the Waterways and Wetlands Works Manual 2003: Environmental Best Practice Guidelines 2. Construction Practices in Waterways and Wetlands.</td>
<td>Operator</td>
<td>Construction</td>
</tr>
<tr>
<td>11</td>
<td>Commissioning monitoring will be undertaken at the completion of Stage 1 and to optimise plant performance and assist in the design of Stage 2 works.</td>
<td>Operator</td>
<td>Construction</td>
</tr>
<tr>
<td>12</td>
<td>A macroinvertebrate sampling program in accordance with the AUSRIVAS sampling protocol will be conducted 1 year after completion of the Stage 1 works. The data collected will be compared against sampling conducted prior to commencement of works.</td>
<td>Operator</td>
<td>Operation</td>
</tr>
<tr>
<td>13</td>
<td>Three new groundwater wells will be established and monitored a minimum of six months prior to commissioning of the Stage 1 upgrade works.</td>
<td>Operator</td>
<td>Construction</td>
</tr>
<tr>
<td>14</td>
<td>Construction equipment will be muffled and construction will occur six days a week during daylight hours only.</td>
<td>Operator</td>
<td>Construction</td>
</tr>
<tr>
<td>15</td>
<td>Waste materials will be stored in a designated laydown zone or in covered bins located in convenient areas and disposed of regularly to a recycling facility or an approved disposal facility as appropriate.</td>
<td>Operator</td>
<td>Construction</td>
</tr>
<tr>
<td>16</td>
<td>Waste minimisation and recycling will be undertaken where possible.</td>
<td>Operator</td>
<td>Construction</td>
</tr>
<tr>
<td>17</td>
<td>A Biosolids Management Plan will be prepared six months prior to the removal of sludge from the site, consistent with the Tasmanian Biosolids Reuse Guidelines (DPIWE 1999).</td>
<td>Operator</td>
<td>Operation</td>
</tr>
<tr>
<td>18</td>
<td>Dangerous goods will be managed in accordance with the Dangerous Goods Act and associated regulations.</td>
<td>Operator</td>
<td>Construction</td>
</tr>
<tr>
<td>19</td>
<td>Dangerous goods will be stored in areas bunded in compliance with Australian standards.</td>
<td>Operator</td>
<td>Construction</td>
</tr>
</tbody>
</table>

Deloraine Wastewater Treatment Plant Upgrade
Development Proposal and Environmental Management Plan
<table>
<thead>
<tr>
<th>Number</th>
<th>Commitment</th>
<th>Responsibility</th>
<th>Schedule</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Control weeds in accordance with the DPIW Weed Control Fact Sheets. Any declared weeds that are currently present, or establish following works, will be controlled as a matter of priority.</td>
<td>Operator</td>
<td>Construction</td>
</tr>
<tr>
<td>21</td>
<td>Disturbance to wetlands, riparian zones and wetland vegetation will be minimized wherever possible. The disposal of water and damp muddy soils at the work site will be minimized or undertaken as far away as possible from waterways or ponds and wetlands. Any water and construction materials that are used at the work site will be sourced from environments free from Amphibian Chytrid Fungus.</td>
<td>Operator</td>
<td>Construction</td>
</tr>
<tr>
<td>22</td>
<td>All machinery and equipment will be managed to control the spread of Amphibian Chytrid Fungus and Phytophthora cinnamomi by adhering to the Tasmanian Washdown Guidelines for Weed and Disease Control: Machinery Vehicles and Equipment, Edition 1 (DPIWE, FT &amp; ACAT 2004). Controls will include thorough washing and cleaning of equipment, footwear and vehicles before entering and leaving the area and between sites. All equipment will be dry and clean before entering the work site and where drying is not possible, equipment should be disinfected.</td>
<td>Operator</td>
<td>Construction</td>
</tr>
<tr>
<td>23</td>
<td>A comparison will be made of potential GHG emissions associated with the proposed nutrient removal processes against discharge of treated effluent to reuse as part of the Effluent Reuse Feasibility Study.</td>
<td>Operator</td>
<td>Operations</td>
</tr>
<tr>
<td>24</td>
<td>Develop an Operational Environmental Management Plan that encompasses all of the Deloraine WWTP including the upgrades.</td>
<td>Operator</td>
<td>Operation</td>
</tr>
<tr>
<td>25</td>
<td>A Contingency Management Plan for the Deloraine WWTP will be developed.</td>
<td>Operator</td>
<td>Operation</td>
</tr>
<tr>
<td>26</td>
<td>BLW to undertake an investigation into stormwater inflow to minimise the volume of peak flows within 12 months of completing the Stage 1 works or prior to commencing Stage 2 works. This investigation will result in an Inflow and Infiltration Management Plan. Significant sources of inflow and infiltration will be prioritised and mitigation will be actioned.</td>
<td>Operator</td>
<td>Operation</td>
</tr>
<tr>
<td>Number</td>
<td>Commitment</td>
<td>Responsibility</td>
<td>Schedule</td>
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</tr>
<tr>
<td>27</td>
<td>BLW is currently developing an Ambient Monitoring Plan for Receiving Waters. This Plan will be used to design a monitoring program to provide information that can be used to confirm the mixing zone and validate impacts on the receiving water quality.</td>
<td>Operator</td>
<td>Pre and Post construction</td>
</tr>
<tr>
<td>28</td>
<td>A complaints and incident register will be established.</td>
<td>Operator</td>
<td>Operation</td>
</tr>
<tr>
<td>29</td>
<td>An annual report will be prepared and submitted to the Director.</td>
<td>Operator</td>
<td>Operation</td>
</tr>
<tr>
<td>30</td>
<td>The treatment plant operator will prepare a Decommissioning and Rehabilitation Plan within 12 months of the decision being made to close the Deloraine WWTP.</td>
<td>Operator</td>
<td>Closure</td>
</tr>
</tbody>
</table>
6. Conclusion

The proposed upgrades and expansion of infrastructure will enable the WWTP to comply with current and projected permit conditions for effluent quality, will cater for an increase in inflow due to growth of the town, and will reduce the extent of short circuiting in the WWTP in wet weather by providing storage capacity for peak inflows. Currently, inflow to the WWTP is in excess of the plants 600 kL/day design capacity and resulting effluent quality is poor.

The proposed Stage 1 upgrades will minimise the treatment plant's impact on the receiving environment both in terms of improved discharge water quality and also, with the extension of the outfall pipeline to mid-channel to minimise the extent of the mixing zone. With the discharge point at the existing location at the river edge, the mixing zone may be as long as 90 metres. However, with the extension of the pipeline to mid-channel, the mixing zone is predicted to be reduced to within 20 metres of the outfall. Overall mass loads of pollutants discharged to the Meander River will decrease as a result of the proposed plant upgrade. This is a significant improvement in reducing the plant’s impact on the receiving environment.

The upgrading works will significantly benefit the community by providing the infrastructure necessary for the continued growth and expansion of the area. This will provide positive flow-on effects in the local community.
7. References


BFP Consultants (2001)


State Policy on Water Quality Management


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Document Status

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<td>H. Kerr</td>
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<td>4</td>
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<td>R. Dodson</td>
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Development Proposal and
Environmental Management Plan
Project Specific Guidelines

for

Meander Valley Council

Deloraine Wastewater Treatment Plant
Upgrade

Deloraine, Tasmania
General

This document identifies the key issues that must be addressed in the Development Proposal and Environmental Management Plan (DPEMP) for Meander Valley Council’s proposed Deloraine Wastewater Treatment Plant Upgrade.

This document should be read in conjunction with the General Guidelines for the preparation of a Development Proposal and Environmental Management Plan (www.epa.tas.gov.au/assess_dpemp_guidelines.html), which provides general information on preparing a DPEMP.

While the DPEMP should evaluate all potential effects of the proposal, the DPEMP should be principally focused on the key issues identified below. The level of detail provided on other issues should be appropriate to the level of significance of that issue for the proposal.

This document identifies the minimum survey requirements and studies required as part of the DPEMP in relation to the key issues.

This document should not be interpreted as excluding from consideration other matters deemed to be significant or matters that emerge as significant from environmental studies, public comments or otherwise during the course of the preparation of the DPEMP.

This document has been prepared on the basis of a Notice of Intent.

Key issues

The key issues that have been identified for consideration in relation to the proposal, and which should be the principal focus of the DPEMP, are as follows:

<table>
<thead>
<tr>
<th>Key issue</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
</tbody>
</table>
Survey and study requirements

The following surveys and studies will be required as part of the DPEMP in relation to the key issues. The relevant sections of the DPEMP General Guidelines are also identified.

<table>
<thead>
<tr>
<th>Key Issue</th>
<th>Survey requirements for DPEMP</th>
<th>Other studies for DPEMP</th>
<th>Relevant section of DPEMP General Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Quality impacts</td>
<td>Modelling of impacts on water quality</td>
<td>• See details below.</td>
<td>• 2.1, 4.2</td>
</tr>
<tr>
<td>Characterisation of receiving environment</td>
<td>Aquatic biology survey</td>
<td>Ambient water quality survey</td>
<td>• See details below.</td>
</tr>
<tr>
<td>Effluent reuse</td>
<td>Determination of potential for effluent reuse</td>
<td>• Feasibility study of reuse potential.</td>
<td>• 4.0</td>
</tr>
</tbody>
</table>
<pre><code>                                                             | • Identification of potential land areas suitable for reuse, and summary of negotiations with land holders |
</code></pre>

Other relevant documents

Some guidance and policy documents that are relevant to this project are listed below.

- National Water Quality Management Strategy (NWQMS) –
  - Australian and New Zealand Guidelines for Fresh and Marine Water Quality. ANZECC / ARMCANZ, October 2000. These Guidelines will be referred to as Australian and New Zealand Environment Conservation Council (ANZECC) Water Quality Guidelines in this document.
Detailed requirements for the DPEMP

The following DPEMP requirements are in addition to the requirements of the DPEMP General Guidelines. These additional requirements are grouped under the relevant section number corresponding to the DPEMP General Guidelines.

2.1 Proposal Outline
In addition to the matters stipulated in Section 2.1 of the DPEMP General Guidelines the DPEMP must contain the following:

- The dimensions of any lagoons, associated with the treatment plant, that may be used for storage of treated effluent or untreated or partially treated sewage.
- The relevant standards for wastewater storage liner construction are included in Appendix A. The DPEMP must contain information demonstrating how the relevant standards will be achieved.
- Design criteria for proposed infrastructure in relation to flood risk, i.e. height in relation to the 1 in 100 year or other periodic flood peak.

2.4 Off-site Infrastructure
In addition to the matters stipulated in Section 2.1 of the DPEMP General Guidelines the DPEMP must contain the following:

- Storm water inflow and groundwater infiltration studies incorporating information on any recent alterations to pumping station storages and pumping regime which affects influent flow rates to the WWTP.
- Storm water inflow and groundwater infiltration management plan.

2.5 Technical and management alternatives
A critique of other available technologies and the reason for the selection of the preferred technology from an environmental perspective should be included where relevant.

For any part of the proposal where alternative technologies, design options or management practices with different environmental consequences may exist, the alternatives should be identified, their environmental performance evaluated and the reason for the proposed choice justified.

3.2 Existing environment
In addition to the matters stipulated in Section 3.2 of the DPEMP General Guidelines the DPEMP must contain the following:

Detailed requirements for water quality

- Seasonal water flow in the receiving environment must be characterised based on stream flow measurements at representative locations, modelling and/or data on expected environmental flows to be released from the Meander Dam. The effluent dilution ratio at various flows including the 7Q10 flow should be estimated.
- A description of ambient water quality, including mass loadings, of key water quality parameters across a range of flow conditions. This description should be based on site specific information where available.
- Assessment of the suitability of current ambient water quality monitoring points.
- Identification of current Protected Environmental Values (PEVs) at the discharge location and within the expected zone of impact.
• Water Quality Objectives (WQO’s) should be proposed in relation to all identified PEVs. Relevant sections of the State Policy on Water Quality Management 1997 (the Water Quality Policy) must be referred to. Water Quality Targets (WQT’s) should also be discussed consistent with the document Water Quality Targets a Handbook.

• The Board of the Environment Protection Authority will set WQO’s or WQT’s on the basis of the information provided in the DPEMP and other relevant sources of information.

Biological Monitoring Program

• An aquatic biology survey consistent with AUSRIVAS or other relevant methods approved by the Director.

4.0 Waste Management Hierarchy

In addition to the matters stipulated in Section 4.0 of the DPEMP General Guidelines the DPEMP must contain:

• A re-use feasibility study is required to demonstrate compliance with Section 16.2 of the Water Quality Policy.

4.2 Liquid Waste

In addition to the matters stipulated in Section 4.2 of the DPEMP General Guidelines the DPEMP must contain the following:

• A summary of past WWTP performance and a discussion of any relevant performance issues especially deviation from permitted limits.

• Details of the predicted characteristics of the effluent generated by the Deloraine WWTP including quality, quantity, mass loads and variability and identify the likely contaminants of concern in the proposed discharge, and their concentrations. Provide all assumptions and references to how certain levels of potential toxicants were estimated. Expected population growth and any changes to trade waste characteristics and the rationale for the estimated changes should be detailed.

• Identification of principal discharge points from the activity to the receiving environment. Details of the current outfall characteristics should be provided ie the location of the outfall point within the stream, outfall design and resultant effluent mixing characteristics. Consideration should be given to redesign of the outfall to improve mixing and dispersal.

• Recommended emission limits. Please note that the recommended emission limits must be justified in accordance with the Water Quality Policy. The recommended limits should be based upon the assessment of the receiving environment seasonal flow and water quality characteristics and the proposed WQO’s and/or WQT’s. It should be noted that consideration of water quality impacts is also required where accepted modern technology emission limits are proposed as the emission limit design criteria for the proposal.

• Unless the recommended WQO’s are to be achieved at the point of discharge, a mixing zone must be determined. The mixing zone must be set in accordance with clause 20 of the Water Quality Policy. Please note that modelling is required to support determination of the size and extent of the mixing zone.

• Detail any seasonal discharge management regimes, as well as flood or storm flow discharge management regimes if relevant.
4.3 Groundwater

In addition to the matters stipulated in Section 4.3 of the DPEMP General Guidelines the DPEMP must contain the following:

- Assess the potential for sewage or treated effluent to contaminate local groundwater. The DPEMP should particularly focus on lagoon treatment system including sludge and equalisation basin.
- Outline a groundwater monitoring plan.
- Review current groundwater monitoring bore locations.

4.5 Solid and Controlled Waste Management

In addition to the matters stipulated in Section 4.5 of the DPEMP General Guidelines the DPEMP must contain the following:

- Sludge management plan in accordance with requirements of the *Tasmanian Biosolid Reuse Guidelines*, DPIWE, August 1999.

4.6 Dangerous Goods and Environmentally Hazardous Materials

In addition to the matters stipulated in Section 4.6 of the DPEMP General Guidelines the DPEMP must contain the following:

- Recommendations in relation contingency planning.
  
  Please note that it will be required that contingency plans be in place for unplanned events, such as power failures, malfunctions, blue green algal blooms, floods, and other incidents that may result in discharge of poorly treated effluent. It will be required that such plans include communication procedures for ensuring that downstream water users and relevant government agencies are informed of any unplanned event.

4.14 Health Issues

In addition to the matters stipulated in Section 4.14 of the DPEMP General Guidelines the DPEMP must contain the following:

- An assessment of the public health risk in relation to the following uses as relevant:
  - Dowstream recreational uses such as primary and secondary recreational contact.
  - Consumption of fish.
  - Potable water use, particularly the risk to the potable water supply for the township of Exton.

5.0 Monitoring and review

In addition to the matters stipulated in Section 5.0 of the DPEMP General Guidelines the DPEMP must contain the following:

- Proposed treated effluent quality monitoring;
- Monitoring to assess plant performance against criteria and to establish optimum operating conditions.
APPENDIX A

Environmental Standards Applying to Liner Construction March 2006

Environment Division has now developed a protocol for ensuring that lagoon liners meet environmental protection standards.

All Sewage Lagoon Liners

- Must be competently designed and installed by suitably qualified engineering personnel
- All compacted clay liner (CCL) material testing should be carried out according to AS1289.5.1.1 or AS1289.5.2.1
- CCL must be protected from drying out or surface hardening if required during installation
- CCL must have in-situ permeability testing undertaken to verify permeability performance
- Liner systems using geomembranes (GM) or geosynthetic clay liners (GCL) must be installed with manufacturers guarantee
- GM or GCL without manufacturers guarantee must have in-situ permeability testing to verify the quality of the liner
- All earthworks and construction must meet the requirements of AS3798
- Appropriate stormwater and weed controls must be in place during construction
- The certified engineer in charge of works shall be responsible for:
  ⇒ supervising liner installation and quality control
  ⇒ supervising all technical staff involved
  ⇒ properly conducting quality control tests and sampling in the field
  ⇒ “signing off” all quality control testing
  ⇒ completing documentation of all relevant activities including engineering design, construction and quality assurance activities
- Lagoon wastewater constituents from any trade wastes or any other constituents of the wastewater stream must be checked for liner compatibility, and risk of migration to ground water

Preferred Approach: Performance Based Liner Design

- There must be good reasons for not adopting a performance based approach. If it cannot be adopted in its entirety, as much of the performance based approach is to be used as possible.
- Full Geotechnical/Geological investigation to AS 1726 for likely seepage affected area to identify:
  ⇒ quality of ground water,
  ⇒ potential effects of contamination from lagoon effluent (nitrates, heavy metals etc),
  ⇒ any corrosive effects or potential for liner damage,
⇒ direction of pore pressure, and  
⇒ flow patterns and recharge effects on/of groundwater.  
⇒ potential problems such as saline subsoils, aquifer recharge zones, local bores etc

• The final design recommends a liner system that  
⇒ achieves an ecologically sustainable flow rate for limiting contaminant movement (most likely nitrates) into groundwater.  
⇒ achieves a permeability rate that, depending on local groundwater quality, geology etc., best protects the groundwater system for future use.

Second Best Approach: Minimum Standard Based

• If a performance based approach is not adopted, there must be good reasons for not adopting a minimum standard based approach. If it can not be adopted in its entirety, as much of the minimum standard approach should be used as possible.

• This approach is not suitable for complex groundwater zones such as recharge/discharge areas

• Minimum depth to groundwater (from bottom of lagoon) must be 2 metres

• Only undertake clay lining with appropriate selected clay

• Liner thickness requirements – lagoon bottom 400mm, lagoon walls 600mm (with further wave wall treatment required to prevent erosion)

• Maximum in-situ permeability is $10^{-9}$ m/sec ($10^{-7}$ cm/s) throughout the full depth of the liner. In-situ testing for verification should be carried out to AS1289

• Synthetic liners with equivalent or lower permeability can also be installed where feasible.

Least Favoured Approach: Net Best Environmental Outcome

• If for some reasons the minimum standards cannot be met then due consideration must be given to demonstrating the need for the new lagoon. This need for constructing the lagoon must be described along with the potential environmental benefits of installing the lagoon. The positive environmental benefits must outweigh the disadvantages and the risks posed to local groundwater and/or surface waters.

• Only for use in low risk groundwater areas.
1 Summary

GHD has reviewed the proposed Stage 1 and Stage 2 upgrade works for the Deloraine Wastewater Treatment Plant (WWTP), as developed by CEE Consultants. The key process/design risks are summarised below:

- Bypass of raw sewage to lagoons during peak weather events is likely to lead to breaches of the effluent discharge limits. GHD recommends that additional wet weather storage capacity should be considered to minimise the frequency of bypasses to the final lagoons.
- The proposed site location for new anaerobic/attenuation tank and sedimentation tank does not appear suitable due to large earthworks requirements and complicated wastewater flow path.
- GHD generally agrees that the proposed arrangement will provide a degree of nitrogen and phosphorus removal, but as there is insufficient raw sewage data available, it is unknown whether the required effluent limits will be achieved.
- Intermittent aeration in the IDEAL Tanks will lead to solids settling upstream of the clarifier and instantaneous solids overloading. To prevent this, mixers should be provided to keep solids in suspension when the aerators are off. The period of intermittent aeration may require adjustment during commissioning to achieve the required levels of nutrient removal.
- The proposed clarifier side wall depth is too low, and should be increased to 4 m. The diameter is also considered too low for peak wet weather flows, as solids washout is likely to occur. We recommend that the diameter be increased to around 11 m to prevent this.
- The maturation lagoons may cause deterioration in effluent quality in future and breaches of licence limits.
- Additional sludge drying pans are required to accommodate the sludge loads forecast for the Stage 1 upgrade and the increased sludge generated in Stage 2 with chemical phosphorus removal.

Based on our review, we believe there may be scope to replace the decanter in IDEAL Tank 2 and significantly reduce the scope of upgrade works required, as the proposed clarifier may not be required. Further investigation is required to confirm the feasibility of this alternative arrangement.

Further detail is provided in the following sections.

2 Overview and Background

GHD has been commissioned by Meander Valley Council to review the proposed process design of the Deloraine WWTP upgrade works, as developed by CEE Consultants, in preparation for the detailed
design of the Stage 1 upgrade works. CEE’s design is outlined in the report titled *Deloraine Wastewater Treatment Plant Upgrade – Options Study and Functional Design Report* (CEE, May 2008).

The Functional Design Report stated that the WWTP is currently operating close to its design capacity of 600 kL/d, and that plant performance is variable, particularly during wet weather events. Two stages of upgrade works have been proposed to increase the capacity of the plant and provide improved effluent quality.

The scope of this review is limited to the review of the process design for the Stage 1 and Stage 2 upgrade works proposed in the Functional Design. This review has not attempted to verify the cost estimate in the Functional Design, nor does it provide a cost estimate for any proposed changes to CEE’s design. If required, this can be provided to Meander Valley Council upon request.

3 Site Visit

Ray Dodson and David Gutteridge of GHD visited the plant on 7 November 2008, and current plant performance was discussed with Meander Valley Council’s Grant Woolley. The site visit found the following:

- There is considerable inflow/infiltration in the sewerage catchment, leading to very high raw sewage flows during wet weather.
- The existing screening system works well, although it has insufficient hydraulic capacity when both upstream pump stations operate simultaneously. Peak flows are first bypassed around the screen whilst higher flows (in excess of ~65 L/s) are diverted into the first maturation lagoon.
- The decant structure on IDEAL Tank 2 appears to be the limiting item severely affecting plant performance. The suspended solids concentration of the decanted effluent is typically 1,700 mg/L compared with expected values of <30 mg/L. The main issues appear to be:
  - The variable-level decanter in IDEAL Tank 2 is set at 700 mm below water level, which is considered too low to allow sludge to reliably settle below this point.
  - The current decant flow rate is estimated to be around 200 L/s. This very high flow rate appears to cause excessive scouring of sludge close the decanter, causing sludge suspended solids in the decanted effluent. Decant periods for Deloraine WWTP are around 6 minutes, much less than typical decant periods of 45-60 minutes.
  - The high decant rate also causing scouring of sludge from IDEAL 1 into IDEAL 2, which results in a plume of scoured sludge in IDEAL 2 which is eventually decanted into Maturation Lagoon 1.
  - The large amounts of mixed liquor from IDEAL Tank 2 that are scoured into Lagoon 1 contribute to poor effluent quality and make sludge age control extremely difficult.
- Although sludge is wasted from IDEAL 2 during aeration for a total of 12 minutes per day, due to the decanter operation the majority of sludge from the plant is currently accumulating in Lagoon 1, rather than in the sludge drying pans. It is understood that the sludge drying pans have not been desludged since commissioning.
- The available site area is restricted as the land is in a floodplain. Any upgrade works will require significant earthworks to build the area above the floodplain level.
4 Review of Functional Design Report

4.1 Effluent Quality and Licence Limits

The Deloraine WWTP is currently licensed to discharge up to an average of 600 kL/d of treated wastewater to Meander River. It is expected that the future discharge licence for the upgraded WWTP will include more stringent effluent quality limits and therefore guideline limits set out by the Department of Primary Industry, Water and Environment (DPIWE) were adopted in the Functional Design. The current licence limits together with the DPIWE’s guideline limits are set out in Table 1.

Table 1 Deloraine WWTP Current Licence Limits and Potential Future Limits

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Current Licence Limit</th>
<th>Emission Limit Guidelines for New and Upgraded Treatment Plants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Median</td>
<td>90%ile</td>
</tr>
<tr>
<td>Suspended Solids (mg/L)</td>
<td>15</td>
<td>20</td>
</tr>
<tr>
<td>BOD (mg/L)</td>
<td>10</td>
<td>15</td>
</tr>
<tr>
<td>Grease and Oil (mg/L)</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Ammonia-N (mg/L)</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Total N (mg/L)</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td>Total P (mg/L)</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>pH</td>
<td>6.5 - 8.5</td>
<td></td>
</tr>
<tr>
<td>Thermotolerant coliforms (orgs/100 mL)</td>
<td>200</td>
<td></td>
</tr>
</tbody>
</table>

4.2 Influent Flow and Quality

The current and projected influent flows to the Deloraine WWTP are outlined in Table 2, with the median influent characteristics in Table 3, as described in the Functional Design Report.

Table 2 Deloraine WWTP Influent Flow

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Current (2007)</th>
<th>Future Design (Low)</th>
<th>Future Design (High)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median Flow</td>
<td>kL/d</td>
<td>570</td>
<td>740</td>
<td>860</td>
</tr>
<tr>
<td>PWWF to WWTP</td>
<td>kL/d</td>
<td>3 420</td>
<td>4 440</td>
<td>5 160</td>
</tr>
<tr>
<td>Peak Flow Through WWTP</td>
<td>kL/d</td>
<td>2 850</td>
<td>2 220</td>
<td>2 580</td>
</tr>
<tr>
<td>Peak Flow Bypassed to Lagoons</td>
<td>kL/d</td>
<td>570</td>
<td>2 220</td>
<td>2 580</td>
</tr>
</tbody>
</table>
### Table 3  Median Influent Composition (Table 7-1, CEE 2008)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOD – total</td>
<td>mg/L</td>
<td>230</td>
</tr>
<tr>
<td>Suspended Solids (TSS)</td>
<td>mg/L</td>
<td>230</td>
</tr>
<tr>
<td>Nitrogen – N (total)</td>
<td>mg/L</td>
<td>60</td>
</tr>
<tr>
<td>Phosphorus – P (total)</td>
<td>mg/L</td>
<td>12</td>
</tr>
</tbody>
</table>

GHD has not reviewed the influent data that this table is based on, and cannot comment on the validity of the values quoted in Table 2 and Table 3. It is noted that no additional information is available on the raw sewage quality. However, the proposed upgrade arrangement discussed in the Functional Design Report will achieve a degree of both nitrogen and phosphorus removal, but there is insufficient information available to predict whether the expected licence limits in Table 1 will be reliably achieved under all conditions.

Based on the available information, however, the TKN:BOD ratio appears high which may result in incomplete denitrification. **It is therefore recommended that the detailed design include provision for future carbon dosing, if required.**

The TP:BOD ratio also appears high, which suggests that chemical phosphorus removal (in addition to biological removal) is likely to be required to achieve the new licence limit for phosphorus. This is proposed for installation in Stage 2, which is considered reasonable as actual plant performance following the Stage 1 upgrade will determine if and when this is required in future.

The future carbon dosing for nitrogen removal and alum/ferric dosing for phosphorus removal could be provided by 1000 L bulky boxes and dosing pumps located within a bunded area. This could be installed in a Colorbond shed with vehicle access for chemical delivery. A potential location for these future dosing systems is between the IDEAL tanks and Maturation Lagoon 1.

#### 4.3 Anaerobic / Flow Attenuation Tank

The Functional Design Report has proposed the installation of a combined anaerobic/attenuation tank for the Stage 1 upgrade works to facilitate biological phosphorus removal and accommodate some of the influent flow during wet weather events. The proposed tank has been sized at 400 m$^3$ (active volume), with up to 290 m$^3$ of anaerobic volume and the remainder for flow attenuation.

At future peak wet weather flows (PWWFs) the attenuation tank will overflow, and up to half of the PWWF is to be discharged directly to the maturation lagoons. This is likely to impact on final effluent quality during high flow periods, particularly with high levels of thermotolerant coliforms. A larger tank or wet weather storage lagoons (1.5-2.5 ML) would attenuate more of this flow and would reduce the impact of bypassing raw sewage to the lagoons and this should be considered.

#### 4.4 Activated Sludge Plant

#### 4.4.1 Intermittent Aeration

It is noted that the Functional Design Report proposes to modify the existing activated sludge plant for biological nitrogen and phosphorus removal, including intermittent aeration of the IDEAL lagoons so that
anoxic conditions are established when the aerators are switched off. Under an intermittent aeration arrangement, solids will settle in the IDEAL Tanks when the aerators are turned off. When aeration recommences, short-term solids overloading is likely to occur in the clarifier, leading to poor performance. This could be managed by providing a dedicated and mixed anoxic zone, or by providing a mixer in each IDEAL Tank that operates when the aerators are off. This could be done by mounting a mixer off the end of each walkway to the IDEAL Tanks.

4.4.2 Anoxic and Aerobic Volume Fractions

Based on GHD experience, the proposed anoxic arrangement of 25% of the aeration cycle appears too low to provide adequate denitrification (nitrate removal) under all conditions. It is suggested that this should be increased to 30-35% of the total activated sludge reactor volume. This could be provided using a 3.5 hour cycle time (i.e. 2 hours of aeration, 1.5 hours of settling and decanting), or by using a dedicated anoxic zone (as suggested in Section 4.4.1).

4.4.3 Mixed Liquor Recycle System

The mixed liquor recycle pipework and pumps are proposed to be 60 L/s, equivalent to 6 times the estimated median influent flow for Stage 2. Typically this recycle stream is around 3-4 times median flow for biological nutrient removal processes, therefore there may be the opportunity to include variable speed drives to minimise power consumption during operation.

4.4.4 Aeration Requirements

The Functional Design recommends that an additional aerator be purchased as a spare. Based on the proposed operation of the plant, this is considered reasonable.

4.4.5 Secondary Sedimentation Tank

The Functional Design Report proposes a secondary sedimentation tank (8.7 m diameter, 3.0 m side water depth) under the Stage 1 upgrade works. Typically, secondary clarifiers are sized with a side wall depth between 3.5-6 m to provide sufficient height above the sludge blanket for clear effluent draw-off. It is recommended that the clarifier sidewall depth be increased to at least 4.0 m.

The solids loading rate of the secondary sedimentation tank at PWWF is high, and solids washout may occur under these conditions. A larger diameter clarifier would improve effluent quality at PWWFs. GHD has proposed an alternative WWTP arrangement which will not require a new clarifier. This is discussed in Section 5.

4.5 Maturation Lagoons

GHD has not reviewed any thermotolerant coliform data for the existing lagoons and therefore cannot comment on current disinfection performance. However, the following points are made:

- The bypass of raw sewage into the lagoons during PWWFs is expected to reduce the effectiveness of the maturation lagoons in peak weather events and lead to exceedance of licence limits.
- It is understood that there is a significant volume of accumulated sludge in Maturation Lagoon 1. This is expected to reduce the available treatment volume for disinfection, and may also lead to phosphorus release (and potential exceedance of licence limits) in the lagoons.
- Following the Stage 2 upgrade works, a deterioration in effluent water quality through the lagoons can be expected if the maturation lagoons are in service, due to the presence of settled sludge and
bypassed raw sewage. Algal growth will occur at times in the lagoons, which may impact on effluent BOD and TSS. Under these conditions, it may be appropriate to take the maturation lagoons off-line, providing the effluent water quality targets are met.

The lagoons provide a useful buffer in treatment plant performance, although the effluent quality may often deteriorate through the lagoons. The accumulated sludge in the lagoons should be removed prior to the Stage 2 works, particularly to avoid phosphorus release from the sludge. The performance of the lagoons should be reviewed after the Stage 2 works are commissioned to determine if the lagoons should be decommissioned in future.

4.6 Sludge Management

The Functional Design Report has included provision for raising the drying pan embankments to RL 230.0 m as well as surface aeration for odour control. This has been included in the Stage 1 upgrade works. It is unclear why the embankment walls are proposed to be raised.

It is understood that 2 No. 500 m$^2$ sludge drying pans exist on site for sludge thickening, stabilisation and natural air drying. GHD has estimated that a third drying pan of similar size is likely to be required for the Stage 2 loads and expected increased sludge generation, and this should mean that mechanical aeration is not required. This is likely to become apparent when waste sludge from the activated sludge plant is directed into the drying pans, rather than into the maturation lagoons.

It is noted that chemical phosphorus removal and tertiary filtration, proposed for the Stage 2 works, will increase the amount of sludge generated from the plant. A fourth drying pan may be required to handle this additional sludge load. The requirement for a fourth drying pan should be considered during the design of the Stage 2 works.

If operated correctly, the sludge drying pans should be filled gradually and kept covered with water (at least 600 mm). This prevents odours from escaping the lagoon surface. The amount of sludge in the pans should be limited so that it can be dried over the summer period (~250 tonnes/hectare). When a pan is full, loading to the pan should cease at least a few months before the start of summer. This enables the sludge to digest so it is not odorous when drying commences. Periodic breaking up of the sludge crust will be required during the drying process.

4.7 Odour Control

CEE has recommended that the anaerobic/flow attenuation tank be covered and ventilated, with the extracted air treated in a wet packed scrubber followed by a biofilter. It is understood that generally odours are not an issue at the Deloraine WWTP, except for a relatively short period recently when the sludge drying pans caused some odour complaints as the water cover had evaporated.

Whilst the proposed CEE odour control system would be a reasonable method of odour control, given that odours are currently not an issue, there may be scope to delay odour control works during the Stage 1 works. Council should consider providing an uncovered anaerobic tank in Stage 1, with provision for future covering and odour control in the Stage 2 works (if required).

4.8 Stage 2 Works

The Functional Design Report has proposed the following works for the Stage 2 upgrade:

* UV disinfection
- Effluent filtration
- Chemical phosphorus removal trim.

It is noted that there are no details on the proposed size or loading rates for these units, so GHD has not reviewed this aspect of the functional design. However, the scope of the proposed works appears reasonable, although it is noted that this works could be delayed if the upgraded WWTP performs well when commissioned.

4.9 Feasibility of Generating Power From Biogas

Under anaerobic conditions (i.e. without oxygen) organic waste is oxidized by bacteria in a three-stage process. One of the byproducts of this biological reaction is a gas mixture of methane and carbon dioxide, known as biogas. Due to the presence of methane, this mixture is combustible and can potentially be used as an energy source.

Covered anaerobic lagoons are typically used to treat high-strength organic waste under anaerobic conditions. The covers are able to capture the biogas that can then be used. Activated sludge plants with anaerobic sludge digesters also produce biogas which is typically used to heat the digesters to their optimal temperature of 35-38°C. Historical practice has been to simply flare the biogas, but many wastewater treatment plants are now beginning to use biogas to produce electrical power and reduce site power demands from the grid.

The proposed design for the Deloraine WWTP includes an anaerobic tank. The purpose of this tank is to promote biological phosphorus removal, rather than biogas production. Recent research by the University of Queensland has indicated that the amounts of methane generated in such anaerobic tanks are minimal. The majority of the methane remains in dissolved form, and it is likely that it is either consumed in the downstream anoxic zone or stripped to atmosphere in the aerated zone. Estimates of the power required to capture the methane suggest that it is similar to the electricity potential of the biogas itself. Therefore it is not considered practical to capture any biogas that may be produced in this case.

It should be noted that incorporating anaerobic processes for wastewater treatment is dependent on the type of waste being treated and the final effluent quality required. Given the existing treatment constraints, there is no scope to incorporate anaerobic treatment for biogas production at the Deloraine WWTP.

5 Proposed Alternative Upgrade

Based on our preliminary review, we believe that there is scope to modify the proposed design to minimise works and reduce capital costs. The following upgrade strategy is proposed as an alternative:

- Installing a new decanter (e.g. siphon or tilting trough decanter) in IDEAL 2 to retain the plant in intermittent operation. This is likely to significantly improve plant performance, and may prevent the need for a secondary sedimentation tank. As the proposed secondary sedimentation tank is a high cost item, it is recommended that the feasibility of this be investigated further, prior to any upgrade works. Preliminary investigations suggest that a new decanter can be installed, but IDEAL Tank 2 would need to be out of service for about 1 week. Operating the plant using temporary pumping from IDEAL Tank 1 to Maturation Lagoon 1 for this short period would not cause significant environment impact.
Construction of a larger attenuation storage (1.5-2.5 ML) is recommended to reduce the amount of PWWF directed to the maturation lagoons.

Construction of an additional sludge-drying pan in Stage 1 for sludge management.

Further investigation is required to confirm the alternative arrangement discussed above, but GHD believes there may be significant cost savings associated with this approach, particularly because significant earthworks are required to construct CEE’s proposed arrangement due to site constraints.

For GHD to develop an appropriate process design of this revised configuration, it is strongly recommended that Council undertake additional raw sewage sampling. A proposed sampling program is provided below in Table 4.

Samples should be taken as 24-hour composites using an automatic sampler. The sample locations should be selected to ensure the influent is well-mixed and representative of actual conditions. Ideally one of the sampling days should include a Saturday to ensure the weekend load variation is considered.

### Table 4  Proposed Raw Sewage Monitoring

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sampling</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flowrate</td>
<td>Hourly flows</td>
</tr>
<tr>
<td>COD</td>
<td>24-hour composites on 3 separate dry weather days and 2 wet weather days.</td>
</tr>
<tr>
<td>BOD</td>
<td>24-hour composites on 3 separate dry weather days and 2 wet weather days.</td>
</tr>
<tr>
<td>Ammonia</td>
<td>24-hour composites on 3 separate dry weather days and 2 wet weather days.</td>
</tr>
<tr>
<td>Total Kjeldahl Nitrogen (TKN)</td>
<td>24-hour composites on 3 separate dry weather days and 2 wet weather days.</td>
</tr>
<tr>
<td>Nitrate and Nitrite (NOx)</td>
<td>24-hour composites on 3 separate dry weather days and 2 wet weather days.</td>
</tr>
<tr>
<td>Total Phosphorus (TP)</td>
<td>24-hour composites on 3 separate dry weather days and 2 wet weather days.</td>
</tr>
<tr>
<td>pH</td>
<td>24-hour composites on 3 separate dry weather days and 2 wet weather days.</td>
</tr>
<tr>
<td>Alkalinity</td>
<td>24-hour composites on 3 separate dry weather days and 2 wet weather days.</td>
</tr>
<tr>
<td>Total Suspended Solids (TSS)</td>
<td>24-hour composites on 3 separate dry weather days and 2 wet weather days.</td>
</tr>
<tr>
<td>Volatile Suspended Solids (VSS)</td>
<td>24-hour composites on 3 separate dry weather days and 2 wet weather days.</td>
</tr>
<tr>
<td>Temperature (taken immediately)</td>
<td>24-hour composites on 3 separate dry weather days and 2 wet weather days.</td>
</tr>
<tr>
<td>Flocculated and filtered COD</td>
<td>3 samples from plant influent and 3 from decanted effluent on separate dry weather days.</td>
</tr>
</tbody>
</table>

Following this, GHD proposes to undertake process modelling to confirm the various unit sizes and to predict the expected effluent quality after the Stage 1 upgrade is completed.
If you have any questions or comments on the above review, please contact either myself or David Gutteridge on (03) 8687-8452.

Regards

Chris Pepperell
Chemical Engineer
Meander Valley Council

Deloraine Wastewater Treatment Plant Upgrade

Options Study and Functional Design Report

May 2008
Meander Valley Council

Deloraine WWTP Upgrade Options Study and Functional Design Report

Prepared for:

Meander Valley Council
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Document History and Status

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<th>Project Manager</th>
<th>Reviewer</th>
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<td>26 Feb 08</td>
<td>For review</td>
<td>jla</td>
<td>jla</td>
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<td>V2</td>
<td>8 May 08</td>
<td>Final</td>
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Report Limitations

This report has been prepared in accordance with an agreement between CEE and the Organisation to whom this report is addressed. The services performed by CEE have been conducted in a manner consistent with the level of quality and skill generally exercised by members of its profession and consulting practices.

This report is prepared solely for the use of the person or organisation for which this report is addressed and in accordance with the terms of engagement for the commission. Any reliance of this report by third parties shall be at such party's sole risk. The report may not contain sufficient information for the purposes of other parties or for other uses. This report shall only be presented in full and shall not be used to support any other objectives than those set out in the report, except where written approval with comments are provided by CEE.
LIST OF CONTENTS

1 INTRODUCTION ................................................................. 1
  1.1 Background and Need for Study ........................................ 1
  1.2 Scope of Work ............................................................ 1

2 EXISTING SITUATION............................................................ 2
  2.1 Site Description and Setting ........................................... 2
  2.2 Description of Plant .................................................. 3
  2.3 Population ............................................................... 3
  2.4 Wastewater Flows ..................................................... 4
  2.5 Plant Performance ...................................................... 5

3 EXISTING AND FUTURE EFFLUENT DISCHARGE REQUIREMENTS .......... 6
  3.1 Existing Licence ....................................................... 6
  3.2 State Policy on Water Quality Management ......................... 6
  3.3 Future DTAE Requirements ............................................. 7

4 KEY ISSUES AND OPTIONS .................................................. 9

5 OPTIONS SCREENING .......................................................... 11
  5.1 Plant Capacity ............................................................ 11
  5.2 Wet Weather Flow ...................................................... 11
  5.3 Influent Flow/Screening Options ..................................... 11
  5.4 Plant Bypass ............................................................. 11
  5.5 Flow Attenuation Options .............................................. 12
  5.6 Phosphorus Removal and Anaerobic Tank ............................... 12
  5.7 Nitrogen Removal and Aerobic/Anoxic Basins ......................... 12
  5.8 Aeration ................................................................. 13
  5.9 Liquid/Solids Separation .............................................. 13
  5.10 Effluent Polishing .................................................... 13
  5.11 Effluent Disinfection ................................................ 13

6 OPTIONS EVALUATION ....................................................... 14
  6.1 Short-listed Options ................................................... 14
  6.2 Option 1 – Intermittent Decanters in IDEAL 1 & 2 ................... 14
  6.3 Option 2 – New IDEAL 3 and Decanting in IDEAL 2 & 3 .............. 16
  6.4 Option 3 – Modify IDEAL 1 & 2 to Aeration, & New Sedimentation Tank ..... 16

7 RECOMMENDED UPGRADE .................................................... 18
  7.1 Staged Development .................................................... 18
  7.2 Preliminary Design Criteria and Data ................................ 21
  7.3 Preliminary Capital Cost Estimate ................................... 23
  7.4 Description of Operation of Proposed Works ......................... 24
Citation:
CEE Report to Meander Valley Council,
26 pp.
1 INTRODUCTION

This report presents a description of the recommended upgrade of the Deloraine wastewater treatment plant (WWTP). This introductory section summarises the background and scope of the functional design report.

1.1 Background and Need for Study

The Deloraine WWTP is serving close to its design population of 2400 persons and is operating at close to its design capacity of 600 kL/d (ie average dry weather flow). Plant performance has been variable since the last process upgrade to a biological nutrient removal plant in 2002, particularly during wet weather (ref: Preliminary Audit of Plant Capacity and Performance, CEE, March 2007).

Recent upgrade of the West Deloraine wastewater pump station has significantly increased the influent flow rate to the plant, which has further reduced performance due to short-circuiting.

Council has placed a moratorium on further development of Deloraine due to the limited plant capacity. Increased plant capacity is required to handle the expected future increase in influent flows and loads and improved plant performance is required to meet design effluent quality objectives.

1.2 Scope of Work

This report documents the functional design of the recommended Deloraine WWTP upgrade and involved the following tasks:

1. Establish present and future wastewater flows and loadings;
2. Identify process issues and plant constraints, regulatory requirements and environmental constraints;
3. Develop, screen and evaluate short-listed options;
4. Develop concept and general sizing of the proposed WWTP upgrade facilities;
5. Describe design intent and specific design criteria for detailed design;
6. Size and locate major equipment;
7. Describe operating and control philosophy;
8. Prepare preliminary capital and annual cost estimates; and
9. Prepare works program to minimise disruption to the plant operation.
2 EXISTING SITUATION

2.1 Site Description and Setting

The Deloraine WWTP is located approximately 700 metres northeast of the township of Deloraine, on the east side of the Meander River within the recreation and racecourse reserve and south of the new Bass Highway (refer Figure 2-1). The nearest residences are located approximately 400 m south of the plant.

The plant is located on a flat 5 ha site in a flood plain. The biological nutrient plant is located on raised land at RL 230.0 m, which is above the 1 in 100 flood level.

![Figure 2-1 Deloraine WWTP Location](source: Google Earth 2007)
2.2 Description of Plant

The plant provides influent screening, biological nutrient removal treatment (3 stage intermittent decant extended aeration lagoon (IDEAL) plant) and sludge drying pans, followed by effluent polishing in polishing lagoons and effluent discharge to the Meander River (refer Figure 2-2).

![Figure 2-2 Deloraine WWTP Layout](image)

2.3 Population

The wastewater system presently serves approximately 1020 residential lots (compared with 960 lots in year 2003). The plant also serves three schools, a nursing home, four hotels and commercial shops. There are currently 143 vacant lots.

The population growth of Deloraine in recent years has been steadily increasing with the new development and is expected to increase further once the moratorium on building is lifted.

The equivalent population (EP) is estimated to be approximately 2300 (year 2006), based on the growth since 2003.

Council advise that a population growth allowance of at least 30% should be used in planning the wastewater treatment plant upgrade.
2.4 Wastewater Flows

The present median annual flow is estimated to be 570 kL/d (year 2007), based on daily influent flow meter readings since July 2004 (refer Figure 2-3).

![Daily Wastewater Flow, kL/day chart]

Note – Lagoons flooded September 2005

Figure 2-3 Deloraine Influent Wastewater Flows 2004 to 2007

Table 2-1 summarises current influent flow data, together with plant design flow data (year 2002), and projected future flows for 30% and 50% growth.

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Orig Design 2021</th>
<th>Actual 2007</th>
<th>Future Design Low value</th>
<th>Future Design High value</th>
</tr>
</thead>
<tbody>
<tr>
<td>POPULATION</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Growth projected allowance</td>
<td>%</td>
<td></td>
<td></td>
<td>30%</td>
<td>50%</td>
</tr>
<tr>
<td>Residential/commercial (EP)</td>
<td>EP</td>
<td>2400</td>
<td>2300</td>
<td>3000</td>
<td>3500</td>
</tr>
<tr>
<td>FLOW</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit flow production</td>
<td>L/EP.d</td>
<td>250</td>
<td>239</td>
<td>240</td>
<td>240</td>
</tr>
<tr>
<td>Median flow</td>
<td>kL/d</td>
<td>670</td>
<td>570</td>
<td>740</td>
<td>850</td>
</tr>
<tr>
<td>L/s</td>
<td>7.8</td>
<td>6.6</td>
<td>8.6</td>
<td>10.0</td>
<td></td>
</tr>
<tr>
<td>Annual volume</td>
<td>ML/yr</td>
<td>250</td>
<td>240</td>
<td>310</td>
<td>360</td>
</tr>
<tr>
<td>Influent pump rate</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>West PS 1 pump</td>
<td>L/s</td>
<td>65</td>
<td>65</td>
<td>65</td>
<td></td>
</tr>
<tr>
<td>West PS 2 pumps</td>
<td>L/s</td>
<td>90</td>
<td>90</td>
<td>90</td>
<td></td>
</tr>
<tr>
<td>East PS</td>
<td>L/s</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Peak dry hour flow/avg dry hour flow</td>
<td>2.5</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Peak wet day/median day flow to WWTP</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>PWWF pumped to WWTP</td>
<td>kL/d</td>
<td>3350</td>
<td>3420</td>
<td>4440</td>
<td>5160</td>
</tr>
</tbody>
</table>
2.5 Plant Performance

Table 2-2 shows the plant effluent quality for the period August 2004 to January 2008.

Table 2-2  Deloraine WWTP Effluent Quality (August 2004 to January 2008)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Design Average</th>
<th>Current Licence Limit</th>
<th>Median</th>
<th>90%ile</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow, kL/d</td>
<td>600</td>
<td>600</td>
<td>570</td>
<td>950</td>
<td>3350</td>
</tr>
<tr>
<td>TSS, mg/L</td>
<td>30</td>
<td>30</td>
<td>56</td>
<td>220</td>
<td>1150</td>
</tr>
<tr>
<td>BOD, mg/L</td>
<td>20</td>
<td>20</td>
<td>44</td>
<td>180</td>
<td>430</td>
</tr>
<tr>
<td>Ammonia-N, mg/L</td>
<td></td>
<td>5</td>
<td>7</td>
<td>20</td>
<td>23</td>
</tr>
<tr>
<td>Nitrate/Nitrite-N, mg/L</td>
<td></td>
<td>2</td>
<td>5</td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>Total nitrogen-N, mg/L</td>
<td>10</td>
<td>15</td>
<td>21</td>
<td>36</td>
<td>94</td>
</tr>
<tr>
<td>Total phosphorus-P, mg/L</td>
<td>3</td>
<td>8</td>
<td>4</td>
<td>15</td>
<td>35</td>
</tr>
</tbody>
</table>

Recent plant performance may be summarised as follows:

- BOD and SS removal is generally less than design, resulting in elevated BOD and SS values in the effluent, particularly during periods of high influent flow and solids wash out.

- Variable nitrification (ie ammonia oxidation) and denitrification (ie nitrogen removal) are achieved, resulting in elevated effluent ammonia levels averaging 7 mg/L, and high effluent total nitrogen levels averaging 21 mg/L. High effluent nitrogen values occur during solids wash out.

- Significant phosphorus removal is achieved, however very high effluent phosphorus values are reported during solids wash out.
3 EXISTING AND FUTURE EFFLUENT DISCHARGE REQUIREMENTS

This Section outlines the requirements for wastewater treatment including the requirements of current plant licences for operations and effluent quality and likely future requirements.

3.1 Existing Licence

The Deloraine WWTP has a current licence to discharge up to an average of 600 kL/d (check) of treated wastewater to Meander River. (Note: The licence is issued in 2002.)

A general requirement for compliance is that the final effluent quality meets the Environment Protection (Water Pollution) Regulations (since superseded by the State Policy on Water Quality Management and associated regulatory documents). Compliance parameters include flow, biochemical oxygen demand (BOD), suspended solids, oil and grease, pH, and faecal coliforms. The current licence does not include any nutrient discharge requirements. Table 3-1 summarises the current licence limits.

Any change to a process that results in an increase in the specified flow rate requires prior written approval of the Director of Environmental Control (Management). Note that the licensed flows are “normal dry weather flow” and therefore reflect the design capacity of the plant. There is no consideration of wet weather flow in the WWTP licences. There is a requirement to report monthly on the “average flow of effluent during the sampling period”.

3.2 State Policy on Water Quality Management

The State Policy on Water Quality Management 1977 requires that limits placed on the discharge of pollutants from point sources, such as wastewater treatment plants, are consistent with the following hierarchy of waste management:
1. Waste avoidance;
2. Reclamation and recycling;
3. Waste reuse;
4. Waste treatment to reduce potentially degrading impacts; and
5. Waste disposal.

Thus before the licences for the expanded treatment plants will be issued, DTAE will need to be satisfied that all reasonable and practical measures have been taken to implement the steps in the waste management hierarchy.

The waste avoidance step involves demand management, to ensure that all reasonable actions have been taken to reduce the volume of wastewater being discharged to the sewers, and trade waste controls, to ensure that industrial and commercial wastes discharged to the sewer do not contain contaminants that cause environmental harm or have deleterious effects on the sewers or treatment plant operations. The Council also imposes additional limits on trade waste discharges to ensure the safety of personnel involved in sewer maintenance and to avoid excessive odours being emitted during the transport of the wastes to treatment plants.
The recovery, reuse and recycling of effluent and biosolids, at various stages in the sewerage system, is to be encouraged and supported to allow positive and sustainable environmental outcomes. The DTAE Guidelines state that "The discharge of effluent to surface waters should not be permitted unless it is demonstrated to the satisfaction of the regulatory authority that effluent application to land is not feasible or would result in a higher net environmental risk".

Improved effluent quality (as discussed in the next section) and careful consideration of discharge arrangements from an environmental perspective are key requirements of the State Policy.

3.3 Future DTAE Requirements

Significantly more stringent effluent quality limits are likely to apply for future discharges to the Meander River, which is a sensitive water body.

New wastewater treatment plants discharging to fresh need to meet the 'Emission Limits – Acceptable Technology for New and Upgraded Plants (Emission Limit Guidelines for Sewage Treatment Plants, Table 1, DPIWE, June 2001) (Ref Table 4-1). Of particular relevance is the need to remove much of the nitrogen and phosphorus.

The likely future licence requirements for the treatment plants will be based on:

- Tightening the requirements of the Licences to Operate Treatment Plants through the issue of Environmental Protection Notices for each of the licensed treatment plants by the DTAE.

- Ensuring the licences reflect the State Policy of Water Quality Management, which requires reduction in impacts on receiving waters from both point and diffuse sources of contamination. The Policy provides for Protected Environmental Values for both primary and secondary uses in fresh waters, and includes provisions for water quality, strategic infrastructure and sustainable residential development. In general terms the smaller plants with land disposal are required to comply with the State Policy on Water Quality Management.

- The Environmental Management and Pollution Control Act, 1994, which requires control of environmental nuisances and environmental harm. The Local Government Act, 1993, (Section 200) provides for Council to order abatement of statutory nuisances.

Under the State Policy on Water Quality Management, 1997, water bodies in Tasmania are defined in terms of Protected Environmental Values (PEVs) and water quality objectives relating to those PEVs.

The PEVs establish the basis for water quality objectives in the receiving waters which are in line with the Guidelines for Fresh and Recreational Waters (ANZECC, 2000).

It is expected that over the next few years DTAE will bring the existing licences into alignment with the State Policy on Water Quality Management and associated Protected Environmental Values and water quality objectives. These renewals are likely to be in the form of Environment Protection Notices issued under the Environmental Management and Pollution Control Act, 1994.
Table 3-1 summarises:

- The current DTAE discharge licence requirements for the Deloraine WWTP discharging to water;
- The Interim discharge requirements for existing plants (Emission Limit Guidelines for Sewage Treatment Plants, Appendix 2, DPIWE June 2001); and
- Emission Limits – Acceptable Technology for New and Upgraded Plants (Emission Limit Guidelines for Sewage Treatment Plants, Table 1, DPIWE June 2001).

It can be seen in Table 3-1 that increasingly stringent effluent quality requirements will apply in the future. The existing treatment plant will have to reduce suspended solids and BOD levels down to a median of < 5 mg/L; ammonia levels will be limited to only 1 mg/L and nutrient removal will be required to achieve the target limits of 7 mg/L for total nitrogen and 0.5 mg/L for total phosphorus.

Table 3-1  Current Licence Limits, Future Discharge Requirements and Guidelines for Deloraine WWTP and New WWTPs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Current Licence Limit</th>
<th>Interim Discharge Max Reqs</th>
<th>Emission Limit Guidelines for New and Upgrades Treatment Plants</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Median</td>
<td>90%ile</td>
</tr>
<tr>
<td>Suspended solids, mg/L</td>
<td>30</td>
<td>20 (60)</td>
<td>10</td>
</tr>
<tr>
<td>BOD, mg/L</td>
<td>20</td>
<td>20 (40)</td>
<td>5</td>
</tr>
<tr>
<td>Grease and Oil, mg/L</td>
<td>10</td>
<td>10</td>
<td>2</td>
</tr>
<tr>
<td>Ammonia-N, mg/L</td>
<td>5</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Total nitrogen-N, mg/L</td>
<td>15</td>
<td>30</td>
<td>7</td>
</tr>
<tr>
<td>Total phosphorus-P, mg/L</td>
<td>8</td>
<td>15</td>
<td>0.5</td>
</tr>
<tr>
<td>pH</td>
<td>6.5-8.5</td>
<td>1,000</td>
<td></td>
</tr>
<tr>
<td>Thermo coliforms/100 mL</td>
<td>200-4,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chlorine, mg/L</td>
<td>1.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1 Current DTAE licence (CHECK)
2 Interim discharge requirements for existing plants (Emission Limit Guidelines for Sewage Treatment Plants, Appendix 2, DPIWE June 2001)
3 Emission Limits – Acceptable Technology for New and Upgraded Plants (Emission Limit Guidelines for Sewage Treatment Plants, Table 1, DPIWE June 2001)
4 where 50:1 dilution requirement is met

DPIWE Permit Conditions - Environmental
Issued 12-07-2002
## 4 KEY ISSUES AND OPTIONS

The key issues and preferred options are listed below.

<table>
<thead>
<tr>
<th>Item</th>
<th>Issue</th>
<th>Potential Options</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influent flow</td>
<td>Plant is currently operating at design average flow of 600 kL/d. Flows are projected to increase with future growth in Deloraine</td>
<td>Increase plant design median flow capacity 30% to 50%</td>
</tr>
<tr>
<td>Inlet pumping to plant</td>
<td>Recent upgrade of west PS has resulted in significant increase in influent pump rate, which is hydraulically overloading the plant, resulting in short-circuiting and poor plant performance. Plant inflow up from 42 L/s to 65-90 L/s during normal operation (depending on whether both west and east PSs are operating), and up to 110 L/s with all pumps in wet weather.</td>
<td>Install PS telemetry and interlocks between PSs, so that east PS cannot operate when west PS is operating. Design WWTP for peak hydraulic flow of &gt;110 L/s</td>
</tr>
<tr>
<td>Wet weather flows and plant bypassing</td>
<td>High wet weather flows overload the plant for prolonged periods</td>
<td>Undertake stormwater inflow and groundwater infiltration investigations and remedial work in catchment. Provide flow attenuation basin d/o of screens and pump at low constant flow to plant. Bypass peak inflows (ie &gt;3 times median flow to lagoons)</td>
</tr>
<tr>
<td>Screenings removal</td>
<td>Existing 400 mm dia screw screen nom. rating is 80 L/s. Screen is hydraulically overloaded when both west and east PSs operating and during wet weather flow. Influent flows &gt;65 L/s currently bypass IDEALs to lagoons due to insufficient head to flow through system</td>
<td>Provide additional mechanical screen and/or reduce peak flow &lt;80 L/s</td>
</tr>
<tr>
<td>Phosphorus removal (anaerobic basin)</td>
<td>Biological P removal is currently limited due to the limited capacity of the existing 100 kL anaerobic basin (~4 hours) and significant short-circuiting due to its shape and dividing wall shortcomings. Additional P removal is required to meet effluent discharge requirements.</td>
<td>Optimise biological P removal with separate and larger basin with nominal 8 hours minimum hydraulic retention time and with adjustable recycle flow. Provide biological P removal (as above) with chemical P trim removal with effluent filtration. Provide chemical P removal with alum or lime dosing, in lieu of biological P removal (possibly two stage).</td>
</tr>
<tr>
<td>Nitrogen removal (aerobic &amp; anoxic basins)</td>
<td>Existing basin capacity is satisfactory for current (HRT ~58 hours) and future flows. Additional N removal required to meet effluent discharge requirements.</td>
<td>Optimise biological N removal with provision of both aerobic and anoxic zones with adjustable times and with significant recycle between zones</td>
</tr>
<tr>
<td>Item</td>
<td>Issue</td>
<td>Options</td>
</tr>
<tr>
<td>-------------------------</td>
<td>----------------------------------------------------------------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Aerators</td>
<td>Aeration capacity is adequate at present, however additional capacity is required in the future and there is no standby units.</td>
<td>Provide up to 50% additional aeration capacity, plus one standby unit.</td>
</tr>
<tr>
<td>Solids/liquid separation (Decanter)</td>
<td>Existing basin configuration and decanter are inadequate. Significant solids loss occurs during decant due to carryover of stirred up settled sludge caused by high velocity flow entering from IDEAL 1 and high decant rate. Two IDEAL 2 basins are required to handle future increased flows (decant drop too high otherwise). IDEAL 2 basins would operate in parallel with no flow from basin 1 to basin 2 in settling/decant mode.</td>
<td>Reduce peak flow through basins (ie &lt; 3 x median flow). Provide larger interconnecting pipe and/inlet baffle chamber. Cease flow to second basin during settling and decant periods with solenoid operated shut-off valve (only short-term fix) Provide two IDEAL 2 basins each with new decanter. Provide secondary sedimentation tank. Provide membrane liquid/solid separation system.</td>
</tr>
<tr>
<td>Effluent BOD and suspended solids</td>
<td>Additional solids removal likely to be required to meet effluent discharge requirements.</td>
<td>Provide effluent filtration if required</td>
</tr>
<tr>
<td>Microbiological removal</td>
<td>Additional pathogen removal likely to be required to meet effluent discharge requirements.</td>
<td>Provide effluent disinfection with either UV or hypochlorite if required</td>
</tr>
</tbody>
</table>
5 OPTIONS SCREENING

5.1 Plant Capacity

Plant capacity is to be increased 30% (ie to serve a population of 3000 persons) in Stage 1. Provision will be made in the design to readily increase the capacity to serve 3500 persons (ie 50% increase) (Stage 2).

5.2 Wet Weather Flow

Stormwater inflow and groundwater infiltration (I/I) studies undertaken to date indicates that there is only minor I/I from houses and from illegal connections. Major I/I is thought to be related to groundwater infiltration and manholes leaks in the collection system. Further studies and remedial work are recommended to reduce the current I/I problem. Peak wet weather flow in 2007 was reported to be 3420 kL/d, which is equivalent to 6.0 x median flow. A design objective is <= 4 x median flow (best practice).

5.3 Influent Flow/Screening Options

It is recommended that all influent flow be screened. During normal operation (ie dry weather) the pump rate to the plant is 65 L/s (with West PS operating) and 85 L/s (if both West and east PSs are operating. The existing fine screen has a nominal capacity of 80 L/s, and as such is overloaded when both pumps are operating. During wet weather there is potential for both pumps at the West PS to operate (considered infrequent event), which results in a peak inflow of 90 L/s to 110 L/s. Options considered are:

- Install PS telemetry and interlocks between PSs, so that east PS cannot operate when west PS is operating. This would limit the inflow to 65 L/s in dry weather (ie less than the screen capacity of 80 L/s).
- Provide an additional nom. 500 mm dia mechanical screen with nominal capacity of 120 L/s to 150 L/s to replace the existing 700 mm wide manually raked bar screen. The budget cost for supply and installation of a second mechanical screen is $90,000.

Limiting the inflow to the screen with interlocks is preferred to providing a second screen due to significant cost savings.

5.4 Plant Bypass

It is recommended that all influent flow up to 3 x median flow receive full treatment and that all screened flows >= 3 times median flow be bypassed direct to the polishing lagoons. Bypassing peak flows protects the plant from hydraulic overload and solids washout. Bypassing peak flows is required if the existing intermittent decant process is retained (ie one decant basin), however if two intermittent decant basins or a separate solids separation tank (ie secondary clarifier) is provided plant bypass is not required, but is still considered desirable.
Peak daily flow currently exceeds 3 x median flow approximately 3 times per year (based on historical daily flow records) and the frequency would be expected to reduce with the recommended I/I reduction program and new development in Deloraine.

5.5 Flow Attenuation Options

Limiting the peak hourly flow treated during normal operation (ie dry weather) provides a number of process advantages, including reduced installed aeration capacity, reduced short-circuiting, improved liquid-solids separation, and improved plant performance.

Options considered are:

- Separate covered flow attenuation tank, with nominal 8 hour storage capacity and pumping wastewater to the plant at 1.2 x median flow, during normal operation and up to 3 x median flow during peak flow events. The budget cost for supply and installation of a 250 kL capacity covered tank is $120,000 (check).

- Combined covered flow attenuation tank/anaerobic tank, with nominal total 12 hour storage capacity (4 hr flow attenuation and 8 hour anaerobic storage) and pumping wastewater to the plant at 1.5 x median flow, during normal operation and up to 3 x median flow during peak flow events. The budget cost for supply and installation of a 400 kL capacity covered tank is $150,000 (check).

Providing a combined flow attenuation/anaerobic tank is preferred on economic grounds, and less odour generation.

5.6 Phosphorus Removal and Anaerobic Tank

Phosphorus removal options include:

- biological P removal (typical median effluent P 1-2 mg/L);
- biological P removal with chemical P trimming (typical median effluent P <1 mg/L);
- chemical P removal (typical median effluent P <1 mg/L).

Biological P removal (with or without chemical P trimming) is preferred to chemical P removal. Biological P removal has considerably lower operating costs (less chemicals) and is the industry standard.

Chemical P trimming is required as backup to biological P removal in some cases to achieve a median effluent P <1 mg/L.

Existing 100 kL anaerobic basin has limited capacity (~4 hours) for optimum phosphorus removal and has significant short-circuiting due to shape and dividing wall shortcomings. A new concrete tank is preferred to a lagoon based design, due to better mixing achievable and lower surface area (less odour emissions). The tank would be covered and well ventilated to an odour treatment facility.

5.7 Nitrogen Removal and Aerobic/Anoxic Basins

The existing two basins are adequately sized to handle present and future flows, however as discussed later, an additional basin would be required if effluent decanting is continued.
Additional N removal is required to meet future effluent discharge requirements. This will require optimising biological N removal with provision of both aerobic and anoxic zones with adjustable times and significant recycle between zones in order to

Two adjustable sludge recycle streams are recommended as follows:

- Recycle nitrate rich flow from aerobic zone to the anoxic zone (6 x median flow) to optimise denitrification.
- Recycle sludge to anaerobic tank, either from a sedimentation tank or from an anoxic zone to optimise phosphorus removal. This recycle stream would not operate during peak wet weather flow (i.e. when the standby pump is operating in the anaerobic tank).

5.8 Aeration

Recommend providing up to 50% additional aeration capacity, plus one standby unit.

5.9 Liquid/Solids Separation

The existing basin configuration and decanter are inadequate. Significant solids loss occurs during decant due to carryover of stirred up settled sludge caused by high velocity flow entering from IDEAL 1 and high decant rate. If decanting practice is to continue, then two IDEAL 2 basins will be required to handle future increased flows, as the decant drop is too high.

Options considered to separate effluent from the biological solids are:

- Provide second IDEAL 2 basin and two new decant systems; the 2 IDEAL 2 basins would operate in parallel with no flow from basin 1 to basin 2 in settling/decant mode
- Provide separate sedimentation tank with sludge recycle system.
- Provide membrane liquid/solid separation system in IDEAL 2; and

The first two options are both costed and assessed. Membrane liquid/solids separation is too costly at present (both capital and annual costs).

5.10 Effluent Polishing

Options considered to polish effluent to meet discharge requirements are:

- Provide chemical addition for phosphorus removal (alum is preferred to lime)
- Provide effluent filtration (eg sand filter) to remove fine suspended solids and phosphorus/alum flocculated solids. Filters are preferred to dissolved air flotation on superior performance achievable.

5.11 Effluent Disinfection

Effluent disinfection with UV is preferred to hypochlorite dosing
6 OPTIONS EVALUATION

6.1 Short-listed Options

The following Stage 1 options were short-listed for development and evaluation:

- Option 1 – Modify IDEAL 1 & 2 to both intermittent decanting;
- Option 2 – New IDEAL 3 and intermittent decanting in IDEAL 2 & 3; and
- Option 3 – Modify IDEAL 1 & 2 to aeration only, and new secondary sedimentation tank.

Each option includes an inlet flow attenuation/anaerobic tank and upgrade of the sludge drying pans.

Stage 2 works are common to each option and involve: chemical dosing to trim effluent phosphorus, effluent filtration and effluent disinfection. These are described and costed in Section 7 - Recommended Upgrade.

6.2 Option 1 – Intermittent Decanters in IDEAL 1 & 2

Major components and features of this option are:

1. Stormwater inflow and groundwater infiltration (I/I) studies and remedial work to reduce peak wet weather flow per day to < 4 x median day flow.
2. Inlet pump station telemetry and interlocks to prevent east PS operating when west PS is operating. This will limit the inflow to 65 L/s in dry weather (ie less than the screen capacity of 80 L/s).
3. Increase plant capacity 50% to design median flow of 860 kL/d (ie population served 3500 persons).
4. New 400 kL covered flow attenuation tank/anaerobic tank, with nominal total 12 hour storage capacity at design median flow (4 hr flow attenuation and 8 hour anaerobic storage). Mixers provided to blend influent with return sludge to optimise phosphorus uptake and maintain homogeneous contents;
5. Influent pumping to IDEAL 1 and 2 at up to 1.5 x design median flow, during normal operation and up to 3 x median flow during peak flow events. Screened flow > 3 x median flow bypassed to polishing lagoons.
6. Modify IDEAL 1 to intermittent decant basin, involving removing existing anaerobic chamber, providing larger 18.5 kW floating aerator, new effluent decanter with associated effluent discharge pipe to polishing lagoon, and sludge recycle and sludge waste pipework.
7. Upgrade IDEAL 2 involving providing a larger 18.5 kW floating aerator and a new effluent decanter.
8. Recycle sludge from IDEAL 1 & 2 to the anaerobic tank during the settling and decant periods to optimise phosphorus removal.
9. Two stage odour removal facility to treat odourous air from flow attenuation/anaerobic tank, involving wet scrubber and biofilter.
10. Upgrade sludge drying pans by raising embankments to RL 230.0 m and providing surface aeration.
Table 6-1 presents a summary of the preliminary capital costs for Stage 1 options. The total capital cost for Option 1 (Stage 1) is estimated to be $1.26 million. As can be seen in the table, the major cost items for Option 1 are the flow attenuation/anaerobic tank and modifying IDEAL 1 and 2 with new aerators and decanters.

**Table 6-1 Summary of Preliminary Capital Cost Estimate for Stage 1 Options**

<table>
<thead>
<tr>
<th>Description</th>
<th>Option 1</th>
<th>Option 2</th>
<th>Option 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Decant both IDEAL 1 &amp; 2</td>
<td>New IDEAL 3 &amp; Decant in IDEAL 2 &amp; 3</td>
<td>Aeration only in IDEAL 1 &amp; 2 and new sedimentation tank</td>
</tr>
<tr>
<td>Limit Influent Flow &lt; 80 L/s</td>
<td>$10,000</td>
<td>$10,000</td>
<td>$10,000</td>
</tr>
<tr>
<td>Plant Bypass Flow &gt; 3 x median flow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow Attenuation &amp; Anaerobic Tank</td>
<td>$259,000</td>
<td>$259,000</td>
<td>$259,000</td>
</tr>
<tr>
<td>Odour Control</td>
<td>$65,000</td>
<td>$65,000</td>
<td>$65,000</td>
</tr>
<tr>
<td>Modify IDEAL 1 Basin</td>
<td>$197,000</td>
<td>$90,000</td>
<td>$34,000</td>
</tr>
<tr>
<td>Modify IDEAL 2 Basin</td>
<td>$155,000</td>
<td>$180,000</td>
<td>$34,000</td>
</tr>
<tr>
<td>Modify SDP to IDEAL 3</td>
<td>$288,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary Sedimentation Tank</td>
<td></td>
<td></td>
<td>$388,000</td>
</tr>
<tr>
<td>Sludge Drying Pans Upgrade</td>
<td>$27,500</td>
<td>$40,000</td>
<td>$28,000</td>
</tr>
<tr>
<td>Siteworks for Future Works</td>
<td>$50,000</td>
<td>$50,000</td>
<td>$50,000</td>
</tr>
<tr>
<td>Electrical &amp; Control</td>
<td>$110,000</td>
<td>$110,000</td>
<td>$130,000</td>
</tr>
<tr>
<td>SUB TOTAL</td>
<td>$874,000</td>
<td>$1,090,000</td>
<td>$998,000</td>
</tr>
<tr>
<td>Contingences 20 %</td>
<td>$175,000</td>
<td>$218,000</td>
<td>$200,000</td>
</tr>
<tr>
<td>SUB TOTAL &amp; CONTINGENCES</td>
<td>$1,048,000</td>
<td>$1,310,000</td>
<td>$1,197,000</td>
</tr>
<tr>
<td>Engineering and Supervision 20 %</td>
<td>$210,000</td>
<td>$262,000</td>
<td>$239,000</td>
</tr>
<tr>
<td><strong>TOTAL CONSTRUCTION COST</strong></td>
<td><strong>$1,260,000</strong></td>
<td><strong>$1,570,000</strong></td>
<td><strong>$1,440,000</strong></td>
</tr>
</tbody>
</table>

The advantages of Option 1 - Decanting in both IDEAL 1 and 2, are:
- Lowest capital cost; and
- Simplest construction.

The disadvantages of Option 1 - Decanting in both IDEAL 1 and 2, are:
- Not best practice;
- Insufficient nitrogen removal to meet future effluent licence conditions;
- Biological reactor capacity marginal at design flows;
- Lower suspended solids removal with decanters compared with sedimentation tank; and
- Limited process variables and control available to adjust performance.

Overall, the cost savings of this option do not outweigh the poor effluent quality achieved and the reduced process flexibility (ie compared with other options).
6.3 Option 2 – New IDEAL 3 and Decanting in IDEAL 2 & 3

Major components and features of this option are:

1. Items 1 to 5 inclusive of Option 1;
2. Modify IDEAL 1 to aeration basin, involving retaining existing anoxic chamber and aerator and upgrading the interconnecting pipework to following tanks, including pit.
3. Upgrade IDEAL 2 involving retaining aerator and providing a standby aerator, a new baffle wall, effluent decanter and associated effluent and sludge pipework.
4. Modify SDP1 to IDEAL3, including deepening and raising the basin and providing the following: HDPE liner, walkway, baffle wall, mixer, aerator, decanter, and associated pipework.
5. Recycle sludge from IDEAL 2 & 3 to the anaerobic tank during the settling and decant periods to optimise phosphorus removal.
6. Two stage odour removal facility to treat odorous air from flow attenuation/anaerobic tank, involving wet scrubber and biofilter.
7. Upgrade sludge drying pan 2 by deepening and raising embankment to RL 230.0 m and providing surface aeration.

The total capital cost for Option 2 (Stage 1) is estimated to be $1.57 million (refer Table 6-1). As can be seen in the table, the major cost items for Option 2 are the flow attenuation/anaerobic tank and modifying IDEAL2, and converting SDP1 to IDEAL3.

The advantages of Option 2 - New IDEAL 3 and Decanting in IDEAL 2 & 3 are:
- Retains existing operation with effluent decanters.
- Process flexibility; and
- Simple construction.

The disadvantages of Option 2 - New IDEAL 3 and Decanting in IDEAL 2 & 3 are:
- Highest capital cost;
- Lower suspended solids removal of decanters compared with sedimentation tank;

This option is preferred to Option 1 on the basis of superior effluent quality and greater process flexibility.

6.4 Option 3 – Modify IDEAL 1 & 2 to Aeration, & New Sedimentation Tank

Major components and features of this option are:

1. Items 1 to 5 inclusive of Option 1;
2. Modify IDEALS 1 & 2 to aeration basins, involving removing existing baffle wall in IDEAL1 and decanter in IDEAL2, providing a standby aerator and upgrading internal pipework and pump.
3. Providing 8.7 m dia sedimentation tank with associated sludge and scum scrapers with peripheral drive and associated sludge removal pit and valve.
4. Recycle sludge from IDEAL 2 & 3 to the anaerobic tank during the settling and decant periods to optimise phosphorus removal.
5. Two stage odour removal facility to treat odorous air from flow attenuation/anaerobic tank, involving wet scrubber and biofilter.

6. Upgrade sludge drying pans by raising embankment to RL 230.0 m and providing surface aeration.

The total capital cost for Option 3 (Stage 1) is estimated to be $1.44 million (refer Table 6-1). As can be seen in the table, the major cost items for Option 3 are the flow attenuation/anaerobic tank and the new sedimentation tank.

The advantages of Option 3 - Modify IDEAL 1 & 2 to Aeration Only, and New Secondary Sedimentation Tank are:
- Superior effluent quality and process control/flexibility;
- Best practice BNR plant; and
- Well suited to future upgrade to tertiary treatment using effluent filters; and

The disadvantages of Option 3 - Modify IDEAL 1 & 2 to Aeration Only, and New Secondary is:
- Medium capital cost.

This option is preferred to Option 1 and option 2 on the basis of superior effluent quality and greater process flexibility.
7 RECOMMENDED UPGRADE

7.1 Staged Development

The Deloraine WWTP upgrade is recommended to be constructed in two stages to meet budgetary constraints (ie Stage 1 – short term and Stage 2 – medium/long term). Stage 1 may be further split up to Stage 1A and 1B. Figure 7-1 shows a schematic flow diagram of Stage 1 upgrade and Figure 7-2 shows a concept layout for the full upgrade.

7.1.1 Stage 1A

The first stage will include the following:
1. Stormwater inflow and groundwater infiltration (WI) studies and remedial work to reduce peak wet weather flow per day to < 4 x median day flow.
2. Interlock pumping from East and West pump stations prevent simultaneous operation to limit dry weather inflow to 65 L/s (ie < 80 L/s screen capacity).
3. Increase plant average flow capacity 50% to design median flow of 860 kL/d (ie population served 3500 persons).
4. Modify IDEALS 1 & 2 to aeration basins, by removing existing baffle wall in IDEAL1 and decanter in IDEAL2, providing a standby aerator and upgrading internal pipework and pump.
5. Provide 6.7 m dia sedimentation tank with associated mechanical sludge and scum scrapers with peripheral drive and associated sludge removal pit and valve.
6. Sludge recirculation from IDEAL 2 & 3 to the anaerobic tank during the settling and decant periods to optimise phosphorus removal.
7. Upgrade sludge drying pans by raising embankment to RL 230.0 m and providing surface aeration for odour control.

7.1.2 Stage 1B

The second stage will include the following:
1. New 400 kL covered flow attenuation tank/anaerobic tank, with nom. 12 hour storage capacity at design median flow (4 hr flow attenuation and 8 hour anaerobic storage), with mixer to blend influent with return sludge for P removal.
2. Influent pumping to IDEAL 1 and 2 at up to 1.5 x design median flow, during normal operation and up to 3 x median flow during peak flow events. Screened flow > 3 x median flow bypassed to polishing lagoons.
3. Two stage odour removal facility to treat odourous air from flow attenuation/anaerobic tank, involving wet scrubber and biofilter.

7.1.3 Stage 3

The third stage will include the following:
1. Chemical dosing system for improved phosphorus removal (P trimming).
2. Effluent filtration facility using deep sand filters; and
3. UV Effluent disinfection facility.
Figure 7-1  Flow Schematic of Proposed Stage 1 Deloraine WWTP Upgrade
Figure 7-2 Concept Layout of Proposed Deloraine WWTP Upgrade
## 7.2 Preliminary Design Criteria and Data

Table 7-1 presents preliminary design criteria for the proposed WWTP upgrade.

### Table 7-1 Design Criteria & Data for Proposed Deloraine WWTP Upgrade

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Proposed Facilities 2008</th>
<th>Proposed Facilities Stage 1</th>
<th>Proposed Facilities Stage 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>POPULATION</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Growth projected allowance</td>
<td>%</td>
<td>0</td>
<td>30%</td>
<td>50%</td>
</tr>
<tr>
<td>Residential/commercial (EP)</td>
<td>EP</td>
<td>2300</td>
<td>3000</td>
<td>3500</td>
</tr>
<tr>
<td><strong>FLOW</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unit flow production</td>
<td>L/EP.d</td>
<td>239</td>
<td>240</td>
<td>240</td>
</tr>
<tr>
<td>Median flow</td>
<td>kL/d</td>
<td>570</td>
<td>740</td>
<td>850</td>
</tr>
<tr>
<td></td>
<td>L/s</td>
<td>6.6</td>
<td>8.6</td>
<td>10.0</td>
</tr>
<tr>
<td><strong>Influent pump rate</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>West FS 1 pump</td>
<td>L/s</td>
<td>65</td>
<td>65</td>
<td>65</td>
</tr>
<tr>
<td>West FS 2 pumps</td>
<td>L/s</td>
<td>90</td>
<td>90</td>
<td>90</td>
</tr>
<tr>
<td>East FS</td>
<td>L/s</td>
<td>20</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Peak influent flow (duty pumps)</td>
<td>L/s</td>
<td>65</td>
<td>65</td>
<td>65</td>
</tr>
<tr>
<td><strong>Peak dry hour flow/avg dry hour flow</strong></td>
<td>L/s</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td><strong>Peak dry weather hour</strong></td>
<td>L/s</td>
<td>10</td>
<td>13</td>
<td>15</td>
</tr>
<tr>
<td><strong>Peak wet day/median day flow to WWTP</strong></td>
<td>L/s</td>
<td>6</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td><strong>Peak flow pumped to WWTP (daily avg)</strong></td>
<td>L/s</td>
<td>40</td>
<td>51</td>
<td>60</td>
</tr>
<tr>
<td><strong>PWWF pumped to WWTP</strong></td>
<td>kL/d</td>
<td>3420</td>
<td>4440</td>
<td>5160</td>
</tr>
<tr>
<td><strong>Peak wet day/median day flow thru' WWTP</strong></td>
<td>L/s</td>
<td>5</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td><strong>PWWF thru' WWTP</strong></td>
<td>kL/d</td>
<td>2280</td>
<td>2220</td>
<td>2580</td>
</tr>
<tr>
<td><strong>PWWF bypassed to lagoons (ex screens)</strong></td>
<td>kL/d</td>
<td>570</td>
<td>2220</td>
<td>2580</td>
</tr>
<tr>
<td><strong>MEDIAN INFLUENT CHARACTERISTICS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BOD - total</td>
<td>mg/L</td>
<td>230</td>
<td>230</td>
<td>230</td>
</tr>
<tr>
<td>Suspended solids (TSS)</td>
<td>mg/L</td>
<td>230</td>
<td>230</td>
<td>230</td>
</tr>
<tr>
<td>Nitrogen - N (total)</td>
<td>mg/L</td>
<td>60</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Phosphorus - P (total)</td>
<td>mg/L</td>
<td>12</td>
<td>12</td>
<td>12</td>
</tr>
<tr>
<td><strong>DESIGN CRITERIA AND DATA</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fine Screen</td>
<td>L/s</td>
<td>80</td>
<td>80</td>
<td>80</td>
</tr>
<tr>
<td><strong>Bypass Screen</strong></td>
<td>L/s</td>
<td>~130</td>
<td>~130</td>
<td>~130</td>
</tr>
<tr>
<td>700 mm wide with 35 mm openings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anaerobic &amp; Flow Attenuation Tank (new covered concrete tank)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diameter (ID)</td>
<td>m</td>
<td>11.7</td>
<td>11.7</td>
<td>11.7</td>
</tr>
<tr>
<td>Height to top of wall</td>
<td>m</td>
<td>4.0</td>
<td>4.0</td>
<td>4.0</td>
</tr>
<tr>
<td>Freeboard @ TWL</td>
<td>m</td>
<td>0.3</td>
<td>0.3</td>
<td>0.3</td>
</tr>
<tr>
<td>Volume @ TWL</td>
<td>kL</td>
<td>400</td>
<td>400</td>
<td>400</td>
</tr>
<tr>
<td>Anaerobic retention time @ median flow</td>
<td>hr</td>
<td>8</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Anaerobic contents depth (ie BWL)</td>
<td>m</td>
<td>1.8</td>
<td>2.3</td>
<td>2.7</td>
</tr>
<tr>
<td>Nom. anaerobic volume</td>
<td>kL</td>
<td>190</td>
<td>250</td>
<td>290</td>
</tr>
<tr>
<td>Volume available for flow attenuation</td>
<td>kL</td>
<td>210</td>
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<tr>
<td>L/s</td>
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<td>Unit</td>
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<td>Facilities Stage 2</td>
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<tr>
<td>Freeboard @ TWL</td>
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<tr>
<td>Volume @ TWL (actual)</td>
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<tr>
<td>Retention time @ median flow</td>
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<tr>
<td>Volume @ TWL (actual)</td>
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<td>930</td>
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<tr>
<td>Retention time @ median flow</td>
<td>hr</td>
<td>38</td>
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<tr>
<td><strong>Operating parameters</strong></td>
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<td>BOD loading (median)</td>
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<td>Aeration time</td>
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<td>IDEAL 2</td>
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<td>IDEAL 1</td>
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<td>15</td>
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<tr>
<td>IDEAL 2</td>
<td>kW</td>
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<td>Overflow rate @ median flow</td>
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<td>Side water depth</td>
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<td>Hydraulic retention time @ median flow</td>
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<td>Recycle Pumps</td>
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<td>ML recycle (denitrification)</td>
<td>x avg flow</td>
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<td>Capacity</td>
<td>L/s</td>
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<td>RAS recycle (P removal)</td>
<td>x avg flow</td>
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<td>Capacity</td>
<td>L/s</td>
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<td><strong>EFFLUENT MEDIAN CONC.</strong></td>
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<td>BOD₅ - total</td>
<td>mg/L</td>
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<td>15</td>
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<td>Suspended solids</td>
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<td>Nitrogen - N (total)</td>
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<td>10</td>
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<tr>
<td>Phosphorus - P (total)</td>
<td>mg/L</td>
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<td>2</td>
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<td><strong>EXCESS SLUDGE PRODUCTION</strong></td>
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<td>Annual excess sludge volume</td>
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<td>3500</td>
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</table>
## 7.3 Preliminary Capital Cost Estimate

Table 7-2 presents a summary of the preliminary capital cost estimate for each stage of the proposed WWTP upgrade.

<table>
<thead>
<tr>
<th>Description</th>
<th>Stage 1A</th>
<th>Stage 1B</th>
<th>Stage 2</th>
<th>Total</th>
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<tr>
<td>Interlock to prevent PSs operating together</td>
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<td>Flow Attenuation &amp; Anaerobic Tank</td>
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<td>Siteworks</td>
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<tr>
<td>Concrete tank 12 m dia &amp; 4 m high (400 kL)</td>
<td>$120,000</td>
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<td></td>
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<tr>
<td>Tank Cover</td>
<td>$25,000</td>
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<tr>
<td>Pumps &amp; mixer</td>
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<td>Pipework</td>
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<td>Odour Control</td>
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<tr>
<td>Siteworks</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Ductwork &amp; Fans</td>
<td>$10,000</td>
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<tr>
<td>Humidifier/Biotower/biofilters</td>
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<td>Pipework</td>
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<td>Modify Existing IDEAL Basins</td>
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<td>Remove inlet baffle &amp; decanter</td>
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<td>Spare 15 kW aerator</td>
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<td>Upgrade internal recycle pipework &amp; pump</td>
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<td>Secondary Sedimentation Tank</td>
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<td>Siteworks</td>
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<td>Mechanical scrapers &amp; half bridge</td>
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<td>RAS pumps</td>
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<td>Siteworks</td>
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<td>Deep bed sand filters with auto backwash</td>
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<td>Backwash tanks (2 x23 kL)</td>
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<td>UV system</td>
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<td>Sludge Drying Pans Upgrade</td>
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<td>Earthworks to raise banks to RL 230.0 m</td>
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<td>New 4 kW aerators</td>
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<td>Siteworks for Future Works</td>
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<td>Electrical &amp; Control</td>
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<tr>
<td>Instrumentation and PLC controls</td>
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<td>SUB TOTAL</td>
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<td>$75,360</td>
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<td><strong>TOTAL CONSTRUCTION COST</strong></td>
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<td>$450,000</td>
<td>$1,090,000</td>
<td>$2,540,000</td>
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</table>
7.4 Description of Operation of Proposed Works

7.4.1 Influent Pumping

Wastewater is pumped automatically on level control from either the West or East pumping stations (PSs) to the plant. The PS controls will be interlocked to prevent simultaneous pumping during normal operation. Simultaneous pumping may occur in wet weather if the high level alarm is initiated in the PS wet wells.

Under normal operating conditions the wastewater flow to the plant will be intermittent and up to 65 L/s. During wet weather the inflow may be continuous and up to 130 L/s with duty and standby pumps operating.

All wastewater flow pumped to the plant is measured and totalised.

7.4.2 Influent Screening

All wastewater pumped to the plant is screened. During normal operation all flow is screened through the mechanical fine screen with nominal 5 mm dia apertures (capacity 80 L/s). Screenings from the mechanical screen are automatically removed from the screen, via an inclined screw and dewatered and discharged into a bin for offsite disposal.

Influent flow in excess of the mechanical screen capacity of 80 L/s will overflow a weir to the 20 mm aperture manual bar screen (ie during wet weather).

Under normal operation all screened wastewater gravity flows to the biological nutrient removal plant. During wet weather flow, flows in excess of up to 30 L/s will overflow to the polishing lagoons when the flow balancing tank is full.

7.4.3 Biological Nutrient Removal (BNR) Plant

- The biological nutrient removal plant consists of the following:
  - Anaerobic and flow balancing tank
  - Two aerobic/anoxic basins with surface aerators and internal recycling
  - Waste activated sludge pumping to sludge drying pans.
  - Secondary sedimentation tank with sludge and scum scrapers
  - Return activated sludge pumping to anaerobic tank

Anaerobic and Flow Balancing Tank

Screened wastewater will discharge by gravity to the covered 400 kL capacity anaerobic/flow balancing tank where it is mixed with return activated sludge (RAS) from the underflow from secondary sedimentation tank. Under normal operation (ie dry weather) the tank will operate approximately half full and provide a nominal hydraulic retention time of 8 hours for phosphorus removal.

The contents of the anaerobic tank ("mixed liquor") is pumped on level control at up to 15 L/s with the duty pump to the first aerobic/anoxic basin.
During wet weather the level in the anaerobic/flow balancing tank will rise and at high water level the nominal 15 L/s standby pump will also start pumping to the first aerobic/anoxic basin (ie total pump rate of up to 30 L/s). Any screened flow in excess of 30 L/s will overflow by gravity to the polishing lagoons when the anaerobic/flow attenuation tank is full (ie flow > 3 x median flow).

The air space under the cover of the anaerobic/flow balancing tank is ventilated and extracted by fan to the odour removal facility (discussed later).

**Two Aerobic/Anoxic Basins**

Mixed liquor from the anaerobic tank flows through the two aerobic/anoxic tanks operating in series and providing a nominal hydraulic retention time of 2 days.

The surface aerator in each basin is operated on timers and dissolved oxygen to provide alternating aerobic and anoxic conditions to achieve complete biological oxidation of organic matter (BOD reduction), complete nitrification (ammonia oxidation) and significant denitrification (nitrogen removal).

The dissolved oxygen concentration in the basins is measured and recorded continuously. The DO output from the meter may be used to control the aerator operation together with the timers.

Mixed liquor in the second basin are recycled back to basin 1 at up to 6 x median flow (ie a high rate) to optimise nitrogen removal.

Excess sludge production (WAS) is wasted each day to the sludge drying pans to maintain a steady biomass in the basins.

**Secondary Sedimentation Tank**

Mixed liquor from the second aerobic/anoxic flows by gravity to the centre well of the secondary sedimentation tank, where quiescent conditions are provided for solids/liquid separation. Effluent (liquid) overflows a peripheral weir into a launder (trough).

In Stage 1, effluent is discharged to the polishing ponds. In stage 2, the effluent is pumped through the filtration facility to the UV disinfection unit.

Settled sludge is scraped to a central hopper (with paddle thickener) and the thickened sludge is removed via an automated telescopic valve to a sludge pump pit and recycled back to the anaerobic tank at the head of the plant.

**Sludge Drying Pans**

Two 500 m2 clay lined pans are provided for natural air drying of excess biological sludge. Excess sludge from the aerobic/anoxic basins is pumped under timer control to the duty sludge drying pan (SDP). The duty SDP is selected via manual isolating valves. The duty basin is operated with a water cap, which is aerated to control odours. Excess water is removed from the pans via a drainage system and flows to a sump and pumped automatically under level control to the anaerobic tank at the head of the plant. Sludge is allowed to further stabilise and thicken in the bottom of the SDP.
During summer the SDP duty is rotated and the water cap is removed from the offline pan and the sludge allowed to dewater and dry. Once dry the sludge is windrowed and then removed and carted offsite for stockpiling for future beneficial reuse.

**Odour Control**

Ventilation air is continuously drawn from the covered anaerobic/flow attenuation tank under a negative pressure of up to 20 Pa and blown through the two stage odour scrubber/filler facility.

Ventilation air is first passed though a wet packed scrubber to remove hydrogen sulphide. Water is sprayed down over the packed media, counter current to the ventilation air. The water is recirculated intermittently and periodically a portion is bled off to ensure the pH is > 2.

Ventilation air is then passed up through biofilters to remove remaining hydrogen sulphide and other odours. Automatic top water sprinkling/drip irrigation system with moisture sensors ensure the bed remains moist.
# MEANDER VALLEY COUNCIL
## DELORAINE WWTP UPGRADE

**Preliminary Capital Cost Estimates**

### Option 1 - Intermittent Decanters (Stage 1)

<table>
<thead>
<tr>
<th>Item/Description</th>
<th>Qty</th>
<th>Unit</th>
<th>Rate</th>
<th>Total Amount</th>
<th>Subtotal Amount</th>
</tr>
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<tbody>
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<td>2. Plant Bypass Flow &gt; 3 x median flow Refer Item 3. Flow Attenuation &amp; Anaerobic Tank</td>
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<tr>
<td>3. Flow Attenuation &amp; Anaerobic Tank</td>
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<tr>
<td>Siteworks</td>
<td></td>
<td>Item</td>
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<td>259,000</td>
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<td>Item</td>
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<tr>
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<td>Item</td>
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<tr>
<td>Ductwork &amp; Fans</td>
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<td>Item</td>
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<tr>
<td>Humidifier/Biotower</td>
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<td>Item</td>
<td>10,000</td>
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<tr>
<td>Biofilters</td>
<td></td>
<td>Item</td>
<td>20,000</td>
<td></td>
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<tr>
<td>Pipework</td>
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<td>Item</td>
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## MEANDER VALLEY COUNCIL
### DELORAINE WWTP UPGRADE
#### Preliminary Capital Cost Estimates
##### Option 2 - Decant Option with Third IDEAL (Stage 1)

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# Preliminary Capital Cost Estimates

## Option 3 - Separate Sedimentation Tank (Stage 1)

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### MEANDER VALLEY COUNCIL
### DELORaine WWTP UPGRADE
### Preliminary Capital Cost Estimates
### Option 3 - Separate Sedimentation Tank (Stage 2)

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<td>Remove decanter</td>
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**SUB TOTAL**

Contingences 20 %

**SUB TOTAL & CONTINGENCES**

Engineering and Supervision 20 %

**TOTAL CONSTRUCTION COST**

$ 1,000,000
# MEANDER VALLEY COUNCIL
## DELORaine WWTP UPGRADE
### Preliminary Capital Cost Estimates
#### Option 3 - Separate Sedimentation Tank (Stage 1b)

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MEANDER VALLEY COUNCIL
DELORAINE WWTP UPGRADE
STAGE 1 AND 2 UPGRADE

PRELIMINARY

LEGEND

EXISTING
STAGE 1
STAGE 2

scale 1:250 for A1
job no. 32-14735
rev no. A

approved ____________________ SK001
## Contents

1. Introduction  
   1.1 Purpose of Report 1  
   1.2 Statutory Status 1  
   1.3 Relationship to DPEMP 1  

2. Project Background  
   2.1 Subject Site 2  
   2.2 Proposal Description 4  

3. Planning Scheme Controls  
   3.1 Statutory Reference 5  
   3.2 Use Classification 5  
   3.3 Consideration of the Development Application 5  
   3.4 Community Purposes Zone Provisions 6  
   3.5 General Provisions 11  
   3.6 Special Areas 13  

4. Strategic Planning & Policy Assessment 14  
   4.1 State Policies 14  
   4.2 Objectives of LUPAA 15  

5. Conclusion 17  

Appendices  
A Copies of Titles
1. Introduction

1.1 Purpose of Report

This report is prepared in conjunction with the Development Proposal and Environmental Management Plan (DPEMP) for the proposed upgrade of the Deloraine Wastewater Treatment Plant (WWTP). It has been structured to address the requirements of the Meander Valley Planning Scheme 1995 (Scheme) as well as State Policies and Schedule 1 Objectives of the Land Use Planning and Approvals Act 1993 (LUPAA).

1.2 Statutory Status

The proposed development is a Level 2 Activity as defined under the Environmental Management and Pollution Control Act 1994 (EMPCA). Accordingly the proposal is deemed to be a discretionary application pursuant to Section 25(1)(a) of EMPCA and Section 57 of LUPAA. The proposed use and development is also discretionary pursuant to the Scheme.

The proposal requires approval from the Board of the Environmental Protection Authority (EPA Board) under EMPCA and Meander Valley Council (MVC) under LUPAA. These two tiers of assessment and approval are undertaken concurrently and relate to different aspects of the project. Council’s assessment is in accordance with the land use planning considerations under the Scheme. Council is not required to assess any matter already addressed in the assessment by the EPA Board.

1.3 Relationship to DPEMP

This report provides an assessment of the proposal against the relevant land use planning considerations of the Scheme. In providing descriptions of the subject site and proposed development in Section 2, reference is made to the relevant sections of the DPEMP. The DPEMP is also referred to during the statutory planning assessment in Section 3 in addressing the Scheme standards which relate to environmental considerations covered by the EPA Board’s assessment.
2. **Project Background**

2.1 **Subject Site**

The Deloraine WWTP is located within the confines of the Deloraine Racecourse, approximately 400 m north of the Deloraine township (Refer Figure 1 in DPEMP). It includes a tertiary treatment plant constructed in 2002 to complement the pre-existing wastewater lagoons. The plant is located immediately to the south of Lagoon 1.

The facilities associated with the tertiary treatment plant include:

- Two underground pump stations within the confines of the plant;
- An above ground inlet screen;
- A 30 m² control building which houses plant electrical installation and instrumentation. The building is single-storey and constructed with face brick and a colourbond roof;
- Two Intermittent Decanted Extended Aeration Lagoons (IDEAL 1 and IDEAL 2). Each is an uncovered structure approximately 750 m² in area);
- Two sludge drying pans (each 1000 m²); and
- Interconnecting pipework and site improvements including embankments, access roads, drainage and fencing.

The general location and layout of these existing facilities is depicted in Figure 1 in the DPEMP and the site layout plan which accompanies the development application. They have been built 300 mm above the level of the 1 in 100 year flood interval (229.7 m asl). The natural surface level at the site of the tertiary treatment plant is approximately 226 m asl.

An overview of the operation of the existing WWTP is provided in Section 2.3 of the DPEMP. The original wastewater lagoons now function as polishing ponds. As discussed within the DPEMP, an upgrade of the WWTP is necessary to maintain design effluent quality objectives and to meet the projected future influent flows and loads.

The WWTP is accessed via a roadway extending from East Westbury Place over the racecourse and adjacent to other recreation areas within the property. The Bass Highway lies approximately 300m to the north of the tertiary treatment plant and approximately 50 m from Lagoon 2.

The WWTP and associated lagoons are located on a relatively flat section of cleared land within the Meander River floodplain. The river itself lies within a few hundred metres to the west. The outfall for the WWTP, which is fed from the lagoons, enters Meander River below the overpass of the Bass Highway, 300m north of the treatment plant.
2.1.1 Land Tenure
The Deloraine Racecourse at East Westbury Place, Deloraine is formally described with Property Id (PID) 1951959. It occupies an area of 29.97ha and is contained in two separate parcels, including:

- Conveyance 10/8969 (29.1 ha approximately); and
- CT Vol. 54466 Fol. 1 (7938 m$^2$). The western portion of the title is subject to a 2 m drainage easement. The title is largely vacant.

The land is owned by Meander Valley Council (MVC). It is generally bounded by the Bass Highway to the north, agricultural land to the east, the Meander River to the west and the Western (railway) Line to the south. The Deloraine WWTP occupies an area of approximately 5 ha within the northern portion of Conveyance 10/8969 and is operated by MVC. The land within CT Vol. 54466 Fol. 1 is unaffected by the proposed WWTP upgrade. A copy of the title documentation and Conveyance 10/8969 is provided in Appendix A.

An overview of the uses and developments located within the property is contained below.

2.1.2 Site Context
The Deloraine Racecourse contains a variety of existing uses and developments, including:

- The Deloraine WWTP described above;
- The racetrack and grandstand associated with the Deloraine Racecourse. The tertiary treatment plant and Lagoon 1 associated with the Deloraine WWTP are located inside the racetrack. Lagoon 2 is located immediately to the north;
- Horse yards and stables associated with the racetrack;
- Recreation ground and football club to the south of the tertiary treatment, also within the racetrack;
- The MVC works depot for Deloraine;
- Tennis courts opposite the works depot; and
- Overnight parking area for motor homes east of the tennis courts.

The majority of these uses are either wholly or partly within 500 m of the proposed WWTP upgrade. The entire site is within the Community Purposes zone under the Scheme.

The land to the west, north and east of the property is agricultural land within the Rural zone under the Scheme. The land to the south is part of the Deloraine township. The Impact fertiliser depot and former Elders Webster (rural merchandise supplier) are located immediately to the south, north of the Western (railway) Line on the eastern side of East Westbury Place. There are two residential properties located on the western side of the East Westbury Place at this location near the entrance into the property.

The closest residences to the WWTP are on the western side of the Meander River along River Road within the Rural zone approximately 400 m away. There are also residences located along Grigg Street and within Railway Street, mostly within the Residential zone, approximately 300 m to the south east of the site. The two adjacent residential properties in East Westbury Place are around 600 m from the WWTP.
2.2 Proposal Description

The Deloraine WWTP upgrade will be undertaken in two stages immediately adjacent to the existing tertiary treatment plant. The works involved within each stage and resultant changes to the operation of the WWTP are detailed in Sections 2.4 and 2.5 of the DPEMP. The upgrade will increase plant capacity and maintain design effluent quality objectives.

An overview of the key aspects of the proposed development involved in each stage of the WWTP upgrade is provided below. These works are also shown on the Upgrade Layout Plan (refer to Figure 2 of the DPEMP).

Stage 1:
- An overflow storage basin with a capacity of 1.5 ML (1500 m² in area) immediately to the south of IDEAL 1 and IDEAL 2. It will be constructed of compacted earth and lined with HDPE (high density polyethylene) to prevent leakage to groundwater;
- A 300 kL anaerobic tank adjacent to the overflow storage basin. The tank will be covered and of a size in the order of 300 m² (approximately 12 m diameter with a depth of 3 metres partly underground);
- A third sludge drying pan of a similar size to the existing pans, constructed from earth fill with a clay liner east of the overflow storage basin; and
- Works associated with the plant upgrade in Stage 1, including a flow splitter after the existing inlet screen, a new decanter to IDEAL 2 and interconnecting pipework.

Stage 2:
- A new 300kL balance tank immediately north of IDEAL 1 and IDEAL 2, with a size similar to the proposed anaerobic tank;
- A small (40 m²) colourbond shed to house pump filters, UV disinfection system and bunded storage of chemicals used for nutrient removal;
- A fourth sludge drying pan of a similar size to the existing pans, constructed from earth fill with a clay liner to the east of the overflow storage basin; and
- Works associated with the plant upgrade in Stage 2 including interconnecting pipework.

As with the previous upgrade the new works will be built up to achieve a ground level at 230 m asl, which is 300 mm above the 1 in 100 year flood interval. Site levels for all new infrastructure will be increased by the placement and compaction of selected imported fill material. Once finished ground level is established, the new infrastructure will be constructed. Fill will be placed in a small portion of Lagoon 1 north of IDEAL 1 and IDEAL for the new balance tank and adjacent equipment.
3. Planning Scheme Controls

3.1 Statutory Reference

The site is subject to the provisions of the *Meander Valley Planning Scheme 1995* (the ‘Scheme’), both general and specific. In particular, this includes:

- Clause 2.2.2 ‘Permit Required in respect of Clause 31.5 of the State Policy on Water Quality Management’;
- Clause 3.8 ‘Community Purposes Zone’ provisions;
- Clause 2.10 ‘Consideration of an Application for a Permit’;
- Clause 4.4 ‘Probable Flood Areas’;
- Clause 4.5 ‘Watercourse Protection’;
- Clause 4.12 ‘Environmental Harm’; and
- Part 7 ‘Items of Cultural Significance’.

3.2 Use Classification

The proposal is classified as part of the existing Utility Services (Major) use and development class applying to the Deloraine WWTP. The use class is defined under Clause 1.6 of the Scheme as follows:

…water treatment, sewage treatment, waste transfer station, refuse disposal site, a power generating works, a council works depot and an electricity substation or switching station of more than 100 kilovolts.

The subject site is zoned Community Purposes under the Scheme. Utility Services (Major) is listed as a discretionary use and development in the zone under the table to Clause 8.1.2 of the Scheme. The development application is generally discretionary pursuant to Section 25(1)(a) of the *Environmental Management and Pollution Control Act 1994*.

3.3 Consideration of the Development Application

Clause 2.10.1 of the Scheme lists the general matters that the planning authority is required take into consideration before granting, either with or without conditions, or refusing a permit for a use and development. This includes the following:

(a) the Goals and Objectives of Scheme, the Settlement Use and Development Strategies, Zone Intent and Policies, any relevant Development Standards and any other relevant provisions of the Scheme;
(e) any provisions of Part 4 of the Scheme not listed in this clause;
(k) the objectives and provisions of the Resource Management and Planning System of Tasmania;

The intent, policies and standards for the Community Purposes zone are considered in Section 3.4 below. The general provisions and special areas relevant to the proposal are considered in Sections 3.5 and 3.6. The Goals and Objectives of the Scheme are delivered through its detailed provisions, and are therefore not specifically addressed. The Scheme overall embodies the objectives of the Resource Management and Planning System in Tasmania (RMPS) set out in Schedule 1 of the *Land Use Planning and Approvals Act 1993*, although they are addressed in Section 4.2.
3.3.1 Other General Consideration

The other matters listed under Clause 2.10.1 are general considerations. Most are related to the more specific provisions of the Planning Scheme. Therefore, only the following is considered to require specific attention in the assessment of the application.

(g) whether the proposed development will adversely affect the existing and planned future use of adjacent land, and vice versa;

The Deloraine WWTP is located within the confines of the Deloraine Racecourse, approximately 400m north of the Deloraine township off East Westbury Place. The Bass Highway lies approximately 300m to the north of the treatment plant. The proposed upgrade is based on the existing WWTP, involving an extension to the tertiary treatment plant constructed in 2002. Surrounding land use is for recreational purposes and public space with the Deloraine racecourse, horse yards, recreation ground and football club to the south and agricultural land to the north, east and west. The closest residences to the WWTP are on the western side of the Meander River along River Road (approximately 400 m away within the Rural zone) and to the south east of the site along Grigg Street, approximately 300 m away. Taking the mitigation measures and commitments set out through the DPEMP, the operation of the proposed use and development will have limited impact on the use of adjoining land.

In particular, the likelihood of additional odours associated with the WWTP as a result of the upgrade is remote (Section 4.1 of the DPEMP). An odour unit associated with the anaerobic tank and chemical treatment of wastewater will be incorporated in Stage 2. As discussed in Section 4.4 of the DPEMP, noise impacts resulting from the operation of the WWTP are considered minimal. Temporary impacts on surrounding uses during the construction phase, including noise, dust and increased traffic in particular, will be managed in accordance with the Construction Environmental Management Plan (Section 4.18 of the DPEMP).

3.4 Community Purposes Zone Provisions

3.4.1 Zone Intent and Policies

The intent of the zone as defined under Clause 3.8.1 of the Scheme is:

To make provision for community facilities and services which have suitable locational and physical characteristics to service the needs of the catchment population.

The zone policies under Clause 3.8.2 state:

To enable ready public access by locating community facilities and services close to public transport routes and commercial activity centres.

The proposed use and development involves an upgrade to the existing Deloraine WWTP. The facility has been in existence at the site since 1972. The use and development, classified as Utility Services (Major), is discretionary in the zone. Therefore, whilst not specifically provided for under the zone intent and policies, it is a permissible use and development subject to a merits-based assessment. As demonstrated by the ongoing operation of the plant and the level of complaints, which have been minimal, the use is compatible with the existing racecourse and other uses and activities within the property. The upgrade will increase plant capacity and maintain design effluent quality objectives.
3.4.2 Development Standards

The development standards for the Community Purposes zone under the Scheme are identified and addressed below.

(1) Development

(a) Development shall take into account the requirements of the adjacent zones in respect of density, height, siting and setbacks, open space, pedestrian facilities and landscaping, design and appearance, access and parking, and the relationship to, and amenity of neighbouring buildings.

As indicated in Figure 5 in the DPEMP, the property adjoins land within a variety of zones. However, given that the WWTP is located north of Deloraine surrounded by land which is predominantly agricultural in nature, it is considered most relevant to take account of the requirements of the adjacent Rural zone. The properties along and surrounding Grigg Street approximately 300m to the south are within the Residential zone. The general provisions for the Residential zone are therefore also taken into account below.

3.4.2.1 Rural Zone – Development Standards

The relevant Building Design and Siting requirements for the Rural zone under Clause 3.6.3(4) of the Scheme are addressed below. It is submitted that these provisions embody requirements relating to the design and appearance of buildings and development, and their relationship to neighbouring buildings and properties.

The provisions of Clause 3.6.3(4)(e)-(g) deal with separation between primary industry activities and sensitive uses. It is submitted that consideration of the provisions of Clause 4.12 ‘Environmental Harm’ is more applicable in this regard since the application does not involve a primary industry activity. This is undertaken further below.

Height

(a) The maximum height of a building or structure shall not exceed 8m.

The proposed development complies with this requirement.

Setbacks

(c) Development must comply with the following setbacks:

<table>
<thead>
<tr>
<th>Front boundary</th>
<th>Side Boundary</th>
<th>Rear Boundary</th>
<th>Water Courses</th>
<th>State Roads</th>
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<td>50m</td>
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<td>100m</td>
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</table>

It is submitted that the proposed development complies with these setbacks, with the exception of the setback from the eastern side boundary. The corresponding provision in the Rural zone Clause 3.6.3(4)(d) allows for a reduction in the setback requirements subject to a range of consideration. In assessing the appropriateness of the discretion, in particular items (iii) and (iv), it is considered the proposed setback to the eastern boundary is acceptable. The land within the adjoining agricultural property is sown with pasture. It is not anticipated that the reduced setback proposed will impact on the amenity of the adjacent property. There are no buildings associated with the property in close proximity.
The design of buildings, structures and works shall aim to achieve minimal alteration to the rural landscape through attention to:

(i) the protection of skylines, ridgelines, areas of visual prominence or high landscape value visible from public roads;

The application does not involve development on skylines or ridgelines.

Potential landscape impacts are an important consideration in relation to this development application given the visibility of the WWTP from the Bass Highway and Meander Valley Road (see discussion below) and its connection of the site to the Deloraine Racecourse.

The proposed development will be sited 300 m south of the Bass Highway. The land surrounding the highway in the Deloraine area, east of the Meander River, is characterised by flat to undulating pastures. The highway is elevated directly to the north of the Deloraine Racecourse and therefore overlooks the property including the WWTP. Photograph 1 below provides an indication of the view of the WWTP from the Bass Highway. The brick control building is the most visible element within the tertiary treatment plant.

Although the new plant will be similarly visible from the highway it will fit in with the surrounding structures and built environment, and will not have any detrimental visual affect on passing traffic. It will be mostly viewed slightly beyond Lagoon 1 and the existing tertiary treatment plant with Deloraine township forming a backdrop.

Photograph 1 - View of existing WWTP from Bass Highway

The Meander Valley Highway is aligned in an east-west direction and is the main approach into Deloraine from the east (providing a connection from the Bass Highway). It is located 700 m south east of the site, where it is lined by a row of poplar trees. The trees act as a screen to the WWTP particularly during summer months. From this general area, however, the WWTP and proposed upgrade will blend into the existing landscape taking account of the factors discussed above.
By way of illustration, Photograph 2 below provides a view towards the WWTP from the Meander Valley Highway taken beyond the row of poplar trees which exist in this area.

Photograph 2 - View of the existing WWTP from Meander Valley

In summary, the visual impacts associated with the proposed development are assessed as acceptable.

(ii) the siting, setbacks, bulk, form, height, scale and external finishes of buildings and structures;

The proposed development involves raising the natural ground level by approximately 4 m above the 1 in 100 year flood interval. The majority of new infrastructure will be constructed within the imported fill material. The key components of external above-ground infrastructure include the Colorbond equipment shed, anaerobic and balance tanks and new decanter for IDEAL 2. The anaerobic and balance tanks will be constructed partially underground. The new development will therefore be of a similar profile to the existing infrastructure at the tertiary treatment plant illustrated in the above photographs.

Furthermore, the development complies with the 8 m height requirement for buildings which applies to the adjacent Rural zone under Clause 3.6.3(4)(a) of the Scheme. It also complies with the setback requirements under Clause 3.6.3(4)(c)&(d), as discussed above.

The colour of external infrastructure has not yet been specified. It is recommended that where possible non-reflective materials and muted tones should be used.

(iii) the number, size and relationship of buildings, building additions and structures, including the visual impact of consolidating, separating or clustering various elements of the proposed development;

As discussed above, the proposed development is adjacent to the existing infrastructure at the tertiary treatment plant and of a similar profile.
(iv) harmonising the forms and colours of buildings or structures with the natural contours and colours of the surrounding landscape;

See comments made in relation to (ii).

(v) minimising the visual impact of vegetation clearance, excavations or the deposition of fill;

The proposed development does not involve removal of existing stands of vegetation.

(vi) the establishment and maintenance of locally appropriate screening vegetation;

The land surrounding the WWTP is part of a cleared flood plain, which is partly used for grazing purposes. Therefore, screening vegetation is not considered to be necessary.

(2) Subdivision

(a) Subdivision shall be appropriate to the approved use or development and land required for the use or development shall be amalgamated into a single title.

Not applicable (the application does not involve a subdivision).

(3) Utility Services

(a) The services of sewerage, drainage, water reticulation and electricity shall be provided to the satisfaction of Council.

The WWTP will require additional electricity supply as a result of the proposed upgrade (see Section 2.6 of the DPEMP). There will be no requirement to enlarge or extend any other utility services associated with the plant.

(4) Access and Parking

(a) Access and parking shall be provided in accordance with Part 3.11 and Part 5.

It is not anticipated that the operation of the upgraded facility will increase traffic volumes associated with the WWTP. The development application does not involve a new access as defined under Clause 3.11 of the Scheme.

As Utility Services (Major) is not listed in Clause 5.2 ‘Car Parking Table’ of the Scheme, the number of parking spaces required to accommodate stationary vehicles associated with the development is as determined by Council. As the operation of the WWTP will not increase traffic volumes, additional parking provision is not considered necessary.

The management of traffic during the construction is discussed in Section 4.17 of the DPEMP.

3.4.2.2 Residential Zone – General Provisions

As discussed earlier, there are residences within the Residential zone along Grigg Street which are located approximately 300 m from the proposed WWTP upgrade. The intent of the Residential zone under Clause 3.1.1 of the Planning Scheme is to provide principally for residential use and development and to further policies which aim to ensure that the amenity, health, and well being of residents is enhanced or protected. The policy under Clause 3.1.2(1) of the zone provisions states the following:

(1) To protect the amenity of land for residential use and development.
Taking the mitigation measures and commitments set out through the DPEMP, the operation of the proposed use and development will have limited impact on the amenity of adjoining residences (including those in the Rural zone discussed earlier).

In particular, the likelihood of additional odours associated with the WWTP as a result of the upgrade is remote (Section 4.1 of the DPEMP). An odour unit associated with the anaerobic tank and chemical treatment of wastewater will be incorporated in Stage 2. As discussed in Section 4.4 of the DPEMP, noise impacts resulting from the operation of the WWTP are considered minimal. Temporary impacts on surrounding uses during the construction phase, including noise, dust and increased traffic in particular, will be managed in accordance with the Construction Environmental Management Plan (Section 4.18 of the DPEMP).

Visual impacts from the residential area along Grigg Street are unlikely to be significant. Photograph 3 is taken near the entry gate into the WWTP south of the access track and provides a view to the south and south east. It shows grazing land within the racetrack in the foreground and the grandstand and buildings associated with the race track (with red roofs). The area visible immediately to the rear is residential development along Grigg Street and beyond. The photograph demonstrates the partial screening offered from the residential area by the racetrack buildings and existing vegetation and that the separation distance between the residences and the WWTP means that visual impacts will be minimal.

Photograph 3 - View from WWTP towards the south

The nearest residential properties in the Rural zone are located on along River Road on the opposite side of the Meander River. Significant vegetation exists along the eastern side of the river which provides a visual screen from this area.

3.5 General Provisions

3.5.1 Clause 4.4 ‘Probable Flood Areas’

The subject site is not shown as being within a probable flood area on the Scheme maps. However, it is known that the natural surface of the land is subject to a 1 in 100 year flood interval. This flood level is 229.7 m asl. Therefore, the Probable Flood Areas provisions of the Scheme apply. Clause 4.4.2 states:

Where a permit is required, it shall not be granted for use or development on land deemed to be land subject to flood hazard unless Council is satisfied that:
(i) The use or development would not unduly restrict the free flow of a watercourse in flood or result in higher flood levels or accelerated water flow; and

The proposed development involves the filling of land within a small section of the flood plain. Therefore, it will not significantly impact or restrict the flow of the watercourse in a flood.

(ii) The occupancy of buildings will not put occupants at risk.

This provision is not applicable since the proposed development does not include habitable rooms.

Furthermore, Clause 4.4.3 of the Scheme requires:

In considering a permit for the use or development of land subject to flood hazard Council shall have regard to the following:

(a) The materials and construction methods for the proposed development.
(b) The storage of materials and location of electrical equipment in the design of building.
(c) Pollution which may result from the escape of fuel or other hazardous materials.
(d) Whether the building can withstand the force of flowing flood waters, including debris and buoyancy features.

Given that the new buildings, including electrical equipment, will be constructed above the level of the 1 in 100 year flood, it is submitted that the majority of these considerations are not relevant. The land will be built up by the placement and compaction of selected imported fill material capable of withstanding the force of flowing waters. Appropriate storage of hazardous materials is discussed at Section 4.6 of the DPEMP.

3.5.2 Clause 4.5 ‘Watercourse Protection’

As the application involves use and development adjacent to a watercourse, the provisions of Clause 4.5.1 of the Scheme are relevant. This states:

For the purposes of controlling erosion and pollution and for the protection of water quality, hydrology, botanical, zoological, landscape values and natural drainage functions of streams, rivers and wetlands, Council in assessing an application for a Permit affecting a watercourse shall have regard to the need to:

(a) require an appropriate setback;
(b) control erosion and to prevent siltation;
(c) avoid unnecessary removal of vegetation;
(d) protect bank stability; and
(e) minimise adverse changes in the hydrology regime.

These issues are all addressed at various sections of the DPEMP, and will be addressed during the construction phase via a Construction Environmental Management Plan (Section 4.18).

3.5.3 Clause 4.12 ‘Environmental Harm’

The relevant provision under Clause 4.12 of the Scheme states:

Development, use or activity shall only be granted a permit:

(a) at a place where its emissions are not likely to cause environmental harm or environmental nuisance; or …
The DPEMP prepared in relation to the Deloraine WWTP upgrade demonstrates that the new facility will not cause environmental harm or nuisance, subject to on-going compliance with the commitments outlined in that document.

In particular, the likelihood of additional odours associated with the WWTP as a result of the upgrade is remote (Section 4.1 of the DPEMP). An odour unit associated with the anaerobic tank and chemical treatment of wastewater will be incorporated in Stage 2. As discussed in Section 4.4 of the DPEMP, noise impacts resulting from the operation of the WWTP are considered minimal. Temporary impacts on surrounding uses during the construction phase, including noise, dust and increased traffic in particular, will be managed in accordance with the Construction Environmental Management Plan (Section 4.18 of the DPEMP).

3.6 Special Areas

3.6.1 Part 7 ‘Items of Cultural Significance’

The Deloraine racetrack and steeple is listed as a place of cultural significance on the Register of the National Trust of Australia (Tasmania). Therefore, the provisions of Part 7 are relevant to the extent that the proposal involves the development of a new building. Clause 7.2.4 of the Scheme requires the following:

Where Council considers a proposed use or development may affect a listed place it shall require the applicant to submit an assessment of the significance of the use or development of the place, including the:

(a) level of impact; and

(b) procedures to be carried out to mitigate adverse impacts.

The Deloraine Racecourse is also listed on the Tasmanian Heritage Register. A heritage assessment has been prepared to assist the Tasmanian Heritage Council’s consideration the works application pursuant to the Historic Cultural Heritage Act 1995. The assessment also addresses the relevant considerations listed under Clause 7.2.4.
4. Strategic Planning & Policy Assessment

The following section provides an assessment of the application against the relevant State Policies and the Objectives of the Resource Management and Planning System in Tasmania. The goals and intents of the relevant Zones have been identified and addressed in the assessment in Section 0. The Goals and Objectives of the Scheme are delivered through its detailed provisions, and have therefore not been specifically addressed in this assessment.

4.1 State Policies

4.1.1 State Policy on Water Quality Management

The State Policy on Water Quality Management 1997 applies to all surface waters, including coastal waters, and groundwater, other than privately owned waters that are not accessible to the public. The objectives of the State Policy are:

1. *focus water quality management on the achievement of water quality objectives which will maintain or enhance water quality and further the objectives of Tasmania’s Resource Management and Planning System;*

2. *ensure that diffuse source and point source pollution does not prejudice the achievement of water quality objectives and that pollutants discharged to waterways are reduced as far as is reasonable and practical by the use of best practices environmental management;*

3. *ensure that efficient and effective water quality monitoring programs are carried out and that the responsibility for monitoring is shared between those who use and benefit from the resource, including polluters, who bear an appropriate share of the costs arising from their activities, water resource managers and the community;*

4. *facilitate and promote integrated catchment management through the achievement of objectives (1) to (3) above; and*

5. *apply the precautionary principle to Part 4 of this Policy.*

Sections 4.2 and 4.3 of the DPEMP identify the existing condition of ground and surface receiving waters, the applicable water quality performance requirements to be achieved and the potential impacts as a result of the proposed upgrade and recommended mitigation measures. In addition, appropriate stormwater management strategies to prevent pollution and erosion will be utilised during both construction and operation as detailed in Section 4.18 of the DPEMP. Subject to the commitments identified in the DPEMP, the proposal is considered to be consistent with the objectives of this State Policy and Clause 2.2.2 ‘Permit Required in respect of Clause 31.5 of the State Policy on Water Quality Management’ of the Planning Scheme.

4.1.2 State Policy on the Protection of Agricultural Land

The ‘interim’ State Policy on the Protection of Agricultural Land 2007 (PAL Policy) aims to foster sustainable agriculture in Tasmania by ensuring the continued productive capacity of the State’s agricultural land resource. It has limited application since the proposal mostly relates to an existing developed site. The WWTP is not sensitive to the kinds of impacts associated with agricultural uses.
defined under the PAL Policy. It will therefore not fetter the ongoing operation of the agricultural activities surrounding the Deloraine Racecourse.

4.1.3 **State Coastal Policy**

The Coastal Zone, as defined by the *State Coastal Policy 1996*, includes all land and waters to a distance of one kilometre from the high water mark. The State Policy therefore does not apply to the consideration of this application.

4.2 **Objectives of LUPAA**


4.2.1 **RMPS Objectives (Part 1 of Schedule 1)**

(a) *to promote the sustainable development of natural and physical resources and the maintenance of ecological processes and genetic diversity;*

All vegetation, species types, biodiversity values, natural habitat and water quality values have been identified and mitigation and management measures are to be applied. The construction phase will be undertaken in accordance within the Construction EMP to manage erosion, dust and air emissions, noise and waste so as to avoid degradation of the land or surrounding waterways. The proposal is therefore considered acceptable in terms of this Objective.

(b) *To provide for the fair, orderly and sustainable use and development of air, land and water;*

The application seeks to use and develop the subject land in a sustainable and efficient manner which will preserve the significance of the environmental values identified in the DPEMP.

(c) *To encourage public involvement in resource management and planning;*

As the proposal requires discretionary planning approval, it will be placed on public exhibition for comment in accordance with statutory requirements.

(d) *To facilitate economic development in accordance with the objectives set out in paragraphs (a), (b) and (c);*

The proposal generally supports economic development objectives through an upgrade to the Deloraine WWTP, which is currently operating at near full capacity.

(e) *To promote the sharing of responsibility for resource management and planning between the different spheres of Government, the community and industry in the State.*

EMPCA section 25(1) provides the process by which both state and local government are involved in the planning and assessment process.
4.2.2 Objectives of Planning Process (Part 2 of Schedule 1)

(a) to require sound strategic planning and co-ordinated action by State and local government; and

The proposed environmental conditions as determined by the EPA Board will be incorporated into the Council planning permit consistent with this objective.

(b) to establish a system of planning instruments to be the principal way of setting objectives, policies and controls for the use, development and protection of land; and

The proposal has been assessed against the relevant provisions of the Meander Valley Planning Scheme 1995. The relevant development environmental plans have been taken into consideration in the assessment of the proposed development consistent with this objective.

(c) to ensure that the effects on the environment are considered and provide for explicit consideration of social and economic effects when decisions are made about the use and development of land; and

The DPEMP provides for a detailed consideration of the proposed effects on the environment.

(d) to require land use and development planning and policy to be easily integrated with environmental, social, economic, conservation and resource management policies at State, regional and municipal levels; and

The proposal is not contrary to the above objective.

(e) to provide for the consolidation of approvals for land use or development and related matters, and to co-ordinate planning approvals with related approvals; and

This application forms part of a combined environmental and planning assessment process consistent with this objective.

(f) to secure a pleasant, efficient and safe working, living and recreational environment for all Tasmanians and visitors to Tasmania; and

The application involves a public utility, and will therefore contribute to the achievement of this objective.

(g) to conserve those buildings, areas or other places which are of scientific, aesthetic, architectural or historical interest, or otherwise of special cultural value; and

Potential impacts on historic cultural heritage values are addressed at Section 4.10 of the DPEMP and in a separate stand-alone assessment.

(h) to protect public infrastructure and other assets and enable the orderly provision and co-ordination of public utilities and other facilities for the benefit of the community; and

As discussed at Section 4.17.3 of the DPEMP, there are no significant impacts to offsite infrastructure facilities anticipated as a result of the proposed plant upgrade.

(i) to provide a planning framework which fully considers land capability

Land capability is considered through the ‘interim’ State Policy on the Protection of Agricultural Land 2007 (see Section 4.1.2).
5. Conclusion

The development application to Meander Valley Council seeks approval for the proposed upgrade of the Deloraine Wastewater Treatment Plant (WWTP).

The proposed development is a Level 2 Activity as defined under the Environmental Management and Pollution Control Act 1994 (EMPCA). Accordingly the proposal is deemed to be a discretionary application pursuant to Section 25(1)(a) of EMPCA and Section 57 of LUPAA. The proposed use and development is also discretionary pursuant to the Meander Valley Planning Scheme 1995.

The land within and surrounding the Deloraine Racecourse property contains a variety of land uses and developments, however the WWTP is in a fairly isolated location within the racetrack. The proposed upgrade is based on the existing WWTP and involves an extension, over two stages, to the tertiary treatment plant constructed in 2002. There are some sensitive uses, particularly residences, within 500 m of the proposed upgrade, however, the general area around the proposed upgrade is used for horse training activities and grazing. Taking the mitigation measures and commitments set out within the DPEMP, the operation of the use will not have a significant impact on the amenity of adjoining land uses. In particular, the likelihood of additional odours associated with the WWTP as a result of the upgrade is remote (Section 4.1 of the DPEMP). An odour unit associated with the anaerobic tank and chemical treatment of wastewater will be incorporated in Stage 2. As discussed in Section 4.4 of the DPEMP, noise impacts resulting from the operation of the WWTP are considered minimal. Temporary impacts on surrounding uses during the construction phase, including noise, dust and increased traffic in particular, will be managed in accordance with the Construction Environmental Management Plan (Section 4.18 of the DPEMP).

Subject to the proposed environmental commitments identified in the DPEMP, the proposal is recommended to Council for approval.
Appendix A

Copies of Titles
PROPERTY INFORMATION SHEET
VALUER GENERAL, TASMANIA
Issued pursuant to the Valuation of Land Act 2001

Property Id: 1951959  Municipality: MEANDER VALLEY

Property Name: "DELORAINE RACECOURSE",
Address: "DELORAINE RACECOURSE",
"EAST WESTBURY PLACE",
"DELORAINE TAS 7304"

Rate Payers: MUNICIPALITY OF MEANDER VALLEY
Title Owners: A821770 THE WARDEN COUNCILLORS AND ELECTORS OF THE MUNICIPALITY OF DELORAINE

Postal Address: PO BOX 102,
"WESTBURY TAS 7303"

Improvements: Sports ground
Valuation Property Classification:
Showground/Racetrack

Construction Year: 1950
of Main Building:
Roof Material: Galvanised Iron
Wall Material: Concrete Block

Land Area: 29.9738 hectares
Building Size: 4253.00 square metres
Title References: 54466 / 1
10 / 8969
LPI References: GVO93
GWD14

Last Sales

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This data is derived from the Valuation List prepared by the Valuer General under the provisions of the Valuation of Land Act 2001. These values relate to the level of values prevailing at the dates of valuation shown.

While all reasonable care has been taken in collecting and recording the information shown above, this Department assumes no liability resulting from any errors or omissions in this information or from its use in any way.

SEARCH DATE : 07-Apr-2009   SEARCH TIME : 10.05 am

Putting it all together.

© COPYRIGHT. Apart from any use permitted under the Copyright Act 1968, no part of the report may be copied without the permission of the General Manager, Land Information Services, Department of Primary Industries, and Water, GPO Box 44 Hobart 7001. Personal Information Protection statement
Memorial

of an Indenture to be recorded pursuant to an Act of Council

in such case made and provided.

Date

The twenty-third day of February in the thousand nine hundred and four.

Names and addresses of parties:

Cornelia Flaherty, alias, now of Launceston in Tasmania, the wife of Andrew Beresford, alias, late of Launceston in Tasmania, deceased, the first party, and John Lee Smith, of Deloraine in Tasmania, deceased, the second party.

James Bashford, of Deloraine, deceased, former farmer and builder, Thomas Little, of Deloraine, deceased, former medical practitioner, Robert Hall, of Devonport, near Deloraine, deceased, former farmer and James Michael Griffin, of Devonport near Deloraine, deceased, former farmer, the third party.

The Warden, Councillors and Electors of the Rural Municipality of Deloraine in the third part.


Council Clerk, Deloraine, Tasmania.

This is now memorizing Indenture, which is supplemental to and continues an Indenture of Conveyance and Mortgage dated the eighth day of March, one thousand eight hundred and ninety-three, and made between William Binney, of Fredericktown, deceased, in Tasmania, former farmer, the first party, and John Lee Smith, of Deloraine, deceased, the second party, James Bashford, of Deloraine, deceased, former farmer and builder, Thomas Little, of Deloraine, deceased, former medical practitioner, Robert Hall, of Devonport, near Deloraine, deceased, former farmer, James Michael Griffin, of Devonport, near Deloraine, deceased, former farmer, and the Warden, Councillors and Electors of the Rural Municipality of Deloraine in the third part.
Robert Hall and William Abel. John Hall, Jonathan Pitt, Francis Bole, Robert Hall and James Michael Griffin had purchased from the said William Abel, by the Warden, the Township of the Rural Municipality of Deloraine, and belonged to them both at law and in equity. And that the said William Abel and John Hall were both dead, and that the said John Hall Smithe, Jonathan Pitt, Francis Bole, Robert Hall and James Michael Griffin had purchased the said Constable, Elinor, to grant and convey the said land and improvements to the Warden, the Township of the Rural Municipality of Deloraine, which she had conveyed to do. And by the power conferring Indenture the said Constable Elinor, allows as mortgagees at the request and by the direction of the said John Hall Smithe, Jonathan Pitt, Francis Bole, Robert Hall and James Michael Griffin, as mortgagees, upon the said mortgagee, at the request of the said John Hall Smithe, Jonathan Pitt, Francis Bole, Robert Hall and James Michael Griffin.
And confirmed the Lands, Boulchaments and premises commonly are described in the theore: within written Indenture unto and to the use of the Warden Connellors and clerks of the Rural Municipality of Delorane, these wherein, and assign, for in the sale, exchanged from an principal and intrest money secured by and from all claims written the said Theore: within written Indenture.

<table>
<thead>
<tr>
<th>Description of the aforesaid Land</th>
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<td>All that aforesaid or piece of Land, situate in the Suburbs of the Municipality of Delorane, containing seventy five acres or thereabouts being part of section five hundred and six acres of land granted by the Crown to RAWSON ROSE and his Heirs, and bounded on the north by a line of forty chains, seventy links, or thereabouts commencing at an angle on the northern side of the lane west of the Old Western Railway former, the land more being reserved within a line conveyed by the said William Dowey to the said balets John Lee Smith and extending northerly along the said land to the Alexander River thence on the north west by the Alexander River in a due South West direction to other part of the said area five hundred and ten acres of land now aforesaid, and to Edward Francis Dawson thence on the west by the last mentioned land to the aforesaid railway and thence on the South East and South West by the Railway to the point of commencement.</td>
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<th>Consideration</th>
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<td>In consideration of all principal and interest moneys due and owing under said by virtue of the aforesaid written Indenture having been paid to the said Warden Connellors and clerks of the Rural Municipality of Delorane to the said balets John Lee Smith, Jonathon, first Francis Bob, Robert Hall and James Michael Griffin.</td>
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Signed, 

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<th>Name</th>
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<td>Edward Adams of Newbury in Tasmania</td>
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J. Edward Adams, of Westbury in the County of Suffolk, make oath and say that the document written on the said parchement, which precedes, sheweth and containeth a just and true account of the several particular things at present in the said

E. Adams

Sworn at Xebourne in Jamaica the twenty-third day of February, one thousand nine hundred and

Before me, Henry Howell Freeman, A Commissioner of the Supreme Court

of Jamaica. 1801.
RESULT OF SEARCH
RECORER OF TITLES, TASMANIA
Issued pursuant to the Land Titles Act 1980

SEARCH DATE: 07-Apr-2009
SEARCH TIME: 10.03 am

DESCRIPTION OF LAND

Parish of CALSTOCK, Land District of WESTMORLAND
Lot 1 on Diagram 54466
Derivation: Part of 3.636ha Vested in the Australian National Railway Commission
Prior CT 4003/9

SCHEDULE 1

A821770 THE WARDEN COUNCILLORS AND ELECTORS OF THE MUNICIPALITY OF DELORAINE

SCHEDULE 2

Reservations and conditions in the Crown Grant, if any

UNREGISTERED DEALINGS AND NOTATIONS

No unregistered dealings or other notations

END OF SEARCH.

Warning: The information appearing under Unregistered Dealings and Notations has not been formally recorded in the Register.

Putting it all together.
Lot 1
7938m²
### GHD

Level 2, 102 Cameron Street  Launceston  
Tasmania  7250  
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#### Document Status

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Date: 17.4.09  
Date: 22.6.09