Huon Aquaculture Group Pty Ltd

PARRAMATTA CREEK FISH PROCESSING FACILITY

INCREASE IN PRODUCTION CAPACITY

DEVELOPMENT PROPOSAL AND ENVIRONMENTAL MANAGEMENT PLAN

HUON
TASMANIA

Final

13/2/2020

This Development Proposal and Environmental Management Plan (DPEMP) was prepared by:

Caloundra Environmental Pty Ltd
PO Box 242
Golden Beach
QLD 4551

Contact: Stephen Kent
Phone: 0417 574 799
Email: stephen@caloundraenv.com.au

In conjunction with:

Adam Chapman
Environmental Manager (Freshwater Operations)
Huon Aquaculture Group Limited
Phone: 0497 042 809
Email: achapman@huonaqua.com.au

Significant input was provided by Macquarie Franklin (soil, groundwater and irrigation assessment), pitt&sherry (2009 Parramatta Creek DPEMP and 2016 DPEMP preliminary investigation, odour modelling and drafting), Airlabs (odour sampling, odour and PM_{10} particulate modelling), Air Environment (air emissions impact advice) and Aquatic Science (water and wastewater assessment and management).

The DPEMP will be submitted to:

The Chairperson
Board of Environmental Management and Pollution Control
Tasmanian Environment Protection Authority
GPO Box 1751
Hobart TAS 7001

Table of Contents

List of Appendices

List of figures

List of tables

List of plates

Foreword

This Development Proposal and Environmental Management Plan (DPEMP) has been prepared to support a development application by Huon Aquaculture Group Limited (HA) to the Latrobe Council (LC). HA is the project proponent for the Fish Processing Facility Production Increase Parramatta Creek project.

The application is to increase production at the existing fish processing facility at Parramatta Creek. This will necessitate the development of a new wastewater storage dam and an offsite Irrigation system.

The purpose of this DPEMP is to provide:

- supporting documentation to the development application to the LC;
- a basis for the LC and the Board of the Environment Protection Authority (EPA) to consider the planning and environmental aspects of the proposal under the *Land Use Planning and Approvals Act 1993* (LUPAA) and the *Environmental Management and Pollution Control Act 1994* (EMPCA);
- a basis for the conditions under which any approval can be given; and
- a source of information for interested individuals and groups to gain an understanding of the proposal.

This DPEMP has been prepared in accordance with the Tasmanian EPA's *General guidelines for preparing a DPEMP for Level 2 activities and 'called in' activities*, January 2014, as well as the project specific guidelines issued on 2 December 2015 by the Board of the EPA titled, *Development proposal and environmental management plan project specific guidelines for Huon Aquaculture Group Pty Ltd proposed fish processing facility production increase Parramatta Creek, Tasmania*.

The development application will be advertised by the LC in relevant newspaper(s) and the DPEMP will be available for public scrutiny at:

- the LC offices at 170 Gilbert Street, Latrobe, TAS, 7307
- the EPA's internet site
- Service Tasmania, at 37 Rooke St, Devonport Tas 7310.

A planning permit will be required from LC for the development.

The DPEMP also fulfils the role of providing information on the proposed activities to other decision-making authorities and the public, who have the opportunity to make submissions on the proposal under Section 57 of the LUPAA. Any person may make representations relating to an application or proposal in the case of a Class 2B assessment, within 28 days after the application or proposal is advertised.

List of abbreviations

ABS	Australian Bureau of Statistics
AHR	Aboriginal Heritage Register
AHT	Aboriginal Heritage Tasmania
ANCOLD	Australian National Committee on Large Dams
ANZECC	Australian and New Zealand Environment Conservation Council
BOD	biochemical oxygen demand
BoM	Bureau of Meteorology
BPEM	best practice environmental management
DPEMP	Development Proposal Environmental Management Plan
DPIPWE	Department of Primary Industries, Parks, Water and Environment
DPIWE	Department of Primary Industries, Water and Environment
DSEMP	Dam Safety Emergency Management Plan
EMS	environmental management system
EPA	Environment Protection Authority (Tas)
ESP	exchangeable sodium percentage
GHG	greenhouse gases
HSEC	health, safety, environment and community
µg	micrograms (10^{-6} g)
ML	megalitres (10^{6} L)
MNES	matters of national environmental significance
MSDS	material safety data sheets
NEPMs	National Environment Protection Measures
NGER	National Greenhouse and Energy Reporting scheme
NOHSC	National Occupational Health and Safety Commission
NVA	Natural Values Atlas
OHS	occupational health and safety
ORP	oxidation-reduction potential
PALP	Protection of Agricultural Land Policy
PEVs	protected environmental values
PM_{10}	particulate matter less than 10 microns in diameter
PWS	Parks and Wildlife Service
RMPS	resource management and planning system
SOERs	specific odour emission rates
STP	standard temperature and pressure
TAPM	The Air Pollution Model
TASI	Tasmanian Aboriginal Site Index (*see* AHR)
TDS	total dissolved salts
tpa	tonnes per annum
VHP	veterinary health plan
WWREMP	Wastewater Reuse Environmental Management Plan
WWTP	wastewater treatment plant

Glossary

Access – The driveway by which vehicles and/or pedestrians enter and/or leave property adjacent to a road.

Biochemical oxygen demand (BOD) – Biochemical oxygen demand is a measure of the amount of biologically and/or chemically degradable organic material that is present in the water. It indicates the amount of oxygen that aerobic aquatic organisms could potentially consume in the process of metabolising all the organic matter available to them. The consequence of high BOD is low levels of dissolved oxygen in affected waterways, resulting in aquatic organisms becoming stressed, and in extreme cases, suffocating and dying. BOD_5 refers to a standard five-day oxidation test.

CALMET – (currently developed by Exponent, Inc.) is a diagnostic meteorological model which reconstructs the 3D wind and temperature fields starting from meteorological measurements, orography and land use data.

CALPUFF – is an advanced non-steady-state meteorological and air quality modelling system developed by scientists at Exponent, Inc.

Dissolved oxygen (DO) – Dissolved oxygen analysis measures the amount of gaseous oxygen (O_2) dissolved in an aqueous solution. Oxygen dissolves in water by diffusion from the surrounding air, by aeration (rapid movement) and as a product of photosynthesis.

Electrical conductivity 1:5 (EC1:5) – EC1:5 results are a measure of electrical conductivity on a 1:5 soil water extract (w/w) determined by equilibrating the waste samples in deionised water overnight, at a solid to water ratio of 1:5 (w/w). This gives an indication of the inherent salinity of the waste material when initially exposed.

SAR – The sodium adsorption ratio (SAR) is an irrigation water quality parameter used to describe the impact of sodium on soils. SAR is a ratio of the concentration of sodium ions to the concentration of calcium plus magnesium ions.

Sodicity – Sodicity in soil is the presence of a high proportion of sodium ions relative to other cations. As sodium salts are leached through the soil, some sodium remains bound to clay particles – displacing other cations. Soils are often considered sodic when the amount of sodium impacts soil structure. Sodicity degrades soil properties by weakening the bond between soil particles.

Standard Temperature and Pressure (STP) – Standard Temperature and Pressure - is defined by IUPAC (International Union of Pure and Applied Chemistry) as air at 0°C (273.15 K, 32°F) and 105 pascals (1 bar).

TAPM (The Air Pollution Model) – An air quality modelling tools for industrial, rural, and urban air sheds developed by the CSIRO.

Executive Summary

Huon Aquaculture (HA) is proposing an increase in production at their existing fish processing facility at Parramatta Creek in northern Tasmania.

The project is being assessed under Section 27 (1) of the EMPCA, mandatory referral by the proponent. A development application and permit (subject to compliance with the relevant acceptable solutions or performance criteria) will be required once the EPA Board has assessed the proposal and approved it.

This Development Proposal and Environmental Management Plan (DPEMP) has been prepared in accordance with the Tasmanian Environment Protection Authority's (EPA) *General guidelines for preparing a DPEMP for Level 2 activities and 'called in' activities*, January 2014, as well as the project specific guidelines issued on 2 December 2015 by the Board of the EPA titled, *Development proposal and environmental management plan project specific guidelines for Huon Aquaculture Group Pty Ltd proposed fish processing facility production increase Parramatta Creek, Tasmania*.

The proposal involves an increase in annual production from the approved 14,000 tonnes per annum (tpa) of fish products produced to 33,000 tpa and for the addition of a new wastewater storage dam onsite and the development of offsite wastewater irrigation to sustainably reuse the sites wastewater.

No additional plant (for processing) will be required for the increase in production at the Parramatta Creek site.

No additional electrical supply is required for the increase in production at the Parramatta Creek site.

The increase in production will increase the wastewater volume produced at the site to a potential maximum of 112.2 Megalitres. The treatment and irrigation of the wastewater will be managed in accordance the Wastewater Reuse Environmental Management Plan (WWREMP) developed by Macquarie Franklin and contained in Appendix B. The WWREMP will provide a long-term, environmentally sustainable solution in terms of public health and receiving ecosystems and provides benefits to HA and the adjacent landowner (Mr Troy Lathan) by facilitating irrigation of crops during otherwise dry times.
To enable a sustainable, long-term wastewater reuse option to be implemented, this plan is based on developing capacity to manage wastewater flows of 112ML per year and be able to accommodate a 90^{th} percentile rainfall year, both in terms of irrigation and storage. To achieve this, 66ML of storage capacity is required. In order to provide additional capacity, a 75 ML storage dam is being proposed, in addition to the increase of irrigation from the current 10.5 hectares to 79.8 ha.

The proposal has access to multiple reliable water sources (>1000 ML), and there is no risk that there will be insufficient fresh water available for the increase of production and the wastewater management at the Parramatta Creek site

The wastewater treatment plant has previously been upgraded and no additional water treatment equipment is required for this proposal.

The increase in production will see an increase in the volume of smoked product produced at the facility however, the current smokehouses are operating below their designed production capacity (during current smoking cycles, there is space for more fish) and no additional smoking cycles are required. Therefore, an increase in smoke emissions is not expected under the proposal.
To evaluate the potential impact of smokehouse operations Airlabs has modelled PM_{10} and $PM_{2.5}$ particulate emissions from the smokehouses.
The modelled 24-hour average ground-level concentration of PM10 particulates at the site boundary of 0.045mg/m3 was significantly below the EPA's Air Policy 24-hour average limit of 0.15 mg/m3. At the nearest receptor, the modelled 24-hour average ground-level concentration of PM10 particulates was <0.003mg/m3.

Airlabs Environmental was also commissioned to undertake an odour impact assessment for the proposed increase in production at HA's Parramatta Creek fish processing facility. The results of the odour dispersion predicted a potential for 2 OU isopleth excursions outside the Huon Aquaculture property boundary. However, due to the sites remote location and being situated amongst pasture and forestry and that the site has not received an odour incident in 10 years of operation, the likelihood of an environmental odour nuisance occurring is regarded as low.

A detailed desktop environmental assessment concluded there will be no impacts on flora, fauna or Aboriginal and cultural heritage values as result of the increase in production.

The DPEMP has identified and assessed the potential environmental and socioeconomic impacts associated with the proposed project.

The DPEMP demonstrates that the proposed project will be in compliance with Tasmanian and Commonwealth policies, legislation and regulations.

The commitments contained in this DPEMP demonstrate that appropriate operations and management measures will be in place to minimise any potential impacts and to minimise any risks to the environment and human health. With these measures in place, there is considered to be no significant risk of residual environmental impacts.

1 Introduction

1.1 Background of project proponent

Huon Aquaculture Group Ltd (HA) operated as a private company from 1994 until it was listed on the Australian Stock Exchange (ASX) in October 2014. The majority owners, Peter and Frances Bender, purchased the company from Huon Atlantic Salmon Pty Ltd through the reorganisation of a Bender family company in December 1994. The business grew to become the largest privately owned salmon farming operation in Australia. With the ASX listing in 2014, it has seen further expansion, currently employing over 700 staff Australia wide.

HA currently operates nine hatcheries as well as a processing facility in the north of the state, and offshore operations with land bases located at Dover and Margate in the south and at Strahan in the west of Tasmania.

This Development Proposal and Environmental Management Plan (DPEMP) refers to the site of the processing facility at Parramatta Creek.

1.2 Name and contact details

Proponent

The Proponent for this development is:
Huon Aquaculture Group Limited.

Registered address

Huon Aquaculture Group Limited
Level 13, 188 Collins Street
Hobart
Tasmania 7001
Phone: (03) 6239 4200
Web: www.huonaqua.com.au
ABN: 79 114 456 781
ACN: 067 386 109

Postal address

7216 Bass Highway
East Sassafras
Tasmania 7307

Contact details

Mr Adam Chapman
Environmental Manager (Freshwater Operations)
Huon Aquaculture Group Limited
Phone: (03) 6295 8111
Email: achapman@huonaqua.com.au

1.3 Proposal background

The development of the Parramatta Creek processing factory in 2009 allowed HA to consolidate its wet processing activities on that site. Before that, it operated wet processing facilities at Port Huon and Strahan.

Both those sites had major constraints, including:

- lack of space at the existing plants for required upgrades
- lack of adequate waste treatment facilities at each of the existing plants
- restriction of the movement of fish between the growing regions because of biosecurity concerns, meaning fish grown in the Huon region could not be processed at Strahan and vice versa.

The consolidation of processing at Parramatta Creek overcame these constraints. The location selected had the benefit of being approximately equidistant from each growing area and the travel time means that harvested fish transported in an ice slurry have been chilled to their optimum processing temperature by the time they arrive at the facility.

The 2009 proposal was to establish a centralised wet processing facility and value-adding facility, including smoke houses, capable of processing up to 14,000 tonnes of wet fish per annum.

The 2009 DPEMP contemplated two stages of development.

1. Consolidation of wet processing to Parramatta Creek. This was completed with the upgrade and operation of the Parramatta Creek facility.
2. Relocation of value-adding processing from Mt Barker in South Australia to Parramatta Creek. This was completed in 2015.

Rapid growth in the industry since 2009 means that HA needs to increase production at Parramatta Creek.
HA is now planning to increase annual processing to 33,000tpa of fish products produced by weight potentially achieving this production in the 2022/23 financial year.

1.4 Other proposals in the region

At the time of writing there are no other known proposals in the region, proposed or approved, that will affect the increase in production at the Parramatta Creek site.

1.5 Proposed project timing

Production reached 18,770 tonnes in the 2018/19 financial year and is predicted to increase to;

26,400 t in FY 2019/20
29,896 t in FY 2020/21
32,365 t in FY 2021/22

This application is for the site to be approved to produce 33,000 tpa of product, with this production figure not expected to be reached before the financial year 2022/23.

HA understands that the current wastewater management utilising irrigation on the HA site is not sustainable for this project to proceed.

Consequently, HA intends to upgrade the site's wastewater management in regards to irrigation practices and winter water storage in accordance with the practices and commitments outlined within this DPEMP and the associated WWREMP. This will see the majority of irrigation occurring as part of a reuse scheme located on neighbouring farmland owned by Mr Troy Lathan.

2 Environmental Legislation

An overview of legislation relevant to the project is given in the following sections. The application of legislation to relevant environmental factors as performance requirements is addressed in Section 8.

2.1 Commonwealth legislation

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is not triggered by this proposal.

The project is operating on existing industrial land and does not involve any clearing of vegetation or actions that should significantly impact on matters of national environmental significance (MNES), namely listed threatened species and communities.

2.2 State legislation

The Tasmanian Resource Management and Planning System (RMPS) was established to achieve sustainable outcomes from the use and development of the state's natural and physical resources. Several pieces of legislation embody the aims of the RMPS.

Within the context of this development proposal, a number of statutes apply:

- *State Policies and Projects Act 1993*
- *Land Use Planning and Approvals Act 1993* (LUPAA)
- *Environmental Management and Pollution Control Act 1994* (EMPCA).

2.2.1 State Policies and Projects Act 1993

The *State Policies and Projects Act 1993* establishes the process to put in place state policies under the Tasmanian RMPS. State policies seek to ensure a consistent and coordinated approach and incorporate the minimum amount of regulation necessary to achieve their objectives of managing natural resources. State policies are implemented by being integrated into local government planning schemes.

Currently there are three state policies:

- State Coastal Policy 1996 (Coastal Policy)
- State Policy on Water Quality Management 1997 (Water Quality Policy)
- State Policy on Protection of Agricultural Land 2009 (PALP).

2.2.2 State Coastal Policy 1996

The purpose of the Coastal Policy is to implement the sustainable development objectives of the RMPS in Tasmania's coastal areas. The policy is based on three core principles that address these objectives:

- Natural and cultural values of the coast shall be protected.
- The coast shall be used and developed in a sustainable manner.
- Integrated management and protection of the coastal zone is a shared responsibility.

The Coastal Policy is applicable to all Tasmanian state waters and land (excepting Macquarie Island) within one kilometre inland of the high-water mark.

The Coastal Policy is not applicable to any part of this proposal as no part of the site is within one kilometre of the high-water mark. The closest coastal area is over 20 km north of the site.

2.2.3 State Policy on Water Quality Management 1997

The purpose of the Water Quality Policy is to achieve the sustainable management of Tasmania's surface water and groundwater resources by protecting or enhancing their qualities while allowing for sustainable development in accordance with the objectives of the RMPS.

2.2.4 State Policy on Protection of Agricultural Land 2009

The purpose of the PALP is to 'conserve and protect agricultural land so that it remains available for the sustainable development of agriculture, recognising the particular importance of prime agricultural land'. The main objective of the PALP is to ensure that the productive capacity of agricultural land is appropriately recognised and protected in the use and development of agricultural land.

There is no prime agricultural land in the area of the proposed development.

2.2.5 Land Use Planning and Approvals Act 1993

Under the LUPAA, councils are required to administer the development and use of land within their municipal boundaries. Development and use will be assessed in accordance with the Latrobe Interim Planning Scheme 2013.

2.2.6 Environmental Management and Pollution Control Act 1994

The project is a Level 2 activity under Schedule 2 of the EMPCA. A DPEMP will be submitted to the EPA for assessment under the Act.

This report and application describes in detail how the potential environmental and planning impacts of the proposal will be managed and mitigated. Approval under this Act will establish the environmental operating permit and conditions for the proposed project.

2.2.7 Other state legislation applicable to the project

2.2.7.1 Aboriginal Relics Act 1975

A search of the Aboriginal Heritage Register (AHR), formerly the Tasmanian Aboriginal Site Index (TASI), found no Aboriginal heritage sites recorded within or close to the Parramatta Creek site.

2.2.7.2 Threatened Species Protection Act 1995

The processing facility site is situated on existing agricultural land. The proposed irrigation is also on existing agricultural land. No native vegetation or fauna habitat is situated on the site of the proposed development. Some remnant native vegetation flora is situated to the immediate north of the proposed expanded irrigation area it will not be impacted by the development.

No impact on threatened or endangered species should occur as a result of this proposed development.

2.2.7.3 Historic Cultural Heritage Act 1995

The site is situated on existing agricultural land. The site was not listed on the latest Tasmanian Heritage Register (3 September 2018).

2.2.7.4 Forest Practices Act 1985

A Forest Practices Plan is required under the *Forest Practices Act 1985* for any activities where the clearing of forest is in excess of 1 hectare or 100 tonnes of timber (in areas of 'vulnerable land' these thresholds are lower).

No clearing is required for this development and consequently a Forest Practices Plan is not required.

2.3 Local government

The proposed development is located within the boundaries of the Latrobe Municipality. The proposed use and development within the municipality will be assessed in accordance with the Latrobe Interim Planning Scheme 2013 (the Planning Scheme).

The proposed development is solely within the Rural Resource zone.

2.3.1 Planning aspects

The project is being assessed under Section 27 (1) of the EMPCA, mandatory referral by the proponent. A development application and permit (subject to compliance with the relevant acceptable solutions or performance criteria) will be required once the EPA Board has assessed the proposal and approved it.
For the purposes of this planning section the works relate to the construction of a new wastewater storage dam of 75 ML.

The land to be used for this proposed development is zoned Rural Resource under the Planning Scheme. The relevant land use under the Planning Scheme will be Resource Processing, being 'Use of land for treating, processing or packing plant or animal resources. Examples include an abattoir, animal saleyard, cheese factory, fish processing, milk processing, winery and sawmilling'. The proposal fits within that definition and will not alter that use.
The water storage facility (dam) is classed as Utility under the Planning Scheme definitions, which includes the use of land for utilities and infrastructure. However, under the Planning Scheme the wastewater storage area will only exist because of the Resource Processing use and in such circumstances the subservient use (the dam) will be classed the same as the dominant use (Resource Processing).

In the Planning Scheme, within the Use table for the Rural Resource zone, Resource Processing is a discretionary use. Within the Planning Scheme there are certain use standards that need to be considered. The use is an existing established use, so the only matter to be formally considered will be the impact of the increase in production on the compliance with the scheme's use standards.

Discretionary Non-Residential uses wishing to locate in a Rural Resource zone must demonstrate compliance with P1 of Clause 26.3.1 of the Planning Scheme in regard to need for that location, access arrangements, use of infrastructure etc. Because the use exists, proving the case to locate in a Rural Resource area has been made redundant by previous planning decisions. The fact that there will be no extra 'take' of agricultural land for the increase in production would suggest there will be no adverse impact on agricultural production on this site. As such, the development complies with P1 of Clause 26.3.1 of the Planning Scheme. All other use standards relate to residential uses, which do not apply in this instance.

The project is being assessed under Section 27 (1) of the EMPCA, mandatory referral by the proponent. A development application and permit (subject to compliance with the relevant acceptable solutions or performance criteria) will be required once the EPA Board has assessed the proposal and approved it.

2.3.1.1 Development standards

As there is no development proposed (to the existing buildings), none of the development standards apply in this instance. The lot has already proved itself suitable for this type of development; the access already complies with State Growth standards; the site has its own water supply; the site also has its own wastewater treatment plant; and stormwater will be dealt with on site – as is the current situation.

2.3.1.2 Codes within the Planning Scheme

The Planning Scheme contains a series of Codes that require consideration: see table 1 (following page)

Table 1: Planning Scheme codes that require consideration

Code	Comment
Bushfire Code	This Code has no application in this instance due to the provisions of clause E1.2 (a) and (b) of the Planning Scheme: *E1.2 Application of this Code This Code applies to:* *development, on land that is located within a bushfire-prone area, consisting of the subdivision of land or the construction of habitable buildings; and* *a use, on land that is located within a bushfire-prone area, that is a vulnerable use or hazardous use.* *A permit is required for all use and development to which this Code applies that is not exempt from this Code under clause E1.4.*
Airport Impact Management Code	The site is outside the defined airport management area. Therefore, this Code does not apply.
Clearing and Conversion of Vegetation Code	There will be no clearing or conversion of vegetation as a result of this proposal.
Change in Ground Level Code	The change in ground level code will apply as there are earthworks associated with the dam.
Local Heritage Code	The site is not on the list of Local Heritage places.
Hazard Management Code	The development does not trigger application of this Code.
Sign Code	No signs are proposed as a result of this development.
Traffic Generating Use and Parking Code	The increase in vehicle numbers as a result of the proposed increase in production is considered insignificant due to the high volumes of vehicles that use the state's road network, particularly the Bass Highway. The upgraded junction is readily able to handle these increased vehicle movements. The Parking/Loading Use Standards Code relies on floor area for calculating car parking for Resource Processing and there will be no increase in floor area so no extra car parks have to be provided under the Planning Scheme and no additional extra loading bays will be required. As there is technically no development taking place, the Development Standards clauses do not apply.
Telecommunication Code	The proposal will not have an impact on any telecommunication infrastructure.
Water and Waterways Code	The Code applies for use or development: '*on land within 30 m of the bank of a body, watercourse or wetland;* *on land within 30 m of the high-water mark of a shoreline to an ocean, estuary, or tidal waters; or* *wholly or partially in, over, on or under a water body, watercourse or wetland or shoreline.*' None of these apply.
Specific Area Plans	The land is not in a Specific Area Plan.

3 Description of Proposed Project

The proposed project is to:

- increase production at HA's Parramatta Creek fish processing facility located at Lot 1, 7216 Bass Highway, Sassafras from the approved 14,000 tpa to 33,000 tpa of fish products and;
- install a 75 ML dam for winter storage of wastewater effluent; and
- irrigate treated wastewater produced both onsite at Lot 1, 7216 Bass Highway, Sassafras, and on the adjacent farm 7218 Bass Highway, Sassafras.

To produce 33,000 tpa of product, approximately 38,000 tpa of fish will be processed. Proportionally, wastes are approximately 10%–15% of whole fish as viscera (typically for head-on gutted fish).

Of the 33,000 tpa of product produced, approximately 1,000 t is likely to be value-added product as a result of filleting, smoking and portions.

3.1 Processing site

The site was originally constructed as a purpose-built food processing facility in the early/mid 2000s. Onsite are two substantial buildings, several smaller structures, an extensive car park and a wastewater treatment system.

Access to the site is via a purpose-built intersection with the Bass Highway.

The site is operational and utilised for the processing of fish, both Atlantic Salmon and Rainbow Trout, on the eastern side of the Bass Highway at Sassafras.

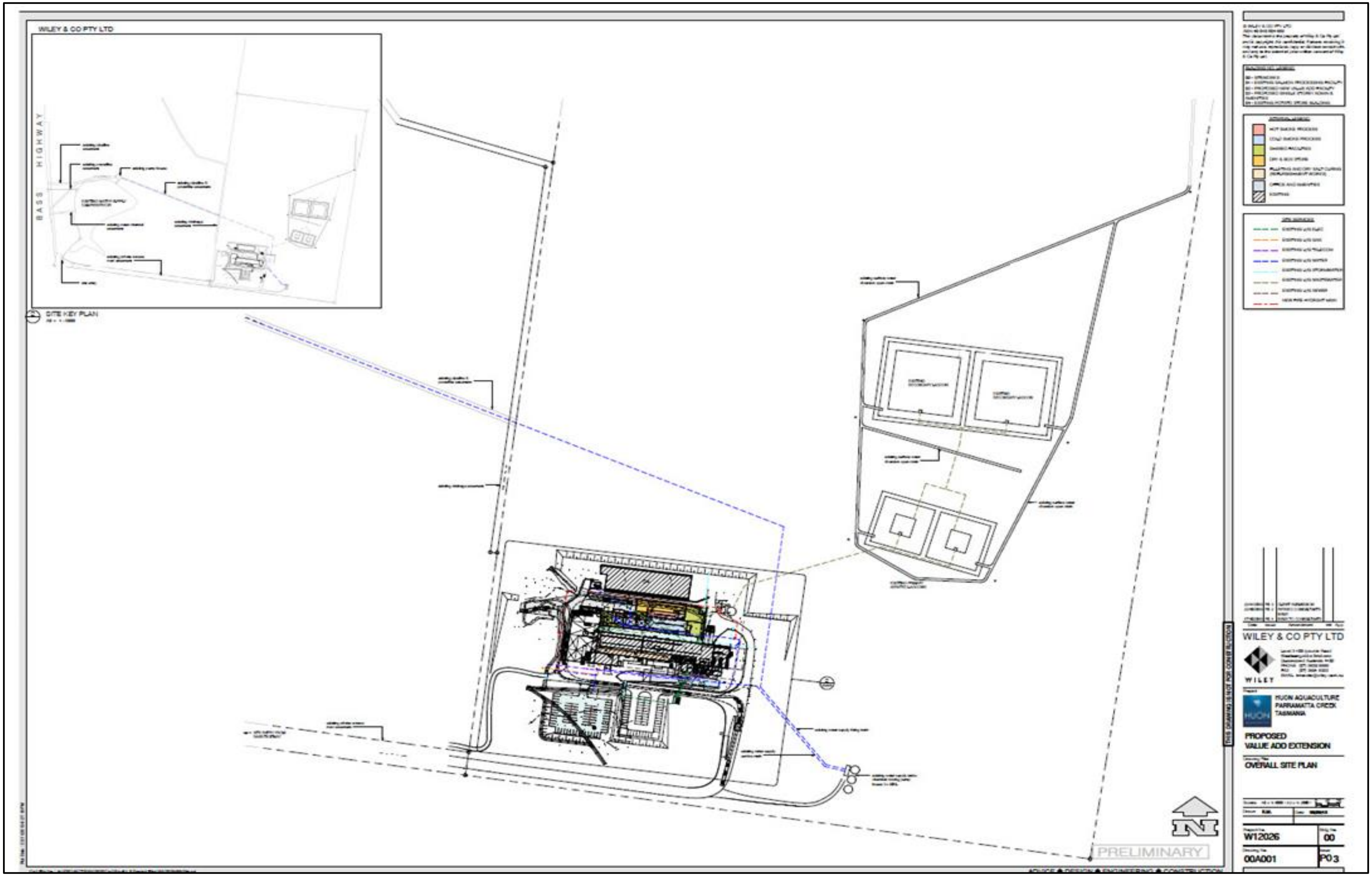
A site plan showing the factory site, the primary and secondary lagoons, water supply tanks and utilities is provided in Figure 1 and in greater detail in Appendix A.

Apart from a new 75 Megalitre effluent storage dam, no increase in the factory's footprint or additional production infrastructure is required for the increase in production to occur.

Table 2: 2018/2019 financial year production

Parramatta Creek Processing Facility Production 2018/19 Financial Year			
Product	**Process**	**Item**	**Tonnes**
Fresh	Raw	Cutlets	2.242
		Fillets	1,912.946
		Frames	1,426.372
		HOG	14,118.177
		Pieces	27.020
		Portions	610.575
	Raw Total		**18,097.332**
Value Added	Cold Smoked	Frames	8.170
		Mince	14.284
		Side	359.825
		Trimmings	76.030
	Hot Smoked	Fillets	39.540
		Dip	4.421
		Pieces	90.204
		Portions	80.320
	Value Added Total		672.794
Grand Total			**18,770.126**

Figure 1: Current processing site layout plan



3.2 Location

The Parramatta Creek processing facility site and current irrigation land is located approximately 25 km south-east of Devonport at Lot 1, 7216 Bass Highway, Sassafras, Tasmania, 7307.

The land is owned by Huon Aquaculture Company Ltd.

The processing factory utilises 4.7 ha of the total 56 ha site.

This plan proposes an extension of irrigation activities to include the property adjacent to Huon Aquaculture, owned by the Layton family and managed by Mr Troy Layton.

HA has an agreement with Mr Layton to irrigate treated wastewater on his land once HA receives environmental approval. The agreement is provided in Appendix F and outlines the land tenure details for these properties.

The regional location is shown in Figure 2. The cadastral parcels proposed to be used for processing and irrigation of effluent, both on the HA site and the Layton land adjacent to the HA site are shown in Figure 3.

Figure 4 depicts the areas mapped as suitable for irrigation and provides the area of each potential irrigable parcel. Detail on why these areas are suitable for irrigation are provided in Appendix B and summarised in Section 6.5. It should be noted that the actual areas proposed for irrigation by pivot irrigators are shown in Figure 23 and in Figure 40, with buffer zones to creeks and boundaries marked.

There are no known financial restrictions on the title that will prevent this proposed development from proceeding.

Table 3: Tenure details

Name	HA processing and irrigation land	Adjacent irrigation land (Troy Lathan)
Property address	7216 Bass Hwy Sassafras Tas 7307	7218 Bass Hwy Sassafras Tas 7307
Property ID	3000065	3058515
Title reference	158261/1	158261/2, 250684/1 and 221705/1
Owner's name	Huon Aquaculture Group Limited	TPF Properties Pty Ltd
Owner's address	961 Esperance Coast Road, Surveyors Bay, Tasmania 7117	7218 Bass Hwy Sassafras Tas 7307

Figure 2: Parramatta Creek facility location in relation to region

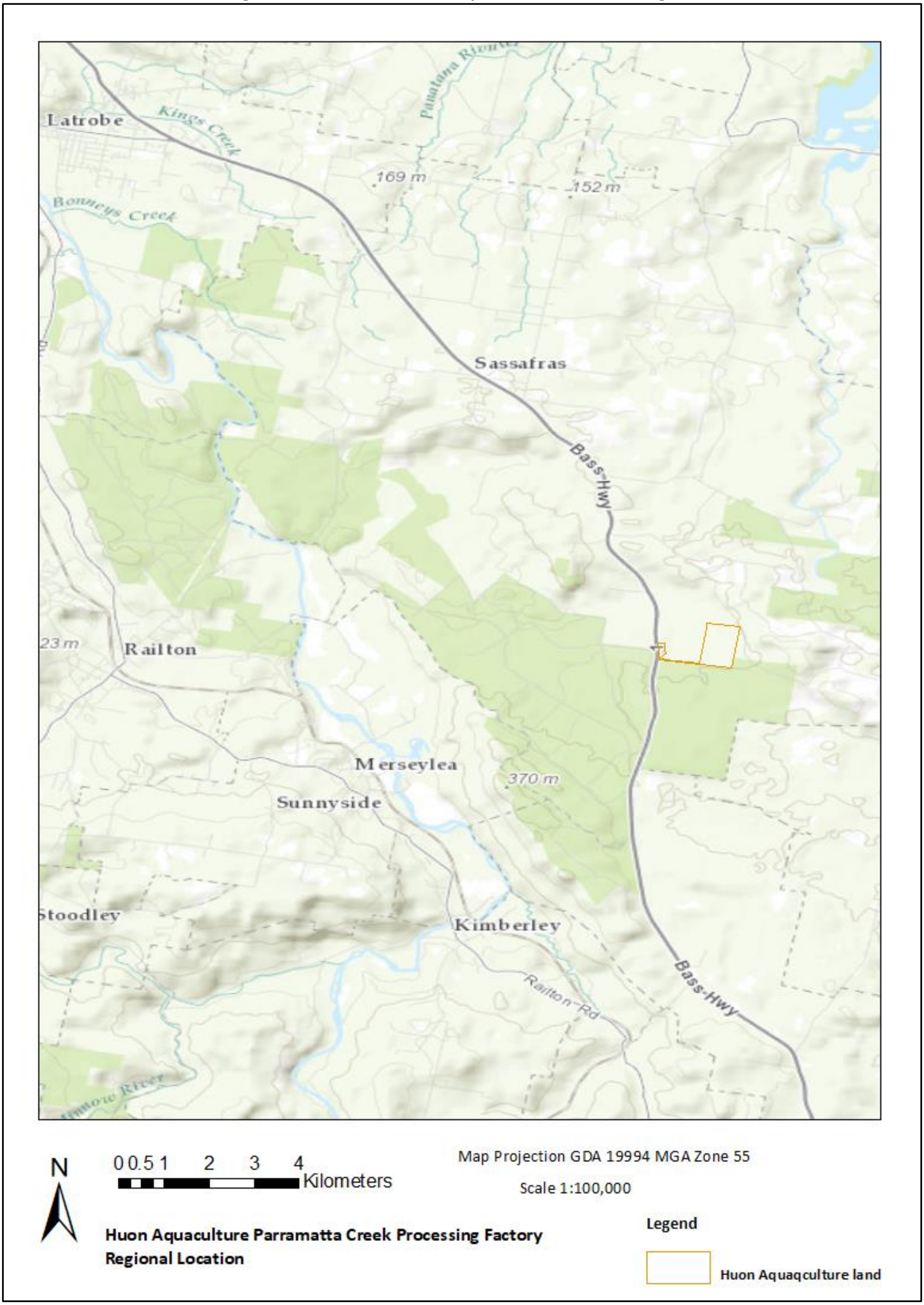


Figure 3: HA and Layton land – proposed fish processing and wastewater irrigation sites

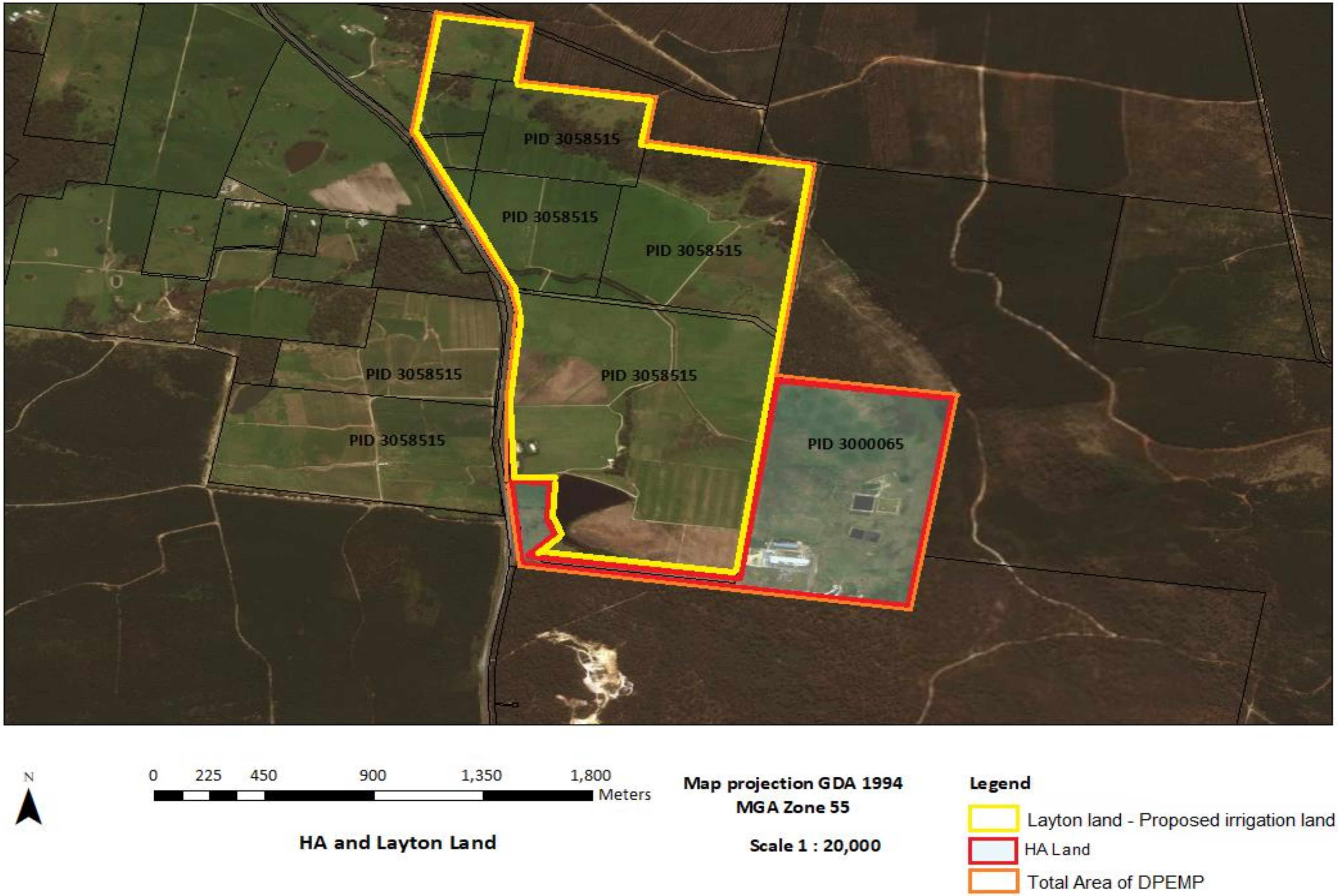
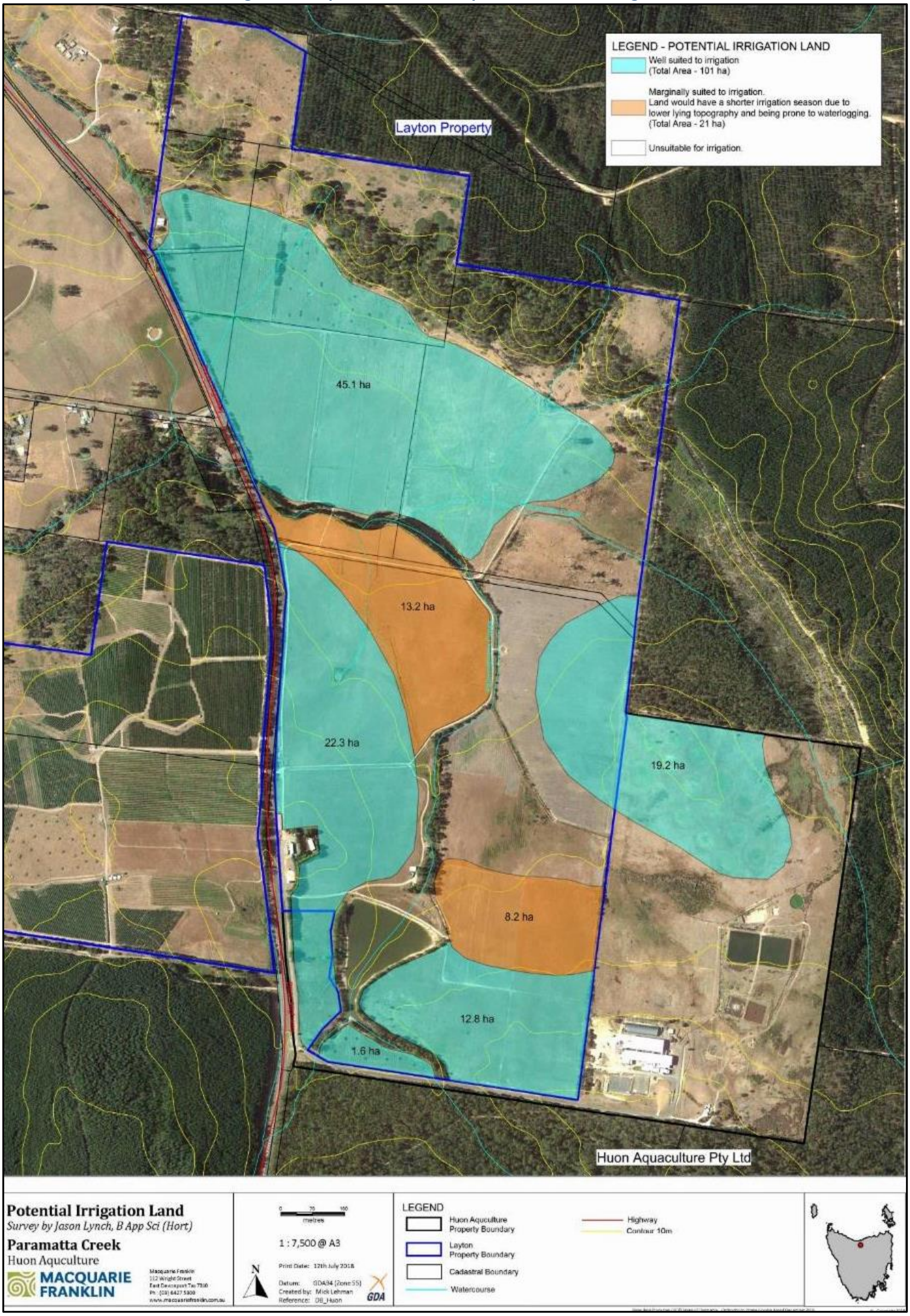
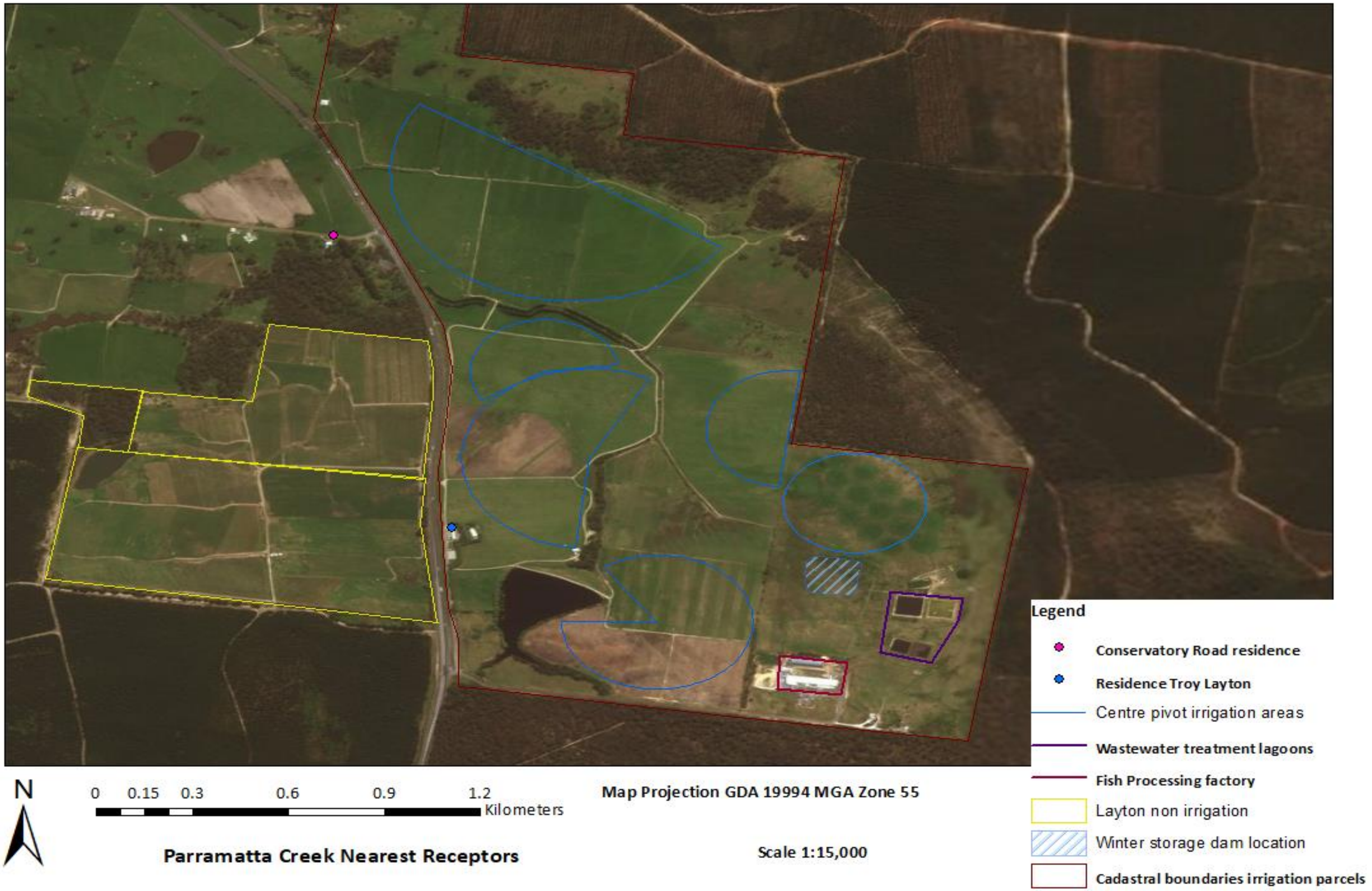


Figure 4: Map of land suitability for wastewater irrigation



The closest residence not associated with the operation is on Conservatory Road, approximately 1,200 m away to the north-west of the wastewater lagoons and 150 m from the western edge of the northern irrigable parcel (Figure 5).

Figure 5: Parramatta Creek processing facility nearest receptors



3.3 Land tenure

The land proposed for the development and the adjoining land is zoned Rural Resources.

Surrounding land uses are:

- forest to the south, north and east which is Permanent Timber Production, Tenure ID 43423 to the north-east and Tenure ID 42300 to the south
- cultivation/orchard-type agriculture to the west.

3.4 Hours of operation and seasonality

Production rates vary seasonally due to market demands.

Peak production is generally when production rates increase over baseline production by 15% (Easter) and 30% (Christmas). Occasionally non-seasonal demand drives a temporary production increase.

The current processing factory runs two parallel product lines (wet processing). There will be no increase in the unit rate of production per hour because each line already runs at its maximum rate. Instead, the hours a shift operates will increase and the number of shifts will increase with additional shifts worked on weekends mainly at peak periods (Easter and Christmas).
The hours of operation for wet processing depend on daily production volumes but generally commence at 5 am and run for an eight-hour period.

Value added operations such as fish portions normally commence at 7am and run for an 8-hour period finishing at 4pm.

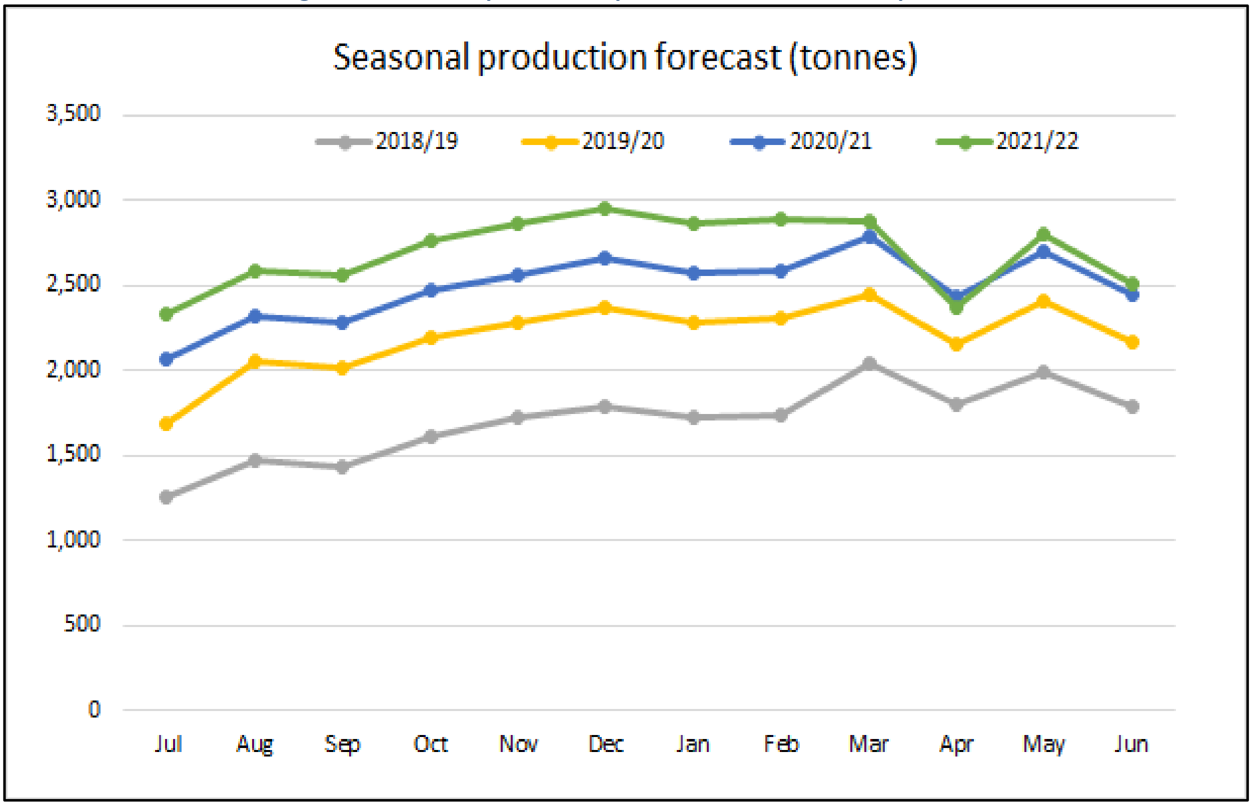
Smoking shifts are carried out on week days with smoking staff working from from 7 am until 8 pm.

Cleaners enter the building each day at 4pm and conduct cleaning and disinfection until around midnight.

The operation is run on a Monday-to-Friday basis (5 days per week), exclusive of public holidays. Increased shifts before Easter and Christmas are worked over weekends.

Forecast production in tonnes of product by month is shown in Figure 6.

Figure 6: Seasonal production past and forecast for comparison



3.5 Water supply

HA holds water licence number 9538, which entitles it to an annual allocation of 400.5 ML consisting of:

- 60 ML from Felminghams Creek via existing dam #4287.
- 340.5 ML of direct supply from the Mersey River.

Troy Layton holds his own water allocations for both the Mersey River (water licence number 8180) and Felminghams Creek, both of which can be utilised to provide fresh water to the system. The Layton allocations total 540.75 ML from the Mersey River and 60 ML from Felminghams Creek. These are not currently utilised and are available for shandying of wastewater for irrigation. The pipeline easement for this allocation is shown in Appendix F. Layton's dam (dam ID 4287, listed as being 300 ML in capacity) is supplementarily filled from the Mersey River supply system during the irrigation season.

In addition to these water allocations, it is possible for any irrigator to purchase water from Hydro Tasmania (released from Lake Parangana) should the need arise. Given the above, any restriction on direct take water from the Mersey River can be compensated via water held within Layton's dam or alternatively via the purchase of water from Hydro Tasmania.

With the access to multiple reliable water sources (>1000 ML), there is no risk that there will be insufficient fresh water in the system for shandying to occur as planned, even during drought years.

3.6 Power supply

The energy demand for the operation is primarily mains electricity. Electricity demand for the proposed development is between 1,153 kVa and 1,488 kVa (using a kW to kVa conversion factor of 1.25). Table 4 shows the energy demand for the operation by process sector. This includes the proposed production increase and installed increases in lagoon aeration capacity.

The site is serviced by 2 × 750 kVa transformers, which provide enough electricity to the processing facility without the need for further power connections.

No additional electrical supply is required for the increase in production.

Table 4: Energy demand

Item	Power
Wet processing	
Refrigeration	230 kW
Air compressors, pumps, other equipment	50 kW
Wet processing and filleting equipment	165 kW
Light and power	114 kW
Office area air conditioning and heating	20 kW
Wastewater treatment plant	30 kW
Diversity factor 0.6–0.8	365 kW – 487 kW
Value adding	
Refrigeration	200 kW
Air compressors, pumps, other equipment	50 kW
Value add and raw processing equipment	369 kW
Light and power	80 kW
Diversity factor 0.6–0.8	419 kW – 559 kW
Total	
Total power (connected/rated load)	1308 kW
Diversity factor 0.6–0.8	784 kW – 1046 kW
Office and amenities building allowance	
Light, power, air conditioning, heating	100 kW
Irrigation	
Irrigation – pump and aerators	77 kW
Total power requirements	961 kW – 1234 kW

3.7 Process raw materials

The major raw materials required for the process are fish, water, salt and wood.

Raw material inputs are summarised in Table 5 for the proposed maximum production rate of 33,000 tpa of processed products.

Table 5: Raw material inputs

Process	Major raw materials	Quantity per annum
Wet processing	Whole fish	38,000 t processed in a financial year.
	Fresh water	The maximum water use expected is 112 ML (3.4 litres per kg produced)
Smoking	Hardwood red gum (chips or sawdust)	18.5 tonnes per annum.
	Salt added to fish before smoking	21 tonnes per annum.

All wood for the smoking process is sustainably sourced river red gum (*Eucalyptus camaldulensis*).

Sawdust and wood chips are stored inside the building.

Other raw materials are required for packaging, portioning and enhancing of products.

These include polystyrene boxes, cardboard boxes, plastic bags, labels, box strapping, cryovaccing materials, boards, tubs and lids, cartons, glass jars and lids, range of spices and product enhancers.

3.8 Processing overview

The process commences at fish farms in the Huon River, Storm Bay and Macquarie Harbour where Salmon and Rainbow Trout are humanely harvested using the stunning and bleeding system developed by Seafood Innovations.

After harvesting, fish are brought to shore at Hideaway Bay or Strahan where they are piped into purpose-built road tankers.
The 30 kL tankers contain approximately 10 kL of chilled water to keep the fish below 5 °C during transportation.
The water is chilled on site (at Port Huon or Strahan) and salted with between 20 and 30 kg sodium chloride salt per tanker to reduce the temperature of the fish as quickly as possible. The tankers have automatic control systems in place to maintain the water temperature below 5 °C during transport to Parramatta Creek.

The process flow is shown diagrammatically in Figure 7.

The facility at Parramatta Creek produces gutted and cleaned whole salmon and salmon fillets as well as hot- and cold-smoked salmon. Small quantities of salmon patties, caviar and pate are also produced.

The two stages of processing, wet processing and value adding, are described on the following pages.

3.8.1 Stage 1 – wet processing

Harvested fish arrive at the Parramatta Creek facility and undergo wet processing.

Wet processing involves:

- fish unloading
- grading
- gutting
- further grading
- filleting.

further explanation of each step below.

3.8.1.1 Fish Unloading

After arrival at the factory the tankers are unloaded and the fish are transferred to a receival tank, which is chilled with fresh clean water. There is a return water system to pump water from the receival tank back to the tanker to keep it pressurised until empty of fish.

Once the tanker is empty it is sterilised utilising the clean-in-place (CIP) system for cleaning. CIP is a method of cleaning the interior surfaces of pipes, vessels, process equipment, filters and associated fittings, without disassembly.

All wastewater from this process is directed to the onsite wastewater treatment plant.

3.8.1.2 Grading

After unloading, the fish are sent to grading by a vacuum delivery system. An operator directs all higher quality fish to Baader gutting machines and lower quality fish to a handline.

3.8.1.3 Gutting

Gutting is performed by 3× Baader 142 machines and a handline.

The Baader 142 machines take the fish via a conveyor for measurement. The fish are then automatically split and the viscera are removed via a vacuum station system.

The fish are then washed and off-loaded onto an inspection conveyor for final inspection. Each machine operates at a maximum rate of 16 fish per minute.

Fish are conveyed from the Baader machines and handline to a second grading station, where they are inspected for machine damage and any other deformities and graded again. Rejects are sent to an insulated bin for further processing in the filleting area.

3.8.1.4 Further grading

This grader consists of six drop bins per side for different fish sizes and grades.

One side of the grader is used to fill insulated bulk bins for further processing by the filleting department. The other side is used to fill polystyrene boxes for customers in the domestic and export markets.

Fish in the polystyrene boxes are conveyed from the grader to a weigh scale where they are identified, labelled and packaged with ice for dispatch to customers via refrigerated transport.

3.8.1.5 Filleting

At the filleting station, fish are de-headed and sent through a filleting machine where they are split into fillets and the main carcass. Bones are dropped into a waste bin.

The fillets then go through a trimming machine.

They are then inspected and put into polystyrene boxes.

The boxes are labelled and packed with ice for dispatch to customers via refrigerated transport.

3.8.2 Stage 2 – value adding (smoking, portioning, etc)

The value-adding process involves:

- pin boning (removal of bones)
- skinning (removal of skin)
- portioning (cutting into portions)
- hot smoking
- cold smoking
- mincing (mincing of small volumes for Pate' and burgers)
- caviar (removal of fish roe/eggs – small volumes/seasonal)
- burger room (as for mincing)
- pate room (as for mincing)
- packaging.

3.8.2.1 Smoking

Smoking is carried out as a batch process.

The smokehouses currently (2019/2020 FY) operate for 800 minutes per day, with up to 300 smoking shifts/days per annum.

Current smoked product production is 3.2 tonnes per smoking shift which is 4 x 400kg racks of fish per smoker with two of the three smokers typically used each day.

Each smoker is designed to house 5 x 400kg racks rather than the current 4 x 400kg, therefore smoking production can increase by 20% above current smoked fish volumes before the need to increase shifts will occur.

It is not anticipated that any additional smoking shifts will need to occur at the proposed peak production.

80 kg of salt is applied to the fish per shift before smokehouse operation. Any residual salt is sent to general waste.

18kg of Red Gum Woodchips/sawdust is utilised in each smoking batch with a potential maximum site woodchip/sawdust use of 54kg per day.

Smoked product accounts for <3.6% of total processed product.

3.9 Proposed processing

Table 6 shows the current production forecast for the activity by month. Monthly figures have been rounded up.

Figure 7: Process flow diagram

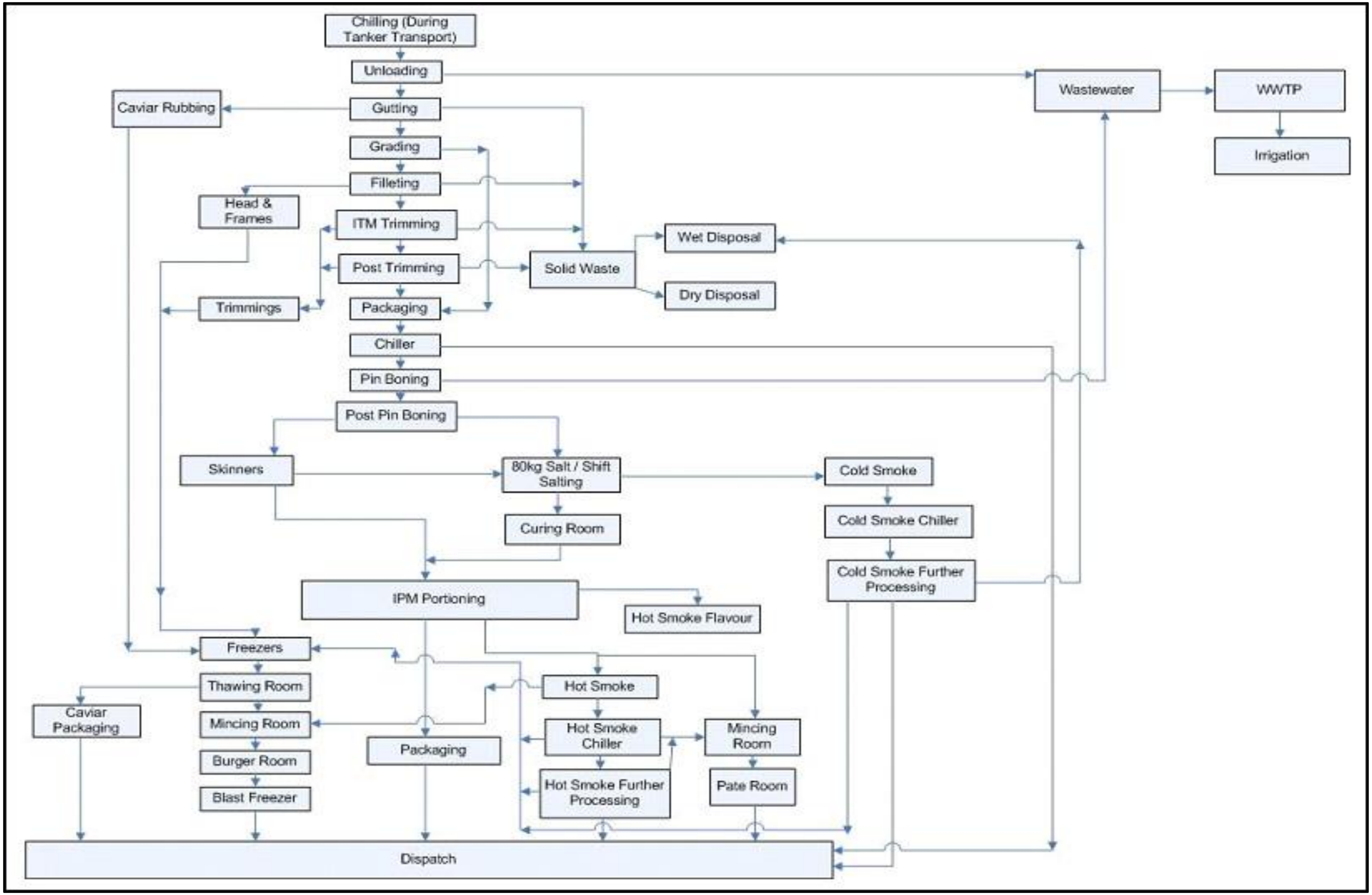


Table 6: Forecast total production

Financial year	Forecast monthly production (tonnes)												Total tonnes
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
FY 2019–2020	1,692	2,056	2,022	2,195	2,281	2,376	2,282	2,302	2,447	2,159	2,412	2,174	**26,398**
FY 2020–2021	2,066	2,319	2,286	2,472	2,566	2,663	2,569	2,588	2,789	2,430	2,703	2,444	**29,895**
FY 2021–2022	2,330	2,592	2,555	2,760	2,863	2,959	2,866	2,887	2,874	2,366	2,798	2,515	**32,365**

Table 7: Predicted wastewater volumes

Financial year	Forecast monthly wastewater production (ML)												Total (ML)
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	
FY 2019–20	5.8	7	6.9	7.5	7.8	8.1	7.8	7.8	8.3	7.3	8.2	7.4	**89.9**
FY 2020–21	7	7.9	7.8	8.4	8.7	9.1	8.7	8.8	9.5	8.3	9.2	8.3	**101.7**
FY 2021–22	7.9	8.8	8.7	9.4	9.7	10.1	9.7	9.8	9.8	8	9.5	8.5	**109.9**

3.10 Wastewater volumes

Wastewater production has two main components:

- a fixed component associated with cleaning the factory for each shift
- a variable component associated with the production of wastewater which relates to production hours and the delivery of harvested fish transported in a chilled ice slurry.

HA has reviewed the fixed component and does not believe further water use efficiencies can be implemented without compromising product hygiene.

Efficiencies in the variable component continue to be evaluated.

Currently the site produces 3.4 litres of wastewater per every kilogram of fish product produced *(including fixed and variable components).* This equation has therefore been utilised to develop future predictions of water use.

The plan outlined in this DPEMP has been developed to meet the expected site wastewater use of 112ML at 33,000tpa.

This is commensurate with the current planned production increase.

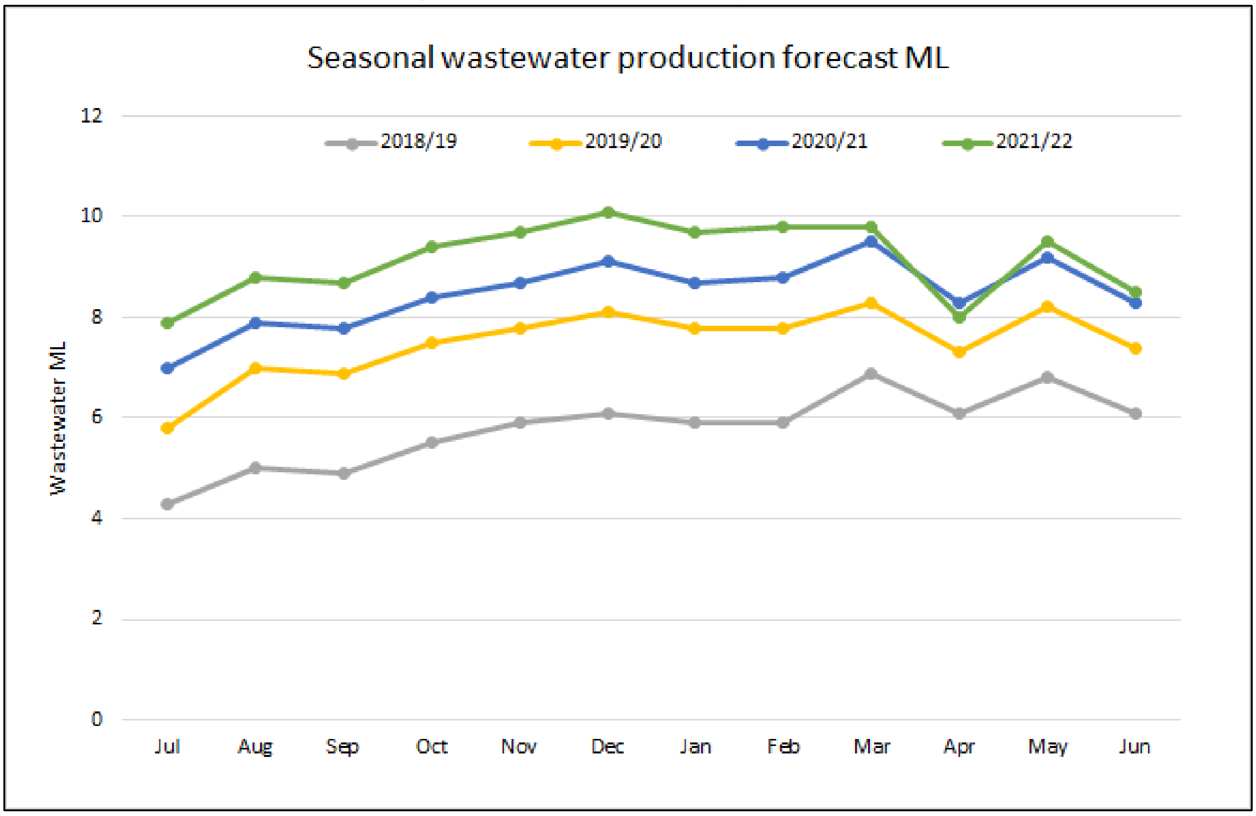
The forecast production allows for both market-driven increases and production decreases due to unpredictable natural factors such as storms and fish mortalities.

Because the forecast production is seasonal (Figure 6 and Table 6), the forecast wastewater production is also seasonal. This is depicted in Figure 8 and Table 7.

In the year FY 2022/23 if the production peak of 33,000 tonnes is achieved the facility will operate at an average production day of 127 tonnes reaching a peak of 165 tonnes at the Christmas peak day.

It is therefore estimated that wastewater daily volume will average 432KL and peak production day will reach a wastewater volume of 561KL. The facility has achieved a previous daily production rate of 150 tonnes in 2018 with an output or 510 KL of wastewater.

Figure 8: Forecast wastewater production



3.11 Process wastewater treatment

3.11.1 Process wastewater

The wastewater treatment plant (WWTP) receives process wastewater containing waste contaminants from fish processing and transport water.

The waste includes:

- fish blood and other fluids/solids liberated through the fish processing
- salt from fish transport
- cleaning products and other chemicals required to clean and disinfect the trucks and the facility.

The process wastewater does not include sewage, which is processed separately (Section 3.15).

3.11.2 Summary of the Environmental performance of the Wastewater Treatment System

The environmental performance of wastewater activities at the Parramatta Creek fish processing facility were below expectations and water quality deteriorated as production increased between 2011 and late 2015.

Some of the issues that appeared within the waste water were.

- Ineffective and underperforming wastewater treatment system unable to meet increased production.
- Below standard management of wastewater leading to high nutrients levels and high BOD water being irrigated.
- Poor water quality leading to odorous pond conditions.
- The wastewater salinity had been considerably higher than forecast and at times significantly outside of a range suitable for agricultural production.
- Wastewater quantity exceeded the predicted volumes, which was used as the basis for determining the irrigation area required and for which the irrigation system was designed.
- Insufficient land area for the actual volume of wastewater produced, resulting in per-hectare application rates greater than what was deemed sustainable in the DPEMP.
- Insufficient storage capacity (with the increased wastewater quantity), resulting in irrigation practices at times being based on the need to empty the reuse dam, rather than plant irrigation requirements (i.e. irrigation of soils that may already be wet).
- The irrigation system was constructed to irrigate directly from the lagoon system, without capacity to shandy wastewater to manage wastewater salinity (either in the dam or in the pipeline).

Huon Aquaculture began upgrades of both the treatment plant and its operations in late 2015 with most of the above issues now considered rectified, the site now producers a consistent wastestream with little or no odours and is designed to meet the increased production levels being applied for.

3.11.3 Waste Water Treatment Plant

The current treatment system is the result of improvements made since 2016 commencing with aerators being added to the first two wastewater treatment ponds. The balance tank and DAF unit were then installed in February 2017 and the screw press was commissioned April 2017.

All process wastewater from the factory is collected and drains to a sump at a WWTP.

The WWTP has a number of stages that serve different functions for achieving the required effluent quality.

The stages occur in the following order within the treatment system:

- screw press
- balance tank
- polymer addition (coagulation)
- dissolved air flotation (DAF)
- aerated pond
- facultative ponds
- water storage
- effluent reuse

The purpose of each component, with the associated effect on water quality, is discussed below.

3.11.3.1 Screw press

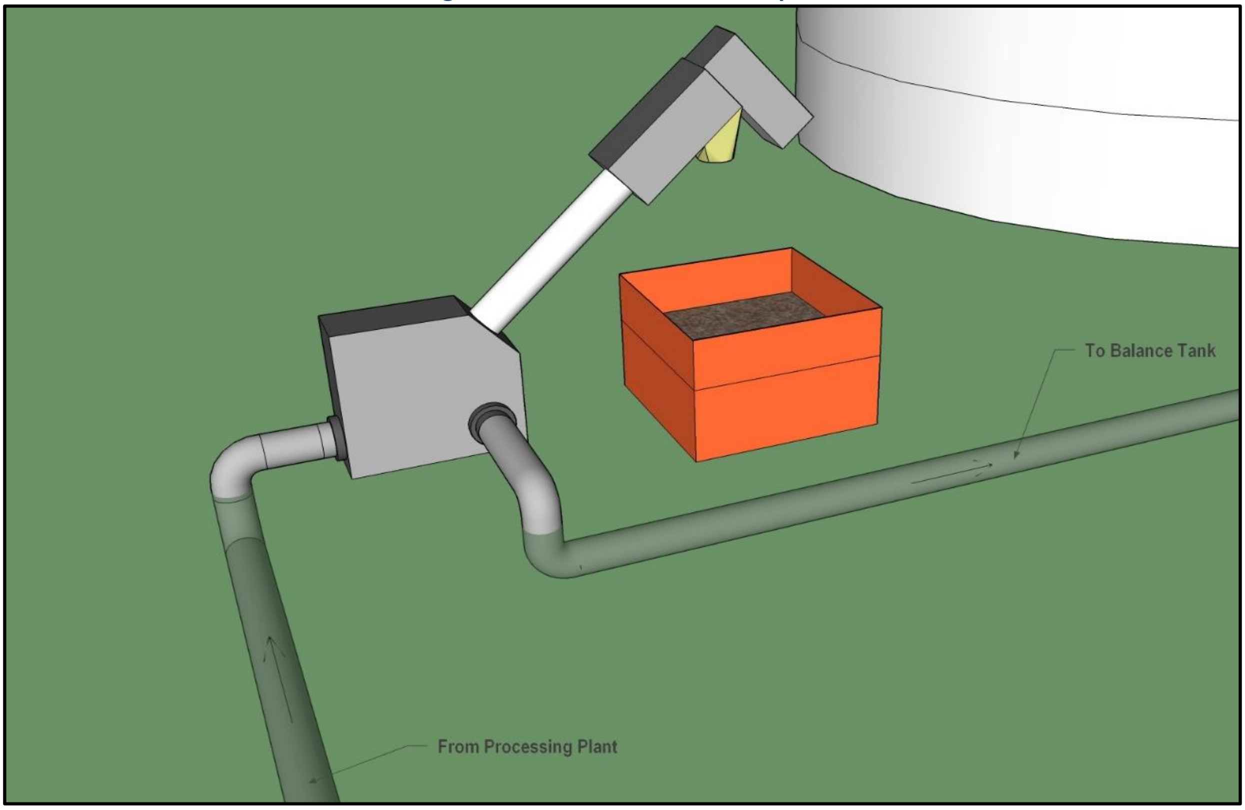
The function of the screw press is to remove solids greater than 1 mm from the inflow processing water, it has a production capacity of 60 KL per hour or 720KL per 12-hour day (561KL is the estimated peak day under this DPEMP).

The Screwpress prevents solids from entering the water treatment plant, including:

- plastic that would not be effectively treated by the system
- hard material that may damage water treatment infrastructure
- larger organic materials that would increase the organic load requiring treatment.

Removed solids report to the organic solid waste management system. These solids are stored in lidded bins and removed off site daily by contractors.

Figure 9: 3D schematic of screw press



3.11.3.2 Balance tank

The balance tank has an operating capacity of 80,000 litres. A 3D schematic of the tank is presented in Figure 10.

The wastewater within the balance tank is aggressively mixed using multiple venturis, the agitation and aeration helps prevent odours by reducing the potential for anaerobic conditions occurring.

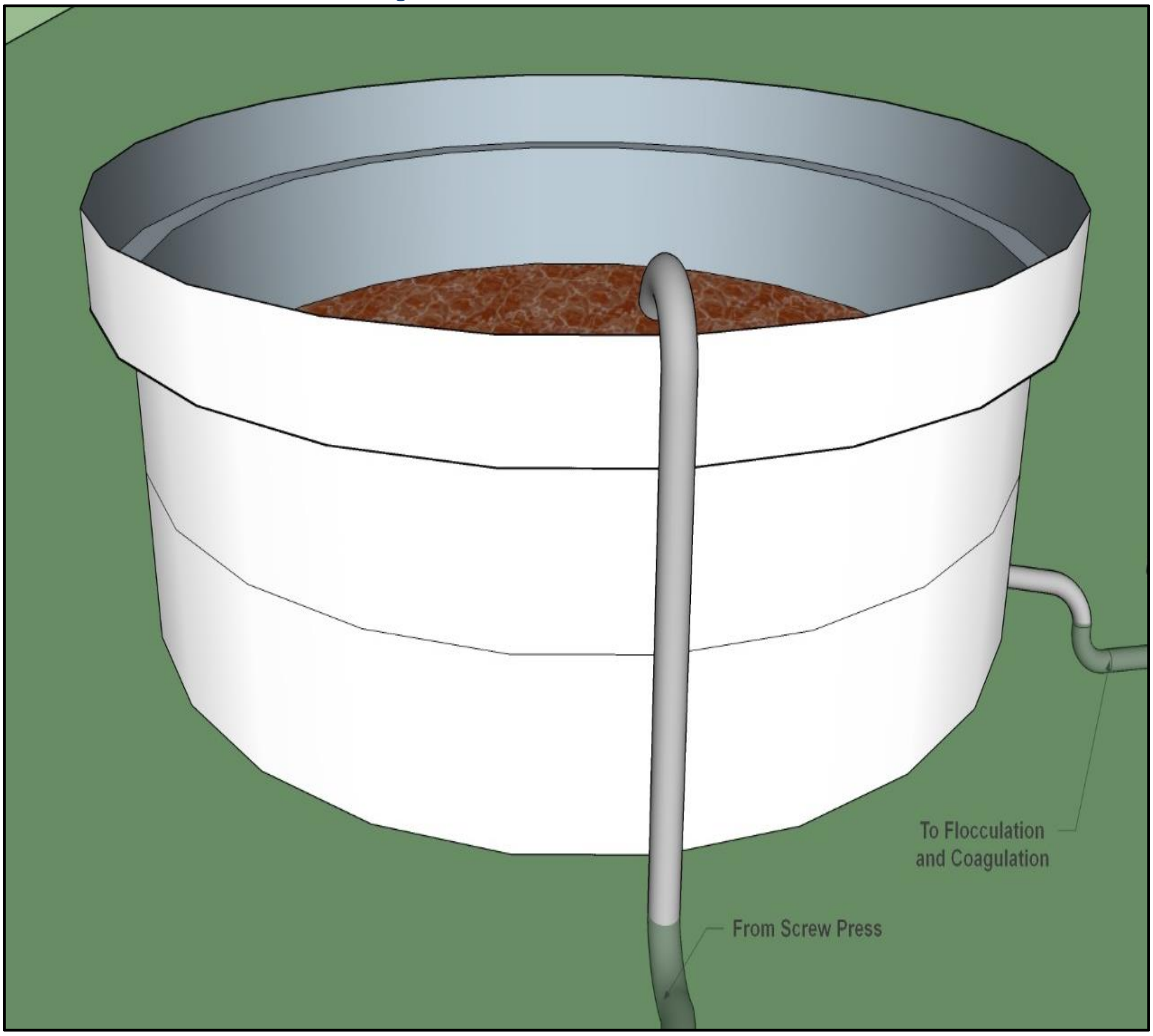
The effluent within the balance tank has a high biochemical oxygen demand (BOD) and is rich in organic material associated with fish waste, such as fish blood.

The agitation, combined with frequently pumping the balance tank down to its base level, prevents the build-up of significant bacterial loads. This also reduces odour formation.

The balance tank also moderates the effluent load on the coagulation and flocculation and dissolved air flotation (DAF) unit. The balance tank moderates the hydraulic load and organic load by storing effluent and providing a constant flow through the remaining units of the treatment system.

Due to the rapid mixing, variations in concentrations are averaged across the entire volume of the balance tank.

Figure 10: 3D schematic of balance tank



3.11.3.3 Chemical additions

The current use of chemicals is kept to the bare minimum.
The waste stream is dosed with an organic-based polymer to improve the flocculation of the <1mm solids.

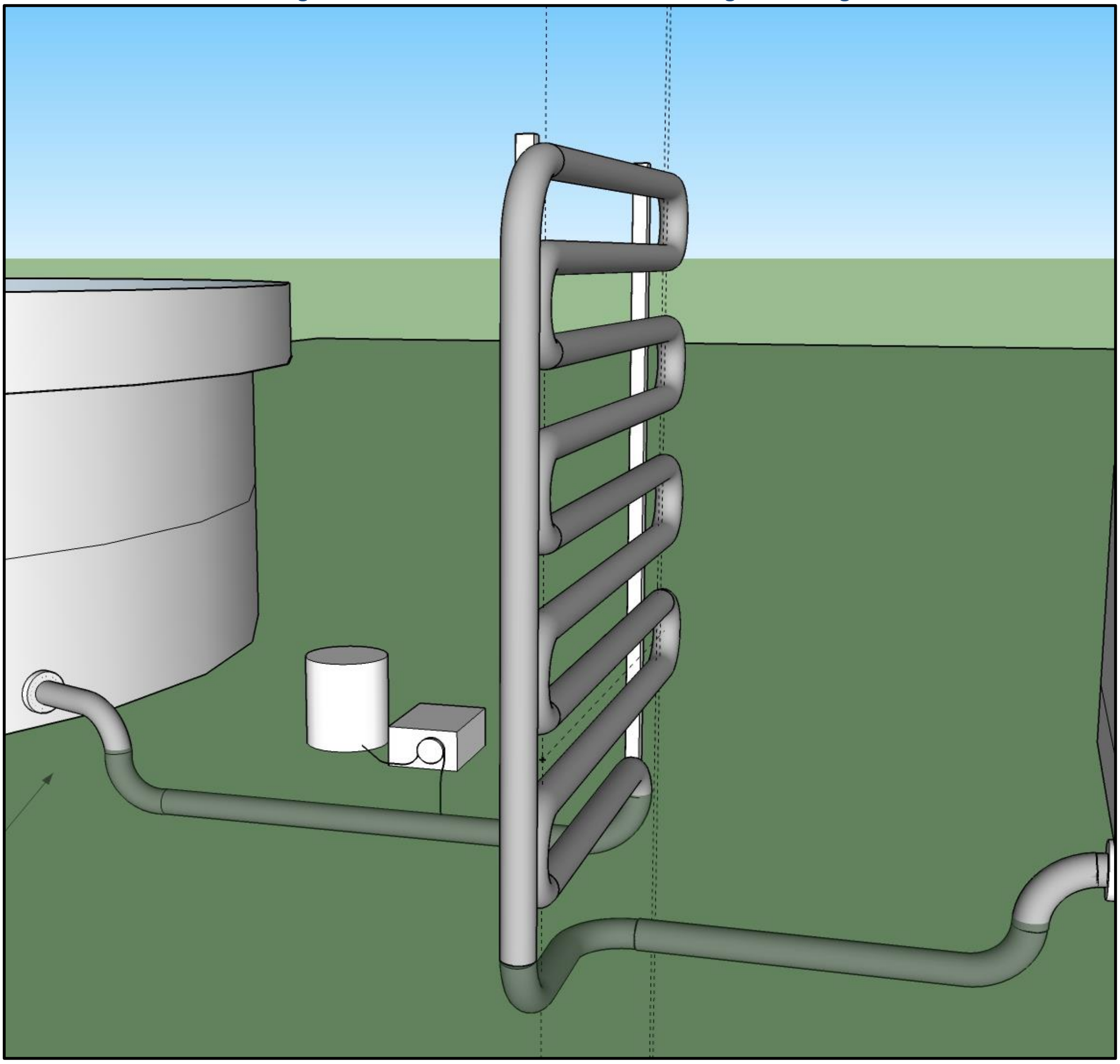
A Hydroflux SS304 polymer batching and dosing system is used for polymer addition.

The dosing of the polymer coagulates the fine solids within the wastestream and consequent flocculation occurs as the water passes from the balance tank to the DAF unit. The organic polymer used for this process is dosed as a liquid, using a variable-speed dosing pump (see Figure 11).
This permits the dose to be varied automatically dependant on water volume to optimise the coagulation of fine solids within the wastewater.

Optimum flocculation and coagulation usually occurs through gentle mixing. This is achieved by passing the dosed wastewater through a stack of pipes with bends, as shown in Figure 11.

Although the total contaminant levels in the wastewater will not change substantively in the flocculation and coagulation process, the proportion of material in the form of larger solids that can be removed in the DAF unit will be increased.

Figure 11: 3D schematic of flocculation dosing and mixing



3.11.3.4 Dissolved Air Flotation

The dissolved air flotation (DAF) unit is a relatively complex water treatment process.

Figure 12 provides a representation of the system.

Wastewater from the flocculation and coagulation process passes into the base of the DAF unit. Recycled water, supersaturated with air, is then passed into the cones at the base of the unit, releasing extremely fine air bubbles. The air bubbles entrain particulates that have been drawn out of solution by the coagulation process. The air bubbles with the collected material rise to the surface of the water in the DAF unit. The water surface is continually skimmed by blades that draw the material to a collection sump at the end opposite the unit's wastewater overflow. The wastewater passes along the entire length of the DAF unit to maximise the flow path for contact with the superfine air bubbles.

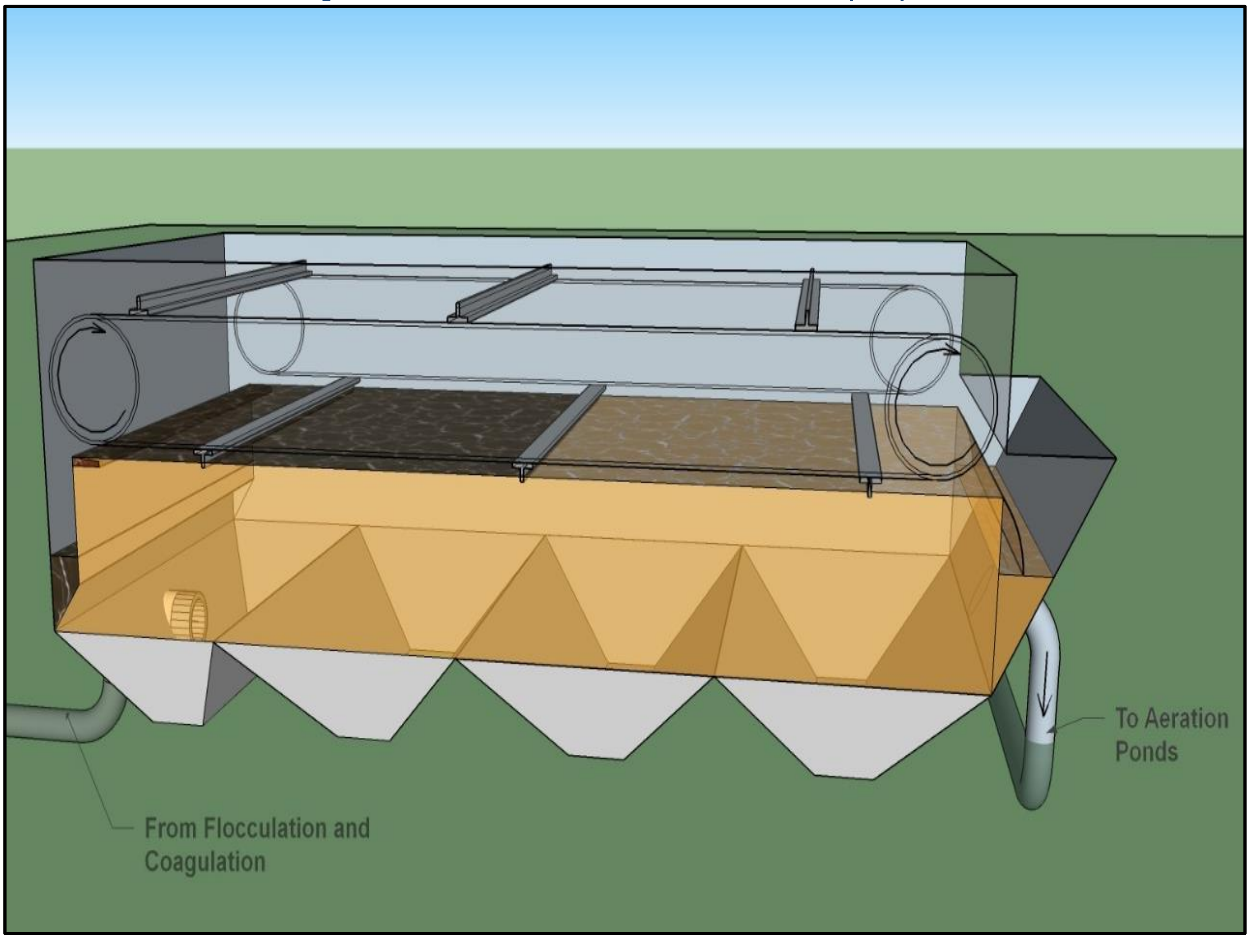
The DAF unit removes substantial quantities of particulate material drawn out of solution through the coagulation process.

The resultant water is lower in organics and nutrients, reducing the loads on the subsequent water treatment infrastructure.

The unit is a HydroDAF 50 model designed to operate at 50KL per hour, effectively treating 600KL per 12-hour day (561Kl estimated peak wastewater production day under this proposal).

As the unit operates fully automatically it has the potential to treat water 24 hours per day (1200KL) if required.

Figure 12: 3D schematic of dissolved air flotation (DAF) unit

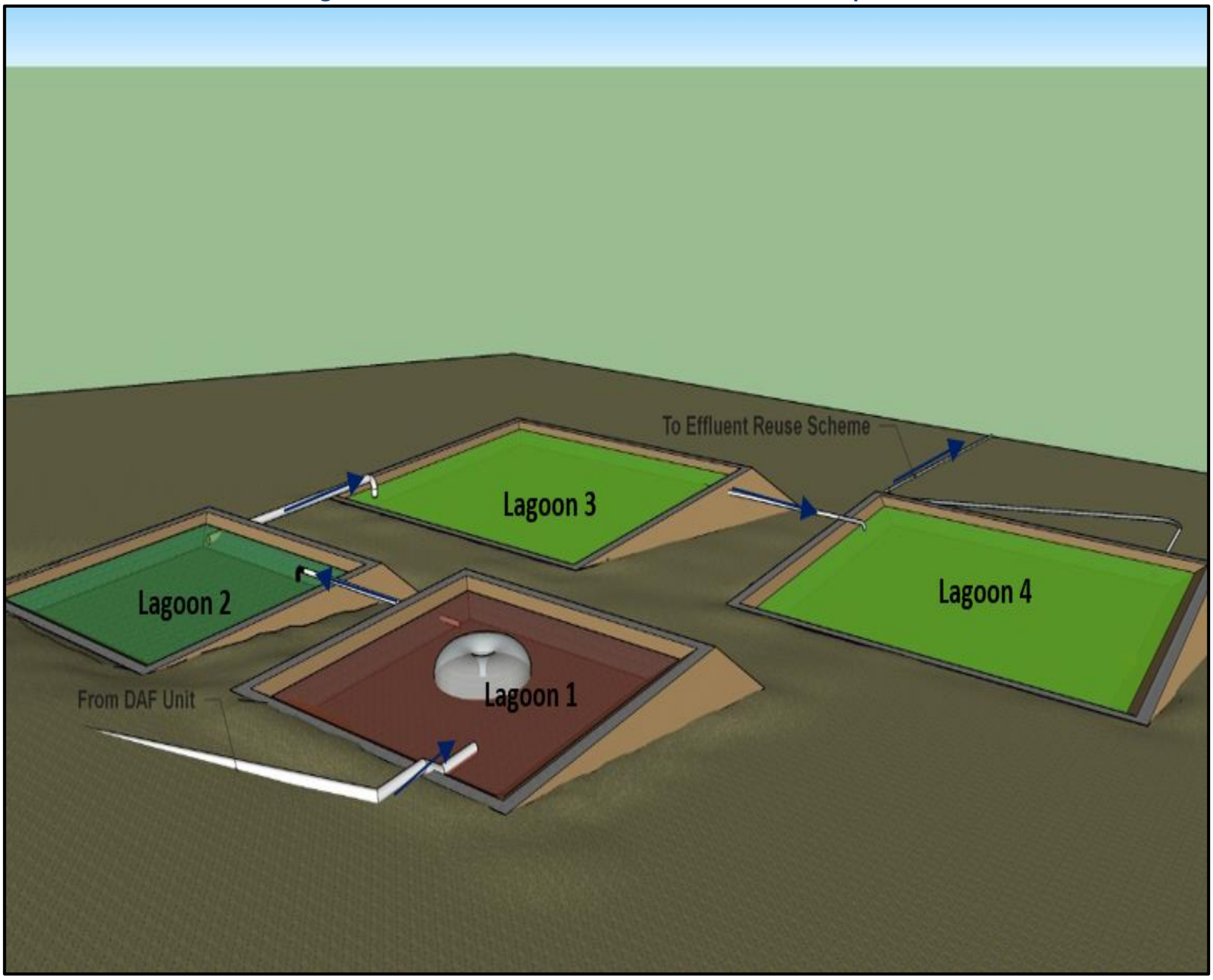


3.11.3.5 Pond system

The Parramatta Creek lagoon treatment system includes four ponds that are separated by levee walls (see Figure 13).

The ponds are used as aeration and facultative lagoons and well as water storage to moderate flows to the current effluent reuse (irrigation) scheme.
To facilitate a sustainable, long-term wastewater reuse option for irrigation on the adjacent Layton land, a 75 ML winter storage dam will be constructed to take overflow from pond 4 (65ML requirement see WWREMP).
The current function for pond 4, which is to moderate flow, will then cease and it will act to increase retention time within the pond system before irrigation.

Figure 13: 3D schematic of aeration and facultative ponds



The bulk of the organic reduction occurs in pond 1. Supplementary aeration is supplied by large 15 kW agitation units. The aerators have been installed because the organic loading is significantly more than the 50 to 70 kg/ha recommended for Tasmanian lagoons (Dowson et al., 1996). If aerators were not used, odours would result once anaerobic conditions developed. The later ponds would then also receive an increased organic load, decreasing overall performance.

Pond 2 has a 20 kW aerator that provides additional BOD reduction and elevated dissolved oxygen levels reducing any potential for odours conditions occurring.

The pond system provides effective disinfection by extended oxidation and ultraviolet radiation from the sun.

The benefit of the photosynthesis that occurs in the ponds is that dissolved oxygen (DO) produced via photosynthesis remain at saturation levels (100%).

The design principals utilised to enhance bacterial disinfection in the system are:

- Four cells/ponds to enhance bacterial die-off. The disinfection rate is much greater (90×) compared to a large single-cell lagoon with a similar retention time.
- The use of the aerators to improve performance.

Now that performance has stabilised (see post treatment wastewater quality 3.12), the positive water quality impacts are:

- The bioavailable organic contaminants entering the lagoon system are degraded to near completion;
- Nutrient loads are decreased through losses to sludge in the base of the lagoon and through nitrification and denitrification reactions;
- The organic load generated by phytoplankton in the effluent stream results in BOD_5 typically around 0 to 40 mg/L, but levels of 80 mg/L can occasionally occur (Figure 14); and
- Effluent bacteria levels are many orders of magnitude lower than the influent levels.

3.11.3.6 Sludge management within the ponds

Over time sludge will build up in the lagoons as organic matter settles. Although not required to date, excess sludge can be removed from the treatment process lagoons by pumping supernatant liquor to the poddy dam which is an existing small dam to the north-east of the treatment pond system (see Appendix A) for temporary storage. The sludge can then be removed off site for composting.

3.12 Post Treatment Wastewater quality

Annual median water quality results relevant to the Tasmanian Recycled Water Guidelines (TRWG) and irrigation activities are presented in table 8 and table 9.

Wastewater quality has at times not met Class B recycled water standards, based on one or more of the required parameters (thermotolerant coliforms, BOD or pH) being outside the specified range. This is clearly represented in table 8.
Additionally, the electrical conductivity (salinity) of wastewater has been high, with particularly high salinity levels reached in 2014–15.

Table 9 demonstrates that Thermotolerant Coliforms, Biological Oxygen Demand and pH have remained compliant to TRW Guidelines in 2018 and 2019, when using median results. Table 10 highlights the improvements made to conductivity across the past 4 years.

As noted in Section 3.11, since late 2015 improvements have been made to wastewater treatment with the installation of the aeration, screw press, balance tank and dissolved air flotation (DAF) unit. Since then, the quality of the wastewater has improved, with a reduction in thermotolerant coliforms, BOD (Figure 14), and ammonia nitrogen and total phosphorous (Figure 15). Improvements in salinity can be seen in Figure 16 and Figure 17. While there has been a considerable improvement, salinity remains higher than what is considered optimal for agricultural production and will be shandied with low salinity water for irrigation reuse under this WWREMP.
The increase in pH observed in the wastewater ponds (Table 9) is due to the improved operation of the water treatment ponds. The ponds utilise algae and bacteria to break down organics in the wastewater stream. As a result, photosynthesis and respiration occur in the pond. HCO_3 (formed when CO2 is dissolved in water) and H+, which both lower pH, are consumed during photosynthesis, resulting in an increased pH. The loss of HCO_3 also decreases the pH buffering capacity of the wastewater. With reduced buffering capacity, the higher pH wastewater will have little effect on soil pH when irrigated as it is unstable and will quickly be influenced by the soils natural pH and CO_2 moving into the air. (D. Ray pers. comm.)
The long-term stabilisation of BOD at low concentrations is also shown in Figure 14.

Table 8: Historical comparison: annual median wastewater quality Parramatta Creek v Tasmanian Reuse Water Guidelines for Class B recycled water requirements prior to 2016 wastewater treatment plant upgrades (red above guideline levels)

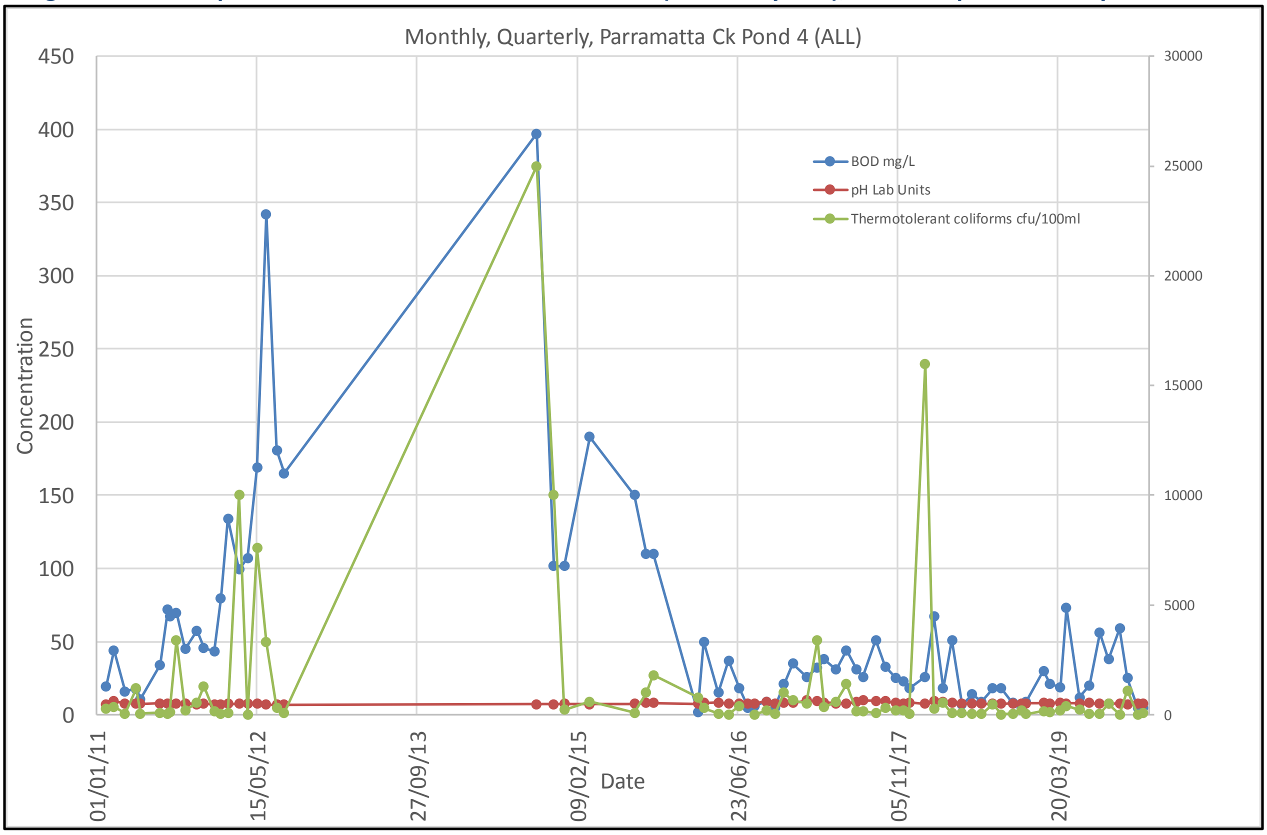
Parameter	TRWG Class B quality	2011	2012	2014	2015
Thermotolerant coliforms (cfu/100 mL)	<1,000	230	150	10000	800
BOD (mg/L)	<50	44.4	134	102	130
pH	5.5–8.0	7.6	7.3	7.3	7.75

Table 9: Annual median wastewater quality Parramatta Creek v TRWG Class B 2016 – Present (August 2019) (red above guideline levels)

Parameter	TRWG Class B quality	2016	2017	2018	2019	Median results 2016-2019
Thermotolerant coliforms (cfu/100 mL)	<1,000	240	250	90	185	195*
BOD (mg/L)	<50	15	31	16	25.5	21*
pH	5.5–8.0	7.8	8.65	7.75	7.9	7.9*

Based on 43 monthly samples conducted between 1/1/2016 – 31/8/2019

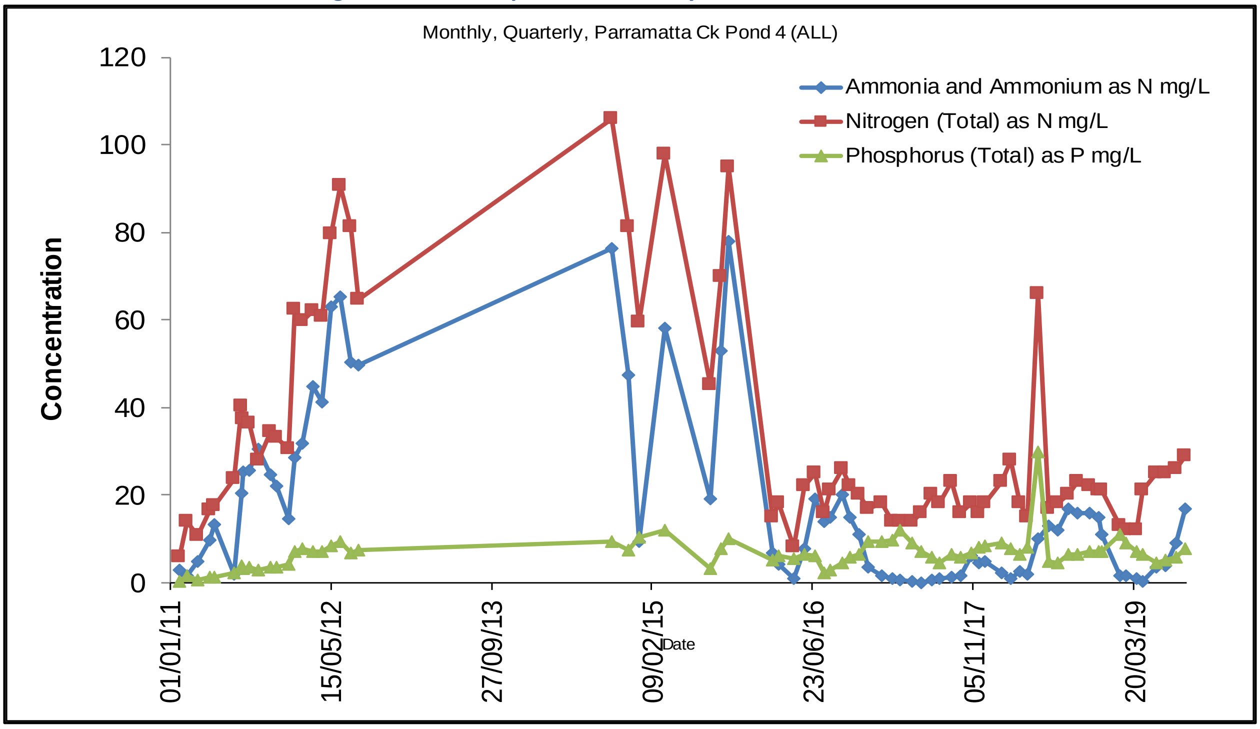
Figure 14:WWTP performance Thermotolerant Coliforms (secondary axis), BOD and pH laboratory 2011-2019



Please note that data could not be located between 8/8/2012 and 6/10/2014, potentially lost through software failure

The decrease in nutrients post WWTP upgrades is depicted in Figure 15. The variation in results post the upgrades seen within the key nutrients shown in Figure 15 reflect to some extent changes in production and also seasonal performance of wastewater pond systems.

Figure 15: WWTP performance key nutrients 2011 – 2019

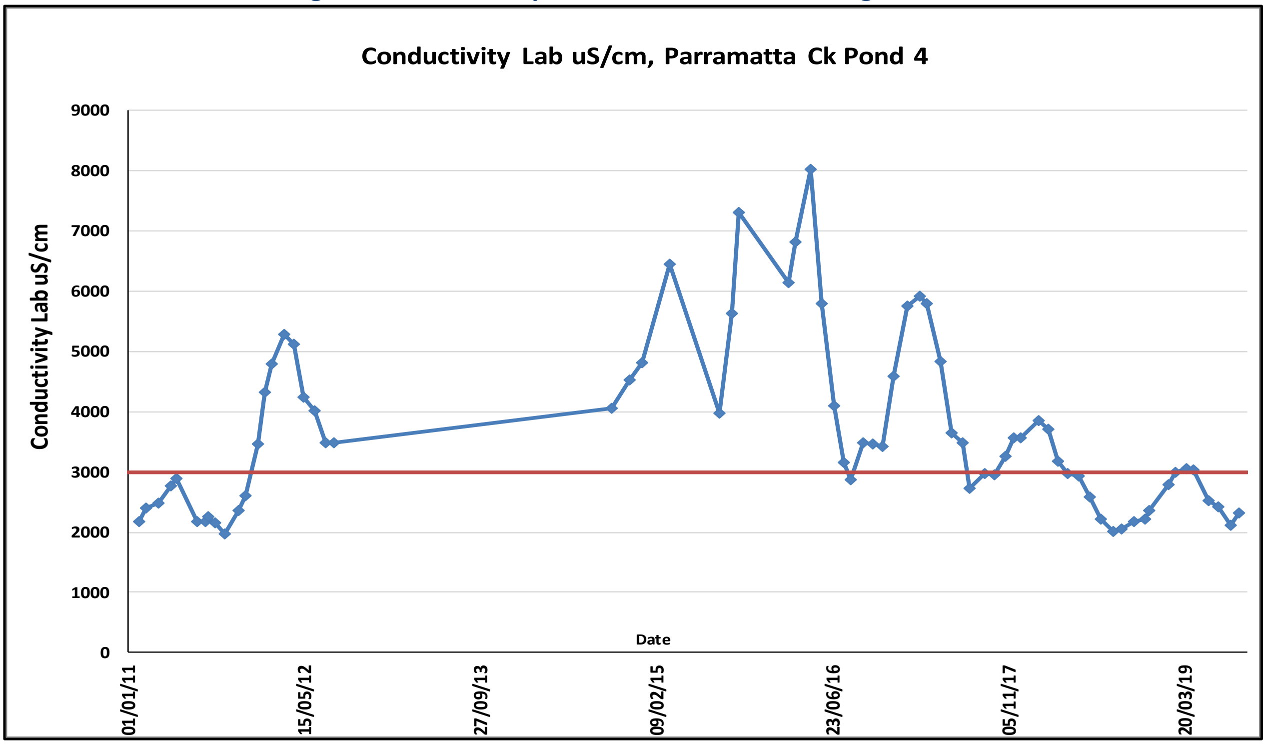


3.12.1 Wastewater Conductivity/salinity

Salt utilised within the transport of fish from Southern and Western operations has caused issues within the wastestream exiting the facility since the beginning of the process. The salt is utilised within a slurry (mix of ice and brine water) to allow for the water portion to be chilled to below 0^{o} without freezing. Fish are placed in this slurry mix which keeps the ice portion frozen longer and reduces the core temperature of the fish to below 4^{o}C when they arrive onsite at Parramatta Creek for food hygiene and flesh quality purposes.

As production increased, salinity (measured as conductivity) steadily increased reaching a peak in 2016. (Figure 16 below).

Figure 16: conductivity Parramatta Creek 2011 – August 2019



Please note that data is not available for conductivity from the middle of 2012 to the end of 2014.

As seen in figures 16 and 17, Electrical conductivity in the wastewater ponds (measured at the irrigation outlet pond 4) has steadily declined since April 2016.

Major improvements have been made to reduce the salinity levels in the wastewater stream. These improvements stemmed from an audit and assessment of salt use directly related to the transport of fish and the use of salt at the Parramatta Creek facility.

Improvements post the 2015 audit have been:

- Strict protocols and procedures were introduced to prevent unnecessary salt use;
- Data management systems introduced at Parramatta Creek and Port Huon to ensure that the salt slurry systems are operating at their minimum salt load and any issues can be identified;
- In 2016 – A salt recovery system was installed at the Parramatta Creek site to capture clean high saline water that was entering the site's waste stream. The high saline water is now recycled through the slurry production system. An estimated $100,000 spend of capital to achieve the improvement;
- 2017 – An upgrade of the salt slurry system at Port Huon to stabilise conductivity within the transport slurry water was completed in March 2017. This included the incorporation of new chilling refrigeration plants and a new slurry storage system ensuring that ice portion of the slurry remained at its highest reducing the water portion, this was an estimated $750,000 spend of capital;
- 2018 – Key fish transport management and staff have refined the salt slurry through a series of system modifications to fine tune the salt operations to use the minimum amount of salt whilst maintaining performance; and
- 2019 – Freshwater portion of slurry mix increased decreasing salt portion further.

Figure 17 below highlights the effect of the above management changes regarding conductivity (us/cm) within the irrigation water at PC. The variation has been reduced when comparing winter (cool ambient temperature and low production) and summer variations (high ambient temperature and high production).

Conductivity levels in 2016 ranged from 3000us/cm to 8000us/cm in 2018/2019 this range has been between 2000us/cm and 3000us/cm.

Figure 17: Conductivity in Irrigation water at Parramatta Creek post the 2016 peak upgrades – trend line in red

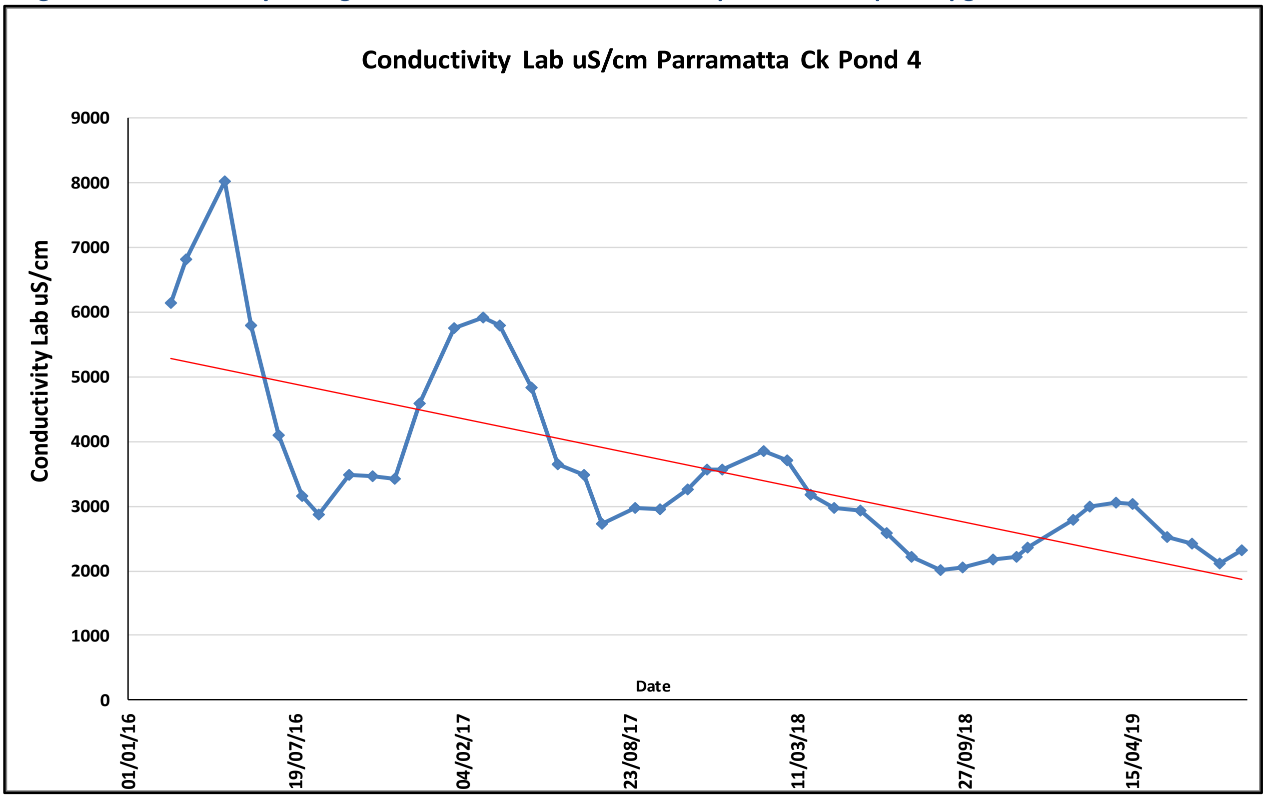


Table 10 below provides a summary of conductivity levels across the site when measured as an annual median result.

The WWREMP provided as a supporting document to the DPEMP was developed on the conductivity of the wastestream remaining below 2500us/cm.

Table 10 highlights that Huon Aquaculture has been able to maintain a median result of <2500us/cm whilst increasing production onsite in 2018 and 2019.

Table 10: Conductivity (median) Annual result Parramatta Creek Irrigation (pond 4) >2500uS/cm in red

	2011	2012	2013	2014	2015	2016	2017	2018	2019
Conductivity uS/cm*	2300	4250	NR	4520	6040	4090	3560	2470	2380

Data based on Quarterly sampling 2011 – 2015, and Monthly sampling 2016 – August 2019

3.13 Expansion of irrigation area

To date irrigation of wastewater from the processing facility has been conducted on the property owned by HA.
This DPEMP proposes an extension of irrigation activities to include the property adjacent to HA, owned by the Layton family and managed by Mr Troy Layton (additional 69.3 ha). Table 3 outlines the land tenure details for these properties and the locations are shown at a regional level in figure 3.

The WWREMP (see Appendix B) provides detail on the:

- baseline environment data;
- transition from current wastewater management to the expanded irrigation;
- wastewater quantity and quality;
- salt load management;
- land capability assessment;
- irrigation system design and the application of wastewater;
- fresh water supply;
- operational management; and
- wastewater management practices.

plus, significant additional data and detail.

A summary of irrigation is provided below and a summary of baseline data is provided in Section 6.
Irrigation infrastructure will be designed and constructed in a way that enables automated shandying of wastewater and fresh water to achieve target electrical conductivity of 1100 µS/cm or less.

3.13.1 Irrigation area

Irrigation sites were selected to maximise the use of the land best suited to irrigation as identified by the land suitability and capability assessments. The proposed system will irrigate land owned by HA and the adjacent property owned by the Layton family and managed by Mr Troy Layton.
Buffers of 50 m from the highway and 20 m from streams were applied in the design process, and irrigators configured to not cross into these exclusion zones. The total proposed irrigated area will be around 79.8ha, plus additional area if the end gun on the existing pivot (CP4) is utilised, bringing the total to close to 80 ha.

3.13.2 System layout

The proposed irrigation concept includes five new centre pivot irrigators in addition to the existing centre pivot installed and operating on the HA site. The details of all six irrigators are provided in Table 11 and depicted in Figure 23.

Figure 18: Layton's land

Table 11:Proposed centre pivot irrigators

Irrigator ID	CP1	CP2	CP3	CP4 (existing)	CP5	CP6
Length	430 m	301 m	225 m	168 m	196 m	174 m
Area (ha)	28.48	15.95	13.47	10.5 (+ end gun)	6.01	5.4
Degree of arc	176°	201°	304°	360°	180°	204°
Flow rate @ 7 mm per day	23 L/s	12.9 L/s	10.9 L/s	10 L/s	5.1 L/s	4.6 L/s

3.13.3 Irrigation application

Sprinkler packages are proposed to deliver 7mm per day over the entire area in a 24-hour period of continued operation. This will be adequate to meet peak irrigation water demand in most years for perennial pasture. It should also be noted that the system does not require all pivot irrigators to be operational all of the time to meet pasture irrigation demand. The system is designed to enable withholding periods for livestock to be implemented.

3.13.4 System flow rate

The proposed system is described in detail in Appendix B. It will have a total design maximum flow of 66.5 L/s The shandying rates will be variable depending on the wastewater salinity (refer WWREMP).

The existing water supply infrastructure to the HA site cannot deliver this volume of fresh irrigation water; therefore, the fresh water supply will be drawn from the existing irrigation dam located on the Layton property (referred to as Layton's dam and marked on Figure 23).

3.13.5 Capacity to irrigate and still implement management practices

The centre pivot irrigators will be configured with 7mm sprinkler packages. This means that if the irrigator was operating continuously for 24 hours and covered the entire area of the circle (i.e. it travelled 360 degrees) in that time it would apply 7mm of irrigation water. Therefore, with a capacity of 7mm per day, the system could apply up to 49mm per week, which is significantly in excess of potential evapotranspiration (ET) within the irrigation period, and the pasture water requirements. This allows for a significant amount of down time on each centre pivot system.

The potential wastewater volume available (based on 33,000 tpa production) is 112ML, which will be diluted with fresh water at a rate of between 2:1 and 3:1 (dependant on conductivity of wastewater), resulting in between 330 and 440ML of total irrigation water available. Including the existing centre pivot on HA land, the application area available is 79.8ha.

With a capacity of 7mm per day, the system can apply up to 5.6 ML per day if operated continuously. Therefore, it is possible to apply the entire volume in 59 to 79 days of continuous irrigation. However, irrigation scheduling with centre pivot systems usually involves a three- to four-day irrigation interval, with the actual depth of application managed to meet pasture ET requirements for that period.

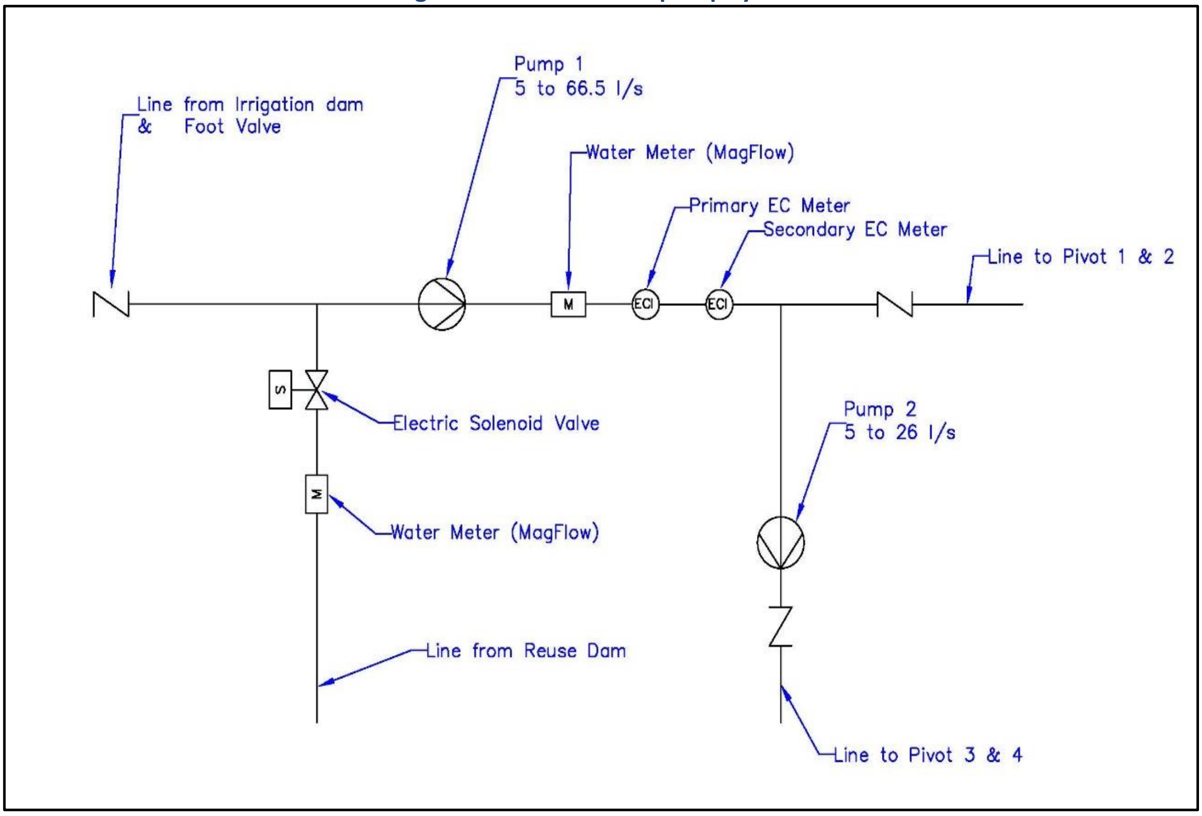
As ET demand increases, the hours of operation increase, while the area covered remains the same; as ET demand decreases, the hours of operation decrease. A three- to four-day irrigation interval is optimal for pasture production. The aim of irrigation scheduling is to apply the right amount of water at the right time and if done correctly excess soil moisture will be avoided. If any area within the site does become too wet due to rainfall, then the system can simply be turned off for an appropriate period of time.

3.13.6 Pumping system

While it is preferable for all irrigators to run concurrently, it is likely that this will not happen all the time. As result, the pump system has been designed to be capable of delivering water to any combination of irrigators and to accommodate the required level of in-line shandying from the wastewater dam and Layton's dam.

A schematic of the proposed pump system is shown in Figure 19 below and a plan view is depicted in Figure 20. This will be reviewed once the wastewater dam design is finalised.

Figure 19: Schematic of pump system



The rate of wastewater transfer will be controlled via an automated control valve and programmable logic controller linked to an EC meter located on the discharge side of pump 1.

Incorporating the wastewater supply into the system prior to pump 1 will ensure adequate mixing of the two water supplies as they pass through pump 1, therefore ensuring correct readings from the EC meter.

The target EC reading will be determined and the control valve will open and close to vary the flow to achieve the target EC (1100uS/cm).

As a safeguard for the system, a secondary EC meter will be installed downstream of the primary EC meter location. This secondary EC meter output will be linked to the control system and operate as safeguard. The control system will monitor the EC values of both instruments, with the primary instrument used to vary the dilution rates to achieve the target EC value. Should the EC value of the water in either instrument exceed the pre-set limit, the system will shut down and irrigation will halt until the system is reset. This will prevent irrigation with non-mixed water occurring if the first controller was to malfunction.

The control system will provide a live read out in the processing factory with a HA representative able to oversee the operation to monitor and ensure that EC limits are being met.

Figure 20: Irrigation metering system plan view

3.14 Winter storage dam

As foreshadowed in Section 3, a new dam is proposed to provide storage of excess wastewater during winter when rainfall exceeds evaporation by the greatest margin. The proposed dam is shown in plan view in Figure 21 and in cross-section in Figure 22. The proposed location of the winter storage dam in relation to other site activities is shown in Figure 23.

Figure 21: Proposed winter storage dam – plan view

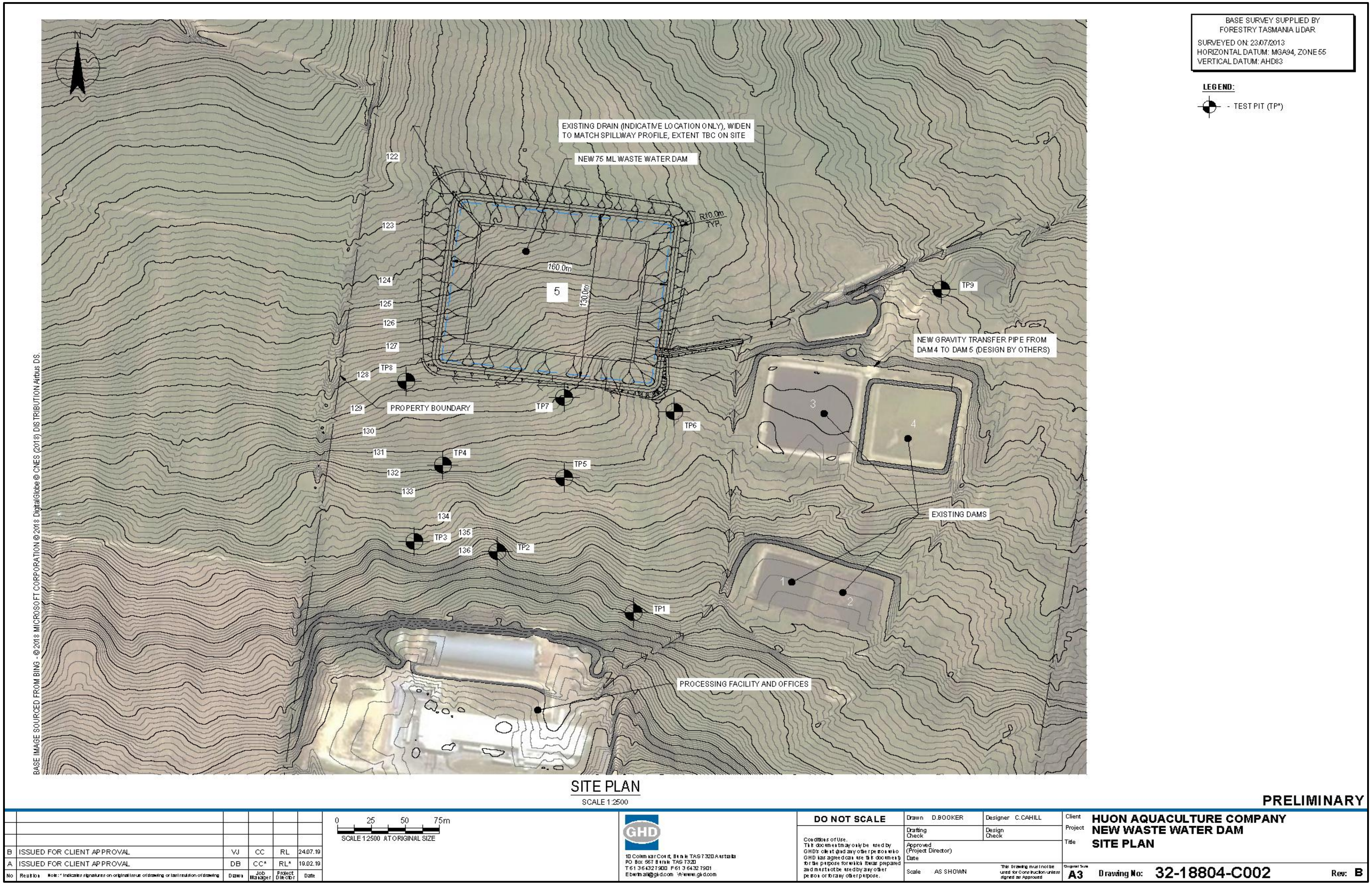


Figure 22: Winter storage dam – longitudinal cross-section

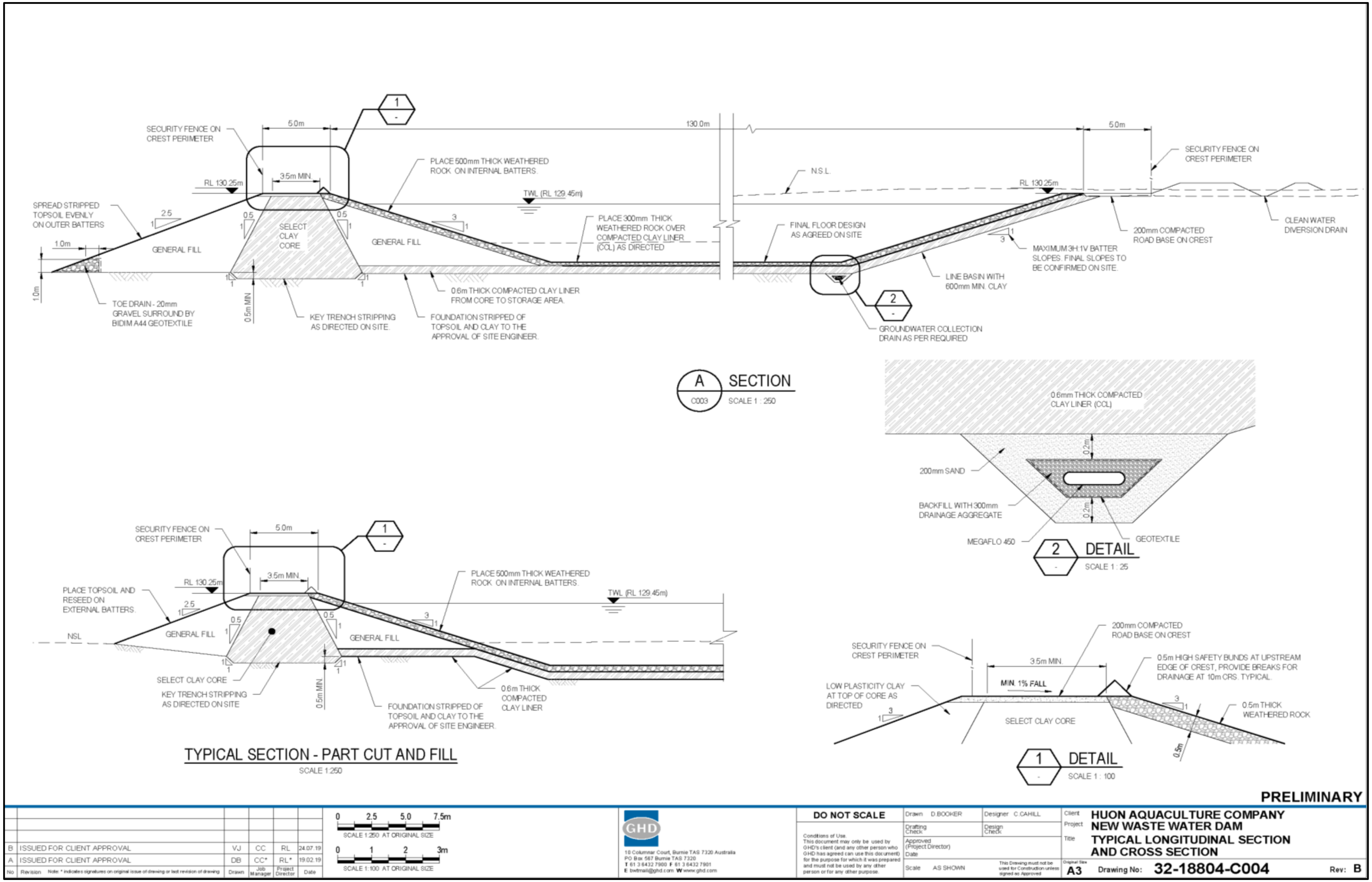
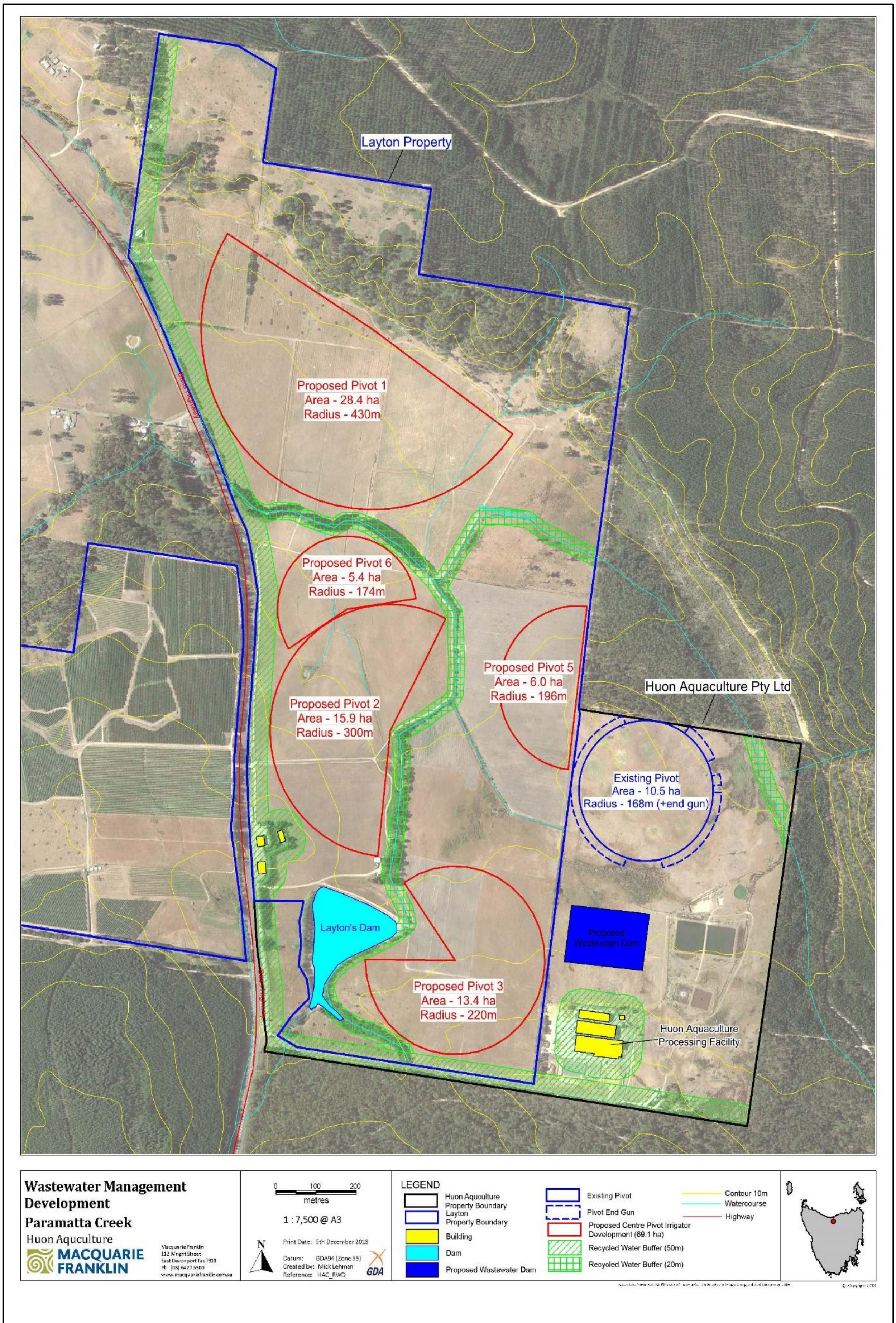


Figure 23: Proposed centre pivot areas showing winter storage dam



3.15 Domestic sewage

Sewage from the staff amenities at the facility is treated by an existing (upgraded 2019) Aerated Wastewater Treatment System (AWTS) at the site, which has a total capacity for 200 staff and assumes a 7 day per week operation. This system exceeds the maximum expected total sewage load for the HA processing facility at the proposed increased production rate.

Effluent from the system is disposed of using an in-ground trench system. The location is shown in Figure 24.

Figure 24: Location of AWTS septic system and disposal location

The trenches for the septic disposal are 131 m from the southern lagoons, 200 m from the northern lagoons, 90 m from the winter storage dam and 89 m from the closest Layton irrigation centre pivot area.

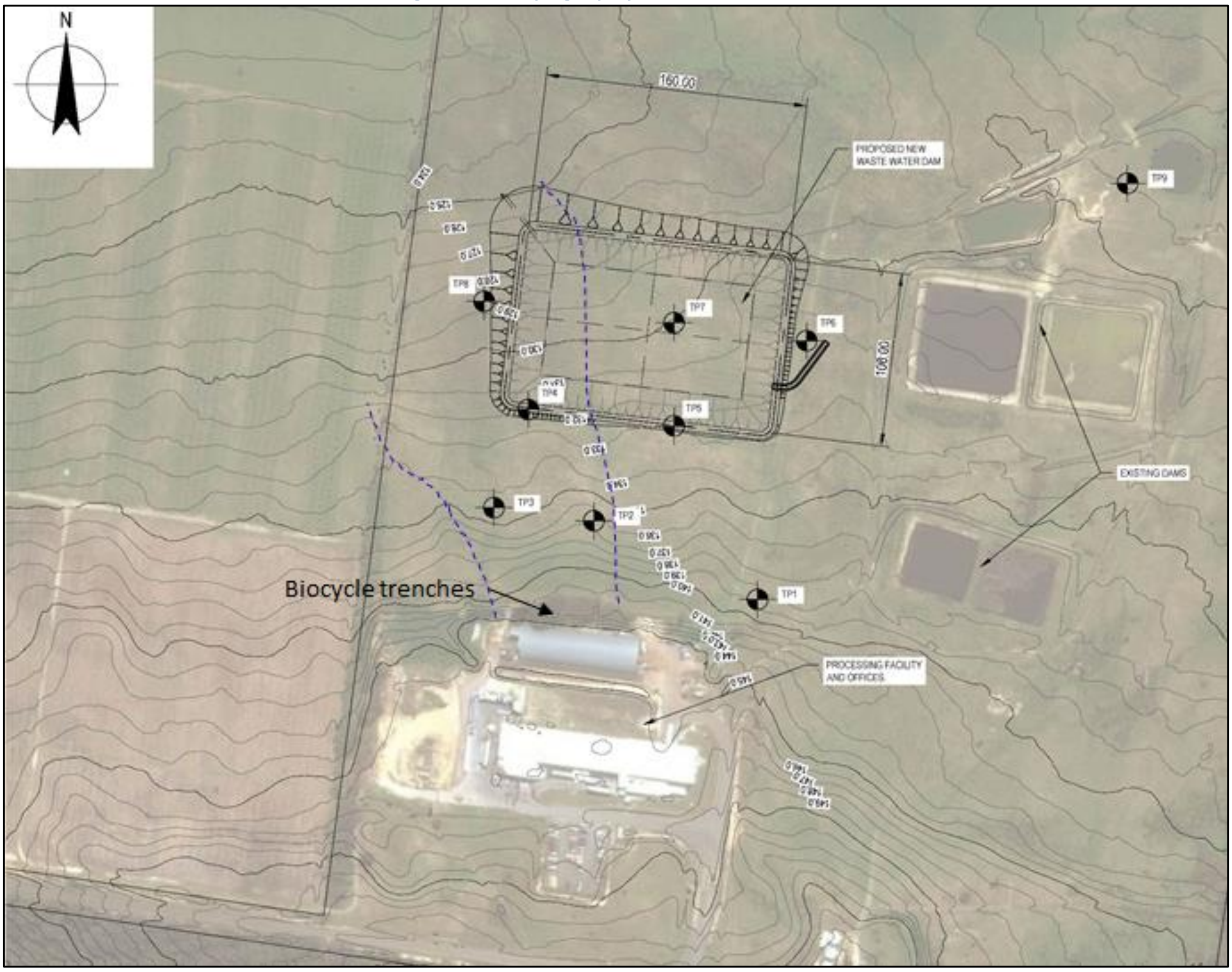
The land, on which the trenches are located on is relatively flat.

Figure 25 is an excerpt from a GHD map of the proposed winter storage dam at a scale of 1:2500.

The excerpt depicts the localised topography adjacent to the trenches. The contours indicate that any seepage from the trenches would report towards the north-east of the winter storage dam and potentially beneath the winter storage dam. These paths are marked as dotted lines. The proposed dam design is a hillside storage, with a low (< 7.5 m high) engineered embankment to confine the pond to the north, east and west. Topsoil will be stripped and stockpiled for later spreading on external batter slopes to aid revegetation. Underlying clay will be stripped and stockpiled for later use as a compacted clay liner (CCL).

Given the site topography and dam design the risk of any seepage from the trenches upwelling through the dam is low to nil.

Figure 25: Topography AWTS trench area



3.16 Wastewater – other

A truck washing bay outside the factory facility is surrounded by a bund. The wash-down water and any stormwater captured in this area is delivered to a balance tank before being sent to the WWTP for treatment in a controlled manner. The wash bay has sufficient capacity to meet the needs of the proposed production increase.

Wastewater production estimates factored in the wash-down water when developing the water balance.

3.17 Stormwater

Uncontaminated site stormwater flows by existing drainage lines into Felminghams and Parramatta creeks.

Stormwater interceptor traps are installed to ensure that sediment and petroleum hydrocarbons are not released to these creeks. As a result, stormwater is not expected to have an adverse impact on protected environmental values (PEVs).

The proposed production process increases will take place inside the existing factory and effluent from the factory will follow existing treatment and management paths, other than for increased irrigation as detailed in this document.

As a result, potentially contaminated process wastewater will continue to be kept separate from clean stormwater.

3.18 Construction

3.18.1 Site preparation and construction works

No additional clearing of the site will be required for the increase in production. The current site hardstand areas will be able to accommodate the increase in production within the existing facilities.

The only new footprint required will be for the construction of a new 75ML storage dam required for winter wastewater storage as detailed in the Wastewater Reuse Environmental Management Plan (WWREMP). All wastewater storage will occur in the winter storage dam. The location is shown in Figure 21. Figure 23 highlights its relationship to the proposed centre pivot irrigation areas, buffer zones and existing waterways.
The new storage dam is proposed to be located to the west of the existing ponds in an area that is already cleared.

3.18.2 Construction materials

The increase in production does not require any additional buildings and therefore no new construction will be required with exception of the new 7ML winter storage dam.

Construction of the proposed winter storage dam is detailed in Appendix G.

Construction materials for the dam will include won topsoil, which will be stripped and stockpiled for later spreading on external batter slopes to aid revegetation; underlying clay, which will be stripped and stockpiled for later use as a compacted clay liner (CCL) to limit seepage risk.

Fill for construction of the dam embankment is to be won from the reservoir excavations.

3.19 Commissioning

There will be no major commissioning activities undertaken at the site as part of the increase in production, as there will be no major equipment upgrades. The components of the irrigation system – the new centre pivots, and the new pumps valves and lines associated with the irrigation system – will require minor commissioning. This is described in detail in Appendix B.

A post-construction assessment of the winter storage dam will be required to ensure the dam has been built and fills to specified design. This will be conducted by the dam engineer.

3.20 Access, infrastructure and equipment

Access to the site is via a sealed existing roadway off the Bass Highway. This was upgraded as part of the original construction works for the facility and no additional upgrade is required.

No new off-site infrastructure will be required as part of the increase in production at the Parramatta Creek site.

The proposed increase in production will not have a significant impact on off-site infrastructure or facilities.

There will be a small increase in transportation both to and from the site, resulting in an increase in traffic on the roads; this is discussed in Section 3.23.

3.21 Solid waste production

General wastes are produced from packaging materials and from staff amenities.

Organic wastes at the site are generated from the WWTP. These are mainly solids from screening and biosolids production.

Some fish processing wastes are produced by the current activity.

The most significant fish processing solid wastes produced at the site are:

- fish viscera, generated through primary processing (intestines etc known as gut)

Fish processing generates approximately 10% by weight of waste in the form of gut material.

With the proposed production increase to approximately 33,000 tpa this will equate to 3,300 tpa of waste generated. To date, viscera have been removed daily by Spectran and taken by tanker to Interlaken for compost production.
Solids removed from the DAF unit reports to a viscera waste management system and are sent to composting twice weekly.
larger organic solids are stored in sealed containers and removed off site daily by Spectran.

Approximately 10–15 kg of waste ash from the smokehouses is removed from the smoke generators daily. This is placed in a designated waste bin, approximately 1 m^3 in volume. When the Waste bin is full (usually once per month) it is collected by a contracted environmental waste service and delivered to Dulverton Waste Management for addition to their compost.

Heads and frames and other offcuts have been frozen and stored before being transported off site on a weekly basis as feedstock for pet food production in Victoria, this is not considered waste but is sold as a cost neutral by-product with the receiver paying for handling and freight. This will continue to occur under the production increase as the product is considered in demand.

3.22 Noise sources

The nearest sensitive noise receptor is located over 800m away. This is a dwelling located to the north-west of the facility, no complaints have ever been raised from this location, the next nearest dwelling is over 1200m away.

To the north, south and east of the facility is state forest and to the west is an existing orchard.

The main potential noise sources associated with the proposed facility are/will be:

- truck movements associated with the operation
- refrigeration compressor and condenser systems on fixed plant
- pumps and valves delivering irrigation water to centre pivot sprinklers
- miscellaneous minor process equipment.

All processing equipment is installed inside buildings.

3.23 Traffic

Access to the site is from the Bass Highway. The Bass Highway is a State Road and in the vicinity of the site is classified as a Category 1 Truck Road (the highest classification) in the Department of State Growth Road Hierarchy System.

The access from the highway was upgraded as part of the development approved in 2009. The upgraded access is sufficient to cater for additional traffic associated with this proposed production increase.

Vehicle movements associated with the current production rate and the proposed production rate are shown in Table 12.

Table 12: Vehicle movements

Vehicles	Actual vehicle movements per day 2018/19	Increased production up to 33,000 tonnes VPD
Trucks		
Semitrailers delivering salmon for processing from Port Huon between October and February	4-9	4 –11
Semitrailers delivering salmon for processing from Strahan via Burnie between March and June	2–4	3–6
Semitrailers delivering cartons and packaging materials, mainly travelling to and from Devonport	1–2	4
Rigid truck for removal of processing waste	1	1
Semitrailers collecting finished goods and transporting them to Devonport for shipping	2–5	4–6
Light Vehicles		
Staff entering the site between 6 am and 7 am and leaving between 3 pm and 6 pm	≤130	≤140
Site visitors, tourists	<10	<20

3.24 Off-site infrastructure

No additional off-site infrastructure facilities are required for the proposed development, other than the offsite irrigation on Troy Lathan's land.

3.25 Personnel

Currently, 140 staff are employed at the Parramatta Creek facility.

The increase in production at the site will require an additional 20 - 50 employees and will also provide increased stability for the existing employees.

4 Project Alternatives

HA is operating a processing facility at Parramatta Creek. The company is wishing to increase the factories production to a maximum of 33,000tpa of processed product.

The site and the project are considered extremely important for Huon Aquaculture, its future expansion and for its employees.

There are alternatives to the project proceeding, however these alternatives are considered unfavourable and have been summarised below;

4.1 Alternative Processing Site

4.1.1 Tasmanian Location

One of the alternatives to the expansion of production at the current site is to develop another location within Tasmania.
Huon Aquaculture still owns the now disused processing plant at Port Huon in Southern Tasmania. Infrastructure onsite at the Port Huon location was considered outdated and beyond repair ten years ago and would therefore require demolition and redevelopment.

In addition, the machinery utilised to process the fish is currently being utilised at Parramatta Creek and new machinery would be required to be purchased and imported from overseas.

No additional equipment is required for the Parramatta Creek increase in production.

The development of a new Tasmanian processing site would also be required to go through the entire development application and assessment process including community consultation, noise, odour and traffic assessments and potentially need to seek direct discharge approval for the wastewater to sea as offsite irrigation in the Port Huon area is unavailable.
The need to undertake the above approvals and development processes would require lengthy delays to future processing expansion and would require considerable financial investment for HA.

4.1.2 Mainland Location

Huon Aquaculture has already established a processing plant in Sydney that could be utilised to process product above the current 14,000 tonne production capacity. This is considered unfavourable due to the additional freight costs for transporting whole fish to Sydney.
Currently this site is utilised to provide local (NSW) customers with specialist value added cuts of Salmon however, its use as a processing facility for whole fish has been considered as a potential contingency if approval of the proposed expansion at Parramatta Creek was rejected.
This outcome is considered unfavourable and would see the reduction in staff levels at the Parramatta Creek facility.
In addition to the above, other mainland locations have been considered such as Geelong in Victoria where the employment opportunities are considered valuable to that location and in addition an expansive water reuse scheme has recently been developed that could utilise the wastestream. Of all the mainland sites Geelong and its closeness to Melbourne is considered the preferred mainland site.
The cost of relocation although considered high could be offset with potentially favourable Victorian state government incentives that may see the move financially viable considering the current elevated level of costs in regards to achieving approvals and the extended green tape delays.

4.2 Wastewater transported off site for disposal

As an alternative to the proposed offsite Irrigation expansion for the reuse of wastewater other disposal options have been considered as below.

4.2.1 Trade waste disposal

HA initiated discussions with TasWater in relation to a trade waste connection from the processing plant to Railton or Latrobe municipal wastewater systems.

TasWater has advised that at Railton, the sewage treatment system is a lagoon system with wastewater irrigation. The Railton system is constrained by issues of wet weather storage and salt/reuse incompatibility, and as such, is not available. The Latrobe sewage treatment plant is at capacity, so it cannot accept a new trade waste stream of the volume required by HA.

Further discussions with TasWater revealed that no facility was available in the state to take the wastewater from the activity on a permanent basis.

4.2.2 Direct discharge to the Mersey River

HA commissioned a pre-feasibility study into the disposal of wastewater by discharge into the Mersey River. This study indicated that limited quantities of excess wastewater could potentially be piped to the Mersey River for direct discharge during winter when rainfall precluded irrigation.

It was considered likely that dilution effect could mean there would be no significant adverse impact on the Mersey River PEVs. However, the pipeline cost would likely be high (5 Million) and summer discharge may not be possible during low flow periods. The time required to fully evaluate the assimilative capacity of the receiving waters means this is not a viable short-term option.

HA will continue to review this option as a potential winter release method, possibly in conjunction with an additional water intake system and pipeline.

HA understands that this would require a new environmental assessment including the assimilative capacity of the Mersey River and the use of accepted or best practice methodology prior to discharge in accordance with the State Policy on Water Quality Management (DPIWE, 1997).

Overall HAC prefer a full reuse of its wastewater and all wastestreams and favours reuse over disposal wherever practicable and sustainable.

4.3 Summary of Project Alternatives

There are no viable project alternatives to facilitate the increase in production other than complete relocation of the facility to the mainland.

The Parramatta site is already operating as a fish processing facility and very little additional infrastructure is required for the increase in production to occur. If production remains at the current site, the increase in production should have minimal environmental impacts, apart from an increase in transportation of raw materials to the site and product and waste materials from the site, and an increase in the volume of treated wastewater that will need to be irrigated.

To manage the increased wastewater, HA is proposing an irrigation plan based on a very different approach from the historical practices at the HA irrigation site.

The major changes forecast in the WWREMP, include the following:

- The EC of wastewater from the facility has reduced considerably in the last few years and will continue to be managed in an efficient manner;
- To prevent elevated conductivity water from being irrigated – the system will be automated to ensure EC does not exceed 1100 µS/cm;
- The establishment of a large storage dam, which has been designed for a > 90th percentile rainfall year, will enable irrigation to be matched to plant water demand – not a disposal-driven irrigation regime;
- Low application rates of wastewater per-hectare;
- Significantly improved management practices of irrigation application and land management. The land (both Layton’s and Huon Aquaculture’s) will be managed by an experienced farm manager, with a mechanism in place for accessing agronomic and land management support. The land manager will undergo training in best practice pasture management and irrigation, as well as irrigation scheduling;
- The infrastructure will be vastly improved through the installation of centre pivots with appropriate sprinkler package design, ensuring even application of waste at rates suited to the varying soil types and plant requirements;
- The soils identified for irrigation on Layton’s farm are generally better suited to irrigation than the soils on Huon land; and

- Pasture varieties typically grown in the region are tolerant of water with considerably greater EC than 1100 µS/cm and moderate soil salinity.

A robust monitoring program (application rates, EC, soils, groundwater, surface water) has been developed and will ensure ongoing monitoring of system performance that will enable management interventions to be implemented if required. Also proposed is an annual compliance check conducted by an external consultant to monitor and report on HA's compliance with implementing the WWREMP. The feedback loop of the monitoring program is a key part of the management process. Annual reporting of all monitoring programs would be supplied to the EPA, pulling together a complete picture of system performance and environmental impact.

The proposed irrigation plan has been designed to comply with the EPA's Wastewater Reuse EMP Review Guidelines, 2014 and the Environmental Guidelines for the Use of Recycled Water in Tasmania, 2002.

The proposed Irrigation plan as outlined within the WWREMP is considered a "Low Risk" irrigation scheme by the developing consultant Macquarie Franklin.

5 Stakeholder Consultation

HA has consulted with stakeholders including the Latrobe Council and the EPA.

The site is an existing facility operating with signposting from the highway to encourage visitors.

HA has not received any complaints in relation to the existing Parramatta Creek facility.

6 Existing Environment

The current and proposed future irrigation sites are private freehold located off the Bass Highway in Sassafras in northern Tasmania. The surrounding land tenure to the north, east and west is also private freehold.

6.1 Topography

The current Huon site and the proposed Layton land for extension of irrigation is relatively flat.

The surrounding areas of state forest are quite hilly, especially to the east of the property.

The current Huon irrigation area has a gentle slope downwards towards the middle of the irrigation area and then the land slopes upwards to a high point in the north-west corner of the property. At the low point in the middle of the irrigation area there are several ephemeral drainage lines, which are obvious during high rainfall.

The adjacent Layton land also has a gentle slope downwards towards the middle of the irrigation area, towards the existing ephemeral Felminghams Creek, which flows from an existing dam to the north and west towards Parramatta Creek.

Figure 23 (page 53) shows the 10 m contours, proposed irrigation zones on Layton's and HA land, as well as buffer zones to the waterways traversing or adjacent to the properties.

6.2 Reserves and conservation areas

There is a private timber reserve to the north and east of the site and Permanent Timber Production Zone land to the south and south-east of the site (Figure 26).

The proposed operation and its potential impacts are local in nature and not expected to have an impact on any of these reserves or conservation areas.

Figure 26: Reserves and conservation areas

6.3 Climate

The site is situated in the cool temperate climatic zone. The closest active Bureau of Meteorology (BoM) weather station is located at East Sassafras (Elphin Grove, station number 091171, which has an elevation of 81 m and opened in 1965). Elphin Grove is approximately 9 km north of the site. This station only records rainfall (Table 13).
The closest active BoM weather station that records temperature is located at the Devonport Airport, station number 091126. It has an elevation of 8 m and opened in 1962. It is located around 21 km north of the site (Table 14).

The Devonport Annual wind rose, shows winds predominantly from west-southwest and southeast. Winds are usually in low (< 3m/s) to medium speed (3 to 6 m/s). The percentage of hourly calms over the year averages to 2.1%. Seasonal breakdown of wind shows that similarities are observed for the summer, autumn and winter season. Spring shows an unusually low frequency of winds from southeast sector. CALMET predicted wind roses for the site are presented in Figure 44, Section 8.6.4 and in Appendix D and Appendix E.

Figure 27 shows the BoM wind rose for Devonport airport (pitt&sherry, 2016). Parramatta Creek is about 21 km inland from the Devonport Airport, which is on the Bass Strait coast. Modelling studies indicate that wind speeds at Parramatta Creek are generally lower, with fewer south and south-easterly winds and more westerly and north-westerly winds. This reflects the inland location and sheltering hills to the east of the site.

Figure 27: Wind rose Devonport BoM

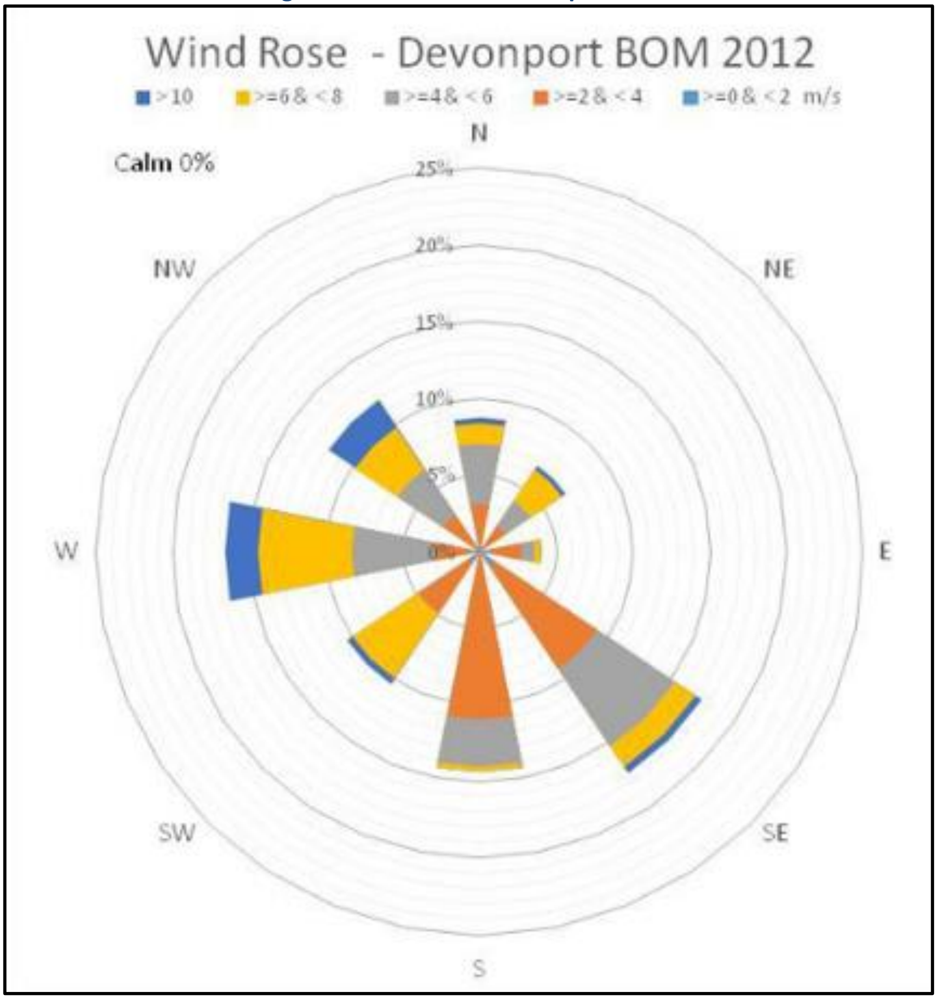


Table 13: Rainfall Elphin Grove

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean monthly rainfall (mm)	47.7	39.5	49.0	70.2	79.4	94.1	111.1	114.7	83.8	67.5	66.7	54.5	**878.2**
Lowest monthly rainfall (mm)	7.8	0.0	0.0	13.4	10.4	9.0	41.0	15.2	6.8	9.6	11.2	2.0	**126.4**
Highest monthly rainfall (mm)	181.4	181.8	206.8	197.8	217.6	198.0	258.2	272.4	173.6	154.4	141.2	154.7	**2337.9**

Table 14: Monthly temperature statistics for Devonport Airport BoM station

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Average
Monthly average temperature (°C)	16.8	17	15.9	13.5	11.3	9	8.3	9	10.4	11.8	13.7	15.2	**12.6**
Mean minimum temperature (°C)	12.1	12.3	11.2	9.1	7.3	5.1	4.3	5	6.2	7.5	9.3	10.7	**8.3**
Mean maximum monthly temp (°C)	21.6	21.8	20.6	18	15.3	13	12.4	13	14.6	16.2	18.2	19.8	**17**

6.4 Geology

The geology of the area is covered by the 1:50 000 sheet for Frankford (Gulline, 1973).
The Huon site is composed of Permian mudstone, sandstone and siltstone beds except for the very north-east corner of the property situated near the Parramatta Creek where Quaternary alluvium is found. The Huon site geology is also discussed in Appendix B referencing ground-truthing from earlier GES studies and the impact of local geology on groundwater.

6.5 Land systems and soils

Only one land system is mapped within the project area (Richley, 1978), although a second land system crosses the north-west corner of the boundary of the site.

6.5.1 564132 Latrobe

The Latrobe land system covers the entire site. The Latrobe land system consists of areas of low hills formed on Permian, Upper Carboniferous sediments. It occurs in the lower catchment of the Mersey River.

Soils within this land system vary greatly. They include sandy soils with hard pans, deeper sands, sandy gradational, and duplex profiles with dense mottled B horizons. With the separate components, there is also a degree of variation in colouring, in the amount of mottling and in the occurrence of gravel within the profiles. Another land system, 572141 Dalgarth Hill, crosses adjacent to the north-western corner of the boundary of the site.

6.5.2 572141 Dalgarth Hill

This land system comprises Jurassic dolerite trending north-west – south-east.
The stony soils are shallow on the crests, but gradually increase in depth downslope. Colours change from yellowish brown on the crests and upper slopes to reddish brown on the steeper mid-slopes, and mottled profiles characterise the gentle footslopes.

6.5.3 Land capability

The assessed land was classified into three categories:

- well suited to wastewater irrigation
- marginally suited to wastewater irrigation (with shorter irrigation season due to being lower lying and more prone to lying wet)
- unsuitable for irrigation.

This is depicted in Figure 4 and described in more detail in Appendix B.

6.5.4 Soils

The soils on the Huon Aquaculture and Layton properties have been previously described by Agricultural Resource Management (2010) and Geo-Environmental Solutions (GES, 2017), and ground-truthed by Macquarie Franklin in the development of the WWREMP (see Appendix B).

The previously completed soil maps and relevant reports were reviewed and assessed to ensure their validity in relation to the topography, known geology of the area, production system (i.e. dryland or irrigated) and agricultural land use activities.

Soil mapping was fine-tuned by assessing in detail the soils at 17 locations across the two properties, describing the soil type, soil profile characteristics and constraints such as drainage, structure and inherent agricultural qualities, and collecting samples of topsoil and subsoil for laboratory analysis.

6.5.4.1 Soil types

The soil types identified on the properties are:

- Roebuck poorly drained (Ro-poor);
- Roebuck moderately well drained (Ro-mod);
- China;
- Duplex; and
- Alluvial.

The characteristics of each soil type are outlined in the following sections.

6.5.4.1.1 Roebuck soil profile class

These soils have previously been described in the surrounding state forest and correlate to the Roebuck soil profile class as described by Hill et al. (1995). The drainage class of these soils varied across the survey and two distinct phases of this soil were mapped. These mapping units separated soils that were dominantly poorly drained (Ro-poor) from those that were dominantly moderately well drained (Ro-mod). Small areas of Roebuck soil were observed to have imperfect drainage; however, these locations were too small to be mapped separately at this scale.

Roebuck poorly drained (Ro-poor)

The poorly drained phase is mainly located on the lower slopes through the centre of the Huon Aquaculture property, with a secondary area associated with the flats surrounding Parramatta Creek. The observed soil properties indicate that these soils are generally unsuitable for irrigation of wastewater. Currently the greatest off-site potential comes from surface run-off. Their impeded drainage and slow saturated hydraulic conductivity mean that any increase to applied water will greatly increase the probability of surface water being present and the potential for off-site movement.

Roebuck moderately well drained (Ro-mod)

The moderately well drained phase was mainly located on the hillslopes situated in the northern half of the property. These soils are moderately suitable for irrigation with wastewater. Their structure and moderate drainage result in higher infiltration rates and a higher saturated hydraulic conductivity than the poorly drained phase. The higher values of organic carbon and cation exchange capacity (CEC) also mean these soils have a greater ability to retain any additional nutrients within the soil profile. However, the relatively shallow depth to the underlying fractured bedrock and the elevated position of these soils has the potential for water seepage to lower lying regions. Careful management of irrigation is needed.

6.5.4.1.2 China soil profile class (Ch)

This mapping unit describes the texture-contrast profiles formed from Permian mudstone, sandstone and siltstone that were observed around the south-eastern boundary of the property. Only a small area of this soil was found and it was generally located on hill slopes and slight rises. The observed China soils are moderately well drained with weakly structured topsoil's overlying coarse prismatically structured subsoils.

6.5.4.1.3 Duplex, deep topsoil

These deep duplex soils are located on the elevated, gently sloping and undulating land on the southern area of the Layton property. The topsoil is deep (0–50 cm) with a fine sandy texture, which abruptly changes to a heavy clay subsoil. The suitability of these soils for irrigation with wastewater is moderate, based on the sandy texture and depth of the topsoil and being moderately to well drained, resulting in higher infiltration rates and lower soil moisture holding capacity. These soils have a lower organic carbon content and cation exchange capacity and a lower nutrient retention capacity.

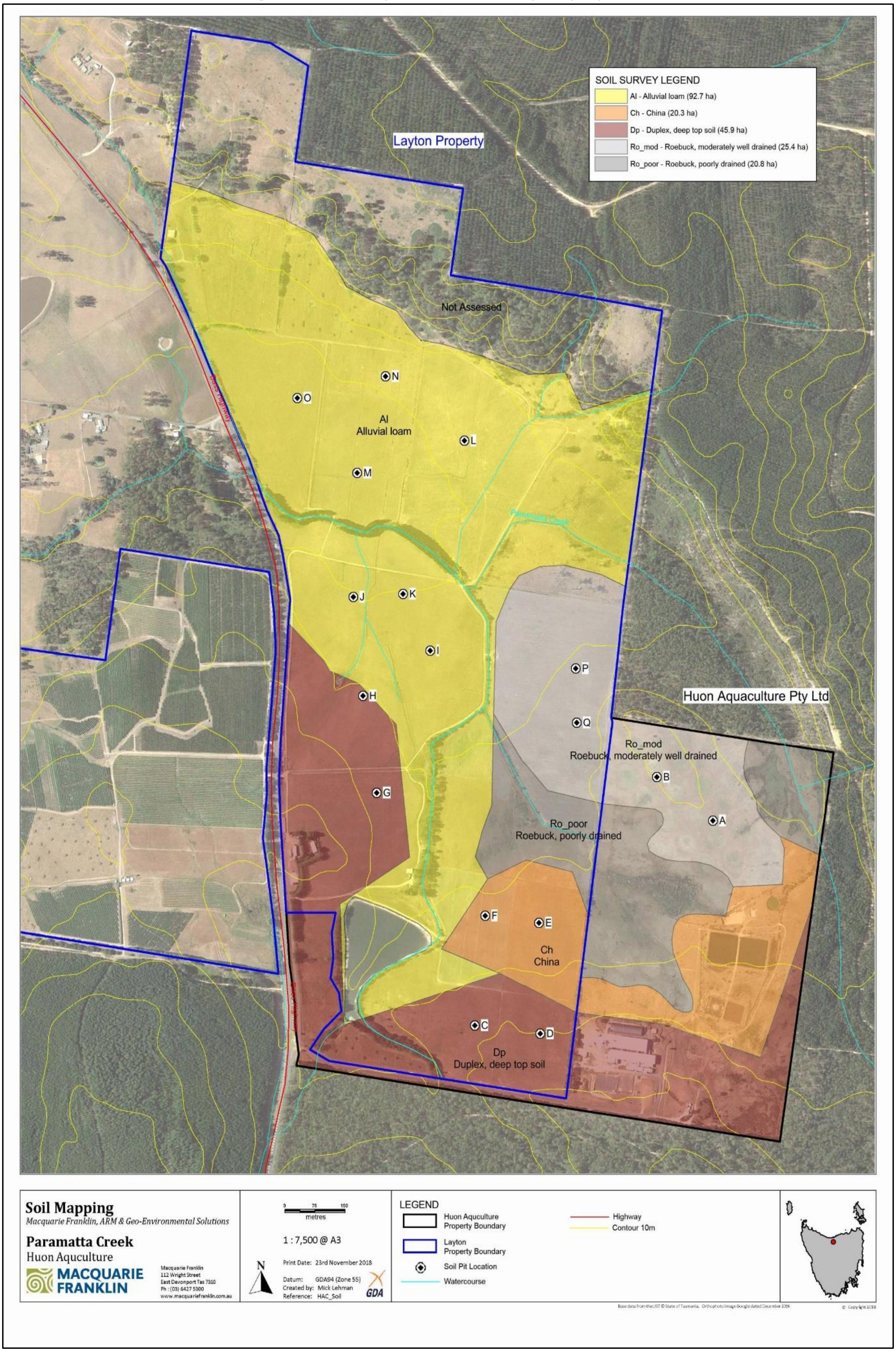
6.5.4.1.4 Alluvial soil

Alluvial soils are located lower in the landscape on the Layton property, on the flat and gently sloping land adjacent to Felminghams Creek and Parramatta Creek and on the foot and mid-slopes on the northern area of the property. These soils vary in texture but are typically a black to brown-grey sandy loam topsoil (0–30 cm) over a clay subsoil. The alluvial soils are moderately suited to irrigation with wastewater, and based on the loamy texture, depth and being imperfectly to moderately well drained, would result in moderate infiltration rates and soil moisture holding capacity.

The alluvial soils have moderate organic carbon content and cation exchange capacity and have a reasonable nutrient retention capacity. Drainage is a key factor in the productivity of these soils.

Where practical, surface and cut-off drains will assist in managing them for irrigation. It is important to note that some of this land is potentially subject to inundation and care should be taken on the sensitive land directly adjacent to the waterways.

Figure 28: Soil map of the HA and Layton properties



6.6 Biodiversity and natural values

The processing facility is located within an area of the site that has been developed and used for industrial and agricultural purposes.

The proposed expanded wastewater irrigation area is currently used for agricultural purposes including irrigation and cropping. No impact on current surrounding flora and fauna should occur.

A Natural Values Atlas Report was generated on 20 July 2017 from the DPIPWE website to inform this section.

No biodiversity surveys were undertaken to develop this DPEMP.

6.6.1 Flora

The vegetation at the Parramatta Creek site largely comprises grasslands, with the site surrounded by state forest to the north, east and south, and an orchard on the western side of the Bass Highway.

6.6.2 Vegetation communities

The vegetation community at the site, in accordance with TASVEG version 3.0, indicates the entire site is classified as agricultural land (FAG), with the exception of the factory site, which is classified as urban areas (FUR).

The surrounding land is a mixture of vegetation communities:

- agricultural land (FAG) – to the west;
- unverified plantations for silviculture (FPU) – to the east;
- plantations for silviculture (FPL) – to the north, with the exception of a thin strip of FPU adjacent to the northern boundary; and
- *Eucalyptus amygdalina* – *Eucalyptus obliqua* damp sclerophyll forest – to the south of the site.

6.6.3 Threatened flora

No threatened flora species have been recorded within 500 m of the site.

6.6.4 Introduced plants

The closest weeds recorded in the vicinity of the site were roadside weeds, pink Pampas, Spanish heath, blackberry and gorse, located along the Bass Highway.

- No *Tasmanian Weed Management Act 1999* weeds found within 150 m of the site.
- No priority weeds found within 500 m.

Both Irrigation sites conduct active weed control.

6.6.5 Fauna

A Natural Values Atlas Report for the proposed site was generated from the DPIPWE website for threatened fauna within 1000 m of the centre of the proposed development site.

6.6.6 Terrestrial fauna habitat

No terrestrial fauna habitat remains on site.

6.6.7 Threatened fauna

No threatened fauna species have been recorded within 500 m of the site.

One threatened fauna species (eastern barred bandicoot [*Perameles gunnii*]) was last recorded in 1992 more than 500 m to the north-west of the site on the Bass Highway. The species is listed as vulnerable by the Commonwealth EPBCA. Figure 29 shows the location of threatened species observations in vicinity of the Parramatta Creek facility. The observation points were sourced from the *Natural Values Atlas 20/07/2017.*

Figure 29: Threatened fauna observations

6.7 Surface water

There are two main watercourses near the property, Felminghams and Parramatta Creeks (Figure 30).

The Felminghams Creek catchment contains a sand mine, forestry, remnant vegetation and the Bass Highway, with the headwaters of its catchment approximately 3 km south of the proposed irrigation area.

The Parramatta Creek catchment contains remnant vegetation and forestry, with its headwaters approximately 1 km south-east of the properties. The confluence of the two creeks is in the middle of Layton's property.

Given the existing land uses within the catchments, they would be classified as slightly to moderately disturbed according to the ANZECC (2000) guidelines.

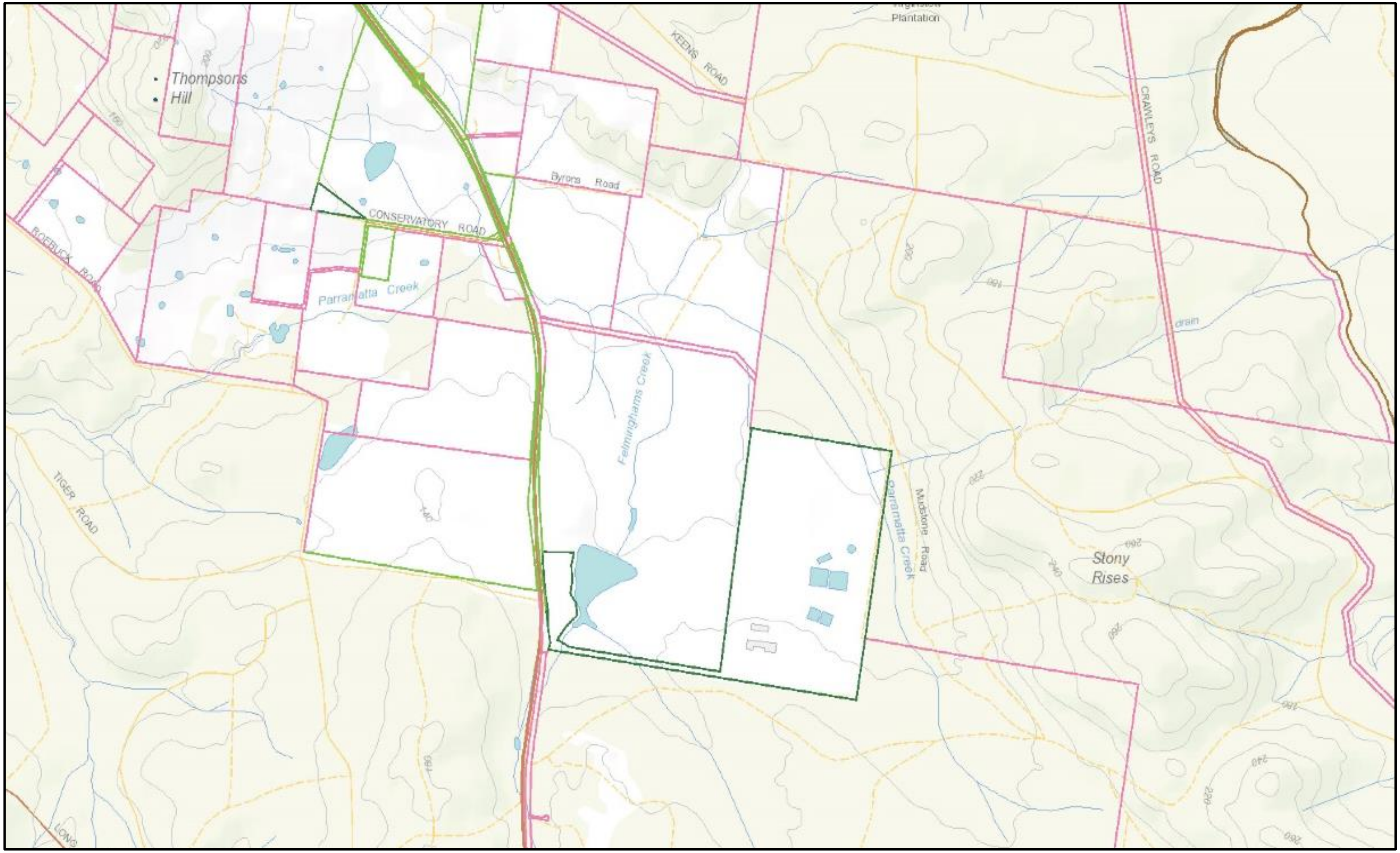
Parramatta Creek downstream of the junction with Felminghams Creek runs under the Bass Highway through the Parramatta Creek rest area and continues westward for about 3 km and then northward through agricultural and forestry land, picking up drainage from a relatively large catchment valley until it flows into the Mersey River about 9 km from Latrobe, near Native Rock.

Figure 30 depicts the Parramatta and Felminghams creeks as well as local water impoundments and cadastral boundaries, the HA land is outlined in green. Felminghams Creek can be seen to the west of the HA site on Layton's land, joining Parramatta Creek downstream of the processing and HA irrigation areas. As result, Parramatta Creek receives any run-off, irrigation overflow or seepage from the operation, whereas Felminghams Creek receives run-off, irrigation overflow or seepage from the irrigation downstream of the freshwater dam on Layton's land. These locations can also be seen in Figure 31, albeit on a larger scale.

Both Parramatta Creek and Felminghams Creek are part of the middle Mersey River catchment. Figure 31 shows the location of Parramatta Creek as it feeds into the middle Mersey River catchment.

It has been observed through surface water sampling since 2015 that Parramatta Creek in this area is ephemeral and is sourced in boggy land in the north-west of the property and approximately 500 m north-west (A. Chapman, personal communication, 1 November 2017). This can be seen in Figure 32 where the boggy pools forming Parramatta Creek are marked. The 'creek' drainage line to the south of this boggy area rarely flows.
Google Earth provides aerial imagery since 1 January 2003 across years and seasons. The boggy path noted in Figure 32 is a consistent feature of these images from before and after the commencement of HA wastewater irrigation.

Figure 30: Parramatta Creek – site and local waterways



Source: https://maps.thelist.tas.gov.au/listmap/app/list/map

Figure 31: Parramatta Creek – regional context

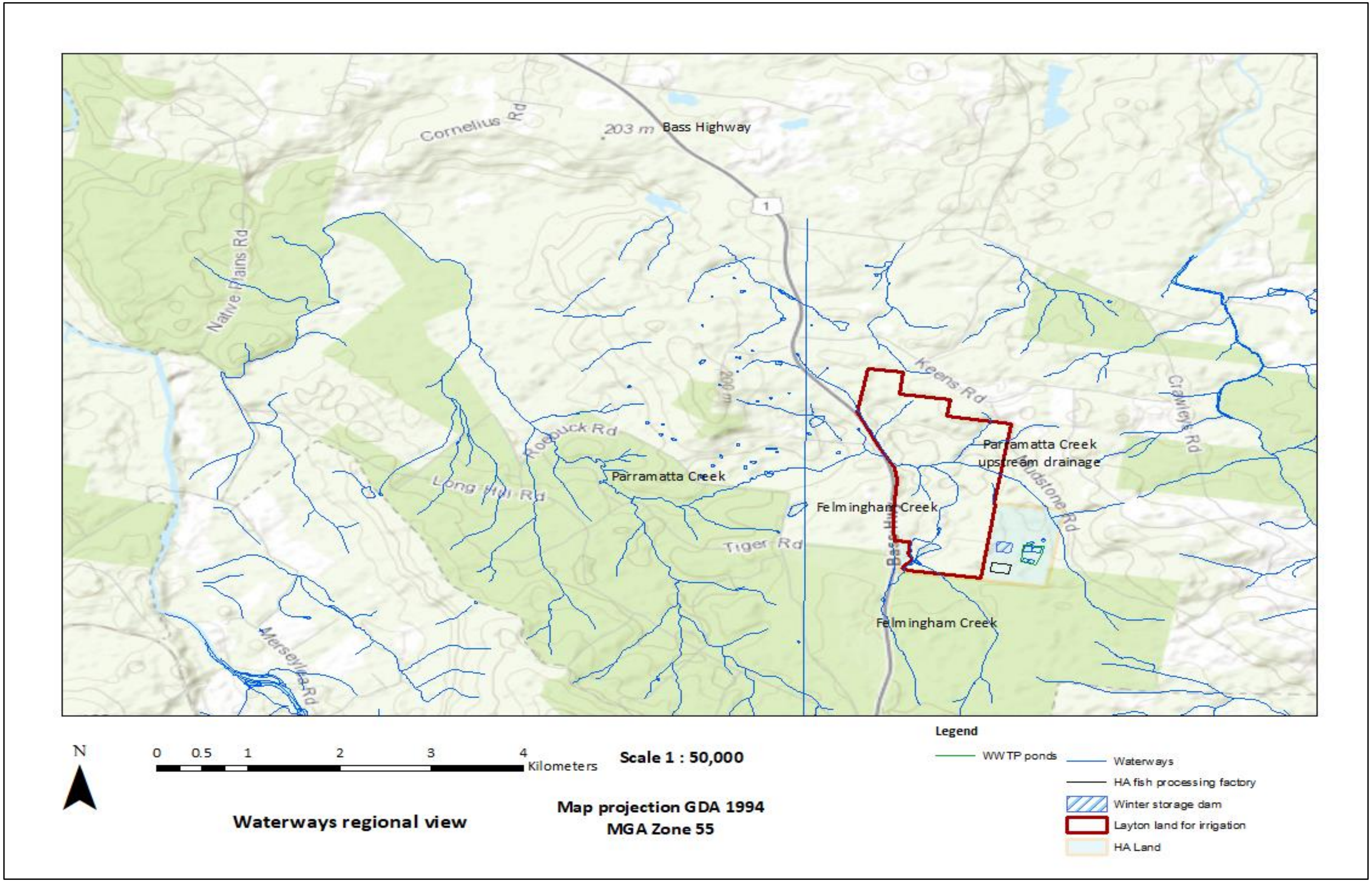


Figure 32: Parramatta Creek – practical source

Source: Google Earth. Image date 1 September 2016.

6.7.1 Surface Water quality

There is limited background data available for Parramatta Creek or similar tributaries.

Descriptive data from a Mersey River catchment perspective is contained in the *Environmental management goals for Tasmanian surface waters, Mersey River catchment, March 2001*. That document is used to provide descriptions of Parramatta Creek and surrounding catchments prior to the presence of the Parramatta Creek fish processing facility. To make the future impacts from the Parramatta Creek fish processing plant available for assessment, a monitoring strategy is recommended.

The protected environmental values (PEVs) document *Environmental management goals for Tasmanian surface waters, Mersey River catchment, March 2001* was compiled well before the existence of HA's Parramatta Creek fish processing facility. The section 'Mersey River catchment overview' characterises water quantity and quality. The following assessment, that the report itself acknowledges is based on limited data, includes:

> *Water quality assessment of rivers in the Mersey Catchment indicate that while most water quality parameters show a gradual deterioration downstream they are diluted by main stream flows. Tributaries of the Mersey, in particular Coilers Creek and Redwater Creek in the middle catchment and Parramatta and Kings creeks in the lower catchment, appear to be much more degraded than the Mersey. Nitrogen and phosphorus levels sufficient to cause algal blooms are evident in Coilers Creek and Redwater Creek. These high concentrations appear to be related to intensive animal industries and sewage treatment plant effluent. The origins of pollutant inputs into Parramatta and Kings creeks are, because of their proximity to Latrobe, more complex due to the greater variety of catchment activities.*
>
> *Microbiological results were also worse in Mersey Catchment tributaries than in the main stream. Six out of 18 sites exceeded ANZECC guidelines for primary contact. Stock access to waterways may underline these results (page 9).*

The report also acknowledges that low oxygen concentrations can occur in Parramatta Creek during low flow events. The report then provides the following macroinvertebrate assessment:

> *Macroinvertebrate communities in the region's waterways appear to be in reasonable health although subject to some impacts arising from degraded water quality, habitat degradation from both forestry and agricultural practices and water diversion. Changes in flow and habitat below the Parangana Dam has had some impact on stream invertebrates, and there is a detectable impact in the lower Mersey, possibly due to degraded water quality.*
>
> *Tributaries in the lower catchment – Kings, Parramatta and Bonneys creeks, the lower Dasher River and Coilers Creek – are of major concern, with reduced species richness probably due to degraded water quality and habitat alteration (page 10).*

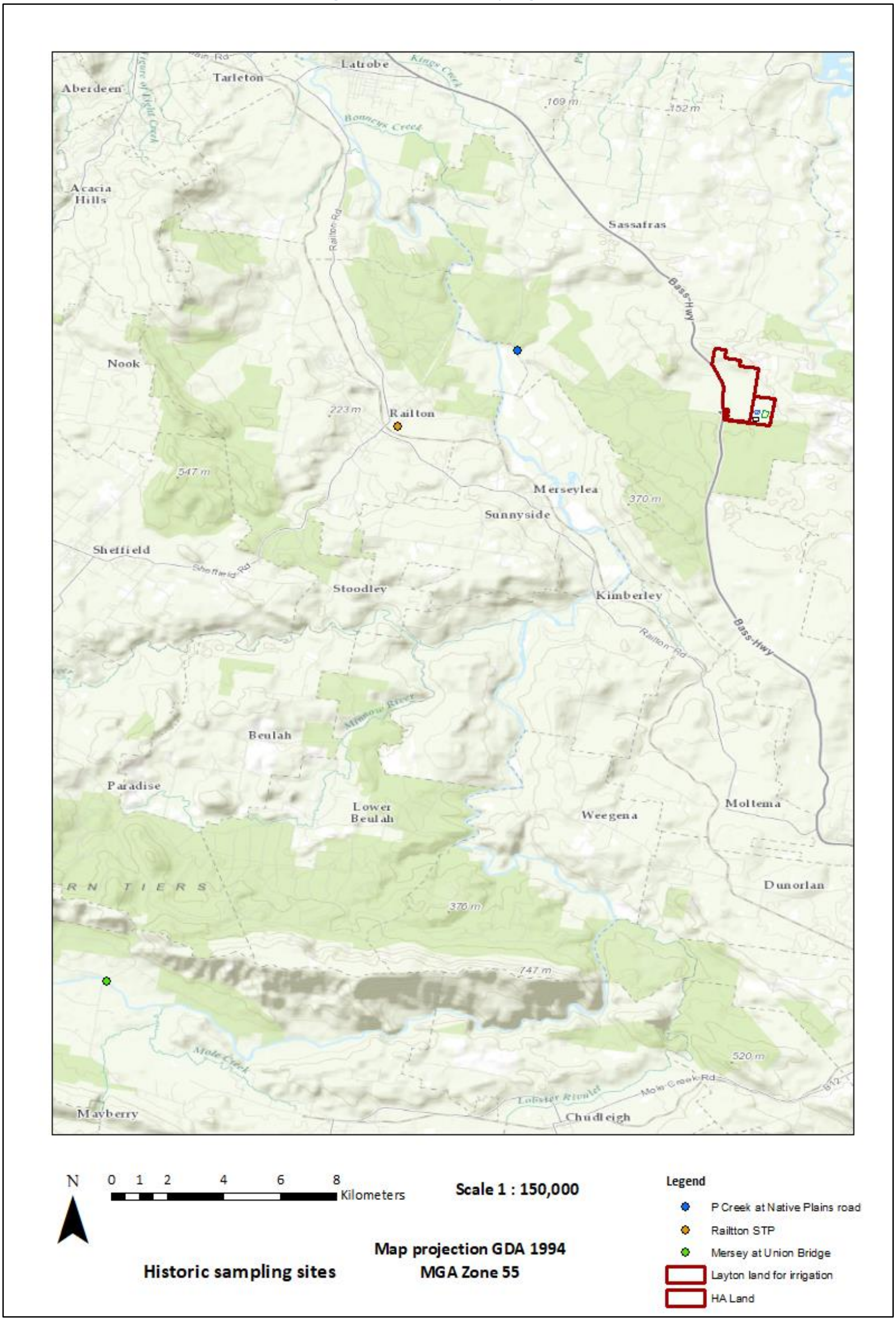
6.7.1.1 Historic data

There is a paucity of historic water quality data for Parramatta Creek and other watercourses in vicinity of the activity. On 27 September 2018, the EPA provided historic water quality values for Parramatta Creek close to the confluence with the Mersey River (Table 15). The sampling locations in relation to the Parramatta Creek site are shown in Figure 33. The data shows the seasonal variation in salinity due to reduced run-off events during summer, causing an increasing electrical conductivity in summer and autumn. This can be attributed to the summer surface water flows being influenced more by groundwater discharge than by rainfall events.

Table 15: Historic values for Parramatta Creek water quality (EPA, 2018)

Analyte	Units	Range	Median	80th percentile	Source
pH	pH units	6.68–7.65	7.28	7.1–7.5	Parramatta Creek at Native Plains Road historic data 2005–2009
EC	µS/cm	265–657	500	540	Parramatta Creek at Native Plains Road historic data 2005–2009
Ammonia N	mg/L			0.02	Mersey at Union Bridge
Nitrate N	mg/L			0.94	Redwater Creek above the Railton sewage treatment plant
Total Nitrogen	mg/L			1.4	Redwater Creek above the Railton sewage treatment plant
Total Phosphorus	mg/L			0.05	Redwater Creek above the Railton sewage treatment plant

Figure 33: Historic sampling sites



2018/2019 surface water quality data

A surface water sampling program was undertaken during spring 2018 (3 October 2018) and autumn 2019 (1 April 2019) by Macquarie Franklin. This is described in more detail in Appendix B.

Analytical results for the sampling are shown in Table 16 and Table 17. The results show a steady increase in pH and electrical conductivity moving down-gradient within the Parramatta Creek system. These parameters show a strong correlation with the baseline groundwater results (Table 24) and can be attributed to the creek falling within a groundwater discharge area (see Appendix B). The nutrient levels at all sites were relatively low when compared with historical results within Parramatta Creek (Table 15) however nitrogen and phosphorus levels increased significantly in Autumn (Table 18). SS3 and SS4 recorded moderate levels of thermotolerant coliforms. This is likely due to the impacts from stock, as cattle were grazing along the creek at the time of sampling. The monitoring locations for the locations SS1 – SS6 are shown in Figure 34.

Table 16: Surface water monitoring results 3 October 2018

Analytes	Unit	SS3	SS4	SS5	SS6
Physiochemical results					
pH water		7.28	7.06	6.72	5.8
pH water		7.28	7.06	6.72	5.8
Temperature	°C	15.6	15.08	14.1	13.6
Electrical conductivity	µS/cm	710	380	270	150
Oxidation-reduction potential	mS/cm	276.5	281	220	315
Analytical results					
Nitrite as N	mg/L	<0.01	<0.01	<0.01	<0.01
Nitrate as N	mg/L	0.04	0.08	0.16	0.02
Nitrite + nitrite as N	mg/L	0.04	0.08	0.16	0.02
Total Kjeldahl Nitrogen as N	mg/L	0.4	0.4	0.4	0.4
Total Nitrogen as N	mg/L	0.4	0.6	0.6	0.4
Total Phosphorus	mg/L	<0.05	0.05	0.06	<0.05
Thermotolerant coliforms	cfu/100 mL	420	660	30	<10
E. coli	cfu/100 mL	410	660	30	<10

Table 17: Surface water monitoring results 1 April 2019

Analytes	Unit	SS3	SS4	SS5	SS6
Physiochemical results				Dry	Dry
pH water	pH units	7.1	7.3		
Temperature	°C	17.2	15.2		
Electrical conductivity	µS/cm	380	380		
Oxidation-reduction potential	mS/cm	54.3	43.9		
Analytical results					
Nitrite as N	mg/L	<0.01	0.02		
Nitrate as N	mg/L	<0.01	0.71		
Nitrite + nitrite as N	mg/L	0.01	0.73		
Total Kjeldahl Nitrogen as N	mg/L	5.9	1.3		
Total Nitrogen as N	mg/L	6	2		
Total Phosphorus	mg/L	0.79	0.09		
Thermotolerant coliforms	cfu/100 mL	21000	2500		
E. coli	cfu/100 mL	21000	250		

6.7.1.2 SS1 monitoring results

Surface water quality has been measured at the Huon Aquaculture site (SS1) downstream of the irrigation area, where groundwater seepage and surface run-off occurs, prior to entering Parramatta Creek. Results from this sampling program are provided in Table 18.

Table 18: Surface water monitoring results for SS1 sampling location

Analytes	Unit	Aug 12	Aug 13	Aug 14	Feb 15	Aug 15	Feb 16	Oct 18	Apr 19
Physiochemical results									
pH	units	7.15	6.5	6.09	6.93	4.41	4.12	3.8	3.5
Temperature	°C	nd	nd	nd	nd	nd	16.9	11.4	15.7
Electrical conductivity	µS/cm	792	1,693	449	6,230	1,118	2,764	2,200	2,468
ORP	ms/cm	nd	nd	nd	nd	nd	560	418	148.1
Analytical results									
Nitrite as N	mg/L	<0.01	0.03	<0.01	0.02	<0.01	<0.01	<0.01	<0.01
Nitrate as N	mg/L	0.03	0.74	0.33	0.04	0.95	0.92	2.1	1.6
Nitrite + nitrite as N	mg/L	0.03	0.77	0.33	0.06	0.95	0.92	2.1	1.6
Total Kjeldahl Nitrogen as N	mg/L	1.3	7.1	1.7	51.5	1.2	1.3	0.5	1.8
Total Nitrogen as N	mg/L	1.3	7.9	2	51.6	2.2	2.2	2.6	3.4
Total Phosphorus	mg/L	0.09	0.25	0.17	11.6	0.14	0.03	<0.05	1.05
BOD	mg/L	2	NR	<2	100	<2	<2	NR	NR

The results of the surface water monitoring at location SS1, near Parramatta Creek on the north-eastern side of the site, have shown a deterioration in surface water quality since monitoring commenced in August 2012. This deterioration is evident through increased salinity, decreasing pH and increasing nutrients. The pH levels have decreased in every sampling event, except for February 2015, which rose slightly before decreasing again in August 2015.
Electrical conductivity has varied over time, potentially reflecting changes in electrical conductivity of the wastewater being irrigated. Typically, higher EC results have been recorded in February when salts may be more concentrated due to lower rainfall and increased evaporation. Some of the causative events have been discussed in Section 3.12, where the wastewater quality was shown to have deteriorated from 2012 to late 2015 when measures to improve wastewater treatment and management were introduced.

Limited surface water monitoring has been conducted in Parramatta Creek downstream of the processing facility. A sampling event was conducted in November 2017 by Aquatic Science. This one-off sampling event included two sites, one on Parramatta Creek and another on Felminghams Creek, and was undertaken when field instruments were not available. The results from this sampling event were reported alongside the only known surface water monitoring results for Parramatta Creek, collected before the fish processing facility was operational (Table 19). The 'Parramatta Creek above Mersey' site was situated just above the junction with the Mersey River and data included is from several sampling events conducted in 2006. These monitoring locations are shown in Figure 34.

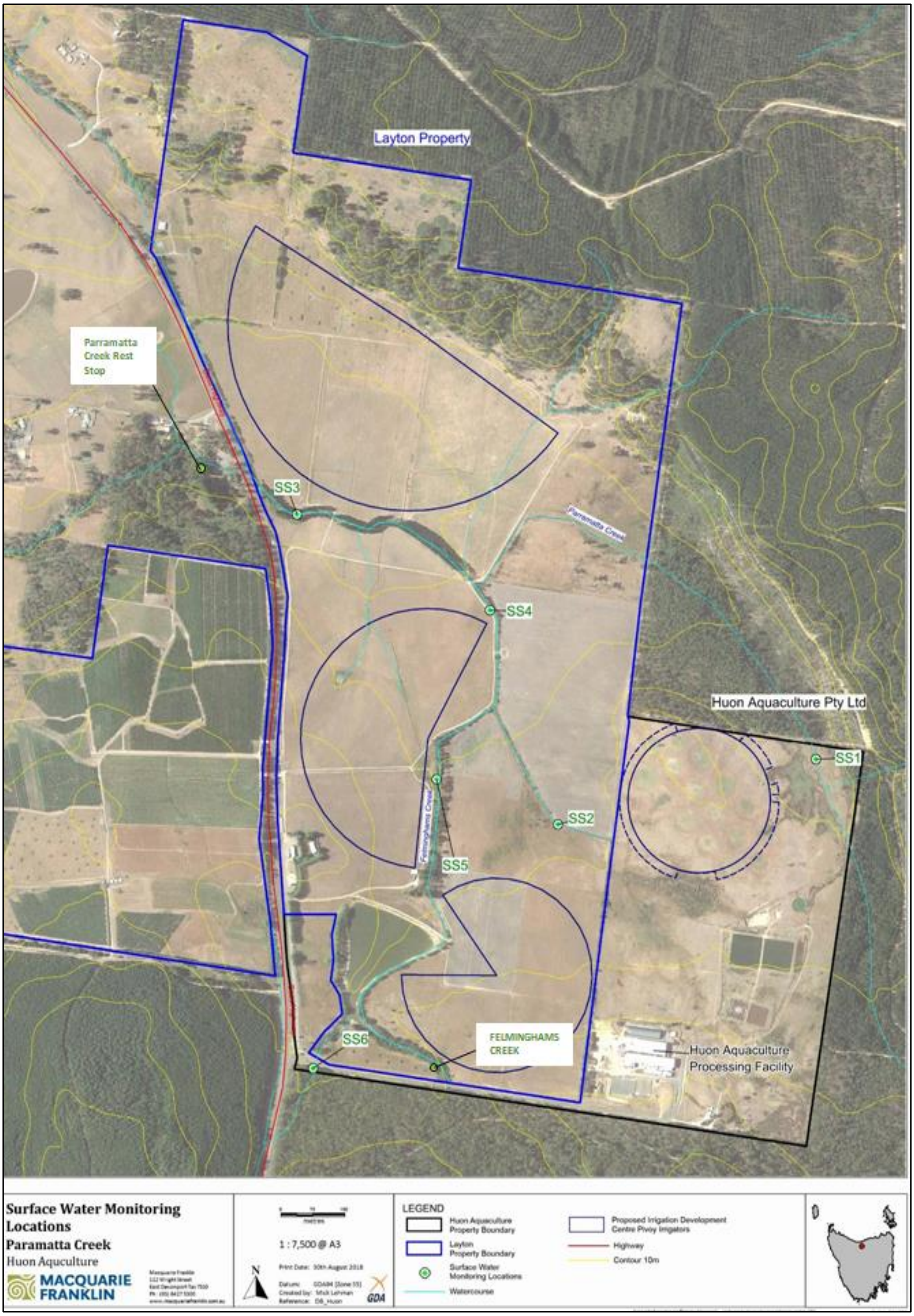
The sample data from 2017 is too limited to draw conclusions from it, but it does show results broadly consistent with levels measured further downstream in Parramatta Creek prior to the construction of the fish processing facility.

Table 19: Surface water monitoring results 2006 and 2017

Parameter	Felminghams Creek	Parramatta Creek Rest Stop	Parramatta Creek above Mersey*	Parramatta Creek above Mersey*	Parramatta Creek above Mersey*	Parramatta Creek above Mersey*
Date	**01-Nov-17**	**01-Nov-17**	**02-Feb-06**	**08-May-06**	**07-Jul-06**	**12-Sep-06**
Temperature °C			20.8	9.2	7.6	5.6
Dissolved oxygen mg/L			7.1		10.4	11.1
Turbidity (NTU)			11.2	35.9	31.3	15
Ammonia mg-N/L	0.026	0.019				
Chloride mg/L	35.9	130				
Conductivity µS/cm (laboratory)	155	524	433	500	315	454
Nitrate mg-N/L	<0.010	0.17	0.153	0.707	0.716	0.237
Nitrite mg-N/L	<0.010	0.008				
Nitrogen, Total mg-N/L	0.51	1	0.566	1.7	1.6	0.659
pH (laboratory)	4.6	7.4	7.43	6.86	7.54	7.24
Phosphorus, dissolved reactive mg-P/L	0.004	0.017				
Phosphorus, Total mg-P/L	<0.01	0.08	0.019	0.062	0.052	0.022
Sulfate mg/L	3.2	13.6				
TSS mg/L	7	28				

**prior to Huon Aquaculture's operation and wastewater irrigation at the site*

Figure 34: Surface water monitoring locations



6.7.1.3 Aquatic ecosystems

Assessments using the Australian river assessment (AUSRIVAS) methodology were carried out by Kanunnah P/L in spring 2017 and autumn 2018. The aim of the assessment was to determine the health of Parramatta Creek. The location of the assessment was downstream of Huon Aquaculture's property, Layton's property and the Bass Highway.

Table 20: AUSRIVAS assessment location

Site	Northing	Easting
HUONPARRAMATTA01	5424443	460730

AUSRIVAS is a rapid procedure to quantify impacts on in-stream biota. This is achieved by predicting the occurrence of macroinvertebrate families at test sites using environmental variables and a large database of high-quality reference sites. The output from this process is a list of the families of invertebrates expected in a standard sample from the site, the probability of occurrence of each family in that sample and a tally of which of those families did occur in the actual sample. These predicted taxa are then compared with the sampled taxa to provide an observed/expected score.

The samples were collected from the edge habitats as riffles were not present. There were significant sediment levels, high turbidity and conductivity at the time of sampling. There are agricultural impacts evident and a major highway upstream of the site. The site itself is a driver rest area, with little riparian cover and obvious human impacts such as rubbish and poor water quality.

The taxa found included worms, various fly larvae, amphipods and one family of stonefly and caddis fly. Those taxa found are representative of poor sites and typical of sites with obvious human impacts such as urban creeks. The taxa missing include mites, beetle larvae and adults, cranefly larvae, mayflies, sensitive stoneflies (Eusthenidae) and numerous caddis flies. These taxa tend to be missing in poorer quality sites.

The O/E score is a ratio relating the number of families of macroinvertebrates recorded in a sample to the number of families expected in that sample according to the predictions of the model for least-disturbed conditions.

Table 21: Scoring system for AUSRIVAS

O/E score	Band	Explanation
>1.19	**X**	Richer than reference. More macroinvertebrate families found than expected
0.82–1.19	**A**	Similar to reference. Most or all the expected families found
0.45–0.81	**B**	Significantly impaired. Several expected families not found
0.08–0.44	**C**	Severely impaired. Many expected families not found
0.00–0.07	**D**	Extremely impaired. Extremely few of the expected macroinvertebrate families found
Sampling results Parramatta Creek (rest stop)		
0.46	**B**	Spring 2017 (Poor Condition)
0.36	**C**	Autumn 2018 (Poor Condition)
0.39	**C**	Spring 2018 (Poor Condition)
0.45	**B**	Autumn 2019 (Poor Condition)

6.8 Groundwater

Baseline groundwater is described in detail in the WREMP (Appendix B) and summarised below.

6.8.1 Overview

Six groundwater bores were installed on the Huon Aquaculture property in July 2009 as part of the groundwater survey undertaken for the initial site approval for HA's Parramatta Creek fish processing facility. Regular monitoring events have been undertaken since then.

In November 2018, six groundwater monitoring bores were installed on Layton's property to capture baseline data for the proposed irrigation expansion area. An additional bore was installed on the HA property to monitor the existing ponds and irrigation areas. A preliminary groundwater sampling event was conducted on each of the bores on 26 November 2018. Results are summarised in Section 6.8.3.

The location of these bores was determined using an understanding of the groundwater flow systems and process operating at Parramatta Creek (Cromer, 2018). This report is provided in Appendix L to the WREMP (see Appendix B). The groundwater bores are shown in Figure 35.

6.8.2 Baseline data

Cromer (2018) undertook an assessment of groundwater conditions at the HA and Layton properties at Parramatta Creek.

His assessment concluded that permanent groundwater at Parramatta Creek occurs in and moves through intersecting fractures in Permian-age sedimentary rocks (mudstone, siltstone, sandstone) and in nearby Jurassic-age dolerite to the north-east. These are hard-rock unconfined aquifers. Groundwater also occurs in the veneer of Quaternary-age alluvium along Parramatta Creek, and to a lesser extent, along Felminghams and smaller tributary drainage lines. These unconsolidated sediments are intergranular unconfined aquifers. This is depicted in Figure 36.

Cromer (2018) also concluded that the relatively low-lying areas adjacent to and including Parramatta and Felminghams creeks are groundwater discharge areas, where upward-moving groundwater is discharged to the surface via evapotranspiration (ET) and streamflow. The water table is close to the surface (within a metre or so in monitoring bores on the Huon Aquaculture property) and it fluctuates in response to changing ET rates, rainfall and irrigation. As a result, irrigation water applied in discharge areas cannot migrate to deeper parts of the aquifer and so would not join intermediate and regional flow directions.

Irrigation water applied in excess of ET at any time will remain in the soil profile (until ET removes it), or it may move vertically downwards towards the water table, and contained constituents may be detected in monitoring bores located within the irrigation area itself. However, the upward groundwater movement inhibits off-site migration in groundwater, so that the effects of irrigation ought to be undetected in off-site 'downgradient' monitoring bores.

As a consequence, the only way applied net irrigation water (irrigation less ET) can move off the irrigated sites is via streamflow. Figure 37 depicts the fundamental principles in a gravity-driven groundwater system like that at Parramatta Creek.

In recharge areas, the hydraulic heads are relatively high and decrease with depth, as shown by the water levels in two adjacent piezometers. In discharge areas (at left), the energy and flow conditions are reversed: heads are low and increase with depth.

Figure 35: Groundwater bores

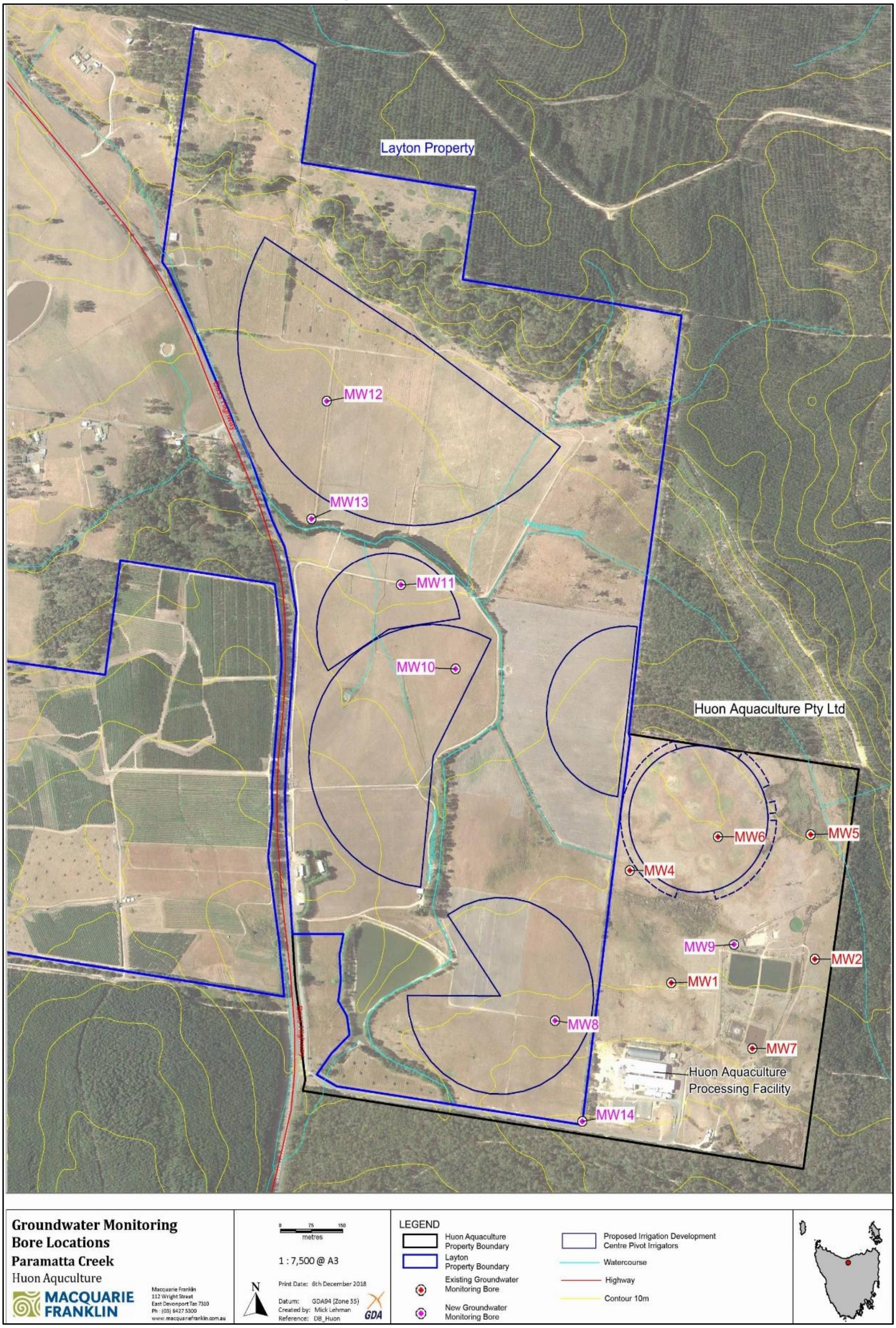
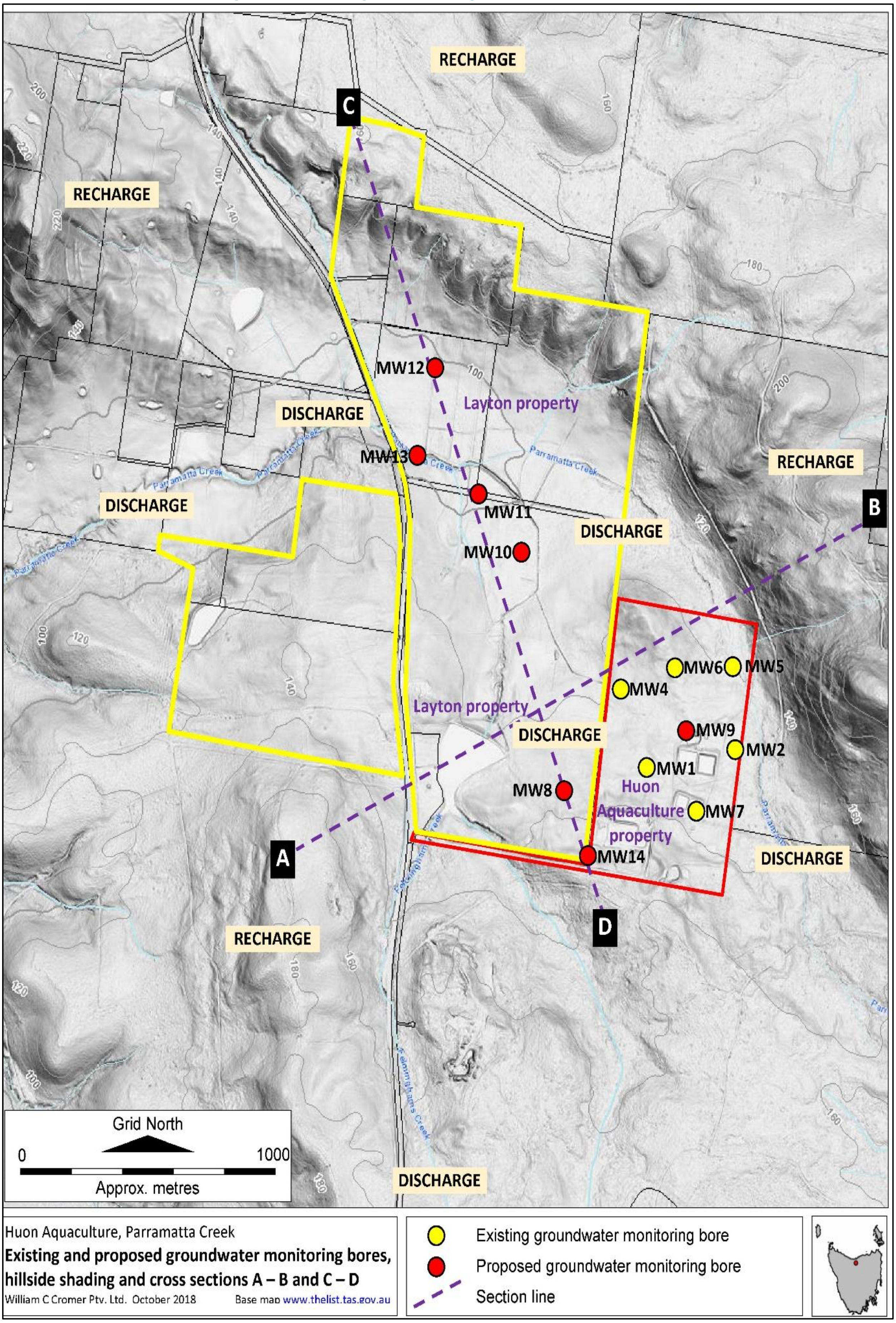
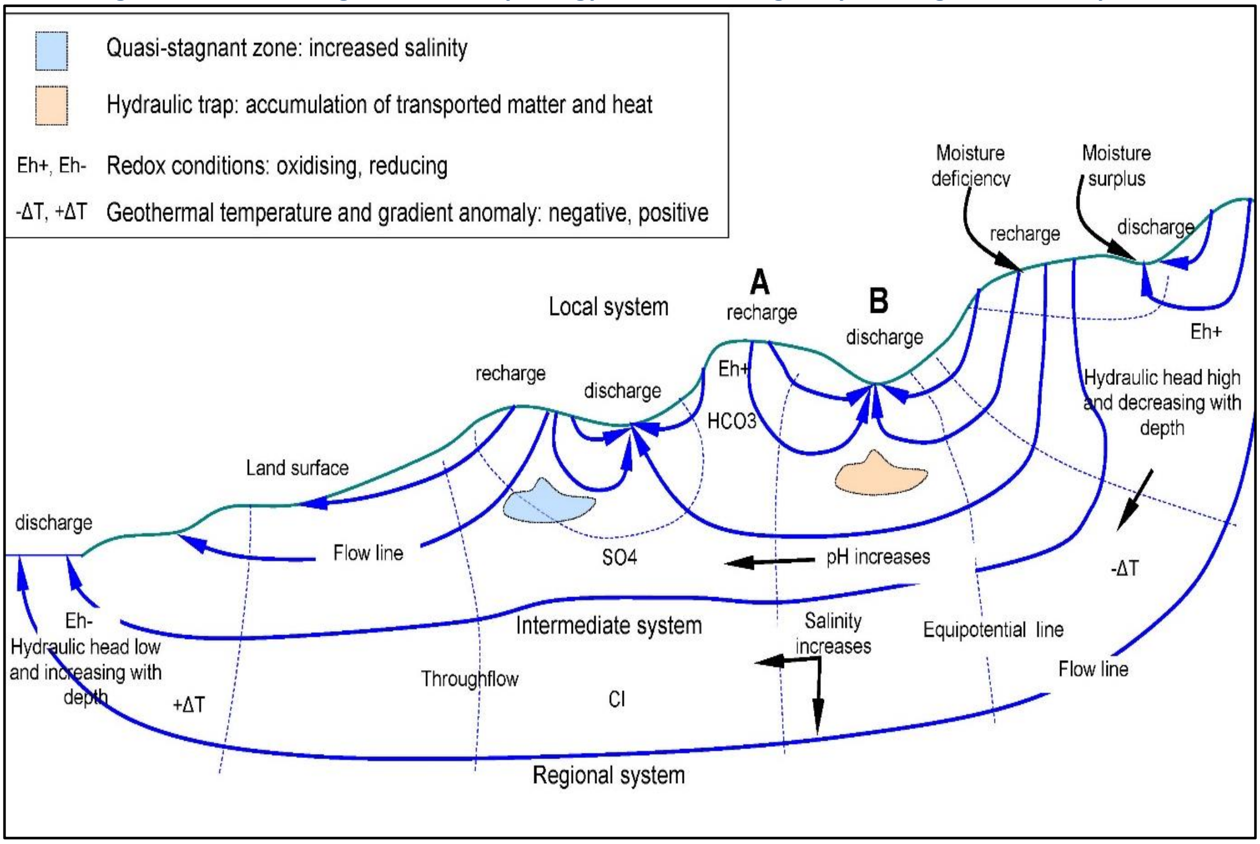


Figure 36: Discharge and recharge areas Parramatta Creek



Source: Cromer, 2018 (see Appendix B).

Figure 37: Schematic: groundwater hydrology fundamentals: gravity-driven groundwater system



Adapted by Cromer (2018) from Sophocleous (2004). Groundwater recharge, in Groundwater, [Eds. Luis Silveira, Stefan Wohnlich and Eduardo J. Usunoff] in Encyclopaedia of Life Support Systems (EOLSS), Developed under the Auspices of the UNESCO, Eolss Publishers, Oxford, UK [www.eolss.net].

6.8.2.1 Groundwater Huon Aquaculture property

Sampling events were conducted on the Huon Aquaculture property in July and December 2009 to collect baseline groundwater data for the existing DPEMP (approved 2009). Results from these initial sampling events are presented in Table 22 and an interpretation of the results is summarised in Table 23.

The baseline groundwater assessment, as described in the existing DPEMP (approved 2009), found groundwater was close to the surface. In 2009, groundwater had a variable, but generally low pH (average pH of 5.3), was highly oxidising, and had a variable (but not high) electrical conductivity (140 to 680 µS/cm).

Table 22: 2009 baseline groundwater monitoring results for HA property

Location	BH1		BH2		BH3		BH4		BH5		BH6	
Analyte	**Jul**	**Dec**	**Jul**	**Dec**	**Jul**	**Dec**	**Jul**	**Dec**	**Jul**	**Dec**	**Jul**	**Dec**
pH	5.32	5.05	5.17	5.05	5.33	5.16	5.28	5.25	6.5	6.61	4.16	4.45
Sodium absorption ratio	4.16	4.3	2.85	3.22	2.74	4.98	<0.1	<0.1	2.31	2.06	1.2	0.96
Electrical conductivity µS/cm	276	204	145	140	143	123	125	118	445	425	370	680
Total dissolved solids mg/L	140	160	84	120	94	90	71	82	254	240	210	460
Carbonate mg/L	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bicarbonate mg/L	20	23	17	14	15	21	11	23	148	178	<1	<1
Sulfate mg/L	37	33	22	21	19	16	5	5	37	34	133	315
Chloride mg/L	34	35	21	25	19	22	22	27	34	21	18	19
Calcium mg/L	3	1	2	1	2	1	<1	<1	30	28	13	43
Magnesium mg/L	2	1	1	1	1	<1	<1	<1	7	6	6	19
Sodium mg/L	35	49	27	20	22	30	20	30	53	60	41	30
Potassium mg/L	2	1	2	1	1	<1	<1	<1	1	6	4	5
Aluminium mg/L	0.05	0.1	0.06	0.009	0.06	0.04	0.09	<0.01	<0.01	<0.01	5.94	8.92
Iron mg/L	<0.05	0.45	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.29	0.06
Fluoride mg/L	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.2	0.2	0.6
Ammonia as N	0.05	0.03	0.01	0.03	<0.01	0.01	<0.01	0.07	0.01	0.02	0.06	0.11
Nitrite as N mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate as N mg/L	0.02	0.02	0.04	0.02	0.23	0.44	<0.01	0.03	<0.01	<0.01	0.47	0.01
Total Kjeldahl Nitrogen as N mg/L	<0.2	<0.1	<0.2	<0.1	<0.2	<0.1	<0.2	<0.1	<0.2	<0.1	<0.2	0.1
Total Nitrogen as N mg/L	<0.1		<0.1		0.2		<0.1		<0.1		0.5	
Total Phosphorus as P mg/L	<0.01	0.03	0.02	0.04	0.1	0.1	<0.01	0.03	0.32	0.29	0.12	0.41

Table 23: Summary of 2009 baseline groundwater results analysis

Parameter	Description in existing DPEMP (approved 2009)
pH	All sites have a groundwater pH value slightly below an acceptable level of 6.0 except for borehole 5. The low pH results may be due to the local site soil type and structure. This will need to be monitored as irrigation starts to ensure that there are no negative effects on the ryegrass production and further decline in soil structure.
EC and TDS	All sites have a low EC and TDS result and can be classified as 'fresh water'.
Bicarbonates and SAR	The groundwater bicarbonate (HCO3) levels in all boreholes are below 200 mg/L. While there are no ANZECC trigger values for bicarbonates in irrigation waters, elevated levels of bicarbonates can adversely affect irrigation equipment, soil structure and crop foliage. Bicarbonates cause hardness and can result in calcium and magnesium in the soil and water precipitating as insoluble carbonates. Sodium is left behind after removal of the calcium and magnesium, leading to an increase in sodicity. This should not be a problem with such low results at each of the sites. SAR readings are also relatively low indicating that the surface soils in the area have good soil structure and are permeable to water resulting in minimal waterlogging.
Chlorides and dissolved cations	Consistent with the low TDS readings for all groundwater samples, chloride and dissolved cations are also low and indicate that the groundwater is 'fresh water'.
Aluminium and iron	All groundwater samples were found to be below the ANZECC freshwater of 0.055 mg/L except for borehole 6. BH6 was found to have a slightly elevated aluminium level of 5.94 mg/L. This should not be a problem given that the groundwater is not used for drinking water purposes in the area. This will be monitored for the management of the reuse application to ensure that levels do not increase further. There are no ANZECC guidelines for iron, however BH6 is slightly elevated and should also be monitored for the reuse application.
Nutrients	Groundwater nutrient levels at all boreholes are within normal levels and meet the freshwater ANZECC guidelines. Nutrient levels will need to be monitored after commencement of irrigation to ensure that there are no negative effects on the groundwater from the application of treated wastewater to the area.
Thermotolerant coliforms and enterococcus	The results from the groundwater microbiological analysis indicate that the groundwater at all borehole sites is clean and does not contain pathogens at significant levels.

Source: HAC DPEMP (Pitt & Sherry, approved 2009).

6.8.2.2 Groundwater Layton's property

Six new bores were installed on Layton's property in November 2018 to monitor the proposed wastewater irrigation areas and to provide baseline data. A preliminary groundwater sampling event was conducted on each of the bores on 26 November 2018. Results are summarised in Table 24. The higher altitude bores MW08 and MW14 have relatively low salinity (130–180 µS/cm), low pH (pH 5–5.5) and slow recharge rates, consistent with groundwater recharge zones. The higher salinity (310–690 µS/cm) and slightly higher pH (pH 5.8–6.2) of the remaining, lower lying bores suggest discharge conditions.

Table 24: Layton's Farm baseline groundwater monitoring results (November 2018)

Analyte (mg/L)	*Units*	*Location*					
		MW08	**MW10**	**MW11**	**MW12**	**MW13**	**MW14**
Alkalinity as $CaCO_3$	**mg/L**	14	47	120	54	66	**7**
Standing water level	**m bgL**	2.6	2.97	0.71	1.09	1.43	**3.03**
pH		5.5	5.8	6.2	6.2	6.2	**5**
EC	**µS/cm**	180	470	690	650	310	**130**
TDS	**mg/L**	130	260	420	400	190	**82**
Chloride	**mg/L**	100	37	120	120	46	**20**
Fluoride	**mg/L**	0.09	0.08	0.16	0.08	0.07	**<0.05**
Aluminium	**mg/L**	0.07	0.09	<0.01	0.01	<0.01	**0.06**
Iron	**mg/L**	0.43	0.79	0.01	<0.01	0.73	**0.08**
Total Nitrogen	**mg/L**	0.2	0.7	<0.1	0.2	<0.1	**3.5**
Ammonia	**mg/L**	<0.1	<0.1	<0.1	<0.1	<0.1	**<0.1**
Nitrite	**mg/L**	<0.01	<0.01	<0.01	<0.01	<0.01	**<0.01**
Nitrate	**mg/L**	0.02	0.23	<0.01	0.03	<0.05	**2.5**
Calcium	**mg/L**	5	4	14	21	11	**1**
Potassium	**mg/L**	1	3	1	3	< 1	**3**
Magnesium	**mg/L**	3	3	6	8	4	**3**
Sodium	**mg/L**	75	22	100	100	43	**14**
Phosphate	**mg/L**	<0.01	<0.01	<0.01	<0.01	0.01	**<0.01**
Sulfate	**mg/L**	28	15	39	120	23	**12**
Total Phosphorus	**mg/L**	**0.09**	**0.21**	**0.07**	**0.05**	**0.1**	**0.12**

6.8.3 Groundwater summary

Results from the ongoing groundwater monitoring program suggest wastewater irrigation has had an adverse effect on the salinity of the groundwater at some bores on HA's Parramatta Creek property. Recent improvements to the application method (via pivot irrigator) and improved wastewater quality (lower salinity) appear to have slowed and in some cases reversed the degradation, with parameters stabilising and decreasing trends becoming apparent. Whilst elevated spikes in thermotolerant coliforms have been recorded from MW6 in the past, levels have declined quickly to an acceptable range. The elevated salinity in the monitoring bores shows seasonal fluctuation, with the electrical conductivity increasing over summer and autumn and decreasing over winter and spring. These fluctuations indicate that the groundwater is heavily influenced by local recharge events with winter rainfall. This seasonal variation also indicates that the salinity levels will decrease in time with the improved management and shandied irrigation water as proposed by HA.

An assessment of the groundwater conditions at HA's site and Layton's property was completed by groundwater geologist Bill Cromer (2018) (see WREMP), who noted that it is important to distinguish between local, intermediate and regional flow patterns, and between groundwater recharge and discharge areas. Cromer found that the majority of both properties falls within groundwater discharge areas, as described below.

In recharge areas, groundwater is replenished by net rainfall (rain less evapotranspiration) infiltrating from above. Water table (unconfined) conditions apply. Groundwater flow lines are down and away from the recharge area. Hydraulic heads are relatively high and decrease with depth. The only source of groundwater is from direct infiltration.

In discharge areas, groundwater may or may not be replenished by infiltration from above (so local water table conditions may or may not apply). The main supply of groundwater is from a recharge area some distance from the discharge area. In the discharge area, groundwater flow lines are up towards the surface, and hydraulic heads increase with depth. Discharge areas are often indicated by swamps and lagoons at least partly fed from below, and by shallow water tables. Importantly, since groundwater flow is upwards in discharge areas, irrigation water (and any contained contaminants) applied at the surface has restricted vertical downward flow, and typically either runs off or evapotranspires without entering the groundwater systems.

6.8.3.1 Aquifers and groundwater conditions at Parramatta Creek

Permanent groundwater at Parramatta Creek occurs in and moves through intersecting fractures in Permian-age sedimentary rocks (mudstone, siltstone, sandstone) and in nearby Jurassic-age dolerite to the north-east. These are called hard-rock unconfined aquifers. Groundwater also occurs in the veneer of Quaternary-age alluvium along Parramatta Creek, and, to a lesser extent, along Felminghams Creek and smaller tributary drainage lines. These unconsolidated sediments are intergranular unconfined aquifers.

The relatively low-lying areas adjacent to and including Parramatta and Felminghams creeks are groundwater discharge areas, where upward-moving groundwater is discharged to the surface via evapotranspiration and streamflow. The water table is close to the surface (within a metre or so in monitoring bores on the HA property) and it fluctuates in response to changing evapotranspiration rates, rainfall and irrigation.

6.9 Air environment

There are minor visible emissions of water vapour, both continuous and intermittent, from the hot water and refrigeration cooling tower systems. These are considered environmentally insignificant.

The facility and ancillary services incorporate measures (including operational procedures) to minimise potential odour emissions from sources, including on-site wastewater treatment facilities and solid waste management procedures.

No external odour complaints have ever been received regarding the Processing facility or its wastewater irrigation.

During a period of poor wastewater treatment which saw BOD concentrations spike significantly (2012 to 2014) some localised odour (on site) occurred. Since this time, wastewater treatment and irrigation management have improved and the water quality has improved, with a reduction in Thermotolerant Coliforms, BOD, Conductivity, Ammonia and Total Nitrogen.

There are currently particulate emissions from the three smokehouses when they are operational.
The map c oordinates (MGA55) for each stack exhaust point are as follows:

- Smokehouse 1 Stack: 461,682E, 5,423,111N.
- Smokehouse 2 Stack: 461,683E, 5,423,113N.
- Smokehouse 3 Stack: 461,683E, 5,423,115N.

Three identical Reich Airmaster® UKQ 10000 BE G 505 H smokehouses were installed at the Parramatta Creek facility and commissioned in October 2014 (Figure 38). Commissioning tests on the smokehouses were completed by LEC in February 2016. The smokehouses currently (2019/2020 FY) operate for 800 minutes per day, with up to 300 smoking shifts/days per annum. Current smoked product production is 3.2 Tonnes per smoking shift which is 4 x 400kg racks of fish per smoker with two of the three smokers typically used each day. Each smoker can house 5 x 400kg racks rather than the current 4 x 400kg therefore, smoked fish production can increase by 20% above current volumes before the need to increase smoking shifts will occur.

Figure 38: Installed smokehouses

Figure 38 above (image left) shows the smokers inside the smokehouse building. The image at right shows the smokehouse building to provide perspective.
Two types of smoking processes are in use: hot smoke and cold smoke. The cycles are different for each type of process.

6.9.1 Smokehouse operation

The smoke generator has a restricted oxygen supply and operates at a temperature between 600 °C and 800 °C so that the Red-gum wood chips do not combust. The smoke is then released from the smoke generator into the smokehouse (the temperature of the smoke is controlled to be between 30 °C and 100 °C), where it circulates around the product. Fresh air is then used to displace the smoke. The ratio of transport air and smouldering air must be kept at a ratio of 20:1 to ensure that explosive smoke densities are never reached (this is specified by German safety regulation BGR 138).

Smoke is only emitted from the smokehouses during certain steps in the cycles. During the intensive smoke (hot smoke) and intensive smoke cool (cold smoke) steps, the majority of smoke is being recirculated inside the smokers. However, the ventilation system is arranged so that during this step a low velocity ‘overflow’ of smoke spills out of the stack. The manufacturer’s specification states that this air flow should be approximately 120 m^3/h during this process. This step of the process cycle has a maximum duration of 20 minutes.

During the smoke reduction step, the external ventilation is closed off to recirculate the remaining smoke so it settles onto the product. There is no exhaust air flow during this time; however, occasionally a small amount of residual smoke in the stack can be sucked out by wind, giving the appearance of an emission.

At the start of the drying (hot smoke) and drying FA1 (cold smoke) steps that follow an intensive smoke, the ventilation system opens and the air and smoke contained within the smoking chamber are emitted at higher velocity. The smoke is displaced by clean air quite quickly – generally within about 3 minutes. This is consistent with observations and the manufacturer’s specifications. The emission of smoke from the smokers is described in Table 25 and Table 26 to show the times in each smoking batch when smoke is emitted into the atmosphere.

Table 25: Hot smoke cycles per batch

Minutes	Item	Smoke emissions
400	total batch time	
100	total time per cycle	
10	warm	no emissions
20	intensive	low velocity emissions
3	reduction	high velocity emissions
67	drying	no emissions
each cycle above is repeated 4 times per batch		

Table 26: Cold smoke cycles per batch

Minutes	Item	Smoke emissions
800	total batch time minutes	
114	total time per cycle	
10	Warming	no emissions
10	Drying Cool	no emissions
20	Intensive Smoke Cool	low velocity emissions
3	Smoke Reduction	high velocity emissions
35.5	Drying FA1	no emissions
35.5	Drying FA1 Cool	no emissions
each cycle above is repeated 7 times per batch		

The emissions noted in Table 25 and Table 26 are described in Section 8.6.4.

Smokehouse emissions have been measured by LEC in February 2016 and Airlabs in July 2017. Total particulate (TP) emissions[1] as reported by LEC and Airlabs are provided in Table 27. Particulate sampling was carried out in accordance with a modified version of AS 4323.2 approved in writing by the Director EPA (LEC, 2016). LEC also reported high concentrations of oils, presumably fish oils, in the stack emissions. The Airlabs sampling methodology removed the oils to prevent filter papers clogging. Because of this the results of the Airlabs report were not considered in assessing the impact from smoker air emissions.

Table 27: Measured smokehouse emissions

Smokehouse	Date	Run	Stack temp (°C)	TP (mg/m^3)	Mass emission rate (g/min.)
1	Feb-16	Hot	36.5	1.6	0.006
1	Feb-16	Hot	29.6	6.6	0.294
1	Feb-16	Hot	37.6	3.2	0.126
1	Feb-16	Hot	40.3	16.2	0.648
2	Feb-16	Hot	38	1.3	0.048
2	Feb-16	Cold	21.7	10.3	0.474
3	Feb-16	Hot	39	4.9	0.192
3	Feb-16	Cold	22.4	11.3	0.534
1	Jul-17	Cold	23	10.3	0.32
1	Jul-17	Cold	23	11.6	0.35
3	Jul-17	Cold	22	12.7	0.37
3	Jul-17	Cold	23	11	0.34

LEC found an average TP emission concentration of 6.9 mg/m^3 and an average PM_{10} particulate emission concentration of 6.8 mg/m^3, suggesting that a high proportion of particulate emissions are PM_{10}. The particulate emissions used to assess impacts included oils as particulates are and presented in Table 52.

6.9.2 Hot smoking

The hot smoke cycle involves heating the core of the fish to 65 °C for at least 10 minutes. The smokehouse chamber is heated to up to 90 °C, using heaters mounted to the roof. The hot smoke process usually runs for 400 minutes with the following steps:

- warming
- drying
  - intensive smoke
  - smoke reduction
  - drying

This occurs 4 times per hot smoking batch.

6.9.3 Cold smoking

The cold smoke cycle involves heating the core of the fish to 12–14 °C and achieves this using a chamber temperature of up to 26 °C. The cold smoke process usually runs for 800 minutes with the following steps:

- warming
- drying cool
  - intensive smoke cool
  - smoke reduction
  - drying FA1
  - drying FA1 cool
- drying cool.

This occurs 7 times per cold smoking batch.

[1] The total particulate emissions referred to exclude the oils and resins collected on the sample filter papers. These were weighed and are incorporated in the results presented in Table 39.

6.10 Noise environment

The existing noise environment consists of rural industry, heavy traffic from the Bass Highway and the existing operational fish processing facility.

6.10.1 Identification of sensitive noise receptors

The nearest sensitive noise receptors not involved with the proposal (including the Irrigation expansion) are shown in Figure 5. These are greater than 1200 m from the processing facility.

6.11 Heritage values

6.11.1 Aboriginal cultural heritage

A search of the Aboriginal Heritage Register (AHR), formerly the Tasmanian Aboriginal Site Index (TASI), identified no Aboriginal heritage sites or values in the sites vicinity.

6.11.2 Historic heritage

A search of the Tasmanian Heritage Register identified no historic heritage sites in the sites vicinity.

7 Identifying Environmental Aspects

Macquarie Franklin, Caloundra Environmental and HA have conducted preliminary assessments to identify key environmental aspects associated with the proposed development. Environmental issues were assessed by identifying and reviewing emissions from and environmental aspects of the existing Parramatta Creek processing facility and the irrigation system and applying these to the expanded production and irrigation proposed. A risk assessment was then carried out for each environmental hazard to assess potential impacts from the operation and to rate the priorities for investigation and management. Mitigation factors were incorporated into the assessment.

7.1 Risk and hazard assessment

The overall methodology for the risk assessment has adopted the recommended approach as outlined by AS/NZS ISO 31000:2009.

7.1.1 Identifying the hazards

This initial step seeks to identify potential hazards and the potential modes of occurrence. It is conducted using a structured, systematic process to ensure that all possible hazards are identified. Thus, the hazard identification process included:

- discussions with operational and environmental personnel to evaluate emissions and associated environmental hazards
- desktop review of available information
- site inspections.

In all cases, the process considered the potential timescale and extent of influence of the hazard's effect.

7.1.2 Risk ranking

7.1.2.1 Methodology

The objective of the assessment is to evaluate the risks associated with potential operational aspects on a semi-quantitative basis to provide a mechanism for prioritising hazards. The risk is scored using a semi-quantitative numerical scoring system that combines estimates of the likelihood and consequences of a hazard in the context of the existing control measures. The risk analysis provides a ranking system that can be used to compare and prioritise risks associated with each hazard.

The evaluation of likelihood and consequence involves comparing the significance of the hazard against predetermined criteria. Table 28 and Table 29 outline the general assumptions used to categorise the likelihood and consequence of the identified hazard.

Table 28: Consequence of hazard

Numerical ranking	Description
1 Low	Negligible or acceptable impact. No further management controls are required, assuming no change to current conditions.
2 Low to moderate	Impact may be acceptable. Further monitoring is required to establish potential significance. Implementation of simple management controls may be required.
3 Moderate	Moderate impact. Potentially acceptable if appropriate management controls are implemented.
4 Moderate to high	Impact has the potential to be unacceptable. Further monitoring may be required to establish potential significance. Implementation of appropriate management controls is required.
5 High	Unacceptable impact. The potential impact has a high severity and cannot be managed should it occur.

Table 29: Likelihood of occurrence

Numerical ranking	Description
1 Rare	Hazard is unlikely to occur within lifetime of project operations. Low likelihood of occurrence. No further management controls are required to minimise potential for occurrence.
2 Low	Minor management control may need to be considered to reduce likelihood of occurrence.
3 Moderate	Hazard has moderate likelihood of occurrence. Appropriate management control can result in low likelihood of occurrence.
4 High	Appropriate management control may not be sufficient to minimise likelihood and thus engineering or design solutions may need to be considered.
5 Almost certain	Hazard will inevitably occur or has already occurred. Management controls cannot practically minimise likelihood of occurrence to acceptable levels. Engineering or design solutions are required.

The ranking for likelihood and severity are combined in a matrix to establish an overall risk ranking as shown in Table 30.

Table 30: Risk ranking matrix

	Consequence				
Likelihood	**Low (1)**	**Low to moderate (2)**	**Moderate (3)**	**Moderate to high (4)**	**High (5)**
Rare (1)	1 Low	2 Low	3 Low	4 Moderate	5 Moderate
Low (2)	2 Low	4 Low	6 Moderate	8 Moderate	10 Moderate
Moderate (3)	3 Low	6 Moderate	9 Moderate	12 Moderate	15 High
High (4)	4 Moderate	8 Moderate	12 Moderate	16 High	20 High
Almost certain (5)	5 Moderate	10 Moderate	15 High	20 High	25 High

Where:

- high degree of risk = score ≥15
- moderate degree of risk = score ≥5 and ≤15
- low degree of risk = score ≤5.

Once the wastewater irrigation and increased production are fully operational, it is envisaged that for low-risk hazards the potential hazard or impact would be acceptable and that no additional management controls would be required. The hazard would be periodically monitored to assess whether the status of the hazard has altered. Conversely, for high-risk hazards, when neither the consequence nor the frequency of the hazard or impact can be appropriately managed, the risk should be engineered to reduce or remove the hazard. Hazards with a moderate risk may only need to be mitigated through administrative changes (management procedures etc.).

7.1.3 Hazard risk evaluation

Table 31 summarises the outcome of the environmental hazard identification and risk evaluation study as outlined above.

It must be understood that the values of likelihood and consequences that have been assigned in this table are based on subjective interpretation and experience. The risk rankings are intended to provide a basis for prioritising the hazards as outlined and should not be interpreted as a relative magnitude of risk. The difference in risk between hazards may be orders of magnitude. In addition, the consequence of the hazard is based on the most sensitive environmental receptors. Hence, in some cases, the environmental receptor may be people, while in other cases it may be ecological species, aesthetic issues or amenity. For each aspect, an inherent risk was initially determined and then risk mitigation measures were applied to reduce that risk to a net risk.

The major environmental risks identified with the project include:

- wastewater treatment
- effluent reuse schemes
- air emissions.
- biosecurity issues

Issues associated with the quality of treated wastewater are discussed in the risk assessment table (Table 31).

The effluent reuse scheme for full reuse of treated wastewater for irrigation to the land is addressed in the wastewater reuse environmental management plan (WREMP).

Air emissions have been assessed. In addition to the environmental risks associated with air emissions there is potential for the hazard as mentioned previously of explosive smoke densities. To reduce this risk, the ratio of transport air and smouldering air must be kept at a ratio of 20:1 to ensure that explosive smoke densities are never reached (this is specified by German safety regulation BGR 138).

Biosecurity risks at the Parramatta Creek site must be addressed by HA to ensure that fish from different growing regions are not compromised. HA has developed a biosecurity plan to ensure that these risks are addressed (Section 8.16).

The assessed net risk of the fish processing facility is low or moderate for most aspects. The higher risks are associated with salinity and wastewater irrigation; however, provided HA reduces salt loads and manages irrigation well, these hazards should be manageable.

Table 31: Preliminary risk assessment

Risk	Potential causes	Potential impacts	Mitigation plans	Consequence	Likelihood	Residual risk rating	Contingency plans
Water emissions							
Wastewater stream EC >3,000 µS/cm	Increases in production from the factory. Hot weather requires additional salt to be used to transport fish safely. Evapotranspiration levels high over summer, concentrating salts in wastewater ponds. Failure in slurry system saline water recycling.	Continued leaching of high salt loads to groundwater. Local soil structure decline. Increased salinity and/or sodicity of soils. High salt loads to surface water. Scorching of pasture	Monitor wastewater salt loading regularly as per the processing facility EC monitoring plan. Apply gypsum to soils in 2019 to reduce sodium ions and decrease risk of sodicity. Game exclusion fencing and no livestock.	2	3	6 (Medium)	Flushing soils with fresh water through Layton's freshwater dam
Thermotolerant coliforms >1000	Increases in production from the factory. Wastewater treatment breakdown. Poor performance of wastewater ponds/treatment plant.	High thermotolerant coliforms in surface water from run-off. High thermotolerant coliforms in pastures. Animal health issues (stock and wildlife [mammals])	No livestock grazing during the 2019–20 summer period. Game exclusion fencing and no livestock. Increase retention time in the ponds if there is the capacity.	1	3	3 (Low)	Increase retention time in the ponds if there is the capacity
High levels of nutrients in wastewater (compared to what is anticipated from 2018 median data)	Increases in production from the factory. Wastewater treatment breakdown. Poor performance of wastewater ponds/treatment plant.	Leaching of high nutrient loads to groundwater. Increased nutrient status of soils. High nutrient loads to surface water.	Continue monthly monitoring of wastewater ponds for nutrient levels. Game exclusion fencing and no livestock. Increase pond retention time to allow volatilisation.	1	3	3 (Low)	NA

Risk	Potential causes	Potential impacts	Mitigation plans	Consequence	Likelihood	Residual risk rating	Contingency plans
Wastewater volumes are excess to soil capacity	Increases in production from the factory. Above-average summer rainfall events. Impaired soil structure. Poor irrigation practices.	Surface water run-off. Soil erosion (rill and sheet) on bare soils. Anaerobic soil conditions. Death of pasture plants.	Game-proof fencing to ensure good pasture cover Support to ensure correct irrigation scheduling. Gypsum application to improve soil structure. BoM forecast for summer rainfall (2018–19) is: Probability of exceeding median rainfall (Dec to Feb) 31%.	1	2	2 (Low)	Macquarie Franklin are evaluating additional land (>20ha) available on Troy Lathan's farm on the western side of the Bass Highway. This land if suitable would become available for irrigation during a wet year.
Contaminated stormwater run-off into surface water	Contaminants from processing and maintenance operations enter and adversely impact receiving waters	Oils, greases and hazardous substances enter and adversely impact receiving waters	Sealed hardstand has been provided around the site buildings to ensure separation of potentially contaminated stormwater from, clean run-off. Few hazardous substances on site and all used within roofed building.	3	1	3 (Low)	Routine site inspections for integrity of stormwater and drainage system
Sewage from personnel on site reaches receiving waters	Seepage from AWTS trenches reaches wastewater storage and is irrigated	High levels of BOD, nutrients and pathogens in receiving waters	Pre-construction geotechnical tests on trench areas, conservative capacity design, distance from trenches to ponds and dams, Clay liner and seepage protection for winter storage dam.	3	1	3 (Low)	Routine site inspections for integrity of stormwater and drainage system and storage dam plus monitoring of wastewater before irrigation

Risk	Potential causes	Potential impacts	Mitigation plans	Consequence	Likelihood	Residual risk rating	Contingency plans
			Air emissions				
Odour issues	Odours produced by fish processing, wastewater treatment or irrigation of treated wastewater	Odours from fish processing, wastewater treatment or irrigation impact on neighbouring residences.	No complaints received to date despite overloaded and poorly managed wastewater management in 2014. Treatment plant now upgraded with shandying of effluent and prescribed irrigation plan. >1200 m north to sensitive receptors. Predominant winds west-southwest and south-easterly. Modelled ground level concentrations of odour units at the site boundary for a mitigated operation (covered DAF unit and balance tank) showed the extent of exceedance (>2OU) outside the boundary is reduced to approximately 25 m outside the facility boundary in Forestry land to the south and to approximately 40 m outside the facility boundary to the east in a private timber reserve.	2	2	4 (Low)	If any odour complaints are received and verified, the DAF and Balance Tank within the WWTP will be enclosed.

Risk	Potential causes	Potential impacts	Mitigation plans	Consequence	Likelihood	Residual risk rating	Contingency plans
High PM_{10} concentrations at adjacent receptors	Emissions of PM_{10} from smokehouses	Potential impact on health if high concentrations enter alveolar sacs.	The distance to sensitive receptors is>1200 m north of the activity. The modelled 24-hour average ground-level concentration of PM_{10} particulates at 0.045 mg/m^3 is significantly below the Air Quality Policy limit of 0.15 mg/m^3 at the site boundary. At the nearest receptor not associated with the operation, the modelled 24-hour average ground-level concentration of PM10 particulates is 0.0022 mg/m^3.	2	1	2 (Low)	Higher stacks can be installed to further reduce ground level concentrations of PM_{10} particulates

Risk	Potential causes	Potential impacts	Mitigation plans	Consequence	Likelihood	Residual risk rating	Contingency plans
			Noise emissions				
Operational noise above 35 dB(A) during the night at sensitive receptors	External pump and fan motors from factory and irrigation pumps	Nuisance and potential health impacts from consistent noise	No complaints received since the facility commenced operations. When the potential noise impact from operations at Parramatta Creek calculated and compared with the environment indicator levels from the Environment Protection Policy (Noise), there should be no adverse impact on acoustic environmental values.	3	1	3 (Low)	Routine noise monitoring to be imported into site EMP
			Solid wastes				
Odours or disease transmission	Odours generated from general wastes and organic wastes from WWTP and fish wastes, e.g. viscera	Odours at nearby receptors, poor waste handling leads to vector-transmitted disease	Daily removal of viscera and weekly removal of other frozen offcuts reduce the potential for odour development. Vacuum pump disposal of wastewater pond sludge's when required.	4	1	4 (Low)	Routine monitoring of management practices

Risk	Potential causes	Potential impacts	Mitigation plans	Consequence	Likelihood	Residual risk rating	Contingency plans
			Biosecurity				
Spread of infectious agents within sites as well as between sites	Transmission of disease from Strahan or Port Huon	Transmission of disease	HA has an extensive effective biosecurity management system in place.	2	2	4 (Low)	Monitor protocols and procedures currently in place

8 Potential Effects and their Management

The relevant receptors considered in this section are the downstream surface waters, the environment surrounding the facility (including wastewater storage), the environment surrounding the irrigation, the environment surrounding all aspects of the operation including potential impacts on the surrounding air, soil, groundwater, heritage and traffic.

Identified Effects

Identified effects covered within this section are:

- Stormwater;
- Sewage;
- Wastewater treatment;
- Wastewater Reuse (soils, groundwater and storage related to the wastewater reuse);
- Air emissions;
- Solid and controlled waste management;
- Dangerous and Environmentally Hazardous materials;
- Biodiversity and natural values;
- Noise;
- Traffic;
- Health;
- Visual;
- Fire Risk;
- Biosecurity;
- Greenhouse Gas emissions;
- Heritage;
- Land use and Development;
- Social and Health economic issues;
- Cumulative and Interactive Effects; and
- Additional Management

8.1.1 Performance requirements

Emissions, including both diffuse and point source emissions to surface waters, groundwater,
and point source pollution should be managed to protect the protected environmental values (PEVs) by implementing best practice environmental management in conjunction with emission limits set by the regulatory authority (State Policy on Water Quality Management 1997).

In February 2001, PEVs were established by the Board of Environmental Management and Pollution Control under the State Policy on Water Quality Management 1997 for the Mersey River catchments. This includes the Parramatta and Felminghams creeks, which are part of the Middle Mersey River catchment.

Table 32: Protected Environmental Values for the Middle Mersey Catchment

Land Tenure	Protected Values
Surface Waters on Private Land	A: Protection of aquatic ecosystems (ii) Protection of modified (not Pristine) ecosystems (a) from which edible Fish are harvested B: Recreational water quality and aesthetics (i) Primary contact water quality (Mersey River – at union Bridge; adjacent to bridle track road Kimberley bridge picnic area, at Oliver's road bridge, at Liena road bridge, at Merseylea bridge and from Lovetts Flats to Bells parade (ii) Secondary contact water quality for all other water surfaces (iii) Aesthetic water quality

8.2 Stormwater

Please note that uncontaminated site stormwater is directed into Felminghams and Parramatta creeks. Stormwater interceptor traps are installed to ensure sediment and petroleum hydrocarbons are not released to these creeks. Stormwater management around the processing factory will remain unchanged. The WWREMP (see Appendix B) describes measures to be implemented in regard to irrigation placement, timing, application and buffer zones (Figure 40) to mitigate against irrigation run-off entering waterways. Adverse impacts from stormwater management should not increase as a result of the proposed production increase.

8.3 Sewage

There will be no change to sewage quality or management as a result of this proposed production increase. The small increase in employee numbers will increase sewage quantities but only marginally. The existing sewage treatment plant has only been recently installed and is capable of treating the additional volume generated by the expected increase in employees with a design capacity of 200 staff 7 days per week.

8.4 Wastewater Treatment

Treated wastewater must be managed and maintained to meet several requirements such as water quality suitable for sustainable reuse and water quality that prevents the development of odour.
As noted in Section 6.7.1, impacts on water quality in the catchment arising from degraded water quality, habitat degradation from both forestry and agricultural practices, and water diversion had been acknowledged in setting PEVs for the Mersey River. Parramatta Creek has been considered poor by the EPA since at least 2001.
Discharging treated or inadequately treated process wastewater into the Parramatta Creek via irrigation and groundwater could increase the nutrient loads in the creek, increase BOD and nutrients, and decrease pH from soil chemistry changes, thus affecting the aquatic ecosystem.

8.4.1 Proposed wastewater limits

HA proposes to comply with the following management limits.

8.4.1.1 Treated wastewater

The quality of treated wastewater will be monitored at the outlet of pond 4 and at the winter storage pond as shown in Figure 55 and described in Tables 33 and 63.

Nutrients are not proposed as wastewater management limits. The principle EC limit is proposed for actual irrigation water. As an added commitment HA proposes that a statistical EC limit be applied to the final wastewater quality before dilution for irrigation.
For nutrients, these are a desirable feature of irrigation water to beneficiate pasture. The potential impact on surface and ground waters will also be managed through use of investigation triggers as described in Sections 9.5 and 9.6. The proposed limits are based on the current level of treatment being achieved onsite at present and HA will maintain this level of water treatment as a minimum. (table 33)

Table 33: Proposed wastewater quality management limits winter storage pond (pre-Irrigation)

Parameter	Unit	Proposed onsite Max limit	Proposed Irrigation maximum limit[2]
Electrical conductivity (EC)	µS/cm	**<2500**	**1100**
BOD	mg/L	**<50**	**<50**
Thermotolerant coliforms	Cfu/1,000mL	**<10,000**	**<10,000**

[2] Maximum limit to apply when wastewater is being irrigated.

Table 34: Salinity Wastewater Aug 2018 – Aug 2019

Statistical levels	Conductivity µS/cm 2018/2019	Biological Demand mg/L (BOD)	Thermotolerant Coliforms CFU/1000ml
10th Percentile	2,062	8.2	30
25th Percentile	2,170	12	50
Mean	2,465	25	190
Median	2,350	19	170
75th Percentile	2,790	30	220
90th Percentile	3,024	52.4	466
Maximum	3,060	73	490
Samples dates			
30-Aug -18	2,010	18	480
25-Sep-18	2,050	18	10
31-Oct-18	2,170	8	60
29-Nov-18	2,220	5	200
12-Dec-18	2,350	9	30
04-Feb-19	2,790	30	170
25-Feb-19	3,000	21	120
28-Mar-19	3,060	19	200
16-Apr-19	3,030	73	410
28-May-19	2,520	12	220
27-Jun-19	2,421	20	30
26-Aug-19	2,320	56	50

8.4.1.2 Irrigation water

Table 35: Proposed conductivity limit for irrigation water

Parameter	Unit	Maximum
Electrical conductivity (EC)	**µS/cm**	**1,100**

8.4.1.3 Process Wastewater avoidance and mitigation measures

HA is committed to preventing adverse impacts from the irrigation of wastewater. To achieve this, HA will irrigate its wastewater as per a Wastewater Reuse Environmental Management Plan developed by Macquarie Franklin (WWREMP). In addition, HA plans to maintain a maximum wastewater salinity of <2,500 µS/cm, at the outlet of the final pond (proposed 75ML winter storage dam) regardless of production throughput. At current production rates, this level of EC is already being achieved outside of summer months (Table 34: Salinity Wastewater Aug 2018 – Aug 2019) HA will undertake the following actions to achieve a consistent EC <2,500 µS/cm regardless of production and seasonality:

- Install a 75 ML winter storage dam which will provide dilution and modulation of the wastewater salinity before it is irrigated. During the winter storage period, the lower salinity wastewater will accumulate in the dam and be additionally diluted to a small extent by influent rainwater. This in turn will dilute the higher salinity summer wastewater before it is shandied for irrigation.
- HA will continue to upgrade the ice slurry systems used to transport fish from Port Huon and Strahan to Parramatta Creek. Huon Aquaculture have invested >750,000 dollars in upgrading the slurry facilities and will continue to upgrade the facilities as required to meet the <2500 µS/cm proposed limit.
- HA are currently trialling refrigerated transport tankers to replace or reduce the slurry portion required to achieve chilling of harvested fish, if successful and cost effective HA will introduce these tankers to further reduce salinity to remain below the 2500 µS/cm proposed limit.

- HA will engage Macquarie Franklin to commence the assessment of additional land owned by Mr Layton on the eastern side of the Bass Highway for irrigation use to provide further management options. HA will develop an expanded wastewater reuse environmental management plan (WWREMP) for EPA approval prior to implementation, if the introduction of chilled tankers is slower than planned.

8.4.2 Wastewater treatment volumes and retention times

8.4.2.1 Primary Wastewater Treatment

The Parramatta Creek Primary treatment section of the Wastewater Treatment plant has been designed to achieve a treatment capacity of 50KL per hour or 600KL per 12-hour production day. Wastewater production flows under this proposal are 561KL per day peak and 432KL per day average. In addition, the Balance tank holds 80KL of water above the treatment rate, allowing for the wastewater treatment to reach 680KL per day. The wastewater system is fully automatic operating on level sensors and float switches to activate and can therefore continue to treat water beyond the 12-hour production period.
The Primary treatment daily capacity can be increased above the current capacity with a larger balance tank (currently 80KL) allowing for increased pre-treatment water storage. The entire system is modular and additional sections can be replicated effectively doubling the Primary treatment capacity.

Table 36: Treatment Capacity Primary Section Parramatta Creek Wastewater Treatment Plant

Equipment	Description	Maximum Wastewater Treatment per hour	Daily Treatment (12 hours)
Tas Engineering 60/8 Screwpress	Course (>1mm) Solids Removal	60KL	720KL
Aerated Balance Tank	Mixing and solids suspension	50KL	600KL
Hydroflux Automatic Polymer Preparation System	Blending and dosing of Polymer	50KL	600KL
Hydroflux HydroDAF 50	Dissolved Aeration Filter system	50KL	600KL

8.4.2.2 Secondary Wastewater Treatment

The Secondary Wastewater Treatment System utilises 4 ponds (cells) The pond system provides effective disinfection by extended oxidation and ultraviolet radiation from the sun.

The benefit of the photosynthesis that occurs in the ponds is that dissolved oxygen (DO) produced via photosynthesis remain at saturation levels (100%).

The design principals utilised to enhance bacterial disinfection in the system are:

- Four cells/ponds to enhance bacterial die-off. The disinfection rate is much greater (90×) compared to a large single-cell lagoon with a similar retention time.
- The use of the aerators to improve performance.

8.4.2.2.1 Cell 1 (2.6ML)

The bulk of the organic reduction occurs in the 2.6ML pond 1. Supplementary aeration is supplied by large 15 kW agitation unit. The aerator has been installed to rapidly decrease the organic loading. If aerators were not utilised odours could result once anaerobic conditions developed. The later ponds would then also receive an increased organic load, decreasing overall cell performance.

8.4.2.2.2 Cell 2 (2.6ML)

Pond 2 has a 20 kW aerator that provides additional BOD reduction and elevated dissolved oxygen levels reducing any potential for odourous conditions occurring. The increased aeration provides additional reduction on organic loading and improves the overall performance of cells 3 and 4.

8.4.2.2.3 Cell 3

Cells/Ponds 3 is 5ML and operates as facultative lagoon within this water treatment design.
With the effective solids removal of the screwpress and DAF unit in the Primary Wastewater system and the intensive aeration of cells 1 and 2, organic loading into cell 3 is low and any solids reporting to the cell are finer than in wastewater systems that don't have effective Primary water treatment.
Cell 3 has always operated as a facultative lagoon within the PC water treatment system effectively allowing for the finer solids to settle in the base of the cell were a population of anaerobic organisms will colonise and digest any accumulated sludge.

8.4.2.2.4 Cell 4

Water from Cell 3 reports to Cell 4. Currently the site utilises cell/pond 4 as Irrigation and wastewater storage but with the development of the proposed 75ML water storage dam Cell 4 will become the sites Polishing pond.
Water reporting to Cell 4 is essentially <2mg/L in Total Suspended Solids and its appearance is clear. The clear water provides improved UV disinfection. Water from Pond 4 will report to the proposed 75ML winter storage/irrigation dam.
Current retention time is reduced as Pond 4 is not considered part of the water treatment process water flows (December 2019) reached 404KL per day or a total retention time of 25.24 days and provided an effective wastewater treatment with low bacterial (<200cfu Thermotolerant Coliforms) and biological oxygen Demand (<25mg/L) (see table 9).
Average water treatment will be effectively increased by nearly 10 days under this proposal and provide for continued reduced levels of contaminants. See table 37.

Table 37: Secondary Wastewater Treatment Retention Times Parramatta Creek

Cell Name	Description	Retention Time Days Maximum Production (33,000tpa) (561KL PD)	Retention Time Days Average Production (33,000tpa) (432KL PD)
Pond 1 (2.6ML)	Aerated Wastewater Pond	4.63	6.02
Pond 2 (2.6ML)	Aerated Wastewater Pond	4.63	6.02
Pond 3 (5ML)	Facultative Pond	8.91	11.57
Pond 4 (5ML)	Polishing Pond	8.91	11.57
		27.08 Days	**35.18 Days**

8.5 Wastewater reuse

Part of the avoidance and mitigation measures is the development and utilisation of a Wastewater Reuse Environmental Management plan (WWREMP).

Irrigation of PC wastewater will be managed in accordance with a WWREMP as detailed in Appendix B.

Macquarie Franklin has developed the WWREMP to provide a sustainable long-term wastewater reuse option for reuse of Parramatta Creek wastewater. Macquarie Franklin's considerable experience with wastewater irrigation schemes across Tasmania and southern Australia, and knowledge arising from being involved in long-term soil monitoring programs, were major factors in determining the recommended irrigation water EC.
They have experience in many soil types being irrigated with water of similar (or higher) salinity, on soils with similar (or worse) constraints. Long-term monitoring in these situations has demonstrated the effectiveness of salts being leached by natural rainfall.
The plan has been developed to:

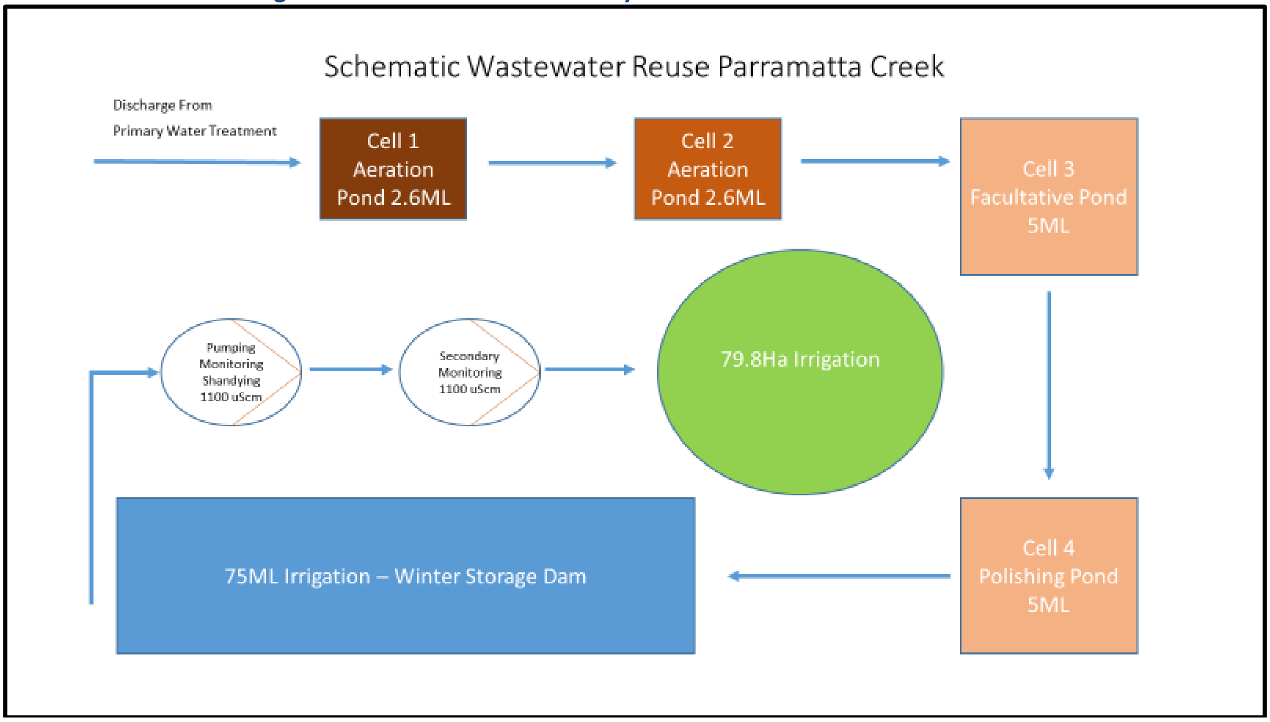
- describe the current and future wastewater production and treatment;
- identify and describe a sustainable, land-based reuse solution (irrigation) for wastewater; produced to address existing wastewater volumes and forecast increased flows;
- outline management practices required to ensure safe and sustainable wastewater irrigation and
- detail an appropriate environmental monitoring program to monitor the impact of wastewater irrigation.

The WWREMP plan covers:

- the regulatory framework;
- a review of previous wastewater reuse activities on site;
- an assessment of baseline environment data for soils, surface water and groundwater;
- a description of the transition from the current wastewater management to recommended wastewater management practices;
- a description of wastewater quantity and quality and improvements to wastewater quality;
- an evaluation of the prospective water balance for irrigation on the land and
- an assessment of salt load management, irrigation, land capability and suitability for wastewater irrigation, soil management, hydrology management and crop management.

It provides detail on the proposed irrigation system design, the irrigation area, the irrigation system layout, irrigation application and flow rate, and the capacity to irrigate, as well as fresh water supply, the pumping system and other applicable aspects to the proposed irrigation of treated wastewater.

Figure 39: Schematic of Secondary treatment and wastewater reuse



8.5.1 Wastewater reuse plan Background Summary

Wastewater from the Parramatta Creek fish processing facility is classified as Class B recycled water (median results), when compared to the *Environmental Guidelines for the Use of Recycled Water in Tasmania, 2002*, referred to herein as the Tasmanian Recycled Water Guidelines (TRWG).
For the purpose of managing the water source in the WWREMP, it is treated as Class B recycled water.

Based on the TRWG, Class B recycled water is suitable for crops for human consumption to be consumed raw (providing no physical contact between recycled water and the produce, with an appropriate management plan in place on site to manage the risk), as a processed product or for irrigation of pasture and fodder for livestock (excluding pigs and poultry).

The current permit conditions environmental (No. 7894) specify that wastewater from the fish processing facility is not permitted for:

- human food crops; or
- irrigation of land to be grazed by livestock; however, pasture and fodder crops may be harvested from the site and fed to livestock.

The section 9.1 of the WWREMP supporting the DPEMP is based on irrigating pasture being grown for removal from site or for grazing by cattle and/or sheep and a 48-hour withholding period between irrigation and stock access being implemented.

The potential risk being managed is the transfer of pathogens and disease from fish (or fish feed) to livestock, however at other sites with very similar circumstances, the risk is managed via a 48- hour withholding period between irrigation and access to the site by livestock requiring a visual inspection by the farmer. The site also provides sampling for Bacteria with results indicating that bacteria counts have been compliant for the past 3 years.

"It is recommended that requirement 3.1 of condition G10 in the environmental permit conditions (No. 7894) be replaced to permit livestock grazing:

3. The plan must be prepared in accordance with the Environmental Guidelines for the Use of Recycled Water in Tasmania and in compliance with the following requirements:

3.1 Grazing by livestock (other than pigs and poultry) requires a 48-hour withholding period post irrigation; and

3.2 No crops other than livestock fodder crops or non-human food crops are to be grown on land subject to irrigation with effluent."

Withholding periods
The following minimum withholding periods apply to the use of wastewater for irrigation under this WREMP. These are in excess of the requirements as outlined in the Environmental guidelines for the use of recycled water in Tasmania 2002.

- 48-hour withholding period between irrigation and livestock access
- 48-hour withholding period between irrigation and harvesting of fodder crops"

8.5.2 WWREMP Buffer zones

To manage the risk of spray drift beyond the property boundaries and sensitive areas, the following buffer distances are to be implemented:

- 50 m buffer distance to property boundaries (excluding the internal boundary between Huon Aquaculture and the adjoining irrigation property owned by Mr Layton);
- 50 m buffer distance to buildings (houses, factory facilities, workshops etc) and
- 20 m to waterways and dams.

These buffer zones are shown in Figure 40. The buffer distances are based on a site-specific approach, with the purpose being to manage the relevant risks (i.e. prevent spray drift to areas accessed by humans and prevent surface water run-off to sensitive areas or other water sources/storages).

In addition, irrigation will not occur when wind conditions are such that there is a risk of spray drift leaving the property boundaries or entering a sensitive area (e.g. houses, factory facilities, workshops).

8.5.3 WWREMP Centre pivot sprinklers

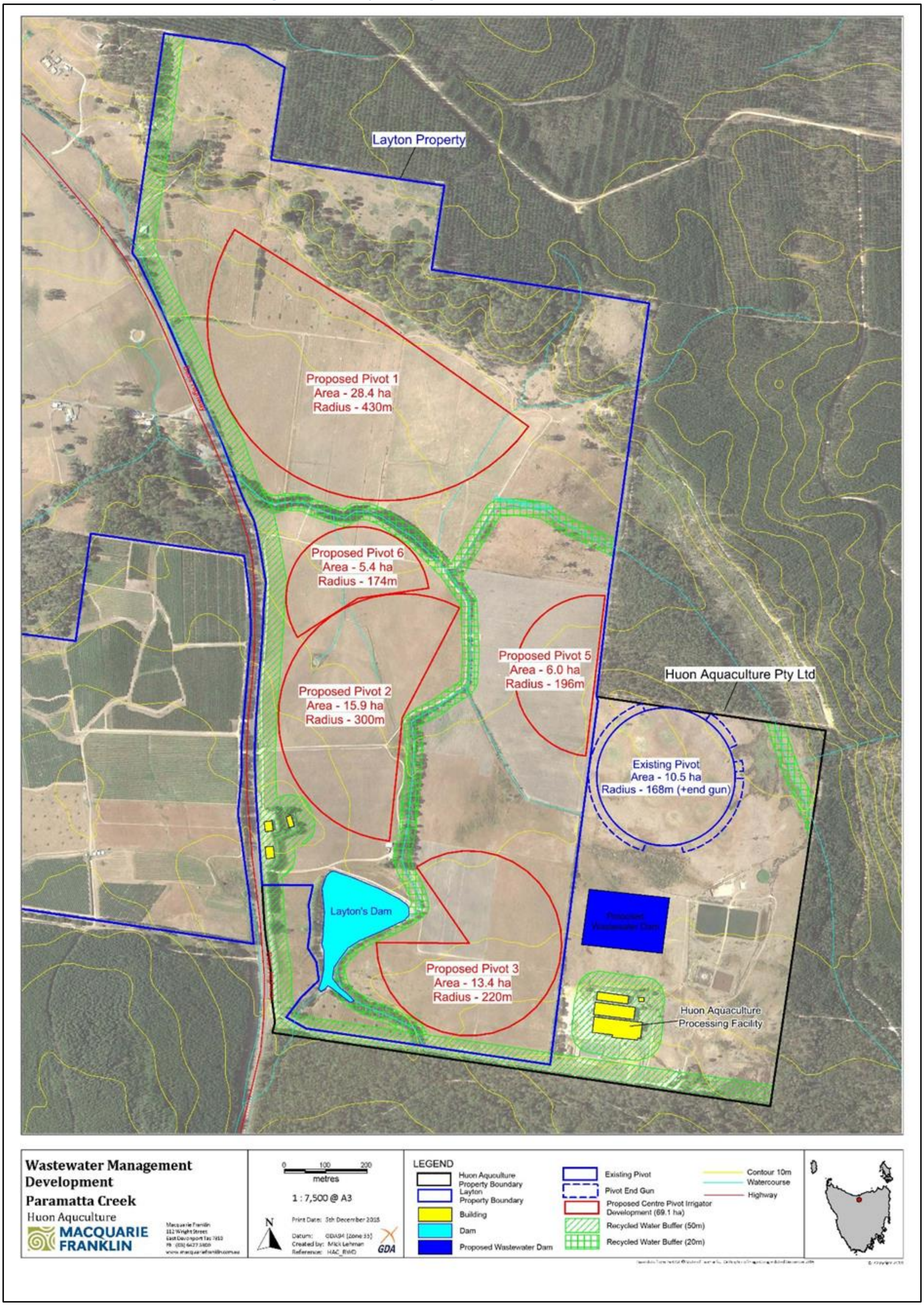
The sprinkler packages for each centre pivot irrigator will consist of Nelson R3000 rotators. Nelson rotators are regarded within the irrigation industry as the premium centre pivot sprinkler. Application uniformity is typically between 90% and 95% coefficient of uniformity (CU), which is exceptionally high. As result, irrigation application is very uniform across the entire area. It should be noted that CU values of above 85% under pivot irrigators is generally accepted as the standard.

8.5.4 WWREMP Wastewater storage

A key component of the upgraded irrigation system and the WWREMP will be the construction and use of a 75 ML wastewater storage dam for winter storage of wastewater. All wastewater storage will occur in the winter storage dam. This facility will feed wastewater into the irrigation system, where it will mix with fresh water from Layton's dam to provide irrigation water at an EC of 1100 µS/cm or less.

The WWREMP provides a long-term environmentally sustainable solution in terms of public health and receiving ecosystems and provides benefits to HA and the adjacent landowner by facilitating irrigation of crops during otherwise dry times.

Figure 40: Map of irrigation areas and buffer zones



8.5.5 Water balance

Water balance calculations were conducted as part of the WWREMP for wastewater produced at maximum factory production using the water balance method outlined in the Tasmanian Recycled Water Guidelines. Crop factors were updated to reflect known pasture growth rates in the Parramatta Creek area during mean and 90th percentile rainfall years. The maximum volume of wastewater produced when the factory reaches 33,000tpa is 112ML. Table 38 summarises the outputs from these calculations for different wastewater salinity levels, during mean and 90th percentile annual rainfall scenarios and the irrigated area of pasture. To achieve the maximum EC of 1100uS/cm in the irrigation water a shandying step is proposed. Table 39 details the shandy rates required for sustainable reuse during a mean rainfall year, 90th percentile rainfall year and with the current mean (2018/19) wastewater electrical conductivity. The water balance modelling conducted as part of the WWREMP has been used to determine the shandy rates which allow for sustainable reuse of wastewater on 79.8ha of irrigable area, under different rainfall scenarios. Table 38 and Table 39 also highlight the maximum wastewater EC and required shandy rates to sustainably irrigate 79.8ha during a mean rainfall year and a 90th percentile rainfall year. The figures used are the same as the WWREMP, however the variables have been set so that the volume of irrigation water (wastewater plus freshwater) and the irrigable area (79.8ha) of pasture are matched. The shandying rates have then been varied as needed so that irrigation water matches pasture requirements during either a mean year or a 90th percentile year. This results in different wastewater ECs being able to be accommodated depending on the rainfall. Shandying will occur within the pipeline, prior to reaching the irrigation equipment. The storage dam will not be required to store shandied water. The irrigation system is designed to accommodate this requirement and is detailed in the WWREMP.

Table 38: Water balance calculations for maximum wastewater production volumes, current and sustainable wastewater salinity levels and mean and 90th percentile annual rainfall conditions[3]

Annual wastewater production volume (ML)	Wastewater storage volume (ML)	Irrigation area available (ha)	Wastewater EC (µS/cm)	Mean rainfall		90th percentile rainfall	
				Irrigation area required (ha)[2]	Storage volume required (ML)	Irrigation area required (ha)[4]	Storage volume required (ML)
112.2	75	79.8	2,380 (2018/19 mean)	54	59	70	66
			2,770	63		**79.8**	
			3,560	**79.8**		104	

Table 39: Shandying ratio for wastewater and fresh water

Reuse water EC	Shandying ratio required to achieve target EC of irrigation water (1,100 µS/cm)
Sustainable in a mean year - 3,560 µS/cm	1 part wastewater to 2.24 parts freshwater
Sustainable in a 90th percentile wet year - 2,770 µS/cm	1 part wastewater to 1.52 parts freshwater
Current* - 2,380 µS/cm	1 part wastewater to 1.16 part freshwater

** current mean EC (September 2018/19) of wastewater stream*

[3] *Climate statistics from Bureau of Meteorology: rainfall data from Devonport Airport (BoM site no: 091126) and evaporation data from Deloraine (Athol) (BoM site no: 091000).*

Crop factors informed by pasture growth rates at Devonport, Deloraine and Sheffield (TIA pasture growth rates model).

[4] ** Irrigation areas based on shandying the wastewater to 1100µS/cm*, not applying wastewater directly

The irrigation system design enables irrigation of 79.8ha of land. At the current mean (2018/19) wastewater salinity level (2,380 µS/cm), up to 112ML per year under mean rainfall conditions can be irrigated (once shandied to 1100µS/cm) on 54ha, considerably less than the proposed 79.8ha.

During a mean year, the irrigation system is sufficiently sized to sustainably irrigate wastewater with an electrical conductivity of 3,560µS/cm, across the 79.8ha, once shandied to 1,100µS/cm.

In extremely wet years, where the annual rainfall is equivalent to 90th percentile rainfall conditions, at the current salinity level (2,380 µS/cm) there would be sufficient land (70ha) to irrigate 100% of the forecasted wastewater production flows of 112ML. During a 90th percentile wet year, a maximum wastewater salinity of 2,770µS/cm can be sustainably irrigated on the 79.8ha, once shandied to 1,100µS/cm.

The water balance has modelled a required wastewater storage volume of 66ML during a 90th percentile wet year. The proposed new wastewater pond will provide a storage volume of 75ML.

8.5.6 WWREMP Surface waters management

Existing water quality results for Parramatta Creek and the proposed investigation guideline values are both lower than the ANZECC (2000) lowland river 95% species protection limits. The 20% trend allows for the seasonal and catchment influences to not trigger an investigation, with the 20% trending investigation limit remaining below the ANZECC (2000) lowland river 95% species protection limits.
A negative or undesirable trend from baseline data can provide an early warning of potential issues, before any upper limits or trigger values are reached. This provides an opportunity for preventative actions to be implemented well before any negative environmental impacts are experienced.
A negative trend over a two-year period, where the change in parameters is greater than 20% of the baseline value and the trend is consistent in one direction, will trigger an investigation as per Figure 16 of the WWREMP. In addition, the ANZECC 2000 and 2018 (as appropriate) guidelines (lowland rivers) will be used as a point of reference for exceedances of measured parameters for surface water. Using these guidelines as the trigger value is appropriate given the baseline data for soils, surface and groundwater.

The Parramatta Creek catchment is highly modified, with impacts from a range of land uses. Historic water quality data from Parramatta Creek and baseline groundwater data from Layton's farm is variable and shows seasonal variation, with ECs of up to 690 µS/cm. Water use in the Parramatta Creek catchment is predominantly stock drinking water, accessed directly from the waterway by livestock. There is no evidence for domestic water off-takes from Parramatta Creek. Parramatta Creek does not supply a drinking water catchment.

8.5.6.1 Surface water investigation guidelines

The recommended investigation guideline values to be used when reviewing surface water quality results are based on historical baseline data collected from Parramatta creek near the confluence with the Mersey River and data collected from Layton's farm. A comparison with the trigger values for lowland rivers in south-east Australia from the Australian and New Zealand Environment and Conservation Council Guidelines for Fresh and Marine Water Quality (ANZECC 2000) has been used to ensure guideline values maintain species protection. Baseline data used to develop the investigation guideline values are from DPIPWE collected water samples from 2006, from Parramatta Creek upstream of the confluence with the Mersey River. Data collected by Macquarie Franklin from Felminghams Creek and Parramatta Creek during 2018/19 has also been used to develop investigation guideline values. The investigation guideline values are to be applied to surface water monitoring site SS3 as it is the most downstream monitoring site. Table 40 provides the proposed surface water investigation guideline values.

The historic salinity data for Parramatta Creek shows seasonal variation with electrical conductivity increasing through summer and autumn. Wastewater irrigation will occur through late spring, summer and autumn when there is a moisture deficit in the soil. This results in all irrigation water applied being evaporated or evapotranspirated, with runoff and leaching events of wastewater unlikely when the irrigation is managed well. Impacts from wastewater irrigation will be more likely through winter and spring when seasonal rainfall will leach or possibly cause runoff of salts. Dilution with high rainfall through winter and spring will reduce any potential impacts on receptors from salt leaching and runoff. The

investigation guideline value for electrical conductivity chosen (550 µS/cm) is based on the baseline data collected in 2006, with an additional 10% increase included to account for seasonal variation. This value is well within the ANZECC lowland rivers salinity range (125-2200 µS/cm), particularly given the historical disturbance and geology of the catchment.

Nitrogen and its forms of ammonia, nitrite and nitrates will be applied through the wastewater reuse irrigation and potentially enter surface water if irrigation is not managed correctly. However, it is also possible for these nutrients to enter surface waters due to intense stock grazing and stock accessing creeks for water. The investigation guideline values for nitrates and total nitrogen are based on baseline data collected from Parramatta Creek in 2006. The ammonia (1.8mg/L @ pH7.1) investigation guideline value is based on data collected from SS3 during April 2019, this value aligns closely with the ANZECC (2002) 95% species protection value (2.1mg/L @ pH 7.1). Table 40 from ANZECC (2000) is to be used to adjust the ammonia level to the correct pH.
pH varies within the catchment, with a low pH (5.8) recorded in Felminghams Creek upstream of Layton's property and increasing to 7.54 downstream near the confluence with the Mersey River. This range (5.8-7.54) will be used to trigger investigations and similar to the recommended ANZECC trigger values (6.5 - 8).
The total phosphorus investigation guideline value has been based on data collected from SS3 in April 2019. While this is double the ANZECC (2002) lowland river value, the property has a long history of horticulture and improved pastures. It is common practice for these land uses to apply phosphorus as a fertiliser, resulting in elevated phosphorus within the catchment. Phosphorus levels in the wastewater are low and therefore phosphorus in the surface water is more likely to be from historical and current agricultural practices than wastewater reuse.

Table 40: Surface water investigation guideline values for Parramatta Creek (SS3) on Layton's property

Analyte	Investigation guideline value	ANZECC 2002 lowland river
pH	5.8 – 7.6	6.5 – 8.0
Electrical conductivity (EC) µS/cm	550	125 - 2200
Nitrate (NO_3) mg/L	0.7	0.04
Total Nitrogen (Total N) mg/L	1.7	0.5
Ammonia N mg/L	1.8 mg/L @ pH 7.1	2.1 mg/L @ pH 7.1*
Total Phosphorus (Total P) mg/L	0.1	0.05

* 95% species protection trigger limits for freshwaters.

8.5.7 WWREMP Groundwater management

The impact of the wastewater irrigation activity on groundwater flow and quality is discussed in detail in Appendix B and summarised below.

8.5.7.1 Existing groundwater conditions

The relevant receptor considered in this section is the groundwater quality of the site. This then seeps into the headwaters of Parramatta Creek and affects surface water quality.
The 2009 groundwater assessment of HA land, as described in the 2009 DPEMP (pitt&sherry, 2009), found that groundwater was close to the surface and that groundwater quality was below the ANZECC trigger values for freshwater at 95% level of protection of surface waters for most parameters tested. The exceptions were pH over all locations and aluminium at BH6.

8.5.7.2 Performance requirements groundwater WWREMP

Groundwater emissions from activities must comply with the following:

- *State Policy on Water Quality Management 1997;*
- *Environmental Management and Pollution Control Act 1994;*
- *Water Management Act 1999 and*
- *Groundwater Act 1985.*

8.5.7.3 Potential effects (groundwater)

The operations of the site could potentially have an impact on groundwater from irrigation of wastewater effluent. There is also potential for seepage from the treatment ponds.

8.5.7.4 Avoidance and mitigation measures (groundwater)

The mitigation measures used to protect surface waters from fuel and oil, sewage and off-site discharge will also protect groundwater. Monitoring of groundwater, management of irrigation, and measures to protect groundwater from the effects of irrigation are provided in detail in Appendix B.

These include:

- monitoring wastewater for nutrient concentrations and developing appropriate fertiliser budgets in collaboration with the landowner and an agronomist;
- monitoring wastewater for salt loading and flushing treated wastewater with fresh water;
- ensuring that sufficient irrigable area is available for diluted wastewater irrigation and
- the provision of pasture and grazing management support to the landowner to ensure pastures are productive and nutrient removal is optimised.

8.5.7.5 Groundwater investigation guidelines

Given that nearby bores are in a Permian mudstone aquifer with a standing water level of 18–40 m below ground level (bgl) (DPIPWE 2007) and existing monitoring bores have a SWL of only 0 m to 5 m bgl; due to this connectivity there is a higher potential for impacts to surface water receptors rather than groundwater receptors.

As noted in the WWREMP (Appendix B), trends in groundwater, surface water or soil quality (relative to baseline data) are at least as important as guideline limits. HA proposes reviewing trends against baseline data to provide an early warning of potential issues, before any upper limits are reached, and so provide opportunities for preventative actions before any negative environmental impacts are experienced.

The recommended investigation guideline values to be used when reviewing groundwater quality results are based on baseline data collected from six monitoring bores installed on Layton's property in 2018. Due to the spatial differences observed in the groundwater quality, investigation guideline values have been developed for each monitoring bore (MW8, MW10, MW11, MW12 and MW13) within the reuse area on Layton's property. Investigation guideline values have not been included for HA's Parramatta Creek property. Historical data will be used to monitor the trends when reviewing data from these bores (MW1, MW2, MW4, MW5, MW6, MW7 and MW9).

Data collected from three baseline monitoring events over 2018/19 has been used to develop the investigation guideline values for each bore within the reuse areas of Layton's property. The key investigation guideline value analytes include electrical conductivity, pH, ammonia, nitrates, total nitrogen and total phosphorus. These analytes have been chosen as they present the highest likelihood of being affected by wastewater irrigation. Other analytes will be assessed and appropriately investigated if trend changes are identified. An additional 10% has been added to each investigation guideline value to allow for seasonal variation and concentration during low recharge periods.

The recommended investigation guideline values proposed (Table 41) when reviewing groundwater quality results, are a combination of the trigger values for lowland rivers in south-east Australia from the Australian and New Zealand Environment and Conservation Council Guidelines for Fresh and Marine Water Quality (ANZECC 2000) and local reference data from the groundwater, Parramatta Creek and Redwater Creek.

Table 41: Groundwater investigation guideline values

Parameter	MW8	MW10	MW11	MW12	MW13
Ammonia N mg/L	0.11	0.11	0.11	0.33	0.11
Conductivity (Lab) µS/cm	440	520	890	1100	340
Nitrate N mg/L	0.14	0.25	0.59	0.04	0.07
Kjeldahl Nitrogen mg/L	0.55	0.55	0.55	0.33	0.22
pH (laboratory)	5.5-5.9	5.8-6.2	6.2-6.8	6.2-6.9	6.2-6.8
Total Phosphorus mg/L	0.21	0.21	0.37	0.23	0.30

8.5.7.6 Assessment of residual effects (groundwater)

The measures outlined above should ensure that any potential impacts on groundwater are properly monitored, managed and controlled and present a low risk to the environment. The future improvements planned by HA should significantly reduce environmental risk and lead to long-term sustainability.

8.5.8 WWREMP Soils Management

The impact of the wastewater irrigation activity on soils is discussed in detail in Appendix B and summarised below.

8.5.8.1 Existing soil conditions

The relevant receptor considered in this section is the soils on HA and Layton land. Baseline conditions are described in Section 6.5.4.

8.5.8.2 Performance requirements (Soils)

Irrigation must be managed in compliance with the following:

- *State Policy on Water Quality Management 1997;*
- *Environmental Management and Pollution Control Act 1994;*
- *Water Management Act 1999; and*
- *Groundwater Act 1985.*

8.5.8.3 Potential effects on soils

The operations of the site could potentially have an impact on soils from irrigation of wastewater effluent.

These include:

- nutrient accumulation in soils;
- salt accumulation in soils; and
- soil structure decline due to poor irrigation practices / impeded drainage (waterlogging) in areas under irrigation.

There is also potential for these pollutants to migrate from soils to receiving waters if irrigation is not adequately managed.

8.5.8.4 Avoidance and mitigation measures (Soils)

Mitigation and management measures are described in detail in Appendix B.

In most cases trends in soil quality (relative to baseline data) are at least as important as exceedances of guideline limits. A negative or undesirable trend from baseline data can provide an early warning of potential issues, before any upper limits or trigger values are reached. This provides an opportunity for preventative actions to be implemented well before any negative environmental impacts are experienced.

The reference used to establish acceptable ranges for soil analytes (nutrient and physicochemical properties) is *Soil analysis – an interpretation manual* (CSIRO, 1999). This is the principal reference manual for soil scientists in Australia.

The management prescriptions described in Appendix B and Section 8.4.1.3 are designed to mitigate impacts on soils and consequent impacts on receiving waters.

8.5.9 Long-term impacts of wastewater reuse

Macquarie Franklin has developed the current WWREMP after detailed assessment of baseline environmental data and projected future wastewater quality and quantity. The assessment concludes that the WREMP (see Appendix B) provides a long-term environmentally sustainable solution in terms of public health and receiving ecosystems and provides benefits to HA and the adjacent landowner by facilitating irrigation of crops during otherwise dry times.

8.5.10 Assessment of residual effects

The measures outlined above are expected to ensure that any potential aqueous emissions are properly monitored, managed and controlled, to present a low risk to the environment.

8.5.11 Commitments

Undertakings	Due date
Legal	
Final legal agreement between Huon Aquaculture and Mr Layton will be finalised to align with WWREMP approval conditions signed.	Within one month of formal EPA approval
Rehabilitation of existing HA irrigation sites	
Undertake activities to rehabilitate sodic soils under HA pivot: • **fencing*** • **application of gypsum*** • **pasture renovation*** • **improved grazing management**	Late 2018 onwards (*completed)
Construction of wastewater storage and irrigation infrastructure (pending approval of DPEMP)	
Wastewater storage dam construction • **approvals process** • **tendering process** • **construction process**	Late 2019 Late 2019 2019–2020
Irrigation infrastructure construction • **tendering process** • **construction process** • **irrigation of wastewater commences on Layton's property**	Late 2019*(completed) Late 2019/early 2020 Late 2020
Full-scale wastewater irrigation commences with irrigation scheme and new wastewater dam connected.	Late 2020 or earlier 2021
Process changes	
Trial of refrigerated trucks.	February 2019 –February 2020
Wastewater quality	
Wastewater quality will continue to be monitored monthly, with a focus on ensuring median quality complies with Class B recycled water requirements (apart from pH, which should be maintained below 9.0 pH units).	2019 onwards
Wastewater electrical conductivity will be maintained below an EC of 2500 µS/cm[5] within Huon's wastewater storage dam.	2019 onwards
Wastewater will be shandied to ensure the electrical conductivity of wastewater irrigated onto land is 1100 µS/cm or less.	Once new irrigation infrastructure is operational
Should the implementation of the expanded chilled tanker program be delayed and additional chilled tankers not implemented by summer 2020, HA Develop and implement an expanded irrigation program utilising an additional 67.8 ha of land to the east of the Bass Highway.	If a second chilled tanker is not commissioned by April 2020, HA will submit a revised WREMP incorporating the expansion by 30 April 2020.

[5] Noting that the median for the past 12 months has been 2,470 µS/cm and that the EC at the winter storage dam discharge point, i.e. before shandying is expected to be below this.

Undertakings	Due date
As part of the monthly water quality testing program conducted by Huon Aquaculture, treatment plant ponds and the new wastewater storage will be monitored for algal blooms. If an algal bloom is evident, a water sample will be sent to a NATA-accredited laboratory for testing to determine whether the bloom is toxic.	2019 onwards
Wastewater reuse irrigation activities (pending EPA approval of DPEMP)	
A minimum of 75 ML of wastewater storage and 79.8 ha of land will be available for irrigation of wastewater flows in a 90th percentile rainfall year.	Late 2019 onwards
Irrigation infrastructure will be designed and constructed in a way that enables automated shandying of wastewater and fresh water to achieve target electrical conductivity of 1100 µS/cm or less.	Late 2019 onwards
All persons involved in irrigation activities will be trained in the appropriate use of the infrastructure prior to irrigation commencing by an appropriately experienced irrigation advisor.	Late 2019
Appropriate irrigation equipment such as pivot irrigators, pumps, valves and solenoids will be determined in consultation with Mr Layton (the main irrigation operator), HA and an appropriately experienced external advisor.	Mid–late 2019
Training in the use of irrigation scheduling equipment and ongoing support from an appropriately experienced irrigation advisor will be available to the irrigation manager.	Late 2019 onwards
Wastewater will be applied and managed in accordance with requirements outlined in the WWREMP (Appendix B).	Late 2019 onwards
The pasture and livestock manager will be coached (as required) by an experienced pasture and grazing advisor to ensure they develop the required skills and have access to professional support to implement best practice.	Late 2019 onwards
Environmental monitoring	
A review or 'compliance check' of irrigation activities and implementation of the requirements outlined in the WREMP will be conducted annually by an appropriately experienced advisor. The findings of the compliance check will be incorporated into the annual reporting process.	Late 2019 onwards
Monthly records of expanded wastewater irrigation will be maintained to enable results from the environmental monitoring program to be linked to irrigation practices.	Late 2019 onwards
The updated monitoring programs for surface water, groundwater and soil will be implemented.	Late 2018 onwards
Following the first full soil sampling event, a fertiliser management program will be developed by an appropriately experienced soils advisor and reviewed annually as part of the annual soil monitoring program.	January 2020
Results and recommendations from the environmental monitoring program will be reported annually to the EPA by January 31st.	January 2020 onwards

8.5.12 Winter storage dam – design and construction

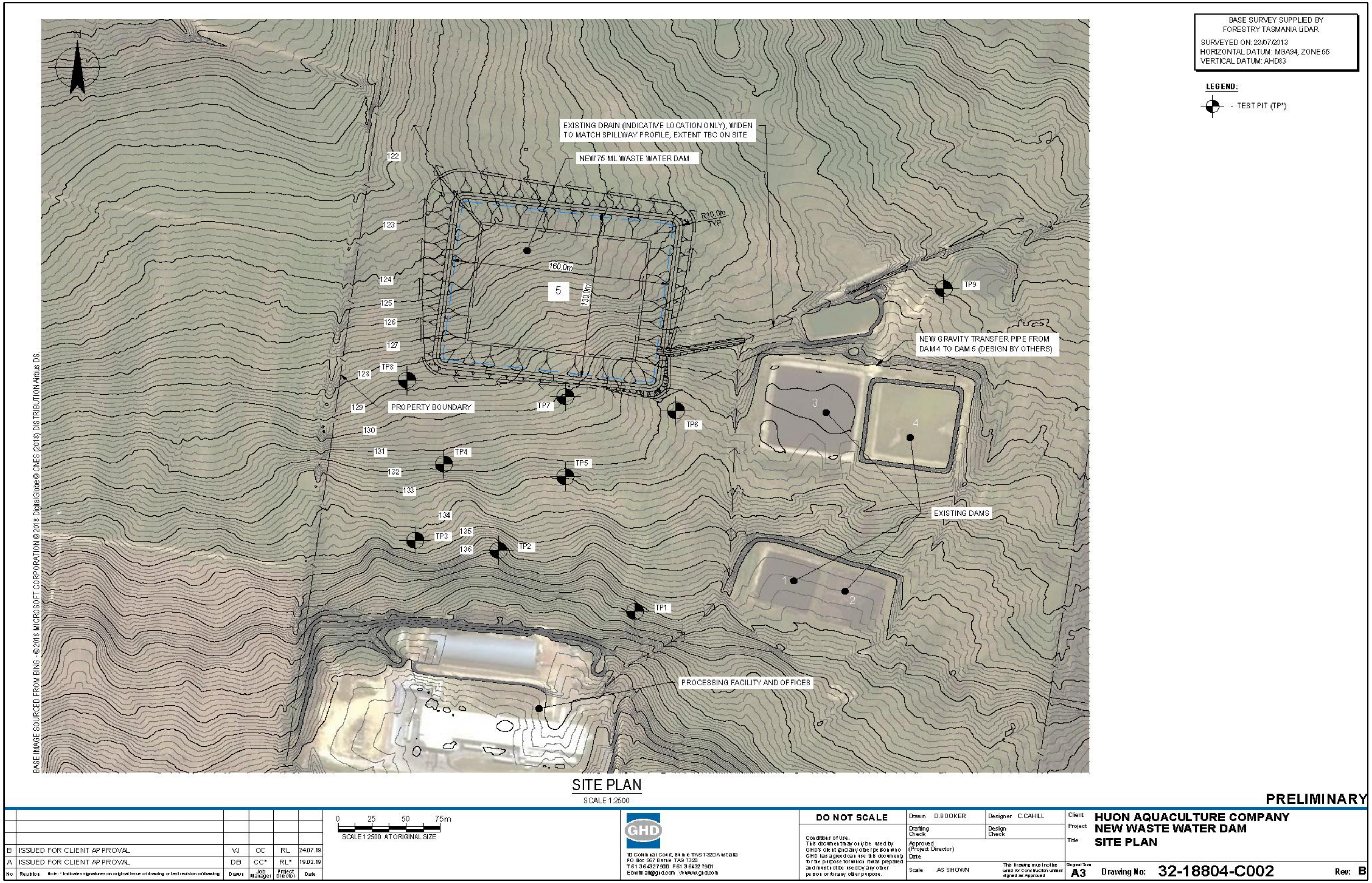
Key specifications underpinning the design are:

- Pond capacity is to be 75 ML at full supply level (FSL) (i.e. spillway crest).
- Wastewater will be piped to the dam via a gravity connection from pond 4. To maintain a gravity supply from pond 4 to the winter storage dam, the FSL of the dam has been set at 129.45 m, which is 2.55 m below the FSL of pond 4.
- Accumulation of sediment is not considered to be an issue as the dam lies downstream of a series of other dams. In event that sediments do accumulate in the dam over time and reduce the available storage, a vacuum truck would be used to de-sludge the dam.
- The dam is to be drained via a submerged outlet. An allowance has been made for a 200 ND outlet pipe.
- The battery limits for dam design are as follows:
  - inlet pipe between pond 4 and winter storage dam: at the interface with embankment
  - outlet pipe: at the point where the outlet pipe emerges from the downstream toe of the embankment.

The proposed site plan for the proposed dam is shown in Figure 41. The dam design report is provided as Appendix G.

Ancillary plant (such as pipelines, pumps and valves for irrigation management) are described in Appendix B.

Figure 41: Winter storage dam: site plan



8.5.12.1 Geology and geotechnical investigations (Dam)

A geotechnical investigation was undertaken in the vicinity of the proposed dam site on 27 April 2018. A total of nine test pits were excavated using a 13 t excavator. The test pits are shown in Appendix G. Ground conditions were similar across all the test pits. A summary of typical subsurface conditions is presented in Table 42. Detailed test pit logs and photographic records are presented in Appendix G.

Table 42: Subsurface summary

Subsurface summary
TOPSOIL; SILT with Sand, 0–0.5 m
Overlying
CLAY/SILT, low plasticity 0.2–1.8 m
Overlying
MUDSTONE, typically Highly Weathered, low strength, IR defects.

8.5.12.2 Groundwater assessment (Dam)

Six groundwater monitoring wells are installed on the Parramatta Creek site. The wells are monitored for environmental water quality on a three-monthly basis. In addition to collecting water samples for analysis, the groundwater level is also recorded. In considering suitable dam design, groundwater monitoring from these bores indicates that the groundwater level is usually shallow across the site, typically within 1 m of the surface. Due to shallow groundwater, conditions will need to be monitored during excavation of the storage to determine if additional measures are required to lower ground water levels, to prevent damage to the compacted clay liner (CCL).

An underdrain has been included in the design to allow construction of the CCL and prevent damage during operation, the final inclusion of the underdrain will depend on the results of the additional geotechnical investigations. If groundwater is more severe than initially thought a sand filter blanket may need to be placed on batters below the CCL.

8.5.12.3 Dam Design basis

The winter storage dam will be used to store up to 75 ML of treated wastewater prior to irrigation of the wastewater. The dam will be a hillside storage, with a low (<7.5 m high) engineered embankment to confine the pond to the north, east and west. Topsoil will be stripped and stockpiled for later spreading on external batter slopes to aid revegetation. Underlying clay will be stripped and stockpiled for later use as a compacted clay liner (CCL) to limit seepage risk.

Fill for construction of the embankment is to be won from the reservoir excavations. Should additional clay be required, site geotechnical investigations identified a large area of consistent clay material directly south of the proposed dam site.

The layout plan showing detail for the dam is shown in Figure 42.

8.5.12.4 Dam Liner

A 600 mm thick CCL is proposed within the dam storage to minimise seepage. The CCL shall have a minimum permeability of 1×10^{-9} m/s. An estimate of seepage from the lagoon with the pond at full supply level has been performed, with 1 L/s being the estimated outflow. The CCL shall be covered with 300 mm of select weathered rock material at the base of the dam and batters shall be covered with 500 mm of select weathered rock-fill.

8.5.12.5 Geometry (Dam)

The design features a 5 m wide embankment crest to facilitate construction. An embankment design featuring a central clay core will be constructed from general fill. Stable downstream batter slopes of 2.5 (H):1(V) have been adopted. Upstream batter slopes of 3(H):1(V) have been adopted for ease of placement of the compacted clay liner (CCL) within the storage area and slope maintenance as required.
General details for the dam are presented in Table 43.

Table 43: General details

Parameter	Value
Dam type	Off stream
ANCOLD Consequence Category	Significant
Full supply level (FSL)	129.45 m AHD
Capacity at FSL	75 ML
Pond area at FSL	19.4 ha
Maximum embankment height	7.5 m
Upstream batter slope	3.0(H):1(V)
Downstream batter slope	2.5(H):1(V)
Crest width	5 m
Crest level	130.25 m AHD
Outlet type	200 ND outlet pipe
Spillway type	3 m long broad crest weir m AHD

8.5.12.6 Spillway and cut-off drains (Dam)

Spillway

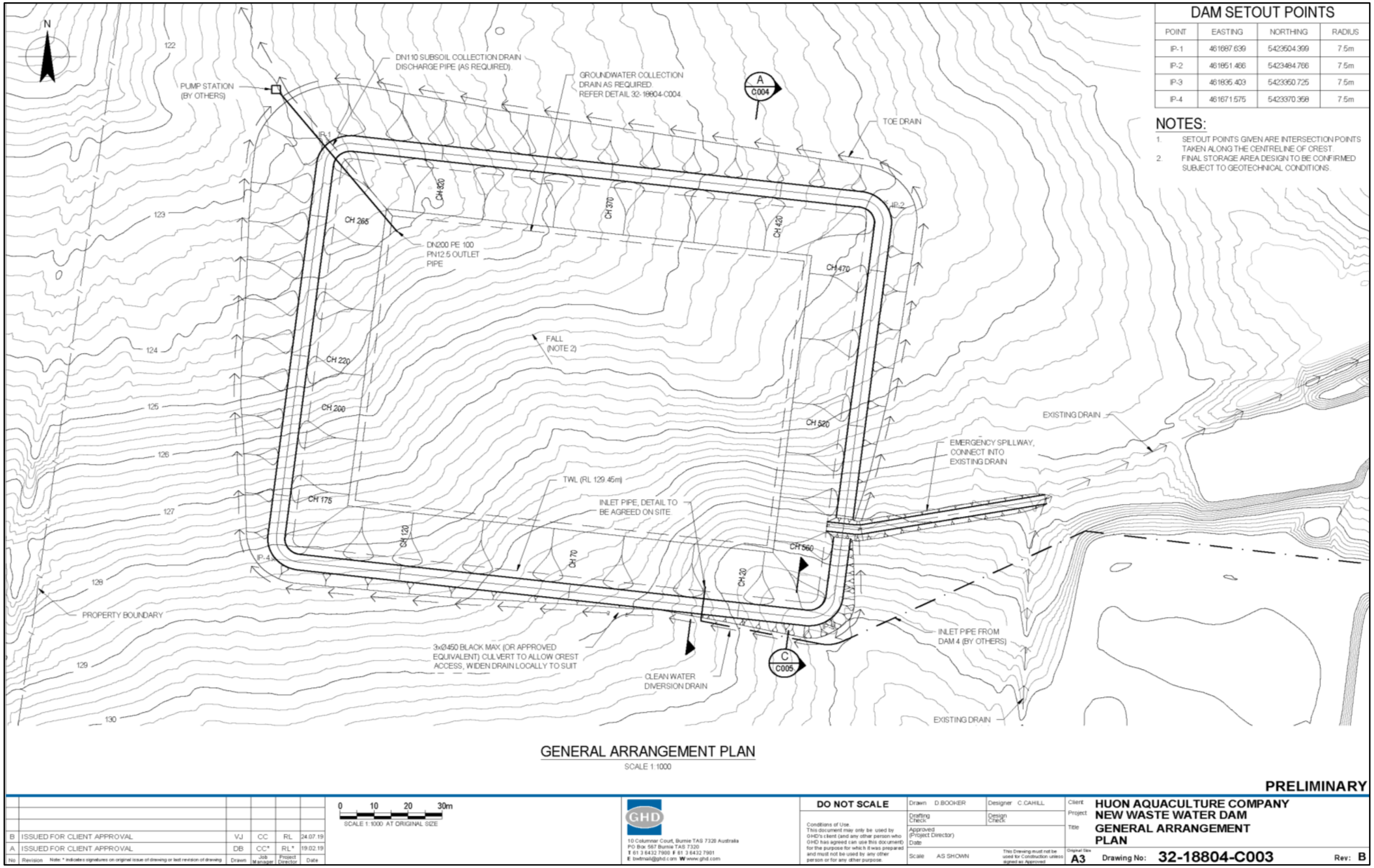
The spillway has been designed as 3 m wide and 0.75 m deep broad crested weir. The spillway can easily pass extreme flood events, with maximum depth of flow calculated as 0.32 m. A concrete crest block is proposed at the inlet of the Spillway, the crest block shall be 500 mm wide and 500 mm deep. The crest block will act as a broad crested weir and prevent erosion of the crest.

Downstream of the crest the spillway chute will comprise a trapezoidal open channel, 3 m wide at the base and 0.5 m deep. The minimum grade shall be 1%. The channel will be reseeded with grass and lined with grassroots or approved equivalent geotextile to prevent erosion during spillway flows.

External cut off drains

The external drains have been sized for extreme flood events. The drains will be trapezoidal with a depth of 0.6m and a base width of 0.5 m. Excavated spoil should be used to form a 0.5 m high earth fill bund on the storage side of the drain.

Figure 42: Layout plan winter storage dam



DAM SETOUT POINTS

POINT	EASTING	NORTHING	RADIUS
IP-1	461687.639	5423504.399	7.5m
IP-2	461851.466	5423484.766	7.5m
IP-3	461835.403	5423350.725	7.5m
IP-4	461671.575	5423370.358	7.5m

NOTES:

1. SETOUT POINTS GIVEN ARE INTERSECTION POINTS TAKEN ALONG THE CENTRELINE OF CREST.
2. FINAL STORAGE AREA DESIGN TO BE CONFIRMED SUBJECT TO GEOTECHNICAL CONDITIONS.

8.5.12.7 Consequence category assessment (Dam)

Tasmanian legislation relating to dam safety includes the *Water Management Act 1999* and the *Water Management (Safety of Dams) Regulations 2015*. On technical requirements, the Regulations defer to the relevant Australian National Committee on Large Dams (ANCOLD) Guidelines.

The guidelines, and to a certain extent the Regulations, adopt a risk-based approach: dam design and safety requirements depend on the potential consequence of a dam failure. The consequence from a dam failure can vary and ANCOLD's Guidelines on the Consequence Categories for Dams (ANCOLD, 2012) defines a range of Consequence Categories according to the severity of impacts from a dam breach.

The Consequence Category is based on the assessed severity of damage, loss and hazard to human life posed by a failure of the structure.

GHD have undertaken an 'Intermediate' level assessment of the Consequence Category of the proposed dam in accordance with ANCOLD (2012).

A failure of the dam would release wastewater into Parramatta Creek, a tributary of the Mersey River. At 1.5 km downstream of the dam, a dam-break flow would pass the Bass Highway. Twin culverts beneath the highway in this location would be quickly inundated, with flow depths up to 0.7 m possible over the highway. The car park of the rest area downstream of the highway would also be inundated, with shallow overland flows possible through the adjacent café/conservatory. Downstream of this location the creek flows through agricultural land and forestry plantation until the confluence with the Mersey River. It crosses a number of minor roads and forestry tracks in this reach; however, no population at risk (PAR) is anticipated downstream of the rest area.

Macquarie Franklin undertook independent flood modelling of the dam break for HA. The modelling generally provided consensus with the GHD modelling. The Macquarie Franklin modelling provided additional understanding of the flood timeframes. It was determined that the rest stop area would begin to flood approximately 21 minutes after the dam break commenced, and remain flooded for 23 minutes.

Methodology developed by Campbell et al. 2013, in the paper titled "*Flooded cars: estimating the consequences to itinerants exposed to dam break floods on roads*" has been used to estimate the hazard posed to itinerants on the highway. A similar methodology has been used to estimate the hazard posed to itinerants at the rest stop. No Population at Risk is considered for the café/conservatory as it was determined that it is situated above the dam break flood level. Its grounds may, however, be subject to shallow, localised overland flooding.

The following assumptions underpin the analysis:

- The Bass Highway in this location has an annual average daily traffic (AADT) of 8184 (Department of State Growth data);
- 80% of traffic occurs during daylight hours (12 hours a day) and 20% of traffic occurs after hours;
- The average occupancy rate of 2 people per vehicle;
- The speed limit on this section of road is 110 km/h;
- There is good line of sight on each approach to the inundation zone;
- The estimated peak flood depth over the highway in a dam-break event is 0.7 m, with a flow velocity of 2.7 m/s;
- The length of inundated road is around 125 m;
- Flooding over the road/rest area occurs for 23 minutes;
- On average,4 cars use the rest stop per hour during daylight hours; no cars use the rest stop after hours; and
- Average stop at the rest area is 10 min.

The result of the analysis is summarised in Table 44.

Table 44: PAR and PLL assessment for dam break

Time of day	Scenario	P_{TS}	$P_{NE:T}$	$P_{A:NE}$	Exposure	PARv	Weighted PARv	$V_{D:A}$	Weighted PLL
Business hours	Vehicle within inundation zone	0.68	0.01	0.90	0.07	2	0.01	0.04	0.01
	Vehicle driving into inundation zone during event	0.68	0.01	0.90	0.07	2	0.01	0.04	0.01
	Vehicle driving into inundation zone after event	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00
	Rest stop	0.67	0.01	0.90	0.072	2	0.144	0.90	0.130
After hours	Vehicle within inundation zone	0.17	0.10	0.90	0.18	2	0.37	0.04	0.01
	Vehicle driving into inundation zone during event	0.17	0.10	0.90	0.18	2	0.37	0.04	0.01
	Vehicle driving into inundation zone after event	0.00	0.00	0.00	0.00	0	0.00	0	0.00
	Rest stop	0.00	0.00	0.00	0.00	0	0.00	0	0.00
						PAR	**1.175**	**PLL**	**0.17**

The severity of damage and loss from a dam break of the dam is assessed as 'Medium', owing to the environmental, business and political implications and fallout from a dam break.

The Consequence Category Assessment is based on the severity of damage and loss in conjunction with the incremental risk to human life expressed as either the population at risk (PAR) or potential loss of life (PLL). The PAR is assessed as 1.175 and the PLL as 0.17. Consequence categories based on both PAR and PLL are reproduced from ANCOLD (2012) in Table 45 and Table 46 respectively.

Table 45: Consequence category based on PAR (from Table 3 in ANCOLD, 2012)

Potential loss of life (PAR)	Severity of damage and loss			
	Minor	**Medium**	**Major**	**Catastrophic**
<0.1	Very low	Low	Significant	High C
≥0.1 to <10	Significant (Note2)	Significant (Note2)	High C	High B
≥10 to <100	High C	High C	High B	High A
≥100 to <1000	(Note 1)	High B	High A	Extreme
≥1000		(Note 1)	Extreme	Extreme

Note 1 With a PAR in excess of 100, it is unlikely damage will be minor. Similarly, with a PAR in excess of 1,000 it is unlikely damage will be classified as medium.
Note 2 Change to 'High C' where there is the potential of one or more lives being lost.

Based on a PAR of 1.17 and 'medium' severity of damage and loss, ANCOLD suggests a Consequence Category of Significant. Based on PLL of 0.17 and 'medium' severity of damage and loss, ANCOLD suggests a Consequence Category of Significant.

The natural catchment upstream of the highway and rest area is not large; therefore, the wet day incremental PAR and PLL is considered unlikely to differ substantially from the sunny day assessment.

The consequence categories from each of the different scenarios and methodologies (PAR/PLL) are summarised in Table 46.

Table 46: Consequence category based on PLL (from Table 4 in ANCOLD, 2012)

Scenario	Assessment	PAR/PLL	Severity of damage and loss	Consequence category
Sunny day	PAR	1.75	Medium	Significant
	PLL	0.17		Significant
Wet day incremental	PAR	1.75		Significant
	PLL	0.17		Significant

On balance, the consequence category of the dam is assessed as Significant.

8.5.12.8 Implications of consequence category (Dam)

Minimum competency requirements for design, construction and surveillance activities

The *Water Management (Safety of Dams) Regulations 2015* outlines minimum competency requirements for individuals undertaking certain activities relating to the design, construction and surveillance of dams in Tasmania. Minimum activity and competency requirements for activities are based on the consequence category and the height of the dam.

Regulatory requirements for the dam i.e. a "Significant" consequence category less than 10 m in height is reproduced in Table 46.

Table 47: Minimum competency requirements

Activity	Competency requirement
Design plans and specifications	Class 1
Pre-construction, investigation, design and report	Class 1 or Class 3
Supervision of construction and decommissioning	Class 1
Work-as-executed report	Class 1
Dam safety emergency management plans	Class 1
Intermediate surveillance inspections and reports	Class 2
Comprehensive surveillance inspections and reports	Class 2
Safety reviews (consequence category assessment)	Class 2
Dam incident investigation and report	Class 1 or Class 3

8.5.12.9 Design parameters

ANCOLD gives guidance on key design parameters based on the Consequence Category of the dam. This includes:

- **Design flood** – ANCOLD's Guidelines on Selection of Acceptable Flood Capacity for Dams (ANCOLD 2000) recommends a fall-back flood capacity of the 10^{-3} to 10^{-4} Annual Exceedance Probability (AEP) for Significant consequence category dams.

8.5.12.10 Inspection requirements

ANCOLD (2003) gives guidance on inspection frequency for different consequence category dams. For a "Significant" Consequence Category the frequency of inspection should be as follows:

- **Comprehensive Inspections** – On first filling then 5 yearly (Class 2).
- **Intermediate Inspection –** Annual to 2-Yearly (Class 2)
- **Routine Visual –** Twice Weekly to Weekly (by Operations Personnel)
- **Special –** As required (Class 1).

The *Water Management (Safety of Dams) Regulations 2015* do not require an inspection frequency. However, HA will adopt the suggested ANCOLD inspection frequencies.

8.5.12.11 Operations surveillance and maintenance manual

ANCOLD (2012a) guidance is that an operation, maintenance and surveillance (OMS) manual be produced prior to the commissioning of all but 'Very Low' consequence category dams. The manual should cover design intent, daily operations and inspections, water management procedures, criteria for mechanical and electrical works (including pumps), surveillance, maintenance and reporting requirements. Operational management plans within the OMS manual should specifically highlight all designer requirements for operation and response actions that must be met to ensure the ongoing safety of the dam. HA will produce an OMS manual prior to commissioning.

8.5.12.12 Dam safety emergency management plan

ANCOLD (2012a) suggests that a Dam Safety Emergency Management Plan (DSEMP) should be prepared where there is potential for a loss of life in the event of dam failure.

8.5.13 Commitments

Commitment	When
HA will produce an OMS manual prior to commissioning.	Prior to dam commissioning.
HA will prepare a DSEMP for the winter storage dam.	Prior to dam commissioning.

8.6 Air emissions

No air emissions with adverse impacts on receptors or the receiving environment are anticipated.

8.6.1 Existing conditions

There are minor, sometimes visible emissions of water vapour, both continuous and intermittent, from the hot water and refrigeration cooling tower systems. These are environmentally insignificant.

There are particulate emissions from the operation of the three smokers. Sampled emissions are tabulated in Table 27 and Table 56.

The processing facility and ancillary services incorporate measures (including operational procedures) to minimise potential odour emissions from sources, including on-site wastewater treatment facilities and solid waste management.

In the past (approximately 2015/16) employees noted occasional site localised odour emissions from the lagoon system. These potential emissions were mitigated by the installation of surface aerators in ponds 1 and 2, and have been further mitigated by upgrades to the wastewater treatment.

No odour emissions have been reported from beyond the property boundaries.

8.6.1.1 PCE 7894 Condition A2

The average total particulate (TP) emission concentration has been measured[6] at 8.4 mg/m^3. Condition A2 of PCE 7894 sets a maximum particulate emission concentration of 100 mg/m^3 referenced to 12% CO_2 by volume and 101.325 kPa air pressure, which is a reference condition for boilers and incinerators in the Air Policy. Using this, the total particulate smokehouse emissions have been calculated to 315 mg/m^3.

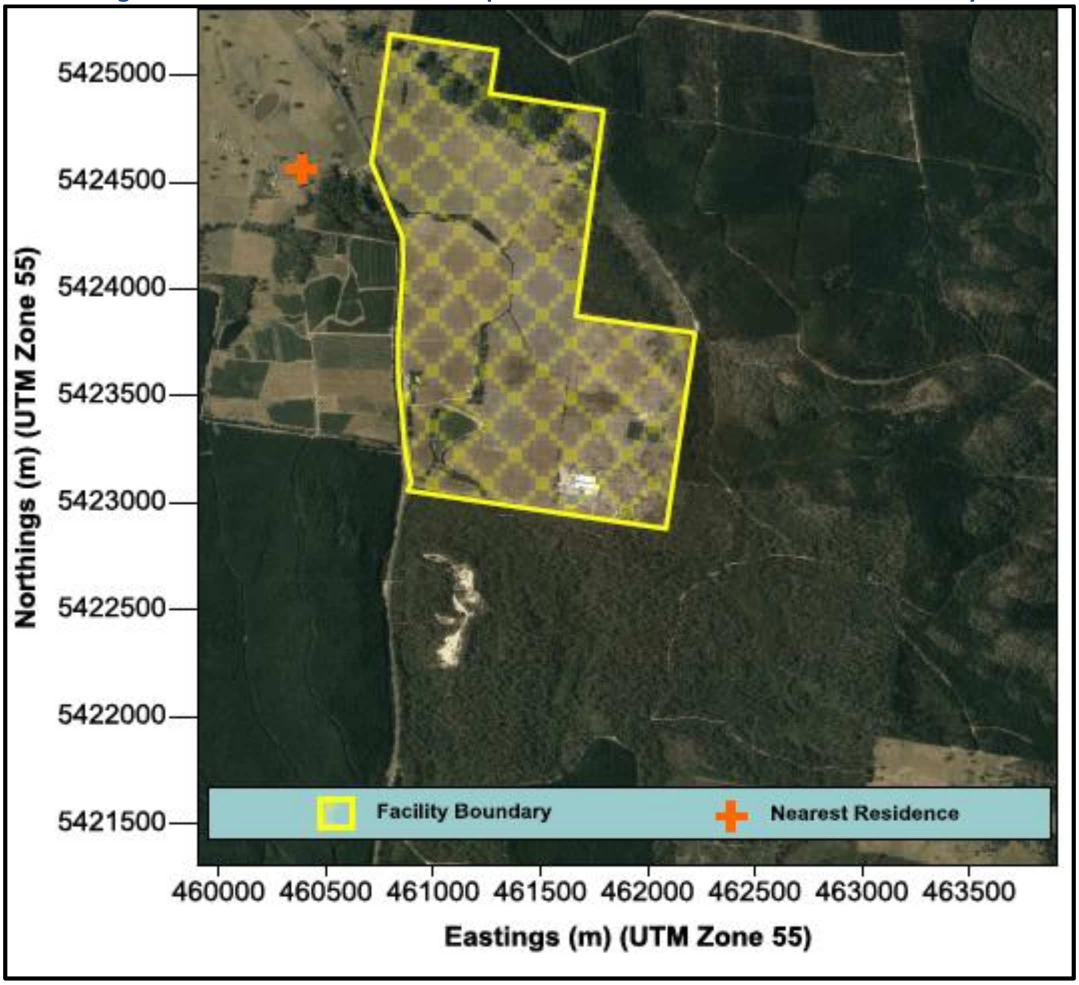
The Air Quality EPP notes that for fuel-burning equipment, the concentration of particles and oxides of nitrogen measured should be adjusted to a reference gas value (oxygen or carbon dioxide) to compensate for variability due to the excess air rates in different combustion processes. This prevents dilution of particulate emissions with ambient air and is commonly used for stacks continually emitting pollutants

[6] The TP measurement of 8.4 mg/m^{3}did not include oils in the air stream. When this was included the range of TP was between 712 mg/m^3 and 1,461 mg/m^3 (see Table 52).

from fuel-burning activities. Boilers and incinerators are devices in which fuel is consumed in the presence of excess oxygen at high temperatures so that the fuel is consumed, and heat is produced. The fuel is decomposed and most of the energy is produced by the combustion of the gases produced at temperatures above 800 °C.

Smokehouses, such as the ones in use at Parramatta Creek, have two components: the actual smoke generator, which produces the smoke, and the smokehouse itself, where the smoke is exposed to the product. The smoke generator has a restricted oxygen supply and a much lower temperature so that the wood chips do not combust. The smoke is released from the smoke generator into the smokehouse where it circulates around the product; fresh air is then used to displace the smoke in each batch process. Due to the way the smokehouse works, the oxygen and carbon dioxide concentrations of the emission leaving the stack are very close to ambient air and are nowhere near the concentrations usually found in boilers and incinerators where a combustion process occurs.

Figure 43: Identified Sensitive Receptors closest to the Parramatta Creek facility



8.6.1.2 Odour

There has never been a public complaint received regarding odour. In the first few years of operations, the wastewater treatment lagoons at times generated localised (onsite) odour issues as result of the lagoons reaching their loading capacity. Employees complained of odours when working adjacent to the lagoons. Wastewater treatment and management upgrades have been completed achieving improvements to wastewater effluent quality, maintenance of aerobic conditions and consequently a reduction in odour emissions.

The fish wet-processing facility does not generate significant odour, even within the immediate surrounds of the HA facility, and therefore could not cause adverse impacts at sensitive receptors in other ownership,

the closest of which is over 1 km away. The same good management practices will continue with the increased production, avoiding any future odour problems.

The solid waste management practices to date have prevented odour generation from fish wastes, which are removed from site quickly. Fish viscera are taken away daily after pH stabilisation by Spectran by tanker to Interlaken for compost production. Heads and frames and other offcuts are frozen and stored before being shipped to Victoria for pet food production.
There is a strong site imperative to keep odour generation to an absolute minimum.

8.6.2 Performance requirements

Air emissions from the proposed operation must comply with the following:

- Tasmanian OHS requirements (*Workplace Health and Safety Regulations 2012*)
- Tasmanian *Environment Protection Policy (Air Quality) 2004*
- Tasmania *Environmental Management and Pollution Control Act 1994* – Environmental nuisance provisions
- National Environment Protection Measure (Air) – PM_{10} and $PM_{2.5}$ limits at the boundary of the premises and at sensitive receptors
- Latrobe Interim Planning Scheme 2013.

The Environmental Management and Pollution Control Act 1994 (EMPCA) is the primary environment protection and pollution control legislation in Tasmania. The EMPCA was developed in the early 1990s to replace the Environment Protection Act 1973. There are a number of regulations made under EMPCA for environmental management and pollution control.

8.6.2.1 Environment Protection Policy (Air Quality) 2004

Environmental Protection Policies (EPPs) have been developed to give effect to the objectives of the EMPCA. The EPP for air quality – Environment Protection Policy (Air Quality) 2004 (Air Quality EPP) commenced on 01 June 2005.

The Air Quality EPP provides a framework for the management and regulation of both point and diffuse sources of emissions to air for pollutants with the potential to cause environmental harm.

According to the policy, the environmental values to be protected are:

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

For particulate emissions Table 48 below provides the relevant emission standards from Schedule 1 of the Air Quality EPP. The Air Quality EPP does not define particulate matter. The AS4323.2 standard defines particulate matter as "particles of any shape, structure or density, dispersed in the gas stream". The United States Environmental Protection Agency (USEPA) defines particulate matter as "the general term used to describe solid and liquid droplets found in the air".

Table 48: Emission standards

Pollutant	Source	In-stack concentration (mg/m^3, unless otherwise specified)
Particulate matter	Any trade, industry or process and any fuel burning equipment or industrial plant	100

The Air Quality EPP notes that to demonstrate that emissions are not likely to cause an environmental nuisance or material environmental harm, plume dispersion modelling will need to be undertaken to establish that the predicted maximum ground level concentration do not exceed those specified in Table

1 of Schedule 2 of the Air Quality EPP. Table 49 provides the relevant ground level concentration from the Policy.

Table 49: Ground level concentration design criteria

Pollutant	3-minute average unless otherwise specified	
	ppm	mg/m^3
Particulate matter (as PM_{10}, 24-hour average)		**0.150**

Section 13 of the Air Quality EPP provides a regulatory framework relating to odour

1. If a regulatory authority is satisfied that an odour from an activity is causing or is likely to cause an environmental nuisance or environmental harm, the authority should require that the odour emission from the source not exceed the odour criteria specified in Schedule 3, at or beyond the boundary of the land on which the source is located.
2. If the activity that is the source of the odour is being carried out at the time that this Policy is made, the time frame for compliance with sub-clause (1) should be determined on a case-specific basis having regard to:
   (a) the environmental impact associated with the pollutant being emitted;
   (b) the economic cost of upgrading and the capacity of the relevant activity to support this cost; and
   (c) the practicability of reducing emissions.

The odour assessment criteria for assessments in Tasmania is outlined in Schedule 3 – Odour Criteria of the Air Quality EPP.

For an unknown mixture, Table 1 of Schedule 3 of the Air Quality EPP specifies the following odour assessment criteria:

- *2 Odour Units (OU), 1-hour average, 99.5th percentile ground level concentration predicted at or beyond the site boundary.*

Schedule 3 of the Air Quality EPP states that for an unknown mixture, the 99.5th percentile model predicted concentrations can be presented where local high-quality and meteorological and emissions data are available.

8.6.2.2 National Environment Protection (Ambient Air Quality) Measure

In June 1998 (revised in 2003), the National Environment Protection Council (NEPC) developed the Ambient Air Quality National Environmental Protection Measure (NEPM) which sets out uniform standards for air quality at the national levels and has included ambient air quality standards for particulate matter with a nominal aerodynamic diameter of less than or equal to 10 microns (PM_{10}). The NEPM was revised in 2003 to include an advisory reporting goal for particulate matter with a nominal aerodynamic diameter of less than or equal to 2.5 microns ($PM_{2.5}$).

It is noted that NEPM goals may not be considered legislative assessment criteria and hence have been presented as advisory reporting goals rather than assessment goals. NEPM Particulate matter advisory goals are presented Table 50 below.

Table 50: Ambient Air Quality National Environmental Protection Measure (NEPM) – Advisory Goals

Pollutant	Ground level concentration	Reported at
Particulate matter (as PM_{10}, 24-hour average)	**50 µg/m^3**	Sensitive Receptors
Particulate matter (as $PM_{2.5}$, 24-hour average)	**25 µg/m^3**	Sensitive Receptors
Particulate matter (as $PM_{2.5}$, Annual average)	**8 µg/m^3**	Sensitive Receptors

8.6.3 Potential effects of increased production

As described above in Section 8.6.1, the potential air emissions from the site include particulate emissions from the smokehouse and odour emissions from on-site wastewater treatment facilities and solid waste disposal.

Minor potential air emissions include dust which has the potential to cause an environmental nuisance if it is blown beyond the boundary of the proposed construction and operational activities. It can cause respiratory annoyance, reduce visual amenity and fall out onto land or surfaces in other ownership, with the potential to soil clean surfaces and contaminate roof-collected water supplies. In addition, dust can fall onto vegetation and, in extreme cases, retard plant growth by blocking photosynthesis.

8.6.4 Assessing particulates from smokehouse operation

As noted in Section 3.8.2.1, < 3% of total product produced is smoked each year.

Smoking is a value adding process which provides for fish which are not (A) sashimi grade or (B) whole fish grade, to be sold. At the maximum proposed annual production of 33,000 tpa this will equate to approximately 1000 tonne of smoked product.

Airlabs Environmental (Airlabs) was commissioned by Caloundra Environmental on behalf of HA to undertake air dispersion modelling to predict the extent of particulate impacts from the facility's smokehouse operations on the surrounding environment.

The smokehouses currently operate 12–14 hours per day, 5 days per week with extra shifts in peak periods for a total of 299 shift/days in the 2018/19 FY period.

Current smoked product production is 3.2 tonnes (2 batches) per smoking shift for a total of 956t per FY.

The smokehouses were designed to cope with additional capacity (2000kg) and a consequence can deliver sufficient product to meet the proposed production increase and proposed VA sales predicted. Smoker capacity can be increased by utilising additional smoker trays in the hot smokers above the current level.

It is not predicted that any additional smoking batches will occur under the proposed increased production.

At full production capacity (33,000 tpa) each smoking shift lasting approximately 800 minutes and will involve either:

- 1 x hot smoke batch and 1 x cold smoke batch
- 2 x hot smoked batches
- 2 x cold smoked batches

Operating 299 shifts per year (approx.) producing 4 tonnes per shift for a potential total of 1,196t per FY (this is above predicted sales expectation of 990t) without the need to introduce increased smoking days and therefore without increasing emissions above current levels.

To evaluate the potential impact from Smokehouse use at full production, an air quality impact assessment was undertaken by Airlabs in 2019 utilising the LEC measured smokehouse emissions and assuming that all particulate emissions were PM_{10} emissions.

Table 52 details the PM_{10} particulate emissions used to develop model inputs to evaluate the potential impact from smokehouse use.

Table 51: Seasonal smoker use and smoked production forecast

FY 2021/2022	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Total	Total at Proposed 33,000 tpa
Tonnes total production	2,330	2,592	2,555	2,760	2,863	2,959	2,866	2,887	2,874	2,366	2,798	2,515	**32,365**	
Smoking tonnes at 3%	69.9	77.76	76.5	82.8	85.89	88.77	85.93	86.61	86.22	70.98	83.94	75.45	**970.95**	**990**
Total smoke shifts	22	24	24	25	26	27	26	27	27	22	26	23	**299**	**299**

Table 52: Smoker modelled particulate emissions

Parameter	Units	LEC Test 1	LEC Test 2	LEC al Test 3	LEC Test 4	LEC Test 5	LEC Test 6	LEC Test 7	LEC Test 8	LEC Test 9	LEC Test 10
Test details		Traverse 2 - intensive smoke cycle only, low velocity	Traverse 2 - intensive smoke, smoke reduction and start of drying cycle	Traverse 2 - intensive smoke, smoke reduction and start of drying cycle	Traverse 2 - intensive smoke, smoke reduction and start of drying cycle	Traverse 2 - intensive smoke, smoke reduction and start of drying cycle	Traverse 2 - smoke reduction and start of drying	Traverse 2 - smoke reduction and start of drying	Traverse 2 - intensive smoke, smoke reduction and start of drying cycle	Traverse 2 - intensive smoke, smoke reduction and start of drying cycle	Traverse 2 - intensive smoke, smoke reduction and start of drying cycle
Total particulate concentration	mg/m3 calculated to STP dry	712	1461	980	1041	1215	354	1141.7	996	1436.1	1245.9
Stack diameter	mm	345	345	345	345	345	345	345	345	345	345
	m	0.345	0.345	0.345	0.345	0.345	0.345	0.345	0.345	0.345	0.345
Average traverse velocity	m/sec	0.4	9.4	9.1	9.5	8.4	8.4	8.4	8.4	8.4	8.4
Actual volumetric flow rate	m3/sec	0.037	0.879	0.851	0.888	0.785	0.785	0.785	0.785	0.785	0.785
Average flue temp	C	36.5	40.6	21.7	22.4	29.6	37.6	34.7	39	40.4	40.4
Moisture percentage	%	3.6	3.9	2	1.9	1.9	2.4	2.5	2.9	3.3	3.6
Fish oil and particulate concentrations	mg/m3 calculated to stack conditions	605	1222	890	944	1075	304	988	846	1210	1046
Estimated particulate matter emission rate	mg/sec	22.6	1074.0	756.8	838.2	844.4	238.5	775.5	664.5	949.9	821.5
	g/sec	0.023	1.07	0.76	0.84	0.84	0.24	0.78	0.66	0.95	0.82

Based on the analysis of data presented in Table 52, Airlabs used Test 2 and Test 5 data as inputs into the modelling of the hot smoke operations.

Test 2 was conducted for 25 minutes of operations and captured all the cycles with potential to emit emissions, namely:

- Intensive smoke (20 min),
- smoke reduction (3 min), and
- start of drying (2 min out of 67 min of drying) of operations

Test 5, Test 8, Test 9 and Test 10 also captured the operations of interest, however the highest emission rates (1.07 g/s) was measured for Test 2. The lowest exit velocity (8.4 m/s) and temperature (29.6°C) were recorded by Test 5.

Based on the analysis of data presented in Table 52, two tests (Test 3 and Test 4) were conducted for cold smoke operations. Airlabs used data from Test 4 data for estimating emission rates for cold smoke operations as it has the highest emission rates. The stack characteristics from Test 3 were used as it recorded lower exit velocity and temperature.

Meteorological modelling was conducted using a combination of 'The Air Pollution Model (TAPM) (Version 4) and CALMET meteorological models. Meteorological modelling was conducted for the 2014 year.

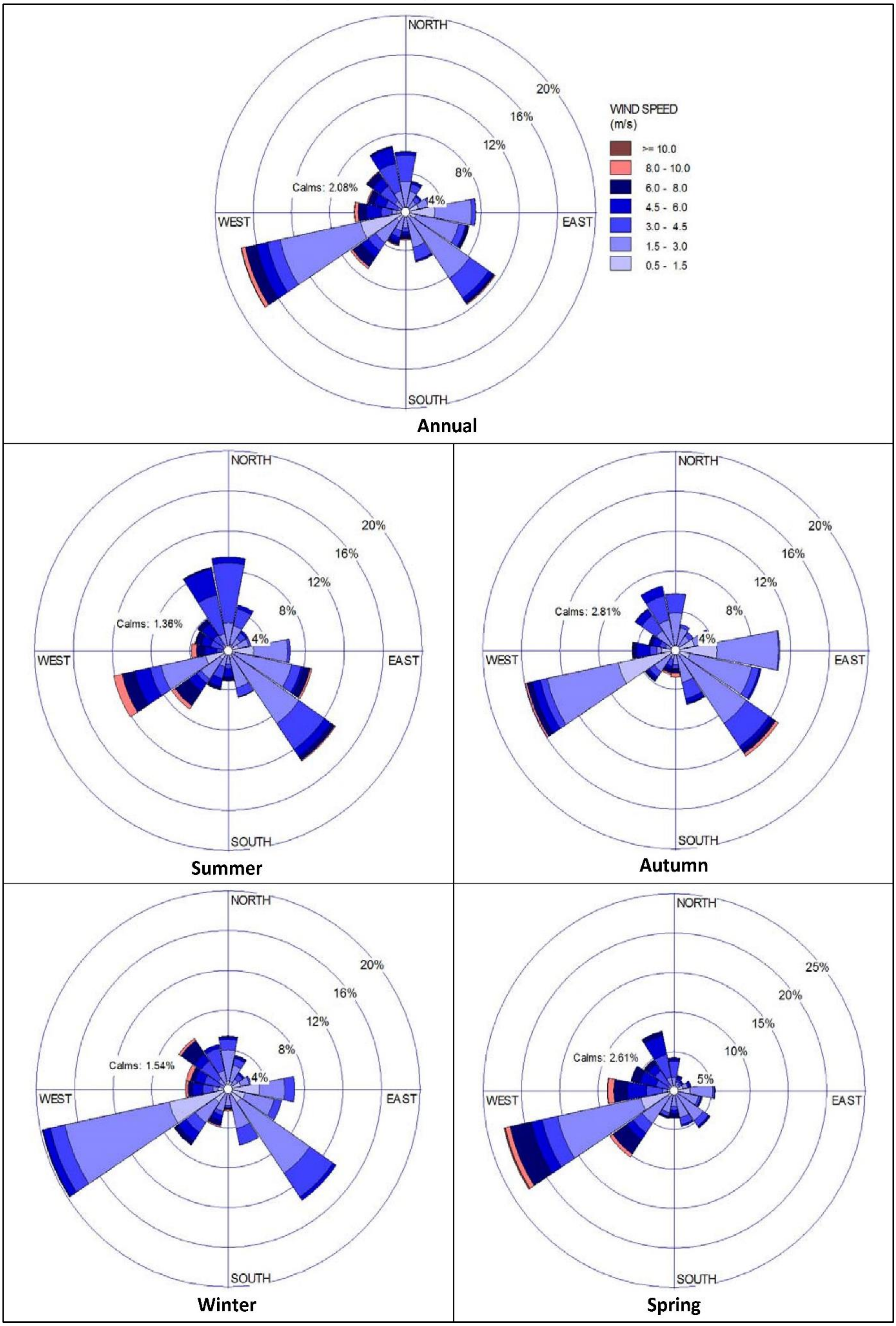
Hourly wind speeds and direction for calendar year 2014 were extracted from the CALMET output at the centre of the facility and are visually presented in the form of wind roses in Figure 44.

Annual wind rose shows winds predominantly from west-southwest and southeast. Winds are usually in low (< 3m/s) to medium speed (3 to 6 m/s). The percentage of hourly calms over the year averages to 2.1%. Seasonal breakdown of wind shows that similarities are observed for the summer, autumn and winter season. Spring shows an unusually low frequency of winds from southeast sector.

To model the particulate (and odour emissions) from the facility, dispersion modelling was undertaken for the calendar year 2014 using the US-EPA CALPUFF dispersion model. The model configuration is described in Appendix D and Appendix E as are the coordinates of four vertices for the modelled odour sources.

The impact of building wake effects on plume dispersion was included in the modelling for buildings and structures located around the smoker stacks. The heights and locations of these structures were entered in to the Building Profile Input Program (BPIP) utility using PRIME algorithm. The wind direction-specific building dimensions calculated by BPIP for the stack at their corresponding heights were entered into the CALPUFF model.

Figure 44: CALMET predicted wind rose –2014



The maximum (reported as 100th percentile) 24-hour average incremental particulate concentrations from the facility were predicted for particulate fractions (PM_{10} & $PM_{2.5}$). No background particulate sources were considered for this assessment, as there were no nearby sources identified outside the facility site boundary that released particulate emissions.

The comparison of predicted particulate results (incremental impacts from HA facility) with the Air Quality EPP is presented in Table 53 and graphically depicted in Figure 45.

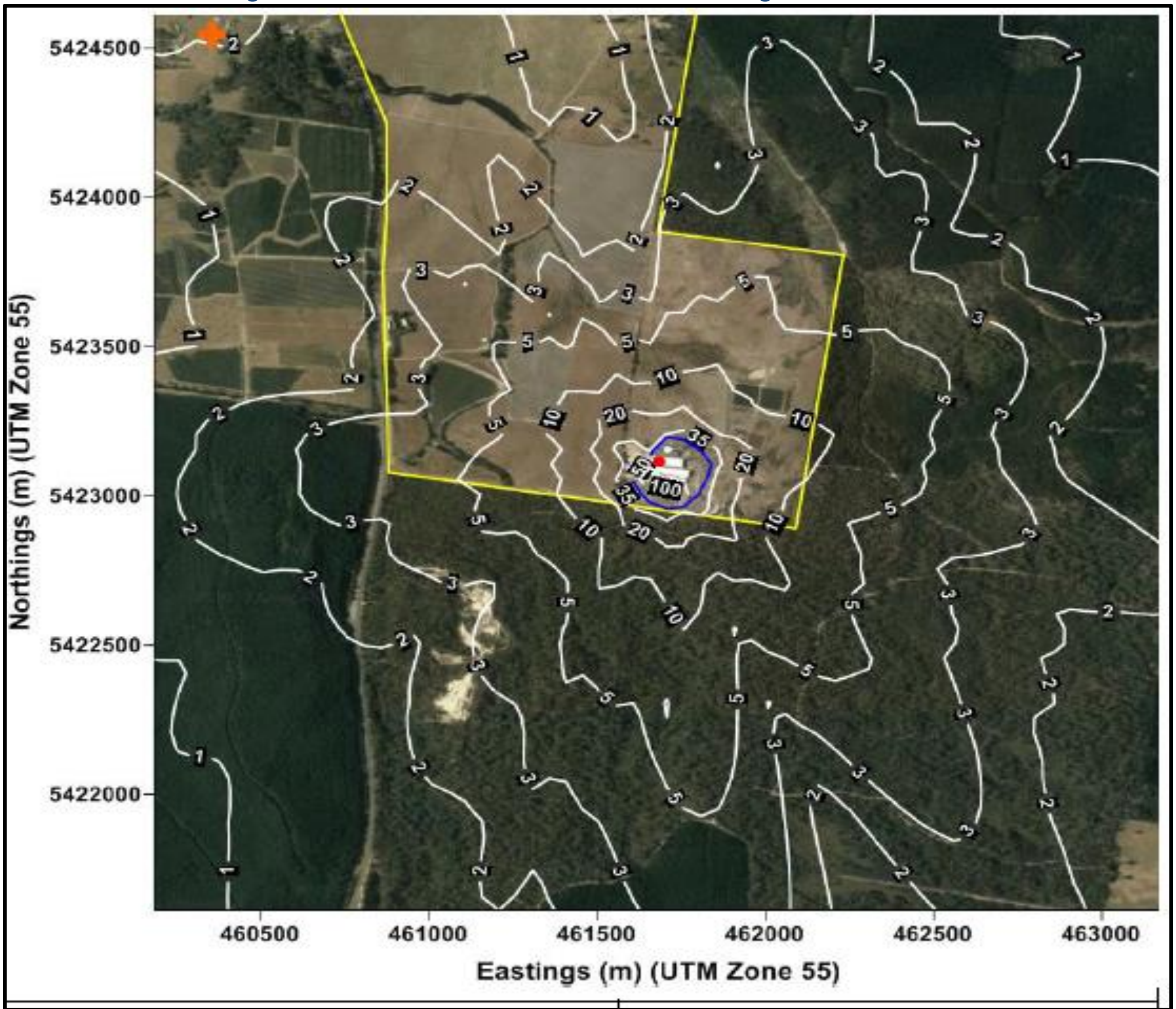
Table 53: Comparison of Predicted PM_{10} Particulate Concentrations with Air Quality EPP

Pollutant	Design Criteria-Air Quality EPP	Predicted Maximum Concentrations at or beyond facility boundary (directly opposite facility)
Particulate matter (as PM_{10}, 24-hour average)	**0.150 mg/m^3**	**0.045 mg/m^3**

The modelled 24-hour average ground-level concentration of PM_{10} particulates at 0.045mg/m^3 is significantly below the EPA's Air Policy 24-hour average limit of 0.15 mg/m^3 at the site boundary closest to the Huon Aquaculture Processing Facility. At the nearest receptor not associated with the operation, the modelled 24-hour average ground-level concentration of PM_{10} particulates is <0.003 mg/m^3 (see Figure 44).

Given the remote location of the operation especially in relation to sensitive receptors and the low modelled ground level concentration of the PM_{10} particulates, the level of environmental risk is low to negligible.

Figure 45: Predicted Maximum PM_{10} 24-Hour Average Concentrations



Scenario: Normal Operations	Site Boundary: Yellow Outline
Included Sources: 1 x Hot smoker, 2 x Cold smoker (operating 7 am to 8 pm, 365 days a year) (All three stacks shown as one red marker)	Included Receptor: 1, Orange Marker (top left of map)
Model used: TAPM V4.0.5, CALMET 6.4.0, CALPUFF 6.42	Modelling Run Dates: 01/01/2014 to 31/12/2014
Computational Grid Resolution: 200 m	Sampling Grid Resolution: 50 m
Pollutant: PM10	Units: µg/m3
Percentile Level: 100th Percentile	Averaging Period: 24- Hour
TAS Air Quality EPP (2004) Criterion Contour: 150 µg/m3 (Not shown in map as all levels are below 150) NEPM Advisory Goal Contour: 50 µg/m3 (Blue contour)	Other Contours: white (1, 2, 3, 5, 10, 20 & 35) µg/m3
Maximum at or beyond site Boundary: 45 µg/m3	Maximum at receptor 2.2 µg/m3

The maximum predicted PM10 24-hour average concentrations at or beyond the facility boundary (Huon Aquaculture land) was 45 µg/m3 and at the nearest receptor <3 µg/m3. If it was assumed that all

particulates were PM2.5 fractions, the concentration at the nearest sensitive receptor would be well below the NEPM advisory goals.

8.6.5 Potential smokehouse emission control technology

Existing air quality and emissions in general and the construction and operation of the smokehouses are discussed in Section 3.8.2.1. Particulate emissions are discussed in Section 8.6.4 above.

To assess the availability and viability of installing smokehouse emission control technology, HA commissioned Air Environment to review and cost particulate control technologies at desktop level. Air Environment then made enquiries with three suppliers of air pollution control technologies to determine approximate costs of various technology options for the control of the oil and smoke emissions generated and released by the fish smoking process. Each supplier was provided with details of emissions from the available stack test data (LEC, 2016). In addition, HA has discussed the matter with the smoker manufacturers (REICH Thermoprozesstechnik of Germany). The responses are summarised below and tabulated in Table 54.

Fowlerex Technologies (estimates are -10% plus +40%):

- Provision of wet scrubbing
  - Using once through fresh water scrubbing.
  - A single tower about 10 m high x 1.5 m diameter.
  - Water consumption rate approximately 60 litres per minute.
  - Water recirculation may be an option to reduce the amount of blowdown water dependent of further evaluation.
  - The wastewater stream will need to be treated and disposed of.
  - Supply only of the scrubber, fan and ducting between the two would be approximately $250,000.
  - Ducting from the smokers to the scrubber, ducting from the fan to the stack, plus the stack, plus installation would be approximately $250,000.
  - Approximate total cost of wet scrubbing option is $500,000.
  - This excludes installation and potential upgrades to wastewater treatment.
- Provision of thermal oxidation
  - Thermal oxidation will treat the combustible aerosols and odours.
  - The energy required would be approximately 4.5 KJ/s energy input.
  - Approximate cost of the thermal oxidiser would be $1,100,000.
  - This would be a single pass unit, so in order to provide some energy efficiency a waste heat boiler on the discharge side of the oxidiser could be considered.
  - A 2 kW hot water boiler would cost in the order of $350,000.
  - Total approximate cost of $1,750,000 for the thermal oxidiser, boiler, ducting, stack and installation.

Aerison

Provision of thermal oxidation:

- Straight thermal oxidiser which would be best with natural gas as the fuel.
  - Budget price between $350,000 to $400,000 + GST (supply only).
  - Dependant of availability of natural gas on site.
- Regenerative Thermal Oxidiser (RTO).T
  - Can be designed with either natural gas or electric heater elements.
  - Lower operating cost than straight thermal oxidation.
  - Budget cost approximately $1,000,000 + GST (supply only)
- Use of baghouse with lime dosing:
  - Assumes that a baghouse at that temperature with lime dosing will reduce the visible emissions.
  - Budget cost between $250,000 to $300,000 (supply only).
  - The oils are considered likely to foul the fabric bags.

Luehr Filter

- Leaning toward a basic oil mist separator.
  - These are commonly used in machining applications.
  - Most systems incorporate a coalescing filter so depending on the level of solid particulate in the inlet gas it could require frequent filter replacement.
  - Heat and control units include clean-in-place capability, but typically increases the cost toward that of a wet scrubbing system.
  - An oil mist separator is unproven for this application.

Table 54: Summary desktop estimates for smokehouse particulate control

Technology	Pros	Cons	Budget cost -10% to +40% estimate
Wet scrubbing	Effective at particulate removal.	Water consumption approximately 60 litres per minute. Wastewater stream requires treatment and disposal. Unproven in this application due to the lack of consistent flow rate of exhaust gases.	**$500,000 plus installation**
Straight thermal oxidiser	Thermal oxidation should destroy the oils, and reduce the particulate as long as the temperature is high enough.	Requires availability of natural gas which is not available.[7] High operating cost. Unproven in this application due to the lack of consistent flow rate of exhaust gases.	**$350,000 to $400,000 + GST (supply only).**
Regenerative Thermal Oxidiser	Can be designed with either natural gas or electric heater elements.	High operating cost, albeit lower than straight thermal oxidation. Unproven in this application due to the lack of consistent flow rate of exhaust gases.	**$1,000,000 + GST (supply only) to $1,750,000 + GST.**
Baghouse with lime dosing	Standard technology.	The oils are likely to foul the fabric bags.	**$250,000 to $300,000 (supply only)**
Coalescing oil mist separator	Cost effective.	Expect filter require frequent filter replacement. Smokehouse manufacturer advice is that there is significant potential for food spoilage if back pressure issues develop or from internal odours as oils coalesce.	**$100,000 plus GST**

Notes: Site conditions, structures, stack height, etc will all impact on these estimates.

Discussions with equipment suppliers suggests that there is a degree of risk associated with the retrofitting of these devices to the REICH smokehouses which are designed to allow smoke to flow over food for extended periods then dissipate out for long periods without fan forcing. This is likely to reduce the efficacy of the controls and or introduce the possibility of food contamination. For example, to provide an even flow of input air into a scrubber or thermal oxidation unit would require a fan to discharge smoky air into the stack at a constant rate. This is in turn could draw smoke from the actual smoking chamber unless a diversion system to draw clean ambient air could be developed. This presents significant risk to the operation of the smokehouse and the operation of the emission control equipment. It was anticipated by several sources that trials would be needed to verify the performance of pollution control equipment. It

[7] The natural gas pipeline runs on the western side of the Mersey River approximately 7 km away at its closest.

was also suggested that development of such equipment would necessitate individual design after trials. The obvious risk is the loss of product and markets during failed trials.

8.6.6 Particulate emission comments

The modelled 24-hour average ground-level concentration of PM10 particulates at the Huon Aquaculture site boundary of 0.045 mg/m3 is significantly below the EPA's Air Policy 24-hour average limit of 0.15 mg/m3. At the nearest receptor not associated with the processing operation, the modelled 24-hour average ground-level concentration of PM10 particulates is <0.003 mg/m3.

The land use surrounding the activity is mainly permanent timber production zones with private timber reserves to the west plus some farmland to the immediate west owned and operated by Mr. Layton and farmland and the Bass Highway further to the east. Given the remote location of the operation especially in relation to sensitive receptors and the low modelled ground level concentration of the PM10 particulates, the level of environmental risk is low to negligible.

In this regard Clause 9 (3) of the Air Quality EPP states:

"(3) The regulatory controls and monitoring requirements applied to a point source of air pollution should be proportionate to the level of environmental risk posed by the emission of pollution from that source."

HA suggests that retrofitting particulate abatement technology to the fish smoking kiln stacks does not represent accepted modern technology as there is no practicable solution which is cost-effective and the potential impact is negligible.

8.6.7 Assessing odours from increased production

An increase in production at the site will increase the quantity of wastewater effluent produced at the site, which could potentially increase odour from the wastewater lagoons if the effluent is not treated effectively. As described in Section 3.11 the wastewater treatment plant (WWTP) has been progressively upgraded. Improvements to the quality of effluent are evident and have been sustained over several years, which in turn has improved the quality of wastewater in the lagoons and reduced odour.

Airlabs was commissioned to undertake an odour impact assessment for HA's Parramatta Creek fish processing facility. The full odour assessment report is provided in Appendix E, the results of that assessment are summarised below.

Odour modelling was carried out by:

- sampling the site and adjacent areas for odours on 1 November 2017 (carried out by Airlabs – See Appendix E). This included around the WWTP and the wastewater lagoons. This provided specific odour emission rates (SOERs) from key odour generating sources on site (Table 53);
- development of site-specific meteorology – using the combination of TAPM/CALMET models;
- dispersion modelling of the facility's SOERs using the US-EPA CALPUFF dispersion model and comparing this to sensitive receptors (see Figure 5, Figure 45 and Appendix E); and
- comparing the model results with the requirements of the Air Quality EPP.

Table 55: Operational conditions odour sampling

Parameter	Observations
Production rates	Production rates at the facility had been ramped up to 30% to meet peak seasonal demand. The resulting daily average wastewater production at the time of sampling was approximately 302kL. This is equivalent to an annualised production rate of 32,000 tpa near proposed maximum production.
Odour sources not sampled	Screw Press: Normal operations. No discernible odours were noticed from the screw press and therefore no samples were collected Flocculation and Coagulation: Normal operations. Pipes were properly sealed, and no leakage was noticed therefore no samples were collected
Odour sources samples	Balance tank: Normal operations DAF unit: Normal operations Aerated lagoons: Normal operations Non-aerated lagoons: Normal operations

A summary of the operating conditions and sampled odour sources and measured SOERs is presented in Table 55 and Table 56.

The winter storage dam had not been constructed at the time of odour sampling, hence the SOERs adopted for dispersion modelling were based on literature. A SOER of 0.05 Odour units (OU).m^3/m^2/sec was reported for the storage dam by Pitt & Sherry, 2016.

SOERs adopted for irrigation areas were based on the SOER for the storage dam. Because the treated water from the storage dam will be diluted with freshwater a SOER of 0.05/3.5 = 0.14 OU.m^3/m^2/sec was adopted for all irrigation areas. Odour from irrigation was modelled for five summer months (November through to March) because there would be no irrigation for the remaining wetter winter months.

Table 56: Odour Analysis Results – Odour Concentrations and SOERs

Sample Location	Date and Time	Sampling Time (min)	Odour Concentration (OU.m^3, wet)	SOER (OU.m^3/m^2/s)
Balance Tank	1 November 2017 08:40	12	6630	918
DAF Unit	1 November 201709:22	13	5500	1280
Aerated Lagoon 1	1 November 2017 10:15	13	36	0.0685
Aerated Lagoon 2	1 November 2017 10:50	12	36	0.0685
Non-Aerated Lagoon 3	1 November 2017 12:01	12	6[8]	0.0036
Non-Aerated Lagoon 4	1 November 2017 13:25	12	6	0.0036

The location of the odour sources is depicted in Figure 46.

[8] The measured SOERs at non-aerated lagoons 3 and 4 were considered too low when compared to literature data for wastewater treatment plants. Consequently, SOERs of 0.0685 OU.m^3/m^2/sec were adopted.

Figure 46: Odour sources

A list of all odour sources and adopted SOERs for purpose of dispersion modelling are presented in Table 57.

Table 57: Odour Sources and Adopted SOERs for Odour Dispersion Modelling

Source	Area (m^2)	Applied SOER ($OU.m^3/m^2/s$)	Source / Comments
Balance Tank	58	918	SOER adopted from on-site sampling conducted by Airlabs on 01 November 2017
DAF unit	21	1280	SOER adopted from on-site sampling conducted by Airlabs on 01 November 2017
Screw Press	Not modelled		During the site inspection, it was determined that the odours from screw press were not significant[9].
Coagulation & flocculation	Not modelled		Enclosed Pipe Works. No odour emissions observed during site visit
Aerated Lagoon 1	1,570	0.685	SOER adopted from on-site sampling conducted by Airlabs on 01 November 2017
Aerated Lagoon 2	1,840	0.685	SOER adopted from on-site sampling conducted by Airlabs on 01 November 2017
Non-Aerated Lagoon 3	5,000	0.685	Conservatively assumed to be same as Aerated Lagoon 1 & 2
Non-Aerated Lagoon 4	4,590	0.685	Conservatively assumed to be same as Aerated Lagoon 1 & 2
Winter Storage Dam	19,400	0.05	The SOER have been referenced from literature and same value was used by Pit & Sherry report submitted to TAS EPA, dated 19th May 2016 (Huon Aquaculture Parramatta Creek Wastewater Treatment Plant – Odour Assessment)
Irrigation Areas	Approx. 80 hectares	0.014	SOER adopted from storage dam were scaled down by a factor of 3.5. The treated water from storage dam will be diluted with freshwater (ratio of 1 wastewater: 2.5 freshwater). Based on the dilution ratio, SOER of 0.05/3.5 = 0.14 $OU.m^3/m^2$. Irrigation will only occur during five months of the year (November to March). Hence SOERs applied to those five months only.
Sludge Handling	Same as Non-Aerated Lagoon 4	1.0	Odour emission rates were measured at the Wodonga wastewater treatment plant in Victoria in 2010. Table 7.2 of West Wodonga WWTP report suggests the sludge drying pans have SOER of 0.2 to 1.0 $OU.m^3/m^2/s$ (Wodonga, 2017).
Accidental Spills	10	1, 000	Assumed spill to occur from Balance tank hence applied similar SOER to Balance tank. Assumed spill over 10 m^2 area.

Meteorological modelling was described in Section 8.6.4.

[9] Considering the small surface area of the source and low odour concentration, it is noted that excluding this source from modelling should have minimal impact on the final modelling results.

To model the odour emissions from the facility, dispersion modelling was undertaken for the calendar year 2014 using the US-EPA CALPUFF dispersion model. The model configuration is described in Appendix E as are the coordinates of four vertices for the modelled odour sources. Five scenarios were modelled to predict defined odour impacts. A description of the five scenarios is presented in Table 58.

Table 58: Scenarios modelled

Scenario	Description
Normal Operations	Representing normal operation of the facility. Does not take into account peak operating hours during Easter and Christmas period. Does not take into account upset conditions.
Worst Emissions and Peak Operating Hours	10% increase in SOER from normal operations to take into account any uncertainties/seasonal variabilities in the odour emission rates. The worst emission scenario also accounts for additional operating hours during peak periods.
Upset Conditions – Sludge Handling	Normal Operations + Sludge handling operations. It is expected that, once every 10 to 15 years, sludge from each lagoon will be emptied. For the sake of conservatism in modelling, it was assumed that sludge handling will occur every hour of the year.
Upset Conditions – Accidental Spills	Normal Operations + Accidental spill. The occurrence risk of accidental spills is quite low. For the sake of conservatism in modelling, it was assumed that an accidental spill from Balance tank, spread over an area of 10 m^2 occurs every hour of the year.
Mitigated Operations	Analysis of odour emission rate inventory indicated that the bulk of odour emissions were emanating from the DAF unit and the balance tank. HA is proposing to cover these two sources thereby reducing emissions from these two sources by at least 25% during operating hours of the facility. It is expected that no emissions will be emitted from Balance Tank and DAF unit during non-operational hours. Emissions from other sources will be same as Normal operations.

A detailed description of adopted odour emission rates and modelled hours for each modelled five scenarios is presented in Table 59.

Table 59: Modelled SOERs and Operating Hours – All Modelled Scenarios

Scenario Name / Sources Modelled	Normal Operations	Worst Emissions and Peak Operating hours)	Upset - Sludge Handling	Upset - Accidental Spill	Mitigated Operations
Balance Tank	SOER of 918 OU.m^3/m^2/sec during operating hours (7 am to 3 pm). Half SOERs during non-operating hours	SOER 110% of Normal. Additional operating hours (21 extra hours before Easter and 43 extra hours during Christmas) when SOER will be 110% of Normal. For the rest of the hours SOER will be half. This was fed through an hourly varying input file.	Same as Normal	Same as Normal	SOER 75% of Normal during operating hours (7 am to 3 pm). Zero SOERs during non-operating hours
DAF unit	SOER of 1280 OU.m^3/m^2/sec during operating hours (7 am to 3 pm). Half SOERs during non-operating hours	SOER 110% of Normal, Additional operating hours (21 extra hours before Easter and 43 extra hours during Christmas) when SOER will be 110% of Normal. For the rest of the hours SOER will be half. This was fed through an hourly varying input file.	Same as Normal	Same as Normal	SOER 75% of Normal during operating hours (7 am to 3 pm). Zero SOERs during non-operating hours
Aerated Lagoon 1	SOER of 0.685 OU.m^3/m^2/sec, constant emissions throughout the year.	SOER 110% of Normal	Same as Normal	Same as Normal	Same as Normal
Aerated Lagoon 2	SOER of 0.685 OU.m^3/m^2/sec, constant emissions throughout the year.	SOER 110% of Normal	Same as Normal	Same as Normal	Same as Normal
Non-Aerated Lagoon 3	SOER of 0.685 OU.m^3/m^2/sec, constant emissions throughout the year.	SOER 110% of Normal	Same as Normal	Same as Normal	Same as Normal
Non-Aerated Lagoon 4	SOER of 0.685 OU.m^3/m^2/sec, constant emissions throughout the year.	SOER 110% of Normal	Same as Normal	Same as Normal	Same as Normal

Scenario Name Sources Modelled	Normal Operations	Worst Emissions and Peak Operating hours)	Upset - Sludge Handling	Upset - Accidental Spill	Mitigated Operations
Winter Storage Dam	SOER of 0.05 OU.m^3/m^2/sec, constant emissions throughout the year.	SOER 110% of Normal	Same as Normal	Same as Normal	Same as Normal
Irrigation Areas	SOER of 0.014 OU.m^3/m^2/sec, continuous source, every hour of the day, for five summer months of November through to March. No emissions during rest of the year.	SOER 110% of Normal	Same as Normal	Same as Normal	Same as Normal
Sludge Handling	No emissions	No emissions	SOER of 1 OU.m^3/m^2/sec over an area of Lagoon 4, SOER to apply every hour of the year	No emissions	No emissions
Accidental Spills	No emissions	No emissions	No emissions	SOER of 1000 OU.m^3/m2/sec to apply every hour of the year over an area of 10 m^2 near Balance Tank.	No emissions

The maximum (reported as 99.5th percentile) 1-hour average incremental odour concentrations from the facility were predicted for the five modelled scenarios and are presented in Table 60: Predicted 99.5th Percentile 1-Hour average ground level odour concentrations Table 60 and depicted in Figure 47. Each of the modelled scenarios is graphically depicted in Appendix E.

No background odours were considered for this assessment, as there were no nearby sources identified outside the facility site boundary that released odour emissions similar to, the odours expected from the assessed sources.
When considering the modelling results, it is important to consider the empirical data, namely that when the site odour conditions were considered less than optimal, there were no public complaints.

Table 60: Predicted 99.5th Percentile 1-Hour average ground level odour concentrations

Scenario	Predicted 99.5th Percentile 1-Hour Average Odour Concentrations (OU)			
	Criterion[10]	At R1 Layton's House	At R2 Conservatory Road	At or Beyond Boundary (as seen in figure 43)
Normal Operations	2	3.5	1.1	22.2
Worst Emissions and Peak Operating Hours	2	5.7	1.6	39.1
Upset Conditions – Sludge Handling	2	3.7	1.2	22.5
Upset Conditions – Accidental Spills	2	4.2	1.2	27.1
Mitigated Operations	2	0.96	0.67	12.3

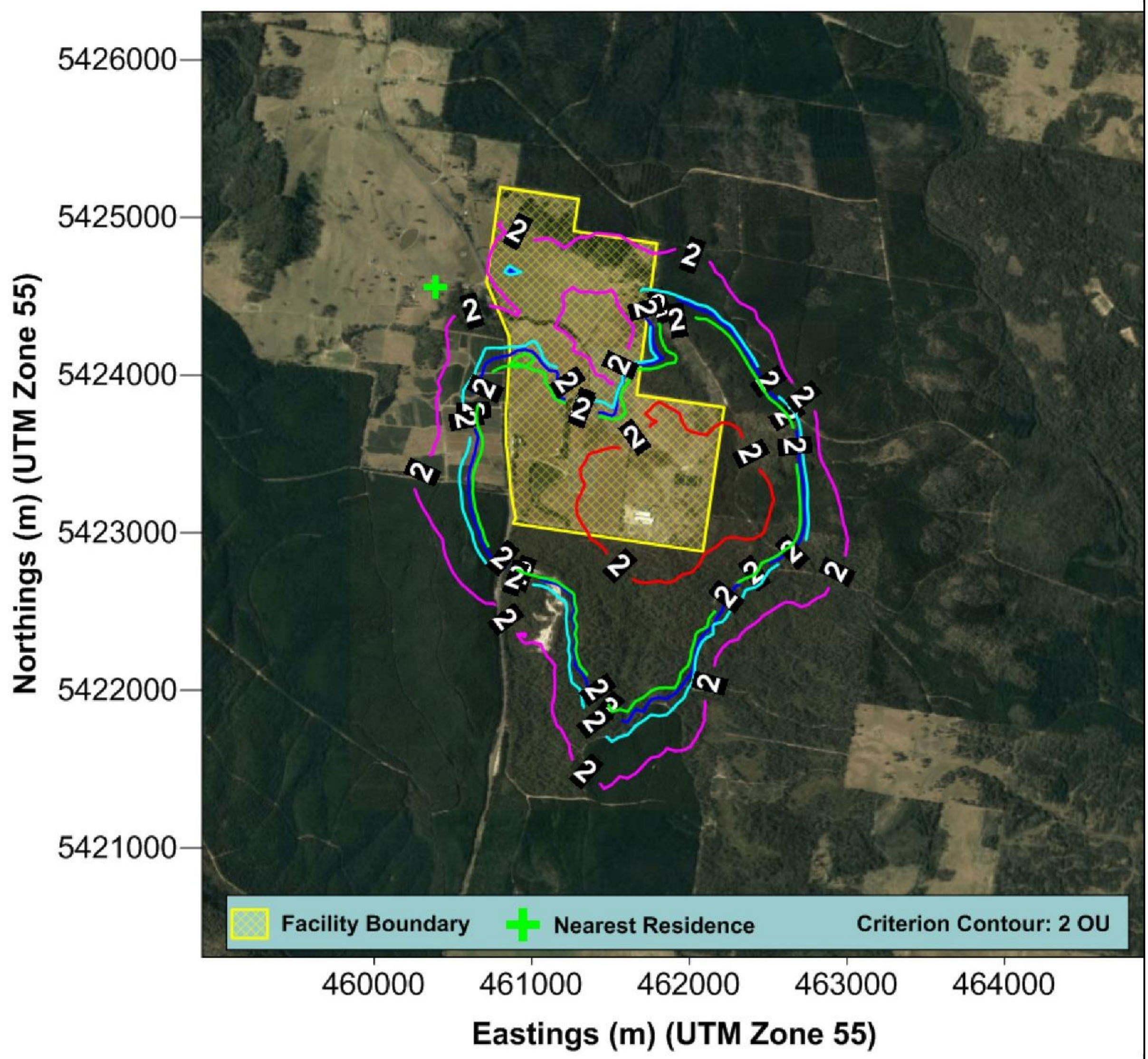
The following observations can be made from the results of the odour dispersion modelling:

- For all five scenarios, the maximum (99.5th percentile) 1-hour average incremental odour concentrations predicted at the nearest sensitive receptor are below 2 OU.
- For all five scenarios, the maximum (99.5th percentile) 1-hour average incremental odour concentrations predicted from the modelled SOERs indicate an exceedance of the 2 OU assessment criteria at the site boundary of the facility.
- For all five scenarios, the 2 OU isopleth outside facility boundary is mainly over permanent timber production zones and private timber reserves to the west (Figure 47) with some coverage across farmland and the Bass Highway to the east.

As irrigation will occur on Mr Layton's land odour modelling was conducted to include the irrigation site as part of the operation in regard to odour. As the wastewater will be diluted 1 parts wastewater to 2.5 parts clean water the potential to generate odour was considered negligible. Figure 47 depicts odour modelling from Huon Aquaculture sources modelled in regards to Mr Layton's land

[10] At facility boundary

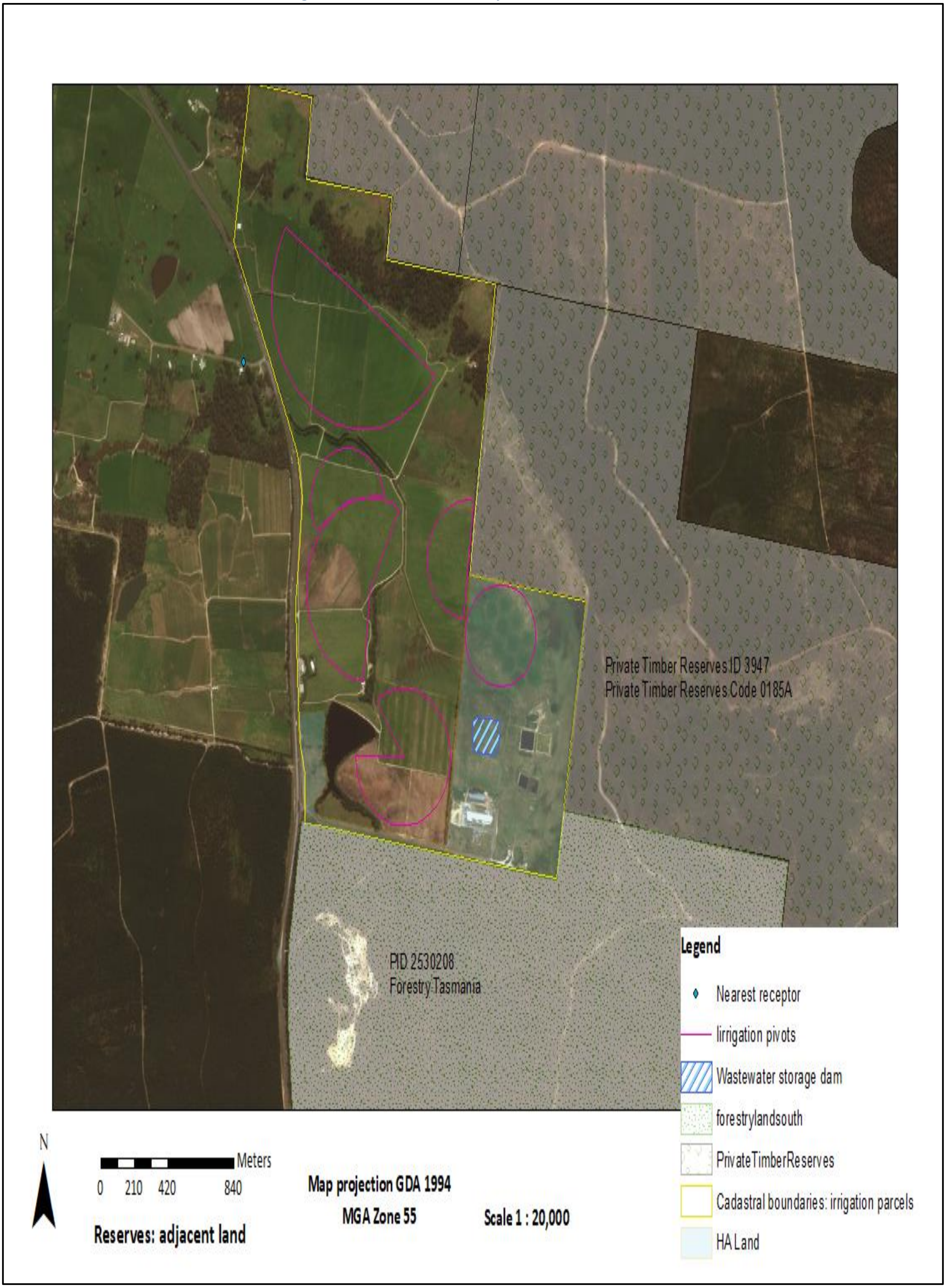
Figure 47: Comparison of modelled scenarios irrigation (Troy Layton's land included)



Scenarios Presented: • Normal Operations • Worst Emissions and Peak Operating Hours • Upset Conditions Sludge Handling • Upset Conditions Accidental Spills • Mitigated Operations	**Concentration Isopleth Presented: 2 OU Only (Varying colours)** • Normal Operations – **Green** • Worst Emissions and Peak Operating Hours - **Magenta** • Upset Conditions Sludge Handling - **Blue** • Upset Conditions Accidental Spills – **Cyan** • Mitigated Operations - **Red**
Model used: TAPM V4.0.5, CALMET 6.4.0, CALPUFF 6.42	Included Receptor: 1, Green Marker
Computational Grid Resolution: 200 m	Modelling Run Dates: 01/01/2014 to 31/12/2014
Odour Criteria: 2 OU	Sampling Grid Resolution: 50 m
Pollutant: Odour	Averaging Period: 1- Hour
Percentile Level: 99.5th Percentile	Site Boundary: Yellow Outline

Figure 48 depicts the location of factory and odour sources in relation to surrounding land tenure and the closest sensitive receptor.

Figure 48: Location of factory and odour sources



8.6.8 Odour Comments

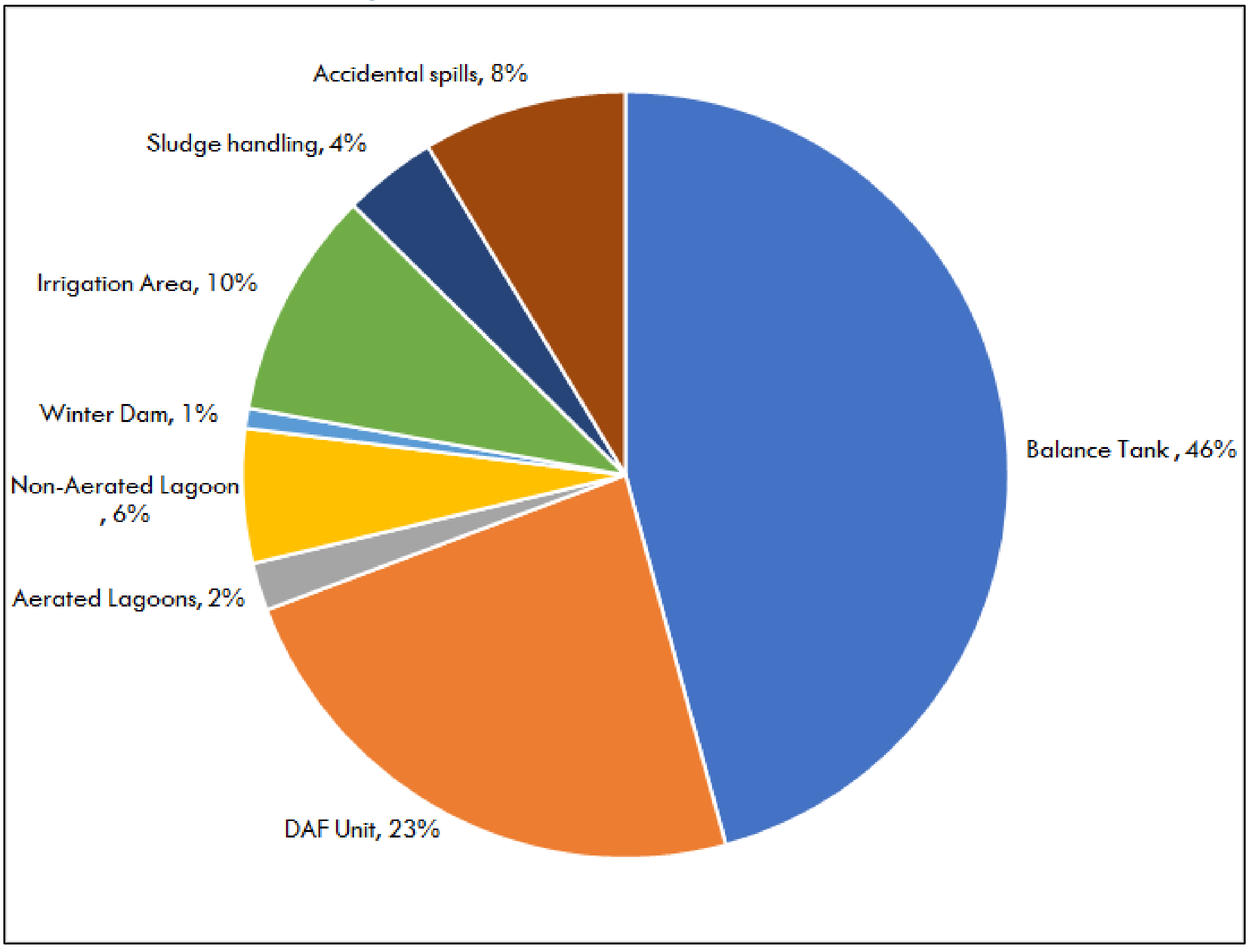
Four scenarios modelled (out of the five scenarios modelled) relate to unmitigated emission rates from the facility. The fifth scenario (mitigated operations) relates to covering of the Balance tank and DAF unit. The results of all five scenarios demonstrated non-compliance of the 2 OU criterion at or beyond facility boundary.

HA is committed to undertake cost effective mitigation actions to minimise odour impacts from facility if a credible odour complaint is received relating to the site's operations.

A breakdown of the odour emissions from the activity (normal operations scenario) is shown in Figure 49. As can be seen, the Balance Tank and the DAF unit contribute to almost 70% of the total facility emissions. It follows that mitigating odours emanating from these two units would lead to a reduction in odour generation if credible odour impacts were being experienced. In event that credible odour impacts were occurring (unlikely considering that no complaints have been received to date), HA would explore those cost-effective mitigation measures.

One option is to cover these two units. For this mitigated operations scenario, the extent of the modelled exceedance outside activity boundary is significantly reduced to approximately 25 m outside the Huon boundary to the south (Forestry land, Figure 48) and to approximately 40 m outside the activity boundary to the east (Private timber reserve, Figure 48).

Figure 49: Contribution of individual odour sources



The improvements predicted by dispersion model for the fifth modelling scenario (mitigated operations) may be under-estimated as it was conservatively assumed that covering the Balance Tank and DAF unit will only lead to 25% reduction in emission rates during the operating hours of the facility (7 am to 3 pm).

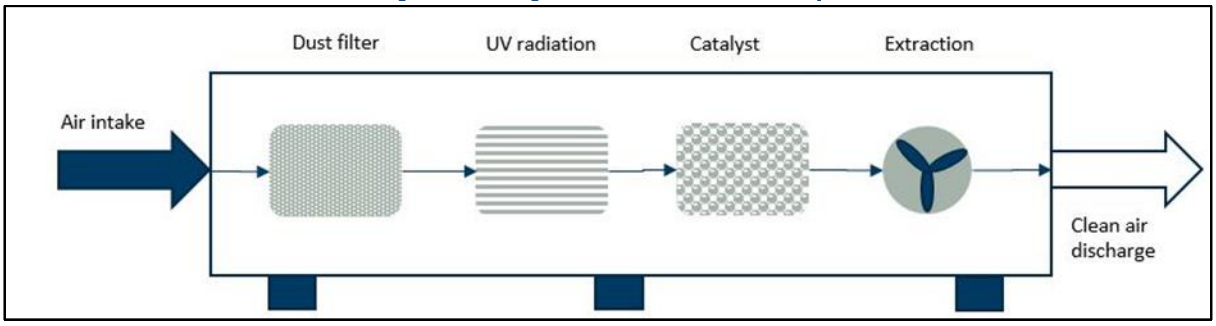
As this land-use is zoned for timber production and reserves and considering that there are no existing or proposed residential dwellings in that impacted area, it is very unlikely that the facility's operations would cause odour nuisance to any human beings outside the facility boundary, despite modelling suggesting the assessment criteria exceeding the site boundary.

In addition, the 2 OU exceedance is not necessarily an indicator of odour nuisance.
When the modelled OU for upset conditions assumes that these situations will occur every hour of the year, the modelled results although showing 2 OU[11] isopleth excursions outside the property boundary do not mean that odour nuisance will actually occur.
This rationale seems to align with the fact that since the factory commenced operations in 2009 no odour complaints have been generated by the factory operations.
HA considers that the potential for future odour nuisance from the factory operations is negligible.

8.6.9 Avoidance and mitigation measures

The facility and ancillary services incorporate measures (including operational procedures) to minimise potential odour emissions from sources, including on-site wastewater treatment facilities and solid waste management. No off-site odour issues have arisen from the wet processing or wastewater treatment to date.
If significant odour development occurs and odour complaints are received and verified, then HA will enclose the Balance tank and DAF unit and if credible complaints continue HA will enclose the WWTP and direct emissions to an exhaust stack with an installed photoionization system to reduce odour emissions.
Photoionization mitigation directs the raw untreated gas through a dust filter capturing larger particles, the filtered gas then passes through a UV compartment where UV light initiates catalytic enhanced chemical reactions which result in the linkages of odour molecules being broken up by the UV light creating oxidants that degrade and otherwise eliminate odours. These are modular systems with easy expansion if required.

Figure 50: Diagram of Photoionization system



Source:http://www.hydrofluxindustrial.com.au/product-item/odour-control-2

8.6.10 Commitments

Commitment	Due date
If PM_{10} particulate ground level concentrations from the smokehouses are demonstrated to cause environmental nuisance or harm, HA will install higher stacks to increase the dissipation of emissions from the smokers.	Within three months of nuisance verification
If credible public odour complaints are received and verified, the DAF unit and Balance Tank will be enclosed within 30 days, if post this other credible odour complaints are received the WWTP will be enclosed and HA will install a photoionization system to reduce modelled odour to ≤2 odour units at the activity boundary	30 days for initial mitigation (enclose DAF and Balance Tank) and within three months of secondary complaint verification (enclose WWTP)

8.6.11 Assessment of residual effects

Adoption of the above mitigation measures and commitments will ensure dust particulate and odour emissions will not cause environmental nuisance. It is expected that the duration of effects would be long term and the quality of the impacts would be neutral.

[11] One OU per m^3 is effectively the perception threshold for sampled odour as perceived by olfactometer panellists.

8.7 Solid and controlled waste management

Solid wastes and controlled wastes are produced at the facility from the WWTP (solids screening), packaging materials and wastes from staff amenities as well as fish processing wastes (Section 3.21) and ash from the smokehouses.

8.7.1 Existing conditions

Fish processing generates approximately 10% by weight of waste in the form of viscera (guts) and <1% additional waste which includes, scales, trimmings and floor spoiled (fish that fall onto the floor).

When the proposed production increase to approximately 33,000 tpa is approved, the site will generate 3,300 tpa of viscera waste.

The current management practices for fish product waste handling are capable with this increase.

To date, viscera has been ensiled (pH adjusted to <5 to reduce bacterial activity) and is removed daily by Spectran and taken by tanker to Interlaken for composting production.

Solids removed from the screw press are stored in lidded bins and removed off site daily by Spectran along with other wastes such as scales and floor spoil.

General waste management facilities are currently located on site. These are associated with the current office and administration on site.

At present the waste ash (approximately 10–15 kg per day) from the smoke generators is removed and placed within a designated 1 m^3 ash bin. When this bin is full (approximately once per month), the bin is collected by Veolia Environmental Services and delivered to Dulverton Waste Management (145 Dawson's Siding Road, Latrobe – transport distance 37.4 km). The waste is then used as compost to add valued carbon content to potting mix/compost. The resulting product is sold on to farmers and gardeners in the area. The rate of collection will increase as production increases.

8.7.1.1 Performance requirements

Solid and controlled waste from sites must comply with the *Environmental Management and Pollution Control (Waste Management) Regulations 2010.*

8.7.2 Potential effects

Waste material can cause environmental nuisance or harm if it is not contained and disposed of appropriately. Inappropriately managed solid waste has the potential to contribute to surface- and groundwater pollution.

8.7.2.1 General solid waste

General solid waste – including papers, plastics, food materials and empty bottles, and materials from routine minor machinery maintenance – may result in impacts to soil and water if not managed appropriately. Inappropriate management of food wastes may result in pests, such as rodents. Solid wastes will also include waste feed plastic bags, waste feed bulka bags and ash from the smokehouses.

8.7.2.2 Organic waste

Organic wastes from the WWTP, including removed solids report to the organic solid waste management system if not managed appropriately odour and or rodent ingress could occur.
Viscera has the potential to cause odorous conditions or impact on waterways if not managed appropriately.
Lagoon sludge could cause odorous conditions and or impact on waterways if not handled appropriately.

8.7.3 Avoidance and mitigation measures

8.7.3.1 General solid waste

Waste minimisation techniques are used by HA wherever possible to ensure best practice environmental management. Such minimisation techniques include:

- source reduction;
- recycling;

- waste auditing; and
- using cleaner production options.

Packing materials and office wastes are segregated, compacted and stored in skips for collection by contractors for recycling and/or disposal as appropriate.

The following will continue to be undertaken to mitigate effects from general solid waste:

- All general solid waste material will be disposed of off site, in accordance with LC requirements;
- Rubbish bins or skips, with lids, will be provided at appropriate locations around the site;
- all staff will be required to avoid littering and to collect and bin any rubbish and litter that they observe on site; and
- Refuse will be periodically taken to an approved waste disposal facility.

Waste minimisation practices will be adopted to reduce waste production and promote recycling as much as is practicable. All waste that cannot be recycled will be disposed of in the appropriate manner. Wastes will be recycled, reused or disposed of accordingly. If products supplied to HA are contained within non-recyclable material, then suppliers of these products will be asked to supply dates for when these will be made recyclable or provide adequate reasons why they cannot conform to HA policy.

The design of the fish processing facility maximises the yield of product and minimises wastes. The facility meets AQIS, USDA and EU standards and incorporates the latest processing technology to reduce waste generation as far as is practicable.

8.7.3.2 Organic waste

Viscera and other production organic waste (floor spoil and scales) will continue to managed as at present with Viscera acid stabilised and removed daily and other organic waste placed in a lidded bin and removed daily. These wastestreams are stored in bunded areas, if spillage occurred, a suction truck would be utilised to remove organics from the bunded area as seen in plate 3.

The wastewater treatment lagoons are accumulating sludge but have not yet reached the stage where they require desludging. When desludging occurs, the sludge will be tested and assessed for reuse/disposal options. If the classification of the sludge allows for beneficial reuse, an approval for reuse will be sought from the relevant authority (Council or EPA).

If beneficial reuse of the biosolids is not possible, then remediation options will be explored to allow appropriate disposal at an approved facility. All management of the sludge will incorporate biosecurity considerations.

It is anticipated that as sludge builds up, a single pond (pond 3 or 4) will be made quiescent by diverting wastewater from that pond to facilitate sludge settling and drying. After two to three weeks, suction trucks will be used to vacuum out the sludge (Plate 1). This minimises the risk of spillage and odour formation because the sludge is moved under negative pressure and then transported off site in sealed vacuum trucks for disposal/reuse.

Plate 1: Current sludge removal at Millybrook fish farm

8.7.4 Assessment of residual effects

The measures outlined above should ensure that potential effects from solid waste are properly controlled, monitored and managed and present a low risk to the environment.

8.7.5 Commitments

Commitment	When
All waste material generated by the processing activities will be stored in appropriate sealed containers and removed from site either for disposal at an appropriately authorised facility or for transport directly to an authorised recycler.	During operations
Pond sludge will be removed from a quiescent pond using a vacuum truck which will transport the sludge off site in accordance with appropriate approvals.	As desludging is required: estimated every 12–15 years.

8.8 Dangerous goods and environmentally hazardous materials

There will be no change to the use and management of dangerous goods and environmentally hazardous materials as result of the proposed production increase.

No additional hazardous materials will be required as result of the increase in production.

8.8.1 Existing conditions

The site is currently used for office, administration and fish processing activities. Few dangerous goods and environmentally hazardous materials are associated with these activities.

In addition to these substances, fuels and oils are also stored and used on site for machine maintenance and operations. LPG cylinders are also located on site and used for the smaller boiler that produces hot wash-down water.

8.8.2 Performance requirements

Management of dangerous goods and hazardous materials must comply with the following statutes, regulations and codes:

- *Work Health and Safety Act 2012;*
- *Australian Dangerous Goods Code*, 7th edition;
- National Occupational Health and Safety Commission (NOHSC). *Approved Criteria for Classifying Hazardous Substances*, 3rd edition, October 2004;
- *NOHSC:1015(2001): National Standard for Storage and Handling of Dangerous Goods;*
- *NOHSC:1005(1994): National Model Regulations for the Control of Workplace Hazardous Substances;*
- *NOHSC:2017(2001): National Code of Practice for Storage and Handling of Dangerous Goods;*
- *AS 1940-2004: The storage and handling of flammable and combustible liquids;*
- *Environmental Management and Pollution Control Act 1994* – Environmental nuisance or harm provisions;
- *Environmental Management and Pollution Control (Waste Management) Regulations 2010;*
- *Environmental Management and Pollution Control (Controlled Waste Tracking) Regulations 2010;*
- *AS 3780-2008: The storage and handling of corrosive substances; and*
- *Dangerous Goods (Road and Rail Transport) Act 2010.*

8.8.3 Potential effects

Incorrect storage and handling of dangerous goods and environmentally hazardous materials could potentially result in land and water contamination. Incorrect storage and handling of fuels and chemicals can also result in health and safety implications including explosions, fire and exposure of personnel to dangerous liquids or fumes.

8.8.4 Avoidance and mitigation measures

A number of hazardous substances will be utilised (Table 61). HA will manage hazardous substances on the site in accordance with the specifications as outlined in the National Code of Practice *NOHSC:2017(2001)*.

Table 61: Dangerous goods register

Product name	Supplier	UN no.	DG class	Identified hazards
Alcafoam CL	Sopura Australia Pty	1814	8	Potassium hydroxide solution.
AM 10A	Sopura	—	Not classified	Irritant
Pur-Chlor 127B	Sopura	1791	8	Hypochlorite solution. Corrosive material
Sodium hypochlorite	Tas Isle Trading	1791	8	Corrosive
Formic acid	Tas Isle Trading	1779	8	Corrosive, flammable
Pur-Exol 2	Sopura	1791	8	Alkaline chlorinated detergent
Pur-Foam 290A	Sopura	1791	8	Hypochlorite solution. Corrosive material
Pur-Line 362C	Sopura	1791	8	Hypochlorite solution. Corrosive material
Pur-Det 200C	Sopura	1791	8	Hypochlorite solution. Corrosive material
Sopuroxoid 5	Sopura	1791	8	Hypochlorite solution. Corrosive material
Pur-Foam 284A	Sopura	1791	8	Hypochlorite solution. Corrosive material

The following measures will continue to be undertaken to manage potential hazards associated with the use of dangerous goods and environmentally hazardous materials:

- Spill kits will be made available when maintenance is being undertaken;
- If any residual contaminated soil is evident after a spill and clean-up, it will be tested and then taken for disposal or treatment at an appropriately licensed facility;
- Material safety data sheets (MSDS's) will be held for all chemicals used on site. MSDS's will be made available to staff as required; and
- Processing plant staff will be trained in the appropriate operation of the plant including use of chemicals, and appropriate safety information will be made available in worker and visitor site inductions.

The chemicals listed in Table 61 are stored in a chemical storage room that is bunded and managed according to National Standard and National Code for the Storage and Handling of Workplace Dangerous Goods. The management of the corrosive substance complies with *AS 3780–2008 The storage and handling of corrosive substances*.

The volumes of dangerous goods and environmentally hazardous chemicals stored on site are well below the levels for the site to be classified as a major hazard facility under the *Dangerous Substances (Safe Handling) Act 2005*. The environmental and safety requirements for storing and handling minor quantities are described in *NOHSC:2017(2001)* Appendix 1, and HA manages its substances in accordance with this Code.

A dangerous goods register, hazard analysis and risk assessment including specified bunding, isolation and action plans, is maintained as part of HA's operational procedures.

Where the above avoidance and mitigation measures are not already reflected in previous commitments, these are included below.

8.8.5 Assessment of residual effects

The measures outlined above should ensure that potential effects from dangerous goods and environmentally hazardous materials are properly controlled, monitored and managed, and present a negligible risk to the environment.

8.8.6 Commitments

Commitment	When
Any spills of potentially contaminating liquids will be reported to the Shift Supervisor immediately and cleaned up as soon as practicable	During operations
Hazardous chemicals to be used at the factory site will be stored in dry, bunded areas that comply with *AS 3780–2008 Storage and handling of corrosive substances*	During operations
The management of the hazardous substances will be in accordance with the National Standard and National Code for the Storage and Handling of Workplace Dangerous Goods	During operations
All workers will be trained to respond to spills and leaks	Ongoing
No ozone-depleting substances will be used or generated during operation of the facility	During operations

8.9 Biodiversity and natural values – flora and vegetation

8.9.1 Existing conditions

The proposed location for the facility is within an area of the site that has been previously developed for industrial and agricultural purposes. No impact on current surrounding flora and fauna should occur.

A Natural Values Atlas Report generated on 20 July 2017 from the DPIPWE website showed:

- The vegetation at the Parramatta Creek site largely comprises grasslands, with the site surrounded by state forest to the north, east and south and an orchard to the west;
- The vegetation community at the site, in accordance with TASVEG version 3.0, indicates the entire site is classified as agricultural land (FAG), with exception of the factory site, which is classified as urban areas (FUR);
- No threatened flora species have been recorded within 500 m of the site;

- The closest weeds recorded in vicinity of the site were roadside weeds, pink Pampas, Spanish heath, blackberry and gorse, located along the Bass Highway;
- No Tasmanian *Weed Management Act 1999* weeds found within 150 m of the site; and
- No priority weeds found within 500 m.

The surrounding land is a mixture of vegetation communities:

- agricultural land (FAG) – to the west;
- unverified plantations for silviculture (FPU) – to the east;
- plantations for silviculture (FPL) – to the north, with the exception of a thin strip of FPU adjacent to the northern boundary; and
- *Eucalyptus amygdalina – Eucalyptus obliqua* damp sclerophyll forest – to the south of the site.

No terrestrial fauna habitat remains on site. No threatened fauna species have been recorded within 500 m of the site. One threatened fauna species (eastern barred bandicoot [*Perameles gunnii*]) last recorded in 1992 more than 500 m to the north-west of the site on the Bass Highway (Figure 29).

8.9.2 Performance requirements

Flora management must comply with the following statutes:

- *Environment Protection and Biodiversity Conservation Act 1999;*
- *Threatened Species Protection Act 1995;*
- *Nature Conservation Act 2002;*
- *Crown Lands Act 1976;*
- *Weed Management Act 1999; and*
- *Forest Practices Act 1985.*

8.9.3 Potential effects

There will be no increase in the size of the footprint of the facility or the wastewater treatment plant and therefore the project will not require any vegetation clearance.

The increased wastewater irrigation land is existing agricultural land subject to cropping and irrigation.

The construction of the proposed 75 ML storage dam will not have an impact on native flora or fauna as the lagoon will be located within an area already cleared and pastured.

No known weeds and diseases that might affect native fauna are present on the site or near the site.

8.9.4 Avoidance and mitigation measures

There will be no impacts to flora or fauna values from the increase in production and therefore no avoidance or mitigation measures are proposed.

8.9.5 Assessment of residual effects

There will be no impacts to flora or fauna values from the increase in production and therefore no long-term adverse impact on sustainability in regards to biodiversity.

8.10 Noise impact

No increase in the noise impact is expected as the result of increased production. There will be a minimal increase in the plant and equipment used on site. Some additional pumps and automated valves will be used to move irrigation water (see Appendix B). Consequently, any increase in the sound pressure levels emanating from the facility should be minimal. There may be an occasional increase in the hours of operation before Easter and Christmas as noted in Section 3.4.

8.10.1 Existing conditions

The main noise sources associated with the facility include truck movements, refrigeration units, condenser systems and other process equipment items such as pumps and blowers.

Continuous noise is generated by machinery such as:

- Blowers;
- Pumps;
- refrigeration units; and

- other processing equipment.

Intermittent noise is generated at the site through such events as:

- truck movements;
- irrigation pumps; and
- machinery that might cycle with rapid increases and decreases in noise levels.

Distinctive tones are generated on site through activities such as:

- trucks backing with backing alarms; and
- refrigerant unit hums.

8.10.2 Performance requirements

Noise emissions from proposed activities must comply with the following:

- *Environmental Management and Pollution Control Act 1994* – Environmental nuisance;
- *Environment Protection (Miscellaneous Noise) Regulations 2004;*
- Environment Protection Policy (Noise) 2009; and
- PCE 7894, which requires that noise levels will not exceed 45 dB(A) during the day (7 am to 6 pm), 40 dB(A) during the evening (6 pm to 10 pm), and 35 dB(A) during the night (10 pm to 7 am) at noise-sensitive receptors.

8.10.3 Potential effects

Noise has the potential to cause environmental nuisance at residential premises and other sensitive uses.

As outlined above, the main noise sources associated with the facility include truck movements, refrigeration units, condenser systems and other process equipment items such as pumps and blowers.

Virtually all processing equipment is installed inside buildings and there are no significant noise nuisance risks. The nearest sensitive receptors are located over 1 km away and are located to the north-east and north-west of the development. To the north, south and east of the proposed development is state forest and to the west is agricultural land.

There is no evidence of neighbours being disturbed by noise, to date, and no expectation of disturbance in the future.

8.10.3.1 Avoidance and mitigation measures

The potential noise emissions from the site are not considered significant and, with the closest sensitive receptors over 1 km away, there is little risk of noise emissions causing nuisance; nevertheless, the following management measures will be implemented to ensure that noise emissions are kept to a minimum.

HA will employ best practice environmental management to minimise noise emissions to the greatest extent that is reasonably possible. All equipment and vehicles will be appropriately maintained.

Use of appropriate hearing protection will be mandatory in any high-noise environments.

8.10.4 Assessment of residual effects

Adherence to the mitigation measures and commitments, as outlined above, will ensure that any noise effects from the operation of the project will be kept to acceptable levels.

8.10.5 Commitments

Commitment	When
HA will employ best practice environmental management to minimise noise emissions to the greatest extent that is reasonably possible	Ongoing
All equipment and vehicles will be appropriately maintained	Ongoing
Use of appropriate employee hearing protection will be mandatory in any high-noise environments	Ongoing

8.11 Traffic impacts

As foreshadowed in the 2009 DPEMP (pitt&sherry, 2009), the access road junction with the Bass Highway has been upgraded. The existing vehicle movements and the new movements anticipated as result of the planned production increase are shown in Table 62.

Table 62: Traffic movement production increase

Vehicles	Current Vehicle movements (2018/19) per day (VPD)	Increased production up to 33,000 tonnes VPD
Trucks		
Semitrailers delivering salmon for processing from Port Huon between July and February	**4-9**	**4 –11**
Semitrailers delivering salmon for processing from Strahan via Burnie between March and June	**2–4**	**3–6**
Semitrailers delivering cartons and packaging materials mainly travelling to and from Devonport	**1–2**	**4**
Rigid truck for removal processing waste	**1**	**1**
Semitrailers collecting finished goods and transporting them to Devonport for shipping	**2–5**	**4–10**
Light vehicles		
Staff entering the site between 6 am and 7 am and leaving between 3 pm and 6 pm	**≤130**	**≤140**
Site visitors, tourists	**<10**	**<20**

The upgraded junction can manage these increased vehicle movements.

The increase in vehicle numbers as result of the increase in production is considered insignificant due to the high volume of vehicles which use the state's road network, particularly the Bass Highway.

8.12 Health impact assessment

For the purposes of this assessment, two populations can be identified:

- employees and contractors working on site at Parramatta Creek; and
- the general public not directly engaged in activities related to the operation.

The issue of adverse health effects on workers is an occupational health and safety matter and, as such, will be addressed in HA's safety management system.

8.12.1 Public health

The general public will not be impacted by emissions from the site. The distance from the site to nearby residences and even to transport routes precludes the concentrations of any emissions – whether noise, dust, gases or liquids – from adversely impacting passers-by. HA maintains that there are no public health issues associated with the proposed project.

8.12.2 Occupational health and safety

Safety management systems consistent with the requirements of Workplace Standards Tasmania, and any requirements attached to the approval of the project, will be applied during the operation of the fish processing facility.

HA operates to a companywide policy and safety management plan. This will ensure that all health and safety issues relating to employees, site visitors and the public are addressed at the Parramatta Creek site for ongoing operations and activities.

8.13 Marine and coastal

The site is located approximately 20 km south of the northern Tasmanian coast, and Bass Strait, the closest coastal and marine area.

The increase in production will not have an impact on any marine or coastal areas, nor will it be affected by any marine or coastal hazards such as:

- potential tidal inundation;
- storm surge inundation or wave impacts;
- impacts from climate-change-induced sea-level rise; and
- potential coastal erosion processes.

8.14 Visual impact

8.14.1 Existing conditions

The existing Parramatta Creek facility can be seen from the Bass Highway, although the facility is generally only visible to traffic heading south on the Bass Highway and from select, distant residences. When the facility was established, an orchard obscured the view of the facility from the highway, but the orchard has since been removed.

The buildings and facilities are already in place at the site. The increase in production at the site will not result in additional buildings or infrastructure that could have an adverse impact on visual amenity.

8.14.2 Performance requirements

The project must comply with the requirements of the Latrobe Interim Planning Scheme 2013.

8.14.3 Potential effects

The increased production proposal will not result in additional buildings or infrastructure other than the new winter storage dam that could have an adverse impact on visual amenity. Off-stream and on-stream dams are common in the locality with agriculture being the dominant land use.

8.14.4 Avoidance and mitigation measures.

Tree plantings will occur around the perimeter of the dam (outside of dam footings) to screen the area. Dam banks will be grassed immediately after development to stabilise and reduce visual effect.

8.14.5 Assessment of residual effects

It is expected that the duration of effects would be long term and the quality of the impacts would be neutral. Impacts upon both the landscape character of the site and the visual amenity of road users and Sassafras residents would be low to negligible or neutral during the construction and operational phases.

8.15 Fire risk

8.15.1 Existing conditions

The potential fire risks, potential on-site sources and potential on-site avoidance measures are identified below.

Potential fire risks:

- fire originating within the site;
- fire escaping from the site; and
- fire originating from outside the site.

Potential on-site sources:

- electrical fire;

- explosion from fuel vapours;
- oil/fuel fire;
- equipment exhaust on flammable material and dry vegetation;
- discarded cigarettes and dry vegetation;
- lightning strike; and
- arson.

The potential fire risk associated with the project is considered low for the following reasons:

- No explosives will be used on site;
- There is limited fuel storage or combustible material stored on site; and
- The availability of water on site will enable a rapid and effective response in the event of fire.

8.15.2 Performance requirements

The legislative and regulatory framework for the preliminary fire response plan is outlined below:

- *Fire Services Act 1979;*
- relevant Australian Standards; and
- requirements of the Latrobe Interim Planning Scheme 2013.

The main objectives of the fire management plan are to protect life and property and surrounds in the event of fire.

8.15.3 Avoidance and mitigation measures

The operations on site will be conducted in accordance with HA's bushfire management and emergency action plan.

8.16 Biosecurity risk

Disease can be caused by a range of agents including bacteria, viruses and parasites. Tasmania is free of many serious diseases affecting salmonid farming overseas; nevertheless, it is important to implement biosecurity measures to prevent the spread of existing disease agents and prevent the introduction of new diseases, such as those that exist overseas or that might reside in local wild stock.

Biosecurity in its broadest definition is the prevention of disease-causing organisms entering or leaving any site where they pose a risk to farmed stock, other animals, humans or the safety and quality of food. Biosecurity in an aquatic environment poses many challenges because potential pathogens can often be carried in wild fish and never totally eliminated from aquatic systems.

A biosecurity plan identifies potential disease risks and implements effective preventative strategies. Biosecurity plays an important role throughout every stage of the life cycle from hatching through to processing. It is not just a case of having good hygiene and disinfection procedures. The level of risk should be identified and procedures established to significantly reduce risks.

Biosecurity aims to avoid the spread of infectious agents within sites as well as between sites.

Site biosecurity is crucial for the success of any aquaculture operation. HA has an extensive effective biosecurity management system, which currently includes the Parramatta Creek facility.

8.16.1 Existing conditions

HA has biosecurity management plans for existing operations. Biosecurity is a component of HA's veterinary health plan (VHP) for its operations. The VHP encompasses all areas of fish health and welfare. The VHP aims to identify and define areas of management and husbandry where agreed protocols and procedures are targeted at 'best practice' to optimise salmonid health and welfare. Veterinary and biosecurity practices are outlined in the VHP. Details of specific operational procedures will be integrated into the VHP as standard operating procedures for the site are developed.

The facility currently processes fish stock from different growing regions. Biosecurity measures are in place to minimise the risk of inadvertently transferring potential pathogens between regions.

These measures are described in a biosecurity plan that has been approved by the Tasmanian Government's Chief Veterinary Officer. The plan ensures that risks are known and managed in accordance with best practice and current legislation.

8.16.2 Performance requirements

Tasmania operates strict biosecurity measures (Tasmanian Biosecurity Strategy 2013–2017). The salmon industry operates in line with these measures. No importation of salmon or other fish products is permitted from outside of Tasmania.

AQUAVETPLAN is the Australian Aquatic Veterinary Emergency Plan. It is a series of manuals that outline Australia's approach to national disease preparedness and propose the technical response and control strategies to be activated in a national aquatic animal disease emergency. The manuals also provide guidance based on sound analysis, linking policy, strategies, implementation, coordination and emergency management plans.

The Tasmanian Salmonid Health Surveillance Program is a key component of any fish health emergency within Tasmanian and ensures open communication with industry together with the early notification of all disease events by the producer or diagnostic laboratory.

The Tasmanian *Animal Health Act 1995* requires HA by law to report any case or suspicion of a notifiable animal disease.

8.16.3 Avoidance and mitigation measures

A summary of biosecurity measures is provided below.

Truck movements:

- All trucks enter the site through a mat disinfection station;
- All tankers have cleaning systems that are started after the tank is emptied of product;
- All tankers then enter a wash station. Wheels and the truck body are sanitised; and
- All trucks leave via the same route and go through a final wheel disinfection station before leaving the site.

Truck drivers:

- All truck drivers enter a disinfectant footbath and sanitise hands immediately upon leaving the vehicle at arrival; and
- All truck drivers, when entering a vehicle to leave the site, do so through a disinfectant footbath.

Wastewater treatment:

- All truck washing is done in a bunded area;
- All wastewater from the bunded area goes directly to and through the WWTP;
- Bunded areas are washed down and sanitised post off-loading;
- Bunded areas (in conjunction with the holding tank) have a sufficient holding and drainage capacity to ensure that there is no overflow during storm events; and
- All wastewater from the processing plant is directed to the WWTP.

Control of wildlife:

- Rodent bait stations are strategically placed around areas where trucks enter, off-load and exit;
- Staff ensure that no birds or other wildlife gain access to fish in the bins or other material during tipping operations;
- The bunded area is thoroughly washed and disinfected at the end of each day; and
- All bins have lids securely in place if staff are not present so that wildlife cannot gain access.

Other measures:

- The balance tank from the bunded area for truck washing is designed to contain 20 kL (based on a 1 in 20 storm event of 20 mins' duration);

- In the event of a spillage of material outside the bunded area, all solid material will be immediately retrieved and disposed of with other solid biological wastes and the area of the spill inundated with disinfectant;
- Treated wastewater is only irrigated to surrounding land during periods when there will be no run-off to the adjacent creeks;
- All solid wastes from the site are stored in secure containers; and
- Sludge removal from wastewater ponds will only be undertaken in dry conditions and in a manner to prevent spillage. Should there be a spill, as much solid material as possible will be retrieved and disposed of securely and the area inundated with disinfectant.

8.16.4 Commitments

Commitment	When
Biosecurity measures will be managed in accordance with the biosecurity plan approved by the Tasmanian Government's Chief Veterinary Officer	During operations
Biosecurity management protocols will be implemented to control: • potential risks resulting in introduction of disease into the site from outside • potential risks resulting in spread of disease from the site to areas outside • potential risks resulting in spread of disease within the site	During operations

8.17 Greenhouse gases and ozone-depleting substances

8.17.1 Existing conditions

Currently, generation of greenhouse gases on the site occurs from plant and equipment, and from vehicle emissions on site and transportation to and from the site.
No ozone-depleting substances are used on the site.

8.17.2 Potential effects

The proposed production increase is not expected to significantly increase the emissions of greenhouse gases or ozone-depleting substances. A small amount of indirect carbon dioxide equivalent will be produced through the use of mains electricity.

The development of the site and associated infrastructure will not result in any vegetation clearance at the site.

8.17.3 Avoidance and mitigation measures

All equipment, machinery and vehicles will be well maintained in order to minimise the generation of greenhouse gases.

8.17.4 Assessment of residual effects

Given the low indirect (scope 2) emission factors for consumption of purchased electricity from the grid in Tasmania as published by the Australian Government Department of Environment and Energy, August 2016, the operation will not have a significant carbon dioxide equivalent emission footprint.

8.18 Heritage

8.18.1 Aboriginal heritage

8.18.1.1 Existing conditions

A search of the Aboriginal Heritage Register (AHR), formerly Tasmanian Aboriginal Site Index (TASI), was conducted by Aboriginal Heritage Tasmania (AHT) in April 2015 for the site. AHT advised that there were no Aboriginal heritage sites recorded within or in the vicinity of the site. As the area is highly disturbed, it is believed that the area has a low probability of Aboriginal heritage being present.

Accordingly, there is no requirement for an Aboriginal heritage investigation.

8.18.1.2 Performance requirements

The project must comply with:

- Tasmanian *Aboriginal Relics Act 1975; and*
- Commonwealth *Aboriginal and Torres Strait Islander Heritage Protection Act 1984.*

8.18.1.3 Potential effects

Although very unlikely, due to the previously disturbed nature of the site, the project has the potential to inadvertently destroy or damage Aboriginal cultural heritage that may exist on the site.

8.18.1.4 Avoidance and mitigation measures

HA will comply with the requirements of the *Aboriginal Relics Act 1975*. If any major disturbance of previously undisturbed land around the project footprint is planned, HA will commission appropriate surveys and apply for appropriate permission prior to disturbance. In the first instance, an assessment will be carried out to determine whether disturbance can be avoided.

Should Aboriginal relics be discovered during construction or operations, they will be left undisturbed and reported to the AHT in accordance with the *Aboriginal Relics Act 1975*, and to the Tasmanian Aboriginal Land and Sea Council.

Under no circumstances will HA allow for Aboriginal or European artefacts be removed, destroyed or interfered with by HA's employees, contractors or subcontractors.

HA will incorporate the requirements of an unanticipated discover plan in its site Environmental Management Plan.

8.18.2 Commitments

Commitment	When
If any Aboriginal site, relic or artefact is found during ground disturbance, work in the immediate vicinity will cease and notification will be given to Aboriginal Heritage Tasmania	During construction and operations

8.18.3 Historic heritage

8.18.3.1 Existing conditions

No heritage properties, sites and/or values as listed on the National Heritage List, Register of the National Estate, Tasmanian Heritage Register or the Tasmanian Historic Places Inventory exist in the area of the proposed site.

8.18.3.2 Performance requirements

The project must comply with the *Historic Cultural Heritage Act 1995.*

8.18.3.3 Potential effects

Construction and operation of the proposed facility and associated infrastructure will not have any impact on any listed heritage properties and/or values because no places or sites exist in the site that are listed on the National Heritage List, Register of the National Estate, Tasmanian Heritage Register or the Tasmanian Historic Places Inventory.

8.18.3.4 Avoidance and mitigation measures

No additional mitigation is considered necessary.

8.19 Land use and development

8.19.1 Existing conditions

The site is an existing fish processing facility owned and operated by HA. The land use of the site will remain the same.

8.19.2 Performance requirements

The project must comply with the requirements of the Latrobe Interim Planning Scheme 2013.

8.19.3 Potential effects

The project is not expected to conflict with other land use and development in the area. Historically, the region has had a focus on industrial activities. No other significant industrial activities are known to be proposed in the area.

8.19.4 Avoidance and mitigation measures

No significant changes will result from the proposed project activities.

No mitigation measures are required as the land use and development remains the same.

8.19.5 Assessment of residual effects.

No significant changes will result from the proposed project activities. No long-term adverse impacts on sustainable land use are anticipated from the proposed development.

8.20 Social, health and economic issues

Currently, 140 members of staff are employed at the Parramatta Creek site. Twenty-eight of these staff members were relocated from Mount Barker in South Australia following the establishment of the onsite smokehouse at the facility. The increase in production at the site will require an additional 20 – 50 employees onsite and will provide increased stability for the existing employees.

The increased production however will require an estimated 100 - 200 employees to join the Huon Aquaculture company across all Tasmanian locations.

Walker and Fairbrother (2015) developed a labour market profile of North West Tasmania and noted that the economic base of the North West Tasmania region is resource industries (agriculture, aquaculture, minerals and forestry), complemented by manufacturing and processing sectors and a range of tertiary (health and education), transport and speciality activities (such as creative industries). Secondary and service-based industries account for a substantial part of the regional economy. Economic activity across the region tends to be unevenly distributed and is often small in scale.

Apart from one municipality, Latrobe, the population numbers have been relatively stable with modest growth; Latrobe has experienced considerable growth between 2010 and 2015 and this is expected to continue.

The region is characterised by high levels of socioeconomic disadvantage, with ongoing problems of high unemployment, low per capita GDP, population ageing and decline, high rates of welfare receipt and low levels of educational attainment. These problems vary throughout the region. A lower proportion of residents aged between 20 and 39 years suggest out-migration to pursue education, employment or lifestyle opportunities.

A summary of the social and demographic characteristics of the population living in the region is provided from the Australian Bureau of Statistics (ABS).

The site is located in the township of Sassafras, which has a population of 347, according to the 2016 ABS Census data. The township of Sassafras sits within the Latrobe municipal area, which covers a larger statistical area.

A summary of statistics from the Latrobe Statistical Area Level 2, from the 2016 Census data, is provided below. This provides a basic overview of the social and demographic characteristics of the area, where employees are likely to reside:

- The total population is 4169 people with 1998 males and 2172 females, and a median age of 44;
- Children 0–14 years made up 18.9% of the population and people aged 65 years and older made up 22.7% of the population; 58.4% of the population were aged between 15 and 64;
- There are 1134 families in the area;

- At the time of the 2011 census, 1889 people reported being in the labour force, and of these 55.6% were employed full time, 31.2% were employed part time and 6.4% were unemployed; and
- The most common occupations in the Latrobe municipal area included technicians and trades workers 17.5%, labourers 15.5%, managers 12.9%, professionals 11.8%, and community and personal service workers 10.7%.

8.20.1 Economic benefits

The proposed increase in production is expected to have a positive socioeconomic impact on the local community and the economy of the area by providing additional jobs in the area and increased stability for existing employees.

8.21 Cumulative and interactive effects

The proposed increase in production is part of HA's commitment to advancing the salmon aquaculture industry in Tasmania towards a long-term sustainable industry.

There are considered to be no cumulative or interactive impacts as part of the proposed increase in production at the existing Parramatta Creek facility.

8.21.1 Cumulative vegetation clearance

No planned vegetation clearance from activities proposed within the wider regional area is known.

8.21.2 Other proposals in the region

At the time of writing there are no other known proposals in the region that will adversely affect the increase in production at this facility.

In terms of biodiversity, there are no known or proposed planned disturbance activities within the wider regional area that could affect threatened species such the wedge-tailed eagle, the Tasmanian devil or the spotted-tail quoll.

8.22 Environmental and management systems

Operation of the facilities will be undertaken in accordance with HA's Health, Safety, Environment and Community (HSEC) system. This system will be developed for the site in accordance with appropriate provisions from the AS/NZS ISO 14000 family of standards and will be applied to the operation of the project.

The site manager will be the management representative for environmental policy and implementation, and will be responsible for ensuring that the operation is managed in accordance with best practice environmental management (BPEM).

HA currently incorporates state-of-the-art systems and procedures into its HSEC system to ensure protection of the marine, land and air environments and to minimise resource and energy consumption and waste generation. The company's objective is to deliver a sustainable operation in keeping with environmental best practice.

HA has developed a companywide environmental policy for which it is seeking accreditation. This incorporates an environmental management system for the company, an organisation structure showing environmental responsibilities and the development of procedures and instructions to employees to ensure BPEM is adopted at the all HA sites.

The Parramatta Creek site is managed in accordance with the developing environmental management system.

8.23 Additional Management of Potential Impacts

8.23.1 Reducing salt loads

8.23.1.1 Port Huon slurry ice system

HA uses salt in the form of an iced sodium chloride slurry which is added to the tankers that transport fish from Port Huon and Strahan to Parramatta Creek. The iced salt slurry reduces the water temperature in the tankers and rapidly reduces the internal temperature of the fish due to freezing point depression.

A Sunwell slurry ice generating plant is used at Port Huon to provide an ice slurry which can be mixed with brine to reduce the water temperature in the tankers and rapidly reduce the internal temperature of the fish to be transported from Port Huon to Parramatta Creek. The plant consists of containerized ice generation equipment and two vertical ice storage silos.

Salt water brine is drawn from the bottom of the storage silos and passes through refrigerated scraped surface ice generators. Slurry ice is returned to the storage silos. The ice formation process utilises the brine for chemical smoothing of the ice crystals to make ice suitable for pumping. Once the ice slurry is returned to the silo the ice crystals separate from the salt brine and float upwards collecting in the upper part of the silo. Ice is removed from the tops of the silos on demand using an ice harvesting mechanism and is delivered via a large diameter spiral–reinforced plastic hose to an ice chute above a mixing tank. As ice is drawn off it is necessary to add fresh water to the storage silos. Salinity also needs to be maintained by the addition of a small amount of brine to replace brine lost to the harvested ice.

Once ice is added to the ice slurry mixing tank, brine is added to form a pumpable ice salt slurry. If too little brine is added the ice agglomerates and causes a blockage that has to be cleared. Brine is supplied to the mixing tank from a brine generation tank in which bags of salt are added to fresh water. Brine from this tank is added in sufficient quantities to maintain a saturated solution. Once the ice slurry is mixed it is pumped to two horizontal storage tanks equipped with an agitation device to keep the slurry in a heterogeneous state.

When empty fish transport tankers arrive at the harvest site (Port Huon or Strahan) they are partially filled with slurry ice and then moved to the fish loading point. Bled fish are then loaded into the tanker. As the number of fish dispatched each day is dependent on orders, the number of fish added to a tanker varies. Once the tanker is loaded with fish the tanker is topped off with more slurry ice and then begins its journey to Parramatta Creek.

8.23.1.2 Slurry ice system upgrades

HA has implemented salt reduction strategies at Port Huon over the past 18 months. This has involved both the ongoing logging of salt dose–related data at the fish loading facility and the application of salt-reducing strategies.

Figure 51 below highlights the salinity at the beginning (blue) and end of each day (orange) within ice slurry at Port Huon. It is evident that there has been a large reduction in salinity from mid-August 2017 onwards and a reduction in the variation between the two. The improvement has been achieved by investing in additional ice storage and chilling units within the slurry plant reducing the potential for overuse due to insufficient capacity.

Figure 51: Salinity in slurry system at the start and end of day.

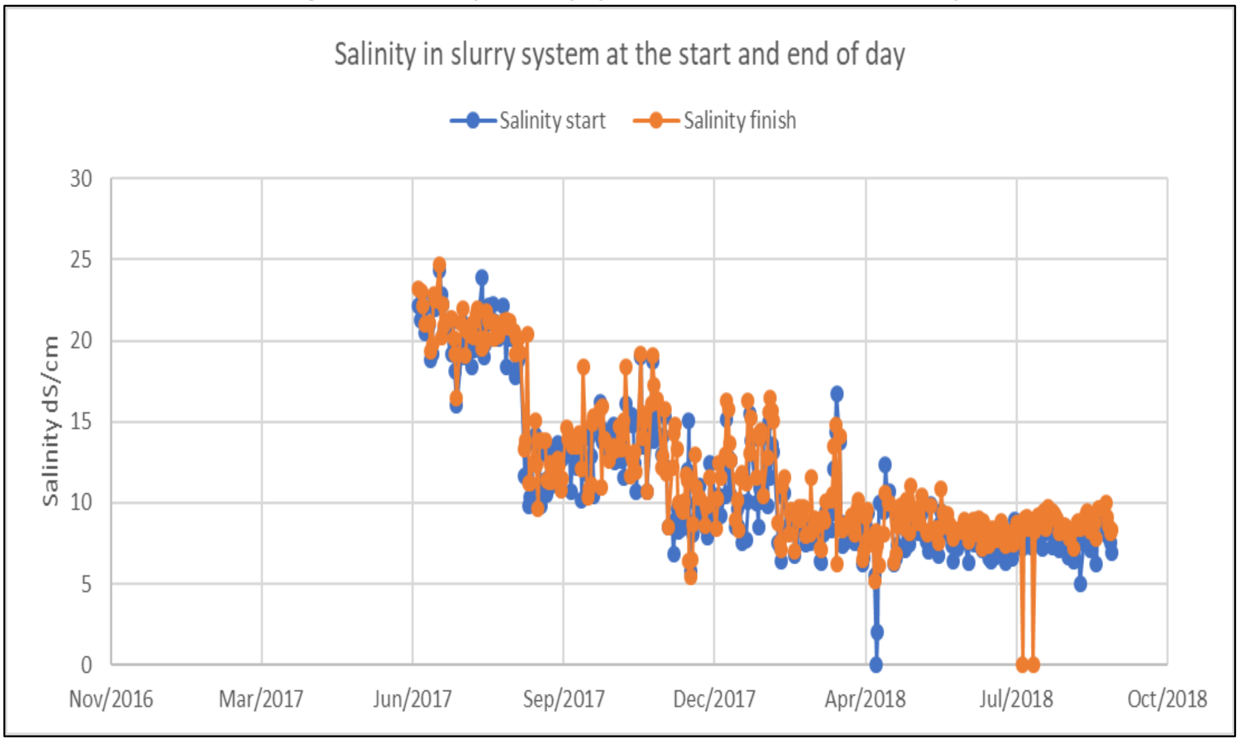
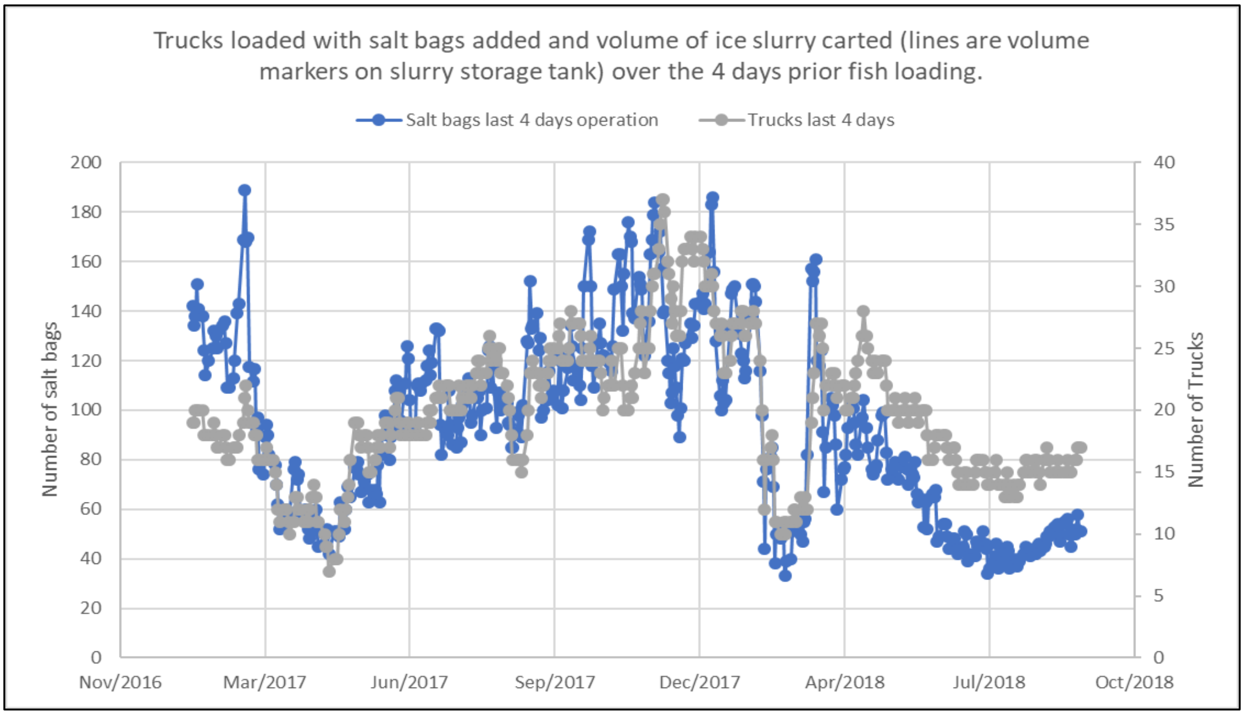


Figure 52: Salt bags added and the volume of fish transported



8.23.1.3 Salt slurry future upgrades

Work has commenced to optimise (and reduce) the amount of slurry ice and associated salt required.

To assess and test improvements in real time, key parameters will need to be provided from harvest areas, the ice slurry plant and the fish processing plant at Parramatta Creek. A data management system for this purpose has been commissioned. Data (outlined below) will be entered directly into the data base at the Port Huon and Parramatta Creek facilities. This will enable the manager and staff at the slurry plant to minimise the saline ice slurry dose while maintaining optimal temperature for fish transport.

The data to be compiled at the ice slurry plant are:

- Details of the types of tankers loaded;
- Quantity of ice slurry loaded in each tanker;
- Salinity of ice slurry before and after melting (used to calculate Total mass of ice added); and
- Total Salt utilised at Port Huon.

The data to be compiled from the Bureau of Meteorology and or loading facility:

- Ocean temperature; and
- Forecast and actual temperatures during transport.

The data to be compiled from Parramatta Creek:

- Fish temperature on receipt;
- The average mass of each fish; and
- Total mass of fish received.

The above data will be used to evaluate the effect of changes, including the utilisation of refrigerated transport and increased proportions of low salinity refrigerated water. Optimisation will then follow.

8.23.1.4 Chilled tankers

HA is trialling the use of chilled tankers to reduce the use of salt by replacing the current salt slurry water in the fish-transport tankers with a chilled water system, augmented by salt if necessary over warmer summer months. Initial design drawing for the tankers are shown in Figure 53.

The first chilled tanker was commissioned in late February 2019 commencing the first trial.

Assessment quickly showed that modifications to the recirculation system inside the tanker were needed to better move the chilled water through the fish to ensure required temperature delivery.

Modifications have been made and the tanker has now returned to use. HA wish to conduct summer trials with the unit to ensure that it functions correctly during warm weather periods summer.

The potential benefits of using chilled tankers are:

- If the chilled tankers are successful in rapidly reducing the temperature of the fish, HA may be able to largely remove the salt slurry from the system or use the salt slurry at a reduced volume; and
- Again, if successful, a chilled water system could allow more fish to be transported in each tanker. This would reduce road use and transport costs.

The tankers will likely still require some salt to depress the freeze point to provide the low temperatures needed to rapidly cool the fish flesh on transport to maintain optimal quality. The amount of salt will be reduced because less ice slurry will be required to compensate for heat gain during transport. As there will be less ice and subsequently more fish, the amount of salt required will decrease in proportion to the reduction in the volume of the ice–water slurry. This will occur with the same rate of cooling within the fish flesh being transported.

If the redesigned tanker is demonstrated to meet the trial objectives (salt reduction and economically viable), HA's transport contractor Spectran is proposing that two tankers could be introduced into the system per year.

HA currently transports four trucks per night at low production and nine trucks per night at peak production. So at a change rate of two trucks per annum, it will take four and a half years to replace the entire fleet.

The cost of each tanker (not including the prime mover) is approximately $320,000.

Figure 53: Chilled tanker preliminary design

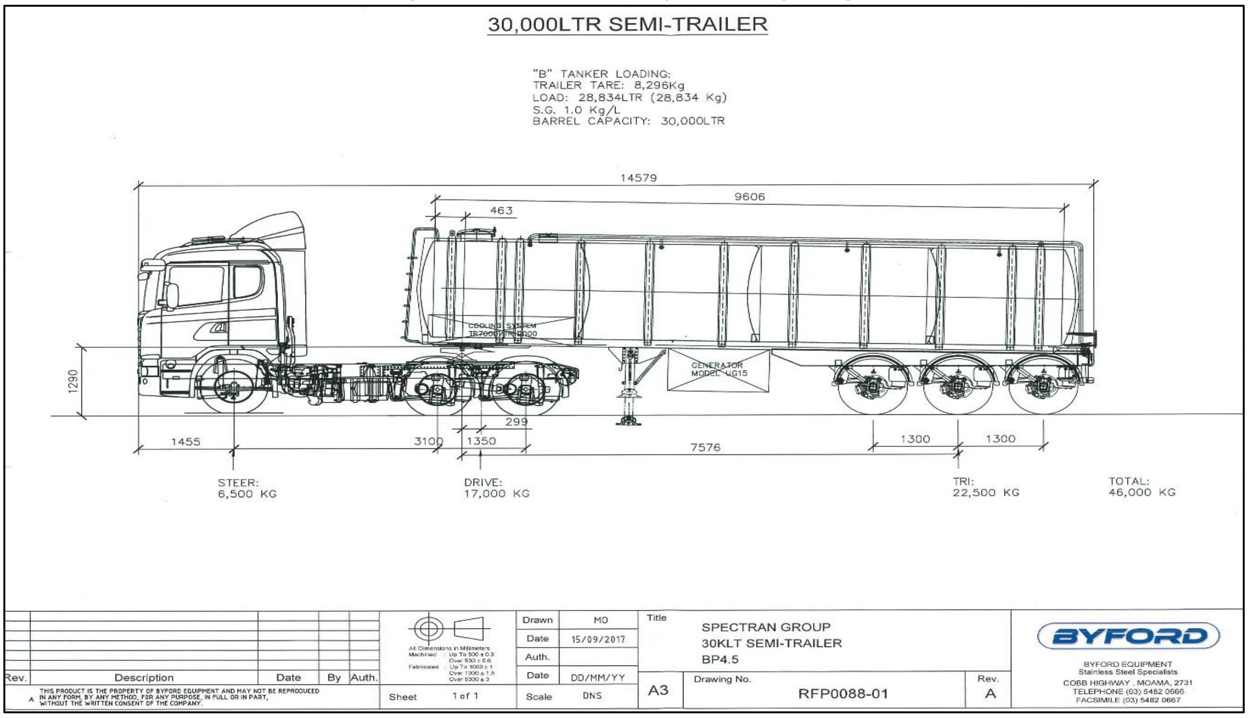


Plate 2: Chilled tanker front view

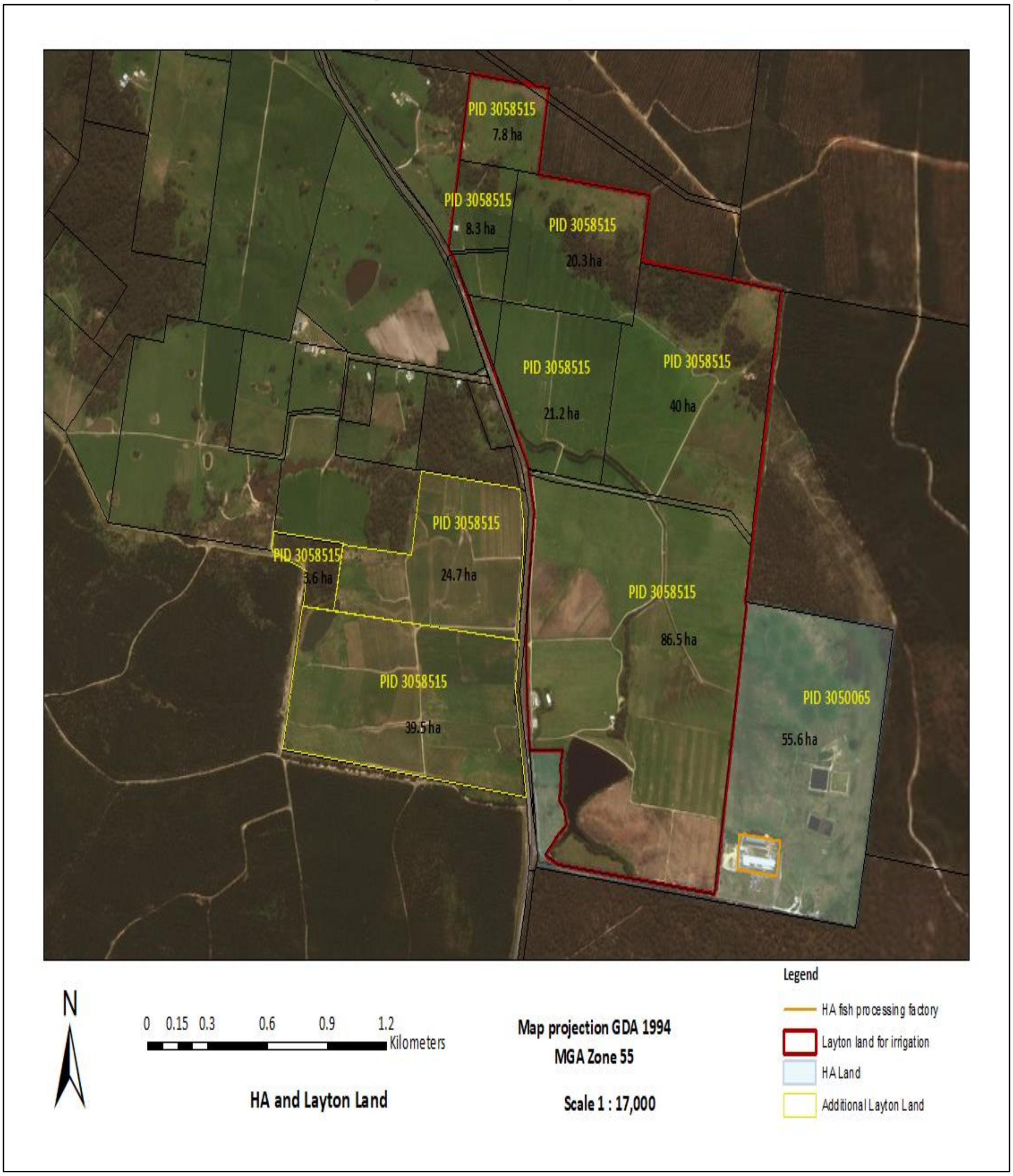
8.23.1.5 Reporting of the chiller tanker program

Follow-up reports will be provided within monthly reports until the trials are either stopped or completed.

8.23.2 Additional Land for irrigation

The additional land is noted in Figure 3 and outlined in yellow in Figure 54 below. It could provide an additional 67.8 ha of land to the irrigation parcel.

Figure 54: Additional Layton land



The land is currently being used for cropping.

HA has commissioned Macquarie Franklin to evaluate this land for use as additional irrigable land to augment the current WREMP.

9 Monitoring

Monitoring for surface water, groundwater and soils to review the impact of wastewater irrigation is described in detail in the WWREMP (see Appendix B). These sections are largely reiterated below.

9.1 Overview

Monitoring programs for wastewater, surface water, groundwater, soils and air emissions are detailed in this section. The programs are largely consistent with historical monitoring programs; however, they have been updated to reflect the current environmental situation and future wastewater irrigation management practices proposed on the HA and Layton properties.

As part of the annual reporting process, where the results from each individual program will be considered and relationships between them analysed, recommendations regarding the program design (sampling frequency, locations, parameters tested etc.) will be made if amendments are deemed to be required. HA will progress any recommendations for changes with the EPA through the annual reporting process.

9.2 Annual compliance check

A review or 'compliance check' of irrigation activities and implementation of the requirements outlined in the WREMP will be conducted annually by an appropriately experienced irrigation advisor. The findings of the compliance check will be incorporated into HA's annual reporting process.

9.3 Irrigation monitoring and record keeping

As noted in Section 3.13, monitoring of irrigation will involve monitoring the rate of irrigation and the EC of irrigation water (see Figure 19 and Figure 20). This will be automated with a programmable logic controller linked to an EC meter to ensure that the target EC is met in the irrigation water. The second EC will be a designated monitoring site with meter output will be linked to a control system. The control system will monitor the EC values. The control system will provide a live read out in the processing factory with a HA representative able to oversee the operation to monitor and ensure that EC limits are being met. As a designated monitoring site, the secondary EC meter data will be reportable to the EPA with HA responsible for the limits set in Table 35.

Monthly records of wastewater irrigation will be maintained to enable results from the environmental monitoring program to be linked to irrigation practices. This will include monthly recording of:

- wastewater dam electrical conductivity;
- electrical conductivity of shandied wastewater applied as irrigation;
- volume of wastewater utilised for irrigation (from pump activity or dam level); and
- areas where wastewater irrigation occurred.

9.4 Wastewater discharge monitoring

HA proposes to sample and analyse WWTP effluent quality at three locations:

- influent raw wastewater before WWTP (sample known as Raw Discharge);
- effluent wastewater from WWTP at pond 4 (sample site known as Pond 4); and
- Final "discharge" wastewater from the winter storage pond. (sample site to be determined)

In addition, the irrigation water EC will be monitored in line at two EC meters. The location of sample points can be seen in Figure 55. The proposed parameters, frequency and sample sites are specified in Table 63.

Samples of the effluent will be analysed by a NATA-accredited laboratory.

Figure 55: Wastewater monitoring locations

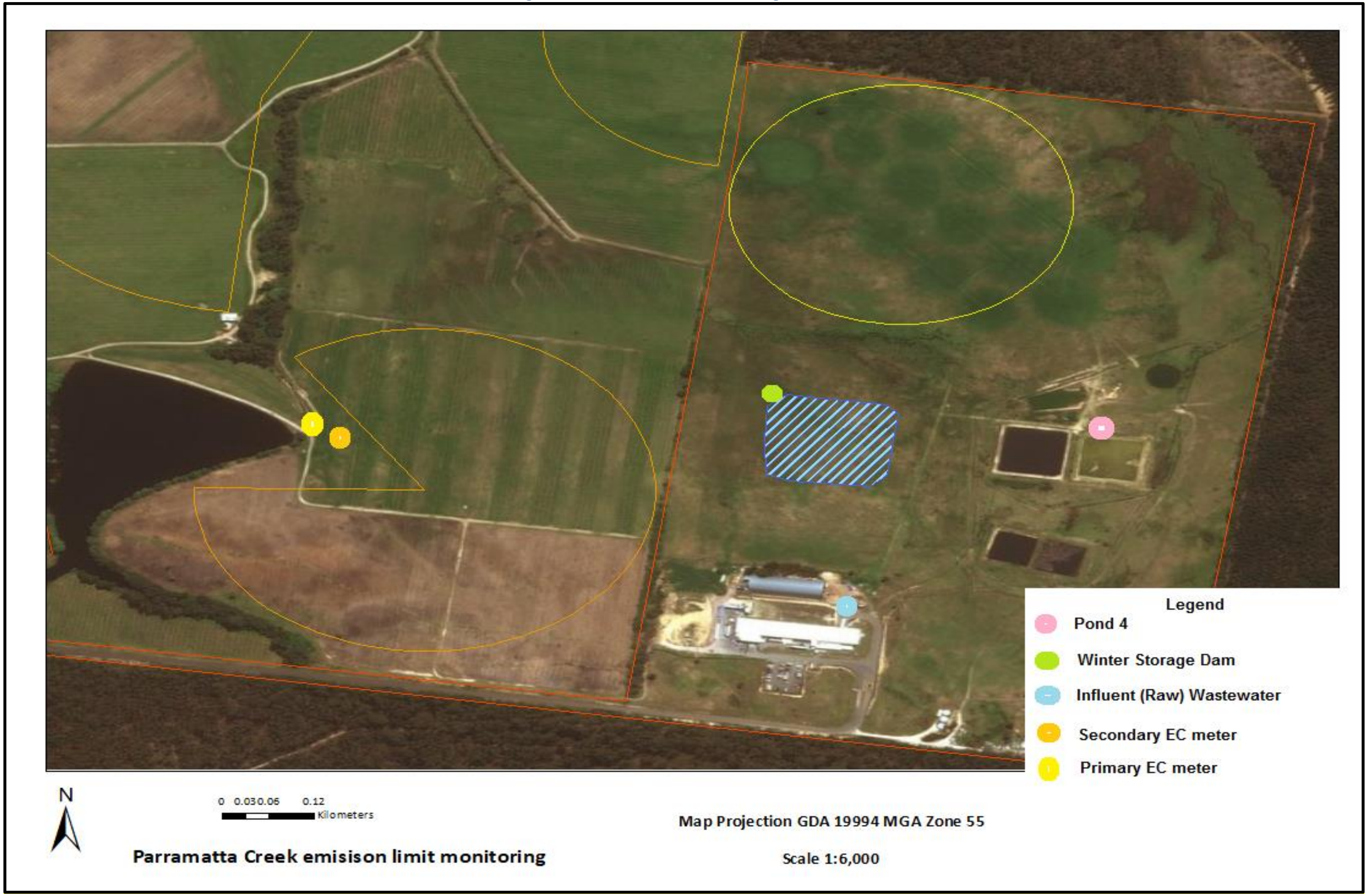


Table 63: Wastewater monitoring

Parameter	Units	Frequency	Location
Influent wastewater (ex processing Raw Discharge)			**461778E: 5423127N**
Flow	L/day	Weekly	**Pre-primary treatment**
pH	Units	Weekly	
Electrical conductivity	µS/cm	Weekly	
Total dissolved solids	mg/L	Monthly	
BOD_5	mg/L	Monthly	
Total P	mg/L	Monthly	
Total N, NH_4 N, nitrate and nitrite N	mg/L	Monthly	
Effluent from WWTP (Pond 4)			**462030E: 5423362N**
Flow	L/day	Weekly	**Post-treatment**
pH	Units	Weekly	
Electrical conductivity	µS/cm	Weekly	
Total dissolved solids	mg/L	Monthly	
BOD_5	mg/L	Monthly	
Total P	mg/L	Monthly	
Total N, NH_4 N, nitrate and nitrite N	mg/L	Monthly	
Thermotolerant coliforms	cfu/100 mL	Monthly	
Effluent from Storage Dam			**Storage Dam Outlet**
Flow	L/day	Weekly	**Pre Mixing**
pH	Units	Weekly	
Electrical conductivity	µS/cm	Weekly	
Total dissolved solids	mg/L	Monthly	
BOD5	mg/L	Monthly	
Total P	mg/L	Monthly	
Total N, NH4 N, nitrate and nitrite N	mg/L	Monthly	
Thermotolerant coliforms	cfu/100 mL	Monthly	
Pre Irrigation – post shandying			**Irrigation Line**
Electrical conductivity	µS/cm	Data logged	**Pre Irrigation**
Electrical conductivity	µS/cm	Monthly	

Note: Weekly, pH, EC and flow will be measured by HA as field samples. Monthly and annual samples will be collected for external analyses.

Monthly Laboratory sampling of the effluent will be analysed by a NATA-accredited laboratory.

9.5 Surface water monitoring

9.5.1 Background

There are two main watercourses that flow through the Huon Aquaculture and Layton properties: Felminghams Creek and Parramatta Creek. The catchment of Felminghams Creek contains a sand mine, forestry, remnant vegetation and the Bass Highway, with the headwaters of its catchment approximately 3 km south of the proposed irrigation area.

The catchment of Parramatta Creek contains remnant vegetation and forestry, with its headwaters approximately 1 km south-east of the properties.

The confluence of the two creeks is in the middle of Layton's property. Given the existing land uses within the catchments, they would be classified as slightly to moderately disturbed according to the ANZECC (2000) guidelines.

9.5.2 Methodology

9.5.2.1 Sampling locations

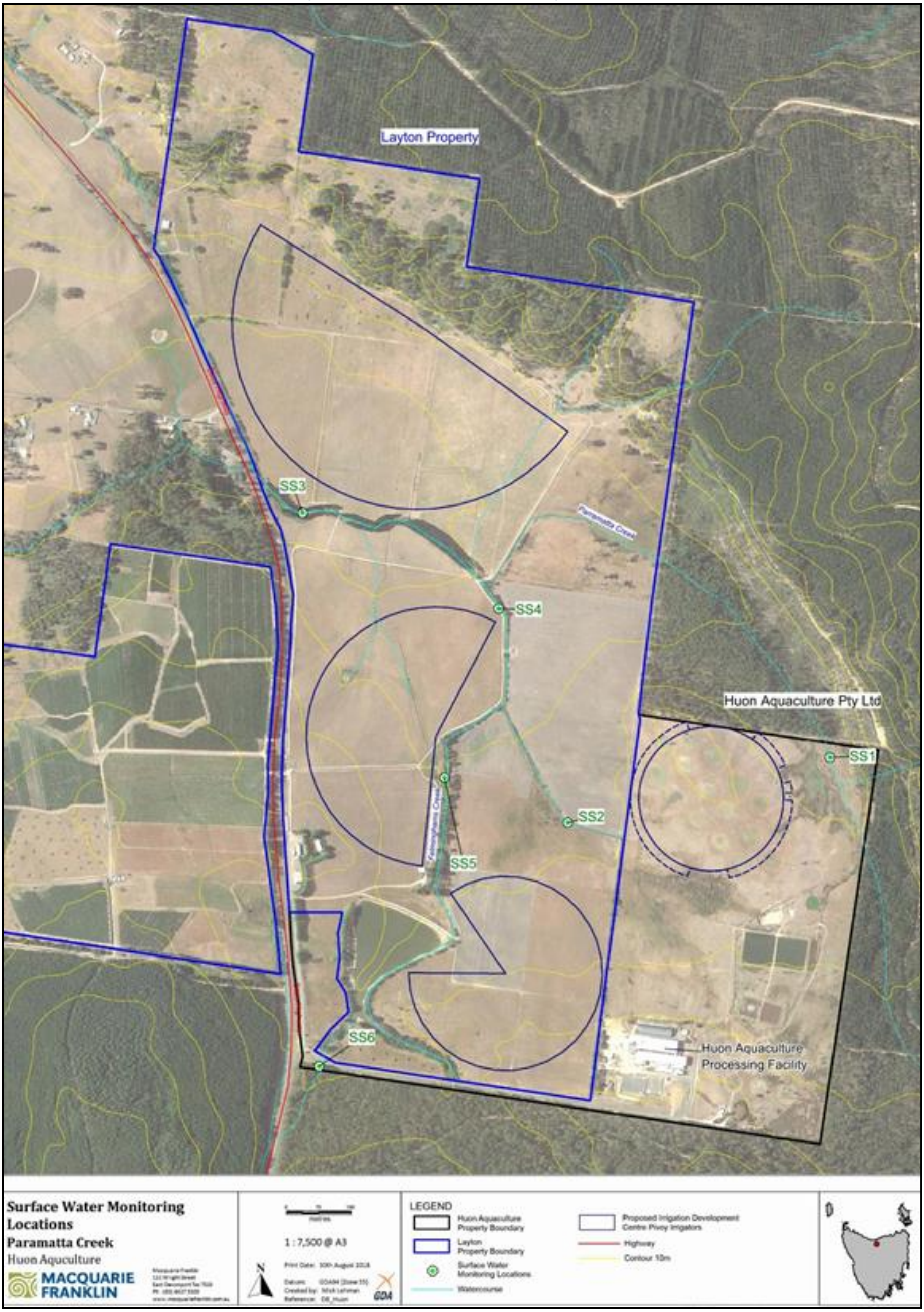
The proposed irrigation locations shown in Figure 40 are adjacent to Felminghams Creek and Parramatta Creek. Due to the proximity of the watercourses to irrigation activities, surface water monitoring is required to detect potential environmental harm. Surface water monitoring is to be conducted at six locations (see Figure 56) on a quarterly basis (Table 64).

The frequency of monitoring and the sample analysis suite will be reviewed one year after irrigation infrastructure is operational and a minimum of four sampling events have been undertaken.

Table 64: Surface water monitoring locations (Datum: MGA [GDA94] zone 55)

Site name	Easting	Northing	Site description and reasoning
SS1	462,110	5,423,777	Existing monitoring site.
SS2	461,501	5,423,627	Existing monitoring site. Historically dry. Site location has been moved further downstream to ensure site has water to sample.
SS3	460,884	5,424,344	Downstream Parramatta Creek, upstream of the Bass Highway. This site will detect if salts or nutrients are leaving the wastewater reuse area.
SS4	461,341	5,424,123	Felminghams Creek upstream of the confluence with Parramatta Creek. This location will help delineate which catchment surface water contamination is being generated in.
SS5	461,214	5,423,731	Felminghams Creek between CP2 and CP3. This location will help establish which irrigation area is generating surface water contamination.
SS6	460,922	5,423,063	Reference site on Felminghams Creek to establish if any contamination is being generated by the sand mine, forestry or road infrastructure and maintenance. Located upstream of Layton's dam to ensure any impacts on the dam from the property are not captured.

Figure 56: Surface water monitoring locations



9.5.2.2 Field and Laboratory testing requirements

Field testing will be conducted in conjunction with collecting samples for laboratory analysis. Field testing is to include:

- pH;
- electrical conductivity (EC);
- dissolved oxygen (DO); and
- temperature.

Laboratory testing will include the analytes listed in Table 65.

Table 65: Surface water quality analytes and trigger values

Analyte	Units	Frequency
pH	pH units	Quarterly
Electrical conductivity (EC)	µS/cm	Quarterly
Total dissolved solids (TDS)	mg/L	Quarterly
Chloride (Cl)	mg/L	Quarterly
Aluminium (Al)	mg/L	Quarterly
Boron (B)	mg/L	Quarterly
Calcium (Ca)	mg/L	Quarterly
Copper (Cu)	mg/L	Quarterly
Iron (Fe)	mg/L	Quarterly
Magnesium (Mg)	mg/L	Quarterly
Manganese (Mn)	mg/L	Quarterly
Phosphorus (P)	mg/L	Quarterly
Potassium (K)	mg/L	Quarterly
Sodium (Na)	mg/L	Quarterly
Sulphur (S)	mg/L	Quarterly
Zinc (Zn)	mg/L	Quarterly
Total Ammonia (NH_3 + NH_4)	mg/L	Quarterly
Nitrate (NO_3)	mg/L	Quarterly
Total Kjeldahl Nitrogen (TKN)	mg/L	Quarterly
Total Nitrogen (Total N)	mg/L	Quarterly
Total Phosphorus (Total P)	mg/L	Quarterly
Biochemical oxygen demand (BOD)	mg/L	Quarterly
Thermotolerant coliforms	cfu/100 mL	Quarterly

* ANZECC (2000) guidelines for freshwaters. pH is trigger values for lowland rivers in south-east Australia. Ammonia is the 95% species protection trigger limits for freshwaters.
^ Based on baseline data from reference bores for Layton's property and surface water baseline data.
# Based on EPA-provided historical data from Redwater Creek.

To augment this, HA proposes downstream monitoring of flow and conductivity. As salt is a conservative pollutant (generally stays in solution) the mass loads entering and leaving the system should be close to equal. However, there will be a temporal component while concentrations build up and decline within aquifers and the soil profile. Monitoring the rate of import and export of salt from within the catchment will inform the likely future directions of changes in salt concentrations within aquifers and Parramatta Creek.

As a result, HA proposes to establish a rated gauge board with monthly routine monitoring of level and conductivity at site SS3 (or thereabouts depending on an accurate gauging location). Monitoring during heavy rainfall events will also be undertaken.

9.6 Groundwater monitoring

Groundwater monitoring is described in the WWREMP (see Appendix B). Given that contained constituents may be detected in monitoring bores located within the irrigation area itself, but that the upward groundwater movement in the locality inhibits off-site migration in groundwater, the effects of irrigation ought to be undetected in off-site 'downgradient' monitoring bores (Cromer, 2018). Monitoring for changes in groundwater are designed to protect the aquifer from inadvertent change and consequently to prevent the aquifer discharge to surface water after dilution, from inadvertently impacting the downstream environment.

9.6.1 Methodology

9.6.1.1 Sampling locations

There are currently six groundwater monitoring bores on the HA property. The locations of the boreholes MW4 and MW5 were selected to monitor low points, and the locations of boreholes MW1 and MW6 were selected to monitor midpoints of the irrigation area.

Boreholes MW2 and MW7 were installed to monitor for potential seepage from the wastewater ponds (pitt&sherry, 2016).

An additional six monitoring bores have been installed on Layton's property to monitor groundwater chemistry (November 2018) (Figure 57, Table 66). The location of these bores was reviewed by a groundwater geologist (see Appendix B).

Four of the monitoring bores (MW8, MW10, MW11 and MW12) are within the proposed wastewater irrigation areas. These monitoring sites will monitor direct infiltration of irrigation water to the water table beneath the centre pivots.

An additional monitoring bore (MW13) has been installed downslope of the new and existing wastewater irrigation areas. This monitoring bore will help to assess if there is any downgradient movement of contaminants from the irrigated areas.

Bore MW9 is directly down the groundwater-flow gradient from the existing wastewater ponds. A new monitoring bore (MW14) is close to the processing facility as a reference bore. The location is upslope of the proposed and existing irrigation areas.

Table 66: 2018 new monitoring bore details

Bore	Depth (m bgl)	SWL (m bgl)	Screen interval (m bgl)
MW08	4.4	2.5	1.4–4.4
MW09	3.8	0.72	1.5–3.9
MW10	6.7	1.91	1.7–6.7
MW11	4.2	0.59	1.22–4.22
MW12	6.0	1	2–6
MW13	5.35	1.4	2.35–5.35
MW14	6	3	2–6

The location of groundwater bores is described in Table 67 and depicted in Figure 57.

Table 67: Groundwater monitoring locations (Datum: MGA [GDA94] zone 55)

Site name	Easting	Northing	Site description and reasoning
MW1	461,769	5,423,307	Existing monitoring site.
MW2	462,116	5,423,361	Existing monitoring site.
MW4	461,669	5,423,564	Existing monitoring site.
MW5	462,106	5,423,646	Existing monitoring site.
MW6	461,882	5,423,641	Existing monitoring site.
MW7	461,965	5,423,157	Existing monitoring site.
MW8	461,488	5,423,221	Monitor potential direct infiltration of irrigation water from CP3 to the groundwater.
MW9	461,923	5,423,405	Downslope of existing wastewater ponds
MW10	461,277	5,424,070	Monitor potential direct infiltration of irrigation water from CP2 to the groundwater.
MW11	461,116	5,424,217	Downslope of CP2. This location will help to monitor if there is any lateral off-site migration of irrigation water constituents in the groundwater.
MW12	460,936	5,424,636	Monitor potential direct infiltration of irrigation water from CP1 to the groundwater.
MW13	460,899	5,424,367	Downslope of CP1. This location will help to monitor if there is any lateral off-site migration of irrigation water constituents in the groundwater. It will also help to identify if these constituents are leaving the site to the north-west along Parramatta Creek.
MW14	461,554	5,423,991	High point of Layton's/Huon Aquaculture's property to provide reference data for background groundwater quality.

9.6.1.2 Sampling procedure

Groundwater monitoring is to be undertaken quarterly. Samples are to be collected following relevant standards and guidelines outlined in:

- Geoscience Australia Record 2009/27: Groundwater Sampling and Analysis – A Field Guide.
- Environment Protection Authority Victoria 2000 – Groundwater Sampling Guidelines.

Samples are to be collected using low flow sampling methods as per industry standards. Low flow methods require field parameters to be stable prior to sample collection. This ensures consistent groundwater chemistry (Table 68). The frequency of monitoring and the sample analysis suite will be reviewed one year after irrigation infrastructure is operational and a minimum of four sampling events have been undertaken.

Table 68: Field chemistry parameters and acceptable variance

Field parameter	Acceptable variance over three consecutive readings of ≥10% of casing volume below standing water level
Groundwater level	**Stable**
Dissolved oxygen	**+/- 10%**
Turbidity	**+/- 10%**
Electrical conductivity	**+/- 3%**
Temperature	**+/- 0.1 °C**
pH	**+/- 0.05**
Redox potential	**+/- 10 mv**

9.6.1.3 Field and laboratory testing requirements

Field testing will be conducted in conjunction with collecting samples for laboratory analysis.
Field testing is to include:

- pH;
- electrical conductivity (EC);
- redox (ORP);
- temperature;
- dissolved oxygen (DO); and
- standing water level (SWL).

With the exception of samples collected for microbiological analysis, all groundwater samples are to be field-filtered (0.4 µm filter) during collection and before submission to the NATA-registered testing laboratory.

Laboratory reports will therefore list dissolved constituents only (except for thermotolerant coliforms).

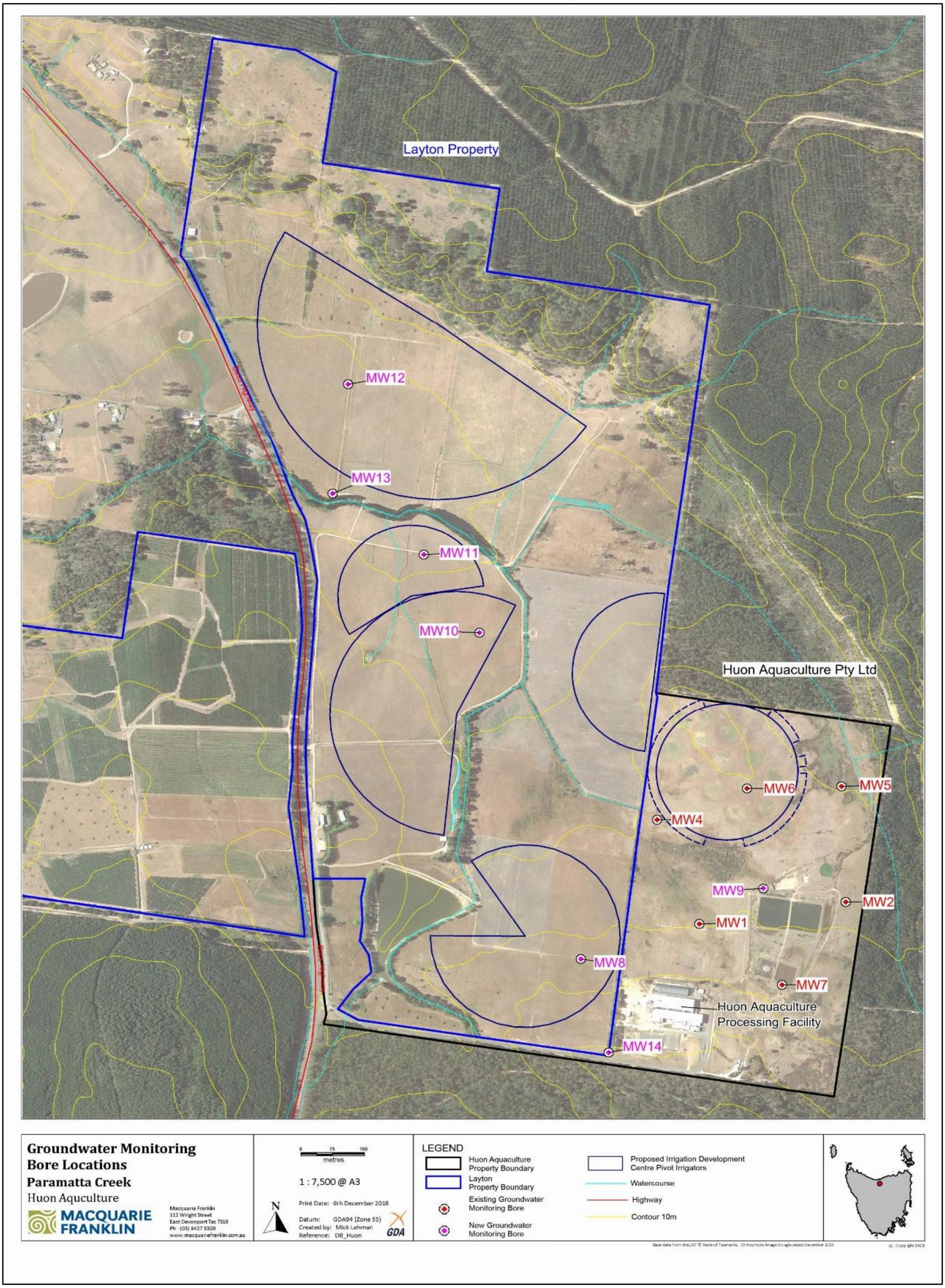
Laboratory testing is to include the analytes listed in Table 69.

Table 69: Groundwater quality analytes

Analyte	Units	Frequency
pH	pH units	Quarterly
Electrical conductivity (EC)	µS/cm	Quarterly
Total dissolved solids (TDS)	mg/L	Quarterly
Total alkalinity	mg/L	Quarterly
Total Ammonia (NH_3 + NH_4)	mg/L	Quarterly
Carbonate (CO_3)	mg/L	Quarterly
Bicarbonate (HCO_3)	mg/L	Quarterly
Aluminium (Al)	mg/L	Quarterly
Boron (B)	mg/L	Quarterly
Calcium (Ca)	mg/L	Quarterly
Chloride (Cl)	mg/L	Quarterly
Copper (Cu)	mg/L	Quarterly
Iron (Fe)	mg/L	Quarterly
Magnesium (Mg)	mg/L	Quarterly
Manganese (Mn)	mg/L	Quarterly
Phosphorus (P)	mg/L	Quarterly
Potassium (K)	mg/L	Quarterly
Sodium (Na)	mg/L	Quarterly
Sodium absorption ration (SAR)		Quarterly
Sulfate (SO_4)	mg/L	Quarterly
Nitrate (NO_3) (dissolved)	mg/L	Quarterly
Total Kjeldahl Nitrogen (TKN)	mg/L	Quarterly
Total Nitrogen (Total N) (dissolved)	mg/L	Quarterly
Total Phosphorus (Total P) (dissolved)	mg/L	Quarterly
Thermotolerant coliforms	cfu/100 mL	Quarterly

* ANZECC (2000) guidelines for freshwaters. pH is trigger values for Lowland rivers in south-east Australia. Ammonia is the 95% species protection trigger limits for freshwaters.
^ Based on baseline data from reference bores for Layton's property and surface water baseline data.
# Based on EPA-provided historical data from Redwater Creek.

Figure 57: Groundwater monitoring bores



9.7 Soil monitoring

9.7.1 Methodology

9.7.1.1 Sampling locations

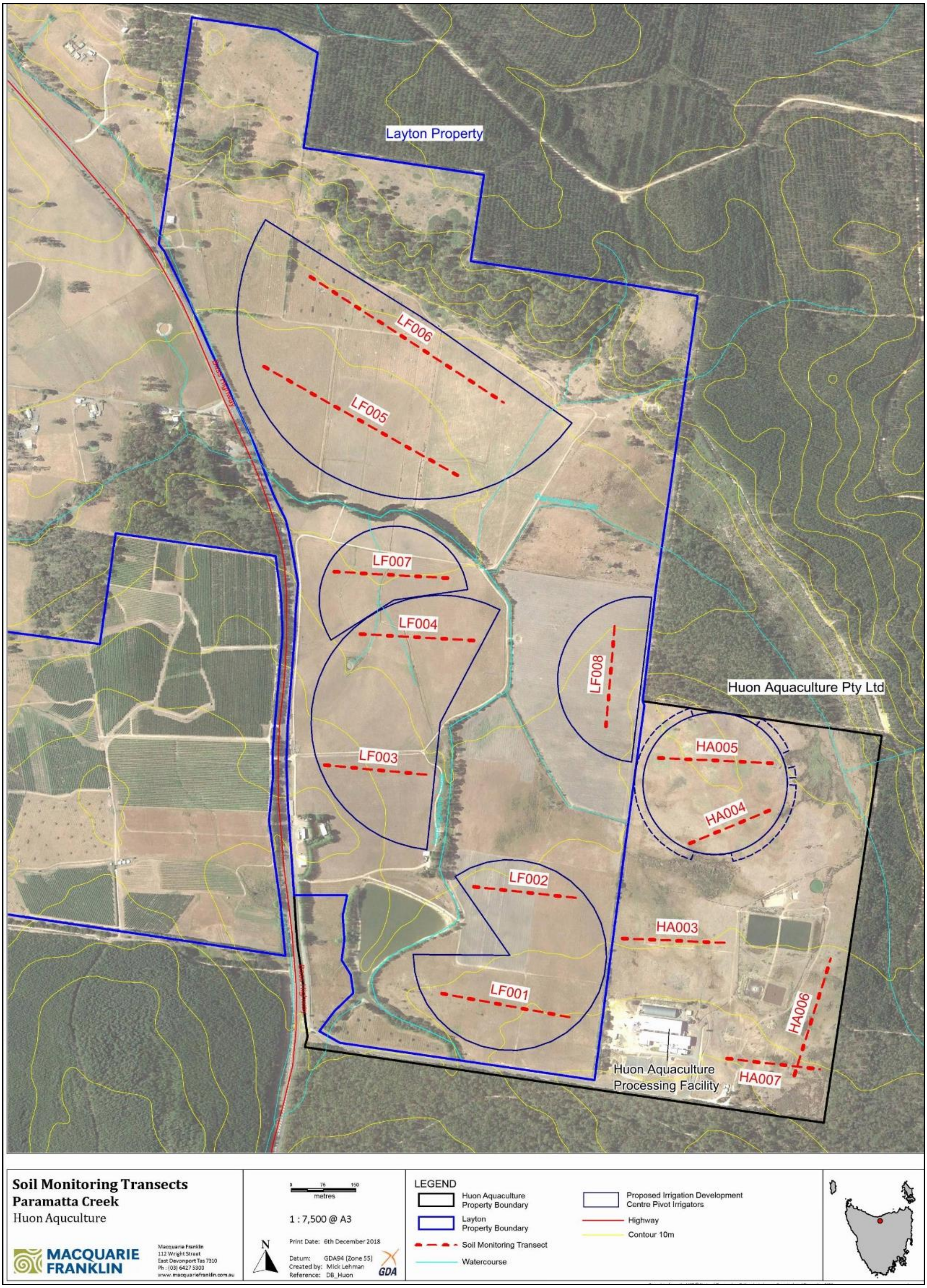
There are five existing soil sampling locations within the wastewater irrigation area on the HA property. An additional eight soil sampling transects are proposed to monitor the different soil types under the five new proposed centre pivots on the Layton property (Table 70, Figure 58).

Transects are utilised in this soil sampling program to collect a representative sample of soil from within a specific soil type under specific management conditions. Because the centre pivot irrigators are designed to apply wastewater irrigation evenly across the irrigated area, the location of transects under the pivot will not be prejudiced (in terms of more or less irrigation water applied) by where they run under a pivot. It is important that transects reflect the predominant soil types.

Table 70: Soil monitoring transects (Datum: MGA [GDA94] zone 55)

Site	Easting Start	Northing Start	Easting Finish	Northing Finish	Reasoning and site description
HA002	461,618	5,423,316	461,871	5,423,305	Existing monitoring site.
HA004	461,775	5,423,541	461,968	5,423,621	Existing monitoring site.
HA005	461,703	5,423,742	461,970	5,423,730	Existing monitoring site.
HA006	462,019	5,422,994	462,104	5,423,269	Existing monitoring site.
HA007	461,862	5,423,034	462,079	5,423,009	Existing monitoring site.
LF001	461,199	5,423,187	461,502	5,423,129	Southern end of CP3. Transect to monitor duplex soils being irrigated with wastewater.
LF002	461,273	5,423,439	461,521	5,423,411	Northern end of CP3. Transect to monitor alluvial loams and china soils being irrigated with wastewater.
LF003	460,925	5,423,725	461,169	5,423,702	Southern end of CP2. Transect to monitor duplex soils being irrigated with wastewater.
LF004	461,008	5,424,035	461,275	5,424,020	Northern end of CP2. Transect to monitor alluvial loam soils being irrigated with wastewater.
LF005	460,783	5,424,665	461,243	5,424,404	Southern end of CP1. Transect to monitor duplex soils being irrigated with wastewater.
LF006	460,891	5,424,877	461,343	5,424,580	Northern end of CP1. Transect to monitor alluvial loams being irrigated with wastewater.
LF007	460,947	5,424,182	461,214E	5,424,167	Central area of CP6. Transect to monitor alluvial loams being irrigated with wastewater.
LF008	461,601	5,424,060	461,580	5,243,817	Central area of CP5. Transect to monitor Roebuck soils being irrigated with wastewater.

Figure 58: Soil monitoring locations



Representative soil profiles will be monitored and assessed annually in September to provide an ongoing comparison to the baseline soil profile information obtained in October 2018. The information obtained at the soil profile assessments would include soil structure score, presence of worms, vegetation cover, presence and depth of plant roots and any other relevant observations.

Table 71: Soil profile monitoring (Datum: MGA [GDA94] zone 55)

Pivot site	Baseline soil profile site identifier (October 2018)	Location	
		Northing	**Easting**
1	M	461,030.7	5,424,450.4
1	N	461,101.8	5,244,676.6
2	G	461,079.6	5,423,699.3
2	I	461,213.2	5,424,033.9
3	C	461,325.3	5,423,154.4
3	F	461,351.2	5,423,411.8
4	A	461,920.8	5,423,634.5
5	P	461,577.3	5,423,992.5
6	K	461,145.6	5,424,166.8

9.7.1.2 Field and laboratory testing requirements

Soil testing parameters are outlined in Table 72. The list of parameters tested will be reviewed after three years of data collection under the new irrigation regime, and rationalised if warranted.

Table 72: Soil monitoring analytes

Parameter	Unit
pH	**pH units**
Electrical conductivity (EC)	**µS/cm**
Exchangeable calcium (Ca)	**meq/100 g**
Exchangeable magnesium (Mg)	**meq/100 g**
Exchangeable potassium (K)	**meq/100 g**
Exchangeable sodium (Na)	**meq/100 g**
Cation exchange capacity (CEC)	**meq/100 g**
Sulfur (total as S)	**%**
Chloride (Cl)	**mg/kg**
Exchangeable aluminium (Al)	**meq/100 g**
Iron (Fe)	**mg/kg**
Boron (B)	**mg/kg**
Calcium (Ca)	**mg/kg**
Manganese (Mn)	**mg/kg**
Zinc (Zn)	**mg/kg**
Nitrate as N	**mg/kg**
Total Kjeldahl Nitrogen as N	**mg/kg**
Exchangeable sodium percentage	**%**
Phosphate sorption capacity	**mg P orb/kg**
Phosphorus (Colwell)	**mg/kg**
Total organic carbon	**%**

9.7.1.3 Reporting

The annual soil monitoring report will include a nutrient balance, where soil test results, plant nutrient requirements, nutrient loadings in applied wastewater and livestock removal of nutrients from the system will be considered. A fertiliser management program will be developed by an appropriately experienced soils advisor, with recommendations considering soil amendments (e.g. liming rates) and the appropriateness of fertiliser products in regard to managing any nutrient issues observed in the soil, surface water or groundwater monitoring programs.

As with both surface water and groundwater monitoring, the results from soil monitoring will not be assessed in isolation but linked with the other monitoring activities. This will provide for rigorous interpretation of all monitoring results with an ability to make appropriate recommendations which will address any issues.

9.8 Data management

Field data and analytical reports will be stored electronically for inclusion in reporting as necessary. Results will be graphed to illustrate trends and allow changes in water or soil chemistry to be observed.

9.9 Air monitoring

The Parramatta Creek Smokehouse emissions are low in terms of emission rates and mass loads. This has been demonstrated through two consecutive annual emission tests.
Annual stack emission sampling and analyses is anticipated going forward.

Table 73: Smokehouse emission monitoring

Substance	Unit of measurement	Location
Total particulates and PM_{10} particulates	mg/m^3 dry gas at 0 °C and 101.325 kPa	Stack sample points

Figure 59: Smokehouse sample points – exhaust stacks

10 Commitments

A summary of commitments is provided in Table 74.

Table 74: Summary of commitments

Commitment number	Commitment	Due date
Legal		
1	Agreement between Huon Aquaculture and Mr Layton signed	**Mid 2019 (Completed)**
Rehabilitation of existing HA irrigation sites		
2	Undertake activities to rehabilitate sodic soils under HA pivot: *Fencing *Application of gypsum Pasture renovation (on going) *Improved grazing management	**Late 2018 onwards (*Completed)**
Construction of wastewater storage and irrigation infrastructure (pending EPA approval of DPEMP)		
3	Wastewater storage dam construction • approvals process • tendering process • construction process	**Late 2019** **Late 2019** **2019–2020**
4	Irrigation infrastructure construction • tendering process • construction process • irrigation of wastewater commences on Layton's property	**Late 2019** **Late 2019/early 2020** **Late summer 2020**
5	Full-scale wastewater irrigation commences with irrigation scheme and new wastewater dam connected	**Late 2020**
Process changes		
6	Trial of refrigerated tanker (chiller truck).	**February 2019 – February 2020**
Wastewater quality		
7	Wastewater quality will continue to be monitored monthly, with a focus on ensuring median quality complies with Class B recycled water requirements (apart from pH, which should be maintained below 9.0 pH units)	**2019 onwards**
8	Wastewater electrical conductivity will be maintained at a median of 2,500 µS/cm with a maximum EC of 3,000 µS/cm **Error! Bookmark not defined.**, when wastewater is being irrigated. (pond 4)	**2019 onwards**
9	Wastewater will be shandied to ensure the electrical conductivity of wastewater irrigated on to land is 1100 µS/cm or less	**Once new irrigation infrastructure is operational**
10	Should the implementation of the expanded chilled tanker program be delayed and additional chilled tankers not implemented by summer 2020, HA Develop and implement an expanded irrigation program utilising an additional 67.8 ha of land to the east of the Bass Highway.	**If a second chilled tanker is not commissioned by April 2020, HA will submit a revised WREMP incorporating the expansion by 30 April 2020.**
11	As part of the monthly water quality testing program conducted by Huon Aquaculture, treatment plant ponds and the new wastewater storage will be monitored for algal blooms. If an algal bloom is evident, a water sample will be sent to a NATA-accredited laboratory for testing to determine if the bloom is toxic	**2019 onwards**

Commitment number	Commitment	Due date
Wastewater reuse irrigation activities (pending EPA approval of DPEMP)		
12	A minimum of 75 ML of wastewater storage and 80 ha of land will be available for irrigation of wastewater flows in a 90th percentile rainfall year	**Late 2019 onwards**
13	Irrigation infrastructure will be designed and constructed in a way that enables automated shandying of wastewater and freshwater to achieve target electrical conductivity of 1100 µS/cm or less	**Late 2019 onwards**
14	All persons involved in irrigation activities will be trained in the appropriate use of the infrastructure prior to irrigation commencing by an appropriately experienced irrigation advisor	**Late 2019**
15	Appropriate irrigation equipment such as pivot irrigators, pumps, valves and solenoids will be determined in consultation with Mr Layton (the main irrigation operator), HA and an appropriately experienced external advisor	**Mid–late 2019**
16	Training in the use of irrigation scheduling equipment and ongoing support from an appropriately experienced irrigation advisor will be available to the irrigation manager	**Late 2019 onwards**
17	Wastewater will be applied and managed in accordance with requirements outlined in the WWREMP (Appendix B)	**Late 2019 onwards**
18	The pasture and livestock manager will be coached (as required) by an experienced pasture and grazing advisor to ensure they develop the required skills and have access to professional support to implement best practice	**Late 2019 onwards**
Environmental monitoring		
19	A review or 'compliance check' of irrigation activities and implementation of the requirements outlined in the WWREMP will be conducted annually by an appropriately experienced advisor. The findings of the compliance check will be incorporated into the annual reporting process	**Late 2019 onwards**
20	Monthly records of expanded wastewater irrigation will be maintained to enable results from the environmental monitoring program to be linked to irrigation practices	**Late 2019 onwards**
21	The updated monitoring programs for surface water, groundwater and soil will be implemented	**Late 2018 onwards**
22	Following the first full soil sampling event, a fertiliser management program will be developed by an appropriately experienced soils advisor and reviewed annually as part of the annual soil monitoring program	**January 2019**
23	Results and recommendations from the environmental monitoring program will be reported annually to the EPA in September	**September 2019 onwards**
Dam safety		
24	HA will produce an OMS Manual prior to commissioning	**Prior to dam commissioning**
25	HA will prepare a DSEMP for the winter storage dam	**Prior to dam commissioning**
Air Emissions		
26	If PM_{10} particulate ground level concentrations from the smokehouses are demonstrated to cause environmental nuisance or harm, HA will install higher stacks to increase the dissipation of emissions from the smokers.	**Within three months of nuisance verification**

Commitment number	Commitment	Due date
27	If odour complaints are received and verified, consideration will be given to enclose the entire WWTP and HA will install a photoionization system to reduce modelled odour to ≤2 odour units at the activity boundary, if shown to be required	**Within three months of complaint verification**
	Dangerous goods	
28	Any spills of potentially contaminating liquids will be reported to the Shift Supervisor immediately and cleaned up as soon as practicable	**During operations**
29	Hazardous chemicals to be used at the factory site will be stored in dry, bunded areas that comply with *AS 3780–2008 Storage and handling of corrosive substances*	**During operations**
30	The management of the hazardous substances will be in accordance with the National Standard and National Code for the Storage and Handling of Workplace Dangerous Goods	**During operations**
31	All workers will be trained to respond to spills and leaks	**Ongoing**
32	No ozone-depleting substances will be used or generated operation of the facility	**During operations**
	Noise	
33	HA will employ best practice environmental management to minimise noise emissions to the greatest extent that is reasonably possible	**Ongoing**
34	All equipment and vehicles will be appropriately maintained	**Ongoing**
35	Use of appropriate employee hearing protection will be mandatory in any high-noise environments	**Ongoing**
	Biosecurity	
36	Biosecurity measures will be managed in accordance with the biosecurity plan approved by the Tasmanian Government's Chief Veterinary Officer	**During operations**
37	Biosecurity management protocols will be implemented to control: • potential risks resulting in introduction of disease into the site from outside • potential risks resulting in spread of disease from the site to areas outside • potential risks resulting in spread of disease within the site	**During operations**
38	Biosecurity measures will be managed in accordance with the biosecurity plan approved by the Tasmanian Government's Chief Veterinary Officer	**During operations**
	Aboriginal heritage	
39	If any Aboriginal site, relic or artefact is found during ground disturbance, work in the immediate vicinity will cease and notification will be given to Aboriginal Heritage Tasmania	**During construction and operations**

11 Additional Approvals

This DPEMP is being submitted to the Director EPA for assessment under the *Environmental Management and Pollution Control Act 1994*. Following approval an additional planning approval may be required from the Latrobe Council (LC).

11.1 DPIPWE dam approval

The winter storage dam will be referred to the DPIPWE Water Management branch for dam safety assessment. This will need approval with conditions on the dam permit in line with a Type 4 dam, which would likely include investigation and supervision during construction and a work-as-executed report.

12 Conclusions

The proposed development aligns with HA's sustainability approach to business by:

- increasing production responsibly and safely;
- improving safety for our workers;
- increasing value to the Tasmanian economy;
- continuing to positively participate in the community; and
- producing world-class salmon products in Tasmania.

The DPEMP has identified and assessed the potential impacts associated with the proposed increase in production.
In summary:

- The site is an existing fish processing facility that currently employs 140 people from the local region;
- There will be no significant plant required for the increase in production, as most sections of the existing facility such as the smokehouses are running under capacity;
- The increase in production will increase the wastewater volume processed at the site and will result in a significantly expanded irrigation footprint;
- The expansion of irrigation will result in short-term positive impacts on the receiving environment because this will facilitate the dilution of high EC wastewater with fresh water to lessen the adverse impact of sodium on receiving soils; and
- The existing irrigation area will be spelled and remediated in the short term before being irrigated at a lower rate going forward.

The treatment and irrigation of wastewater will be managed in accordance with a wastewater reuse environmental management plan (WWREMP) as detailed in Appendix B. Macquarie Franklin has developed the WWREMP to provide a sustainable long-term wastewater reuse option for disposal of Parramatta Creek wastewater. Macquarie Franklin's considerable experience with wastewater irrigation schemes across Tasmania and southern Australia, and knowledge arising from being involved in long-term soil monitoring programs, were major factors in determining the recommended irrigation water EC. They have experience in many soil types being irrigated with water of similar, or higher, salinity, on soils with similar (or worse) constraints. Long-term monitoring in these situations has demonstrated the effectiveness of salts being leached by natural rainfall.

The proposed wastewater irrigation therefore will provide a sustainable, land-based reuse solution for wastewater produced by the Parramatta Creek fish processing facility and addresses existing wastewater volumes and forecast increased flows. The WWREMP provides a framework to allow the sustainable reuse and recycling of wastewater in a manner which is practical and safe for agriculture, the environment and the public.

The Smokehouse emissions although elevated in some emission concentrations, are low in emission rates and mass loads and the potential for environmental impact therefore appears low.

Given the remote location of the operation especially in relation to sensitive receptors and the low modelled ground level concentration of the PM_{10} particulates, the level of environmental risk is low to negligible. There will be no increase to emission rates or current mass loads under this proposal.

Due to the site's remote location and history of no odour complaints, it is considered very unlikely that the facility's operations would cause an odour nuisance to any human beings outside the facility boundary. If verified odour nuisance was confirmed HA are committed to implement mitigation, such as encapsulating the main odour sources within 3 months.

The specific commitments contained in the DPEMP demonstrate that appropriate operational and management measures will be in place to minimise any potential impacts and to minimise any risks of significant residual environmental impacts.

The DPEMP demonstrates that the proposal will be compliant with applicable Commonwealth and Tasmanian policies, legislation and Regulations.

13 References

Agriculture Victoria (1997). Salinity and the growth of forage species. http://agriculture.vic.gov.au/agriculture/farm-management/soil-and-water/salinity/salinity-and-the-growth-of-forage-species#

Agricultural Resource Management, 2009. *TPF Properties Pty Ltd Parramatta Creek orchard water supply and management plan, Bass Highway, Parramatta Creek, Tasmania (February 2009)*.

Agricultural Resource Management, 2010a. *Soil suitability for waste water application, Huon Aquaculture, Parramatta Creek,* September 2010.

Agricultural Resource Management, 2010b. *Orchard suitability for waste water application, Huon Aquaculture, Parramatta Creek,* December 2010.

Air Environment, June 2019. *Technical Review Parramatta Creek Fish Smokehouse Particulate Emissions.* Prepared for Huon Aquaculture Group.

Airlabs, 2019a. *Huon Aquaculture – Parramatta Creek – Fish Processing Facility Odour Dispersion Modelling.* Report for Huon Aquaculture. January.

Airlabs, 2019b. *Huon Aquaculture – Parramatta Creek – Fish Processing Facility Odour Dispersion Modelling.* Report for Huon Aquaculture. January.

ANCOLD, 2012. *Guidelines on tailings dams*, Australian National Committee on Large Dams (ANCOLD), Hobart.

ANZECC, 1992. *Australian water quality guidelines for fresh and marine waters*, Australian and New Zealand Environment and Conservation Council (ANZECC), Canberra.

ANZECC/ARMCANZ, 2000. *Australian and New Zealand guidelines for fresh and marine water quality*, Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand (ANZECC & ARMCANZ), Canberra.

Australian Bureau of Statistics (ABS) 2011 census.

Australian Bureau of Statistics (ABS) 2016 census.
http://www.abs.gov.au/websitedbs/D3310114.nsf/Home/census

Australian Resource Management, 2010. Compiled into the report *Soil suitability for waste water application, Huon Aquaculture, Parramatta Creek, September 2010.*

Brancher, Marlon & David Griffiths, K & Franco, Davide & Lisboa, Henrique. (2017). A review of odour impact criteria in selected countries around the world. Chemosphere. 168.

Brown, J.W., and L. Bernstein. 1953. Salt tolerance of grasses. Effects practices of variation in concentrations of sodium, calcium, sulfate, and chloride. Report to Collaborators. U.S. Salinity Lab., Riverside, CA.

Campbell J, Barker G, Southcott P and Wallis M (2013) Flooded Cars: Estimating the Consequences to Itinerants Exposed to Dambreak Floods on Roads. ANCOLD, Sydney, Australia.

Cromer, B. 2018. Desktop assessment of groundwater conditions at Huon Aquaculture and Layton properties at Parramatta Creek, Tasmania. Unpublished report prepared for Macquarie Franklin.

Department of Premier and Cabinet, 2009. *State policy on protection of agricultural land.*

Department of Primary Industries, Parks, Heritage and the Arts, 2008. *Noise measurement procedures manual*.

Department of Primary Industries, Water and Environment (DPIWE), 1997. *State Policy on Water Quality Management 1997* (Water Quality Policy).

Department of Primary Industries, Water and Environment (DPIWE), 1999. *Tasmanian biosolids reuse guidelines 1999*.

Department of Primary Industries, Parks, Water and Environment (DPIPWE), 2001, *Environmental management goals for Tasmanian surface waters – Mersey River catchments*.

Department of Primary Industries, Water and Environment (DPIWE), 2002. *Environmental guidelines for the use of recycled water in Tasmania*.

Department of Primary Industries, Water and Environment (DPIPWE), 2004. *Environment Protection (Air Quality) Policy*.

Department of Primary Industries, Parks, Water and Environment (DPIPWE), 2012. *Tasmanian biosecurity strategy 2013–2017*. Tasmanian Biosecurity Committee.

Department of Primary Industries, Parks, Water and Environment (DPIPWE), 2013. *Natural values atlas report*, accessed 20 July 2017

Department of Primary Industries, Parks, Water and Environment (DPIPWE). *Tasmanian soil condition evaluation and monitoring project*. The data for this site was accessed through CSIRO's Australian Soil Resource Information System website (www.asris.csiro.au), where the site is labelled as C13. Accessed 16 November 2017.

Department of Tourism, Arts and the Environment (DTAE), 2006. *Approved management method for biosolids reuse,* Environment Division, DTAE.

Dowson, G., Ray, D. & Norath, D., 1996. *Design and management of Tasmanian sewage lagoon systems*. Produced and published by Environment Tasmania, Department of Environment and Land Management. Hobart.

Environment Australia, 1999. *Emission estimation technique manual for meat processing*. Published for the National Pollutant Inventory.

Environment Protection Authority Victoria 1993. *Guidelines for wastewater irrigation*. Publication 168. Environment Protection Authority Victoria, Australia.

Geo-Environmental Solutions, 2017. *Site suitability for effluent irrigation, Layton's Farm Parramatta Creek.* Report to Huon Aquaculture, April 2017.

Geo-Environmental Solutions, 2018, *Site suitability for effluent irrigation, Layton's Farm Parramatta Creek*. Report to Huon Aquaculture, January 2018.

Gulline, A. B., 1973. Geological Atlas 1:50 000 Series, Sheet No. 38, *Frankford*. Geological Survey of Tasmania, Department of Mines, Hobart.

Hart, B. T., 1974. *A compilation of Australian water quality criteria*. Technical Paper, Australian Water Research Council 7.

Huon Aquaculture, 2015. *Bushfire management & emergency action plan – Parramatta Creek, 18 November 2015, Version 2*.

Huon Aquaculture Group, 2016. *Wastewater reuse environmental management plan, Final V1 2016, Parramatta Creek fish processing facility, 7128 Bass Highway East Sassafras Tasmania 7307*.

LEC Environmental, 2016. *Report on atmospheric emissions no. 5 boiler stack, 17 & 18 February 2016, Huon Aquaculture Parramatta Creek, Tasmania*. Report issued 29 April 2016.

Macquarie Franklin, 2018. *Wastewater reuse environmental management plan Parramatta Creek fish processing facility*. Report for Huon Aquaculture Group Pty Ltd.

National Occupational Health and Safety Commission (NOHSC), 2001. *National standard for the storage and handling of workplace dangerous goods* [NOHSC: 1015 (2001)], available from: http://www.safeworkaustralia.gov.au/sites/swa/about/publications/pages/ns200103storageandhandling.

National Occupational Health and Safety Commission (NOHSC), 2004. *Approved criteria for classifying hazardous substances*, 3rd edn.

Noble, K. E., 1992. *Tamar*, 1:100 000 map. Land Capability Survey of Tasmania. Department of Primary Industry, Tasmania, Australia.

PAE Holmes, 2009. *Air quality assessment for a smokehouse at Parramatta Creek*. Report prepared for Huon Aquaculture Group and submitted with the 2009 DPEMP.

pitt&sherry, 2009. *Parramatta Creek fish processing facility, development proposal and environmental management plan (DPEMP)*, prepared for Huon Aquaculture Company Pty Ltd, October 2009.

pitt&sherry, 2016. *Huon Aquaculture Parramatta Creek, waste water treatment plant, odour assessment, May 2016*.

Richley, L. R., 1978. *Land systems of Tasmania Region 3*. Tasmanian Department of Agriculture.

Roberts Irrigation, 2017, *Centre pivot irrigation Huon Aquaculture and Layton*, Report for Huon Aquaculture Company Pty Ltd, October 2017.

USEPA, 1995 (September). *Compilation of air pollutant emission factors, Volume 1: Stationary point and area sources*, 5th edition, AP-42. Section 9.5.2 Meat smokehouses, United States Environmental Protection Agency, Office of Air Quality Planning and Standards. Research Triangle Park, NC, USA.

Walker, M., & Fairbrother, P., 2015. *Labour market profile: North West Tasmania*, *Australia*, Centre for Sustainable Organisations and Work, RMIT University. www.rmit.edu.au/research/csow.

Walsh, T. (2017). *AusRivAS surveys at Parramatta Creek*. Report by Todd Walsh of Kanunnah Pty Ltd, November 2017.

Warrence, N. J., Bauder, Dr J. W., & Pearson, K. E., 2003. *Bozeman basics of salinity and sodicity effects on soil physical properties.* Land Resources and Environmental Sciences Department, Montana State University.

LIMITATIONS OF REPORT

Purpose of Report

Caloundra Environmental Pty Ltd ('Caloundra Environmental') has prepared (collated and contributed to) this document titled 'Huon Aquaculture Group Pty Ltd Parramatta Creek Fish Processing Facility Increase in Production Capacity, Development Proposal and Environmental Management Plan' (the 'Report') for the use of Huon Aquaculture (the 'Client').

Limitations of Report

The Report must be read in light of:

- the readership and purposes for which it was intended;
- its reliance upon information provided to Caloundra Environmental by the Client and others which has not been verified by Caloundra Environmental and over which it had no control;
- the limitations and assumptions referred to throughout the Report;
- the cost and other constraints imposed on the Report; and
- other relevant issues which are not within the scope of the Report.

Care Taken by Caloundra Environmental

Subject to any contrary agreement between Caloundra Environmental and the Client:

- Caloundra Environmental makes no warranty or representation to the Client or third parties (express or implied) in respect of the Report, particularly with regard to any commercial investment decision made on the basis of the Report; and
- use of the Report by the Client or third parties shall be at their own risk.