DEVELOPMENT APPLICATION
D-2018/455

APPLICANT:  Mr C Ferguson

PROPOSAL:  Water Reuse Pipeline (Utilities)

LOCATION:  Derwent River, 12A Balemo Street, Algona Street & South Arm Road/Spitfarm Road from 2972 South Arm Road (Iron Pot Golf Course) to 150 Spitfarm Road (Arm End).
(The pipeline traverses the Derwent River from the Blackmans Bay wastewater treatment plant to 12A Balemo, Street South Arm).

RELEVANT PLANNING SCHEME:  Clarence Interim Planning Scheme 2015

ADVERTISING EXPIRY DATE:  17 December 2018

Note: this proposal is accompanied by many supporting documents. The information following this cover page is considered to be the most relevant (to most people) and includes:

- Proposal Plans (folder 03)
- Applicant’s Introduction (folder 02)
- Development Proposal and Environmental Management Plan (DPEMP) and select Appendixes (part of folder 06)
  - Apx 02 Marine Environmental Impact Assessment – Marine Solutions, July 2018

In addition to the above the following information is also available from Council’s website:

- Application forms and consents (folder 01 & 05)
- Certificates of Title (folder 04)
- Remainder of DPEMP appendices (folder 06):
  - Apx 01 South Arm Peninsula Recycled Water Pipeline (duplicate of proposal plans)
  - Apx 02 EPBC Act Protected Matters Report – Dept Env & Energy, 27 September 2017
Apx 02 Natural Values Atlas Report, 27 September 2017
Apx 03 Arm End Reuse Water Assessment (150 Spitfarm Road) - Geo-Environmental Solutions, June 2018
Apx 03 Advice on suitability of recycled water irrigation on the proposed Arm End Golf Course - Macquarie Franklin, 25 September 2017
Apx 03 Recycled Water Irrigation and Environmental Management Plan - Macquarie Franklin, July 2018
Apx 04 South Arm Peninsula Irrigation Water Pipeline - Network Analysis Report - Impact Blue PTY LTD, 2018
Apx 05 Aboriginal Heritage Assessment Interim Report – Austral Tasmania, 28 June 2018
Apx 07 Using Recycled Water On Golf Courses - Environmental Institute for Golf, date unknown
Apx 08 Miscellaneous Letters of support
Apx 09 Blackmans Bay Sewage Treatment Plant Upgrade - Information Brochure Taswater, date unknown
Apx 09 Taswater Blackmans Bay STP DPEMP- GHD, August 2016
Apx 10 Notice of Intent (NoI) Blackmans Bay Sewage Treatment Plant to South Arm Peninsula Reuse Water Pipeline - prepared by Craig Ferguson and All Urban Planning Pty Ltd, date unknown
Apx 10 EPA response to NoI, 22 February 2018
Apx 11 CCC Prospectus - 2012
Apx 12 Environmental Assessment Report Replacement of Blackmans Bay Outfall – EPA, December 2008
Apx 12 Development Plan and Environmental Management Plan for Blackmans Bay Outfall Extension – CEE, date unknown
Apx 13 Environmental Guidelines for the Use of Recycled Water in Tasmania - Environmental Division, December 2002
Apx 14 Float and Sink pipelines – diagrammatic description – source and date unknown
Apx 15 Code of Practice Upstream Polyethylene Gathering Networks – CSG Industry – APGA, March 2017
Apx 17 Email: John Wheeler – Craig Ferguson Re; Agriculture in Opossum Bay, 26 October 2015
Apx 18 Power Point Presentation to CCC, 4 June 2018
Apx 19 Water and the Golf Industry – AGIC, date unknown
Apx 20 Preliminary Groundwater Assessment (Arm End) – GES, January 2012
Apx 21 Arm End Multi Use Recreation Reserve Water Related Issues – Allan Boase, 21 April 2017
Apx 22 Sustainable Reverse Osmosis Desalination - Sasan Moridpour, March 2014
Apx 22 Desalination Plants: Potential impacts of brine discharge on marine life - Rashad Danoun, 5 June 2007
Apx 23 Water Quality Measurement Units Explained - source and date unknown
Apx 24 Pipeline Project Plan - source and date unknown
• Miscellaneous information relating to Scheme provisions, pump specifications and noise (folder 07)
• Miscellaneous information relating to Arm End, Reserve Activity Assessment (RAA) & Horizontal Drilling (folder 08)
• Aboriginal Heritage Assessment Report – Austral Tasmania 30 October 2018 (folder 09)

The relevant plans and documents can be inspected at the Council offices, 38 Bligh Street, Rosny Park, during normal office hours until 17 December 2018.

Any person may make representations about the application to the General Manager, by writing to PO Box 96, Rosny Park, 7018 or by electronic mail to clarence@ccc.tas.gov.au. Representations must be received by Council on or before 17 December 2018.

To enable Council to contact you if necessary, would you please also include a day time contact number in any correspondence you may forward.

Any personal information submitted is covered by Council’s privacy policy, available at www.ccc.tas.gov.au or at the Council offices.
INTRODUCTION

- A sustainable and publicly available supply of a valuable resource - irrigation water to a dry region. Water will be available to whoever wants it (under controls of contractual agreement).
- The water will enable the re-vegetation and regeneration of the Arm End public playground and golf course.
- An opportunity to make regional farming land great, potential for small scale agricultural production.
- Water provides opportunity - bringing water to South Arm creates opportunity that has never before existed.
- Access to water adds value to land.
- More agriculture will provide more employment.
- Water allows for economic prosperity
- ‘Do not withhold good from those who deserve it when its in your power to help’ - ancient proverb
TASWATER - BLACKMANS BAY WTP. CURRENTLY UNDERGOING $40M PLANT UPGRADE. DUMPING OF APPROXIMATELY 4.5 ML OF CLASS B+ QUALITY WATER EVERY DAY INTO THE RIVER ENVIRONMENT.

PIPELINE - HORIZONTALLY DIRECTIONAL DRILLED UNDER MARINE HABITAT.
PIPELINE - HDPE 225mm - AS/NZS 4130:2003, POLYETHYLENE (PE) PIPES FOR PRESSURE APPLICATIONS.
DN225 HDPE PIPE ANCHORED TO SEABED. FLOAT AND SINK CONSTRUCTION METHOD.
PIPELINE LENGTH; 6800m.

CONSTRUCTION STAGE ONE (BLACK); IRRIGATION WATER EXTENDING NORTH TO PROPOSED ARMEND GOLF COURSE.
CONSTRUCTION STAGE TWO (BLUE); IRRIGATION WATER EXTENDING SOUTH TO IRON POT GOLF CLUB AND CALVERTON COMMUNITY OVAL.

WARNING: BEWARE OF UNDERGROUND SERVICES. THE LOCATION OF UNDERGROUND SERVICES ARE APPROXIMATE ONLY AND THE EXACT POSITION SHOULD BE PROVEN ON SITE. NO GUARANTEE IS GIVEN THAT ALL SERVICES ARE SHOWN.

POTENTIAL FUTURE WATER CONNECTED LAND.

PLAN
SCALE 1:40000
PIPELINE DIRECTIONALLY DRILLED DOWN CLIFF FACE

BOOSTER PUMP AND CONTROL EQUIPMENT LOCATED INSIDE TASWATER LAND TENURE AREA.

TASWATER - BLACKMANS BAY WTP. CURRENTLY UNDERGOING $40M PLANT UPGRADE. DUMPING OF APPROXIMATELY 4.5 ML OF CLASS B(+) QUALITY WATER EVERY DAY INTO THE RIVER ENVIRONMENT

SOUTH ARM PIPELINE FOLLOWING TASWATER OUTFALL ALIGNMENT FOR 600m. DN600 OUTFALL DIFFUSER

ELEVATION USED FOR GRAVITY FEED, CONNECTION ELEVATION 23m

NOTE: TASWATER BLACKMANS BAY SEWAGE TREATMENT PLANT
THE UPGRADED BLACKMANS BAY SEWAGE TREATMENT PLANT (STP) WILL TREAT INCREASED VOLUMES OF SEWAGE AND THE OVERALL QUALITY OF ALL EFFLUENT WILL BE SIGNIFICANTLY IMPROVED. TASWATER WILL INTRODUCE NEW TECHNOLOGY TO IMPROVE THE PLANT PERFORMANCE.

THE UPGRADED CAPACITY OF THE STP WILL BE MORE THAN DOUBLED, FROM BEING ABLE TO RECEIVE AN AVERAGE OF 4.1 MEGALITRES PER DAY TO 8.5 MEGALITRES

SOUTH ARM PIPELINE FOLLOWING TASWATER OUTFALL ALIGNMENT FOR 600m. DN600 OUTFALL DIFFUSER

PLAN SCALE 1:500

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OUTFALL PIPE COMPARISON SCALE 1:40

DN600 (EXISTING OUTFALL) DN225 (PROPOSED PIPELINE)

DN600 (EXISTING OUTFALL) DN225 (PROPOSED PIPELINE)

SCALE 1:250

PLAN

SCALE 1:500

NOTICE OF ASSESSMENT INFORMATION

TASWATER BLACKMANS BAY PENINSULA RECYCLED WATER PIPELINE

FOR INFORMATION

TASWATER; 116 TINDERBOX ROAD, BLACKMANS BAY

TASWATER; 112 TINDERBOX ROAD, BLACKMANS BAY

END OF OUTFALL DIFFUSER

CROWN LAND ALIGNMENT = 800m

PLANGE CONNECTION FOR JOINING HDPE Pipe TO THE FLOAT AND SINK PIPE

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FOR INFORMATION

NOTES

GENERAL

NOTES HAVE BEEN PROVIDED AS A GUIDING SUMMARY OF AS2566.1 AND WSA 03. WHERE THERE IS CONFLICT BETWEEN STANDARDS AS2566 TAKES PRECEDENCE OVER WSA. THE DESIGNER SHALL PROVIDE A DESIGN THAT IS IN ACCORDANCE WITH THE REQUIRED STANDARDS AND PERMITS.

1. GUIDELINES ON RE-USE OF MATERIAL

EXCAVATED GROUND IS THE PREFERRED SOURCE OF EMBEDMENT AND TRENCH FILL MATERIALS FOR PIPELINE PIT. IN COMBINATION WITH GEOTECHNICAL SURVEY RESULTS, THE FOLLOWING GUIDELINES MAY BE USED TO INDICATE THE SUITABILITY OF SUCH EXCAVATED MATERIAL FOR EXCAVATION PITS. EXCAVATED MATERIALS FREE OF ORGANIC MATERIAL MAY BE SUITABLE FOR RE-USE IN THE FOLLOWING TRENCH ZONES:

- PIT FILL
- HAUNCHING, SIDE SUPPORT AND OVERLAY
- BEDDING

EXISTING TOPSOIL SHALL BE REMOVED BEFORE EXCAVATION AND REPLACED AFTER PIPE INSTALLATION. TOPSOIL MUST NOT BE MIXED WITH OTHER MATERIAL.

2. MATERIAL GRADING LIMITS

EXCAVATED MATERIAL USED FOR EMBEDMENT AND PIT FILL SHOULD BE UNIFORMLY GRADED AS PER AS2566.1 TABLE C2 TO ALLOW ADEQUATE COMPACTION AND PIPE LOADING TRANSFER. TABLE C2 HAS BEEN INCLUDED BELOW FOR REFERENCE.

<table>
<thead>
<tr>
<th>SIEVE SIZE (mm)</th>
<th>MASS PASSING (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>19.0</td>
<td>100</td>
</tr>
<tr>
<td>2.36</td>
<td>75 +/- 25</td>
</tr>
<tr>
<td>0.60</td>
<td>55 +/- 35</td>
</tr>
<tr>
<td>0.30</td>
<td>35 +/- 25</td>
</tr>
<tr>
<td>0.15</td>
<td>≤ 25</td>
</tr>
<tr>
<td>0.075</td>
<td>≤ 10</td>
</tr>
</tbody>
</table>

3. VEHICULAR CROSSING REQUIREMENTS

AS PER AUTHORITY STANDARDS AND PERMITS.

4. TREATMENT

MATERIAL WHICH DOES NOT INITIALLY MEET THE SPECIFICATIONS FOR SUITABLE BEDDING OR BACKFILL MATERIAL MAY BE TREATED UNTIL IT IS SUITABLE. THE NEED FOR MATERIAL TREATMENT SHALL BE VERIFIED BY THE DESIGNER.

5. EMBEDMENT GEOMETRY

THE EMBEDMENT GEOMETRY SHALL BE IN ACCORDANCE WITH AS2566.1 FIGURE 3.1. THE DIMENSIONS TABLE HAS BEEN INCLUDED BELOW FOR REFERENCE.

<table>
<thead>
<tr>
<th>DEPTH OF COVER (mm)</th>
<th>MINIMUM VALUES</th>
</tr>
</thead>
<tbody>
<tr>
<td>D_0</td>
<td>l_b</td>
</tr>
<tr>
<td>700-900</td>
<td>75</td>
</tr>
<tr>
<td>900-1200</td>
<td>100</td>
</tr>
<tr>
<td>1200-1500</td>
<td>100</td>
</tr>
<tr>
<td>1500-1800</td>
<td>150</td>
</tr>
</tbody>
</table>

6. COMPACTION SPECIFICATION

SUPPLIED BY CONTRACTOR IN CONSTRUCTION METHODOLOGY. CONTRACTOR'S SUPPLY. COMPACTION TO BE IN ACCORDANCE WITH AS2566.1 TABLE 3.2

7. PIT STOPS AND BULKHEADS

IN ACCORDANCE WITH WSAA AND AS2566.1 REQUIREMENTS CONFIRMED ON SITE BY ENGINEER DURING CONSTRUCTION.

8. CROSSING OTHER SERVICES

PIPELINE MUST BE PLACED WITH AT LEAST 300mm SEPARATION FROM OTHER SERVICES. REFER AUTHORITIES/REGULATIONS FOR OTHER SERVICE SEPARATION DISTANCES.
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NO ANCHOR ZONE

SOUTH ARM PIPELINE FOLLOWING TASSWATER OUTFALL ALIGNMENT FROM 600m DN600 OUTFALL DIFFUSER

DN225 HDPE INTERPOLATED BETWEEN BATHYMETRY AND BLACKMANS BAY SURFACE

NO ANCHOR ZONE

LOW POINT

SOUTH ARM PIPELINE FOLLOWING TASSWATER OUTFALL ALIGNMENT

AIR VALVE (ARV) TO BE CONFIRMED IF ONE EXISTS WITHIN PUMP STATION

PROFILE

SCALE 1:10000

NOTE:

AIR VALVE LOCATIONS TBC PENDING FURTHER ENGINEERING DESIGN DEVELOPMENT
PIPE INSTALLED NOMINALLY 900mm BELOW GROUND VIA HDD AVOIDING WORKS AND MITIGATING DISTURBANCE INSIDE IDENTIFIED COASTAL EROSION HAZARD AREA, REFER SPECIFICALLY TO:
COASTAL EROSION HAZARD AREA (E16.7.1)
AND
WATERWAY AND COASTAL PROTECTION CODE (E11.7.1 - A1)

SEAGRASS HABITAT AND SENSITIVE MARINE HABITAT AVOIDED BY HDD CONSTRUCTION METHOD

PIPE INSTALLED NOMINALLY 900mm BELOW GROUND VIA HDD AVOIDING WORKS AND MITIGATING DISTURBANCE INSIDE IDENTIFIED COASTAL EROSION HAZARD AREA, REFER SPECIFICALLY TO:
COASTAL EROSION HAZARD AREA (E16.7.1)
AND
WATERWAY AND COASTAL PROTECTION CODE (E11.7.1 - A1)
PUMP BOOSTER STATION, located on the eastern side of South Arm Road. Pumps mounted underground for noise mitigation / suppression. Area includes maintenance vehicle parking place.

PIPELINE FOLLOWING EXISTING BIKE PATH AS PER ADVISE BY CLARENCE CITY COUNCIL.

NOTE: PIT LOCATIONS DIRECTIONAL DRILL ENTRY LOCATIONS APPROXIMATELY EVERY 150m ALONG LAND PIPELINE ALIGNMENT. TBC WITH COUNCIL AND CCC. BACKFILL ACCORDINGLY. FINAL PIT LOCATIONS TO BE RELOCATED AS REQUIRED.
PLAN
SCALE 1:10000

PROFILE
SCALE 1:10000

PIPE SIZE & CLASS

EXISTING LEVEL

DEPTH TO invert

CHANGES

DN160 HDPE (TBC)

SOUTH ARM PENINSULA RECYCLED WATER PIPELINE

FOR INFORMATION

Sheet 4 - South Stage 2


CONTINUES ON 1365-12
CONTINUES ON 1365-13
CONTINUES ON 1365-14
CONTINUES ON 1365-15
EPA Tasmania

Mary Ann’s Island P/L and Arm End Public Recreation Reserve

Parks and Crown Land Services

TasWater
Planning Considerations and Approval pathway;

This sustainable use of reuse water proposal has progressed through the initial phases of development including:

- development of the concept **COMPLETED**
- feasibility studies **COMPLETED**
- economic feasibility **COMPLETED**
- design concept and consultation **COMPLETED**
- environmental investigations **COMPLETED**
- design engineering **COMPLETED**

The above have all been completed.

Following on, and progressing through the red tape, the simplified summary of the formal planning and approval steps are outlined below:

1. Pre-lodgement consultation with EPA **COMPLETED**
2. Issue Notice of intent to EPA for pipeline and water reuse scheme. (* see below note) **COMPLETED**
3. Preparation of DA documents including: **COMPLETED**
   - Project Drawings, maps and plans. **COMPLETED**
   - DPEMP **COMPLETED**
     - Operational Concept
     - Aboriginal Heritage Assessment / report
     - Ground Water Management Plan
     - Irrigation EMP
     - Marine Environmental Investigations and assessments.
     - Engineering and Modelling
    - Demand and network analysis
4. Application to Aboriginal Heritage Tasmania (interim) **COMPLETED**
5. Pre-lodgement consultation with CCC and Kingborough Council **COMPLETED**
6. Pre-lodgement consultation with Parks / Crown Land Services **COMPLETED**
7. Lodgement of PWS Reserve Activity Assessment (RAA) and Licence applications to Crown Land Services **COMPLETED**
8. Seek Land Owner Consent to lodge DA (Clarence and Kingborough Councils and Crown) **COMPLETED**
9. Prepare Final DA documents package **COMPLETED**
10. Lodge DA to Clarence and Kingborough Councils
11. Council’s issue planning permits (or not)
12. Development of detailed information to address permit conditions and seek approval to commence works
(*) As a result of ongoing preparation of the DPEMP, our environmental studies and Notice of Intent to the EPA have determined that no significant impacts are expected, and that the approvals process will remain at a state and local government level, rather than requiring Commonwealth approval.

Council will advertise the DA and DPEMP in local newspapers and make copies of the plan available for the public to read and provide comment for 28 days. This period is expected to commence in September 2018. Any comments received from the public are taken into consideration by council and the EPA, who will then determine approval of the project and issue a permit with conditions (if required). After approval, the project will commence detailed design and construction will follow.

- **Pre-lodgement consultations and advice / information from Clarence City Council includes:**

  Zoning and use.; Under the Clarence Interim Planning Scheme 2015 the zone provisions relevant are those of the:
  - Open Space Zone (use: utilities are discretionary)
  - Village Zone (use: utilities are discretionary)
  - Rural Resource Zone (use: utilities are discretionary)

  Also, under the Clarence Interim Planning Scheme 2015 the code relevant are those of the
  - Bushfire Prone Areas Code
  - Coastal Erosion
  - Hazard Area Code
  - Inundation Prone Areas Code
  - Natural Assets Code and the
  - Waterway and Coastal Protection Code

  As part of Council's statutory assessment timeframe public notification of the development application would be required.

- **Pre-lodgement consultations advice / information from Kingborough Council includes:**
The treatment plant at 116 Tinderbox Road is zoned Utilities under the Scheme. We understand that the pipeline would exit to the east over land zoned Environmental Living and would then enter the Environmental Management Zone after high watermark.

It appears that the Council’s jurisdiction extends approximately 15m past high watermark, so the pipeline would need to be assessed under all 3 zones.

The use would be defined as ‘Utilities’ under the Scheme, which is a permitted use in a Utilities Zone, and a discretionary use in an Environmental Living Zone and Environmental Management Zone. We don’t anticipate that there would be any particular issues that would arise through assessment against the standards of the respective zones.

The following Codes would apply to varying degrees:

- Biodiversity Code
- Coastal Erosion Hazard Code
- Landslide Code
- Waterway and Coastal Protection Code
- The Attenuation and Inundation Prone Areas codes

Lands administered by TasWater, Kingborough and Clarence Councils form part of the route as proposed, the consent of the respective General Manager would be required to the lodgement of the application.

- **Pre-lodgement consultations advice / information from Crown Land Services / PWS includes:**

We have undertaken a preliminary assessment of your development proposal as it relates to these reserves via the PWS Reserve Activity Assessment (RAA) Checklist process. We have determined that a Level 3 RAA is required, based on the need for further assessments to clarify potential impacts and mitigation measures.

**In summary, your Level 3 RAA will need to include the following information:**

- A detailed site plan drawn to scale showing the location and extent of the proposed infrastructure on and through the Marine Conservation Area and the nature recreation area
- A detailed design of the proposed infrastructure to be located on and through the Marine Conservation Area and the Nature Recreation Area
- An Aboriginal Heritage Assessment for the pipeline alignment and associated infrastructure and disturbance with the Nature Recreation Area
- A natural values and impact assessment for the pipeline alignment and associated infrastructure and disturbance within the Nature Recreation Area, to identify the risk to threatened flora and fauna species
- A further marine natural values assessment, including field surveys as identified in the Marine Solution’s Tasmania Pty Ltd preliminary report, to identify the risks to threatened marine fauna and habitat. Methodology for the field surveying is to be as approved by PCAB, and the assessment must include the identification of a pipeline alignment that presents minimal disturbance to the values within the marine conservation area
- A detailed Irrigation and Environmental Management Plan for recycled water use within the nature recreation area
- A Construction Management Plan detailing the proposed installation and maintenance methodology of the infrastructure within the Marine Conservation Area, and the Nature Recreation Area. The CMP is to be consistent with the principles and approaches within the Tasmanian Reserve Management Code of Practice 2003, where applicable
Further information to clarify the proposed ownership, management and maintenance responsibilities associated with the water reuse infrastructure

I understand that the RAA template is not a 'one size fits all' projects – particularly when it comes to a complex, multi-tenured proposals such as this. However, it would be great if you could include the information in the attached reports into the relevant sections of the RAA. This will make it easier to be assessed by the number of specialists it will go to.

In order to begin processing your RAA, we will require the following further information under section 4.1 and 4.2 of the RAA:

- The completed marine natural values assessment for the Opossum Bay Marine Conservation Area, as outlined in my previous email. The presence of seagrass habitat, Handfish and other threatened marine species (state and national) in the vicinity of the proposed pipeline alignment, mean that this is an important aspect to be considered by the RAA process. Please include the main findings from the assessment in the RAA template, as well as any specific management actions that will be taken to mitigate potential impacts to the marine environment (under Section 4.1 Estuarine and Marine).

- The completed Irrigation and Environmental Management Plan specific to the Gellibrand NRA site, as outlined in my previous email. The IEMP should address runoff/drainage issues, including the likelihood of nutrient rich recycled water impacting the Opossum Bay Marine CA

- Detail of any specific impacts and associated management actions to mitigate potential impacts on the Mary Ann Bay Raised Marine Bed geosite (i.e. resulting from irrigation infrastructure installation and or use). I note that you have identified that this will be addressed in the IEMP on page 25 of the RAA.

- The completed Aboriginal heritage assessment, with any specific management actions to mitigate values within the reserves.

And Section 4.3:

- Detail of how biosecurity risks to the reserves will be mitigated (i.e. introduction of Phytophthora and other diseases on construction machinery), consistent with standard hygiene procedures.

Having this information in your RAA upfront will hopefully minimise the need for further information to be requested later down the track when the RAA goes out to the relevant specialists. I understand that the DPEMP you are in the process of preparing will include much of this information – which is great. You can just refer to that document in the RAA and attach.

➢ Pre-lodgement advice from TasWater.

Please address correspondence including file reference to ‘Development@taswater.com.au’. It gets registered by our admin staff and gets acted on quicker that way.

We suggest that Arm End’s engineers meet with our Major Projects design team for Blackmans Bay STP to talk through the concept design. Prior to the meeting we would like to see;

1. A concept plan for the transfer system from Blackmans Bay STP to Arm End;
2. Location of offtake, which will need to be post UV disinfection;
3. Location of a pump station including wet well;
4. Location of chlorine disinfection;
5. Size and location of buffer storage, (if any since this depends on proposed pump rate compared to typical effluent flows);
6. Overall footprint of infrastructure on Blackmans Bay site;
7. Pump rate (L/s);
8. Access requirements (description);
9. Power supply requirements on Blackmans Bay STP site.

Once the basic requirements are known, we can provide advice as to whether this is feasible or if they need to review the proposal before they get too far into the design.

Of course, without first-hand knowledge of the BB STP site, some of the location information would be indicative only. I have attached an aerial from our GIS.
TasWater CEO Mike Brewster has also been briefed on the pipeline proposal:

I am pleased to provide in-principle support for your proposed pipeline development based on our understanding of the social, environmental and economic benefits that the irrigation water will bring to the region.

In particular we note the Arm End Public Recreation Reserve project intends to make use of available recycled water, is expected to generate 30 plus jobs for the region, will result in significant revegetation, and creates the potential for irrigation water to be provided to other land owners. These envisaged benefits strongly align with TasWater’s desire to support economic development in a sustainable and environmentally sensitive manner.

Please note that while we are supportive of both the Arm End project as well as the recycled water pipeline project proceeding, any subsequent applications to use the recycled water will be considered by TasWater on its merits and in the normal course of business following completion of normal due diligence processes.

We look forward to seeing the pipeline project proceeding smoothly and successfully delivering the envisaged benefits to the local community.

Yours sincerely

Michael Brewster
Chief Executive Officer
3. Documentation included as part of this DA package.

As part of the development application approval and review process, the proponent will submit documentation including a Development Proposal and Environmental Management Plan (DPEMP) and Irrigation Environmental Management Plan (IEMP).

This DPEMP and DA document package will provide an overview of the proposed project, potential impacts on the environment and how they will be managed.

The DPEMP is the key document by which the public (and regulators) can obtain an understanding of the project and its potential impacts and benefits.

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<td>A copy of the current Certificate of Title (*), for each parcel of land on which the use or development is proposed.</td>
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<td>Request seeking land manager or owner consent to lodge application.</td>
<td>I. TasWater&lt;br&gt;II. Kingborough Council&lt;br&gt;III. Crown / Parks&lt;br&gt;IV. CC Council</td>
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<td>The main application document containing (or referring to) all information.</td>
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<td>Some of the appendices also have appendices.</td>
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- GEO
- Co-ordinator General
- Premier

Appendix 9:
TasWater DPEMP’s related to proposal
- DPEMP for TasWater Blackmans Bay STP upgrade.
- DPEMP for Blackmans Bay Outfall Extension (Southern Water / Kingborough Council)

Appendix 10:
Notice of intent to Tas EPA and response.

Appendix 11:
Other supporters and public meetings

Appendix 12: ???

Appendix 13:
Environmental Guidelines for the Recycled Water in Tasmania

Appendix 14:
Typical Float and Sink Diagrammatical Drawing

Appendix 15:
HDD trenchless Construction Industry Handbook

Appendix 16:
National Guidelines for water recycling: Managing Health and Environmental Risk.

Appendix 17:
Recycled Water Pipeline - Blackmans Bay Water to South Arm; potential users survey

Appendix 18:
Recycled Water Pipeline - Blackmans Bay Water to South Arm. Presentation to CCC.
Blackmans Bay
to
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Development Proposal and
Environmental Management Plan (DPEMP)
Water is too precious to be used only once
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This DPEMP for the Recycled Water Pipeline from TasWater Blackmans Bay Water Treatment Plant to South Arm Peninsula has been prepared by Mary Ann’s Island Pty Ltd (ACN 64 141 272 568)

Mary Ann’s Island Pty Ltd is the entity who are proposing to develop the Arm End Public Recreation Reserve.

See www.armend.com.au

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Document Status

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This Development Proposal and Environmental Management Plan (DPEMP) has been prepared for the purpose of:

a) Understanding the investigations and feasibility process to determine the most suitable water servicing option(s) for the Arm End Multi-Use Public Recreation Reserve

b) Assessing, for construction approval, the Recycled Water Pipeline from TasWater Blackmans Bay Water Treatment Plant to South Arm Peninsula

c) Consideration of the Social, Environmental and Financial (triple bottom line) impacts and implications for the identified water servicing option

This document does not consider in detail how the water is to be used. The specifics associated with how the water is managed, applied, stored and controlled will be detailed in full by way of an Irrigation Environmental Management Plan (IEMP).
1. Introduction

It is in the interest of:

- the landholder on whose land recycled water is being re-used
- the supplier of the water
- the regulators
- the community

that recycled water is applied to land in a manner that is sustainable and does not cause environmental harm or a public health risk.

The two primary documents associated with the development proposal as well as the operation details of the reuse water pipeline are:

1. The Development Proposal and Environmental Management Plan (DPEMP) (this document) is a source of information from which individuals and groups may gain an understanding of the proposal, the need for the proposal, the alternatives, the environment that it could affect, the positive and negative impacts that may occur and the measures that will be taken to maximise positive outcomes, and minimise any adverse impacts, including specific management commitments.

The DPEMP is a basis for public consultation and informed comment on the proposal. A framework against which decision makers (and in particular the local Council) can consider the proposal and determine the conditions under which any approval might be given.

A demonstration that the proposal is consistent with objectives as required by the relevant statutes and policies, including the Tasmanian Resource Management and Planning System (RMPS) and the Environmental Management and Pollution Control System (EMPCS).

2. The Irrigation Environmental Management Plan (IEMP) (included in appendices) for a re-use water scheme is the basic mechanism for ensuring that the proponents of the re-use scheme have addressed all of the relevant issues to ensure that the objectives are achieved, and that there is agreement on the key management prescriptions.

IEMPs must supply adequate detail on the design and implementation of all the environmentally relevant activities and management practices for a proposed wastewater re-use scheme.

The IEMP will also provide a framework for annual monitoring of the ongoing sustainability of the wastewater re-use project. Therefore, the IEMP documents must be clearly understood, applied and accessed by the operators, managers and the public.

1.1 Executive Summary

The State Policy on Water Quality Management 1997 encourages the recycling and re-use of wastewater and, where appropriate, the irrigation of wastewater to land to maximise its beneficial use while protecting the quality of surface waters. The Policy also requires that
land application of wastewater be carried out in accordance with the current Environmental Guidelines for the Use of Recycled Water in Tasmania. (See attached as appendix to this DPEMP)

**Water recycling** is becoming a critical element for managing water resources. By safely irrigating recycled water, sustainable development can be achieved while conserving our high-quality water supplies. Being able to access alternative safe water sources for agriculture is particularly critical in times of drought.

By providing an additional source of water, recycling can help to decrease the demand and diversion of Tasmania’s high-quality water from sensitive catchments, rivers and wetland ecosystems.

A major benefit of effluent reuse by irrigation is the decrease in wastewater discharges to natural waterways. When pollutant discharges to waterways are removed or reduced, the pollutant loadings to these waters are decreased. Substances that can be pollutants when discharged to waterways can be beneficially reused for irrigation. For example, plant nutrients such as nitrogen and phosphorus can stimulate harmful algal blooms in waterways but are a valuable fertiliser for crops.

Many water needs can be satisfied with recycled water as long as it is adequately treated to ensure water quality is appropriate for the proposed use. Greater treatment and management is required for uses where there is a greater chance of human exposure to the recycled water.

Effluent can pose environmental, public health or agricultural resource risks if not managed appropriately and the information in this document will support the establishment of safe effluent irrigation reuse schemes.

Water recycling has proven to be effective and successful in creating a new and reliable water supply, while not compromising public health. Effluent reuse by irrigation is now an accepted practice that will play a greater role in our overall water supply in the future.

The reuse of effluent by irrigation can make a significant contribution to the integrated management of our water resources. When the water and nutrients in effluent are beneficially utilised through irrigation some of the water extracted from rivers can be replaced and the amount of pollutants discharged into our waterways can be reduced.

The use of recycled water for irrigation in non-domestic irrigation situations is the only water use addressed in this document.

Recycled municipal water is a relatively inexpensive, reliable, continuous source of irrigation water for golf courses, which have large expanses of turf that can absorb relatively large amounts of nitrogen and other nutrients often found in recycled water.

Arm End, with large expanses of turf and a massive native revegetation program, is particularly well-suited to a recycled water irrigation program. Recycled water management controls are of utmost importance in the use of this valuable resource.

As the proposed primary user of the irrigation water, the Arm End water quality and quantity requirements are:

- Golf course and site more generally will require summer peak demand of a minimum of 0.8 mega litres (ML) per day; 800,000 litres per day.
- Equates to a 24-hour flow rate of 9.2 litres per second.
• Estimated annual demands (with considerations of seasonal variations) is two hundred million (200,000,000) litres of water per annum. (200 ML). 200 ML equals in volume about 85 Olympic sized swimming pools.

• The site has approved on site water storage of 4 ML. (in 2 x 2 ML storage tanks).

Irrigation for Arm End and other agricultural users on South Arm Peninsula with recycled water from Blackmans Bay is an intelligent use of a readily available and valuable commodity - presently being wasted and dumped into the Derwent River.

1.2  Key messages:

• The creation of an opportunity for sustainable economic prosperity and enhancing the region’s attractiveness as a place to live, invest and visit

• It is difficult to extrapolate the full potential benefits for the introduction of plentiful quantities of recycled water to the greater South Arm Peninsula

• The delivery of water to South Arm will enable community users to have access to a missing ingredient and to open up the sustainable agricultural and tourism potential of the peninsula

• This water solution enables the start of the Arm End Public Recreation Reserve

• Widespread support, from all levels of regulator assessments, for this infrastructure project would assist the initiation of a significant and potentially transformational climate change adaptation for the South Arm Peninsula

1.3  This Document

The DPEMP focusses on the key issues for the proposal. For this DPEMP not all issues (typically nominated in a DPEMP) will have the same degree of relevance to the proposed recycle water pipeline and associated activities. Due to the low construction impact of the Recycled Water Pipeline from TasWater Blackmans Bay Water Treatment Plant to South Arm Peninsula and its location, some issues may be more relevant than others, while others will not be applicable at all. The level of detail provided on each issue is appropriate to the level of significance of that issue for the proposal.

This DPEMP has been compiled by Mary Ann’s Island Pty Ltd (the proponent) following on from about two years of project work aimed at providing the solution for the Arm End irrigation water demands.
MAI would like to thank all who have contributed to helping provide this sustainable solution to an issue we had underestimated in terms of planning and regulation complexities. Assistance, input, information, advice, professional consultant’s reports, conversations, contributions and support to this document package and the proposal include:

Clarence City Council

Marine Solutions Tasmania P/L

CSIRO

Specifically, only in relation to The Spotted Handfish (endemic to the Derwent River estuary in Hobart and is critically endangered). A CSIRO project is underway to conserve this unique species and save it from further decline.

Alan Boase – Impact Blue
Macquarie Franklin

Macquarie Franklin specialises in economic studies and business and resource management including feasibility studies, irrigation and water development, land capability and mapping, natural resource management, training and extension, and technical agricultural consulting.

Kingborough Council

IPD Consulting

Austral Tasmania. Aboriginal Heritage Assessment
1.4 Definitions / Glossary of Terms

ANZECC  Australia and New Zealand Environment and Conservation Council Advanced

Aquifer  A geological formation or structure that stores or transmits water in useable quantities.

Best Practice  The practice of seeking out, emulating and measuring performance against the best standards identifiable

Biochemical Oxygen Demand (BOD)  A measure of the oxygen demanding substances in wastewater – which indicates the level of pollution present. It is expressed as the amount of oxygen required by micro-organisms to oxidise the organics in a litre of the water over a period of time. It is expressed as milligrams per litre (mg/l)

Chlorination  A chemical method of disinfection which destroys pathogenic micro-organisms.
Disinfection  A process that destroys inactivates or removes pathogenic micro-organisms.

DHHS  Tasmanian Department of Health and Human Services

DPEMP or EMP  Development Proposal and Environmental Management Plan or Environmental Management Plan. The regular review of the DPEMP becomes an EMP and the review is typically on a 3-yearly basis.

DPIPWE  Tasmanian Department of Primary Industries, Water and Environment

E.coli (Escherichia coli)  This is a thermotolerant coliform organism, predominantly faecal coliform and used as an indicator of recent faecal contamination. It is expressed as organisms/100ml.

EMCPA  Environmental Management and Pollution Control Act 1994

ESP (%)  Exchangeable Sodium Percentage, used to determine the effects of sodium content of effluent on the soil from both salt and carbonate sources.

Groundwater  Water located beneath the land surface.

ICM  Integrated catchment management

Irrigation  The application of wastewater to land to replace soil moisture lost by evapotranspiration and to promote the growth of plants.

Nephelometric turbidity unit (NTU).  A unit of measure of the turbidity of water which occurs due to suspended, colloidal and particulate matter.

NH&MRC  National Health and Medical Research Council

Nutrients  Substances that stimulate and enhance growth. Generally, refers to nitrogen and phosphorus in waters.

Operator  The responsible authority managing and operating a wastewater scheme

Organic matter (%)  A measure of the available carbon in the soil, and is affected by BOD in effluent. PAC (kg/ha)  Phosphorus Adsorption Capacity of soil.

Potable Water  Water suitable for human consumption as drinking water or in the preparation of food.

Primary Treatment  Initial treatment of wastewater involving screening and sedimentation to remove solids

Reclaimed water  Water that has been reclaimed from wastewater or sewage and treated to a standard which is satisfactory for its intended use.

Re-use  The application of appropriately treated wastewater for a specific purpose

Quality turf: sustainable and scientifically managed world class golf turf supports the business model and success of the golf-based revenue at Arm End

Secondary Treatment  A level of treatment that removes approximately 85% of BOD and suspended solids, generally by biological or chemical treatment processes. Secondary effluent generally has BOD of 30 mg/L, SS <30mg/L but may rise to >100 mg/L due to algal solids in lagoon or pond systems

Sewage  Any untreated waste containing human excreta or domestic wastewater. Also called blackwater.
Sodium adsorption ratio, SAR or Adjusted SAR  Sodium absorption ratio for determining the contribution of wastewater to possible salinity and soil structure decline. A measure of the amount of sodium, relative to calcium and magnesium, to indicate the effect on soil structure and reduced rate at which water moves through the soil.

Soil pH  (CaCl$_2$ + H$_2$O) 1:5 soil:water suspension

SPWQM  State Policy on Water Quality Management 1997

Suspended solids (SS)  The non-filtrable residual solids which are suspended in sewage or effluent. It is expressed in milligrams/litre (mg/L).

Tertiary Treatment  Includes treatment processes beyond secondary or biological processes which further improve effluent quality. Tertiary treatment processes include detention lagoons, conventional filtration via sand, dual media or membrane filters which may include coagulation dosing and land based or wetland processes.

Treated Effluent  Effluent that has been subjected to biological oxidation and clarification to secondary standard. Such effluent may not have been disinfected.

Treatment System  A device or means of treating waterborne wastes from individual households or other sources with similar types and volumes of wastewater.

Water balance or water budget  Irrigation requirements for an average year given seasonal rainfall & evaporation data, and crop irrigation requirements

WWTP  Wastewater Treatment Plant
2. Water Servicing Options Study

The whole of the South Arm Peninsula in not water-serviced land; Arm End and the South Arm Peninsula, past Lauderdale, does not have reticulated water services or sewer services. TasWater in-ground water mains terminate at Lauderdale (South).

All residents and business on South Arm Peninsula either catch rainfall into tanks and or have water delivered by water tankers. All dwellings have individual treatment systems, septic tanks or aerated water treatment systems (AWTS), and waste outfall is supposed to be managed and disposed of within the property boundaries.

Approximate population for South Arm Peninsula is 4207 and close to 1909 private dwellings

Map below shows water serviced land in blue - the Arm End site isolated and surrounded by salt water

When considered from a geographical point of view, the South Arm Peninsula is relatively remote and isolated. Surrounded by salt water, the Peninsula is somewhat island-like with land connections at Lauderdale and additionally the isthmus between Clifton Beach and South Arm Village.

As part of establishing the optimum water servicing option, the project team has considered and evaluated the following potential water sources- listed here in brief:

- **Droughty Point Water Pipeline**: A metered pipeline connected into the existing TasWater treated water in ground infrastructure located to the north of the Arm End site at Droughty Point.

- **Rokeby WTP Reuse Water Pipeline**

Re-use water pipeline connection into the output from TasWater Rokeby Water Treatment Plant. Pipeline infrastructure would be trenched in along the length of Droughty Point and
continued as an anchored sub marine pipe placed on the seedbed of the short marine
crossing south from Droughty Point across to the Arm End landform.

This option was dropped as a potential reliable water source due to the contracted and
committed quantities of water the WTP. During the summer months 100% off the WTP outfall
are pumped into the Cole River Valley Reuse irrigation scheme.

- **Ground Water Investigations**: Arm End engaged geotechnical consultants to
  investigate the potential to extract groundwater via bores from the site and general
  South Arm Peninsula.

- **Desalination**: With the Derwent River surrounding the site the production of irrigation
  quality water via the reverse osmosis process has been fully investigated and costed.

- **Rainfall and Storage**: Investigations and research into the potential ground runoff and
  catchment. Included seasonal and evaporation considerations.

- **Blackmans Bay WTP to SAP re-use Water Pipeline**: Re-use water pipeline
  connection into the output from TasWater Blackmans Bay Water Treatment Plant.
  Pipeline infrastructure will be placed on the seabed across the Derwent River to the
  South Arm Peninsula.

- **Truck**: Like most residential users of water on the South Arm Peninsula we have
  considered the option of having water delivered by road via water tankers to the site.

- **Lakes, Rivers**: none at Arm End

- **Solar/condensation**: developing technology based around the evaporation and
  condensation of salt water to produce irrigation quality has been researched.

- **Combination** of the above options.

Analysis, potentials pros and cons for the above water sources are discussed below.

### 2.1 Arm End water quality and quantity requirements;

- Golf course and site more generally will require summer peak demand of a minimum of
  0.8 mega litres (ML) per day; 800,000 litres per day equates to a 24-hour flow rate of
  9.2 litres per second.

- The turf grow in period requires up to 2.5 ML every day.

- Estimated annual demands (with considerations of seasonal variations) is 200,000,000
  L of water per annum. *(200 Mega Litre)*. 200 ML equals in volume about 85 Olympic
  sized swimming pools.

- **Maximum salinity** for turf high quality turf grass is 1000 parts per million (ppm).

- **The site** has approved on-site water storage of 4 mega litres (in 2x 2 2ML storage
  tanks).

- **Turfgrass** is the most important asset of a golf course, the putting greens represent the
  area with the highest value.
• **Irrigation water** for the dry climate Arm End public golf course is an **essential** resource required by the development and therefore water security is also essential. Without reliable and consistent irrigation water, the golf course turf quality will suffer and potentially die. The business and development will fail.

### 2.2 Re-use Water Pipeline from Blackmans Bay

The TasWater Blackmans Bay Sewage Treatment Plant was identified as the most likely major water source. It generates approximately 1500 ML per annum of secondary treated effluent which is currently all discharged via an outfall to the River Derwent.

A $40 million plant upgrade is being undertaken by TasWater. This involves the addition of nutrient removal, via a new membrane bioreactor process unit.

A preliminary review suggests a gravity supply from the plant could be delivered to the beach area at Half Moon Bay on the SAP. This would then require pumping to provide the pressure required to service user storages. Alternatively, a fully pumped system from the BBWTP could be considered.

This option forms the basis of the DPEMP.

### 2.3 Droughty Point Pipeline

This proposal was based around a metered connection point located at an existing TasWater water main. The two potential connection locations are:

- Connecting into the existing TasWater in ground water mains at the southern end of Tollard Drive, Rokeby; trench and lay pipeline running south along Droughty Point land form extending to a sub marine pipe across water way between Droughty Point and Arm End.

- Connecting in to the existing TasWater in ground water mains on the western side of Droughty Point, Tranmere; trench and lay pipeline running south along Droughty Point land form extending to a sub marine pipe across water way between Droughty Point and Arm End (Gellibrand Point)

Encouraged by TasWater, the Arm End project team thoroughly explored both of the potential Droughty Point pipeline connection points.

For both of the options, the water would be metered and supplied at the TasWater supply rates. Currently the rate is about $1 per kilolitre. ($0.97c)

The TasWater rates multiplied by the annual expected quantity required (200 ML) by the Arm End golf course equates to operational costs of around $200,000 (2017).
For **option #1** above; (Tollard Drive), the supply capacity required for the golf course was available was and a pipeline proposal was established. The concept was to connect into the 300mm water main located on the southern end of Tollard Drive.
The pipeline would require the mutual consent form four private freehold property owners. The concept was to connect into Tollard Drive water main and trench in along the length of Droughty point. The pipe would continue as an anchored sub marine pipe placed on the seedbed of the short marine crossing south from Droughty Point across to the Arm End landform.

This option was **dropped as a potential option.** While three out of the four private property consents were obtained we were **unable to gain approval from** one of the landowners.

For **option #2** above: the existing TasWater infrastructure supply capability on the western side of the Droughty Point landform was not sufficient to supply the Arm End development.

This option while was being encouraged by the single private landowner, was dropped as a viable water supply option as discussions with TasWater indicated severe capacity restrictions and a user pays system employed in order to upgrade the capacity and infrastructure

The demands from both the Arm End project additional to the capacity requirements from the expanding residential developments on the western side, would require **major infrastructure upgrades.** The upgrades were suggested to include new larger pipes from the potential 2-connection location (extent of existing residential development) all the way back close to the Shoreline Shopping center.

### 2.4 Groundwater Investigations.

The prospects of sourcing irrigation quality water from underground is an extremely attractive one for golf courses including Arm End. While the prospects and reward of obtaining the sufficient quality and quantities are appealing the reality in this option has proven to be very risky

The major risk associated with groundwater is when and if the water is identified or detected and accessed the long-term viability of the source is questionable in terms of quality and quantity. Confidence in groundwater sources are only obtained if the source stands up under severe testing and stressing to prove the quality can consistent.

The quantity of water required by a golf course (Arm End requires 200 ML per annum) from all data obtained, has not proven to be viable.

We have engaged consultants to investigate potential ground water as part of the following studies;

#### 2.4.1 Groundwater Assessment #1

Geo-Environmental Solutions – Arm End Golf Course Groundwater Assessment 2012.

As part of the original project scoping and as included in the original Arm End Public Recreational Reserve Clarence City Council Development Application the project engaged specialist geotechnical consultancy Geo Environmental Solutions (GES) to investigate the potential for regional groundwater and opportunities to extract the water.

This scope of the GES report was to assess:

- The quality of groundwater resources on the site.
- The quantity of groundwater available for use.
- Sustainability of the groundwater resource.
- Possible borehole drilling locations

The report identified the following potential recharge basins:

<table>
<thead>
<tr>
<th>Recharge Basin</th>
<th>Primary Aquifers</th>
<th>Aquifer Recharge</th>
<th>Water Quality ppm</th>
<th>Groundwater Yield (l/s)</th>
<th>Relative Storage Potential</th>
<th>Basin Area (Ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RB1</td>
<td>Pux</td>
<td>Infiltration</td>
<td>2900 to 3800</td>
<td>0.1 to 1.5</td>
<td>High</td>
<td>83.31</td>
</tr>
<tr>
<td>RB2</td>
<td>Qhi Qpsb Jd</td>
<td>Overland flow &amp; Infiltration</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Moderate</td>
<td>20.32</td>
</tr>
<tr>
<td>RB3</td>
<td>Qhwd Jd</td>
<td>Overland flow &amp; Infiltration</td>
<td>Unknown</td>
<td>Unknown</td>
<td>Low</td>
<td>6.16</td>
</tr>
<tr>
<td>RB4</td>
<td>Qhwd Qhi Jd</td>
<td>Overland flow &amp; Infiltration</td>
<td>6620</td>
<td>Unknown</td>
<td>Low</td>
<td>5.84</td>
</tr>
</tbody>
</table>

The report concludes that the smaller aquifers will provide limited scope for sustainable yields throughout dry years (RB3 and RB4) and as spring water seeping from RB3 is highly saline, there is limited scope for groundwater resource in this part of the project area.

The larger aquifer RB1 has a relatively large area for recharge and there is a high potential for groundwater storage however salinity may be a limiting factor for the aquifer. The deep-water bores within this aquifer will prove to be sustainable provided that they are not over pumped. Excessive over-pumping is likely to result in a saline wedge intrusion from the Derwent River or Ralphs Bay. Total yields achievable for the RB1 aquifer would be in the order of 83 ML per annum.

The aquifer comprising of RB2 may be worth investigating for water quality. Total yields achievable for the RB2 aquifer would be in the order of 20 ML per annum considering a 20% aquifer recharge rate or 10 ML per annum considering a 10% aquifer recharge rate.

It is recommended that the 10% recharge be used as a basis for determining sustainable yields. This equates to less than 41.5 ML for RB1 (given an allowance for residential extraction) and 10 ML for RB2. The annual water demand for the Arm End Recreation Reserve is expected to be 200 ML.

Given continual pumping of both aquifers, salinity will need a reviewed to determine irrigation sustainability given the existing soil conditions. It will need to determine if these quantities are viable for the irrigation area.

**Summary**

From a business risk and company perspective, the findings of the Geo-Environmental Solutions – Arm End Golf Course Groundwater Assessment 2012 does not provide the confidence as this option as a stand-alone water source. There is potential to use the groundwater as component part of a multi-source water supply.

Risks include:
• salt intrusion and water quality sustainability;
• very low yields during dry years; and
• quality impacts on other existing users.

Additionally, and as a requirement to conduct further intrusive studies including a drilling bores, capital costs for bore infrastructure, stress testing of the groundwater for salt intrusion, eliminates this option from further consideration as a potential stand-alone water source.

The Geo-Environmental Solutions – Arm End Golf Course Groundwater Assessment 2012 report is attached in the Appendices.

2.4.2 Deep Level Groundwater

The Arm End project explored and investigated the potential for deeper level subterranean free water. Our hypothesis was to research the opportunity to located and tap into deep underground streams yielding clean high-volume water of suitable quantity to service the golf course requirements.

Reference materials and citations included:

- Engineering geology of the Greater Hobart Area by P. J. Hofto, D. J. Sloane, and B. D. Weldon

The results for the potential for deeper level groundwater concluded the local area geology was not supportive of deep level groundwater in the region. Included in the finding was that potential water could be expected if geological features such as contacts and or fault lines were found to be running in an east to west direction. The east to west direction would support further investigation based around the likelihood of water flows originating from the higher rainfall areas of the Wellington Range.

The geological studies concluded that the geological features such as contacts and or fault lines were found to be aligned in a north south direction.

The potential for deeper level groundwater has not been considered further due to the discouraging geological features of South Arm-Sandford Area.

Additionally, and as a requirement to conduct further intrusive studies including a drilling deep ground wells, capital costs for well infrastructure, stress testing of the groundwater for salt intrusion, eliminates this option from further consideration as a potential water source.

2.4.3 Groundwater Investigation #2

Encouraged by from an approach from a Hobart geology and engineering firm, Arm End again considered the potential for sourcing groundwater.

The study concluded similar results for our original Geo-Environmental Solutions – Arm End Golf Course Groundwater Assessment 2012. (See above).
The rainfall observations and groundwater recharge rates when considered by local area geology types, suggested that the viability for sustainable harvesting of groundwater was not feasible. Estimated flow rates for previously identified and known aquifers in the area fell well below the required flow rate of 9.3 l/s/pa.

- Estimated in a dry year flow rates = 2.5 l/s
- Estimated average year flow rates = 3.2 l/s

2.4.4 Regional Groundwater Potential

There is evidence of historical and current use of groundwater from shallow interdunal aquifers on the peninsula along the land section of the pipeline. Aquifer testing to confirm aquifer hydraulic properties would be warranted in view of the potential cost-effectiveness of any proven groundwater resource. Close to the mentioned landfall, there is a significant recharge catchment draining to the dunes at Half Moon Bay. The presence of groundwater in this area is confirmed by the 1991 Geological Survey Report in Dropbox. There are over 20 historical bores in South Arm and Opossum Bay, with a maximum yield of 1.5L/s. Groundwater could be either onsite or if sourced remotely, it can be injected into the pipeline. A field of spear point or drilled wells could generate higher yields.

See full report from Impact Blue in DPEMP appendices.

2.5 Desalination / Reverse Osmosis (RO)

Arm End Golf Course will require a reliable, year-round supply of water for irrigation purposes.

With consideration of the water servicing options available to the development, the use of containerised seawater RO plant is one of the few viable water sources available.

Reverse osmosis technology is based on displacing salt water under high pressure (50-70 bar) through reverse-osmotic membrane which passes water molecules through, but doesn’t pass salt molecules.

One of the treatment plants Arm End is considering was originally the pilot plant associated with Veolia Melbourne Desalination Project bid (2011). The plant has subsequently and since been successfully deployed in Christchurch New Zealand for emergency potable water supply following the earthquake in 2013 and is currently in storage.

The treatment capacity of the plant is approximately 0.6 ML/D (~25 kL/hr), although this maybe varied depending on the actual water chemistry and site conditions.

The treatment plant consists of a series of 40’ shipping containers and associated piping and tankage. It is able to be installed with minimal site works within an approximate footprint of 30m x 30m.

The concept for Desalination / Reverse Osmosis (RO) water production would include suitable site location close to the shore to enable seawater intake and brine outfall piping to be minimised. This would be likely to be area close to the proposed maintenance areas and water storage tanks would be ideal, with access to Mitchell's Beach. (refer to site master plan). This location is also hidden from the residents to the south by adjacent landforms, which will provide some acoustic attenuation, reducing any potential noise or visual impact from the plant.
There are a number of options for supplying seawater to the Desalination Plant. Typically, a conventional piped seawater intake is used with a series of screened inlets to minimize impact on local marine life. An alternative approach using “beach wells”, where a number of boreholes are placed into the sandy shoreline may be possible in this location. This would have advantages in terms of marine impact and seawater pre-treatment.

A beach well intake located at the Northern end of Mitchell's Beach has been identified as a preferred intake method. Further investigation into the local geology and access for boreholes would be required.

The reverse osmosis desalination process concentrates the seawater salinity into a brine stream which is then discharged back into the marine environment. This also requires a pipe running off the beach and to a series of diffuser pipes off shore. The diffuser pipes ensure that the concentrated brine is quickly dispersed and must be located in an area of good currents and well away from the intake structure. Any backwash wastewater from the pre-treatment stage would be returned to the sea via the brine concentrate outfall. Other waste waters from periodic chemical cleaning would be taken off site.

The treated water from the desalination process can be used for irrigation purposes, provided that some water quality aspects (e.g., salt levels) are managed for long term viability.

The treated water would not be suitable for potable usage without further post treatment such as disinfection.

The project has thoroughly researched and costed this option. Capital to purchase the required base plant has been quoted as $600,000 - $800,000 plus costs. Further expenses associated with planning, engineering, construction and installation and commissioning is estimated at $400,000.

The desalination plant would require a 415V power supply, with expected power demand up to 150 kW maximum. At 2017 power rates from Aurora and with factors such as Derwent River salinity and temperature factored in, the estimated power rates per kl is about $1.25. Therefore, annual power charges equate to about $250,000.

Operational consumables, such as treatment chemicals and cartridge filters, and maintenance, would be additional to the annual operational costs. Operation costs are estimated to be $35,000 per annum.

In summary, the capital costs expected are $1,000,000-plus, with annual operational cost of around $285,000.

We have further investigated the leasing and or debt servicing options for desalination plants.

Further considerations such as environmental impacts, noise emissions, social acceptance and the precedence for use of Desalination / Reverse Osmosis (RO) systems in an environment such as Tasmania has not been fully studied at this stage.

Desalination / Reverse Osmosis (RO) remains as a viable option for servicing the requirements of the Arm End Development.

Other considerations related to the desalination are the plant locations.

1) Arm End site - The traditional treatment concept would be to use a desalination plant located at Arm End, with a pumped river intake supplying a modular desalination plant. The water quality at this point has been shown to be typical of a mixed estuary with Salinity around 30-33 PSU. Standard plants use large amounts of energy due to the high permeate recovery rates normally sought through the RO membrane.
Alternative approaches include the use of low recovery rate side stream units which reduce operating costs but have higher flow throughput from readily available Derwent waters. Monitoring results available indicate that west of the site is a preferred intake location, compared to north or east in Ralphs Bay.

2) Half Moon Bay - An alternative location for the treatment plant would be near the eastern landfall of the submarine pipe across the River Derwent. This location corresponds to an area of the river that long term water quality monitoring has shown to have water quality in the range 5 to 29 PSU for 2-20 percent of the time. This is believed to be due to fresh groundwater inflows from the peninsula and limited tidal mixing of the seawater and freshwater wedges in this part of the estuary.

Desalination plants operate more efficiently when the intake water is over 20 degrees. Innovative engineering may help with this aspect should we pursue the desalination option. Additionally, the less saline or salt that the desalination plant needs to press out of the intake water has massive production upside. Less salt to take out equals less energy to run the plant.

We have looked at the Derwent River past salinity sampling data and have found some interesting results.

![Figure 5.3 Salinity in a) surface waters and b) bottom waters (Jan 2009 – Dec 2013)](source: Derwent Estuary Program-State of Derwent Report 2015.)
It can be seen from the above that Half Moon Bay (B5) in the lower estuary and Ralphs Bay (RB) are both at times much less saline than the lower estuary in general. For example, the 2-20 percentile range is 5-29 PSU at B5 and 19-26 PSU at RB. This could be significant for event based seasonal pumping to storage for ultimate use in a desalination plant compared to median values of over 31-32 PSU at these locations.

We are aware of other bulk desalinations users, including Nyrstar, are using desal systems to produce suitable water for their operational requirements.

Water is an essential ingredient for not only Arm End but for all life existing on earth. Water is valuable – especially when you don’t have any. Producing water via desalination remains a strong and viable water source.

For additional information associated with Desalination / Reverse Osmosis (RO) systems refer to attachments in Appendix.

2.6 Rainfall and Storage, Stormwater Harvesting.

See the details for Opossum Bay below - observations tables taken from the Bureau of Meteorology, (BOM).

- Rainfall
- Temperature
- Solar Exposure (evaporation)

Rainfall: Observations of daily rainfall are nominally made at 9 am local clock time and record the total for the previous 24 hours. Rainfall includes all forms of precipitation that reach the ground, such as rain, drizzle, hail and snow.

<table>
<thead>
<tr>
<th>Summary statistics for all years</th>
<th>Information about climate statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statistic</td>
<td>Jan</td>
</tr>
<tr>
<td>Mean</td>
<td>43.7</td>
</tr>
<tr>
<td>Lowest</td>
<td>1.8</td>
</tr>
<tr>
<td>5th %ile</td>
<td>9.3</td>
</tr>
<tr>
<td>10th %ile</td>
<td>13.0</td>
</tr>
<tr>
<td>Median</td>
<td>33.7</td>
</tr>
<tr>
<td>90th %ile</td>
<td>84.2</td>
</tr>
<tr>
<td>95th %ile</td>
<td>100.5</td>
</tr>
<tr>
<td>Highest</td>
<td>145.4</td>
</tr>
</tbody>
</table>

Temperature: The monthly mean maximum temperature is the average of all available daily maxima for the month. The Daily maximum air temperature is nominally recorded at 9 am local clock time. It is the highest temperature for the 24 hours leading up to the observation and is recorded as the maximum temperature for the previous day.

<table>
<thead>
<tr>
<th>Summary statistics for all years</th>
<th>Information about climate statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Statistic</td>
<td>Jan</td>
</tr>
<tr>
<td>Lowest</td>
<td>20.2</td>
</tr>
<tr>
<td>Highest</td>
<td>22.6</td>
</tr>
</tbody>
</table>

Solar Exposure: The Daily global solar exposure is the total solar energy for a day falling on a horizontal surface. It is measured from midnight to midnight. The values are usually highest in clear sun conditions during the summer and lowest during winter or very cloudy days.
Solar exposure at the site tends to follow a consistent annual sinusoidal pattern, with January having the most exposure and June having the least. **As solar exposure is the primary element which influences evaporation**, it can be inferred that the months that have the greatest groundwater recharge occur between June and August where solar exposure is relatively low where evaporation is kept to a minimum. The month of May also has relatively low solar exposure, however as rainfall is typically very low, there is limited potential for groundwater recharge.

### Summary statistics for all years

<table>
<thead>
<tr>
<th>Statistic</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>23.3</td>
<td>19.5</td>
<td>14.4</td>
<td>9.2</td>
<td>6.0</td>
<td>4.5</td>
<td>5.3</td>
<td>8.3</td>
<td>12.4</td>
<td>16.9</td>
<td>20.4</td>
<td>23.3</td>
</tr>
<tr>
<td>Highest monthly mean</td>
<td>26.4</td>
<td>22.6</td>
<td>17.2</td>
<td>11.0</td>
<td>7.1</td>
<td>5.7</td>
<td>6.4</td>
<td>10.8</td>
<td>14.8</td>
<td>19.4</td>
<td>24.5</td>
<td>28.1</td>
</tr>
<tr>
<td>Lowest monthly mean</td>
<td>19.0</td>
<td>16.8</td>
<td>9.7</td>
<td>8.1</td>
<td>5.2</td>
<td>3.5</td>
<td>4.1</td>
<td>7.0</td>
<td>11.0</td>
<td>14.9</td>
<td>14.1</td>
<td>19.7</td>
</tr>
</tbody>
</table>

The South Arm Peninsula is a dry environment. The SAP receives below average rainfall, among other climatic influences, due to being in the rain shadow created by Mt Wellington and the dominate westerly wind patterns.

Annual mean rainfall observations for Opossum Bay are 547.7 mm. Together with seasonal variations (315mm per annum) and solar exposure (evaporation) the prospect or catchment of water via rainfall and ground runoff is quickly established as not being a feasible or sustainable water source option. The rainfall to water storage balance is extremely disproportionate in terms of reserve water to manage year-round irrigation demands. From the 547.7mm annual rainfall (not allowing for seasonal and dry years) the required water storage size and volume would be approximately 15 ha (*)

The level of availability of storm water runoff at Arm End could be assessed using a daily rainfall runoff model with parameter selection to reflect the likely high infiltration to site groundwater. Golf water features (lined) could be used to store any such surface runoff from storm events. The course inground drainage network can be used to more efficiently convey runoff to a single designated dam storage than may occur under existing conditions.

This study included considerations and potential surface water runoff and catchments into storage dams. **The results concluded**, due to limited and seasonal rainfall observations compared to the water demands during peak periods of irrigation, **to be not feasible**. The **areas and volumes of storage required** to capture and maximise rainfall events were massive – 250 ha (site area is 116 ha).

Solar exposure (evaporation) was not considered here as base level variables did not support this form of water servicing. The influence of solar exposure would further push this option below the line as an acceptable solution. Evaporation rates for open water bodies in Hobart are 1308 mm per year.

Roof runoff will be collected from all buildings. These are sufficient to provide for the potable water needs of the site subject to dedicated tanks and adequate disinfection.

(*) conversation / discussion estimate from GHD engineering over a coffee. (i.e. not feasible)

### 2.7 Truck

Typical Rates for delivery by road tanker to Opossum Bay are currently about $140 for 15,000 litres. This equates to $9.30 per kL.
Annual operational budget requirements for the irrigation water demands (200 ML) serviced by this option are $1,860,000 per annum.

While a TasWater potable water source exists at Lauderdale, it is unlikely to address any of the water servicing irrigation demand requirements for cost and logistical reasons. Tankers are limited to 10,000 litres per load and around 15 trucks, operating a one-hour turnaround service from Lauderdale, would be required to deliver each megalitre of water. Cost could exceed $6,000 per day. This may be a viable option for occasional potable water to supplement site rainwater tanks.

**Cost prohibitive and the option is eliminated and considered as not suitable** for the golf course irrigation demands.

### 2.8 Solar / condensation.

Other potential forms of water sources were considered including solar evaporation (of seawater) and condensation via solar thermal arrays.

This option was not considered feasible due to the massive land area of the infrastructure required to produce the irrigation demands of the golf course. Additionally, the limitations of daylight (need to produce all water requirement in daytime hours) and specifically the Solar Exposure of the Tasmanian latitude required to create the evaporation effects – make this option unviable.

### 2.9 Combination.

The annual irrigation demands for the golf course will approach two hundred million (200,000,000) litres of water per year; 200 Meg Litres

It certainly is feasible to supply 200 ML sourced from a combination of the above viable sources.

Water sourcing options available include;

- Groundwater
- Rainfall catchment.
- Desalination
- Truck.

The Blackmans Bay pipeline is not considered here as a source that will contribute to the water demands. It is assumed that if a pipeline becomes a source of supply, it will be a single source supply, designed and engineered to deliver 100% of the 200 ML per annum requirements.

The significant costs associated with construction of pipeline and infrastructure to deliver any water across to the Arm End site (and SAP) would not make it economically sensible to consider further additional infrastructure cost for other combination water sources.
2.10 Servicing Options Study and Assessment.

Arm End with large expanses of turf and a massive native revegetation program is particularly well-suited to a recycled water irrigation program. Recycled water management controls are of utmost importance to ensure only positive impacts result for use of this valuable resource.

Irrigation for Arm End and other agricultural users on South Arm Peninsula with recycled water from Blackmans Bay is an intelligent use of a readily available and valuable commodity - presently being dumped into the Derwent River.

From the above sections investigating the water servicing option for Arm End we have concluded that only two sources studies remain feasible and economically viable.

- Re-use Water Pipeline from Blackmans Bay
- Desalination / Reverse Osmosis (RO)

Understanding the various factors and influences include:

- infrastructure complexities
- capital costs
- operational costs
- sustainability
- associated risks
- environmental impact
- quality and quantity

For the above studied source options, it is important to clearly establish and determine the Blackmans Bay recycled water pipeline option as the best, logical, economically and absolutely sustainable water source.

The concept to service the Arm End water requirements via a pipeline connecting into TasWaters existing outfall infrastructure at the Blackmans Bay Water Treatment Plan and running on the riverbed of the Derwent River Estuary to the South Arm Peninsula is the assumed water source for the Arm End.
<table>
<thead>
<tr>
<th>Considerations</th>
<th>Re-use Water Pipeline from Blackmans Bay</th>
<th>Desalination / Reverse Osmosis (RO)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average cost per kilo litre used</td>
<td>Low (assume operational costs @ $50K)</td>
<td>Very high (x6 more)</td>
</tr>
<tr>
<td></td>
<td>0.25 cents per k/l</td>
<td>1.5 cents per k/l</td>
</tr>
<tr>
<td>Supports shared users - multi</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Regional economically benefit</td>
<td>yes</td>
<td>Some via Arm End</td>
</tr>
<tr>
<td>Supports Agricultural development</td>
<td>yes</td>
<td>no</td>
</tr>
<tr>
<td>Management governance</td>
<td>same</td>
<td>same</td>
</tr>
<tr>
<td>Energy rating</td>
<td>Very low</td>
<td>Very high</td>
</tr>
<tr>
<td>Environmentally impact</td>
<td>Positive overall impact</td>
<td>Negative overall impact</td>
</tr>
<tr>
<td>Quantity</td>
<td>Not restricted</td>
<td>Extremely limiting</td>
</tr>
<tr>
<td>Capital cost</td>
<td>estimate $ 3.5 M (stage 1)</td>
<td>$1.8 M plus</td>
</tr>
<tr>
<td>Operational cost per annum.</td>
<td>$40K</td>
<td>$200k</td>
</tr>
<tr>
<td>Maintenance rating</td>
<td>Low</td>
<td>High / consumables and energy</td>
</tr>
<tr>
<td>Operational risk rating</td>
<td>Very Low – with controls</td>
<td>Medium to high (complex plant)</td>
</tr>
<tr>
<td>Supports employment increase</td>
<td>yes</td>
<td>marginal</td>
</tr>
<tr>
<td>Planning and approvals summary</td>
<td>precedents for similar concepts</td>
<td>Unapproved – unprecedented in Tasmania</td>
</tr>
</tbody>
</table>
2.11 Conclusion

The proposal to use this currently wasted water source from Blackmans Bay makes sense on many levels.

The studies, research, investigations and engineering advice all suggest a fully feasible and sustainable water source.

Wastewater is the only water resource of which volume increases proportionally to economic development and consumption.

Water reuse is the use of treated wastewater for beneficial purposes other than the initial use.

Implementing water reuse technologies help optimise their water costs and minimise their environmental impact.

With the high cost of transporting water, Technologies are helping more municipalities around the world turn to water reuse technologies to:

- support agricultural irrigation
- water community areas and parks
- wash streets
- maintain and develop their tourism industry
- protect the environment

Water Reuse Applications include:

- watering green spaces and golf courses.
- ground water storage and recovery and salt intrusion barriers in coastal communities.
- agricultural opportunities
The Reuse Water Pipeline; Blackmans Bay Water Treatment Plant to South Arm is absolutely 100% sustainable.

When assessed according to the triple bottom line model (as diagrammatically outlined above) - sustainability is the optimal outcome for any proposal.
3. South Arm Recycled Water Pipeline

3.1 Introduction

A major benefit of effluent reuse by irrigation is the decrease in wastewater discharges to natural waterways. When pollutant discharges to waterways are removed or reduced, the pollutant loadings to these waters are decreased. Substances that can be pollutants when discharged to waterways can be beneficially reused for irrigation. For example, plant nutrients such as nitrogen and phosphorus can stimulate harmful algal blooms in waterways but are a valuable fertiliser for crops.

The reuse of effluent by irrigation can make a significant contribution to the integrated management of our water resources. When the water and nutrients in effluent are beneficially utilised through irrigation some of the water extracted from rivers can be replaced and the amount of pollutants discharged into our waterways can be reduced.

Recycled municipal water is a relatively inexpensive, reliable, continuous source of irrigation water for golf courses, which have large expanses of turf that can absorb relatively large amounts of nitrogen and other nutrients often found in recycled water.
Above; Overall Plan of the proposal. (to ensure version quality control- See the full detailed concept drawing set in the DPEMP appendices).
The proposal has been designed to be constructed in **two stages**.

Stage one includes;
- Blackmans Bay (TasWater site) connection and pumping and buffering tank infrastructure.
- Pipeline across Derwent River
- South Arm booster station.
- Pipeline running north to the Arm End site

Stage two includes;
- Pipeline running South to Iron Pot Golf club
- Connection of other users to both north and south sections including Ian Grubb.
- Potentially addition of further water treatment (filtration and UV)

### 3.2 What is recycled or reuse water?

Recycled or reuse water is any water that has undergone one cycle of use, and after treatment, is suitable for limited reuse, including irrigation. Recycled water can also be referred to as reuse water, reclaimed water, wastewater, effluent water, treated effluent water and treated sewage water.

Recycled water may be primary, secondary or advanced (also called tertiary) treated municipal or industrial wastewater. Primary treatment is generally a screening or settling process that removes organic and inorganic solids. Secondary treatment is a biological process in which complex organic matter is broken down and metabolized by simple organisms, which are then removed.

Advanced or tertiary wastewater treatment consists of processes similar to those used to prepare potable water and may include chemical coagulation and flocculation, sedimentation, filtration or adsorption of compounds by a bed of activated charcoal or polymers.

Water recycling is becoming a critical element for managing our water resources. By safely irrigating recycled water, sustainable development can be achieved while conserving our high-quality water supplies. Being able to access alternative safe water sources for agriculture is particularly critical in times of drought.

By providing an additional source of water, recycling can help to decrease the diversion of water from sensitive river and wetland ecosystems.

A major benefit of effluent reuse by irrigation is the decrease in wastewater discharges to natural waterways. When pollutant discharges to waterways are removed or reduced, the pollutant loadings to these waters are decreased. Substances that can be pollutants when discharged to waterways can be beneficially reused for irrigation. For example, plant nutrients such as nitrogen and phosphorus can stimulate harmful algal blooms in waterways but are a valuable fertiliser for crops.
Many water needs can be satisfied with recycled water as long as it is adequately treated to ensure water quality is appropriate for the proposed use. Greater treatment and management is required for uses where there is a greater chance of human exposure to the recycled water.

Effluent can pose environmental, public health or agricultural resource risks if not managed appropriately and the information in this document will support the establishment of safe effluent irrigation reuse schemes.

Water recycling has proven to be effective and successful in creating a new and reliable water supply, while not compromising public health. Effluent reuse by irrigation is now an accepted practice that will play a greater role in our overall water supply in the future.

The reuse of effluent by irrigation can make a significant contribution to the integrated management of our water resources. When the water and nutrients in effluent are beneficially utilised through irrigation some of the water extracted from rivers can be replaced and the amount of pollutants discharged into our waterways can be reduced.

Most state legislators have adopted a policy of encouraging the beneficial use of effluent where it is safe and practicable to do so and where it provides the best environmental outcome.

The use of reuse water for irrigation in non-domestic irrigation situations is the only option addressed in this document. **This document does not consider uses of recycled water for purposes other than for irrigation**

### 3.3 Blackmans Bay Water Treatment Plant – TasWater Upgrade

The Blackmans Bay WTP upgrade project and information is detailed in; the Appendix; Blackmans Bay WTP Upgrade DPEMP.

TasWater is currently upgrading the existing Blackmans Bay Sewage Treatment Plant (STP) as part of the overall Kingborough Sewerage Upgrade Project.

This existing STP has been operating for 30 years and is nearing the end of its service life.

The upgrade will improve its environmental performance, bringing it in line with modern standards and allowing TasWater to enhance the Kingborough sewerage system.

The upgraded Blackmans Bay STP will offer a significant improvement in odour and noise in comparison to the existing STP and increase capacity to treat a higher volume of sewage to a better quality with more reliability.

The capacity of the STP will be more than doubled, from being able to receive an average of 4.1 mega litres per day to 8.5 mega litres.

By upgrading a plant that is 30 years old, TasWater will be able to introduce newer technology to improve its performance.

Construction includes earth works, new roadways, new buildings and new tanks as well as equipment installation and commissioning.

The Blackmans Bay STP will continue to operate throughout the upgrade.

The current STP cannot be seen by most of the surrounding residents and TasWater intends this to continue. The new STP will be built into the hill side to minimise its visual impact and a
new vegetation screen will be planted along the western boundary to provide screening for nearby residents and members of the community who enjoy walking in the area.

The upgraded Blackmans Bay Sewage Treatment Plant (STP) will treat increased volumes of sewage and the overall quality of all effluent will be significantly improved.

The outfall site is within a sandy habitat and any potential impacts from discharged effluent are expected to be restricted to within several metres either side of the diffuser at the end of the pipe. There is no sensitive marine life identified within the broader mixing zone beyond the pipe.

TasWater monitoring of water quality will be undertaken at 15 sites during pre-commissioning and commissioning, during the first year of operation and annually thereafter.

3.4 suitability for use.

Each type of re-use has its own particular water quality requirements to ensure that the use is sustainable and that no adverse effects result from the re-use. It is convenient to consider quality either in terms of health or environmental aspects, although for some quality indicators (for example toxicants), these considerations may overlap.

Successful irrigation management at a golf course requires regular monitoring of both soil and water chemistry, especially salt content. It also requires knowledge of local soil conditions, primarily soil texture and drainage characteristics and the salinity tolerance of the plants being grown.

The goal is to maintain soil salinity at levels that provide adequate growing conditions for the turf so that the turf provides marketable playing conditions.

“Recycled municipal water is a relatively inexpensive, reliable, continuous source of irrigation water for golf courses, which have large expanses of turf that can absorb relatively large amounts of nitrogen and other nutrients often found in recycled water.”.

The major uses of treated wastewater and associated application methods and minimum disinfection requirements are shown in in the table below.
<table>
<thead>
<tr>
<th>Use of Wastewater</th>
<th>Mandatory Effluent Quality</th>
<th>Mandatory Treatment Requirement</th>
<th>Options for Wastewater Re-use</th>
<th>Suggested Treatment Measures</th>
<th>Monitoring</th>
<th>Management Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class A Recycled Water</td>
<td>&lt; 10 median thermotolerant coliforms per 100ml</td>
<td>Advanced treatment with disinfection</td>
<td>Indirect potable groundwater recharge by spreading</td>
<td>Treatment – Coagulation, flocculation, advanced filtration and other best practice treatment processes to remove nutrients, sediments and other contaminants</td>
<td>pH – weekly, BOD – weekly, SS – weekly, Disinfection – daily, Turbidity and chlorine residual – continuous, Coliforms – daily, Virus and parasites – twice yearly, Nutrient, toxicant and salinity – regularly</td>
<td>Municipal uses may include irrigation of open spaces, sports grounds, parks, dust suppression and land rehabilitation areas. The system must be managed to prevent spray drift. No spray drift must be detected beyond the boundaries of the irrigation area.</td>
</tr>
<tr>
<td>Class B Recycled Water</td>
<td>&lt; 1,000 median thermotolerant coliforms per 100ml (&lt; 100 thermotolerant coliforms per 100ml in special cases *)</td>
<td>Secondary treatment with disinfection</td>
<td>Crops for human consumption: Crops to be consumed raw but not in direct contact with reclaimed water (edible product separated from contact with effluent, eg. By peel or use of trickle irrigation) or crops sold to consumers cooked or processed. Pasteure and fodder (no pigs or poultry) for grazing animals withholding period applies – 5 day for dairy, 4 hour for non-dairy Industrial processes (open system) Non-potable municipal irrigation with controlled access. Note: * &lt;100 thermotolerant coliforms per 100ml (stock drinking standards) applies for pasture and fodder crops (dairy and non dairy) without withholding period.</td>
<td>Treatment – High rate processes such as activated sludge, trickling filters. Lagoon treatment with separate polishing lagoons is acceptable for &lt;100 thermotolerant coliforms per 100 ml.</td>
<td>pH – weekly, BOD – weekly, SS – weekly, Turbidity – continuous in high rate processes, Disinfection – daily, Coliform – weekly, Nutrient, toxicant and salinity – regularly. Monthly monitoring for re-use schemes less than 1 Ml/day</td>
<td>The system must be managed to prevent spray drift. No spray drift must be detected beyond the boundaries of the irrigation area. Dropped crops not to be harvested from the ground. Crops contacted by effluent must be cooked (&gt;70°C for 2 minutes), commercially processed, or ponded before consumption, Restricted public access. Withholding period of nominally 4 hours or until irrigated area is dry. Withholding period 5 days for grazing animals.</td>
</tr>
<tr>
<td>Class C Recycled Water</td>
<td>&lt; 10,000 median thermotolerant coliforms per 100ml (pH 5.5 – 8.0 BOD &lt; 50mg/l, Nutrient, toxicant and salinity controls)</td>
<td>Secondary treatment</td>
<td>Agriculture (non-human food chain eg, forestry, cotton) Industrial processes (closed system) Non-human food chain aquaculture</td>
<td>Lagoon based systems No additional disinfection required</td>
<td>pH – monthly, BOD – monthly, SS – monthly, Disinfection daily except for 30 day maturation ponds Coliform – weekly, Nutrient, toxicant and salinity – regularly. Quarterly monitoring for re-use schemes &lt; 1 Ml/day</td>
<td>The system must be managed to prevent spray drift. No spray drift must be detected beyond the boundaries of the irrigation area. Restricted public access. Withholding period of nominally 4 hours or until irrigated area is dry. No human food chain crops.</td>
</tr>
</tbody>
</table>
Irrespective of use, minimisation of risk to the public and the environment requires that recycling of wastewater must comply with following performance requirements:

- use of wastewater for direct domestic potable purposes is not permitted
- primary treated wastewater is not considered acceptable for irrigation re-use in Tasmania
- wastewater may only be used where the quality achieves the level required for that particular beneficial use
- maintenance of high levels of pathogen reduction is required to safeguard health where domesticated grazing animals are present or public access is possible
- the impacts of nutrients and other substances on the soil, water and plant environment need to be assessed and managed by the user to avoid adverse impacts.

3.5 Irrigation Environmental Management Plan

The Irrigation Environmental Management Plan (IEMP) (included in appendices) for a re-use water scheme is the basic mechanism for ensuring that the proponents of the re-use scheme have addressed all of the relevant issues to ensure that the objectives are achieved, and that there is agreement on the key management prescriptions.

IEMPs must supply adequate detail on the design and implementation of all the environmentally relevant activities and management practices for a proposed wastewater re-use scheme.

The IEMP will also provide a framework for annual monitoring of the ongoing sustainability of the wastewater re-use project. Therefore, the IEMP documents must be clearly understood, applied and accessed by the operators, managers and the public.

The proponent has engaged Macquarie Franklin to investigate the specific application and proposal.

The Irrigation Environmental Management Plan (IEMP) is included in the DPEMP appendices.

Macquarie Franklin specialises in economic studies and business and resource management including feasibility studies, irrigation and water development, land capability and mapping, natural resource management, training and extension, and technical agricultural consulting.
Taken from the IEMP is the Executive Summary. The Full IEMP is included in the appendices.

Executive summary

The proposed Arm End Public Recreation Reserve (AEPRR) and Golf Course Development includes an 18 hole golf course, of approximately 40ha of fairways and greens, within a 112ha recreation reserve. With no local water supply adequate to meet the irrigation demand of the golf course, it is proposed that a pipeline constructed across the Derwent River will convey Class B recycled water sourced from the TasWater Blackmans Bay Sewage Treatment Plant (STP) to the South Arm Peninsula.

This IEMP has been developed specifically for the AEPRR site and describes how and where recycled water will be used. This plan, developed in accordance with the Environmental Guidelines for the Use of Recycled Water in Tasmania (DPIWE, 2002), describes the measures to be implemented to protect public health and manage environmental sustainability. This document will be used as the basis for ongoing environmental monitoring (related to recycled water) and future auditing of recycled water activities on the site.

The site’s topography is characterised by lower lying, gently sloping and undulating land to the south, with elevated and rolling ground to the north, and moderate to steep slopes and cliffs associated with ground around White Rock Point, Mary Anne Bay and Gellibrand Point. The soils and geology of the site are divided between the clay soils on Jurassic Dolerite geology from Mary Anne Bay north with sandy soils derived from alluvial sediments covering the balance of the land to the south. The site receives on average 535mm annual rainfall which is relatively evenly spaced throughout the year, and experiences 1,325mm evaporation. Based on the topography, soils and environment the AEPRR site has been assessed as is suitable for irrigation with recycled water.

Following construction of the Derwent pipeline and supply infrastructure to the AEPRR site it is likely that additional properties will be connected to this recycled water supply. The likely future irrigation properties are identified on Appendix B. This broader recycled water scheme would require construction of a recycled water storage dam and development and approval of individual IEMPs for each individual site.
3.6 Sustainable Development

Fundamental to meeting sustainability objectives is the concept of sustainable development. Tasmania’s Resource Management and Planning System (RMPS) objectives define sustainable development as:

Managing the use, development and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic and cultural well-being and for their health and safety while:

- sustaining the potential of natural and physical resources to meet the reasonably foreseeable needs of future generations
- safeguarding the life-supporting capacity of air, water, soil and ecosystems
- avoiding, remedying or mitigating any adverse effects of activities on the environment.

The Recycled Water Pipeline to South Arm Peninsula both for construction and operation will meet all of these criteria.

Two key components of the RMPS are the:

- Environmental Management and Pollution Control Act 1994 (EMPCA) and the

The objectives of the environmental management and pollution control system established under EMPCA include prevention of;

"...environmental degradation and adverse risks to human and ecosystem health by promoting pollution prevention, clean production technology, re-use and recycling of materials and waste minimisation programmes..." (Schedule 1, EMPCA).

The State Policy on Water Quality Management 1997 encourages the recycling and re-use of wastewater and, where appropriate, the irrigation of wastewater to land to maximise its beneficial use while protecting the quality of surface waters.

3.7 Stakeholder Support

3.7.1 Potential Local Users

The proponent, in 2015, sought out the larger regional land owners in order to understand the potential users in the area by way of letters sent;

To assist in our discussions with government and other parties we are seeking to gain a collective view of the potential demand for irrigation quality reuse water to be supplied to the South Arm area.
Our proposal to supply reuse irrigation water to Arm End is to install a pipeline, across the Derwent River from the TasWater Blackman Bay Water Treatment Plant. The reuse water is of a quality suitable for irrigation. The use of the water would be controlled under appropriate management plans. It should be noted that at this stage any potential water servicing solution would be for commercial users only.

This “Expression of Interest’ form is being distributed to potential commercial operations in the South Arm region. I have sent this letter out to a total of 11 potential users in the South Arm Area.

By completing this form, you are not committing your business or organisation to buy recycled water. This is an expression of interest process only. By completing this form, you are however agreeing for these details, if required, to be passed on representatives of the Tasmanian Government and TasWater.

Please give me a call to discuss any part of this EOI and or the reuse water concept. I look forward to hearing back from you.

- Nature of your operation?
- For what purposes would your operation benefit from recycled water? I.e. what does it enable you to do.
- What is the potential financial value of additional productivity or activity from recycled water (average $ per annum)
- How many new jobs could be potentially created if recycled water was available to your business or organisation? Please express this as full time equivalent positions.

The results of the above survey (note only 5 returns from 11 sent) can be found in the DPEMP appendices however in summary replies amounted to (in summary):

- 9 FTE jobs.
- $500,000 potential financial value of additional productivity or activity.

We also had the following reply email from one of the larger land owners (*):

Hi Craig

Further to our phone conversations, I would just like to reiterate the many benefits that a permanent and consistent supply of water would bring to the Agricultural industries in Opossum Bay and South Arm. Ventures that I am aware of include Ian Grubb’s Protea and vegetable farm at Half Moon Bay, the growers of potatoes and other vegetable crops such as Colin Gumley and Rex Richardson, and David Calvert’s sheep farm, all based in Opossum Bay itself. Personally, I have the following crops growing on my farm in Opossum Bay: garlic, and cauliflower and fennel for seed. I am currently trialling the production of cantaloupes, and the success of this venture is dependent on the security of a reliable water supply. My ventures are only small scale at the moment, given the lack of
access to good water. I have the land to expand production of these crops, as well as diversify into other crops, but I have limited access to ground water, which has a salt content that is not compatible with a lot of other crop options that I would like to investigate. I believe that the potential for increased Agricultural business in Opossum Bay would lead to an increase in seasonal employment of possibly up to 30 – 50 people (I currently employ less than 15). It would also assist in ensuring that farm land does not lie fallow and uncared for, but is productive and well maintained as a consequence, including improved weed and vermin eradication.

I would be grateful if you could include this information in any submissions made for the establishment of a permanent water supply for the Arm End Golf Course to demonstrate that the benefits would extend to other residents and business ventures on the South Arm Peninsula. If you require any more information, please do not hesitate to contact me.

(*) the above was received from John Wheeler (dec). Tragically and suddenly John passed away in 2016. John is sadly missed.

He was a massive supporter of the irrigation water proposal and was active in his support for the opportunity both for his property as well as others. The property has now been sold and it is unknown what will become of the fertile paddocks John had tended.
3.7.2  State Government

The proponent has, over the past months, met and briefed many stakeholders, including the following State Government Ministers and other politicians in relation to the South Arm Recycled Water Pipeline;

- Sarah Lovell - Legislative Council
  Sarah Lovell (Labor member for Rumney), Shadow Minister for Workplace Relations, Mental Health and Small Business.

- Jeremy Rockliff
  Deputy Premier, Minister for Education and Training, Minister for Infrastructure, Minister for Advanced Manufacturing and Defence Industries

- Jacqui Petrusma
  Minister for Aboriginal Affairs
  Minister for Disability Services and Community Development
  Minister for Sport and Recreation
  Minister for Women

- Will Hodgman
  Premier
  Minister for Heritage.
  Minister for Parks.
  Minister for Tourism, Hospitality and Events.
  Minister for Trade.

3.7.3  Environment Protection Authority (EPA) Tasmania

As an initial step in the planning and approvals process, following from concept design, was to inform the EPA Tasmania of our intentions. The proposal and information was submitted to the EPA via a Notice of Intent (NoI).

The statutory assessment process commences with the submission of a Notice of Intent by the proponent.

The NoI is prepared by the proponent and provides an overview of the proponent, the proposal, proposal location and potential impacts that may be caused by the proposed activity. The NoI enables the Board of the Environment Protection Authority to determine the class of assessment and to develop guidelines for preparation (by the proponent or a consultant engaged by the proponent) of the case for assessment.

The submitted NoI can be found in the appendices.

The Response from the EPA is below:
I refer to the Notice of Intent for the above proposal, which was lodged with the Board of the Environment Protection Authority (the Board) on 9 February 2018.

I am of the view that the above proposal does not require assessment by the Board under the Environmental Management and Pollution Control Act (1994) (EMPC Act). The reasons for my opinion are as follows;

The Notice of Intent indicates that a pipeline is proposed to be laid across the Derwent River from the Blackmans Bay Sewage Treatment Plant to South Arm Peninsula at Halfmoon Bay. It is understood that Horizontal Direct Drilling will be used to install up to 400 m of the pipeline from the respective terrestrial connections, thus avoiding intertidal and sensitive habitat.

Based on the information provided in the Notice of Intent and supporting information, I am satisfied that the activity does not constitute a 'Level 2 activity' under Section 7(e) of Schedule 2 of the EMPC Act (Conduct of Certain Activities in Waters Within the Limits of the State).

Accordingly, no further action will be taken by EPA Tasmania on the Notice of Intent at this stage.

Please be aware however, that assessment and approval may be required from Clarence Council, Kingborough Council, and Parks and Wildlife Service, inclusive of Crown Land Services. It is recommended that you consult with the above agencies to determine the appropriate approval pathways.

Finally, please note that the above opinion is based on the information provided in the Notice of Intent and supporting information. If details of the proposal change significantly, you should seek my advice before proceeding.

3.7.4 Local Councils

Operation of wastewater re-use schemes may involve the following responsibilities for local government.

- All wastewater re-use proposals must be discussed in the first instance with the local Council as the planning authority for the area to determine if a formal development application is required. All wastewater re-use proposals with level 2 activities acting as the supplier must also contact Environment Division to determine the approval process and requirements.

- Where the wastewater is being generated from a plant that is not a level 2 activity (and therefore, is not regulated by the Environment Division) the local Council will have a role in ensuring that the reuse scheme is operated in accordance with an
agreed management plan or set of parameters to protect human health and the environment.

- If local government is the supplier of wastewater to a re-use scheme, or a re-user, it may be subject to a 'supplier-user' contractual agreement. Compliance with the agreement, particularly on issues such as end use of wastewater, must be ensured by the supplier.
- If local government is a user of wastewater, it may itself be responsible for ensuring that the re-use is carried out in accordance with a management plan and any regulatory requirements.
- Local government also administers public health and food safety legislation that requires that activities such as effluent re-use do not cause public harm and that all food produced for human consumption is safe to eat.

3.7.5 Kingborough

Pre-lodgement consultations advice / information from Kingborough Council includes;

The treatment plant at 116 Tinderbox Road is zoned Utilities under the Scheme. We understand that the pipeline would exit to the east over land zoned Environmental Living and would then enter the Environmental Management Zone after high watermark. It appears that the Council’s jurisdiction extends approximately 15m past high watermark, so the pipeline would need to be assessed under all 3 zones.

The use would be defined as ‘Utilities’ under the Scheme, which is a permitted use in a Utilities Zone, and a discretionary use in an Environmental Living Zone and Environmental Management Zone.

We don’t anticipate that there would be any particular issues that would arise through assessment against the standards of the respective zones.

The following Codes would apply to varying degrees:

- Biodiversity Code
- Coastal Erosion Hazard Code
- Landslide Code
- Waterway and Coastal Protection Code
- The Attenuation and Inundation Prone Areas codes

Lands administered by TasWater, Kingborough and Clarence Councils form part of the route as proposed, the consent of the respective General Manager would be required to the lodgement of the application.
Clarence City Council is active in encouraging business investment and has the appropriate land use planning schemes and associated zonings in place to assist growth and expansion.

CCC agricultural district has sustainable competitive advantages, including the capacity of the land for intensive agriculture, access to irrigation, and proximity to Hobart airport, seaport, and metropolitan Hobart populations.

The introduction of Irrigation Schemes greatly increased the available agricultural options. Irrigated cash crops have expanded annually since the schemes commenced and further development is expected.

"Reuse schemes provides a low-cost supply that is highly reliable - even during periods of drought. The Water Scheme recycles treated waste water from urban areas that was previously disposed. The scheme has a wide range of end users including agricultural irrigators and amenity irrigators such as golf courses."

The supply of recycled water is reliable to the end user, being a by-product of regular domestic consumption of the urban community. The recycled water has a wide range of end uses, including pasture, wheat/barley, seed crops, lucerne/oats, vines/fruit, turf, nursery trees, and amenity trees. Other opportunities include use in light industrial processes and the irrigation of recreation areas. The recycled water supply will be available at low cost and enables end users to make choices in regard to the water source used for different production applications. The schemes result in the saving of thousands of megalitres of potable water each year.

The cool temperate climate makes it ideal for production of a wide range of agricultural crops and there is considerable scope for growth in intensive agricultural production for local and export markets. The globalisation of agricultural and food markets and the liberalisation of world trade has created a whole new competitive environment for primary producers, food manufacturers and retailers throughout the world.

- Pre-lodgement consultations and advice / information from Clarence City Council includes:

Zoning and use.: Under the Clarence Interim Planning Scheme 2015 the zone provisions relevant are those of the:

- Open Space Zone (use: utilities are discretionary)
- Village Zone (use: utilities are discretionary)
- Rural Resource Zone (use: utilities are discretionary)

Also, under the Clarence Interim Planning Scheme 2015 the code relevant are those of the

- Bushfire Prone Areas Code
- Coastal Erosion
• Hazard Area Code
• Inundation Prone Areas Code
• Natural Assets Code and the
• Waterway and Coastal Protection Code

As part of Council’s statutory assessment timeframe public notification of the development application would be required.

Relevant and Specific CCC interim planning scheme sections include;

1) Clarence Interim Planning Scheme 2015 » Part E Codes » E11.0 Waterway and Coastal Protection Code » E11.7 Development Standards » E11.7.1 Buildings and Works

E11.7.1 Buildings and Works

Objective:
To ensure that buildings and works in proximity to a waterway, the coast, identified climate change refugia and potable water supply areas will not have an unnecessary or unacceptable impact on natural values.

See included:
Addendum 01 Waterway and Coastal Protection Code E11.7.1 CCC IPS

And

2) Clarence Interim Planning Scheme 2015 » Part D Zones » 29.0 Environmental Management Zone » 29.3 Use Standards » 29.3.1 Use Standards for Reserved Land

29.3.1 Use Standards for Reserved Land

Objective:
To provide for use consistent with any strategies for the protection and management of reserved land.

Proponent Comment:
The development and operational phases of the pipeline through assessment by Parks Via the RAA process (level 3) demonstrates compliance to values of reserved land.

The reserved land areas being the Opossum Bay Marine Reserves as well as the Gellibrand Point NRA have both been assessed and granted Land owner consent (Crown) to lodge the DA to CCC.

CCC and Parks RAA assessment team teams are expected to communicate to ensure use consistent with any strategies for the protection and management of reserved land.
For the Gellibrand Point NRA the Crown has previously granted the proponent a lease to develop the site with specific terms and conditions.

For the Opossum Bay Marine reserve – it is expected the installation methodology will fully bypass (no impact) the reserve.

Section 5, 6, 7 of the DPEMP details this methodology.

And

3) [Clarence Interim Planning Scheme 2015](#)

- Part E Codes
  - E16.0 Coastal Erosion Hazard Code
  - E16.7 Development Standards
  - E16.7.1 Buildings & Works
  - E16.7.1 Buildings & Works

**Objective:**

To ensure that development in Coastal Erosion Hazard Areas is fit for purpose and appropriately managed based on the level of exposure to the hazard.

**Proponent Comment:**

The development is fit for purpose. "Fit for purpose" (the development should be suitable for the intended purpose); and "right first time" (mistakes should be eliminated).

The proposed pipeline hardware will be engineered to suit operational and worst-case the pipe reaching as far as 500m out from the coast and inland up Algona Street beyond the CCC IPS venerable overlay area. The pipeline will pass underneath areas susceptible to erosion.

The perceived level of exposure of the development in terms of erosion is considered low.

The pipeline, by means of HDD installation and bypassing under the immediate coastal erosion zone will not contribute nor diminish the effects of naturally occurring erosion.

From thorough understanding of the proposal in terms of construction and operational aspects -from understanding of the construction method all below performance criteria can be satisfied.

3.7.7 Parks / Crown

*We have undertaken a preliminary assessment of your development proposal as it relates to these reserves via the PWS Reserve Activity Assessment (RAA) Checklist process. We have determined that a Level 3 RAA is required, based on the need for further assessments to clarify potential impacts and mitigation.*
measures. Whilst the documentation that we have received to date refers to a single proposed pipeline alignment (i.e. across the Derwent to Halfmoon Bay, along the South Arm Road and into the Gellibrand NRA), there was a potential second alignment mentioned at your public meeting last Thursday attended by our Regional Operations Manager. Please include both potential pipeline alignments in your RAA.

In summary, your Level 3 RAA will need to include the following information:

- A detailed site plan drawn to scale showing the location and extent of the proposed infrastructure on and through the Marine Conservation Area and the nature recreation area
- A detailed design of the proposed infrastructure to be located on and through the Marine Conservation Area and the Nature Recreation Area
- An Aboriginal Heritage Assessment for the pipeline alignment and associated infrastructure and disturbance with the Nature Recreation Area
- A natural values and impact assessment for the pipeline alignment and associated infrastructure and disturbance within the Nature Recreation Area, to identify the risk to threatened flora and fauna species
- A further marine natural values assessment, including field surveys as identified in the Marine Solution’s Tasmania Pty Ltd preliminary report, to identify the risks to threatened marine fauna and habitat. Methodology for the field surveying is to be as approved by PCAB, and the assessment must include the identification of a pipeline alignment that presents minimal disturbance to the values within the marine conservation area
- A detailed Irrigation and Environmental Management Plan for recycled water use within the nature recreation area
- A Construction Management Plan detailing the proposed installation and maintenance methodology of the infrastructure within the Marine Conservation Area, and the Nature Recreation Area. The CMP is to be consistent with the principles and approaches within the Tasmanian Reserve Management Code of Practice 2003, where applicable
- Further information to clarify the proposed ownership, management and maintenance responsibilities associated with the water reuse infrastructure

I understand that the RAA template is not a ‘one size fits all’ projects – particularly when it comes to a complex, multi-tenured proposals such as this. However, it would be great if you could include the information in the attached reports into the relevant sections of the RAA. This will make it easier to be assessed by the number of specialists it will go to.

In order to begin processing your RAA, we will require the following further information under section 4.1 and 4.2 of the RAA:

- The completed marine natural values assessment for the Opossum Bay Marine Conservation Area, as outlined in my previous email. The presence of seagrass habitat, Handfish and other threatened marine species (state and national) in the vicinity of the proposed pipeline alignment, mean that this is an important aspect to be considered by the RAA process. Please include the main findings from the assessment in the RAA template, as well as any specific management actions that will be taken to mitigate potential impacts to the marine environment (under Section 4.1 Estuarine and Marine).

- The completed Irrigation and Environmental Management Plan specific to the Gellibrand NRA site, as outlined in my previous email. The IEMP should address runoff/drainage issues, including the likelihood of nutrient rich recycled water impacting the Opossum Bay Marine CA (I note that the Macquarie Franklin report indicates that the southern part of the reserve has soils with low water holding capacity requiring frequent irrigation), and specific reference to acid sulphate soils. Please
include a summary of the relevant aspects of the IEMP, as well as any specific management actions that will be taken to mitigate potential impacts on the values of the Gellibrand NRA; adjoining Opossum Bay Marine CA; and on public users of the site. This information fits best under Section 4.1 Water Quality in the RAA template. Some of the information regarding Class B water quality that is in the Macquarie Franklin report would be useful within the body of the RAA.

– Detail of any specific impacts and associated management actions to mitigate potential impacts on the Mary Ann Bay Raised Marine Bed geosite (i.e. resulting from irrigation infrastructure installation and or use). I note that you have identified that this will be addressed in the IEMP on page 25 of the RAA.

– The completed Aboriginal heritage assessment, with any specific management actions to mitigate values within the reserves.

And Section 4.3:

– Detail of how biosecurity risks to the reserves will be mitigated (i.e. introduction of Phytophthora and other diseases on construction machinery), consistent with standard hygiene procedures.

Having this information in your RAA upfront will hopefully minimise the need for further information to be requested later down the track when the RAA goes out to the relevant specialists. I understand that the DPEMP you are in the process of preparing will include much of this information – which is great. You can just refer to that document in the RAA and attach.

3.7.8 TasWater

As a corporation TasWater strongly supports the philosophy of reuse water to encourage economic development in a sustainable and environmentally sensitive manner.
Recycled Water

What is recycled water?

Recycled water is wastewater that has been treated to remove solids and pathogens. Depending upon the level of treatment, recycled water can be safely used for a variety of non-domestic purposes including irrigation of farm land, golf courses, vineyards, horticulture and nurseries. Recycled water may also be suitable for some industrial applications (e.g. boiler/cooling water) however TasWater has no such customers.

The Environmental Protection Authority (EPA) requires, as a mandatory component of all sewage treatment plant improvement plans, an assessment of opportunities to divert treated effluent for beneficial purposes including options for the irrigation of agricultural, forestry or public land. The EPA position is consistent with the Tasmanian Waste and Resource Management Strategy 2009 hierarchy.

This strategy lists the most acceptable to least acceptable outcomes as:

<table>
<thead>
<tr>
<th>Strategy</th>
<th>Most Acceptable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Avoidance</td>
<td></td>
</tr>
<tr>
<td>Reduction</td>
<td></td>
</tr>
<tr>
<td>Reuse</td>
<td></td>
</tr>
<tr>
<td>Recycling</td>
<td></td>
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<tr>
<td>Recovery of Energy</td>
<td></td>
</tr>
<tr>
<td>Treatment</td>
<td></td>
</tr>
<tr>
<td>Disposal</td>
<td></td>
</tr>
</tbody>
</table>

The EPA will only approve an alternative process with a discharge to an inland waterway or the marine environment (disposal) when all reasonable reuse options have been ruled out for practical, economic or environmental reasons.

TasWater is responsible for 16 recycled water schemes in the south and 14 in the north. They range from simple lagoon systems to the largest; the Clarence Recycled Water Scheme.

What are the environmental benefits of recycled water?

Use of recycled water offers a range of environmental benefits. These include:

- reduced discharge of nutrient rich treated waste water to water ways
- reduced demand on less sustainable water sources for irrigation
- beneficial recycling of nutrients in wastewater (in particular Nitrogen and Phosphorous) which reduces fertiliser demand
We have experienced a long, staggered yet ongoing development discussions with TasWater in regard to the access of the Blackmans Bay irrigation water.

While the discussions have all been initiated by the proponent and largely been focused and limited by risk and compliance (i.e. TasWaters’ governance and corporate-based obligated administration processes and templates), both parties agree that the Recycled Water Pipeline to South Arm Peninsula is a positive thing.

Pre-lodgement advice from TasWater included:

- A statement of TasWater position in relation to the proposal - one of cost recovery and a strict position where by TasWater can’t offer any financial, engineering or operational support and advice
- Recycled water customers are required to enter into a formal Recycled Water Agreement. The Agreement details legal arrangements such as infrastructure ownership and recycled water pricing. Each recycled water property must also have a site-specific Irrigation and Environmental Management Plan detailing recycled water management, how the recycled water will be used in a manner that is safe and sustainable. TasWater conducts regular property reviews to ensure this is happening.

and

Please address correspondence including file reference to ‘Development@taswater.com.au’. It gets registered by our admin staff and gets acted on quicker that way.

We suggest that Arm End’s engineers meet with our Major Projects design team for Blackmans Bay STP to talk through the concept design. Prior to the meeting we would like to see;

1. A concept plan for the transfer system from Blackmans Bay STP to Arm End;
2. Location of offtake, which will need to be post UV disinfection;
3. Location of a pump station including wet well;
4. Location of chlorine disinfection;
5. Size and location of buffer storage, (if any since this depends on proposed pump rate compared to typical effluent flows);
6. Overall footprint of infrastructure on Blackmans Bay site;
7. Pump rate (L/s);
8. Access requirements (description);
9. Power supply requirements on Blackmans Bay STP site.

Once the basic requirements are known, we can provide advice as to whether this is feasible or if they need to review the proposal before they get too far into the design.

Of course, without first-hand knowledge of the BB STP site, some of the location information would be indicative only. I have attached an aerial from our GIS.

Following on from initial meetings with TasWater the proponent met with TasWater CEO Mike Brewster to discuss the concept.

See below letter.
4 April 2018

Mr Craig Ferguson
Project Director - Arm End
Mary Ann’s Island Pty Ltd

Emailed to: craig@armend.com.au

Dear Mr Ferguson

Letter of in-Principle Support — Recycled Water Pipeline

I am pleased to provide in-principle support for your proposed pipeline development based on our understanding of the social, environmental and economic benefits that the irrigation water will bring to the region.

In particular we note the Arm End Public Recreation Reserve project intends to make use of available recycled water, is expected to generate 30 plus jobs for the region, will result in significant revegetation, and creates the potential for irrigation water to be provided to other land owners. These envisaged benefits strongly align with TasWater’s desire to support economic development in a sustainable and environmentally sensitive manner.

Please note that while we are supportive of both the Arm End project as well as the recycled water pipeline project proceeding, any subsequent applications to use the recycled water will be considered by TasWater on its merits and in the normal course of business following completion of normal due diligence processes.

We look forward to seeing the pipeline project proceeding smoothly and successfully delivering the envisaged benefits to the local community.

Yours sincerely

Michael Brewster
Chief Executive Officer
3.7.9 Community

It is in the interest of:

- the landholder on whose land recycled water is being re-used,
- the supplier of the water,
- the regulator and
- the community,

that recycled water is applied to land in a manner that is sustainable and does not cause environmental harm or a public health risk.

Community consultation meeting was held at the RSL club in May 2018. We had overwhelming positive response to the meeting and have collected name of all at the meeting who offered support to the concept.

It is the intention to send these folks a full copy of the DPEMP so as they can fully understand the proposal to the extent similar to the regulators assessing the application. The proponent will offer and encourage the community contacted a choice to submit to the Council a representation in support of the application.

The water pipeline will not increase local council rates.

Notes; The proponent realises the potential for public objections / appealing aimed at hindering the Arm End project. The RMPAT processes certainly allows for this.

However, the pipeline is to be considered as separate development to the Arm End project. Yes, pipe will enable and support sustainable solution to Arm End water demands yet approval for course has already been given. This is not the correct platform to actively demonstrate concerns or opposition to the Arm End development.

It is likely that the following community members will raise concerns with the pipeline proposal.

- Nola Foxcroft (multiple development objector and part time actor)
- Karen and Tony Puckering (retired residents)
- Robyn McNicol (Opossum Bay Land Care convener and Tas Conservation Trust)
- Peter McGlown (Tas Conservation Trust)

3.8 Typical Irrigation Use

Wastewater is part of the total water cycle. Like rainfall or groundwater, it is a resource available for use. At a community level, appropriate utilisation of this resource is a benchmark for sustainable development. Creative thinking will find many innovative ways in which wastewater may be used – for example, urban green spaces or high value food
crops. In practical terms, wastewater recycling brings positive benefits in the areas of water conservation and pollution abatement. While there are environmental and public health issues associated with wastewater - whether recycled or discharged to waterways - appropriate management techniques will minimise risk to acceptable levels.

See Appendix: Environmental Guidelines for the Use of Recycled Water in Tasmania

Parts of Tasmania regularly suffer from water shortage. It makes sense then that all potential uses for wastewater should be explored as an alternative to using scarce freshwater resources. In light of the high costs for nutrient removal processes, many municipalities and other operators of wastewater treatment plants (WWTP) utilise wastewater as a resource for its nutrient content, seeing re-use on land as a viable alternative to treatment and disposal to waterways.

3.9 Further Treatment

The purpose of tertiary treatment is to provide a final treatment stage to further improve the water quality. Further treating the water transferred across the river, on the South Arm side, certainly has merit.

In summary (From the table on page 38) –the higher quality treatment allows for wider use of the recycled water.

<table>
<thead>
<tr>
<th>Use of Wastewater</th>
<th>Mandatory Effluent Quality</th>
<th>Mandatory Treatment Requirement</th>
<th>Options for Wastewater Re-use</th>
<th>Suggested Treatment Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class A Recycled Water</td>
<td>&lt; 10 mg/L total phosphorus</td>
<td>Advanced treatment with disinfection</td>
<td>Indirect potable groundwater recharge by spreading indirect potable groundwater recharge by injection Non-potable municipal irrigation (uncontrolled release) Urban non-potable (general household use)</td>
<td>Treatment: Coagulation, flocculation, advanced filtration and other best practice treatment processes to remove nutrients, sediments and other contaminants Disinfection – microfiltration, U.V. disinfection and chlorination Chlorination may be best practice if a residual is required to prevent the bacterial regrowth</td>
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<td></td>
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<td></td>
<td></td>
<td>Monitoring</td>
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<td></td>
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<td></td>
<td></td>
<td>pH – weekly</td>
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<td></td>
<td>BOD – weekly</td>
</tr>
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<td></td>
<td>SS – weekly</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Disinfection – daily</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Turbidity and chloramine residue – continuous</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Coliforms – daily</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Viruses and parasites – the system must be managed to prevent spray drift</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Nutrients, turbidity and salinity – regularly</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Municipal uses may include irrigation of open spaces, sports grounds, parks, dust suppression and land rehabilitation areas</td>
</tr>
</tbody>
</table>

3.9.1 Filtration

**Sand filtration** removes much of the residual suspended matter. Filtration over activated carbon, also called carbon adsorption, removes residual toxins.

Filters, as commonly understood in water treatment generally consist of a medium within which it is intended most of the particles in the water will be captured. Such filters might be manufactured as disposable cartridge filters, and small-scale industrial applications. Larger forms of cartridge filters exist which can be cleaned. One version is precoat filtration in which a porous support surface is given a sacrificial coating of diatomaceous earth, or other suitable material, each time the filter has been cleaned. Additionally, a small amount of the diatomaceous earth is applied continuously during filtration. However, in most cases, filters used in municipal water treatment contain sand or another appropriate granular material (e.g. anthracite, crushed glass or other ceramic material, or another
relatively inert mineral) as the filter medium. Filtration using such filters is often referred to as in-depth granular media filtration.

**Membrane Filters** Modern technology allows manufacture of membranes from synthetic materials, and semi-permeable. Being semi-permeable means that the membrane is selective in what submicron-size particles can and cannot pass through it that is in the feed stream. During operation, permeable components in the water pass through the membrane with the water whilst impermeable submicron-size components are retained on the feed side. Consequently, the product stream is relatively free of the impermeable components and the waste stream is rich in impermeable components. Flow of water through such a semi-permeable membrane is achieved by pressure, usually produced by pumping.

There are four categories of membranes loosely defined by the types of materials rejected, operating pressure and nominal pore size. The categorisation of pore size is approximate since, for example a high-end UF membrane can have similar permeability to a low-end NF membrane:

- **Microfiltration (MF)** - approx. 0.1 µm pores: impermeable to particles, algae, animalcules and bacteria
- **Ultrafiltration (UF)** – approx. 0.01 µm pores: impermeable to small colloids and viruses
- **Nanofiltration (NF)** – approx. 0.001 µm pores: impermeable to dissolved organic matter (DOM) and divalent ions
- **Reverse osmosis (RO)** – effectively non-porous: impermeable to monovalent ions

The thickness of membranes means that they have to be formatted in a way that provides structural strength, so they will not collapse because of the pressure difference across them, provide a large area for filtration but are compact and can be cleaned effectively. They are generally structured as thin tubes (hollow fibres) or as a coiled sheet. A coil is a sandwich of the semi-permeable membrane, a separating mesh, a thin sheet of impermeable material and a second layer of thin mesh. The layers of mesh provide the channels for flow to the inlet and from the outlet side of the membrane.

It is usual to include a preliminary stage of treatment before membrane filtration to protect the membrane from being fouled too rapidly by excluded material, although there are also ways to operate membrane filters to slow the rate of fouling of the membrane before having to apply a cleaning process. The routine, and frequent, cleaning process is flushing to remove the accumulated detritus on the feed side. However, over time there is a slow loss in membrane performance that can only be recovered by chemical cleaning.

Membrane filtration (MF, UF and low-end NF) have become relatively common in potable water treatment, such as for removal of colour from otherwise relatively good quality water
so avoiding complexities associated with coagulation, and for reliable exclusion of Cryptosporidium.

3.9.2 Disinfection

The purpose of disinfection in the treatment of waste water is to substantially reduce the number of microorganisms in the water to be discharged back into the environment for the later use of drinking, bathing, irrigation, etc. The effectiveness of disinfection depends on the quality of the water being treated (e.g. cloudiness, pH, etc), the type of disinfection being used, the disinfectant dosage (concentration and time), and other environmental variables. Cloudy water will be treated less successfully, since solid matter can shield organisms, especially from ultraviolet light or if contact times are low.

Ultraviolet (UV) light can be used instead of chlorine, iodine, or other chemicals. Because no chemicals are used, the treated water has no adverse effect on organisms that later consume it, as may be the case with other methods. UV radiation causes damage to the genetic structure of bacteria, viruses, and other pathogens, making them incapable of reproduction. The key disadvantages of UV disinfection are the need for frequent lamp maintenance and replacement and the need for a highly treated effluent to ensure that the target microorganisms are not shielded from the UV radiation (i.e. any solids present in the treated effluent may protect microorganisms from the UV light). UV light is becoming the most common means of disinfection because of the concerns about the impacts of chlorine in chlorinating residual organics in the wastewater and in chlorinating organics in the receiving water.

UV disinfection is popular around the globe for wastewater treatment and water reuse treatment largely due to the fact that, unlike chlorine, it doesn't increase effluent toxicity. Pressure from Governments and environmentalists to eliminate unwanted chemicals from the ecosystem, whilst providing pathogen free water, is also driving interest in UV disinfection for wastewater treatment. This interest is leading to many wastewater and water reuse plants being converted from chlorine to UV disinfection. Water re-use is also becoming important, with purified wastewater disinfected by UV disinfection systems increasingly being used for irrigation.

Advantages of UV Disinfection of Wastewater & Reuse Water

- No hazardous chemicals involved
- No disinfection by products
- Effective against ALL microbes, including Cryptosporidium and Giardia
- Flexible disinfection performance at lowest cost

UV wastewater systems are a well-established method of wastewater treatment and reuse water treatment safeguarding public health and protecting wildlife. There are different types of wastewater, such as municipal sewage or industrial effluent, and these different wastewaters all have their own types of microbiological environment, microbiological counts, levels of suspended solids, UV transmission rates and temperatures. Depending on whether the effluent is to be discharged into rivers, lakes and seas or re-used for
applications such as irrigation, the required microbiological counts are usually specified by local regulations.

The most common method of reuse water treatment has long been chlorination. Despite chlorine’s impressive track record, concerns regarding disinfection by-products (DBPs) and, more recently, disinfection performance with respect to pathogen inactivation, are driving the conversion from chlorine disinfection to other disinfection methods such as UV disinfection, which does not produce any DBPs.

Closed vessel UV wastewater disinfection systems are easy to install within existing pipework, so there is minimal disruption to plant operation. Day to day operation is simple and only minor maintenance is needed. The only regular requirement is changing the UV lamps and wiper rings once a year, a straightforward operation that can be carried out by on-site personnel.

Ultraviolet energy causes permanent inactivation of micro-organisms by disrupting its DNA so that they are no longer able to maintain metabolism or reproduce. All bacteria, spores, viruses and protozoa (including Cryptosporidium and Giardia oocysts are permanently inactivated by UV). The maximum effectiveness occurs at between 240nm and 280nm.

**The Mechanism of Ultraviolet Disinfection**

Strong sunlight disinfects water by permanently de-activating bacteria, spores, moulds and viruses. Over a century ago, scientists identified the part of the electromagnetic spectrum responsible for this well-known effect; wavelengths between 200nm and 300nm, often called UV-C. The most effective single wavelength is typically UV at 265nm, however recent research in the USA has shown that 271nm light and 263nm light are the most effective UV wavelengths for the deactivation of particular target organisms.

**Ultraviolet Applications**

Research is now being undertaken to verify the effect that shorter wavelength ultraviolet light has on the other cell membrane of the organism. This shorter wavelength is more energetic and is absorbed by the organism’s outer membrane. A lethal insult is affected, which means that the cell is unable to effectively regulate osmotic pressure. This effect coupled with the fusing of the DNA means that UV is a simple, elegant disinfectant and one that will increasingly replace the more traditional chemical techniques.

**3.10 Water Quality Measurement Units Explained**

For details and understanding of the most common units used when monitoring and determining the quality of recycled water. See document in appendices.
4. **Economic Development through Agriculture and Tourism**

4.1 **South Arm Peninsula Regional Benefits**

The water pipeline planning approval will allow for final regulator conditions to be met prior to construction start of the Arm End Public Recreational Reserve.

While MAI always were confident on solving the problem of a sustainable irrigation water supply for the golf course demands, we have certainly underestimated the time, consultation and planning red tape in order to realise the solution.

Arm End itself will provide significant regional benefits including:

- 30 jobs – sourced when skills and qualifications align from the local region.

See DPEMP section 12. For full details of the Arm End

We have the opportunity to help others.

…”do not withhold good from others when it is in your power to help…” ancient proverb

The water will importantly facilitate the full environmental rehabilitation of Arm End public playground and the associated public golf course, however we have the opportunity to help transform good farming land into great framing land. The irrigation water has a wide range of end uses, including pasture, wheat/barley, seed crops, Lucerne/oats, vines/fruit, turf, nursery trees, and community amenity trees, to grow grapes, proteas, garlic, turf and anything else the local users want to grow, -a potential for small scale specialist market produce.

An example of the benefits can be seen with a larger, yet similar recycled water project completed in 2006 by the Clarence City Council in the Coal River Valley.

**The Clarence Recycled Water Scheme** supplies water annually to horticultural, viticultural, orchard and other high value uses in the Coal River Water District The scheme has been the catalyst for the development of a range of agricultural enterprises in the region which have brought significant employment and economic benefits.

The reuse scheme provides a low-cost supply that is highly reliable especially during periods of drought. **The Clarence Recycled Water Scheme** recycles treated waste water from the urban areas of Clarence that was previously ocean disposed. The scheme has a wide range of end users including major agricultural irrigators and amenity irrigators such as golf courses.

The scheme pumps treated waste water to a reservoir on the Meehan Range from where it is reticulated by gravity feed through the Coal River Valley to Richmond and to the Seven Mile Beach area via a spur-line.
The supply of recycled water is **reliable** to the end user, being a by-product of regular domestic consumption of the regional community.

The recycled water supply is **available at low cost** and enables end users **to make choices** in regard to the water source used for different production applications. The scheme results in the saving of thousands of megalitres of potable water each year the dry local climate coupled with seasonal temperate variations and a rich and fertile soil provides for a multitude of agricultural opportunities.

Without spending thousands on an economic study is difficult to extrapolate the full potential benefits for the introduction of plentiful quantities of recycled water to the greater South Arm Peninsula.
From the last census survey, the approximate population for South Arm Peninsula (past Lauderdale) is 4207 and close to 1909 private dwellings.

The South Arm Recycled Water Pipeline presents a strategic opportunity to further capitalise on the unique climatic conditions, soils and topography of the south-east region of Tasmania to supply high quality, golf turf, environmental rehabilitation, viticultural, horticultural and vegetable products for domestic and export markets.

This section of the DPEMP has been prepared to present the development logic and economic rationale underpinning the planning and engineering design work undertaken to seek approval and support for the Blackmans Bay Water to South Arm Recycled Water Pipeline.

As the proponent (MAI) we have primarily needed to provide for our business (Arm End) a sustainable irrigation water source to meet the demands of the golf course. In doing so we have identified a greater benefit to wide range of potential users.

The findings in the DPEMP and specifically this section (4) provides for the preparation of an overall Business Case. (Case) which if required can be presented to stakeholders, State Government, Commonwealth Government for construction funding support.

Key issues to be covered in a Business Plan to support the South Arm Recycled Water Pipeline may include:

- Management Structure of the New Facilities
- Agricultural and Golfing Recreational Tourism Industry Profile
- Market Analysis
  - How existing businesses will expand
  - Targeted new business activities
  - Investor stimulus – from Tasmania and the mainland
- Marketing Plan
  - Accessing Agricultural markets and Golfing Recreational Tourism public
  - Integrating the existing opportunities with the new facilities
- Financial Plan
  - Development of Financial Assumptions
  - Development of Financial Projections of revenues and costs
  - Estimation of required maintenance and management costs

4.2 The (preliminary) Business Case;

The Business Case (economic based study) includes the following key components:

- to indicate the strategic fit of the proposed initiative. This is the extent to which the proposed development meets a range of strategic policy goals at the local, regional and state level.
• to provide the necessary studies and research which can support and justify public sector investment in the development of a new Recycled Water scheme.

• to examine the deliverability of the Project in terms of its long-term financial viability and sustainability, based on proven and precedented similar reuse water project.

The case and DPEMP demonstrates the project resolves the problem posed, i.e. to provide for fully sustainable and reliable irrigation water source for the Arm End public development.

It also shows that there have been a number of alternative technical options considered and that the recommended option is in line with the development needs and infrastructure priorities of Tasmania.

4.3 Project Appraisal Methodology

Infrastructure projects worldwide and across Australia, including those in Tasmania, may be regarded as the ‘cutting edge’ of local and regional development. The primary objective of preparing a business case is to develop an understanding of how a specific investment project may be developed and analysed to determine its overall viability. It requires the specification of the project’s vision, focus and rationale in terms of direct and quantifiable economic costs and benefits. It needs to show the catalytic effects on the local/regional economy from the investment. Investment analysis, as conducted on a project-by-project basis, relies on widespread appeal. Its emphasis on logic and rationality, and its underpinning of welfare economics principles, in terms of focusing on improving total community welfare.

4.4 Project Analysis Questions

The following fundamental issues or questions have been addressed in the preparation of the Business Case and DPEMP. They include:

(i) what is the objective(s) of the project?

(ii) what is the situation ‘with’ and ‘without’ the project?

(iii) does the project represent the best alternative?

(iv) who are the beneficiaries
(v) what is the structure/component mix for the project?

(vi) is the project justifiable on broad economic, social and environmental grounds?

(vii) is the project financially sustainable?

(viii) what is the most appropriate timing for implementation and delivery

(ix) is the project a risky investment?

4.5 Relationship of Economic Development to Infrastructure Investment

From the mid-20th century worldwide and in Australia, it has been demonstrated that high quality public infrastructure (public port/wharf facilities, roads/highways, railways, water supplies, sewerage systems, airports and power generation/transmission assets) were essential prerequisites for economic reconstruction and local/regional development. The case for such an assumption has been widely demonstrated throughout all Australian states.

More specifically, the belief that public investment in infrastructure, particularly water reuse schemes facilities will generate economic growth, has also been proven. Examples of where State/local governments have invested in new water and irrigation facilities and have seen significant local/regional economic growth and investment from tourism and recreation and population in-migration and resultant employment growth.

Despite its temperate climate, Tasmania has a long history of irrigated agriculture. Irrigation allows Tasmanian farmers to overcome the regular dry spells in spring, summer and autumn when evaporation exceeds rainfall. More than half the value of Tasmania’s agricultural production comes from the 7-8% of Tasmanian farmland that is irrigated. In 2006 it was reported that Tasmania’s dairy, vegetable and perennial horticulture sectors used 40%, 40% and 20% respectively of the state’s irrigation water.

Irrigation is seen as a key to increasing opportunity and wealth at farm, regional and state levels.

Three new irrigation schemes are already operational (Great Forester, Sassafras/Wesley Vale and Whitemore), three more are under construction (Kindred/North Motton, Midlands and Lower South Esk) while the infrastructure of two existing schemes (Winnaleah and Meander Valley) has been upgraded and extended to service more land. A further seven schemes are either undergoing feasibility assessment or are offering water for sale. The schemes have sound economic and environmental foundations.

Significant benefits are likely from irrigators working with scientists and extension professionals to fully realise opportunities from investment in new irrigation infrastructure. The expansion of irrigated agriculture across Tasmania represents a significant cultural
change that is likely to have consequences for the demographic composition of communities, and lifestyles. The economic and social impacts of these substantial on-farm and regional changes will need to be managed jointly by communities, industries and governments. Through new science and the adoption of best management practices Tasmanian growers can avoid or minimise the impact of many of the social and sustainability issues associated with irrigation in other areas of Australia and the world.

4.6 Good Example of Place-Based Impact Investment

Across Australia, State and Commonwealth government agencies are striving to develop new forms of place-based investments. The specific goals, as relevant to the Arm End Public Recreational Reserve Project as well as the Recycled Water Pipeline from TasWater Blackmans Bay Water Treatment Plant to South Arm Peninsula include:

- to plan for new public infrastructure at key locations, for tourism and recreation development
- to stimulate local business investment and employment
- encourage urban investors to more remote locations
- improve information sharing and marketing as a destination
- maximise State government interest and involvement with existing roles and service delivery

Place-based investment seeks to generate positive impacts in under-serviced communities and achieve positive returns for investors (private and public).

Place is an increasingly important lens for regional policy innovation and investment. Place-based impact investment presents an opportunity to prevent and reverse cycles of relative decline in Australian communities, such as and potentially for the residents of the South Arm Peninsula. South Arm offers considerable potential to develop new tourism and employment markets and areas of unique specialised economic activity, where traditional investment markets are harder to access and are less predictable.

The proposed Case for the Recycled Water Pipeline involves two forms of public and private investment. These are:

- growth capital – initially in the public-sector infrastructure, leading to private sector investment in new and existing businesses; and
- risk capital to assist with potential high growth opportunities in new forms of nature-based eco-tourism.
As a form of the economic analyses underpinning the Recycled Water Pipeline from to South Arm Peninsula Case, a social assessment of the proposed investment option(s) was undertaken.

This is summarised as follows. The results of the assessment are shown in the right-hand column.
<table>
<thead>
<tr>
<th>Social Wellbeing Indicator</th>
<th>Social Capital Element ( Likely Impacts )</th>
<th>Rating (5 – Very High; 1 – Low)</th>
</tr>
</thead>
</table>
| (i) Sense of belonging      | Proposed public ownership by local government, with specific private sector investment in services  
                             | Full and friendly cooperation among visitors’ experiences  
                             | Full social participation within the local community  
                             | High external visitor satisfaction levels with repeat visits  
                             | 5 (preferred option  
                             | 4                             |
| (ii) Community ownership    | Local community care and maintenance of assets and the natural environment  
                             | Local community promotion of use and management of public assets  
                             | 4                             |
| (iii) Community focus       | Appropriate size of infrastructure investment – not overbuilt  
                             | Distribution of social benefits across the entire area of influence (SAP landscape)  
                             | 4                             |
| (iv) Role in the ongoing life of the SAP community | Strong interaction with private sector interests  
                             | Ability to openly welcome and assist visitors  
                             | Provide a broad range of incentives for new investor interest  
                             | 5                             |

The results of this high-level social assessment of the proposed investment in irrigation water facilities indicate that the investment is highly likely to be well accepted and will attract a high-level of community ‘ownership’ and support.

### 4.7 Intangible or Non-Quantifiable Benefits

With some private sector investment projects, there are often additional impacts or local benefits, which can be identified. However, they cannot be reliably quantified, monetised and included in the economic analyses and reflected in the Business Case findings.
In many ways, the listing of the potential intangible benefits captures the innermost social gains for the South Arm community, now and for the next few generations.

A listing of these intangible benefits may include:

- Encouragement of new forms of water-based sports, including kayaking and canoeing
- Provision of incentives for investment in new buildings/upgrading of existing buildings in the SAP area
- Additional opportunities for day visitors and local residents to develop new forms of outdoor recreation, including bird watching and beach walking
- Provide additional recreational stimulus to the existing MAST facilities at South Arm and Opossum Bay
- Opportunity for young residents to learn to become golfers and or promote their region
- Improvements in the quality of life of SAP residents with the provision of additional recreational activities
- Social, and environmental awareness through information, interpretation and education opportunities

4.8 Marketing Directions

Broad community support will be required of South Arm residents to achieve full realisation of the financial, economic and social benefits of the recycled water investment.

An investment plan if required could be developed by the proponent, stakeholders and community representatives to underpin the funding support from State/Commonwealth governments.

This Plan will show that the community is fully committed to the sustainable development of the Recycled Water Pipeline to South Arm Peninsula and that the investment, over time, will not be a 'stranded asset'.

4.9 Economic Development Summary and Recommendations

- The proposed development of the Recycled Water Pipeline to South Arm Peninsula is likely to be a highly attractive public-sector investment for South Arm and the Arm End project.
• It will ensure the increased appeal and sustainability of South Arm and Arm End as an attractive destination.

• It will also be an economic development incentive for the local economy, in particular, and for the agricultural and tourism economy, in general.

• The proposed Project will provide a unique opportunity for the South Arm and greater regional economy to strengthen and diversify its economic base, in terms of existing economic activities and additional tourism and outdoor recreation opportunities.

• The Recycled Water Pipeline to South Arm Peninsula is expected to an economically viable public-sector investment, with a broad range of forecast benefits.

• There are no perceived technical, economic or environmental risks associated with the project.

• The Project represents an investment of State and Commonwealth Government significance to the local and Tasmanian residence, Given the uniqueness of South Arm and Arm Ends natural environs and appeal it meets all necessary preconditions for the development of a recreational and agricultural activities.
4.10 Capital Infrastructure and Financial support Funding

While the proponent has assumed and included in financial forecasts all cost associated with the pipeline proposal and seeking of developmental approval, we intend to seek financial support for the proposal.

Upon full construction start approvals (shovel ready) being in place we intend to seek support funding for the pipeline project.

The specific and detail structure for such financial support will be developed with entities over the next few months. The final structure may involve the following entities;

- State Government infrastructure support grant.
- Tas Irrigation support
- Local council support.
- Mary Ann Island support.
- TasWater involvement.
- Federal Infrastructure grant
- Tas Department of State Growth longer term loan.

As the proponent and applicant, we consider the proposal wholeheartedly worthy of political and financial support to deliver the widespread potential the pipeline and water will provide.

Management of potential funding support will be held in trust until preconstruction and planning requirements are compiled to and as agreed by all parties.

4.11 Construction Costings.

Construction costs for stage one of the South Arm Peninsula Recycled Water Pipeline are estimates established from engineering and construction contractor discussions, materials sales quotes.

See appendices for detail costing spreadsheet.
4.11.1 Labor and Resources

Costs have been considered from the below task breakdown items:

- **Project manager:**
  - contract, resource
  - OHS
  - Quality
  - construction and commissioning
- **Boats and equipment**
- **Construction contractors estimate**
- **Directional drilling – Terrestrial**
- **Marine contractors**
  - Divers
  - Marine Construction contractor
- **Shoreline crossings allowance**
- **Mast Notifications**

Rawlinson’s 2016 Australian Construction Handbook has some indicative unit costs for pipes:

Land in Trench:

- **110/125mm PE:**
  Supply and lay incl. joints and fittings and testing is about $55 per m and excavation and backfill is $20 per m. Total is $75 per m.

Other larger sizes of PE are not given but would be slightly cheaper than DICL and PVC. These are as follows:

- **150mm PVC Class 12 with RRJ:**
  Supply and lay incl. joints and fittings and testing is about $140 per m and excavation and backfill is $25 per m. **Total is $165 per m.**

- **200mm PVC Class 12 with RRJ:**
  Supply and lay incl. joints and fittings and testing is about $200 per m and excavation and backfill is $25 per m. **Total is $225 per m.**

DICL is similar but marginally more expensive to lay but more robust.
We will need to separately source larger PE pipe supply and install costs for the sizes of interest but can estimate rates from the above.
5. Engineering Considerations

From an engineering perspective there is technically sustainable evidence that the proponent can construct an irrigation water pipeline system, in stages, that will provide extensive access to Class ‘B’ effluent for irrigation purposes to landowners, farmers and organisations across the South Arm Peninsula.

Referring to the DA Project Drawing Set in the DPEMP appendices

Using public domain topographic and hydrographic charts, an assessment of the route of the recycled effluent pipeline has been undertaken. This comprises a submarine pipe of approximately 6875 metres and two stages; north 4222 metres and south 3650m of land-based pipe.

The maximum channel depth is 26 metres at about 2600 metres from Blackman’s Bay STP.

It is important to note the construction methods for both marine and terrestrial pipe sections.

For all terrestrial sections including coastal crossings (out to approximately 500m offshore) Horizontal Directional drilling will be used. (see full details in section 7.3.1)

For the marine section, float and sink construction methodology will be used. (see section 7.3.2)

Directional drilling, commonly called horizontal directional drilling or HDD, is a steerable trenchless method of installing underground pipelines with minimal impact on the surrounding area. Directional drilling is suitable for a variety of soil conditions. Directional drilling is typically used to provide less traffic disruption, lower cost, deeper and/or longer installation, no access pit, shorter completion times, directional capabilities, and environmental safety. The technique has extensive use in urban areas for developing subsurface utilities as it helps in avoiding extensive open cut trenches.

The process starts with receiving pit and entrance pits. These pits will allow the drilling fluid to be collected and reclaimed to reduce costs and prevent waste. The first stage drills a pilot hole on the designed path, and the second stage enlarges the hole by passing a larger cutting tool known as the back reamer. The reamer’s diameter depends on the size of the pipe to be pulled back through the bore hole. The driller increases the diameter according to the outer diameter or the conduit and to achieve optimal production. The third stage places the product or casing pipe in the enlarged hole by being pulled behind the reamer to allow centring of the pipe in the newly reamed path.

5.1 Engineering Discussion

An unfortunate profile feature, enroute, is the Blatherwick Rise (45m elevation) on South Arm Highway at the start of Opossum Bay, 8527 metres along the pipe. This is a significant point due to the potential to increase in the pumping head and cost of transfers,
and its capacity to initiate water column separation and associated transient overpressures in the pipeline, also leading to a higher design pressure rating requirement and the need for appurtenances for surge protection against transients.

These observations suggest that alternate routes should also be considered that bypass this high point. Using Bezzant’s Road and the western side of Ralphs Bay is one option. Using a cost route around Opossum Bay shore seems problematic due to housing and the Marine Reserve in that area.

Using standard design charts to AS/NZS 4130: Polyethylene pipes for pressure applications, and assuming a flow requirement of 1.5 ML/d, it is possible to use a 225 mm OD SDR17, PN10 pipe with gravity flow from Blackmans Bay to the beach at South Arm.

However, the recommendations for design of submarine pipes suggest a Service Factor of 1.75 be used in lieu of the 1.25 service factor normally used for PE water supply pipes. Therefore, a careful assessment of all operating pressures is required before a final size, SDR and pressure rating is selected.

It is also noted the up to 160 mm, PE can be supplied in 100 metre rolls, in lieu of 12 or 20 metre lengths for larger sizes. This significantly affects the butt fusion welded joint quantity required for the construction of the near 7km of terrestrial based pipe.

In view of the significant cost implication of pipe size and wall thickness (as pipe cost is directly proportional to the volume of resin used) it is also important to more accurately model irrigation demands and use storages to balance flow delivery over the year and thereby minimize the transfer pipe size required.

For example, a solution involving a gravity pipe to Half Moon Bay, using the available head from Blackman’s Bay STP and a subsequent booster pump station, would reduce the submarine pipe size to 160mmOD if only 80% of peak demand was the transfer flow rate. This would be effective with adequate balancing storage available.

It is possible to model the entire water system using software tools. Source software, or similar dynamic simulations with daily time steps, to determine the best combination of storages, pumps and pipes to meet all user needs. Simple operating rules can also be introduced into such modelling to replicate realistic scenarios. It is not necessarily optimal to pump from Blackmans Bay STP to meet peak demands at Arm End with only 4 days of emergency supply stored on site. It is probable that by allowing for the effective use of system storage, including existing farm dams and proposed water features or additional lined storages, would reduce the capital headworks required and reduce operating costs.

Site reticulation would be sized using a dynamic network analysis model to optimize layout and storage connections;

- KYPipe 2018 software from the University of Kentucky. KYPipe software was chosen because of its wide usage for water network analysis and to undertake dynamic extended period simulations of a system where fluctuating demands and extensive water storage behaviour is important.
By using an Extended Period Simulation of 72 hours for the report, we observed the time related behaviour of significant water storages in this system, including the Arm End Storage Tanks, and sequences of pump operations under time varying demand patterns. The maximum golf turf irrigation demand was assumed to be 56L/s for four hours, an average peak day requirement of 800,000 litres, 0.8ML. The engineering consideration also includes the potential for Cavitation at Blatherwick Rise, and energy Recovery from the Pipeline Arm End Storage Tank Behaviour.

From and engineering perspective there is technically sustainable evidence that the proponent can construct an irrigation water pipeline system, in stages, that will provide extensive access to Class ‘B’ effluent for irrigation purposes to landowners, farmers and organisations across the South Arm Peninsula.

Initial engineering results show that there is capacity in the Half Moon Bay Pump Station to also support future expansion of the irrigation supply if warranted by additional irrigation user or community demand.

Back-up fire water supply to tanks at South Arm and Opossum Bay could also be achieved, subject to point of use treatment to Class ‘A’, which allows for a wider range of uses.

For example, Clarence City Council could use this irrigation water supply for the establishment and long-term maintenance of the landscaping associated with their adopted Master Plan for facilities at Calverton Oval / South Arm Community Centre.

In addition, Council support for this infrastructure project would assist the initiation of a significant and potentially transformational climate change adaptation for the South Arm Peninsula.

A combination of two minor booster stations are required to meet the irrigation demands of the Arm End Recreation Reserve site during an extended dry period. However, short term peak requirements would usually be met from the Arm End storage tanks with less pumping required. Minor flows can potentially, with controller be supplied to the South Arm Peninsula by gravity from the Blackman’s Bay Balance Tank.

Full site water demands for Arm End Recreation Reserve and all other potential users can be met by this system.

The potential for South Arm Peninsula co-operative irrigation users to participate, allows for River Derwent discharge volumes by TasWater to be reduced relative to their current projections and thereby reduce the existing outfall’s marine environment impacts.

The scheme proposed will reduce effluent discharge volumes by up to 20% in the immediate future with attendant short term environmental benefits on water quality and ecosystem health. Notwithstanding the permanent diversion of up to 350ML/annum (full scheme uptake) away from river discharge, the percentage reduction in discharge will slowly decline over time, as the Blackman’s Bay Treatment Plant effluent volumes increase to the projected design capacity.
The detailed engineering Scope of Works will likely include the following:

Review of existing documentation surrounding location/alignment and Blackmans Bay Treatment plant (We are aware of major investigations and environmental studies undertaken through 2008-09 on a proposal to extend the Blackmans Bay wastewater treatment plant outfall into the Derwent, which has various parallels with this project and will likely influence some regulatory requirements and inform possible construction options);

Detailed design, incorporating:

- **Blackmans Bay Pump Station:**
  - Suggest nominally capable of pumping 1.5ML/day along pipeline, during say a 12-hour overnight pump cycle / off peak (35 L/s approx.), all TBC
  - Civil (building, foundations, drainage etc.), including any necessary geotechnical investigations. Likely that effluent lagoon may act as pump station well/inlet. All pipework and pump(s) likely to be under ground in precast concrete structure.
  - Structural and Architectural, including Certificate of Likely Compliance and Form 55 (should a building permit be required)
  - Pipework (internal & external to pump station building)
  - Duty/standby pumps
  - Electrical - scope include considering all electrical works to Australian Standards, including:
    - Incorporation of preferred equipment
    - Power supply design, including liaison with TasNetworks
    - Switchboard design

- **Treated Effluent Rising Main (generic):**
  - Nominally a DN225 or DN280 HDPE pipeline approximately 10.5km pending
  - final alignment and storage dam/reservoir location
  - Plan and longitudinal sections;
  - Air and scour valve details
  - Location of the pipeline outlet is pending final approval of the storage site and will be provided once this process is finalised

- **Derwent river crossing investigation and design (submerged pipeline):**
  - Design detail of HDPE submerged pipeline, including installation and restraints
  - Design detail of pipework (if required) for cliff/rock face traverse from Blackmans Bay treatment plant to river.
Development of possible construction methodology for contractor consideration
- Functional description, SCADA & Telemetry works
- Development of a system Functional Description for the operation of the pumping system.
- Design comment for pressure and flow monitoring which can potentially be linked via the mobile phone network to detect and alarm on failures of pipeline and pump(s)
- Automation of pump as required
- Technical Specifications
- Design drawings
- Schedule of prices and pre-tender cost estimate (±25%)
- Safety in design report

Engineering Delivery Methodology will include a two-stage approach for the delivery of this project:

Stage 1: Preliminary Design & Review
- Undertake a preliminary review of all available information
- Site familiarisation inspection – key features/constraints, general alignment Inspection meeting with local operators of Blackmans Bay treatment plant
- Coordinate & review formal Site Topographic & Bathymetric Survey
- Coordinate Site services locations, DB4UDIG, TasWater operators RFI
- Prepare concept detail for PS and inlet works, WWTP area arrangements - notes & hand sketches
- Preliminary informal discussions with Local Councils, DSG, MAST, EPA, Tas Networks and other relevant authorities on likely permit requirements affecting design detail - INFORMAL ONLY
- Develop a preliminary hydraulic design for the pipeline
- Prepare preliminary construction schedule estimate (+/-40%), review against budget and identify key risk items

Stage 2: Detailed Design & Documentation

The two-stage approach can provide an opportunity for client and stakeholder input to the design development at an early stage, with a goal of providing maximum value by focusing on the key risks early, as well as providing sufficient information to enable informed client, stakeholder and consultant decision-making for the delivery of the project.
• Prepare Letter Style Report which summarises the key design criteria, design issues/constraints identified key risks (environmental, budget and time) identified additional investigations required (i.e. geotechnical, flora fauna, aboriginal heritage etc)

• Meet with proponent to discuss the preliminary design review

Stage 2: Detailed Design

• Review Preliminary design feedback and include in detailed design planning
  • Seek any required further external investigations, and report on key outcomes affecting design
  • Meetings/Workshops with proponents, sub-consultants and other parties for input during detailed design phase (3 off meetings)
  • Site visits as part of alignment preparation and confirmation
  • Prepare functional description (FD)
  • Develop preferred PS arrangements inlet & STP area layout, including specification pumps, building, foundations, etc. and prepare drawings
  • Prepare design drawings for pipeline alignment, including long sections
  • Design air valve sizing and spacing, (including drawings detailing Air valves, scour valves and incidental arrangements), pressure/control valve details (if required)
  • Switchboard and Telemetry design review & inclusion – propose using existing TasWater Electrical Specification, and consider options to provide recommendations for telemetry (if required)
  • Design and detail of Derwent River Crossings prepare design drawings (for External Authority review)
  • Certify structures including pump shed building (including Form 55 & Cert of Likely Compliance)
  • Prepare Safety in Design Report
  • Development of Technical Specifications Documents
  • Prepare Final Project Schedule and updated Cost summary (+/-20%)

5.1.1 TasWater Land Tenure; engineering considerations

We have experienced a long staggered yet ongoing development discussions with TasWater in regard to the access of irrigation water servicing options.

While the discussions have been largely focused and limited by risk and compliance; (i.e. TasWaters’ governance and corporate based obligated administration processes and
templates), both parties agree that the Recycled Water Pipeline to South Arm Peninsula is a positive thing.

TasWater suggest that Arm End’s engineers meet with TW Major Projects design team for Blackmans Bay STP to talk through the concept design. Consideration TW would like to see include;

1. A concept plan for the transfer system from Blackmans Bay STP to Arm End;
2. Location of offtake, which will need to be post UV disinfection;
3. Location of a pump station including wet well;
4. Location of chlorine disinfection;
5. Size and location of buffer storage, (if any since this depends on proposed pump rate compared to typical effluent flows);
6. Overall footprint of infrastructure on Blackmans Bay site;
7. Pump rate (L/s);
8. Access requirements (description);
9. Power supply requirements on Blackmans Bay STP site.

Pre-lodgement advice from TasWater also included;

- Once the basic requirements are known, we can provide advice as to whether this is feasible or if you need to review the proposal before you get too far into the design.
- Of course, without first-hand knowledge of the BB STP site, some of the location information would be indicative only. I have attached an aerial from our GIS.
- Statement of TasWater position (in relation to the proposal) was one of cost recovery and TasWater can’t offer any financial, engineering or operational support.

Proponent Comment:

Specific engineering and detailed design relating to the on-site infrastructure on the TasWater site will be completed, working with TasWater, upon DA approval of the Recycled Water Pipeline to South Arm Peninsula

Agreed engineering solutions will be required with both TasWater and the proponent in regard to the final design, set out location, control equipment, controller and operation logic, process connections and measurement instrumentation and controller logic before construction commencement.

Space is tight on the Blackmans Bay site and larges vessels such as storage tank and pumping station arrangements will require input and TasWater to ensure optimal
integration with the existing infrastructure and processes at the Blackmans Bay treatment plant.

Site-based discussions with TasWater have confirmed that the connection into the process outfall is possible.

5.1.2 South Arm Booster

Final location and design of this booster station will be determined with Clarence City Council and the proponent.

This proposal suggests an underground booster station (potentially incorporating UV treatment and filtration) will be located in most suitable place determined by CCC engineers and planners.

The design and location will need to consider:

- Infrastructure required to determine final structural size;
  - Entering and exit pipe work, pumps, valves, further treatment, and control and safety equipment.
- Noise attenuation (booster underground and noise insulation) to ensure very low disturbance to proximate residents.
- Road traffic.
- Other services.

5.1.3 Statement from IPD consulting engineers.

Thank you for the opportunity to provide our professional services proposal to assist to undertake detailed design consultancy works for the Recycled Water Pipeline to South Arm Peninsula, Pumping Station and Storage project, as generally detailed from our discussions and information you have provided.

IPD Consulting understands the Provision of Consultancy Services for this project is for the design and documentation works scope for the technical aspects of this project.

The following outlines IPD’s appreciation of the project requirements, details the scope of the services IPD can provide are set out in the engineering program.

IPD understand that the required outcomes of the consultancy includes documentation sufficiently detailed to enable the project proponent to call public tenders, investment and financial support and or seek a directly selected contractor for the project construction works.

The engineering documents typically being required include:

- Detailed design drawings
5.1.4 Pipeline depths and alignment.

See DA drawing set (appendix 1)

The HDD construction methods allows for accurate and flexible placement of the pipe on a vertical depth and horizontal alignment basis. (mm accurate control on a x and y axis)

5.1.5 Service, Administration and Maintenance Considerations

The operational maintenance, service tasks and frequency, administrational obligations, post commissioning, will be established and documented to allow for an annualised estimation of operational costs.

Considerations such as;

- Preventative maintenance for all equipment pending on wear and duty cycles
- Planned / Routine servicing of all moving parts (pumps, valves)
- Monitoring equipment and control systems review
- System data review and responses if required
- Reporting to regulators
- Quality assurance and control obligations
- Site inspections and demonstrated conformance
- Spare parts and stock levels and service contracts
- Labour and skills demands for operational compliance

At this stage a provisional sum estimates of $45,000 has been made to cover the above points. This cost will become part of the user pays philosophy far water users. That is the volume of water use is proportional to the maintenance costs of that user’s percentage.

5.1.6 Pipe Sizing and Consumer Demands.

Using published crop factors for Southern Tasmania (as a typical irrigation indicator) we found we need 3.75ML/ha across a growing season at a peak rate in January of 1.07L/sec per hectare of to feed to farm dams using off peak tariff. Other months are lower.
Using irrigation estimates, the Arm End golf irrigation demands would be around 0.8ML/d and a peak rate (using off peak tariff for 9 hrs) of 15L/s. This can be ex storages allowing a lower supply rate to fill tanks.

Iron Pot Course would be around 0.13ML/d due to less turf areas length

Total pipe demand will be determined by network analysis, but it’s expected to be able to supply all users for 15L/s ex Blackman’s Bay STP depending on whether some of the seasonal peak is met from storages.

5.2 Quality Assurance and Quality Controls

To satisfy requirements for best practice under EMPCA, large wastewater re-use schemes should develop an environmental management system (EMS) to provide a framework for managing the environmental, health and legal risks involved in the re-use of treated wastewater. Management systems will include audit checks of standard procedures, training/education and regular inspection of services.

The implementation of an effective environment management system demonstrates application of due diligence to the supply and use of wastewater. The important features of an environment management system are shown in the table below.

<table>
<thead>
<tr>
<th>Legislation and Standards</th>
<th>Management Systems</th>
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<tr>
<td>• due diligence checklist</td>
<td>• security and public safety</td>
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<tr>
<td>• licences and permits</td>
<td>• environmental safeguards</td>
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<td><strong>Communication Plan</strong></td>
<td>• quality assurance systems</td>
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<td>• responsibilities assigned</td>
<td>• contingency plans</td>
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<td>• reporting systems</td>
<td>• data and inventory management</td>
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<td>• feedback on performance</td>
<td>• performance reporting</td>
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<td>• statutory authorities</td>
<td><strong>Training Systems</strong></td>
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<td>• community groups</td>
<td>• management</td>
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<td>• emergency services</td>
<td>• public relations and operating staff</td>
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<tr>
<td><strong>Management Plan</strong></td>
<td><strong>Environmental Audit System</strong></td>
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<tr>
<td>• land (soil, geological conditions)</td>
<td>• improvements in management</td>
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<td>• water (surface and groundwater)</td>
<td>• nutrient utilisation</td>
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<td>• air emissions</td>
<td>• monitoring performance</td>
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<td>• aesthetics of sewage re-use</td>
<td>• physical and environmental risks</td>
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<td>• recreational resources</td>
<td>• financial risks and liabilities</td>
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<td>• roles and responsibilities</td>
<td>• spill and leak prevention</td>
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<td><strong>Environmental Monitoring</strong></td>
<td>• record keeping</td>
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<td>• background monitoring</td>
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<td>• on-going monitoring performance monitoring</td>
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<td>• monitoring of improvements</td>
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<td>• on-going water quality improvements</td>
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</table>
An agreed reporting and QA/QC procedures relating to the activities of both the wastewater supplier and user are to be put in place:

- to provide arrangements for the submission of performance reports to agencies, users and the community
- to alter management practices to best protect environment and public health
- to identify incidents of non-compliance with the Guidelines and to ensure the appropriate people and agencies are notified

Wastewater treatment operators have monitoring and reporting requirements imposed by their permit or EPN. Typical best practice management will require:

- annual reports summarising monitoring data
- listing or register of re-use schemes
- suppliers providing reports to users on a regular basis

Monitoring and record keeping requirements will also be included in the permit or EPN for a wastewater re-use activity. Regular inspections and maintenance of treatment and re-use facilities are to be undertaken and details recorded. Records of monitoring results should also be kept in order to demonstrate ongoing compliance.

An annual report of wastewater irrigation to land scheme should include:

- Summary of performance assessed against performance indicators including exceedance of quality limits;
- Discussion of any problems or potential problems with details of incidents and corrective action taken;
- Inspection and maintenance reports;
- Monitoring data for effluent, soil and groundwater;
- Identification of areas of management/practice that may be improved; and

A record of water flow data is essential for the management of wastewater. Flow data meters at the water treatment facility should at least record the total flow.

The supplier of wastewater TasWater notifies users of any quality compliance problems. Similarly, the user is to notify the supplier of any problems. All supplier or user incident reports (non-compliance with objectives) are submitted to the appropriate agency as soon as practical. Repeat sampling and testing is immediately undertaken if any result does not comply with the water quality limit and appropriate action is taken.
6. Environmental Considerations, Risks and Impacts

It is in the interest of the landholder on whose land recycled water is being re-used, the supplier of the water, the regulator and the community, that recycled water is applied to land in a manner that is sustainable and does not cause environmental harm or a public health risk.

The Irrigation Environmental Management Plan (IEMP) for a re-use water scheme is the basic mechanism for ensuring that the proponents of the re-use scheme have addressed all of the relevant issues to ensure that the objectives are achieved, and that there is agreement on the key management prescriptions.

IEMPs must supply adequate detail on the design and implementation of all the environmentally relevant activities and management practices for a proposed wastewater re-use scheme.

The IEMP will also provide a framework for annual monitoring of the ongoing sustainability of the wastewater re-use project. Therefore, the IEMP documents must be clearly understood, applied and accessed by the operators, managers and the public.

The Development Proposal and Environmental Management Plan (DPEMP) (this document) is a source of information from which individuals and groups may gain an understanding of the proposal, the need for the proposal, the alternatives, the environment that it could affect, the positive and negative impacts that may occur and the measures that will be taken to maximise positive outcomes, and minimise any adverse impacts, including specific management commitments.

The DPEMP is a basis for public consultation and informed comment on the proposal. A framework against which decision makers (and in particular the local Council) can consider the proposal and determine the conditions under which any approval might be given.

A demonstration that the proposal is consistent with objectives as required by the relevant statutes and policies, including the Tasmanian Resource Management and Planning System (RMPS) and the Environmental Management and Pollution Control System (EMPCS).

Irrespective of use, minimisation of risk to the public and the environment requires that recycling of wastewater must comply with following performance requirements:

- use of wastewater for direct domestic potable purposes is not permitted
- primary treated wastewater is not considered acceptable for irrigation re-use in Tasmania
- wastewater may only be used where the quality achieves the level required for that particular beneficial use
• maintenance of high levels of pathogen reduction is required to safeguard health where domesticated grazing animals are present or public access is possible
• the impacts of nutrients and other substances on the soil, water and plant environment need to be assessed and managed by the user to avoid adverse impacts.

6.1 Marine Environment Considerations

One of the biggest potential risks to the proposal has been that of negative impact to the sensitive marine habitat. Arm End and South Arm is an area surrounded by a sensitive marine environment. We wholeheartedly accept the responsibility we have to ensure we protect and enhance our and marine and coastal environment.

We have considered this in detail and is understood by way of the attached document.

**Marine Environmental Impact Assessment of a Proposed Pipeline Route Between Blackman’s Bay and South Arm, Tasmania**

An extracted from the document is below:

Mary Ann Island Pty Ltd (proponents for the Arm End Public Recreation Reserve project) are proposing to transport reuse water across the mouth of the Derwent River via a 225mm HDPE pipeline laid across the seabed from TasWaters’ Blackman’s Bay Wastewater Treatment Plant (WWTP) to South Arm. The reuse water will be used at South Arm for irrigation purposes, both for the Public Recreation Reserve and any other compliant irrigation user.

Marine Solutions were contracted by Mary Ann Island Pty Ltd to investigate the potential marine based environmental impact of the pipeline.

The following report describes and analyses the findings from a 3-stage process including:

- Investigation of a suitable route to install a pipeline across the Derwent River (Bathymetric mapping and habitat mapping forming stage 1)
- Desktop assessment of natural values, to inform field surveys in the vicinity of the potential route (desktop research forming stage 2)
- Field surveys in search of identified natural values (Handfish, Gunn’s screw shell, Giant kelp surveys), sediment analysis (particle size analysis, toxic dinoflagellate cyst analysis) and recommendations to mitigate marine environmental impact forming stage 3
This study has been developed to comply with current guidelines for natural values surveys under the Policy and Conservation Advice Branch (Natural and Cultural Heritage Division, 2015). The study is designed to identify any potential interactions with threatened and protected species found in the vicinity of the proposed pipeline, and to propose appropriate mitigations where applicable.

A combination of preliminary video footage and bathymetric mapping was used to determine a suitable pipeline route across the Derwent River mouth. The proposed route enters the Derwent River at the Blackmans Bay wastewater treatment plant and exits in Halfmoon Bay, South Arm. Horizontal direct drilling will be used to a distance past the 14 m depth contour (approximately 500m).

6.1.1 Report Summary and Conclusions

Mary Ann Island Pty Ltd is proposing to construct a pipeline across the Derwent River to transport reuse water from the Blackman’s Bay WWTP to Halfmoon Bay on the South Arm Peninsula. The reuse water will be used for irrigation purposes in the South Arm region and including the Arm End Public Recreational Reserve.

Bathymetric mapping demonstrated that the depth of the development area ranges from 0 m to 26 m, with the deepest section in the middle to western part of the river. The cross-sectional depth profile demonstrates relatively few undulations, making the area conducive to laying the pipeline.

Results from the habitat mapping were congruent with previous work in the area and confirmed that the majority of the proposed development area is sand with a narrow band of reef on the western shore and a patchwork of seagrass, algae and ascidians along the eastern shore. This was consistent with diver swum surveys.

Field surveys found four spotted hand fish within the development area on the eastern shore in Halfmoon Bay, and giant kelp was found to be present on the western shore at Blackmans Bay.

The potential impacts to these threatened and protected species and communities can be avoided through horizontal directional drilling of the pipeline to an appropriate depth.

6.2 Threatened fauna

Due to the construction mythology employed (HDD) it is not anticipated to be any impact to threatened fauna.

Consideration has been given to threatened fauna, including avifauna and terrestrial fauna;

- Impacts on species, communities and habitats, with particular reference to rare and threatened species, migratory species, communities and habitats, including those listed under the relevant Schedules of the Commonwealth EPBC Act (including but
not limited to those listed at 5.2) and the Tasmanian Threatened Species Protection Act 1995 (TSPA).

- Details on whether any impacts are likely to be unknown, unpredictable or irreversible.
- Impacts on identified areas or habitats of conservation significance

The potential for migration and/or introduction of pests, weeds and plant and animal diseases as a result of the proposal is considered very low.

Potential impacts of vehicle movements on wildlife as a result of the proposal, and to proposed mitigation measures for any wildlife priority areas are a possibility and may be discussed with CCC.

It is not considered necessary to survey the land in accordance with the Guidelines for Natural Values Surveys, which can be found at: http://dpipwe.tas.gov.au/conservation/development-planningconservation-assessment/survey-guidelines-for-development-assessments.

6.3 Meteorological Considerations.

Meteorological considerations have been identified as risks in terms of the marine sections of the pipeline.

The marine section of the pipe shall be installed and engineered (anchored and fixed to the seabed) to allow for worst case storm conditions. This will be demonstrated in detailed engineering designs and relative to the currents and marine climate.

The terrestrial section will be at least 700 mm underground and not susceptible to extreme weather event.

6.4 Noise emissions

The impacts of the proposal on ambient (surrounding) noise levels (during both the construction and operational phases), include:

- Construction equipment (operational only during typical construction times of the day and only for the construction period of the project)
- South Arm Booster station

Vibration and noise are often a result of machine faults or poor maintenance and servicing. Data feedback is transmitted from the communications control system, monitoring all mechanical performance aspects of the booster station, to a remote monitoring location. If there is a problem, maintenance crews are alerted and respond accordingly.

Pumping stations are intrinsic parts of a water transfer systems. They pump water from low points in the reticulation system to facilitate the passage to the storage destination or end user.

Noise can emanate from pumping station motors, pumps, and ventilation fans.
The South Arm Booster station has potential for noise emissions (during both the construction and operational phases) to cause nuisance for nearby land users and residents.

Pump Stations however are generally very quiet because they are located underground and the soil around them provides noise suppression. The South Arm Booster Stations will be designed to meet the noise level limits set by the Environmental Protection Authority (EPA).

The significance of the noise can be influenced by such external factors as wind direction, topography, and proximity of nearby buildings. Internal factors such as the pumping station location (underground) pump motors (modern multistage pumps and the associated controls), fan sizes, and building enclosure materials can all be important factors.

Noise management is related to the station location, building materials and detailed sealing of the enclosure.

Careful attention to design of noise control is required to comply with statutory requirements and ensure that resident impacts are minimised.

There are four basic considerations in regard to noise (i.e. sound) management:

- Minimisation of the generation of sound energy
- Minimisation of the objectionable characteristics of the sound
- Reduction of sound energy using attenuation measures such as sound absorption
- Deflection of sound energy away from sites

All four aspects should receive explicit consideration in the design and siting process:

- Design specifications for pumps, motors and other equipment should aim for the minimum sound levels in line with minimizing the effects of the pumping station once installed
- Any equipment which may produce tonal sound should be carefully scrutinized to ensure the design minimizes tonal components
- Pumping stations should be placed underground wherever possible
- Sound absorption can be ineffective if the installation is not designed correctly in its early stages. Retrospective installations of sound attenuation barriers are difficult and should be avoided
- Vibration of equipment can lead to unsatisfactory sound emissions. Design of suitable supports for the pumps and their connections should be investigated in the original design of the installation
- Regular maintenance is essential. Noisy equipment should be repaired or replaced as soon as possible. The design of the site should enable easy access to the machinery
- Lights or sirens to indicate emergencies should be considered in relation to the proximity of residential premises. Lights would be preferable to a siren if the
installation is close to residential premises as a siren could cause an environmental nuisance

When a wall is struck by sound, only a small portion of the sound is transmitted through the wall, while most of it is reflected. The wall's ability to block transmission is indicated by its transmission loss (TL) rating, measured in decibels. Noise reduction (NR) is the number of decibels of sound reduction actually achieved by a particular enclosure or barrier.

Noise generated by pumps can be divided into fluid noise and mechanical noise.

Fluid noise has two components.

- The first, rotary noise is produced by the interference of the wake from the impeller with the casing tongue parts.
- The second component is vortex flow noise, caused by turbulence in the flow between the impeller blades or inside the casing.

Mechanical noise also has two components:

- one resulting from vibration caused by imbalance of the impeller, shaft, or shaft coupling, etc the second generated by the rotation of the bearings.

Noise can create physical and psychological stress. Luckily, noise exposure can be controlled. No matter what the noise problems may be in a particular situation, technology exists to reduce the hazard.

Noise control usually involves three elements: source of noise, receiver of noise, and various paths noise can travel between source and receiver. If a given noise emission cannot be reduced at the source, noise control engineering entails inhibiting the propagation of sound between source and receiver.

The Human ear is less sensitive to low frequency noise than to high frequency noise. If it is not possible to reduce the noise, it may be possible to change it so that more of it is at lower frequencies.

Engineering noise controls include:

- designing equipment to reduce the speed or impact of moving parts;
- maintaining equipment to replace worn parts and to lubricate all moving parts;
- isolating equipment either by distance, by enclosures or by barriers;
- damping noise sources by using vibration absorbing pads to reduce vibration and noise; and
- installing absorptive baffles in areas to absorb generated sounds.

Noise and vibration are best controlled at their source.

6.5 Visual impacts

Pump Stations can include equipment above and below ground level.
Above the ground, there is a secure electrical cabinet that houses the power supply and pump controls. There is also a communications mast with an antenna which enables the operators to monitor and control assets from a remote location.

At ground level there is a visible flat concrete slab with secure access covers. Underneath sit the pumps and their associated valves.

With most of the pipeline and associated infrastructure being underground impacts of the proposal on the visual landscape will be very close to nil.

The final design and location of the South Arm Booster station will be determined upon advice from

- Clarence City Council,

### 6.6 Socio-Environmental Aspects

The proponent suggests the project will make an overall positive environmental and social impact.

We have considered this proposal and believe we have designed and presented a Responsible, Well Considered, Absolutely Sustainable and Energy efficiency proposal.

### 6.7 Spotted Hand Fish

The **Spotted Handfish**, endemic to the Derwent River estuary in Hobart, is critically endangered. A project is underway to conserve this unique species and save it from further decline. As the proponent we have considered the Recycled Water Pipeline from TasWater Blackmans Bay Water Treatment Plant to South Arm Peninsula has no adverse impact on *Brachionichthys hirsutus*.

For all works during construction and operations and we have very very seriously considered the habitat of our absolutely unique little critically endangered endemic and iconic fish.

Our engineering, specialist environmental consultant as well as construction approach, materials used, and methodology reduced the risk of negative impact on the Spotted Handfish to very low / unlikely.

It is our intention to become involved in and assist in the recovery project. We have met with and discussed all potential impacts with both the CSIRO project manager as well as the professional engagement of Marine Solutions - Hobart based and recognised marine environmental experts.
6.8 Pipeline failure bursting and leakage

Our system will monitor pressures and flows to ensure operations are as expected. Alarms conditions and system shut down in a fail-safe mode will be activated upon detection of system abnormalities. Responses will be immediate and or as required.

Control of spill procedure documents are expected to be required as per permit conditions.

6.9 Coastal Impact Assessment and Coastal Erosion.

Not considered required as operations and construction practice will avoid the immediate coastal shoreline areas.

Due to the nature of the construction of the proposed pipeline with horizontal directional drilling to circumvent the ecosystems within 500 m of the shoreline, impacts to the marine environment are considered very low.

The offshore wave climate under varying sea levels and wind speeds could be, if deemed necessary, determined and used to assess the nearshore impact of the waves using computational fluid dynamics software. Wave run-up and overtopping could be considered at this stage.

Relevant and Specific CCC interim planning scheme sections include;

1) *Clarence Interim Planning Scheme 2015 > Part E Codes > E11.0 Waterway and Coastal Protection Code > E11.7 Development Standards > E11.7.1 Buildings and Works*

   **Objective:**
   To ensure that buildings and works in proximity to a waterway, the coast, identified climate change refugia and potable water supply areas will not have an unnecessary or unacceptable impact on natural values.

See included:

*Addendum 01 Waterway and Coastal Protection Code E11.7.1 CCC IPS*

And

2) *Clarence Interim Planning Scheme 2015 > Part D Zones > 29.0 Environmental Management Zone > 29.3 Use Standards > 29.3.1 Use Standards for Reserved Land > 29.3.1 Use Standards for Reserved Land*
**Objective:**
To provide for use consistent with any strategies for the protection and management of reserved land.

**Proponent Comment:**
The development and operational phases of the pipeline through assessment by Parks Via the RAA process (level 3) demonstrates compliance to values of reserved land.

The reserved land areas being the **Opossum Bay Marine Reserves** as well as the **Gellibrand Point NRA** have both been assessed and granted Land owner consent (Crown) to lodge the DA to CCC.

CCC and Parks RAA assessment teams are expected to communicate to ensure use consistent with any strategies for the protection and management of reserved land.

For the Gellibrand Point NRA the Crown has previously granted the proponent a lease to develop the site with specific terms and conditions.

For the Opossum Bay Marine reserve – it is expected the installation methodology will fully bypass (no impact) the reserve.

Section 5, 6, 7 of the DPEMP details this methodology.

And 3)

_Clarance Interim Planning Scheme 2015 »_
Part E Codes »
E16.0 Coastal Erosion Hazard Code »
E16.7 Development Standards »
E16.7.1 Buildings & Works

**Objective:**
To ensure that development in Coastal Erosion Hazard Areas is fit for purpose and appropriately managed based on the level of exposure to the hazard.

**Proponent Comment:**
The development is fit for purpose. "Fit for purpose" (the development should be suitable for the intended purpose); and "right first time" (mistakes should be eliminated).

The proposed pipeline hardware will be engineered to suit operational and worst-case the pipe reaching as far as 500m out from the coast and inland up Algona Street beyond the CCC IPS venerable overlay area. The pipeline will pass underneath areas susceptible to erosion.

The perceived level of exposure of the development in terms of erosion is considered low.
The pipeline, by means of HDD installation and bypassing under the immediate coastal erosion zone will not contribute nor diminish the effects of naturally occurring erosion.

From thorough understanding of the proposal in terms of construction and operational aspects -from understanding of the construction method all below performance criteria can be satisfied.

6.10 Bathymetry and Marine Profile

The bathymetric mapping of the Derwent River mouth demonstrated that the pipeline would be approximately 6800 m in length. The profile identified few undulations across the river mouth, indicating the proposed route would be relatively conducive to laying the pipeline.

Marine Solutions undertook bathymetric mapping to identify any bathymetric features or significant barriers in the immediate vicinity of the proposed pipeline route. The study area was mapped using a GARMIN echoMAP enabled mid-band sounder with a multi-channel CHIRP chart plotter, logging GPS positions and water depth each second. The depths were measured to the nearest tenth of a metre, and tidally and barometrically corrected for Chart Datum (CD) and Australian Height Datum (AHD) using Hobart tide charts and observations from the Bureau of Meteorology. The resultant files were interpolated using GIS software Surfer 11.0, thus creating bathymetric profiles of the area.
6.11 Wastewater affects Quality of Soil Condition & Plant Growth

The level of management required by any wastewater re-use scheme depends on the condition of the soils and crops to be irrigated. This section deals with water quality indicators as they relate to the soil and plant growth. This subject is very complex and continuing research is encouraged beyond the design and management methods provided.

Hazards that may arise from wastewater irrigation can be broadly classified as follows:

- Those caused by materials which accumulate in, or leach from, the soil with potentially harmful effects on the soil, groundwater or surface waters. The problems that fall into this group include those caused by heavy metals and dissolved salts, particularly sodium. The severity of the problem depends on wastewater quality, soil characteristics and management approach.

- Those which cause changes to pasture composition or kill vegetation but can be readily corrected. The problems of this group are generally associated with organic wastes which, if application is excessive, may cause temporary deficiencies in essential plant nutrients and oxygen in the root zone.
The problems described in the first group are the more serious where toxicity to plants, animals or humans is involved. Further information on these substances is given in the following sections.

6.12 Public exposure

Many water needs can be satisfied with recycled water as long as it is adequately treated to ensure water quality is appropriate for the proposed use. Greater treatment and management is required for uses where there is a greater chance of human exposure to the recycled water.

Effluent can pose environmental, public health or agricultural resource risks if not managed appropriately and the information in this document will support the establishment of safe effluent irrigation reuse schemes.

Water recycling has proven to be effective and successful in creating a new and reliable water supply, while not compromising public health. Effluent reuse by irrigation is now an accepted practice that will play a greater role in our overall water supply in the future.

The sewerage system we have today has been the most important contributor to our standard of living and the elimination of waterborne diseases. To prevent health problems and epidemic outbreaks from the use of wastewater, it is important to recognise the risk factors. Human contact with wastewater creates a risk of infection from microorganisms. Pathogens of concern are detailed below.

- Viruses, while derived from human faeces, can survive for long periods in the water. Filtration and disinfection to the levels specified minimise the risk to human health.

- Pathogenic bacteria can be excreted by an apparently healthy population and many of the very large numbers of bacteria found in the wastewater can cause disease. Some bacteria, particularly thermotolerant coliforms (also known as faecal coliforms), are indicators of faecal contamination. E. coli, which is found in the intestinal tract of humans and other warm-blooded animals, may be used as the specific indicator of faecal contamination.

- Protozoa can cause disease in humans and infective forms may be present in wastewater as cysts. Enteric protozoa, including Giardia spp. and Cryptosporidium spp., are of particular importance and can cause moderate to severe enteritis.

- Parasitic helminths (for example roundworms and flatworms) have a complex life cycle and many require an intermediate host. Taeniasis in cattle can be a major veterinary problem and a nuisance parasite in humans. The best practice measure to control risks from the micro-organisms is to ensure that infective doses of a pathogen are not found in wastewater and an infective dose cannot reach a human host.

- Radioactive substances may originate from medical or extractive industry sources. Wastewater from these sources must contain less than 0.1 becquerel per litre gross alpha activity and 0.1 becquerel per litre gross beta activity in water used for irrigation.
There are public health risks associated with the utilisation of some treated wastewater. While both chemical and microbiological aspects can influence human health, waterborne enteric diseases are more common and are the focus of most management strategies to minimise public health risk.

This proposal DPEMP includes a specific supporting documentation that addresses public health concerns. A separate map showing buffer zones to sensitive areas, residences, public access areas, signage location and details of fencing and potable water supply are to be supplied.

There is also a need to consider food safety and to ensure that foods for human consumption that are produced using treated wastewater are safe to eat.

A wastewater re-use system in any public recreation area must be designed in accordance with the following public health requirements.

- Spray systems must be designed to avoid misting from sprinklers and spray drift beyond the actual irrigation area. There should be no spray irrigation within 100m of the boundary of any residential property. There must be no drift onto neighbouring residential or public access areas.
- Vegetative zones can be used to good effect if designed with a view to aerosol collection. Wind direction and wind speed should be monitored continuously, and the system should automatically shut down irrigation if speed or direction becomes a concern.
- There must be no above ground water outlets from the irrigation system. Any outlets for temporary connection of hoses or portable sprinklers shall be in a below ground valve box with an appropriate warning sign.
- Drip systems must incorporate a filter system to prevent blockage.
- There must be no ponding of irrigant on areas accessible to the public or areas with continual high moisture content.
- There must be no run-off of irrigant beyond the designated irrigation area.
- In general, irrigation on publicly accessible land should only be conducted at night. Public access to the area should be restricted before the commencement of irrigation and the irrigation event must terminate not less than 4 hours before public access to the area is permitted.
- Where public access cannot be prevented, such as on unfenced municipal gardens, verges or median strips, clear signs advising of the use of treated wastewater must be placed on the boundary of the irrigated area. These signs must also advise the public to avoid the area during irrigation periods and must be erected at regular intervals around the perimeter of the irrigation area.
• Any area used for irrigation must be adequately signposted and incorporate where appropriate Australian Standard recognisable signage (see AS 1319: Safety signs for the occupational environment). The Department of Health and Human Services can provide details as to the appropriate Australian Standards for public health warning signs.

• Irrigation systems must be designed and clearly identified in order to prevent the possibility of cross-connection to potable water supply lines and to prevent access by members of the public to the treated wastewater. Back-flow prevention devices must be installed to minimise accidental leakage of effluent in the case of pipe breakage.

• Public drinking fountains, natural or artificial water bodies, barbecue and picnic areas must be protected from contamination by spray drift or run-off from irrigated areas.

The included IEMP document includes documentation that clearly addresses all of the above public health concerns. A separate map showing buffer zones to sensitive areas, residences, public access areas, signage location and details of fencing and potable water supply is supplied.

6.13 Health Concerns

The sewerage systems and treatment technology we have today has been the most important contributor to our standard of living and the elimination of waterborne diseases. To prevent health problems and epidemic outbreaks from the use of wastewater, it is important to recognise the risk factors. Human contact with wastewater creates a risk of infection from microorganisms.

The best practice measure to control risks from the micro-organisms is to ensure that infective doses of a pathogen are not found in wastewater and an infective dose cannot reach a human host.

6.14 Concentration of Pollutants Risk

The impact on the environment over a period of time depends upon the type and concentration of pollutants contained in the wastewater. This pollutant load may limit the amount of wastewater that can be used in a sustainable manner without causing harmful effects.

Toxicants are substances which may, even in trace amounts, poison living organisms or damage their life processes in some way. The persistent hazardous substances include heavy metals, pesticides and petroleum products. These pose a potential risk to the biota in the soil surface and in ground waters by remaining intact, or in toxic form, for decades. Accumulation in tissues of aquatic life and soil organisms may adversely affect other organisms, including humans, further up the food chain. These toxicants must be reduced to the lowest practical levels as they may resist conventional treatment.
Nutrients released after the break-down of organic matter may be washed into waterways and stimulate the growth of aquatic plants. High inputs of nutrients may produce 'eutrophic' waterways subject to undesirable levels of algal growth.

Best practice is achieved by control measures to reduce or eliminate the run-off from land irrigated by wastewater.

6.15 Food Laws and Food Safety

Food is a fundamental human need and a prerequisite to good health. Access to safe food is a basic human right and ensuring that the food we eat is safe is a major function of both government and industry.

In Tasmania, food safety is governed by several pieces of legislation, including the Food Act 1998. This Act is administered by the Department of Health and Human Services and by local government officers. Importantly the Act requires that all food intended for human consumption must be safe to eat - regardless of whether it is primary food production or retail and whether it is produced conventionally or with treated wastewater.

There are also national laws adopted under the Food Act 1998 governing the standards of safety, composition and labelling of food products produced here. The principal national legislation is the Australia New Zealand Food Standards Code which sets national standards for the microbiological and chemical safety of foods, and the minimum labelling requirements for packaged and some unpackaged foods. The Code also contains four food safety standards that govern matters such as personal hygiene, temperature control, skills and knowledge, food premises construction and operation and food safety programs.

It is important to note that the Code is part of a system of nationally consistent food safety legislation that is designed to ensure the safety of the food supply in Australia and to minimise the incidence of food-borne illness. Both the Code and the Food Act 1998 is applicable to all sectors of the food industry, including primary food production and the use of treated wastewater on food crops.

Effective food safety practices must focus on identifying, understanding and reducing hazards. This principle applies to all stages of food production from “paddock-to-plate” and includes growing, harvesting, packing and transporting food produce.

Effective food safety practices identify risk and implement procedures that prevent, reduce or eliminate the hazard before it reaches the consumer. However, in many cases it is not possible with current technologies to eliminate all potential food safety hazards associated with the food we eat, particularly fresh produce that will be eaten raw. In these cases, the aim is to reduce the risk to an acceptable level rather than trying to eliminate all risk.

6.16 Micro-organisms in Wastewater and Soils

Faecal coliforms, and Escherichia coli (E. coli) in particular, usually do not cause disease but may indicate the presence in wastewater of other disease-causing organisms. Wastewater treatment should reduce the number of potentially harmful organisms to safe levels.
Sunlight and evaporation following irrigation are important agents which destroy microorganisms remaining on the soil surface. The residual levels of bacteria on plants grown with reclaimed water treated to secondary standard are not significantly different to those grown without reclaimed water.

While some micro-organisms infiltrate with the irrigation water into the soil, they do not survive indefinitely. Survival depends on many factors including moisture, temperature, pH, nutrients, organic matter and the presence of antagonistic organisms or toxins.

6.17 Good Agricultural Practice

Good agricultural practice is an approach to primary food production that seeks to ensure that identified food safety hazards are addressed in a systematic way. Typically, this is done by the use of check-lists that identify sources of potential hazards and put in place mechanisms to deal with them. Good agricultural practice is consistent with the approach taken in the food retail and food manufacturing sectors where food safety programs based on Hazard Analysis Critical Control Point Principles (HACCP) are used to identify and control hazards.

To be effective, a check-list should examine all facets of the production system including growing, harvesting, packing and transporting. Under each of these areas, a more detailed examination should be made of the inputs (for example, water, fertiliser, pesticides etc.) and the likely hazards (for example, biological, chemical or physical). For each of these hazards, a control mechanism is required, for example, it may be necessary to regularly test water sources for pathogenic indicator organisms.

In addition to identifying and managing hazards, it is also necessary to recognise that food handler skills and knowledge are critical to managing food safety. As a general principle and in order to reduce the risk of producing unsafe food, all food businesses, including primary food producers, must make sure that workers know how to do the job that they are employed to do. Indeed, under new national food safety laws, food handlers and supervisors in retail and manufacturing are required to have adequate levels of skills and knowledge in food hygiene and food safety.

Skills and knowledge requirements can be met in a number of ways, including formal training, on-the-job training, prior experience or in-house training. The particular training approach is up to individual businesses to decide and may depend on the seriousness of the hazards identified. However, generally speaking, more serious hazards will require more extensive food handler skills and knowledge.

6.18 Public consent risk & Public appeals

While we have briefed and discussed openly our proposal with as many stakeholders as possible, our planning system, rightly, provides for the public to appeal the councillor vote to issue a planning permit.

Opportunity for appellants to delay / hinder the progress of the project.
It is important that community information and communication programs reflect the local circumstances of an operator’s activities. In some cases, it is advisable to take pro-active measures to inform neighbours (for example about environmental and health safeguards to be implemented). After the initial assessment of the potential for wastewater re-use has been made and a long-term site proposed, public involvement may be necessary to determine viability and, where favourable, system design can begin. Neighbourhood acceptance of re-use schemes can be developed by providing information and involvement in any proposals, visits to similar re-use schemes and community attitude surveys.

While we have taken all due care to cover off and consider the proposal from as many angles and differing impacts and points of view as we could possibly imagine.

The public system enables public to appeal against the CCC decision.

The appeals must be based on substantive grounds and supported by professional scientific data.

Appeals that are in the opinion of the company board not backed by logical and scientific data will be directed immediately to RMPAT for efficient and timely resolution.

Public acceptance of wastewater re-use has been surveyed for a variety of applications.

Public opinion towards wastewater re-use appears to be influenced by:

- Conservation Issues
- Treatment levels
- Availability of other sources of water
- Distribution system
- Level of human contact
- Cost/price
- Health issues
- Community expectations
- Environmental issues

A high level of public acceptance is essential for projects involving public contact with irrigated wastewater to be successful. This acceptance is generated when there is confidence in sewerage system operations and trade waste controls. There is a high level of goodwill towards the concept of wastewater re-use and community attitudes towards the practice are fairly consistent. In general, the higher the level of public contact or the closer the proximity to the application, there is an increased possibility of unfavourable attitudes. Particularly in these situations it may be necessary to consult with the public about options for wastewater re-use.

If there are no other determining factors, low contact uses are a good first option to be examined for wastewater re-use projects.
6.19 Risk of pipeline failure – rupture

Engineering shall be compliant so as not to over pressure or rupture the pipeline, or connections. Pumps and monitoring equipment shall monitor and safely shut down the system should an abnormal condition be detected.

Rupture by means of mechanical impact is unlikely to the nature of the pipe being underground by a minimum of 700mm

6.20 Marine boat users – anchor drag - MAST

The possibility of snagging onto the submerged pipeline must be considered.

The mitigations employed include:

- fully drilled pipe out past 15 m depth (500m)
- installation of the pipeline within an existing no anchor corridor across the Derwent.
- We will communicate all alignments with MAST and have existing marine charts updated as required. Mast comments are included;
  - signposted at each end where it meets the land
  - Refer to TasPorts as it is within pilotage waters are it is possible that ships could anchor in this region. – Tas ports Harbour Master David Willetts.
  - The land signage and pipe route will have to be advertised via a Notice to Mariners and added to the nautical charts by the Hydrographic Office of the RAN.
  - MAST’s other involvement would be in the Notice Mariners advising the public of the installation works- contractor will need to liaise closely with Tasports to fit with shipping movements.

6.21 Storm Surges and River Water Level Rise.

HDD will exclude the pipe from storm-based waves and erosion events. The marine section of the pipe will be firmly anchored to accommodate worst case scenario of river currents environment.

6.22 Operational Hazards

In January 1, 2013, the Tasmanian introduction of the Work Health and Safety Act 2011 (Cth.) and the Work Health and Safety Act 2012 (Tas.); these Acts intend to harmonise Work Health and Safety standards throughout Australia.

The WHS Act provides a framework to protect the health, safety and welfare of all workers at work and of other people who might be affected by the work. The WHS Act aims to:
• protect the health and safety of workers and other people by eliminating or minimizing risks arising from work or workplaces
• ensure fair and effective representation, consultation and cooperation to address and resolve health and safety issues in the workplace
• encourage unions and employer organisations to take a constructive role in improving work health and safety practices
• assisting businesses and workers to achieve a healthier and safer working environment
• promote information, education and training on work health and safety
• provide effective compliance and enforcement measures
• deliver continuous improvement and progressively higher standards of work health and safety

In furthering these aims regard must be had to the principle that workers and other persons should be given the highest level of protection against harm to their health, safety and welfare from hazards and risks arising from work as is reasonably practicable.

For these purposes ‘health’ includes psychological health as well as physical health. (Guide to the Model Work Health and Safety Act).

6.23 Injuries

Injuries could range from minor slips, trips and falls to life-threatening accidents. Mitigation measures may include but are not limited to the following:

• Providing clear signage and high visibility marking/identification around any potential trip hazards
• Provide clearly marked pedestrian pathways that deter passers-by from the work area
• Provide clearly marked pedestrian pathways within the precinct
• Securely protect and guard users and public from all potential pinch points and mechanical movements
• Securely and safely prevent public from access
• Ensure all users have the appropriate level of training before granting access to static and mobile plant, tools and machinery
• Where vehicle movement occurs, this should be in a controlled and safe manner by competently trained/inducted users
• Ensure appropriate scaffolds and/or fall protection are provided for working at heights and where necessary erected by competently trained personnel
• Provide users with comprehensive OH&S training
• Provide reasonably practicable awareness to all potential users of the potential risks

6.24 Electrical Hazards

There may be electrical sockets within infrastructure precinct. These sockets provide users with access to power for the operation of electrical tools in the booster area. By the nature of the work, it is likely that the area will periodically become sodden, further increasing a risk of electric shock.

Mitigation measure may include but are not limited to the following:

• Installation of RCDs on all outlets
• Ensure all leads are appropriately insulated, paying attention to areas that are likely to become wet. Leads are to be elevated from the ground via appropriate lead stands
• Ensure that power leads and electrical equipment carry current test and tag compliance

6.25 Exposure to Hazardous Substances

Hazardous substances in the infrastructure will be limited but may potentially include a variety of chemicals and or cleaning agents. Certain substances can cause acute injury and/or chronic detrimental health effects when handled, used or stored improperly.

Mitigation measure may include but are not limited to the following:

• Implementation and maintenance of a Chemical Register and Inventory in conjunction with Material Safety Data Sheets (MSDS) for relevant hazardous substances that are produced, transported, stored, handled and used on site, this is to be well organized and easily accessible.
• Ensure there is appropriate storage of hazardous substances, including secondary containment to contain a minimum of 110% of the volume of the largest container/tank in the containment area and adequate segregation of hazardous materials. This should include hazardous substances bought to site by contractors, visitors working on site.
• Personnel involved with the use, storage, transportation and delivery of hazardous substances should use proper labelling and placarding on product containers and tanks.
• Installation of appropriate firefighting equipment that is designed for the types of hazardous substances used, handles, generated or stored at the workplace.
• Ensure work areas are well-ventilated, especially where the use of chemicals is required.
• Ensure work-appropriate footwear and clothing are worn on site.
• Ensure appropriate PPE is applied when using hazardous substances.
• A list of banned substances should be developed and displayed.

6.26 Fuel Spill

Fuel spills are an unlikely source of contamination within the environment around the infrastructure. However, depending on the size of the spill, the environmental impacts can be significant and long-term. There is a potential for fuel spills to occur.

Mitigation measures may include but are not limited to the following:

• In the case of an emergency, provide and implement emergency assembly areas that are demarcated with appropriate signage;
• Keep fuel spill kits close, so that any spill can be efficiently responded to with the following actions;
  o CONTROL the source of the spill
  o CONTAIN the spill immediately to prevent it from migrating further
  o CLEAN UP the spill and all contaminated material used
  o COMMUNICATE all spills immediately to your supervisor)
• Ensure all staff are appropriately trained in the use of the fuel spill kits
• All hydrocarbon products must be stored in accordance with AS1940
• Routinely check, fuel connections and pipelines and keep records of the inspections
• Standard Operating Procedures (SOP’s) for hydrocarbon transportation, unloading, transfer, storage, handling, use and disposal should be developed, kept current, effectively implemented and personnel trained

6.26.1 Risk References

Standards Australia, AS/NZS 4360:2004 Risk Management

6.27 Blackmans Bay - General Environmental Aspects.

See DPEMP - Apx 09 TasWater Blackmans Bay Sewage Treatment Plant DPEMP.
and
DPEMP Apx 12 Treatment Plant Outfall Extension Blackmans Bay DPEMP
The Blackmans Bay TasWater STP site is currently undergoing a $40 million upgrade.

6.28 Environmental Management.

Specifically, and in response to the CCC IPS;
The pipeline will be considered as Utilities use.
Performance criteria at Clause 29.3.1P1 of the CCC IP Scheme specifies:

*Use must satisfy all of the following:*

(a) be complementary to the use of the reserved land;

(b) be consistent with any applicable objectives for management of reserved land provided by the National Parks and Reserves Management Act 2002;

(c) not have an unreasonable impact upon the amenity of the surrounding area through commercial vehicle movements, noise, lighting or other emissions that are unreasonable in their timing, duration or extent.

For the above part (a) of Clause 29.3.1P1 of the CCC IP Scheme;

The Reserved Land in this case will be the Opossum Bay Marine Reserve in the Derwent River.
The pipeline is considered as complementary to the Opossum Bay Marine Conservation Area by way of improving the water quality of the reserve. The significant quantiles of water taken by the pipeline for irrigation to South Arm will reduce by up to 25% the nutrient rich water being disposed of into the Derwent River Environment by the water TasWater Plant.

For the above part (b) Clause 29.3.1P1 of the CCC IP Scheme

*Note; The project is additionally and separately assessed under the Tas Govt PWS RAA process. The RAA also is assessed under the National Parks and Reserves Management Act 2002*
The following objectives are provided with proponent responses:

(a) to conserve natural biological diversity;
   - the proponent suggests the pipeline through managed and environmentally low impact construction practises and operational processes, the pipeline will conserve the current biological diversity of the conservation area.
   - The pipeline can be considered as an inert object and will not pollute the conservation area.
   - A very unlikely rupture of the pipeline will be managed and controlled via a control system. (flowmeter measuring the rates and volumes entering and exiting the pipe. Any data discrepancies will shut down the pipe pumping until the issues is resolved.
   - The pipeline through maintenance routines will be inspected, biological diversity will be monitored (divers) and demonstrated to be of nil environmental impact and specifically marine flora and fauna diversity.

(b) to conserve geological diversity;
   - Geological diversity of the Opossum Bay Marine Conservation Area is not expected to be impacted via operations or construction of the project pipeline.
   - The HDD technology construction method will insert the pipeline under the Opossum Bay Marine Conservation Area for approximately 500 meters of the 600 meter reserve. The remained will be installed by the float and sink methodology.
   - When considered from a geotechnical conservation perspective the pipeline will either sit on top of the sea bed or be drilled into the earth under the reserve.

(c) to preserve the quality of water and protect catchments;
   - The pipeline is considered as complementary to the Opossum Bay Marine Conservation Area by way of improving the water quality of the reserve. The significant quantiles of water taken by the pipeline for irrigation to South Arm will reduce by up to 25% the nutrient rich water being disposed of into the Derwent River Environment by the water TasWater Plant.

(d) to conserve sites or areas of cultural significance;
   - No cultural significance will be impacted by the construction or operations of the pipeline.
   - Refer to separate aboriginal heritage study.
(e) to provide for the controlled use of natural resources including special species timber harvesting, and including as an adjunct to utilisation of marine resources;

- Not considered applicable for the Opossum Bay Marine Conservation Area

(f) to provide for exploration activities and utilisation of mineral resources;

- Not considered applicable for the Opossum Bay Marine Conservation Area
- The pipeline will allow for no change in exploration activities and utilisation of mineral resources

(g) to provide for the taking, on an ecologically sustainable basis, of designated game species for commercial or private purposes, or both;

- Not considered applicable for the Opossum Bay Marine Conservation Area
- The pipeline via construction or operations is not considered to have any impact on the taking, on an ecologically sustainable basis, of designated game species for commercial or private purposes, or both;

(h) to provide for other commercial or industrial uses of coastal areas;

- Not considered applicable for the Opossum Bay Marine Conservation Area
- The pipeline is unlikely to have impact on other users (none are identified)

(i) to encourage education based on the purposes of reservation and the natural or cultural values of the conservation area, or both;

- The proponent intends to support and encourage education based on the purposes of reservation and the natural or cultural values.
- It is the intention of the proponent to support the Spotted Hand fish breeding and conservation program.

(j) to encourage research, particularly that which furthers the purposes of reservation;

- The proponent will encourage research however this objective may be considered as N/A

(k) to protect the conservation area against, and rehabilitate the conservation area following, adverse impacts such as those of fire, introduced species, diseases and soil erosion on the conservation area’s natural and cultural values and on assets within and adjacent to the conservation area;

- The pipeline is not expected to nor has identified any detrimental area’s natural and cultural values

(l) to encourage appropriate tourism, recreational use and enjoyment (including private uses) consistent with the conservation of the conservation area’s natural and cultural values;

- Not considered applicable for the Opossum Bay Marine Conservation Area when considered in terms of the pipeline construction or operations.
(m) to encourage cooperative management programs with Aboriginal people in areas of significance to them in a manner consistent with the purposes of reservation and the other management objectives.

- Not considered applicable for the Opossum Bay Marine Conservation Area when considered in terms of the pipeline construction or operations.

**For the above part (c) Clause 29.3.1P1 of the CCC IP Scheme**

Considered as not applicable.

*The pipeline construction or operations will not have an unreasonable impact upon the amenity of the surrounding area through commercial vehicle movements, noise, lighting or other emissions that are unreasonable in their timing, duration or extent.*
7. Pipeline Construction and Commissioning

It is the very low impact construction methodology of the project that allows for approvals of many other pipeline projects. These precedents, feasible construction costs and local skill capabilities allow for the sustainable construction and operational phase of the pipeline.

There are comprehensive international design guidelines covering design methods and deployment and installation options for submarine PE pipelines.

Our Tasmanian Salmon farming companies as well as local councils have had successfully designed constructed and operated similar pipeline projects.

All construction contractors will operate under Australian Standards and appropriate industry best practice procedures and guidelines.

The project proposal has been designed to be constructed in two stages.

Stage one includes:

- Blackmans Bay (TasWater site) connection and pumping and buffering tank infrastructure
- Pipeline across Derwent River
- South Arm booster station
- Pipeline running north to the Arm End site

Stage one costings are as per below:

<table>
<thead>
<tr>
<th>Tasks &amp; Deliverables</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Concept Design</td>
</tr>
<tr>
<td>2</td>
<td>Proposal and Concept</td>
</tr>
<tr>
<td>3</td>
<td>Engineering and Consultation</td>
</tr>
<tr>
<td>4</td>
<td>Approvals</td>
</tr>
<tr>
<td>5</td>
<td>Contract Award</td>
</tr>
<tr>
<td>6</td>
<td>Construction</td>
</tr>
<tr>
<td>7</td>
<td>Materials</td>
</tr>
<tr>
<td>TOTAL (ex GST)</td>
<td>$3,488,980</td>
</tr>
</tbody>
</table>
Stage two includes:

- Pipeline running South to Iron Pot Golf club
- Connection of other users to both north and south sections including Ian Grubb.

Stage two construction cost have yet to be established.

Estimate:

- Dam storage $400,000
- Pipeline $600,000
- Construction $500,000.

### 7.1 Project Management

The project will manage and aligned and in accordance with:


Generally maximum efficiency and quality on a project can be realised through consistency of attention by a project champion throughout a project life-cycle (plan-design tender- build-commission), with project knowledge and understanding garnered during planning and design phases proving invaluable during construction and commissioning. The proponent would be happy to have assistance in any capacity that best suit the regulators requirements.

Included in the responsibilities of the Project Manager will be QA/QC and OHS obligations. Contractor management will include (as required) for the contractor to demonstrate consideration of the following:

- WORKPLACE SAFETY MANAGEMENT PLAN
- EMPLOYEE RELATIONS MANAGEMENT PLAN
- ENVIRONMENTAL MANAGEMENT PLAN
- CONSTRUCTION PROGRAM
- CULTURAL HERITAGE MANAGEMENT PLAN
- SITE ESTABLISHMENT & Mobilisation Plan
- QUALITY VERIFICATION CHECKLIST

All be approved first before referenced on ITP's

- SITE ESTABLISHMENT SAFE WORK METHOD STATEMENT
- SITE EMERGENCY RESPONSE PLAN
- SITE ELECTRICAL SAFETY STANDARD
- SITE COMPETENCY VERIFICATION STANDARD
SITE FITNESS FOR WORK STANDARD
SITE PERSONAL PROTECTIVE EQUIPMENT
HAZARDOUS MATERIALS AND DANGEROUS GOODS MANAGEMENT.
INSPECTION & TEST PLAN/check sheets –
TRAFFIC MANAGEMENT PLAN
ENVIRONMENTAL MANAGEMENT PLAN
FUEL AND OIL MANAGEMENT PLAN –
List of Proposed Sub-Contractors
Project Execution Plan
Safety Management Plan
Insurances/Bank Guarantees

7.2 Project task Gantt and time lime / Program

It is the intention to have water available at the Arm End Recreation Reserve by the end of the summer season 2019 and consequently we are aiming to hit the tight timeframes of this project.

Time periods for the submission of information to, and review by other authorities and regulators, including submissions for various permit(s), can vary greatly from several days to many weeks or months at times of peak activity or other circumstances.

Time periods for these activities which are out of our control and will mark these hold points for the project.

Hold Points identified which may affect program if not managed and resolved include:

- TasWater consultation and review of preliminary design information for approval
- DSG/MAST and other authorities review of proposed design and approvals for any permits
- Kingborough and Clarence Council reviews of proposed design and approval for permit & subsequent conditions.
- DPIPWE and EPA review of proposed design and approval for Permit & subsequent information.
- TasNetworks review of power supply availability and likely provision of services for required pumping facility
7.3 Construction Methodology

The proponent recognises that the health and safety of all workers, subcontractors, the public and third parties visiting controlled construction sites is of highest priority.

Our policy is to ensure, so far as is reasonably practicable, that our workplaces:

- Represent a healthy and safe working environment
- Incorporate safe systems of work
- Utilise plant, equipment and materials in a safe manner
- Provide facilities that are prescribed for the operations under that workplace

The construction phase of the pipeline will as required operate under a formally documented WHS system. The relevant information, instruction, training and supervision is to be provided as is reasonably necessary to all workers, as appropriate to their duties and responsibilities.

Work Health and Safety legislation requires all supervisors and ultimately the project principal to ensure that their workers have the skills and training required to undertake their work in a safe manner, address health aspects of the work and the interface with the working environment.

Any health and safety issues that may arise during this project will be referred, in the first instance, to the Project Manager or Project Director for review who will then, if required, refer the issue for resolution.

Survey work includes the preparation of plans by a surveyor, which identify the possible if required areas for any future easements to be created. We have allowed for documentation by a Registered Land Surveyor, including submission of titles and the like. From experience, the formation of easements is possibly best undertaken after the completion of the works, and once landholder negotiations are finalised.

Authority approval including Commence works notice will be required and as such act as a final preconstruction review of all aspects.

Three basic main methods we be used for the construction installation of the infrastructure.

- HDD for all terrestrial pipe and coastal crossings
- Float and sink for the marine section of the pipe.
- Vacuumed excavations back filled with same material for HDD pits

7.3.1 Horizontal Directional Drilling

It is essential that all regulators and assessor understand the concept of HDD.
Each trenchless construction project has its own specific considerations; however, the following are applicable to all techniques:

- Operational considerations. Trenchless construction is a minimal surface impact technique.
- Consider access if the pipeline or service needs to be removed or inspected.
- Environmental considerations, such as; sensitive areas, soil types, water course etc.
- Competency of personnel designing and constructing the chosen method.
- Signage and third-party awareness.
- Pipeline pressure ratings or de-ratings according to the construction method used.
- Solids build up in low points.
- Pressure testing, (to be in accordance with relevant Code of Practice).
- Site investigations (topographical surveys, hydrographic surveys, etc.).
- Service and utility locations (Dial Before You Dig / pot holing etc.).
- Sub-surface investigations (test holes/bores, soils analysis, etc.).
- Pipe fabrication / stringing considerations (i.e. bundling of multiple strings, rollers/equipment for support during insertion etc.).
- Safety (machine safety practices, entry into excavations, exposure to chemicals used in drilling, high pressure fluids, etc.).

Pre-construction drawings could be made of all trenchless requirements. This will minimise construction risks, facilitate approvals and enable accurate “as-built” drawings to be made. A sample Construction Drawings of a typical HDD can be found for reference along with advice and discussion on the different techniques from the Australasian Society for Trenchless Technology at www.astt.com.au.

Directional drilling, commonly called horizontal directional drilling or HDD, is a steerable trenchless method of installing underground pipelines with minimal impact on the surrounding area. Directional drilling is suitable for a variety of soil conditions.

Directional drilling is typically used to provide less traffic disruption, lower cost, deeper and/or longer installation, no access pit, shorter completion times, directional capabilities, and environmental safety.

The technique has extensive use in urban areas for developing subsurface utilities as it helps in avoiding extensive open cut trenches.

The process starts with receiving pit and entrance pits. These pits will allow the drilling fluid to be collected and reclaimed to reduce costs and prevent waste. The first stage drills a pilot hole on the designed path, and the second stage enlarges the hole by passing a larger cutting tool known as the back reamer. The reamer’s diameter depends on the size of the pipe to be pulled back through the bore hole. The driller increases the diameter according to the outer diameter or the conduit and to achieve optimal production. The third stage places the product or casing pipe in the enlarged hole by being pulled behind the reamer to allow centring of the pipe in the newly reamed path.

Pipes can be made of materials such as PVC, polyethylene, polypropylene, ductile iron, and steel if the pipes can be pulled through the drilled hole.

Known colloquially as ‘keyhole surgery for the environment’, trenchless technology is a non-invasive construction technique used in a variety of government-funded infrastructure projects. Its uses range from the construction of tunnels and the installation of pipelines, to the rehabilitation of existing assets, such as water and wastewater sewers.

Trenchless technology refers to network monitoring equipment and techniques used to install, repair, or replace water infrastructure while minimising surface disruption. These
techniques eliminate the need for open-cut excavation, and therefore offer environmental, social and economic benefits to government and the community.

In addition to these immediate benefits, trenchless technology often results in reduced costs. Trenchless techniques for installing new infrastructure and rehabilitating existing underground assets provide many benefits to councils, water authorities and communities. It is vital for workers within the water industry to be across trenchless methods and technologies in order to provide safer worksites for contractors, to minimise social costs to communities, and to reduce costs involved in capital works programs.

It is the solution to many of the problems that Australia is facing in the near term. With an economic slowdown at home and a tight global credit market abroad, every dollar counts. Trenchless technology is no longer an expensive alternative, but instead offers many ways to do more with less.

HDD can be also used to avoid high points along the pipe alignment as well as environmentally sensitive and endangered ecological communities, and to minimise impacts around schools, mine sites and commercial premises.

Final and accurate plans, precisely showing a final pipe depths and alignments (and joins) will be provided to CCC and dial before you dig.

Accurate surveys and as built drawing are an essential future consideration to efficiently locate the pipe.

Potential future water users can efficiently live (under pressure) tap the pipe at any time once all applicant’s approvals are in place for the particular user.

7.3.2 Float and Sink

Float and sink;
https://youtu.be/Wo8RyCel3gU

See also the diagrammatic description included in the DPEMP appendices.

The Float-and-Sink Method -Basic Design and Installation Steps; In nearly all underwater applications, the design and installation of PE piping is comprised of the following basic steps:

- Selection of an appropriate pipe diameter
- Selection of an appropriate pipe SDR (i.e., an appropriate wall thickness) in consideration of the anticipated installation and operating conditions
- Selection of the design, weight and frequency of spacing of the ballast weights that will be used to sink and then hold the pipe in its intended location
- Selection of an appropriate site for staging, joining and launching the pipe (Arm End site)
• Preparing the land-to-water transition zone
• Assembly of the individual lengths of pipe into a continuous string of pipe
• Mounting of the ballast weights (This step may be done in conjunction with the next step.)
• Launching the joined pipe into the water
• Submersion of the pipeline into the specified location
• Completion of the land-to-water transition

For further detail see links such as: https://plasticpipe.org/pdf/chapter10.pdf

Other more specific aspects of the Float-and-Sink Method include;

The butt fusion of individual lengths into a long string of pipe should be conducted by trained personnel and by means of appropriate equipment. The heat fusion parameters – e.g., temperature, interfacial pressure, heating and cooling times – should be as recommended by the pipe manufacturer for the particular pipe material and the joining conditions, including outdoor temperature and wind. (PE Joining Procedures.) Upon the completion of the heat fusing of an added individual length to the pipeline, the resultant longer pipe string is further moved into the water. The pipe should always be moved to the water using suitable mechanical equipment that will cause no damage to the pipe or to the pipe ends. Ballast weights can be mounted before the pipe string reaches the water. If circumstances make it more practical, the ballasts can also be attached on the floating pipe from a floating barge.

To prepare the pipe for submersion, it is first accurately positioned over its intended location. The sinking operation basically consists of the controlled addition of water from the on-shore end of the pipe and the release of the entrapped air from the opposite end. The sinking is conducted so that it starts at the shore where the pipe enters the body of water and then gradually progresses into deeper waters. To achieve this, an air pocket is induced by lifting the floating pipe close to the shore. As the water is allowed to enter the pipe from the shore side, the added weight causes this initial air pocket to move outward and the intermediate section of pipe between the air pocket and the shore end to sink. As additional water is added, this pocket moves to deeper waters causing the sinking to progress to its terminal point in the body of water. This controlled rate of submersion minimises pipe bending and it allows the pipeline to adjust and conform to the bottom profile so that it is evenly supported along its entire length.

A potential risk during the submersion operation is that, when the pipe sinking occurs too quickly, the bending of the pipe between the water-filled and air-filled portions may be sharp enough to risk the development of a kink, a form of localized pipe buckling. As a pipe is bent, its circumferential cross-section at the point of bending becomes increasingly ovalized. This ovalisation reduces the pipe’s bending moment of inertia, thus decreasing the bending force. Upon sufficient ovalisation, a hinge or kink can form at the point of maximum bending an event that also leads to a sudden reduction of the bending force. Since the formation of a kink impedes the submersion process and can also compromise
the pipe’s flow capacity and structural integrity – in particular, the pipe’s resistance to collapse under external pressure – it is essential that during submersion the bending of the pipeline be limited to an extent that will not risk the formation of a localised kink.

In summary the construction or the Marine component of the pipeline will be as per the following basic steps.

1. Organise materials and equipment to be used in the marine section (only) of pipeline construction, as per design requirements
2. Carry out required preparations to each section of pipeline in readiness for towing off-shore.
3. Launch off-shore (with assistance from others on-shore, using excavator or similar to move/guide pipeline sections into water)
4. Using workboats, tow each section of pipeline to required location in river
5. Sink each section at required location in river under supervision of dive crew, as per installation procedure
6. Dive crew join sections together via stainless steel flanges located at each end of pipeline section
7. With section/s of pipeline laying on seabed, install pipe cradles under pipeline at required intervals, as per design requirements/installation procedure
8. Installation frame with top section of pipe cradle attached lowered onto pipeline and both sections of cradle fastened together
9. Screw anchors installed via hydraulic drill rig, fastening cradles over pipeline and into seabed.
10. Installation procedure repeated at required intervals along length of pipeline into sandy/silty seabed until complete.

7.3.3 HDD and Float and sink connection interface.
The above diagrammatic image simplifies the flange connection interface between the HDD (from shore) to the float and sink sections of the main river crossing.

7.3.4 Washdown LV, HV and Machinery

For all construction machinery it will be the responsibility of the construction contractor to use an approved washdown procedure.

REFERENCES


7.4 Commissioning of pipeline and infrastructure

Completions plan including commissioning and operational testing against design will be systematically performed.

Inspection Test Plans (ITPs) will be used for both the construing and completions of the pipeline project.

ITPs shall include the following as a minimum:

- Description of each operation
- Description of each test, examination or inspection
- Controlling specification or procedure
- Acceptance criteria
- Verifying document
- Provision for hold point, witness point, review point and monitor point requirements of the Supplier (or sub-supplier), the Purchaser, certifying authorities and statutory authorities where applicable. To enable the Purchaser and others to nominate their requirements, a column for each party shall be available in the ITP

All equipment, workmanship and materials used during manufacture, construction and commissioning to satisfy the requirements of this specification shall conform to the relevant Australian Standards, Codes, Statutory Regulations as well as all laws and
regulations of local authorities. Reference to any standard shall include all amendments or substitutions as well as other standards referenced within those standards.

Where other standards and codes are used, they shall also satisfy Australian requirements. In the event of conflicting requirements between standards and codes the Australian requirements shall apply.

For any given project a project specific Inspection Test Plan (ITP), procedures and a final Commissioning manual shall be produced which documents in detail the job-specific tasks to be carried out and results according to the minimum requirements of this document.

Pre-operational inspection and testing of equipment shall be carried out according to the following general sequence:

- Inspection
- Pre-energisation testing
- Energisation
- Energised testing
- Functional testing

Following completion of pre-operational testing equipment shall be released for,

- Operational testing
- Performance testing

Detailed results of all inspections and tests shall be documented.
Steps shall be taken to ensure that sufficient labour is on hand to rectify any defects found. Any defects identified by checks shall be rectified and documented. At any stage of testing or energised pre-commissioning, testing shall cease while remedial work is carried out. Checks shall be repeated from an appropriate earlier point following completion of remedial work, keeping in mind the potential for related effects in previously tested areas. The results of re-checks shall be documented.

Work shall be carried out by suitably qualified, competent and experienced personnel.
It is recommended however that personnel involved in the design be involved in commissioning.
Throughout the process any changes or corrections made which deviate from the original drawings shall be marked on the drawings in red ink.
A functional safety management plan for safety related systems shall be created to cover all testing, verification and validation in accordance with the relevant standards.

7.4.1 Australian standards

Applicable standards include but are not limited to:

- AS/NZS 2566 Buried flexible pipelines
  - This Standard specifies requirements for the installation, field testing and commissioning of buried flexible pipelines with structural design in accordance with AS/NZS 2566.1. These pipelines rely primarily upon side support to resist vertical loads without excessive deformation by adopting an elliptical shape.
- AS/NZS 3000 Electrical installations (known as the Australian/New Zealand Wiring Rules)
- AS/NZS 3017 Electrical Installations - Verification Guidelines AS 4024 Safety of machinery (all parts)
- AS 61508 Functional safety of electrical/electronic/programmable electronic safety-related systems - Functional safety and AS 61508 (all parts)

7.4.2 Regulations

In particular the works shall comply with the following regulations:

- Occupational Health, Safety, Welfare and Environment Act and Regulations
- Australian Workplace Safety Standards Act and Regulations
8. **Operations and Management**

Management of the pipeline will be not for profit.
The pipeline will require to be operated, managed and serviced.
The entity responsible for the operation and management of the completed pipeline infrastructure is likely to be a registered co-operative membership of water users, stakeholders and regulators.

However initially project proponent and Development Application (DA) for the Reuse Water Pipeline; Blackmans Bay Water Treatment Plant to South Arm has been prepared by;

Mary Ann’s Island Pty Ltd (64 141 272 568) is the entity who are proposing to develop the Arm End Public Recreation Reserve.

MAI will initially (and until a management / entity is formed and approved by all stakeholders). assume all responsibilities for plan-design tender- build-commission stages of the project.

The costs associated for operation, management and service will include:

- Energy (electrical) costs
- Administrational management
  - Reporting and QC obligations
  - Accounting/ financials
  - Regulator communications and compliances
- Spare parts review and essential stock levels
- Field inspections
  - Equipment hardware
  - Preventive maintenance tasks
  - User compliance demonstrations
- Servicing and maintenance procedures
  - These will be established during commissioning and as per manufactures recommendations.

The Reuse Water Pipeline: Blackmans Bay Water Treatment Plant to South Arm will aim to operate on a cost neutral basis.

The Reuse Water Pipeline will not be considered as a potential revenue stream, all other users will proportionally pay (via a metered use) by for energy and maintenance (operation overheads)
8.1 Operational / Process Control

The pipeline infrastructure will be fully automated, safe, smart and be operated remotely. The automated smart fully integrated control system, with instantaneous instrumentation measuring a variety of parameters will be developed to monitor, collect data, report and alarm operators or safety shut down as designed.

The system operational description is still to be confirmed and will likely have an interface with the TasWater network system.

8.1.1 Logical control system

The software or control logic for the system will be tested and developed during the commissioning phase of the project.

The proposed connection of the Arm End Public Recreation Reserve to recycled water from the Blackmans Bay, allows for an opportunity to extend the benefits of a reliable irrigation water supply to additional parties on the South Arm Peninsula. These have previously been identified as multiple other agricultural properties with potential irrigation uses suited to Class B recycled water.

A proposed framework for managing recycled water governance and ongoing environmental monitoring for sites, will be produced and approved.

Initially it is proposal that Mary Ann’s Island P/L (MAI) will be responsible for management and operation of the scheme.

MAI, may likely in the future, however create a recognised and separate membership co-operative to manage and operate the infrastructure.

In developing this entity, it is assumed that MAI (or membership co-operative) will be the owner of the recycled water infrastructure (pipeline and any pumps etc.) between TasWater’s Blackmans Bay STP and the South Arm Peninsula.

<table>
<thead>
<tr>
<th>Step</th>
<th>Mechanism</th>
<th>Inclusions</th>
</tr>
</thead>
</table>
| 1 | **EPA Approval**  
  It is anticipated that the recycled water proposal (via the DPEMP and IEMP) will be referred by Council/TasWater to the EPA convened Water Recycling Coordination Group (WRCG) for approval. | The initial approval (based on the DPEMP and attachments) will be sought for the use of recycled water on the AEPRR.  
It is recommended that a supplementary map and note outlining the future scheme footprint be submitted. This will prevent future surprises for the WRCG (or proponent) and provide opportunity for comment on the required approval process for additional customer connections.  
Full drawing set attached. |
| 2 | **MAI enter into a recycled water supply agreement** with TasWater.  
Attached to this agreement will be the Irrigation and | The agreement will define roles and responsibilities of recycled water management and include:  
• Definition of a supply point (from which the responsibility for infrastructure/recycled |
|   | Environmental Management Plan (IEMP) for the use of recycled water on the Arm End Nature Recreation Reserve | water transfers from TasWater to MAI)  
- Pricing arrangements  
- Monitoring and reporting arrangements  
- Minimum water quality standards |
|---|---|---|
| 3 | Establishment and enter into an agreement with local area landowner of the future recycled water storage dam. | This agreement will assign responsibilities for:  
- Obtaining DPIPWE dam approvals  
- Construction costs for the dam, pipeline and pumping infrastructure  
- Installation of monitoring equipment (including groundwater bores)  
- Ongoing dam surveillance (if required by DPIPWE) and water quality monitoring (if required) |
| 4 | Prior to supply of recycled water to any site MAI (or future management entity) will enter into supply agreement with any third party requesting access to recycled water. Any EPA feedback from step 1 must be addressed prior to entering into an agreement | As a minimum each site will require an IEMP (appended to supply agreement) and management contract; Considerations will also include:  
- Definition of a supply point (from which the responsibility for infrastructure/recycled water transfers from MAI to third party)  
- Pricing arrangements  
- Environmental monitoring and reporting arrangements (including site access requirements)  
- Minimum water quality standards Consultation |
with TasWater outlining third party users’ connection.
- Volumetric allowances and storage requirements (if necessary)

|   | Ongoing environmental monitoring to be undertaken by MAI (or future management entity), in accordance with the recommendation of the DPEMP. Annual report to be provided to TasWater | MAI (or future management entity) to be responsible for ongoing environmental monitoring:

  - Soil
  - Groundwater
  - Environmental monitoring and auditing of third party users (once they’re on line) |

9.1 **State Government Responsibility**

Under the Environmental Management and Pollution Control Act 1994 sewage treatment plants treating more than 100kL/day are level 2 activities and are regulated by the Environment Division of DPIWE.

Wastewater re-use schemes are not level 2 activities and are not, therefore, directly regulated by the State.

However, in recognition that it has regulatory control over how wastewater from wastewater treatment plants is disposed of, DPIWE has taken on the role of assessing the environmental effects and sustainability of wastewater re-use schemes. Recognising the interests and expertise that a number of other Government agencies have in this area, DPIWE has established the Wastewater Re-use Coordinating Group (WRCG) to foster a whole of government approach to the re-use of wastewater from wastewater treatment plants and to facilitate an efficient and comprehensive assessment process.

The WRCG will assess proposals for wastewater re-use from wastewater treatment plants.

Recommendations of the WRCG will be implemented as appropriate by the Environment Division through the permit conditions for wastewater treatment plants. Other proposals linked to wastewater reuse, such as those from industrial premises, will be assessed by the Environment Division and/or the Environmental Management & Pollution Control Board with input from other agencies as appropriate.

The WRCG will examine issues including suitability of the effluent for re-use, suitability of the site, protection of groundwater quality, and other specific management issues. Where necessary, the WRCG may require additional information or data to be presented within a
Development Proposal and Environmental Management Plan (DPEMP) for the proposed scheme.

9.2 Local Government Responsibility

Operation of wastewater re-use schemes may involve the following responsibilities for local government.

- All wastewater re-use proposals must be discussed in the first instance with the local Council as the planning authority for the area to determine if a formal development application is required. All wastewater re-use proposals with level 2 activities acting as the supplier must also contact Environment Division to determine the approval process and requirements.

- Where the wastewater is being generated from a plant that is not a level 2 activity (and therefore, is not regulated by the Environment Division) the local Council will have a role in ensuring that the reuse scheme is operated in accordance with an agreed management plan or set of parameters to protect human health and the environment.

- If local government is the supplier of wastewater to a re-use scheme, or a re-user, it may be subject to a ‘supplier-user’ contractual agreement. Compliance with the agreement, particularly on issues such as end use of wastewater, must be ensured by the supplier.

- If local government is a user of wastewater, it may itself be responsible for ensuring that the re-use is carried out in accordance with a management plan and any regulatory requirements.

- Local government also administers public health and food safety legislation that requires that activities such as effluent re-use do not cause public harm and that all food produced for human consumption is safe to eat.

The specific legal mechanism/s for each re-use site will be determined by the requirements of the CCC planning scheme and the level of complexity and associated risk of the proposed scheme.

There are four mechanisms which may be utilised to ensure that re-use schemes are appropriately and sustainably operated and in accordance with commitments or conditions of approval.

1. Conditions may be attached to the permit to operate the wastewater treatment plant that produces effluent destined for a re-use scheme. The conditions may prevent effluent being discharged to the re-use scheme unless certain requirements and undertakings are met. These can include ensuring that the re-use scheme is
operated in accordance with agreed parameters, monitoring the quality of effluent being discharged to the re-use scheme, and ensuring that appropriate supplier-user agreements are in place.

2. A ‘supplier-user’ agreement is a legal contract between the supplier and the user that specifies issues relating to the quantity and quality of wastewater as well as environmental management and public health requirements. The supplier is responsible to ensure the user complies with all conditions in the agreement.

3. In some circumstances, a permit to establish and operate the re-use scheme may be required under local government planning schemes. If a permit is required, conditions which detail the various planning, environmental management and public health requirements will be specified by the planning authority.

4. An environment protection notice (EPN) could be served either by local government or by the Director of Environmental Management to apply environmental management and public health requirements.

9.3 TasWater Responsibility

TasWater has responsibilities to operate the Blackmans Bay WTP, manage and comply to obligations as determined by the EPA.

TasWater will be the water supplier only.

TasWater will be required to provide (instantaneously if possible) the user all data in relation to quality of the outfall water.

TasWater statement of position in relation to the proposal is of cost recovery only.

TasWater supports the proposal.

9.4 Quality Compliance

As per details in the IEMP.

All suppliers and users of wastewater have a responsibility to implement a planned program for monitoring and recording environmental performance following commissioning of the scheme.

Collected data will demonstrate to the user that the water quality is suitable for the intended use; will identify and monitor the fate of various waste constituents in the environment; and will quickly highlight any problems with the wastewater treatment system and allow corrective / remedial action to be taken.

Management systems must include processes to monitor for these changes on a continual basis and implement appropriate changes in irrigation practice when required. To ensure that remedial action can be taken early, the following are recommended:

- flow monitoring (influent and effluent)
• wastewater quality monitoring (influent and effluent)
• soil monitoring
• groundwater monitoring
• surface waters monitoring

Quality Monitoring Indicators & Recommended Frequencies

Monitoring should be carried out annually if the waste quality is expected to be reasonably constant. More regular monitoring is necessary for low quality wastes and if water quality is expected to fluctuate. The quality indicators will vary depending on the waste characteristics.

All samples must be collected and analysed in accordance with the relevant Australian Standards or other standard(s). Analysis should only be undertaken by laboratories with National Association of Testing Authorities (NATA) accreditation.

9.5 Reuse Water - Management Guidelines

• This document (DPEMP)
• Irrigation Environmental Management Plan
• National Water Recycling Guidelines Health Environmental
• Environmental Guidelines for the Use of Recycled Water in Tasmania

9.6 Summary

MAI (or future management entity) will be responsible for all aspects of recycled water management beyond the supply point at Blackmans Bay STP.

• EPA approval for a recycled water scheme (via the WRCG) will initially be sought for the Arm End site. The documentation supplied to the EPA will highlight future scheme expansion potential.
• MAI (or future management entity) will be responsible for all environmental monitoring (prescribed within the DPEMP and supporting documents).
• MAI (or future management entity) will provide an annual report to TasWater (in an agreed format) on: recycled water use, environmental monitoring, third party supply and any other relevant factors.
• TasWater, at its own discretion, may wish to undertake independent auditing of recycled water activity on the scheme.
10. **Local Council Planning and Assessments**

All municipal councils should take an active role in investigating and evaluating all possible uses for wastewater, establishing goals and targets for re-use.

A simplified summary of the formal planning and approval steps are outlined below;

1. Pre-lodgement consultation with EPA **COMPLETED**
2. Issue Notice of intent to EPA for pipeline and water reuse scheme. (* see below note) **COMPLETED**
3. Consultation
4. Preparation of DA document package including; **COMPLETED**
   - Project Drawings, maps and plans. **COMPLETED**
   - DPEMP **COMPLETED**
   - Irrigation EMP **COMPLETED**
     - Operational Concept
     - Aboriginal Heritage Assessment / report
     - Ground Water Management Plan
     - Marine Environmental Investigations and assessments.
     - Engineering and Modelling
     - Demand and network analysis
5. Application to Aboriginal Heritage Tasmania (interim) **COMPLETED**
6. Pre-lodgement consultation with CCC and Kingborough Council **COMPLETED**
7. Pre-lodgement consultation with Parks / Crown Land Services **COMPLETED**
8. Lodgement of PWS Reserve Activity Assessment (RAA) and Licence applications to Crown Land Services **COMPLETED**
9. Seek Land Owner Consent to lodge DA (Clarence and Kingborough Councils and Crown) **COMPLETED**
10. Prepare Final DA documents package **COMPLETED**
11. Lodge DA to Clarence and Kingborough Councils
12. Council’s issue planning permits (or not)
13. Development of detailed information to address permit conditions and seek approval to commence works
Irrespective of recycled water use, minimisation of risk to the public and the environment requires that recycling of wastewater must comply with following performance requirements:

- use of wastewater for direct domestic potable purposes is not permitted
- primary treated wastewater is not considered acceptable for irrigation re-use in Tasmania
- wastewater may only be used where the quality achieves the level required for that particular beneficial use
- maintenance of high levels of pathogen reduction is required to safeguard health where domesticated grazing animals are present or public access is possible
- the impacts of nutrients and other substances on the soil, water and plant environment need to be assessed and managed by the user to avoid adverse impacts.

Wastewater is part of the total water cycle. Like rainfall or groundwater, it is a resource available for use. At a community level, appropriate utilisation of this resource is a benchmark for sustainable development. Creative thinking will find many innovative ways in which wastewater may be used – for example, urban green spaces or high value food crops. In practical terms, wastewater recycling brings positive benefits in the areas of water conservation and pollution abatement. While there are environmental and public health issues associated with wastewater – whether recycled or discharged to waterways - appropriate management techniques will minimise risk to acceptable levels.

Typical categories for augmenting water supplies using wastewater are listed below.

**Urban/Residential Recycling**: Wastewater can be excellent for municipal landscape watering of gardens or grassed areas. It contains nutrients essential for plant growth and can be used in public areas - subject to simple precautions - as an alternative to discharge into nutrient-sensitive waterways. Other uses may be for watering of golf courses, racecourses, aerodromes or for dust suppression on roads and sewer flushing. It could also provide added capacity for emergency firefighting.

**Agricultural Use**: Wastewater is a valuable resource for agricultural activities such as food crop and wine grape production. Use of wastewater on food crops which require processing before eating is preferable to use on those eaten unprocessed. Irrigation of pasture for cattle or sheep grazing, fodder crops or cereals are other common uses of wastewater. Constituents of wastewater, such as nitrogen and phosphorus, are beneficial to crops and can readily be used to produce protein and fibre, to enhance grass and other vegetation or to produce processed food crops – many agricultural irrigation needs can be met by wastewater re-use. Proponents of wastewater irrigation often report better plant growth than is obtained from chemical fertilisers, and with the added benefit of improving soil quality.
As part of the development application approval and review process, MAI documentation including a Development Proposal and Environmental Management Plan (DPEMP) as part of a Development Application (DA) to the following regulators for review and formal approval:

- Kingborough Council.
- Clarence City Council
- Crown Lands / Parks
- EPA Tas— referred from Local Councils
- MAST

This DPEMP and DA will provide an overview of the upgrade, potential impacts on the environment and how they will be managed. It is the key document by which the public can obtain an understanding of the Recycled Water Pipeline to South Arm and its potential impacts and benefits, obligations and responsibilities.

As a result of ongoing preparation of the DPEMP, our environmental studies have determined that no significant impacts are expected and that the approvals process will remain at a state and local government level, rather than requiring Commonwealth approval.

Council will advertise the DPEMP in local newspapers and make copies of the plan available for the public to read and provide comment for 28 days. This period is expected to commence in late July 2018.

Any comments received from the public are taken into consideration by council and the EPA, who will then determine approval of the project and issue a permit with conditions (if required). After approval, the project will commence detailed design and construction will follow.

10.1 Planning Aspects

This Assessment to Planning Requirements should be considered specifically to address the impacts of the Recycled Water Pipeline from TasWater Blackmans Bay Water Treatment Plant to South Arm Peninsula only and not as part of the Arm End Public Recreation Reserve.

The pipeline should be considered as a separate development.

10.2 Planning Scheme Purpose

The stated purpose of the interim planning scheme is:

- To further the Objectives of the Resource Management and Planning System and of the Planning Process as set out in Parts 1 and 2 of Schedule 1 of the Act;
To achieve the planning scheme objectives set out in clause 3.0 by regulating or prohibiting the use or development of land in the planning scheme area.

The vision for the Regional Land Use Framework is to make intelligent use of the region’s natural advantages to create an affordable and competitive future for all communities. The creation of opportunities for sustainable economic prosperity and enhancing the region’s attractiveness as a place to live, invest and visit is a priority.

The planning scheme seeks to further the principles and policies established in the Regional Land Use Framework.

10.3 Location and access
See the project drawing set for location(s).

10.4 Land Use and Tenure
The pipeline by nature of being long and skinny passes through multiple land areas, zones, planning overlays, rivers, and in road casements.
See included drawings and a copy of the included land titles and proposal drawings.

10.5 Kingborough Interim Planning Scheme 2013
See section 3.7.5 of the DPEMP

10.6 Clarence Interim Planning Scheme 2013
See section 3.7.6 of the DPEMP

Relevant and Specific CCC interim planning scheme sections include;
1) Addendum 01 Waterway and Coastal Protection Code E11.7.1 CCC IPS

Objective:
To ensure that buildings and works in proximity to a waterway, the coast, identified climate change refugia and potable water supply areas will not have an unnecessary or unacceptable impact on natural values.

See included:
Addendum 01 Waterway and Coastal Protection Code E11.7.1 CCC IPS
And

2)

Clarence Interim Planning Scheme 2015 » Part D Zones » 29.0 Environmental Management Zone » 29.3 Use Standards » 29.3.1 Use Standards for Reserved Land

29.3.1 Use Standards for Reserved Land

Objective:
To provide for use consistent with any strategies for the protection and management of reserved land.

Proponent Comment:
The development and operational phases of the pipeline through assessment by Parks Via the RAA process (level 3) demonstrates compliance to values of reserved land.

The reserved land areas being the Opossum Bay Marine Reserves as well as the Gellibrand Point NRA have both been assessed and granted Land owner consent (Crown) to lodge the DA to CCC.

CCC and Parks RAA assessment team teams are expected to communicate to ensure use consistent with any strategies for the protection and management of reserved land.

For the Gellibrand Point NRA the Crown has previously granted the proponent a lease to develop the site with specific terms and conditions.

For the Opossum Bay Marine reserve – it is expected the installation methodology will fully bypass (no impact) the reserve.

Section 5, 6, 7 of the DPEMP details this methodology.

And

3)

Clarence Interim Planning Scheme 2015 »
Part E Codes »
E16.0 Coastal Erosion Hazard Code »
E16.7 Development Standards »
E16.7.1 Buildings & Works

Objective:
To ensure that development in Coastal Erosion Hazard Areas is fit for purpose and appropriately managed based on the level of exposure to the hazard.

Proponent Comment:
The development is fit for purpose. "Fit for purpose" (the development should be suitable for the intended purpose); and "right first time" (mistakes should be eliminated).

The proposed pipeline hardware will be engineered to suit operational and worst-case the pipe reaching as far as 500m out from the coast and inland up Algona Street beyond the CCC IPS venerable overlay area. The pipeline will pass underneath areas susceptible to erosion.

The perceived level of exposure of the development in terms of erosion is considered low. The pipeline, by means of HDD installation and bypassing under the immediate coastal erosion zone will not contribute nor diminish the effects of naturally occurring erosion.

From thorough understanding of the proposal in terms of construction and operational aspects - from understanding of the construction method all below performance criteria can be satisfied.

10.7 State Coastal Policy

This policy applies to all land to a distance of one kilometre inland from the highwater mark.

The policy principles are:

- 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.

10.8 Protection of Cultural Values

Aboriginal sites and areas of conservation values on the route have been identified and protected.

See below note from Austral - Archaeological & Heritage Consultants;

SUBJECT: SOUTH ARM RECYCLED WATER PIPELINE – ABORIGINAL HERITAGE ASSESSMENT INTERIM REPORT

PERSONNEL: Alan Hay - Senior Archaeologist
TO: Craig Ferguson - Project Manager, Arm End Public Recreation Reserve
DATE: 28 June 2018

Introduction

This memorandum provides a brief summary of the engagement of Austral Tasmania Pty Ltd (Austral Tasmania) by the Arm End Public Recreation Reserve (the Proponent) to complete an Aboriginal heritage investigation of the South Arm Recycled Water Pipeline. It should be considered a preliminary summary of the archaeological findings of the field survey completed to date and the programme of archaeological work, analysis and reporting that is still to be completed as part of this project.

This Aboriginal heritage investigation was required by Aboriginal Heritage Tasmania, DPIPWE, in a
letter of 26 April 2018, due to the presence of a number of Aboriginal heritage sites within the project area. The project was assigned Aboriginal Heritage Tasmania Project No. 3945.

**Summary of Preliminary Results**
The field survey was conducted on 11 June 2018 by Alan Hay (Senior Archaeologist) and Caleb Pedder (Aboriginal Heritage Officer). The results of the survey are:

- As the proposed development is within the road corridor, a generally low potential exists for Aboriginal heritage sites throughout the majority of the study area.
- The re-identification and re-recording of the Grote Rieber Midden (AH2767) within the study area.

Aboriginal community consultation is currently being undertaken by Caleb Pedder and the Aboriginal archaeological heritage assessment report is currently in preparation for submission to Aboriginal Heritage Tasmania.

**South Arm Recycled Water Pipeline Aboriginal Heritage Assessment Staging**
This project has been undertaken in accordance with *The Aboriginal Heritage Act 1975* and *Aboriginal Heritage Standards and Procedures* (Aboriginal Heritage Tasmania 2017), which outlines the process by which Aboriginal heritage is assessed and how permits are obtained. The following stages outline the progress of this project by indicating the state of completion next to each stage in red text.

*Stage 1 – Aboriginal Heritage ‘Desktop Assessment Review’ (Completed)*
The client has already completed this and determined that an AHAR is required in order to manage currently known Aboriginal heritage sites and potentially new sites.

*Step 2 - Engage Heritage Consultant (completed)*
The client has engaged Austral Tasmania for this project.

*Step 3 – Aboriginal Heritage Register Search (Completed)*
A detailed search of the Aboriginal Heritage Register (AHR) database has been completed to obtain detailed information, such as previous archaeological reports and site cards, regarding Aboriginal heritage in the local region of the proposed development and to obtain any archaeological reports which are relevant to the study area.

*Step 4 – Develop and Conduct Aboriginal Heritage Survey (Completed)*
The methodology for the Aboriginal heritage survey was developed based on the analysis and predictive modelling of the results obtained from the AHR search undertaken in Step 2.

The purpose of the survey was to identify and map areas of Aboriginal cultural heritage and was designed to meet the requirements of the Heritage Assessment Process. The survey was completed on 11 June 2018 and the results summarised above.

*Step 5 – Register Aboriginal Sites (Being completed)*
If any sites are encountered during the survey, on completion of the fieldwork we will submit site recording forms to AHT so that they can register them and issue site numbers.

*Step 6 – Report the Results of an Aboriginal Heritage Assessment (Being completed)*
We will summarise all the work undertaken to this point into a thorough yet concise archaeological assessment which will meet the full requirements of the Aboriginal Heritage Standards and Procedures. This report will incorporate engineering advice supplied by the client indicating that the horizontal drilling itself will be through culturally sterile geological strata. This report will also include management recommendations and advise the Client on any additional steps of work that may be required prior to ground disturbance occurring within the study area. The mitigation advice in this project will be directed towards avoiding any impacts and therefore avoiding the requirement for an Aboriginal Heritage Permit, although as noted, it is not possible to guarantee the absence of harm by the proposed development prior to the completion of the assessment; mitigation advice will be given on how to best avoid this outcome if possible.

*Step 7 – Community Consultation (Being completed)*
Mr Pedder will undertake community consultation following the field survey. His consultation will be in accordance with the Aboriginal Heritage Standards and Procedures and will involve sending a précis of the results of the field survey and preliminary assessment to the relevant Aboriginal Community organisations.

**Step 8 – Report Review and Community Distribution (To be completed)**

Upon completion of the draft report, an electronic copy will be forwarded to the Client for review. Once comments have been received, the draft assessment report will be provided to Mr Pedder who will liaise with the wider Aboriginal community and the Aboriginal Heritage Council (AHC), (as required) for feedback.

AHT will review the draft report and determine whether or not it is acceptable. Once found acceptable the report will be finalised and must be forwarded to the Aboriginal community groups consulted during the assessment process. Once this process is finalised, the Client will be provided with one electronic copy of the final report.

**Step 8 Further Works and Permits (To be completed)**

The Client should note that the successful completion of the steps outlined above does not necessarily signal the completion of legislative requirements in respect to Aboriginal heritage. Based on the results of the assessment, the likely predicted impacts from the development and consultation with the Client, AHC and Aboriginal stakeholders, further mitigation/additional tasks may be required. In particular it may be necessary to apply for a permit under the Aboriginal Heritage Act 1975 although mitigation options will be directed towards avoiding this outcome.

These tasks may include the undertaking of a subsurface archaeological test program; the collection and relocation of artefactual material; or the undertaking of a subsurface salvage excavation programme. High potential or sensitive sites may need to be avoided altogether. These outcomes can only be determined following the completion of the tasks outlined above and receipt of a permit under the Aboriginal Heritage Act 1975.

**Conclusion**

If any further information is required, please do not hesitate to contact me.

Yours sincerely,

Alan Hay
SENIOR ARCHAEOLOGIST
11. **Arm End Project Description**

This section outlines the specifics of the Arm End project based on being the primary user of the proposed water pipeline.

The Company has master planned a world class multi-purpose public recreation facility on the site, with its commercial basis being an 18-hole links golf course. This will financially underpin a major investment in the natural environment and non-golf recreation resources.

When complete, we are committed to realising Arm End as a remarkable land transformation; creating one of the world's greatest golf courses, environmentally rehabilitating the site, providing habitat to support the re-establishment of native flora and fauna.

There will be unrestricted public access to the whole site.

11.1 **Overall Project Description**

**Arm End** is a visually spectacular and dynamic landform surrounded by water with five (5) separate beaches, several kilometres of cliffs and a dramatic land topography.

The Arm End project is the development of an open access public recreation facility, known as the **Arm End Multi-Use Public Recreation Reserve**. The Arm End site can easily and comfortably accommodate a mix of outdoor activities including a unique golfing experience.

The project aims to regenerate this area of fallow, weed infested open agricultural land into a multi-functional recreational reserve that includes:

- World class 18-hole golf course
- Extensive environmental floral rehabilitation
- Native animals and bird habitat rehabilitation
- Public Café
- Family open play spaces
- Public BBQ facilities and shelters
- 10 km of public walking and jogging trails
- Single track cycle pathways
- Lookouts and shelters
• Open access to beaches
• Bird watching
• Fishing
• Natural and heritage interpretation

An essential component of the project is the comprehensive rehabilitation plan aimed at increasing biodiversity and wildlife habitat by introducing many thousands of plants from the planned on-site nursery. The **Arm End Multi-Use Public Recreation Reserve** intends to provide a genuine experience for the visitor, rich in nature and an environment that is designed to thrive and grow over the years.

Arm End is located 40 minutes by road from Hobart City, 25 minutes from Hobart International Airport. Via boat Arm End is 20 minutes from Hobart’s busy waterfront precinct.

“We believe Arm End will become one of Tasmania’s most widely used and enjoyed areas of public land. The site is absolutely spectacular – the perfect location for Tasmanian families and their children.”
11.2 Arm End Master Plan
11.3 Company Details

Arm End Multi-Use Public Recreation Reserve is managed by the Tasmanian company Mary Ann’s Island Pty Ltd.

Mary Ann’s Island Pty Ltd was formally created by the founding directors in December 2009. The founding group developed the idea to design and deliver one of the world’s great developments on the landmark known as Arm End.

Website Address: http://armend.com.au/

Company Status: Registered

Company Type: Australian Proprietary Company, Limited by shares. ACN: 141 272 568

Contact Information;
- Craig Ferguson Project Manager – 0409 222 858.
- craig@armend.com.au

11.3.1 Golf Tourism in Tasmania

Tasmanian Golf Tourism market has experienced significant growth with Northern Tasmania. Barnbougle Dunes has increased ten places to be the 4th most visited golf destination in Australia.

The contribution of the golfing industry in Tasmania, as reported by the Australian Golf Industry Economic Report for 2010, was indicated to be more than $50 million. This is partly due to the fact that tourists who specifically travel to play a game of golf are in the highest spending tourist demographics and traditionally stay for a longer period of time.

Equally as important as the direct economic contribution are the benefits golf is bringing to associated industries, such as the jobs it supports in hospitality and increased visitation of Tasmania’s plethora of outstanding tourism opportunities including breathtakingly scenic wilderness, the well preserved cultural and historic heritage, and some of the world’s finest wines and produce.

Hobart is the only Australian capital city that does not currently have an 18-hole public golf course.

Tasmanian golf clubs have nearly 12,000 members, with a significant number of social players making it one of the highest participant sports in the state.

Tasmania recently was announced as The World’s Undiscovered Golf Destination of the Year.

“Tasmania richly deserves being named Undiscovered Golf Destination of the Year. It is estimated that tourists, who have golf as a primary motivating factor for travel, spent an approximated $1.4 million.”
With the value of the Australian Golf Industry being measured at approximately $2.9 billion dollars, it is clear that golf is not just a Saturday afternoon recreational activity. It is in fact a major contributor to the Australian economy.”

Golf tourism generates spending around travel including accommodation, food and beverage, transportation and entertainment.

11.4 Arm End Project Location

Arm End is 43 km from the centre of Hobart and takes around 40 minutes to drive.

Location Google maps search: Arm End Opossum Bay 7023

The 286-acre Arm End Recreational Reserve is located on the northern tip of the South Arm Peninsula, near the coastal community of Opossum Bay. The site terrain is relatively flat with stunning views across the Derwent to Kingston, Tinderbox and Blackmans Bay back towards the city, with Mt Wellington forming a picturesque backdrop, is quite different to any you might see at other vantage points around the city.

The South Arm Peninsula forms the eastern side of the Derwent River mouth. This location provides easy and convenient access to the city of Hobart and its surrounds. The site is approximately 45 minutes travel by car from the Hobart CBD area and 25 minutes from Hobart International Airport. By ferry or charted boat, the trip across the Derwent River from the Hobart CBD, is 15 - 20 minutes.

11.5 Project Approvals

The status of the Arm End Multi-Use Public Recreation Reserve development is fully approved, pre-construction.

The company has full approvals ready to construct and operate the business Arm End Multi-Use Public Recreation Reserve.

The company has obtained the following approvals:

- Site Exclusivity Licence
- Crown Lease - Arm End Nature Reserve
- 50-year lease signed between the Company and the Minister responsible for the Tasmania Government Department of Primary Industries, Parks, Water and Environment
- Local Council Planning Permit (DA 2012- 319)
- Local Council Planning Permit (DA 2015- 345)
- Reserve Activity Assessment (RAA) - Parks & Wildlife Service - Project Concept RAA
- Reserve Activity Assessment (RAA) - Parks & Wildlife Service - Quarry Specific RAA
11.6 Existing Site Features.

The Arm End Development site is located at the end of the South Arm Peninsula, north of Opossum Bay. The large 116 ha site extends from the end of the Spit Farm Road to Gellibrand Point and includes White Rock Point and The Spit. It includes the coastline line bordered by the Derwent River to the west and Ralphs Bay to the East.

The landform surrounded by 5 beaches, several kilometres of cliff and with spectacular and dramatic views from the whole site. The site, under previous private ownership, zoning and land tenure, has been extensively cleared and heavily grazed over time and as such is degraded with limited native values of remnant grassland and coastal scrub remaining.

Due to the history of disturbance the site contains wide range of exotic grass and herb and woody weeds species. The exotic species range from pasture grasses and herbs to declared environmental weeds.

The Arm End site can easily and comfortably accommodate a mix of world class outdoor activities including golfing, cycling, walking, swimming, fishing, birdwatching, windsurfing, concerts and performances, boating facilities and with a range of hospitality, goods and services sold on-site to visitors.

Arm End is located 40 mins by road from Hobart City, 15 minutes from Hobart’s waterfront by ferry and is 25 mins from Hobart International Airport. Proximity to Hobart airport will enable day visits from interstate cities, Melbourne and Sydney in particular.

For the development of the site and specifically the golf course, Arm End’s idyllic landform means that there will be no bulk earthmoving. Desirable soil profile - the abundance of sand throughout the site delivers huge cost savings through low drainage costs, rapid turf establishment & low ongoing maintenance. Parts of the middle and northern soils are sandy loam, but the contours deliver excellent surface drainage and will still provide excellent turf growth.

11.7 Arm End Site Environmental Rehabilitation

An essential component of the project is the comprehensive rehabilitation plan aimed at increasing biodiversity and wildlife habitat by introducing many thousands of plants propagated from the planned on-site nursery. Community involvement opportunities may exist in the sites rehabilitation stages.

The Arm End Multi-Use Public Recreation Reserve intends to provide a genuine experience for the visitor, rich in nature and an environment that is designed to thrive and grow over the years.
11.7.1 Botanical Report - Arm End South Arm.

The Botanical Report - Arm End South Arm document provides an assessment of the botanical values of the site. The report has been carried out to provide a baseline assessment of the native and exotic flora species present at the site. This information will be used to develop a weed management plan and revegetation plan for the site.

The site is dominated by cleared agricultural land with some small native grassland and sheoak remnants along the coastline. There is also a telecommunication tower within the site and an historic grave site and a range of mowed tracks and trails across the site (currently utilised for recreation including walking, dog walking and bike riding).

The site contains limited environmental values due to the clearance of most native vegetation from the site. The values are restricted to small native remnants of coastal grassland and sheoak forest and a population of coast hounds tongue. The majority of the site is however degraded due to a long history of disturbance (clearance and grazing) and weed species are abundant.

The management of the flora values on the site as part of the future development will be aimed at improving the existing values through weed control and rehabilitation of eroded areas and then increasing the natural values through a substantial revegetation program. The revegetation program will expand the existing remnants, rehabilitate areas currently dominated by weeds, strategic revegetation along the public trails and landscaping around the future golf course and facilities.

The management of weeds on the site and the rehabilitation and revegetation of degraded area is detailed in a separate document ‘Weed Management and Rehabilitation Plan’. The management of the threatened species on the site is also covered in this document however the legislative implications of disturbing the species is discussed below.

11.7.2 Weed Management and Rehabilitation Plan.

An integral part of the development of the public recreation reserve will be the control of environmental weeds to improve the condition of the site and promote the establishment of native species and fauna habitat. The weed control works will also ensure weeds are not present to spread around the site during the construction period.

In addition, significant rehabilitation and revegetation works will be undertaken to expand areas of existing native vegetation; revegetate along public walking trails and across the golf course; improve visual amenity; and rehabilitate areas of erosion and weed infestation.

The Weed Management and Rehabilitation Plan is to ensure learning/continuous improvement of the weed control and revegetation actions and techniques.

The plan is divided into two broad sections –

1. Weed Management Plan – outlines the current extent of weeds across the site and provide management prescriptions to control all weeds species with the ultimate aim of eradicating species from the site; and
2. **Rehabilitation and Revegetation Plan** - the revegetation plan provides methodology for revegetation of the site including site preparation, planting lists, propagation details and methodology and maintenance plans. The rehabilitation of eroded areas and areas containing dense weed infestations is also detailed in this section.

11.8 **Tourism, Community and Employment.**

The Arm End developers have worked hard to consult and engage with the local community. The overwhelming and vast majority want the project to proceed as quickly as possible, as they recognise the economic, environmental and social benefits that the Arm End recreational reserve will bring to the local community.

Arm End has coordinated meetings of the local community reference groups in order to provide information and gain feedback from the local community as the project progresses through the pre-construction phase.

Apart from the world-class public golf course, Arm End will provide and deliver extensive walking, cycling, golfing, bird watching, fishing, nature and heritage interpretation locations and operations. The site is absolutely spectacular – the perfect location for local community members, their families and children to enjoy and to be included as part of the public development aspects of the site.

Numerous opportunities exist at the site that may directly involve local community members and groups; including revegetation and landscaping, memorial garden, art sculpture trail, community groups areas and gardens, development of an onsite native nursery for propagation of locally harvested seeds.

The current estimated stage one employment for Arm End is **22** full time equivalent jobs.

Employment will be across hospitality, business management, golf course and site maintenance sectors. Employment opportunities will be offered to suitably skilled personnel sources from the local community.

11.9 **Sustainability.**

The **Arm End Multi-Use Public Recreation Reserve** development aims to deliver an impact positive project.

Done properly golf developments provide multiple positive benefits to local environments and wider communities. Those benefits are complex and often interconnected but provide the opportunity to enhance quality of life and enrich landscapes and ecosystems. All over the world, ethical and environmental issues are directly influencing consumer choices. Resources costs are rising, and governments are gaining votes with policies that protect our environment.

Golf development businesses that proactively engage with these issues are better placed for success and to embrace the challenge. Sustainability was part of golf in the beginning
and it must be part of golf in the future, creating golf courses that respect their surroundings and honour the natural environment.

We have and assumed responsibility to provide a sustainable development that considers;

- Environmental aspects:
  - Terrestrial native
  - Marine impacts
  - Native animals
- Energy
- Waste

We are working with all our stakeholders to ensure we comply with our obligations and responsibilities required under authority approvals and permits.

The community of South Arm-Opossum Bay form a key stakeholder in the progress of the design and assets the facility will provide into the future such as walking, cycling, golfing, bird watching, fishing, nature and heritage interpretation.

A strong component of the project is also the comprehensive rehabilitation plan aimed at increasing biodiversity and wildlife habitat by introducing around 80,000 – 100,000 plants from the planned on-site nursery. This approach intends to provide a genuine experience for the visitor, rich in nature and conditioned to thrive and grow over the years.

Arm End Public Golf and Recreational Reserve is coming forward with a blueprint for the kind of golf course developments we want to see in the future - full public access, numerous non-golfing activities across the site, sensitive design and placement of golf holes, rehabilitation of land and a genuine ambition to contribute to the quality of life for the wider community.

11.10 Course Architecture

The Company has selected the leading Australian golf architectural firm of Crafter & Mogford Golf Strategies to masterplan the golf course and recreation facilities. Further information about Crafter & Mogford can be found at: www.golfstrategies.com.au

Crafter & Mogford has provided the following positioning statement:

“The site is unlike any other golf course property in Australia, with a magnificent coastline, water views in every direction, and many unique landscape experiences. Our design embraces these natural features and requires only minimal earthworks. Fairways will be simply draped over existing contours. Being so open it will be windy, but we will compensate by designing to a generous width and playable length for all. A fun, fair and unforgettable layout, very likely par 71. Given its wonderful terrain, and coastline we
believe that the site is equal to any of the top 20 courses in the world, and our goal as we get into the construction phase is to deliver Arm End as being among Australia's top 5 courses."
12. **Document Summary and Conclusion**

The whole-of-project DPEMP has identified and assessed the potential impacts. It also demonstrates that appropriate operational and management measures have been identified and proposed to mitigate the potential impacts and to ensure minimal risk to the environment and human health.

The Australian golf industry has been aware for a number of years of the impending crisis in relation to water and many golf clubs have already made significant investment in alternative water sources and water saving management plans.

The golf industry also acknowledges that recycled water, where possible, should be the preferred water source for turf management. However greater support from the government will be necessary for this to be more broadly implemented.

With the value of the Australian Golf Industry being measured at approximately $2.71 billion dollars it is a major contributor to the Australian economy, when measured as a value output against every megalitre of water consumed, the golf industry generates approximately $22,000 in output for each megalitre used, positioning it as a value producing industry in terms of water use.

Research has found that almost one third of Australian clubs are currently under some type of water use restriction. These restrictions are having an impact on these businesses.

The Australian golf industry is well advanced with modern water management practices and should be considered a leading and progressive industry with regard to water management. It also has significant value and is a major contributor to national employment. The golf industry, a skilled water manager and a major contributor to the Australian economy.

12.1 **DPEMP assessment summary**

The DPEMP has been created to address the issues for the proposal and outlines the project work aimed at providing the solution for the Arm End irrigation water demands.

MAI would like to thank all who have contributed to helping provide this sustainable solution to an issue we had underestimated in terms of planning and regulation complexities.

It is clear what the problem is (no water available close to the Arm End region) and the solution both the cause and effect. The benefits that will result from fixing the problem have been adequately defined.

The recommended solution is the best value for money way to respond to the problem and deliver additional benefits.

The benefits are of high value to the government, local council, local’s residents, the environment.
There is evidence to demonstrate that the strategic proposal options are feasible, and the pipeline solution can be delivered after consideration of costs, risks, timeframes, social and environmental aspects.
13. Appendices.

13.1 Appendix 1; Concept Proposal Drawing Set

13.2 Appendix 2; Marine Environmental Assessment
  • Natural Values Report
  • EPBC Act Protected Matters Report

13.3 Appendix 3; Irrigation Environmental Management Plan
  • Includes: Groundwater Monitoring Plan
  • Includes: Advice on water sustainability and use

13.4 Appendix 4; SAP Reuse Water Network Analysis Engineering Report

13.5 Appendix 5; Aboriginal Heritage Assessment

13.6 Appendix 6; Cost Estimates

13.7 Appendix 7: Guide to Using Recycled Water on Golf Courses

13.8 Appendix 8: Letters of Support
  • TasWater
  • GEO
  • Co-ordinator General
  • Premier

13.9 Appendix 9: TasWater DPEMP’s related to proposal
  • DPEMP for TasWater Blackmans Bay STP upgrade.

13.10 Appendix 10: Notice of intent to Tas EPA and response.
13.11 Appendix 11: Other supporters and public meetings

13.12 Appendix 12; DPEMP for Blackmans Bay Outfall Extension (Southern Water / Kingborough Council)


13.14 Appendix 14: Typical Float and Sink Diagrammatical Drawing


13.16 Appendix 16: National Guidelines for water recycling; Managing Health and Environmental Risk.

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13.19 Appendix 19: Water and the Golf Industry

13.20 Appendix 20: GES Arm End groundwater report

13.21 Appendix 21: Impact Blue potential water source study

13.22 Appendix 22: Reverse Osmosis options study

13.23 Appendix 23: Recycled Water Quality Units and Measurements Explained

13.24 Appendix 24: Project Gannt Extract
MARINE ENVIRONMENTAL IMPACT ASSESSMENT OF A PROPOSED PIPELINE
ROUTE BETWEEN BLACKMANS BAY AND SOUTH ARM, TASMANIA

Report to

Mary Anns Island Pty Ltd.

July 2018

www.marinesolutions.net.au
© Marine Solutions 2018. This document should only be used for the specific project and purposes for which it was commissioned being the **Blackmans Bay to South Arm Recycled Water Pipeline**

<table>
<thead>
<tr>
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<th>Author</th>
<th>Date reviewed</th>
<th>Reviewed by</th>
<th>Stage</th>
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<td>1 of 2</td>
<td>Sarah Castine</td>
<td>13/10/2017</td>
<td>Annie Ford</td>
<td>Report outlining stage 1 (Bathymetry and habitat mapping) and stage 2 (desktop research)</td>
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<tr>
<td>2 of 2</td>
<td>Sarah Castine and Carly Giosio</td>
<td>13/06/2018</td>
<td>Joanna Smart</td>
<td>Updated V1 to V2 to include stage 3 (Handfish and Giant kelp surveys and sediment sample analysis)</td>
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1 **EXECUTIVE SUMMARY**

Mary Anns Island Pty Ltd (proponents for the The Arm End Public Recreation Reserve project) are proposing to transport reuse water across the mouth of the Derwent River via a 225mm HDPE pipeline laid across the seabed from TasWaters’ Blackman’s Bay Wastewater Treatment Plant (WWTP) to South Arm. The reuse water will be used at South Arm for irrigation purposes, both for the Public Recreation Reserve and any other compliant irrigation user.

Marine Solutions were contracted by Mary Anns Island Pty Ltd to investigate the potential marine based environmental impact of the pipeline.

The following report describes and analyses the findings from a 3-stage process including:

1. **Investigation of a suitable route to install a pipeline across the Derwent River** (Bathymetric mapping and habitat mapping forming stage 1),
2. **Desktop assessment of natural values**, to inform field surveys in the vicinity of the potential route (desktop research forming stage 2) and
3. **Field surveys in search of identified natural values** (Handfish, Gunn’s screw shell, Giant kelp surveys), sediment analysis (particle size analysis, toxic dinoflagellate cyst analysis) and recommendations to mitigate marine environmental impact forming stage 3.

This study has been developed to comply with current guidelines for natural values surveys under the Policy and Conservation Advice Branch (PCAB; Natural and Cultural Heritage Division, 2015). The study is designed to identify any potential interactions with threatened and protected species found in the vicinity of the proposed pipeline, and to propose appropriate mitigations where applicable. The design of field surveys in this study has been approved by consultation with PCAB.

A combination of preliminary video footage and bathymetric mapping was used to determine a suitable pipeline route across the Derwent River mouth. The proposed route enters the Derwent River at the Blackmans Bay wastewater treatment plant and exits in Halfmoon Bay, South Arm. Horizontal direct drilling (see the pipeline DPEMP for HDD information) will be used to a distance past the 14 m depth contour (approximately 500 m) to fully avoid sensitive habitats.
No obvious obstructions have been identified for the pipeline route. Subsequently, targeted field surveys were conducted along the proposed pipeline route including a search for identified marine threatened and protected species in the area. Diver swum transects found four spotted handfish at Halfmoon bay to a depth of 14 m, and giant kelp communities were identified to a depth of approximately 9 m towards Blackmans Bay.

Sediments were collected at two locations along the pipeline and analysis of these samples indicated that these sediments do not comprise a biosecurity risk with no toxic cysts detected. Ten sediment grabs were collected along the pipeline route in search of the native Gunn’s screw shell, with none found, therefore following PCAB (2015) guidelines and approval, no further surveys are required. Particle size analysis indicated that sediments along the proposed pipeline route are predominantly fine sediments. Resuspension of sediment during the construction phase will be localised where the direct drilling ends at approximately 14 m depth and will be a once off event. Therefore, impact from sediment resuspension is deemed unlikely.

Due to the nature of the construction of the proposed pipeline with horizontal directional drilling to circumvent the ecosystems within 500 m of the shoreline, impacts to the marine environment are considered very low.

Appropriate measures to mitigate potential impact to the marine environment will be in place during construction and are outlined in this report. Table 1 summarises the findings of field surveys to date and describes proposed mitigation measures to protect environmental values.

Table 1 Summary of findings and recommendations from the 2017 and 2018 field survey across the mouth of the Derwent River.

<table>
<thead>
<tr>
<th>Stage</th>
<th>Works conducted</th>
<th>Date</th>
<th>Project findings</th>
<th>Interpretation and Recommendations</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAGE 1</td>
<td>Bathymetry</td>
<td>2017</td>
<td>Bathymetry mapping demonstrated that the river mouth reached a depth of 26 m. The profile showed few undulations and is therefore relatively conducive to laying a pipe across the river mouth.</td>
<td>There are no physical barriers to installing the pipe across the Derwent River mouth.</td>
</tr>
</tbody>
</table>
**Habitat Characterisation 2017**
The video surveys demonstrated that the benthic habitat was predominantly sand with a mosaic of seagrass and algae. The habitat was biologically depauperate and very few marine organisms were evident.

**STAGE 2**

**Threatened and Protected Species 2017**
The desktop study, together with expert opinion, demonstrated that handfish are found in and around Halfmoon Bay. Marine mammals, giant kelp and Gunn’s screw shell also (potentially) occur in the area. Mitigations are required to ensure these species and communities are protected.

The eastern end of the pipe will be horizontally directional drilled (HDD) for approximately 500 m, to the 15 m depth contour to avoid impact on the handfish population or habitat. The western end will be HDD in alignment with the existing TasWater’s effluent pipeline to circumvent the giant kelp community which extends to approximately 50-60 m perpendicular to the shore. Visual marine mammal surveys should be conducted during construction and works ceased if mammals are within 300 m radius.

**STAGE 3**

**Handfish Field surveys 2018**
A search for handfish in Halfmoon Bay found four spotted handfish from approximately 7 m to 14.0 m.

It is recommended that the pipe be horizontally directional drilled for approximately 500 m to the 15 m depth contour from the shoreline in Halfmoon Bay to avoid impacts to handfish and handfish habitat. A clearance dive may also be required at the time of construction.
<table>
<thead>
<tr>
<th>Activity</th>
<th>Year</th>
<th>Description</th>
<th>Implications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kelp surveys</td>
<td>2018</td>
<td>Giant kelp surveys on the western shore at Blackmans bay found Giant kelp to a depth of approximately 10 m.</td>
<td>Horizontal directional drilling to a depth past the giant kelp reef edge on the western end will avoid impacts to the kelp community. Additionally, the proposed pipeline will align with an existing TasWater pipeline.</td>
</tr>
<tr>
<td>Sediment Sampling</td>
<td>2018</td>
<td>Sediment cores analysed for toxic dinoflagellate cysts found these sediments do not comprise any biosecurity risk. Particle size analysis found that all sites exhibited reasonably fine sediments. No live or dead Gunn’s screw shells were found from ten sediment grabs across the proposed pipeline route.</td>
<td>Construction should occur during calm weather to minimise sediment disturbance. No further surveys are required for Gunn’s screw shells as per PCAB (2015) guidelines.</td>
</tr>
<tr>
<td>Intertidal survey</td>
<td></td>
<td>An intertidal survey was not deemed necessary due to the nature of construction, whereby the pipeline will be horizontally directional drilled under the seabed, therefore the intertidal zone will not be impacted.</td>
<td>Horizontal directional drilling will avoid impact to the intertidal zone, and therefore, there is no risk to the live-bearing Seastar.</td>
</tr>
</tbody>
</table>
2 INTRODUCTION

2.1 PROPOSAL BRIEF

The construction of a pipeline has been proposed from TasWaters Blackmans Bay WWTP to Halfmoon Bay on the SAP. Reuse water will be used to irrigate the proposed Arm End public recreation reserve golf course on South Arm while also providing opportunity for other to use the resource. The proposal entails the pipeline to be drilled from inside TasWaters WWTP site at Blackmans Bay and horizontal direct drilled down the cliff, into the water. The pipeline will follow TasWaters existing outfall alignment which is approximately 600 m perpendicular to the shoreline. The pipeline will be anchored to the seabed across the Derwent Estuary to Halfmoon Bay, where it will be direct drilled under the seabed to land (Figure 1).

Directional drilling, commonly called horizontal directional drilling or HDD, is a steerable trenchless method of installing underground pipelines with minimal impact on the surrounding area. Directional drilling is suitable for a variety of soil conditions. Directional drilling is typically used to provide less traffic disruption, lower cost, shorter completion times, directional capabilities, and environmental safety. The technique has extensive use in urban areas for developing subsurface utilities as it helps in avoiding extensive open cut trenches.
Figure 1 Plans for pipeline proposal from Blackmans Bay to South Arm (Image: Arm End, 2018)
2.2 Purpose and Scope

The purpose of this report is to

(a) identify a suitable pipeline route from Blackman’s Bay WWTP to South Arm,

(b) characterise the marine environment in the vicinity of the proposed pipeline footprint, and

(c) make comment and recommendations to mitigate marine environmental impact.

The information presented in this report includes analysis of the findings from each of the 3 stages by qualified and experienced marine scientists, and includes:

Stage 1

Bathymetric and habitat mapping to inform the development application design phase;

Stage 2

Desktop assessment of the natural values pertaining to the proposed pipeline development site to inform field surveys; and

Stage 3

An assessment of field surveys conducted, as approved by the Policy and Conservation Advice Branch (PCAB) including:

- Threatened and protected species search
  - Spotted handfish
  - Giant kelp
  - Gunn’s screw shell
- Sediment sampling
  - Particle size analysis
  - Toxic dinoflagellate cyst analysis
- Recommendations based on field surveys to mitigate impact to marine environment.
Please note that the scope does not extend to terrestrial ecology or heritage studies.

Marine Solutions consists of a team of qualified marine scientists with extensive experience in marine environmental impact assessments. Marine Solutions has significant site-specific experience within the Derwent River. In addition to specific research projects within the Derwent River, Marine Solutions have conducted numerous assessments in the areas of South Arm and have a strong field capability combined with a deep understanding of the nearfield and far field environments in which this project is to be conducted.

The project team has the required blend of knowledge and experience to undertake the planning, survey and sampling, mapping and associated data analysis and reporting for ecological programs.
3 STUDY AREA

3.1 CHARACTERISTICS IN THE VICINITY OF THE PIPELINE ROUTE

A number of environmental issues affect the Derwent Estuary including but not limited to heavy metal contamination, elevated nutrient concentrations, introduced marine pests and weeds and impacts of climate change including erosion and habitat loss. Industries have historically been the main source of heavy metal pollution in the Derwent Estuary, and sewage treatment plants are the largest source of bioavailable nutrients (Derwent Estuary Program, 2015). The area of the proposed pipeline route across the Derwent Estuary encompasses predominantly sand. The direct drilling of the pipeline to approximately 500 m from the shorelines will circumvent known reef and giant kelp ecosystems and handfish habitat within these areas.

The Derwent catchment area is predominantly private freehold with some state and nature reserves, and government owned parcels of land (Figure 2). The Opossum Bay Marine Conservation Area was proclaimed a conservation area under the Nature Conservation Act 2002 in 2009 and is located on the southeast of the River Derwent between Gellibrand Point in the north and Johns Point in the south. The reserve comprises an area of 555.5 hectares and contains a combination of sand beaches and rocky reefs (Department of Primary industries, Parks, Water and Environment, 2016). The primary objective of the reserve is the protection of habitat for the endangered spotted handfish. The reserve also contains a resting area for shearwaters, a shark refuge, and significant habitat for shorebirds. This reserve class provides for the protection and maintenance of the natural and cultural values of the area and the sustainable use of natural resources.

The Marine Conservation Area is mostly within the 15 m depth contour, with the area extending to between the 15 m and 20 m depth contour at the northern end of Halfmoon Bay.

If deemed necessary, the route of direct drilling of the pipeline to 500 m at the South Arm end may be modified.
Figure 2 Land tenure adjacent to the Derwent River mouth. Opossum Bay Marine Conservation Reserve enlarged (image source: land tenure layer added on LISTmap, 2018)
3.2 **Shared Use**

The pipeline proposed for this project will be crossing the Derwent River on the seabed with direct drilling at both the eastern and western shorelines.

Although the coastline of the Derwent River is a high use area, especially on the western shore (Figure 3), this project will not impact the coastline due to the nature of construction of the pipeline including horizontal direct drilling to approximately the 15 m depth contour, therefore **circumventing and not impacting the coastline.**

*Figure 3* Tourism value (based on foreshore recreation) of the lower Derwent River and surrounds. *(Image source: foreshore recreation layers added on LISTmap, 2017).*
4 STAGE 1

4.1 BATHYMETRY

4.1.1 Methods
On 28th of September 2017 Marine Solutions undertook bathymetric mapping to identify any bathymetric features or significant barriers in the immediate vicinity of the proposed pipeline route. The study area was mapped using a GARMIN echoMAP enabled mid-band sounder with a multi-channel CHIRP chart plotter, logging GPS positions and water depth each second. The depths were measured to the nearest tenth of a metre, and tidally and barometrically corrected for Chart Datum (CD) and Australian Height Datum (AHD) using Hobart tide charts and observations from the Bureau of Meteorology. The resultant files were interpolated using GIS software Surfer 11.0, thus creating bathymetric profiles of the area. An operational summary of the bathymetric mapping site visit (and subsequent site visits) is included in Appendix 1.

4.1.2 Results
The bathymetric mapping of the Derwent River mouth demonstrated that the pipeline would be approximately 6800 m in length. The profile identified few undulations across the river mouth, indicating the proposed route would be relatively conducive to laying the pipeline (Figure 4).
Figure 4 Bathymetry of the Derwent River mouth and depth profile along the proposed pipeline route, corrected to Australian Height Datum.
4.2 **Habitat Mapping**

4.2.1 **Methods**

Habitat mapping was conducted on the 29th of September 2017 (Appendix 1). Video footage was captured to obtain information on habitat types and benthic features. Video tow transects were conducted within the subtidal zone from Halfmoon Bay to Blackman’s Bay (Figure 5). Transect locations were chosen based on potential reef or notable habitats (acoustic roughness and hardness signals) recorded on the sounder while conducting the bathymetric mapping. Underwater towed video was conducted along the proposed pipeline route at 12 locations along including 6 sites at South Arm (Figure A), 4 sites in the middle of the Derwent River (Figure B) and 2 at Blackman’s Bay (Figure C), and each was stamped with date, time and positional information (Figure 5).
Figure 5 Approximate location of the transects recorded with a drop camera at A) Halfmoon Bay, B) middle of the Derwent River mouth and C) Blackmans Bay
4.2.2 Results

With the exception of Halfmoon Bay, the benthos was predominantly sand (transects 3 – 12; Figure 7). The benthic habitat in Halfmoon Bay (transects 1 and 2) was a mosaic of seagrass, algae and ascidians (Figure 6). In this zone starfish, a small shark, and molluscs were present.
Figure 6 Still frames from the video footage from 12 transects along the proposed pipeline route

The field data are congruent with previous habitat mapping in the area which demonstrates that the benthos along the proposed pipeline route was predominantly sand (Figure 7).
Figure 7 Benthic habitat types in the mouth of the River Derwent (image source: temperate reef base\(^1\))

\(^1\) [http://temperatereefbase.imas.utas.edu.au/portal/search](http://temperatereefbase.imas.utas.edu.au/portal/search)
5 **STAGE 2: DESKTOP STUDY**

5.1 **PROTECTED MATTERS**

The EPBC Act Protected Matters Search Tool (PMST) is a software tool managed by the Federal Department of the Environment to help determine whether Matters of National Environmental Significance or other matters protected by the *Environment Protection and Biodiversity Conservation Act 1999* are likely to occur in a given area. A PMST search (adopting a 5,000m buffer zone from approximately the middle of the proposed pipeline route) was conducted in 2017, and used to identify protected matters relating the area between Blackmans Bay and South Arm. The report is summarised in Table 2 below and the full report can be found in Appendix 4.

**Table 2 Summary of the findings of the EPBC Act Protected Matters Search Tool (EPBCA PMST).**

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<thead>
<tr>
<th>Item</th>
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</tr>
<tr>
<td>National Heritage Places</td>
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<tr>
<td>Wetlands of International Importance</td>
<td>None</td>
<td>-</td>
</tr>
<tr>
<td>Great Barrier Reef Marine Park</td>
<td>None</td>
<td>-</td>
</tr>
<tr>
<td>Commonwealth Marine Area</td>
<td>None</td>
<td>-</td>
</tr>
<tr>
<td>Listed Threatened Ecological Communities</td>
<td>3 (1 marine)</td>
<td>1 Community is marine: Giant Kelp Marine Forests of S.E. Australia Endangered; likely to occur in area (refer to section 5.2.1.7)</td>
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<tr>
<td>Listed Threatened Species</td>
<td>55 (9 marine)</td>
<td>(Refer to section 5.2.1)</td>
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<tr>
<td>Listed Migratory Species</td>
<td>27</td>
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<tr>
<td>Commonwealth Land</td>
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<tr>
<td>Commonwealth Heritage Places</td>
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<td>Commonwealth Reserves Terrestrial</td>
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<tr>
<td>Commonwealth Reserves Marine</td>
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<td>-</td>
</tr>
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<td>State and Territory Reserves</td>
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<td>1. Fossil Cove 2. Gellibrand Point 3. Thinking Frog - Tinderbox</td>
</tr>
<tr>
<td>Regional Forest Agreements</td>
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<td>Tasmanian RFA</td>
</tr>
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</table>

Marine Solutions Tasmania Pty Ltd

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5.2 **AQUATIC FLORA AND FAUNA**

5.2.1 **Threatened and Protected Species/Ecological Communities**

There are a number of marine species listed as threatened that may occur in the vicinity of the proposed development. Threatened species are protected under the *Threatened Species Protection Act 1995* (TSPA Act, Tasmanian state legislation) and/or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act, Australian Government legislation).

Under the TSPA, no listed species is allowed to be collected, disturbed, damaged or destroyed without a permit. Under the EPBC Act, any action with significant impact on a listed threatened species and/or community is prohibited without approval (EPBC Act Section 18 and 18A).

In addition to threatened species legislation, the *Fisheries (General and Fees) Regulations 2006* under the *Living Marine Resources Management Act 1995* (LMRMA) prohibits the taking/possession of a number of marine species, including Syngnathids (seahorses, seadragons and pipehorses), Handfish, Threefin Blennies, Limpets/False Limpets of three superfamilies, and five species of shark. Additional species are protected by the schedules of the *Wildlife (General) Regulations 2010* (Regulations under the *Nature Conservation Act 2002* (NCA)), under which a person must not take, buy, sell or have possession of any protected wildlife or any product of any protected wildlife without a permit. Threatened species that could potentially occur within the vicinity of the study area are discussed in greater detail in this section.

In a search of the Natural Values Atlas (NVA, 2017) and EPBC Protected Matters Search Tool (EPBC, 2017), 11 threatened marine species or communities were identified as possibly occurring in the area or known to occur in the area, including the endangered spotted handfish, identified as occurring based on range boundaries (NVA, 2017) (Table 3).
Table 3 Summary of threatened marine communities and species identified in a search of the Natural Values Atlas and the EPBC Protected Matters Search Tool. Note that the scope does not extend to terrestrial or avian biota.

<table>
<thead>
<tr>
<th>Species</th>
<th>EPBC Act</th>
<th>TSP Act</th>
<th>NVA findings</th>
<th>EPBC PMST findings</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Australian grayling</strong> <em>(Prototroctes maraena)</em></td>
<td>Vulnerable</td>
<td>Vulnerable</td>
<td>Based on range boundaries; within 5,000 m</td>
<td>Species or species habitat known to occur within area</td>
</tr>
<tr>
<td><strong>Spotted Handfish</strong> <em>(Brachionichthys hirsutus)</em></td>
<td>Critically Endangered</td>
<td>Endangered</td>
<td>Based on range boundaries; within 500 m. Verified records within 5,000 m</td>
<td>Species or species habitat known to occur within area</td>
</tr>
<tr>
<td><strong>Red handfish</strong> <em>(Thymichthys politus)</em></td>
<td>Critically Endangered</td>
<td>Endangered</td>
<td>-</td>
<td>Species or species habitat may occur within area</td>
</tr>
<tr>
<td><strong>Southern right whale</strong> <em>(Eubalaena australis)</em></td>
<td>Endangered</td>
<td>Endangered</td>
<td>Verified record within 5,000 m</td>
<td>Breeding likely to occur within area</td>
</tr>
<tr>
<td><strong>Humpback whale</strong> <em>(Megaptera novaengliae)</em></td>
<td>Vulnerable</td>
<td>Endangered</td>
<td>Verified record within 5,000 m</td>
<td>Foraging, feeding or related behaviour known to occur within area</td>
</tr>
<tr>
<td><strong>Blue whale</strong> <em>(Balaenoptera musculus)</em></td>
<td>Endangered</td>
<td>Endangered</td>
<td>-</td>
<td>Species or species habitat likely to occur within area</td>
</tr>
<tr>
<td><strong>White shark, Great White Shark</strong> <em>(Carcharodon carcharias)</em></td>
<td>Vulnerable</td>
<td>Vulnerable</td>
<td>-</td>
<td>Species or species habitat known to occur within area</td>
</tr>
<tr>
<td><strong>Gunn’s screw shell</strong> <em>(Gazameda gunnii)</em></td>
<td>-</td>
<td>Vulnerable</td>
<td>Verified record within 5,000 m</td>
<td>-</td>
</tr>
<tr>
<td><strong>Tasmanian live-bearing seastar</strong> <em>(Parvulastra vivipara)</em></td>
<td>Vulnerable</td>
<td>Vulnerable</td>
<td>-</td>
<td>Species or species habitat may occur within area</td>
</tr>
<tr>
<td><strong>Giant kelp marine forests of South East Australia</strong> <em>(Macrocystis pyrifer)</em></td>
<td>Endangered</td>
<td>Endangered</td>
<td>-</td>
<td>Community likely to occur within area</td>
</tr>
<tr>
<td><strong>Subtropical and temperate coastal saltmarsh</strong></td>
<td>Vulnerable</td>
<td>Endangered</td>
<td>-</td>
<td>Community likely to occur within area</td>
</tr>
</tbody>
</table>

### 5.2.1.1 Australian Grayling

The Australian grayling is native to Tasmania and southeast mainland Australia. The Australian grayling migrates between fresh and marine waters; inhabiting fresh water streams as adults and migrating to
coastal seas as larvae. Spawning takes place in late spring/early summer (Bryant and Jackson, 1999). Larvae are transported to sea in stream/river currents and return as migrating juvenile’s approximately 4-6 months later (Bryant and Jackson, 1999).

The most serious threat facing the Australian grayling population is habitat disturbance resulting in barriers to migration. Pollution of waterways is also considered a threat to their survival. Laying across the mouth of the Derwent River does not have foreseen consequences to the migratory route of the Australian grayling. However, during the construction phase it will be important to reduce particle re-suspension, thereby ensuring water quality impacts are minimised.

5.2.1.2 Handfish

Handfish are small, colourful, slow moving benthic fish (Threatened Species Scientific Committee, 2012) and are only found in south east Tasmania. The handfish are found in benthic environments that contain coarse sand and grit (Spotted Handfish Recovery Team, 2002).

Spotted Handfish spawn in early Spring from September to October and the female remains with the egg mass for 7-8 weeks until hatching (Pogonoski et al 2002). They are reliant on spawning substrate for attachment of eggs, preferring stalked ascidians Sycozoa sp. but also utilising sponges and seagrass (Bruce and Green 1998; Spotted Handfish Recovery Team 2002). Availability of suitable spawning substrata is considered critical to their reproductive success (Pogonoski et al 2002). The spotted Handfish does not have a larval dispersal phase; juvenile hatchlings are thought to settle in the immediate vicinity of the hatch-site (Bruce et al 1997).

Verified records of the spotted handfish were found within 5,000 m of the proposed pipeline route, and within 500 m based on range boundaries (NVA, 2016). Spotted handfish have a low breeding capacity and are therefore are vulnerable to actions which impact their breeding cycle or breeding habitat. Spotted handfish tend to have high site fidelity and migration rates of spotted handfish between the Ralphs Bay population and other populations in the Derwent Estuary are likely to be low (Green 2005). Very few known populations of spotted handfish exist and even fewer red handfish populations are known.
A number of anthropogenic development activities can impact handfish populations, including commercial and recreational dredging and land management activities that alter turbidity, water and sediment quality (Threatened Species Scientific Committee, 2012). Potential but unlikely impacts to handfish because of this project include degradation of species habitat and subsequent disturbance to breeding. Any reduction in the availability of suitable spawning substrate has been found to limit the reproductive success of spotted handfish in the Derwent Estuary (Spotted Handfish Recovery Team, 2002).

It is recommended that the pipe be horizontally direct drilled for approximately 500 m in Halfmoon Bay, to extend outside the handfish habitat. This will mitigate any potential impacts to the handfish and handfish habitat.

5.2.1.3  Marine Mammals
All cetaceans are protected under the EPBC Act 1999. Marine mammals are known to occur in the Derwent Estuary and Storm Bay, particularly during their migration in the winter months.

A visual marine mammal survey should be conducted prior to any works commencing. If a marine mammal is observed within a 300 m radius, works should cease until the marine mammals have moved away from the area.

5.2.1.4  Sharks
The white shark is listed as vulnerable and migratory under the EPBC Act 1999. In addition, it is protected by multiple nations and is listed under the Convention on International Trade in Endangered Species and the Convention on Migratory Species. The biggest threat to the white shark is fishing or shark control activities. It is unlikely that the proposed development would present any significant risk to white sharks given that they are highly mobile and can avoid any construction works. In addition, the development is unlikely to significantly alter any critical habitat of the white shark.

5.2.1.5  Gunn’s screw shell
The native Gunn’s screw shell, *Gazameda gunnii*, is a relatively small gastropod which inhabits areas of sandy substrate, shell grit and fine gravel from depths of 3-80 m. Very little is known about this species; however, it is thought to be affected by coastal and marine development.
In accordance with the DPIPWE Gazameda Sampling Protocol, sampling should be undertaken within benthic habitats occurring in depths of 3 to 80 m and where the average sediment size is expected to be greater than 0.125 mm (Natural and Cultural Heritage Division, 2015). An initial survey consisting of 10 sediment grabs is required, with no further sampling required unless any live or dead G. gunnii are found.

5.2.1.6 Tasmanian live-bearing Seastar
The Tasmanian live-bearing Seastar, Parvulastra (a.k.a. Patiriella) vivipara, is endemic to Tasmania and is listed as endangered under the TSP Act 1995. No known populations exist in the lower Derwent Estuary (Department of the Environment, 2017). Nevertheless, this species can be cryptic, and it is possible that populations exist that have not yet been discovered/reported. The EPBC search tool identified that the live-bearing Seastar or habitat “may occur in the area”. To the best of our knowledge there are no known populations of the live-bearing seastars on either shore within the development footprint.

The greatest threat to the live-bearing Seastar is changes to habitat as they are restricted to rocky reefs in a narrow intertidal zone and prefer living under rocks near the high tide mark. They are at risk from pollution, including eutrophication or sedimentation. They are also at risk from direct impacts (e.g. trampling), therefore, should a proposed development involve access to the intertidal zone during or post-construction, there may be a high risk of impacts to the live-bearing Seastar.

This project will involve horizontal direct drilling to install the pipeline, therefore circumventing the intertidal zone. Consequently, there will be no direct impact on the live-bearing Seastar.

5.2.1.7 Giant kelp
“Giant Kelp (also known as string kelp; Macrocystis pyrifera) marine forests of south east Australia” were added to federal legislation as a threatened ecological community in August 2012. The progressive decline of these forests has been the most noticeable in Tasmanian waters and is attributed to changing oceanographic conditions, including rising sea surface temperatures (DSEWPC, 2012). Giant kelp grows on rocky reefs in cold temperate waters off south-east Australia. The vertical structure provided by giant kelp forests increases local biodiversity by creating habitat for numerous marine species (DSEWPC, 2012). Giant kelp is found along the western shore (Figure 8).
Figure 8 Map showing estimated extent of Giant kelp, *M. pyrifera* from surveys conducted in 1999 (LISTmap, 2018)

An existing 600 mm effluent pipe runs through the giant kelp forest through which TasWaters sewage treatment plant operates its outfall. This corridor will also be used to run the proposed 225 mm pipeline, and subsequently won’t significantly impact the existing giant kelp forest. In addition, installation of the pipeline through horizontal directional drilling to a depth past the giant kelp edge will avoid impacts to the community.

5.2.1.8 Seagrasses

Seagrasses are important contributors to coastal productivity and biodiversity. They play an important role in nutrient cycling through the uptake of nutrients and can substantially alter the oxygen
concentrations in sediments by releasing oxygen through rhizomes (roots). Due to their extensive rhizome structure, seagrasses are particularly important in maintaining sediment stability. Given the importance of seagrass beds in coastal ecosystems they have been extensively studied in some Australian regions, with descriptions of the spatial or temporal patterns of seagrass growth parameters such as changes in biomass, shoot or epiphyte characteristics (Bultuis and Woelkerling, 1983; McKenzie 1994; Lanyon and Marsh, 1995; Kendrick and Burt, 1997).

A range of factors have been linked to seagrass decline including increased nutrient levels and turbidity causing a decline in light penetration. Furthermore, growth in seagrasses is known to vary spatially and temporally, however a lack of research means it is often difficult to determine if fluctuations in seagrass beds reflects human impacts or natural variability (Jordan et al., 2002).

There is a narrow patch of seagrass in the northern part of Halfmoon Bay (Figure 7). However, the installation of the pipeline via direct drilling below the benthos mitigates potential impacts to seagrass beds in this project.
6  STAGE 3 FIELD INVESTIGATIONS

6.1  HANDFISH SURVEYS

6.1.1  Methods
Dive transects were conducted perpendicular to the shoreline along an approximate proposed pipeline route in Halfmoon Bay on 1st June 2018 (Figure 9). Transect 1 started at a depth of approximately 2m and ended at approximately the 15 m depth contour, with an area of 4 m either side of the transect surveyed and transect 2 started at approximately the 5 m depth contour and reached a depth of approximately 8 m, with an area of 2 m either side surveyed (Figure 10).

Paired divers swam either side of the transect(s) and collected the following information:

- The presence and number of spotted handfish individuals, including information on the size, position along the transect and the time of identification.
- The presence of vertical structures that could provide potential substratum appropriate for attachment of handfish eggs.
- Presence of Northern Pacific sea stars (Asterias amurensis).

Intensive surveys are not necessary on the western shore (Blackmans Bay) where the benthic environment consists of mobile re-worked sediments that are not suitable for handfish. However, Marine Solutions conducted 10-15 drop camera surveys from Blackmans Bay to approximately the 17 m depth contour, and no handfish or handfish habitat was identified.

6.1.2  Results
Along transect 1, four spotted handfish were found during the dive surveys. Spotted handfish were found at 7.6 m, 7.9 m, 12.8 m and 14.0 m. The survey conducted follows the proposed alignment of the pipeline (Table 4; Figure 9, Figure 10 and Figure 11).

The Northern Pacific Seastar; Asterias amurensis was present along both transects and is a known threat to the Spotted handfish through predation on egg masses or on the food supply of the handfish (Environment, Australia, 2002).
Table 4 Location and Depth of handfish found along transect dive

<table>
<thead>
<tr>
<th>Handfish</th>
<th>Size</th>
<th>GPS Location</th>
<th>Depth (m)</th>
<th>Distance from start of Transect 1 (m)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Latitude</td>
<td>Longitude</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>~6 cm</td>
<td>43.01003</td>
<td>147.40339</td>
<td>7.6 m</td>
</tr>
<tr>
<td>2</td>
<td>~8 cm</td>
<td>43.01064</td>
<td>147.40221</td>
<td>12.8 m</td>
</tr>
<tr>
<td>3</td>
<td>Not measured</td>
<td>43.01075</td>
<td>147.40194</td>
<td>14.0 m</td>
</tr>
<tr>
<td>4</td>
<td>Not measured</td>
<td>43.01042</td>
<td>147.40256</td>
<td>7.9 m</td>
</tr>
</tbody>
</table>

Figure 9 Location of diver swum transects and approximate location of handfish found
Figure 10 Approximate area covered by handfish surveys in alignment with proposed pipeline route
6.2 GIANT KELP SURVEYS

6.2.1 Methods

Two 200 m transects were surveyed for Giant kelp on the western shore at Blackmans Bay. A shot line was deployed at predetermined GPS locations and formed the mid-points of the 200 m survey transects (Figure 12).

Estimates of giant kelp stipe density were made by counting the number of stipes in alternating 5 x 1.5 m blocks along the transect (i.e. counts were made in every second 5 x 1.5 m). Only attached stipes extending from reef to at least 1 m from the seafloor will be recorded. Divers also quantified giant kelp surface canopy coverage every 5 m along the transect by observing the surface canopy from the seafloor and estimating cover to the nearest 20 %. The degree of epiphyte coverage on giant kelp stipes and
fronds was also be estimated every 5 m. This involved a ranking of 1-5, with very low epiphyte coverage indicated by a score of ‘1’ and high epiphyte coverage by a score of ‘5’.

Video and photographic records were taken at each site. To capture the density and canopy coverage of giant kelp, divers filmed the transect in a horizontal direction. The entire 200 m transect was filmed, encompassing a band approximately 5 m wide. For still imagery, a series of 5 haphazardly positioned photo quadrats (quadrat area 0.25 m2) was be taken every 20 m, with images taken vertically to capture the coverage of benthic macroalgae. The video stills will not be analysed but will be archived in case they are required for future analysis.

Figure 12 Location of Giant kelp surveys in Blackmans Bay

6.2.2 Results

Video footage from the transect dives indicate the presence of canopy forming *Macrocystis pyrifera* along both transects to a depth of approximately 9 m. The habitat along these transects includes rocky
reef habitat with mixed macroalgae communities and have been represented by still images captured from the video footage below (Figure 13, Figure 14, Figure 15).

Giant kelp surface canopy coverage for each recorded canopy forming plant indicated an estimated 20% cover for plants within approximately 80 m to the shore along transect 1. Stipe count was low past approximately 80 m from the shore (Figure 16 and Figure 17). Epiphyte coverage on giant kelp stipes was low for all recorded stipes (Appendix 2).

Mitigation measures to protect the Giant kelp on the western shore include using horizontal direct drilling to lay the pipe to a suitable depth past the reef edge to sandy substrate at approximately the 10 m depth contour.
Figure 13 Still images captured by Giant kelp video survey along transect 1 consisting of: A) *M. pyrifera*, B) Mixed algae community including *M. pyrifera*, C) Mixed algal/rock assemblage D) *E. radiata* E) *E. radiata* coverage F) Draughtboard shark G) Sand cobble and algal mixed assemblage and H) Encrusting coralline algae on rock and *M. pyrifera* at the end of transect 1.
Figure 14 Still images captured by Giant kelp video survey along transect 2 consisting of: A) *Acrocarpia paniculata* B) *Cystophora sp.* C) *E. radiata* D) mixed assemblage brown and red assemblage E) *M. pyriforma* stipe F) mixed assemblage brown algal cover including *M. pyriforma, E. radiata and cystophora sp.*
Figure 15 Still images captured by Giant kelp video survey along transect 2 consisting of: A) *M. pyrifera* canopy B) Mixed algae community and encrusting coralline algae on rocks C) Leatherjacket D) *M. pyrifera* E) Encrusting coralline algae on rock, urchin, mixed red and brown algae F) Sandy bottom with mixed brown algae at the end of transect 2
Figure 16 Stipe count and canopy height along transect 1
Figure 17 Stipe count and canopy height along transect
6.3 **Gunn’s Screw Shell**

6.3.1 **Methods**

The sampling protocol for Gunn’s screw shell, *Gazameda gunnii* was followed since the development area is downstream of Taroona (Natural and Cultural Heritage Division, 2015). To investigate presence/absence of *G. gunnii*, ten grab samples were taken across the Derwent along a corridor from Blackmans Bay to Halfmoon Bay at South Arm, covering approximately 12 km across the Derwent Estuary (Figure 18).

Following the Natural and Cultural Heritage Division (2015) guidelines, since the development corridor will cover approximately 12.5 ha, ten initial grab samples were taken to investigate for *G. gunnii*. The samples were randomly located along the corridor from Blackmans Bay to Halfmoon Bay.

![Figure 18 Location of ten sediment grabs for Gazameda survey](image)

6.3.2 **Results**

Ten sediment grabs along the pipeline route found no live or dead *G. gunnii*, therefore no further grabs are required according to PCAB’s sampling protocol (NCHD, 2015). This is not an unexpected result, as particle size in the area is finer than that thought to be preferred by *G. gunnii* (NCHD, 2015). Furthermore, the area is more estuarine in nature and the area has the variable physiological and biological features characteristic of an estuary; *G. gunnii* typically prefer a more stable marine environment.

No live or dead *G. gunnii* were found, therefore no further sampling is required.
6.4  **DINOFLAGELLATE ANALYSIS**

6.4.1  **Methods**
Sediments were collected in 30 cm cores from the two sediment sampling sites and delivered to Professor Gustaaf Hallegraff for analysis. The surface veneer of each core was examined by microscopy and the presence of any dinoflagellates recorded.

![Figure 19 Location of sediment core samples for toxic dinoflagellate analysis](image)

6.4.2  **Results**
Results indicate that sediment in core 1 was coarse sand and in core 2 was mud (Figure 19). Both cores contained very sparse dinoflagellate cysts, mostly round brown *Protop eridinium* as well as diatom frustules (e.g. *Campyodiscus, Surirella, Diploneis*). No cysts of the toxic dinoflagellates *Alexandrium tamarense* nor *Gymnodinium catenatum* were detected. Therefore, these sediments do **not** comprise a biosecurity risk.
6.5 PARTICLE SIZE ANALYSIS

6.5.1 Methods
Sediments were collected at ten sites along a corridor from Blackmans Bay to Halfmoon Bay (Figure 21). Samples were collected from the top 10cm of sediment cores and transferred into sterile glassware for particle size analysis.

Particle size distribution was assessed volumetrically for sediments taken from the ten sites, by washing samples through a series of stainless steel sieves with mesh sizes of 4 mm, 2 mm, 1 mm, 500 μm, 250 μm, 125 μm and 63 μm. The content of each sieve was drained completely of water and transferred to a measuring cylinder, beginning with the coarsest sediment fraction (4 mm) and working down to the finest (63 μm). The volume of sediment measured in the measuring cylinder was recorded for each sieve size. The sediment fraction <63 μm was assumed to be the total volume of the sample minus the combined volume of all other size classes.
6.5.2 Results

Particle size analysis indicated benthic habitat consists of predominantly fine sediments, with the majority of particles less than 0.125 mm. Sites 1 and 2 indicate slightly coarser sediments with approximately 5% of particles greater than 0.500 mm at site 1 and approximately 5% greater than 0.250 mm at site 2 (Figure 22).

This is expected as deeper waters with less water movement will exhibit finer silt and mud sediments (depositional areas), while shallower waters tend to have coarser sand and shell-based sediments (erosional areas).

This project will not resuspend sediments significantly, with a once off localised impact which will be in depths past identified threatened and protected habitats.
Figure 22 particle size analysis for 10 sites in the development area from Blackmans Bay to Halfmoon Bay.
7 CONCLUSION AND RECOMMENDATIONS

Mary Anns Island Pty Ltd is proposing to construct a pipeline across the Derwent River to transport reuse water from the Blackman’s Bay WWTP to Halfmoon Bay on the South Arm Peninsula. The reuse water will be used for irrigation purposes in the South Arm region and including the Arm End Public Recreational Reserve.

Bathymetric mapping demonstrated that the depth of the development area ranges from 0 m to 26 m, with the deepest section in the middle to western part of the river. The cross-sectional depth profile demonstrates relatively few undulations, making the area conducive to laying the pipeline.

Results from the habitat mapping were congruent with previous work in the area and confirmed that the majority of the proposed development area is sand with a narrow band of reef on the western shore and a patchwork of seagrass, algae and ascidians along the eastern shore. This was consistent with diver swim surveys.

Field surveys found four spotted hand fish within the development area on the eastern shore in Halfmoon Bay, and giant kelp was found to be present on the western shore at Blackmans Bay.

The potential impacts to these threatened and protected species and communities can be avoided through horizontal directional drilling of the pipeline to an appropriate depth.

The proposed pipeline will be direct drilled in alignment with an existing TasWater effluent pipe on the western shore, therefore avoiding impact to the giant kelp community. Similarly, construction via direct drilling will occur on the eastern shore, which will avoid impact to handfish and handfish habitat.

Across the Derwent River between these two zones on the eastern and western shores is sandy substrate, with no evidence of reef, and the absence of the native Gunn’s screw shell. Therefore, the installation of the pipeline across the seabed is deemed to have a very low risk of impact to the marine environment. Following PCAB guidelines (2015), no further surveys are required for the Gunn’s screw shell, and no biosecurity threat is posed with the absence of toxic dinoflagellate cysts in the sediment.
In summary, due to the nature of the construction of the proposed pipeline with horizontal directional drilling to circumvent the ecosystems within 50 m (giant kelp) to 500 m (hand fish habitat) of the shoreline, impacts to the marine environment are considered to be very low.
8 References


## 9 APPENDICES

### Appendix 1. Operational summary of site visits

<table>
<thead>
<tr>
<th>Date</th>
<th>Personnel*</th>
<th>Location</th>
<th>Start Time</th>
<th>Finish Time</th>
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<th>Cloud Cover</th>
<th>Wind (knots)</th>
<th>Sea</th>
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<td>14:00</td>
<td>Bathymetry mapping</td>
<td>Field observation: High tide</td>
<td>3/8</td>
<td>25 knots NW</td>
<td>0.5 m swell</td>
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<td>14:00</td>
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<td>Field observation: High tide</td>
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<td>01/06/2018</td>
<td>S. Ibbott, I. Cooksey, L. Smith, D. Watson</td>
<td>Derwent River mouth</td>
<td>09:30</td>
<td>Handfish survey dives</td>
<td>Mid falling</td>
<td>4/8</td>
<td>Calm – 15 knots NW</td>
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<td>I. Cooksey, L. Smith, J. Smart</td>
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<td>10:00</td>
<td>Kelp survey, video and photo transects and dinocysts sediment collection</td>
<td>Low rising 4/8</td>
<td>Calm</td>
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*All personnel are from Marine Solutions unless otherwise specified.*
## Appendix 2. Giant Kelp Survey

<table>
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<tr>
<th>Transect</th>
<th>Transect 1 (north of STP pipe)</th>
<th>Transect 2 (south of STP pipe)</th>
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# Appendix 3. Species List

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<th>Group</th>
<th>Common Name</th>
<th>Scientific Name</th>
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<tbody>
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<td><strong>Algae &amp; Seagrasses</strong></td>
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<tr>
<td>Common kelp</td>
<td><em>Ecklonia radiata</em></td>
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<tr>
<td>Giant kelp</td>
<td><em>Macrocystis pyrifera</em></td>
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<tr>
<td>Unidentified green algae</td>
<td><em>Caulerpa spp.</em></td>
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<tr>
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<td><em>Sargassum spp.</em></td>
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<td>Zonaria</td>
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<td>Filamentous reds</td>
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<tr>
<td><strong>Invertebrates</strong></td>
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<tr>
<td>Annelids</td>
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<tr>
<td>Southern rock lobster</td>
<td><em>Jasus edwardsii</em></td>
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<tr>
<td><strong>Arthropods</strong></td>
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<tr>
<td>Blacklip abalone</td>
<td><em>Haliotis rubra</em></td>
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<tr>
<td>Pencil urchin</td>
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<tr>
<td>Velvet star</td>
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<tr>
<td>Purple urchin</td>
<td><em>Heliocidaris erythrogramma</em></td>
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<tr>
<td>Pencil urchin</td>
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<td>Velvet star</td>
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<td>Southern biscuit star</td>
<td><em>Tosia australis</em></td>
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<td><strong>Other</strong></td>
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<td>Globefish</td>
<td><em>Diodon nithemerus</em></td>
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<td>Bastard Trumpeter</td>
<td><em>Latridopsis forsteri</em></td>
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<td><em>Rhombosolea tapirina</em></td>
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<td>Bluetroat wrasse</td>
<td><em>Notolabrus tetricus</em></td>
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Pipeline Environmental Assessment 58
Appendix 4. EPBC Protected Matters Report and Natural Values Report

Available from Marine Solutions