5. Potential Environmental Impacts and Management Measures

5.1 Introduction

This chapter provides details of the potential impacts of construction and operation of the water supply pipeline component only. The potential impacts have been assessed using the impact assessment methodology described in Chapter 4.

5.2 Land Use and Planning

5.2.1 George Town Council Planning Scheme 1991

Use, Zone and Permit Status

In accordance with Part 4 of the George Town Planning Scheme 1991, the water supply pipeline is defined as a Utility Services (Major) Use Classification, which:

Means any land used for a utility service which is not a minor utility service defined elsewhere in this Scheme and includes a water supply/treatment plant, a sewerage treatment plant, a refuse disposal site, a waste transfer station, a power generating works and an electricity substation or switching station of more than 110 kV.

The water supply pipeline will traverse the Bell Bay Major Industrial and Agricultural zones. Table 5-1 below details the zones through which the pipeline traverses and the permit status of Utility Services (Major) in each of these zones:

Table 5-1 Approval Status - Water Supply Pipeline (George Town Planning Scheme)

<table>
<thead>
<tr>
<th>Zone</th>
<th>Permit Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bell Bay Major Industrial</td>
<td>Permitted (Permit Required)</td>
</tr>
<tr>
<td>Agricultural</td>
<td>Discretionary</td>
</tr>
</tbody>
</table>

5.2.2 Launceston Planning Scheme 1996

Use, Zone and Permit Status

The water supply pipeline is defined as a Utility Services (Minor) under the Planning Scheme, which states:

- a minor pump station, electrical substation or gross pollutant trap, an existing flood levee, a scour and surcharge outlet, and the like'
- roads including footpaths, drains, bus shelters, traffic management works and the like;
- water supply, sewerage, stormwater and goas reticulation, electricity lines (66 kV or less), telecommunication cables and minor railway undertakings and the like; and
- public toilets

The pipeline will traverse the Road, Public Recreation, Rural Residential, Rural, and Forest Practices Zones. Table 5-2 below details the zones through which the pipeline traverses and the permit status of Utility Services (minor) in each of the zones:

<table>
<thead>
<tr>
<th>Zone</th>
<th>Use Permit Status</th>
<th>Development Approval Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road</td>
<td>Permitted (No Permit Required)*</td>
<td></td>
</tr>
<tr>
<td>Rural Residential</td>
<td>Permitted (No Permit Required)</td>
<td>Permitted (Permit Required)</td>
</tr>
<tr>
<td>Forest Practices</td>
<td>Permitted (No Permit Required)</td>
<td>Permitted (No Permit Required)</td>
</tr>
<tr>
<td>Public Recreation</td>
<td>Permitted (No Permit Required)</td>
<td>Discretionary</td>
</tr>
<tr>
<td>Rural</td>
<td>Permitted (No Permit Required) conditional upon the following being met: -</td>
<td></td>
</tr>
<tr>
<td></td>
<td>If not located on prime agricultural land;</td>
<td></td>
</tr>
<tr>
<td></td>
<td>If the public benefit test of clause A3.3 is satisfied.</td>
<td></td>
</tr>
</tbody>
</table>

*Single Use or Development Table for the Road Zone

5.2.3 Municipality of Beaconsfield Planning Scheme 1986

Use, Zone and Permit Status

The water supply pipeline is classified as a Public Utility under the Planning Scheme, which states:

*Public Utility: means any land used by Council, a Public Authority or other body as may be required to provide a water, sewerage, electricity, gas, drainage, communication or other similar service.*

A Public Utility is depicted as Discretionary use and development status within all zones under the Planning Scheme.

The pipeline is not contrary to the intent of the relevant planning zones and development standards. In particular, the water supply pipeline from Trevallyn Dam will ensure that the proposal has adequate water while protecting public infrastructure. The pipeline route will as far as practicable be located in existing easements and road reserves to minimise impact on existing land use. The pipeline route will involve some restriction on the use of agricultural land but as discussed in Section 4, these are not such that will fetter or fragment agricultural land. Further, the pipeline will be located to a depth of at least 700 mm below the surface and minimal vegetation clearance is required for construction.
5.2.4 Planning Scheme Amendment

- The current definition of Public Utility is limited to land used by ‘Council, a Public Authority or other body’. In order to facilitate the use and development of the water supply pipeline, the definition of ‘Public Utility’ needs to be amended.

- The definition of Utilities under the Common Key Elements Template, as required by the RPDC Planning Directive Number 1 - The Format and Structure of Planning Schemes dated 17 December 2003, states: -

  Utilities: Means use and development of land for:
  
  (a) telecommunications;
  
  (b) transmitting or distributing gas, oil, or power;
  
  (c) transport networks;
  
  (d) collecting, treating, transmitting, storing or distributing water; or
  
  (e) collecting, treating, or disposing of storm or floodwater, sewage, or sullage.

- Examples include a gas, water or sewerage main; electrical sub-station; power line; pumping station; retarding basin; road; railway line; sewage treatment plant; water storage dam for potable water supply; storm or flood water drain or retention basin and weir.

- This definition is adopted in the West Tamar Draft Planning Scheme 2003. The above definition removes the restriction of utilities to be for land use by public authority. However, the above definition expands the definition of Utilities to include ‘transport networks’. It cannot therefore be used in its entirety, due to the interface with the existing definition of Road under Clause 1.11 of the Planning Scheme.

- An alternative approach is to consider definitions from Launceston and George Town Planning Schemes. However, this approach is not considered appropriate as those Planning Schemes split utilities into two ‘Major’ and ‘minor’ definitions. Two new definitions would be difficult to incorporate into the current Scheme.

- It is therefore recommended that the Planning Template definition, as amended below, be adopted. The proposed amendments to the Municipality of Beaconsfield Planning Scheme 1986 are as follows:

- Amend Clause S1.2 to Schedule 1 ‘Use Categories’ by deleting definition of ‘Public Utility’ and substitute,

  Utilities: Means use and development of land for:
  
  (a) telecommunications;
  
  (b) transmitting or distributing gas, oil, or power;
  
  (c) collecting, treating, transmitting, storing or distributing water; or
  
  (d) collecting, treating, or disposing of storm or floodwater, sewage, or sullage.
Examples include a gas, water or sewerage main; electrical sub-station; power line; pumping station; retarding basin; sewage treatment plant; water storage dam for potable water supply; storm or flood water drain or retention basin and weir.

Amend Table of Uses to Schedule 2 by **deleting** “Public Utility” and **substitute** “Utilities”:

Amend Clause S.7.7.1(b) by deleting “Public Utility” and substitute “Utilities”

### 5.2.5 Management Measures

Management measures to address potential impacts identified above, include:

- A planning scheme amendment as outlines in section 5.2.4.

### 5.2.6 Summary of Impacts and Management Measures

The water supply pipeline is not contrary to the intent of the relevant planning zones and development standards. A minor amendment is required to the Beaconsfield Planning Scheme to remove reference to public authority.

Consultation with potentially impacted landholders has been undertaken and will continue through the development of this project. Discussions, letters and draft contracts/agreements have been prepared and will be further developed as necessary.

A summary of potential impacts, management measures to minimise the impact and a overall rating associated with land use and planning is provided below.

#### Table 5-3 Summary of potential impact rating and management measures – land use and planning

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Impact Rating</th>
<th>Proposed Management</th>
<th>Management Impact</th>
<th>Overall Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Use and Planning</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inconsistencies with definition of Public Utility in Beaconsfield Planning Scheme 1986</td>
<td>Minor negative impact</td>
<td>Planning Scheme amendment</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
</tbody>
</table>

**Overall impacts on landuse and planning are considered to be insignificant.**

### 5.3 Infrastructure and Services

#### 5.3.1 Buildings

The water supply pipeline route will not physically impact on existing buildings during construction and operation of the water supply pipeline.
A new pump station will be built at Lake Trevallyn. The pump station building will be constructed from reinforced concrete and cavity block work. The roof will be a suspended concrete slab to attenuate noise. All doors will be acoustically rated. There will be a separate switch room for motor control centres, instrumentation and telemetry systems.

A balance control tank will be constructed in the vicinity of the Reatta Road WTP.

5.3.2 Services

Water Supply

A new pipeline is required to meet the demand for raw water by the pulp mill. It will require approximately 75 ML of raw water per day, 26 GL per year (based on a 350 day working year).

The water supply pipeline will not use existing potable water supply pipeline for the distribution of water to the mill. The water supply pipeline will follow existing infrastructure alignments where possible, primarily the Esk Water pipeline, but will not directly impact on this service.

The water supply pipeline may, however, traverse other water reticulation infrastructure. Users may experience temporary disruptions to the existing water service during construction.

There will be an approximate average 1% reduction in flow through Trevallyn Power Station. The potential impact on water flows is addressed in section 5.7 of this volume.

The Launceston town water supply offtake point is upstream of the pulp mill water supply pipeline offtake. The likelihood of a pump leaking oil is low. Online monitoring of the pumps will detect malfunctions and enable preventative action to be taken.

Part V right holders around Lake Trevallyn or water licensees upstream of the Lake will not be affected by any proposed extraction. Extraction will not impact on upstream flows and it is approximately 1% of average total flows. The extraction for the pulp mill would utilise flows currently diverted by Hydro Tasmania.

Sewerage

The water supply pipeline will potentially traverse sewerage lines. The location of sewerage services will be determined in the detailed design phase. Traversing sewerage lines may lead to interruptions of the service area for a short period during construction.

Electricity

The water supply pipeline will require electricity for the operation of the pumps. The estimated annual power consumption for the 26 GL/yr volume is 10,000 MWhrs (Appendix 7, Volume 6).

Aurora has agreed to provide power at 22 kV via the existing overhead line that feeds the Hydro intake tunnel (Gunns pers comm.). The conductors in the three phase power lines will need to be enlarged and a short branch extension made to the pump station location. The total ultimate power supply required for the pump station will be approximately 1.5 to 2 MW (Appendix 7, Volume 6).
Natural Gas

Natural Gas is not required for the water supply and associated infrastructure is highly unlikely to be impacted by this component of the proposal.

Telecommunications

The water supply pipeline will traverse numerous telecommunication cables.

It will be necessary to confirm the extent of these services during the detailed design phase.

Road and Rail

Potential impacts on road and rail services are discussed as part of the transport infrastructure, traffic and access section, section 5.12.

5.3.3 Management Measures

Management measures to minimise potential impacts identified above, include:

- Avoid major infrastructure and services;
- Ongoing liaison and negotiations with land owners, utility/service providers and infrastructure agencies regarding relocation of services, new infrastructure and any approvals required, prior to commencement of construction works;
- Relocation and new services will be negotiated with the service provider and land holder;
- Advise service providers and users of the time and duration of disruptions to services; and
- Register the pipeline with Dial-before-you-dig.

5.3.4 Summary of Impacts and Management Measures

Service requirement solutions, including the provision of 26 GL annual water supply requirements, have been identified for the water supply pipeline. All such requirements can be met without placing significant additional demand on existing services. Construction of the pipeline will require coordination with all relevant utility/service providers, avoidance of services where practicable and implementation of appropriate management strategies to minimise disruption of services.

A summary of potential impacts, management measures to minimise the impact and a combined rating associated with infrastructure and services is provided below.

Table 5-4 Summary of potential impact rating and management measures – infrastructure and services

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Impact Rating</th>
<th>Proposed Management</th>
<th>Management Impact</th>
<th>Combined Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buildings and Services</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Impacts on existing buildings</td>
<td>Insignificant impact</td>
<td>There are no impacts on existing buildings structures.</td>
<td>Insignificant impact</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>Potential Impact</td>
<td>Impact Rating</td>
<td>Proposed Management</td>
<td>Management Impact</td>
<td>Combined Rating</td>
</tr>
<tr>
<td>------------------------------------------------------</td>
<td>---------------------</td>
<td>-------------------------------------------------------------------------------------</td>
<td>-------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Disruption to major infrastructure and services</td>
<td>Insignificant</td>
<td>Avoid major infrastructure and services</td>
<td>Insignificant</td>
<td>Insignificant</td>
</tr>
<tr>
<td>Reallocation of existing water supply</td>
<td>Moderate negative</td>
<td>New raw water supply pipeline from Trevallyn Dam</td>
<td>Moderate positive</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>Increase in demand for power supply</td>
<td>Insignificant</td>
<td>Cogeneration facility as part of the project</td>
<td>Moderate positive</td>
<td>Moderate positive impact</td>
</tr>
<tr>
<td>Increase in demand for telecommunications</td>
<td>Minor negative</td>
<td>Utilise existing capacity in telecommunications network</td>
<td>Insignificant</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td>Relocation of services</td>
<td>Minor negative</td>
<td>Coordinated management with relevant utility/service providers. Minimise disruption times. Optimise timing of works to minimise disruptions</td>
<td>Insignificant</td>
<td>Minor negative impact</td>
</tr>
</tbody>
</table>

The overall impact on buildings and services is considered to be minor.

5.4 Topography, Climate and Meteorology

5.4.1 Topography

Topographical environmental impacts are likely to be localised and confined to the construction phase. The pipeline passes through relatively low relief slopes and the route been selected to avoid significant topographical features as far as practicable, thereby reducing potential impacts. Figure 5-1 provides a longitudinal section of the pipeline illustrating the topography of the route and surrounding area.

Potential sources of impact during pipeline construction include earthworks associated with removal of topsoil, temporary excavations and the creation of stockpiles with a designated construction corridor. Furthermore, construction of laydown areas, temporary and permanent access ways, temporary work camps and associated above ground facilities may result in ground levelling and earthworks. Pipeline construction activities are not expected to significantly alter the existing topography of the area. However, during trenching activities and rehabilitation, there is potential for short-term soil erosion.

The pipe will be underground and the surface will be rehabilitated similar to the topography prior to construction works. Following construction, the alignment topography will be similar to the present terrain.
5.4.2 Climate

Construction and operation of the water supply pipeline is unlikely to affect local or regional climatic conditions.

5.4.3 Meteorology

Construction and operation of the water supply pipeline is unlikely to affect local or regional weather conditions.

5.4.4 Management Measures

- The main preventative measure is that the pipeline will predominantly follow existing road and water pipeline alignments. Significant topographical features have been avoided as far as possible.
- Management measures will include:
  - micro management of the construction corridor to avoid significant environmental or heritage values;
  - clearly marking the construction corridor;
  - minimising the area of disturbance;
  - stockpiling and resspreading of stripped topsoil;
  - minimising the clearing of vegetation within the construction corridor;
  - preparing and adhering to an Erosion and Sediment Control Management Plan;
  - utilising existing roads, tracks and disturbed areas; and
  - rehabilitating the landscape following construction.

Refer to Volume 4 and Section 5.7.2 for management measures related to soil and water respectively.

5.4.5 Summary of Potential Impacts and Management Measures

Impacts to topography, climate and meteorology are likely to be minor and can readily be managed through standard construction practice. Preparation of a Construction EMP as outlined in Volume 4 of the Draft IIS will address all construction phase issues. There are not expected to be any operational phase impacts.

Table 5-5 Summary of potential impact rating and management measures – topography, climate and meteorology

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Impact Rating</th>
<th>Proposed Mitigation</th>
<th>Management Impact</th>
<th>Combined Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Topography, Climate and Meteorology</td>
<td></td>
<td>Preparation of a construction phase Environmental Management Plan</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>Topography</td>
<td>Minor negative impact</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Bell Bay Pulp Mill Preliminary Draft IIS
Volume 3

Volume 3: 5-154
Overall, topographic, climate and meteorological impacts are considered to be insignificant.

5.5 Air Quality

Air quality directly adjacent to pipeline construction may be temporarily impacted during the construction phase as a result of vehicle emissions and dust generation due to earthworks required for burial of the pipeline. This may occur through vehicle movement on access tracks, movement of soil during excavation and backfilling or from soil stockpiles. The extent of impacts will primarily be influenced by wind speed and direction during such works and the distance to sensitive receptors.

Works will be undertaken sequentially, with clearing followed by trenching, pipe construction, pipelaying and backfilling. Any particular site should only be exposed to concentrated construction activities over a period of days, subject to the construction contractor’s approach. For any given area, the disturbance will be short term.

Access roads will potentially generate dust over a longer period as vehicles will be travelling to and from the construction area over an extended period. The length of time a particular access road is utilised will depend on the availability of access along the alignment, property access and site terrain.

Adverse air quality impacts such as dust inhalation by construction workers and site personnel, soil erosion, damage to vehicles and reduced visibility will be limited to the immediate area of construction. Operation of the water supply pipeline will not impact on the air quality of the local and regional area.

5.5.1 Management Measures

Dust emissions during construction can readily be minimised by:

- Minimising the period the site is left exposed to wind disturbance;
- Water carts regularly spraying working areas to settle and compact the dust;
- Limiting construction activities on high wind days;
- Limiting vehicle speed along exposed surfaces, particularly where adjacent to residential areas; and
- Progressively revegetating exposed areas soon after completion of construction activities along sections of the route.

These strategies will form part of the Construction EMP which will be developed prior to any construction activities. Details of the requirements of this plan are outlined in the Mitigation Management Plans in Volume 4.

In order to minimise impacts on the existing air quality, workers will avoid unnecessary use of equipment. When equipment is not in use for long periods, the motor will be shut down to minimise fuel emissions. Regular maintenance of equipment is recommended to assist in achieving maximum efficiency and minimise air emissions.

5.5.2 Summary of Potential Impacts and Management Measures

Dust generation will occur during construction of the pipeline, but will be readily managed by standard management measures. These impacts are also only likely to be short term. Where access roads pass
close to residential areas or other sensitive receptors, attention will be required, particularly if the roads are going to be used for extended periods.

There will be no operational phase air quality impacts.

### Table 5-6 Summary of potential impact rating and mitigation measures – air quality

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Impact Rating</th>
<th>Proposed Mitigation</th>
<th>Management Impact</th>
<th>Combined Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust generation during earthworks</td>
<td>Minor negative impact</td>
<td>Construction EMP</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>Dust generation from access roads</td>
<td>Minor negative impact</td>
<td>Construction EMP</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>Vehicle emissions</td>
<td>Minor negative impact</td>
<td>Construction EMP</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
</tbody>
</table>

Overall, with the implementation of appropriate management, air quality impacts are considered to be insignificant.

### 5.6 Geology and Soils

**Pipeline**

Construction and excavation processes will result in a moderate negative impact on the geology and soils of the site area, primarily as a result the extent of earthworks required.

A construction corridor of 20 metres is required to allow access and operation of construction machinery and placement of the pipeline. Ground disturbances will occur during site preparation works, including clearance of vegetation, cut and fill activities and the creation of stockpiles. A trench approximately 2 m wide by up to 3 metres deep will be excavated to allow for placement of the pipe. Excavation will involve removal of rock and soil to the volume of the trench. Once the pipeline is in place, the trench will be backfilled. This will result in surplus rock and/or soil which will be disposed of at a suitable location. The trench will be backfilled to a height slightly above the surface height, to allow for subsidence/settling of the backfill. During construction works, areas of soil will be unprotected at various stages for short periods of time and susceptible to wind and water erosion. Machinery will clear specified vegetation areas, expose soils, excavate and move rock and soil and potentially weaken soil structures and local soil stability. These issues will be addressed by the Construction EMP.

The landslip classes (Section 3.6) for the pipeline route indicate some areas of doubtful stability. The land unit classifications identify the major hazards as low to severe sheet and gully erosion. Areas within the Deviot land system may be subject to landslips. The final corridor alignment will be confirmed based
on detailed survey and geotechnical assessment. Areas of potential geological instability will be avoided wherever possible.

It is anticipated that blasting may be required, however rock breakers will be sufficient in many areas. Geotechnical investigations will be undertaken during detailed design to identify whether and where blasting will be required. Exposed soils combined with high risk of erosion and general to steep slopes may lead to the loss of soil during rainfall events and create the potential for particulate matter to enter water streams, creating minor turbid water plumes, pending the effectiveness of management measures to stabilise the soil. These sites will need to be effectively managed during preparation works, construction and operation.

As discussed in Section 5.9, vegetation clearing is required in the 20 metre wide corridor and will expose underlying soils. The removal of vegetation may result in an increase in run-off.

The construction plant will contribute to the compaction of the soil, particularly in areas of high traffic movement. Compacted soil results in less water being absorbed into the soil profile and a potential increase in run-off.

Soils have the potential to become contaminated by hydrocarbons (oils, petrol, diesel) associated with construction vehicles. The greatest risk of significant contamination will be at refuelling and maintenance sites. The location and management of such sites will be specifically addressed in the Construction EMP.

Gurung (2001) did not identify any likely sediment with the potential to host acid sulphate soils along the pipeline corridor. The pipeline is not expected to impact on potential acid sulphate soils through excavation works.

No geoconservation areas will be impacted by the proposal.

**Pump Station**

The pump station options are discussed in Section 2.3.

**Option 2**

In the event that Option 2 – Inclined Draft Tube Arrangement is the chosen method of pumping raw water from Lake Trevallyn, excavation of a sump approximately 1 metre deep is required to provide the necessary submergence at minimum reservoir water level. It is likely that the excavation will be into rock and a large excavator using a rock breaker will undertake this. Excavated material will be sidecast. No blasting will be undertaken.

Draft tube supports will comprise prefabricated steel supports that would be fixed to reinforced concrete footings anchored to the base rock material.

**Option 3**

Option 3 will involve boring a hole for the pipeline near the embankment of the dam. The specific requirements for this work will be identified during detailed design. It is likely that excavation will be in rock using excavated mounted rock breakers and pneumatic equipment.

Surplus rock will be disposed of at a suitable location.
5.6.1 Management Measures

The following management measures will be implemented to minimise potential geological and soil impacts. These management measures will be included in the environmental management plan and will be monitored and reported as specified (refer to Volume 4):

- undertake a detailed pipeline route assessment based on survey, soil investigations and geotechnical assessment to ensure the suitability of the final alignment;
- preparation and implementation of construction and maintenance phase environmental management plans detailing erosion, sediment and pollution control measures during site preparation and construction works;
- ground disturbance will be limited to the 20 metre corridor;
- where possible, existing tracks and roads will be used, especially for watercourse crossings; and
- water trucks and other dust suppression and erosion management measures will be implemented to stabilise soils subject to heavy construction traffic.

5.6.2 Summary of Potential Impacts and Management Measures

Potential impacts on geology and soils are anticipated to be minor and can readily be addressed through standard management strategies as outlined in the Water Supply Pipeline Mitigation Management Plan (Volume 4 of the Draft IIS). The final alignment will be determined based on additional assessment to be undertaken as part of detailed design. These investigations will allow avoidance of potential problem areas.

Table 5-7 Summary of potential impact rating and mitigation measures – geology and soils

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Impact Rating</th>
<th>Proposed Mitigation</th>
<th>Management Impact</th>
<th>Combined Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geology and Soils</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil erosion</td>
<td>Minor negative impact</td>
<td>Construction Environmental Management Plan</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Minimise area of disturbance</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Use existing roads and tracks</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Erosion control measures to be installed prior to significant disturbance</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
</tbody>
</table>

Overall, with the implementation of appropriate management, geology and soil impacts are considered to be insignificant.
5.7 Groundwater and Hydrology

5.7.1 Groundwater

Trenching for the pipeline will be up to 3 m in depth and will be unlikely to impact on local or regional groundwater. Further investigations to be undertaken prior to detailed design will confirm the alignment, trench depths and presence of any shallow groundwater systems. The pipeline will not disrupt artesian and sub-artesian groundwater flows.

The Environmental Management Plan will outline construction procedures to control water used for maintenance, hydrostatic testing and watering of access tracks, camp sites and waste disposal and will specify management strategies to avoid contamination risks to local groundwater.

5.7.2 Hydrology

The impact of drawing water from Lake Trevallyn was assessed using historical flow data obtained from Hydro Tasmania for the period spanning 1994 to 2004.

The assessment assumed the following scenario for taking water from Lake Trevallyn:

1. Water will be taken from the portion of flow entering Cataract Gorge when the dam is surcharging (that is, there would be no impact on the Trevallyn Power Station Operations); and/or
2. On all other occasions the water will be taken from Hydro Tasmania’s water rights for the Trevallyn Power Station.

The seasonal results of the water balance analysis are as shown in Table 5-7.

The potential impact on water flows out of the Trevallyn Dam as a consequence of water usage by the pulp mill based on the past 10 years historical records (1994 to 2004) is as follows:

Table 5-8 Impact of Mill Water Extraction on Lake Trevallyn

<table>
<thead>
<tr>
<th>% Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow Through Cataract Gorge</td>
</tr>
<tr>
<td>Flow Through Power Station</td>
</tr>
</tbody>
</table>

If no water was taken from flows into Cataract Gorge when the dam was surcharging and all the pulp mill’s requirements were extracted through the Trevallyn Power Station allocation, the power station flow would reduce by 1.66%.

Flows down the Cataract Gorge will be reduced by only in the order of 1%. The designated environmental flows currently in place for the Gorge will be retained.

The percentage average impact on the net power station and Cataract Gorge flows is minimal as outlined in Table 5-9 and Table 5-10.
### Table 5-9  Percentage Average Seasonal Impact on Net Power Station and Cataract Gorge Flows

<table>
<thead>
<tr>
<th>Season</th>
<th>Retention in flow through Trevallyn Power Station</th>
<th>Retention in flow through Cataract Gorge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Autumn</td>
<td>98.0%</td>
<td>98.7%</td>
</tr>
<tr>
<td>Winter</td>
<td>99.1%</td>
<td>99.2%</td>
</tr>
<tr>
<td>Spring</td>
<td>99.1%</td>
<td>98.9%</td>
</tr>
<tr>
<td>Summer</td>
<td>98.4%</td>
<td>99.0%</td>
</tr>
</tbody>
</table>

### Table 5-10  Lake Trevallyn Water Balance Analysis Seasonal Results

<table>
<thead>
<tr>
<th>Year</th>
<th>Season</th>
<th>Power Station Average Flow</th>
<th>Cataract Gorge Average Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Before Pulp Mill @ 26 GL/yr</td>
<td>After Pulp Mill @ 26 GL/yr</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[cumecs]</td>
<td>[cumecs]</td>
</tr>
<tr>
<td>1995</td>
<td>Autumn</td>
<td>36.0</td>
<td>35.2</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>55.5</td>
<td>54.9</td>
</tr>
<tr>
<td></td>
<td>Spring</td>
<td>45.3</td>
<td>44.6</td>
</tr>
<tr>
<td></td>
<td>Summer</td>
<td>60.1</td>
<td>59.5</td>
</tr>
<tr>
<td>1996</td>
<td>Autumn</td>
<td>40.6</td>
<td>39.9</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>65.6</td>
<td>65.2</td>
</tr>
<tr>
<td></td>
<td>Spring</td>
<td>47.6</td>
<td>47.1</td>
</tr>
<tr>
<td></td>
<td>Summer</td>
<td>28.2</td>
<td>27.4</td>
</tr>
<tr>
<td>1997</td>
<td>Autumn</td>
<td>32.9</td>
<td>32.1</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>52.9</td>
<td>52.1</td>
</tr>
<tr>
<td></td>
<td>Spring</td>
<td>43.1</td>
<td>42.3</td>
</tr>
<tr>
<td></td>
<td>Summer</td>
<td>30.9</td>
<td>30.0</td>
</tr>
<tr>
<td>1998</td>
<td>Autumn</td>
<td>33.4</td>
<td>32.5</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>62.7</td>
<td>62.0</td>
</tr>
<tr>
<td></td>
<td>Spring</td>
<td>59.9</td>
<td>59.3</td>
</tr>
<tr>
<td></td>
<td>Summer</td>
<td>57.7</td>
<td>56.9</td>
</tr>
<tr>
<td>1999</td>
<td>Autumn</td>
<td>58.6</td>
<td>57.8</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>54.0</td>
<td>53.5</td>
</tr>
<tr>
<td></td>
<td>Spring</td>
<td>51.9</td>
<td>51.2</td>
</tr>
<tr>
<td></td>
<td>Summer</td>
<td>51.3</td>
<td>50.5</td>
</tr>
<tr>
<td>2000</td>
<td>Autumn</td>
<td>3.9</td>
<td>3.0</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>38.1</td>
<td>37.4</td>
</tr>
<tr>
<td></td>
<td>Spring</td>
<td>69.5</td>
<td>69.2</td>
</tr>
<tr>
<td></td>
<td>Summer</td>
<td>48.6</td>
<td>47.7</td>
</tr>
<tr>
<td>2001</td>
<td>Autumn</td>
<td>54.6</td>
<td>54.0</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>55.2</td>
<td>54.9</td>
</tr>
<tr>
<td></td>
<td>Spring</td>
<td>74.8</td>
<td>74.4</td>
</tr>
<tr>
<td></td>
<td>Summer</td>
<td>44.6</td>
<td>43.9</td>
</tr>
<tr>
<td>2002</td>
<td>Autumn</td>
<td>48.9</td>
<td>48.2</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>46.7</td>
<td>45.9</td>
</tr>
<tr>
<td></td>
<td>Spring</td>
<td>55.3</td>
<td>54.8</td>
</tr>
<tr>
<td></td>
<td>Summer</td>
<td>45.1</td>
<td>44.2</td>
</tr>
<tr>
<td>Year</td>
<td>Season</td>
<td>Power Station Average Flow</td>
<td>Cataract Gorge Average Flow</td>
</tr>
<tr>
<td>------</td>
<td>--------</td>
<td>-----------------------------</td>
<td>----------------------------</td>
</tr>
<tr>
<td></td>
<td>Before Pulp Mill</td>
<td>After Pulp Mill @ 26 GL/yr</td>
<td>Before Pulp Mill</td>
</tr>
<tr>
<td></td>
<td>[cumecs]</td>
<td>[cumecs]</td>
<td>[cumecs]</td>
</tr>
<tr>
<td>2003</td>
<td>Autumn</td>
<td>50.0</td>
<td>49.3</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>78.3</td>
<td>78.0</td>
</tr>
<tr>
<td></td>
<td>Spring</td>
<td>58.1</td>
<td>57.7</td>
</tr>
<tr>
<td></td>
<td>Summer</td>
<td>52.1</td>
<td>51.6</td>
</tr>
<tr>
<td>2004</td>
<td>Autumn</td>
<td>34.9</td>
<td>34.2</td>
</tr>
<tr>
<td></td>
<td>Winter</td>
<td>66.5</td>
<td>66.1</td>
</tr>
<tr>
<td></td>
<td>Spring</td>
<td>34.5</td>
<td>34.3</td>
</tr>
<tr>
<td></td>
<td>Summer</td>
<td>46.5</td>
<td>45.7</td>
</tr>
</tbody>
</table>

Based on the above calculations, with full extraction of water under the model specified above, flows through Cataract Gorge would reduce by less than 1% and total flows into the Tamar River from the South Esk catchment by less than 1.2%. Mean annual flows from the South Esk Basin are approximately 70 cumecs. Flow gauging of the North Esk at Ballroom has indicated mean annual flows of 5.6 cumecs from the North Esk, though mean flows from the entire North Esk catchment probably approach 10 cumecs (HEC, 1995). In considering flows from both systems, total reductions in flows to the Tamar River will be approximately 1%.

Given the fluctuating flows entering both systems as shown above, a reduction of flows of this magnitude is not considered significant. Such reduction will fall well within the tolerances of an already highly regulated estuarine system.

### 5.7.3 Drainage and Catchments

Several water crossings will be required for construction of the water supply pipeline. Numerous drainage lines and small creeks will be traversed. The main watercourses include:

**Table 5-11 Main Water Crossings**

<table>
<thead>
<tr>
<th>Chainage - Distance from start of pipeline at Lake Trevallyn</th>
<th>Location</th>
<th>Pipe Route</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.60 km</td>
<td>Tamar River</td>
<td>Trench through the bed of the Tamar River</td>
</tr>
<tr>
<td>11.39 km</td>
<td>Barnard's Creek</td>
<td>Pipe to run parallel to Esk Water main on similar type of pipe</td>
</tr>
<tr>
<td></td>
<td></td>
<td>bridge structure</td>
</tr>
<tr>
<td>15.77 km</td>
<td>Large Creek</td>
<td>Trench through creek bed downstream of large culvert</td>
</tr>
<tr>
<td>23.31 km</td>
<td>Swan Bay Creek</td>
<td>Trench through creek bed</td>
</tr>
<tr>
<td>24.74 km</td>
<td>Faheys Creek</td>
<td>New pipe bridge</td>
</tr>
<tr>
<td>34.53 km</td>
<td>Fourteen Mile Creek</td>
<td>New pipe bridge similar to Esk Water main</td>
</tr>
</tbody>
</table>
Crossing methodologies for other minor waterways will be determined on a site-by-site basis subject to the final alignment and field investigations undertaken as part of detailed design. Any crossing design will require minimal hydrological impact as well as consideration of environmental issues.

Laying of the pipe across the Tamar River using the water jet trenching method will minimise potential impacts on the waterway and aquatic environment. The volume of silt that might enter suspension during the installation of the pipeline will be negligible relative to the total volume of silt in the estuary. As detailed in Appendix 56, Volume 16, acid generation from silt suspension, oxygen depletion and dissolution of heavy metals in general by the release of contaminated silt to the water columns are of insignificant environmental concern.

A sediment plume is likely to occur for approximately two days (Appendix 56, Volume 16). The visibility of the plume would decrease once the pipe and trenching machine have sunk below the silt surface. More details on the visibility of the plume are discussed in section 5.15.

5.7.4 Management Measures

- Water extraction from Trevallyn Dam will minimise reductions in flows through Cataract Gorge by utilising Hydro Tasmania’s water allocation;
- Pre-engineering assessments of groundwater conditions along the pipeline route to ensure areas of shallow groundwater are avoided or appropriately managed;
- For waterway crossings, changes to flow rate and volume will be minimised by the construction technique and duration;
- Implementation of appropriate erosion controls;
- The timing of construction of the pump station will align with Hydro Tasmania’s maintenance activities in order to minimise flow disturbances downstream of the dam; and
- Turbidity monitoring will be taken at various locations upstream and downstream of the Tamar River crossing following the installation of the pipeline. This is to delineate the physical extent of the sediment plume and how it dissipates.
- To assist Launceston City Council’s silt management program, water samples will be taken at locations to be determined in consultation with the Council as part of calibrating and/or testing numerical models of estuary dynamics.
- Further measures to protect surface waters from construction and operational activities include revegetation as set out in Section 5.9.

These strategies will form part of the Construction EMP which will be developed prior to any construction activities. Details of the requirements of this plan are outlined in the Mitigation Management Plans in Volume 4.

5.7.5 Summary of Potential Impacts and Management Measures

Whilst a significant volume of water is required to supply the pulp mill, extraction of this water from Trevallyn Dam will result in a very minor (approximately 1%) reduction in overall flows to the Tamar River and less than 1% change to total flows down Cataract Gorge. Neither reduction is considered significant in regards to the overall hydrology of the system.
Pipeline crossings of waterways can potentially modify the hydraulics by restricting flows or altering bed conditions. Standard design requirements will avoid any such flow modifications. Specific design for the crossings will be determined based on further field investigations to be undertaken during detailed design.

Construction mitigation measures will be detailed in the pipeline Construction EMP.

**Table 5-12  Summary of potential impact rating and mitigation measures – groundwater and hydrology**

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Impact Rating</th>
<th>Proposed Mitigation</th>
<th>Management Impact</th>
<th>Combined Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groundwater and Hydrology</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Modification to flows in Cataract Gorge and Tamar River</td>
<td>Moderate negative impact</td>
<td>Extraction model to utilise Hydro Tasmania’s water allocation in other than dam surcharge events</td>
<td>Minor positive impact</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td>Interception of shallow groundwater</td>
<td>Minor negative impact</td>
<td>Field investigations as part of detailed design to identify areas of shallow groundwater</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>Modification of flows as a result of pipeline waterway crossings</td>
<td>Minor negative impact</td>
<td>Appropriate design for waterway crossings will not modify flows</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>Modification to Cataract Gorge and Tamar river flows as a result of pump station construction</td>
<td>Moderate negative impact</td>
<td>Time construction activities with maintenance lowering of Dam water levels</td>
<td>Moderate positive impact</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>Minimise modification to waterways as a result of erosion triggered by construction activities</td>
<td>Minor negative impact</td>
<td>Construction Environmental Management Plan</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
</tbody>
</table>

*Overall, impacts on groundwater and hydrology are considered to be minor.*

### 5.8 Aquatic Ecology

Potential impacts on aquatic ecology as a result of construction and operation of the water supply pipeline can result from the following:

- Modification to flows in Cataract Gorge and the Tamar River as a result of water extraction from Trevallyn Dam;
- Construction impacts from the proposed pump station to be located in Lake Trevallyn;
- Operational impacts from the proposed pump station to be located in Lake Trevallyn;
- Construction impacts from waterway crossings of the water supply pipeline; and
Construction impacts associated with the discharge of waters during dewatering and hydrostatic testing.

These are discussed below.

5.8.1 Modification of Flows to Cararact Gorge and the Tamar River

As discussed in the previous section, changes to flows within Cataract Gorge and the Tamar River as a result of water extraction from Trevallyn Dam are less than 1%. The current environmental (minimum) flows to Cararact Gorge would not be affected.

Both Cataract Gorge and the Tamar River are heavily modified systems with extensive upstream regulation and flow management. Environmental flows down the Gorge are currently set at 1.5 m$^3$/s base line. The water currently utilised by the power station is discharged in to a large, tidal waterway where water levels are driven by tidal influence. Previous studies (Section 3.8) have identified that the aquatic ecology within the Gorge has been strongly influenced by the modifications to flows brought about by Trevallyn Dam. Similarly, changes to flows within the Tamar River, and those waterways which flow into it, have resulted in modifications to the ecological characteristics of this system.

Low (environmental) flows through Cataract Gorge will not alter as a result of water extraction. Flow changes are proposed only when the dam is surcharging, when a small proportion of flows will be extracted, which otherwise would have flowed to the Gorge. Based on Table 5-10, average seasonal reductions in flows would be:

- Autumn 1.3 %
- Winter 0.8 %
- Spring 0.9 %
- Summer 0.8 %

Given that environmental flows will be maintained at current levels, such a small modification to surcharge flows is not considered significant and would be unlikely to result in modification to the aquatic environment within the Gorge.

Similarly, the extraction at Trevallyn Dam will result in reduced discharge from the power station into the tailrace and the Tamar River. Based on Table 5-10, average seasonal reductions in flows from the South Esk catchment would be:

- Autumn 2.0 %
- Winter 1.0 %
- Spring 0.9 %
- Summer 1.7 %

Given the tidal nature of this waterway and other inputs to the system, this further, but very small, modification to flows is not considered significant and within the tolerance limits of the existing aquatic environment. As a consequence, it was not considered necessary to undertake further investigation of environmental flow requirements.
5.8.2 Pump Station Construction Impacts

Whilst final pump station specifications will not be finalised until the detailed design phase, it is likely that works will be required within the inundation area of Trevallyn Dam and as a consequence, potentially result in impacts on the aquatic environment. Works will be required for the excavation of a pit or well, and the construction of inlets and pipework below the normal operating levels of the dam.

Excavation of a wet well to RL 117 m AHD (Option 3 pump station) will require extensive works.

As blasting works will not be permitted by Hydro Tasmania, the excavation works will likely require a rock breaker. This will require lowering of the dam water to allow controlled and safe access for construction crews.

It is intended to coordinate any such work with Hydro Tasmania’s regular maintenance program which requires lowering of water levels to clean trash racks. As a consequence, with appropriate environmental management during construction, impacts on the aquatic environment are expected to be minor.

5.8.3 Waterway Crossing Construction Impacts

Disturbance of Aquatic Biota

The benthic environment in this area is inherently unstable due to frequent and erratic scouring from flood discharges. Therefore, benthic biota in the vicinity of the pipeline crossing will be resilient to physical disturbance (Pitt and Sherry, 2006f).

It is anticipated that the gross disturbance of the sediments by the pipeline installation will be neither an unusual nor a significantly harmful occurrence for these species. The nature of the silt and the nature of the pipeline installation method means that the infauna will simply be displaced with the sediment, with little direct impact damage. They may be moved a short distance up or down stream depending on the currents at the time before settling onto the estuary bed again to re-establish themselves. The disturbed sediments would also be quickly recolonised from adjacent areas, just as would occur following flood scouring.

Impacts on the benthic fauna from jet trenching installation of the pipeline are expected to be negligible, and confined to temporary displacement and recolonisation.

The most likely effect of the trenching operations on fish species, (including the mosquito fish (Gambusia holbrooki), an introduced pest species that have been recorded in the vicinity of the crossing), will be to cause the fish to move away from the area for the duration of the disturbance, and the impacts on the species would therefore be neutral.

Physical effects of silt suspension on Biota

The disturbance of silt by jet trenching will be orders of magnitude less than open-then-backfill trenching but some silt will nevertheless be lifted into suspension and hence transported up and/or down the estuary until it settles.

The silt plume created by the pipe installation will be similar to commonly experienced natural scour plumes but it is likely to occur at a river flow less than at which scour events normally occur.
A slow settling rate of the silt means that silt entrained in the main channel is unlikely to settle out until it reaches the toe of the delta, downstream of Rosevears. As normally happens with suspended silt in the Tamar River, the plume silt is likely to be carried up and down the estuary with the tides several times while it gradually settles.

It is expected that biota in the water column will respond to this temporary increase in silt concentrations in the same manner that they do in response to a natural scour event. After complete mixing, the plume concentrations are not exceptional relative to concentrations that would frequently occur in the estuary (Pitt and Sherry, 2006f).

Impacts on swimming fauna from jet trenching installation of the pipeline are expected to be negligible, and confined to avoidance behaviour.

**Chemical effects of Silt on Biota**

Silt contamination in the Tamar Estuary is historical and unrelated to the current project. However, the construction of the water supply pipeline has the potential to disturb the contaminated sediments and suspend them into the water column.

Nevertheless, the current project will introduce silt into suspension and hence potentially make these contaminants more bioavailable.

As with the other potential impacts of silt on biota, the scale of the potential impacts of the contamination on biota must be assessed against the background exposure of biota to such contamination, and also against exposure from alternative installation methods. Like the other potential impacts, the exposure caused by dredging will be in a concentrated burst on a scale comparable with exposure to natural scouring, which is likely to occur several times a year naturally. This natural exposure has been occurring for many decades (and possibly more than one hundred years) since contamination started, and will continue for many decades (or longer) to come.

Some form of jet trenching is considered to be the most practical means of installing the pipeline. It is also a method that will cause an order of magnitude or more less silt suspension than dredge-then-backfill trenching.

**5.8.4 Water Discharges During Pipeline Construction**

Water pressure testing of the pipeline will be undertaken in sections to test the pipe and joins. Typically water is released at low points along the alignment so that testing water can drain from the pipe. As a risk management measure, it is likely that the pipe would be tested in sections, rather than the whole length at once.

There will be at least three major low points along the water supply pipeline, resulting in six "sections for testing". The specific location of these points will be determined during detailed design, once the alignment has been surveyed. The likely locations are:

- The Tamar River crossing at Launceston;
- Dilston (Lady Nelson Creek); and
- East Arm (refer to longitudinal section drawings in Appendix 44, Volume 15).
Each low point would experience two releases. Each section would typically only be tested once assuming it passes the test. If not, the section would need to be retested. The total pipe volume is approximately 31.5 ML, so approximately 6 to 8 ML would be released per section.

Water would most likely be sources from the nearby Esk Water pipeline. This water is not potable and has not been chlorinated. The water is also of good quality so would be expected to be free of contaminants.

Release of testing waters typically occurs at low points such as drainage lines or close to waterways. The releases will be gravity fed (low pressure) and controlled by release valves. Controls will be established around the release point to reduce flow velocities and spread the flow, so as to minimise potential erosion impacts and vegetation disturbance. Structures such as geotextile fabric fences can be used to achieve such effects. The release point will be selected to minimise site impacts during discharge.

The release will be monitored at all times. Should problems be observed during release, the valves can be closed and problems rectified.

As the water to be used will be of good quality but will not have be treated, water quality impacts may result from:

- Sediment and erosion during release; and
- Release of freshwater into an estuarine system.

Sediment and erosion impacts will be managed as part of the Construction EMP. As discussed, appropriate controls will be established around the release point to control velocity, minimise scoure and protect vegetation cover. Locating the release point in an area with heavy grass cover would be preferred.

The release of a large volume of fresh water into an estuarine system within a short period of time (possibly twice assuming each low point receives releases from two sections) may have some environmental effects. Such a release would however be similar to runoff after a heavy rainfall event, particularly as the release point will be located near a natural drainage line. Releases are likely to occur directly adjacent to The Tamar River at Launceston, Dilston and East Arm. Each release will be into a substantial body of water and any potential effects from the influx of fresh water will quickly be mixed with brackish water, as occurs after rainfall events.

5.8.5 Management Measures

In order to reduce impacts on aquatic ecology, the following strategies will be implemented:

- Utilise the existing Hydro Tasmania water allocation to provide the bulk of water for the pulp mill. Flows other than this allocation will only be utilised when the dam is surcharging;
- Pump station construction will be undertaken in conjunction with regular maintenance programs so as to minimise additional dam lowering events and duration;
- Waterway crossings will be undertaken to minimise disturbance to the riparian areas, bed and banks. Final crossing methodologies will be identified based on assessments carried out as part of detailed design.
Any discharges from the pipeline during construction for hydrostatic testing or other functions will be managed according to the Construction EMP so as to minimise erosion and disturbance impacts associated with individual release points.

The release point will be located to minimise erosion and disturbance to the waterways and adjacent vegetation. All releases will be visually monitored for erosion and excessive disturbance.

These strategies will form part of the Construction EMP which will be developed prior to any construction activities. Details of the requirements of this plan are outlined in the Mitigation Management Plans in Volume 4.

### 5.8.6 Summary of Potential Impacts and Management Measures

Extraction of an approximate average of 1% of the existing water flow from Lake Trevallyn is anticipated to have negligible to very minor negative impacts.

Construction of the pump station will occur in conjunction with Hydro Tasmania’s maintenance activities and will not result in any additional impacts on aquatic ecology.

Construction activities will be managed by the environmental management plan which will define specific controls and monitoring to protect the aquatic environment.

**Table 5-13  Summary of potential impact rating and mitigation measures – aquatic ecology**

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Impact Rating</th>
<th>Proposed Mitigation</th>
<th>Management Impact</th>
<th>Combined Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modification of flows to Cataract Gorge and Tamar River</td>
<td>Moderate negative impact</td>
<td>Utilisation of existing water allocations from Hydro Tasmania</td>
<td>Minor positive impact</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td>Construction impacts within Trevallyn Dam from construction of the pump station</td>
<td>Moderate negative impact</td>
<td>Conduct works during regular maintenance events for the dam</td>
<td>Minor positive impact</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td>Construction impacts from Tamar River crossing</td>
<td>Major negative impact</td>
<td>Utilisation of jet trenching construction methods</td>
<td>Minor positive impact</td>
<td>Moderate negative impact</td>
</tr>
<tr>
<td>Minimise impacts to waterways as a result of construction activities</td>
<td>Minor negative impact</td>
<td>Construction Environmental Management Plan</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
</tbody>
</table>

*Overall, the impacts on Aquatic Ecology from the Tamar River crossing are considered to be moderate but short term. Operational impacts are considered to be minor.*

### 5.9 Terrestrial Flora

For the purpose of the water supply pipeline impact assessment, it has been assumed that all vegetation within the 20 m construction corridor could be removed. Consequently, potential impacts may be
overestimated by up to 50%, because there are two (and sometimes four) potential route options for considerable lengths of the corridor. These route options were not compared because they were not totally separate options. The pipeline may swap between options along its length, based on site-specific factors, making it problematic to compare one route with another.

The route following the East Tamar Highway for the majority of its length is labelled WSP1, while the alternative route is labelled WSP2. The Tamar River crossing options are designated option 1-4, with ‘1’ being the southernmost option and ‘4’ being the northernmost.

A number of assumptions have been made in assessing potential ecological impacts. It has been assumed that when using the preferred method of pipeline installation (i.e. trenching), the width of disturbance for construction of the pipeline will generally be 20 metres, although this distance may be able to be reduced across narrow areas of ecological sensitivity.

Within the impacts component of this report, it is also assumed that trenching will be used for the entire length of the water supply pipeline.

5.9.1 Flora Impacts

A total of 12 potential ecological impacts have been identified. These impacts are briefly described below. For more detailed descriptions of individual impacts, refer to Section 10.2.1 of Appendix 29, Volume 12.

1. Loss or damage to native vegetation (State threatened ecological vegetation community)

The development of the water supply pipeline will result in the loss of up to 249.4 ha of vegetation, of which an estimated 18.4 hectares is threatened native vegetation, including portions of six State significant Ecological Vegetation Communities (EVCs). The maximum potential area to be cleared for each of these EVCs is outlined as follows:

- Freshwater aquatic sedgeland and rushland (ASF) – 1.1 hectares;
- _Eucalyptus amygdalina_ forest and woodland on sandstone (DAS) – 7.2 hectares;
- _Eucalyptus ovata_ forest and woodland (DOV) – 3.4 hectares;
- _Allocasuarina littoralis_ forest (NAL) – 0.4 hectares;
- _Melaleuca ericifolia_ swamp forest (NME) – 5.9 hectares; and
- _Eucalyptus viminalis_ wet forest (WVI) – 0.4 hectares.

2. Loss or damage to native vegetation (general)

The construction of the pipeline will result in the direct loss of up to 66.7 hectares of non-threatened native vegetation communities in relatively good condition. It may also result in a localised reduction in species richness, via localised extinction of a small number of species. However, it should be noted that similar habitat and vegetation communities are common within the local area.

3. Fragmentation of native vegetation

The vegetation along the corridor is already highly fragmented along most of its route, due to land clearing for agriculture, urban development, roads, rail, pipelines and powerlines. Construction of the
pipeline will slightly increase the already high level of fragmentation within the local landscape, with the greatest impact likely to arise in the northern section, where the vegetation is most intact.

4. **Loss or damage to a population of a nationally significant flora species**

No nationally threatened flora species have been identified from within the corridor. However, there is potential habitat within the site for one species of national significance, *Epacris exserta*. Although there is potentially suitable habitat for this species along waterways at the southern end of the pipeline, it is unlikely that this species is present within the study area, as it is a shrub species that would be difficult to overlook in the field, especially given the intensity of the field surveys.

5. **Loss or damage to a population of a State significant flora species**

A total of 11 State significant flora species (Table 5-14) are present within the corridor. There will potentially be a direct impact upon all of these species, depending on the alignment chosen. There is also potential habitat within the site for 40 species of state significance previously recorded within 5 km of the pipeline route, but not within the corridor itself.

6. **Introduction of environmental weeds**

There is potential for the introduction of environmental weeds during the construction and development phase of the pipeline, particularly by heavy machinery that may be carrying viable weed seeds on their bodies or wheels.

7. **Spread of existing environmental weeds**

In addition to the impact identified above, existing environmental weeds in the corridor (particularly in highly disturbed and weedy areas, e.g. FAG, FWU) may be spread on and off-site by the various trucks and construction vehicles. There are numerous weed species already present along the pipeline route that may colonise freshly cleared ground. Common and/or serious weed species include *Chrysanthemoides monilifera* subsp. *monilifera*, *Cotoneaster pannosus*, *Craetaegus monogyna*, *Erica lusitanica*, *Kunzea ericoides*, *Paspalum dilatatum*, *Phalaris aquatica*, *Rubus fruticosus* aggregate, *Salix* spp. (especially on the margins of the Tamar River in Launceston) and *Ulex europaeus*.

8. **Introduction and spread of Phytophthora cinnamomi**

Along the Water supply pipeline, three EVCs, ‘*Eucalyptus amygdalina* coastal forest and woodland’ (DAC), ‘*Eucalyptus amygdalina* forest and woodland on sandstone’ (DAS) and ‘*Eucalyptus ovata* forest and woodland’ (DOV), have been identified as being highly susceptible to *Phytophthora cinnamomi* (Forest Practices Authority 2005). It should be noted that plants within the Epacridaceae, Fabaceae, Proteaceae and Mimosaceae families are especially susceptible to the pathogen (Barker and Wardlaw 1995) (see Appendix B of Appendix 29, Volume 12) for a complete list of species occurring within these genera along the pipeline route). None of the threatened species present within the site are known to be particularly susceptible to *Phytophthora cinnamomi*, although it should be noted that little information exists for many of these species. There was no evidence of *Phytophthora cinnamomi* within the corridor.

9. **Erosion and/or sedimentation**

Soil erosion occurs to varying degrees at a number of locations within the corridor. The development of the pipeline may result in an increase in on-site erosion, with a corresponding increase in levels of sedimentation within waterways flowing through the site and into the Tamar River. In the absence of mitigation measures, increased erosion may damage or destroy localised areas of retained native
vegetation (on and off-site), while sedimentation may have a deleterious effect on aquatic, semi-aquatic and riparian flora. Erosion and sedimentation control issues are discussed in Volume 4 of the IIS.

10. Altered surface water runoff into waterways

Following rainfall events, surface water runoff may be altered into waterways flowing through the site. In the absence of mitigation measures, any such runoff may collect chemicals/pollutants that might be spilled at the site during the construction phase and eventually deposit these materials in the Tamar River. Runoff and pollution control issues are discussed in Volume 4 of the IIS.

11. Inhibition of plant photosynthesis and reproductive capability due to airborne dust

During the installation of the pipeline there would be extensive soil disturbance, which will lead to the generation of dust. This may result in a potentially short-term negative impact on plant species growth and seed viability in the vicinity (i.e. less than 100 m) of the works footprint.

12. Altered hydrogeology

Earthworks associated with development and operation of the pipeline may result in localised changes to the groundwater table, which may subsequently influence vegetation community structure and composition directly adjacent to the corridor. This is addressed in section 5.7.

5.9.2 Management Measures

A number of mitigation measures can be undertaken to minimise the impact of the proposed development. Mitigation measures are listed below.

A. Minimising or altering the footprint of disturbance

The significance of the footprint of disturbance can be minimised by selecting sections of the alignment that have the lowest impact. In addition, small sections of the pipeline containing threatened species and/or high levels of sensitivity can be constructed within a narrower alignment than the nominal 20 m width, in order to avoid or minimise disturbance to threatened species. Furthermore, micro-siting the alignment to avoid or minimise damage to threatened species and EVCs would also reduce the significance of the footprint of disturbance.

Finally, when pipeline construction activities are occurring within private land, existing access points and gates will be used wherever possible from public roadways. If new access points are required into private land from public roadways, ecological advice will be sought in order to determine a route involving the lowest possible ecological impact. This ecological advice should aim to find an appropriate location along the roadside reservation (i.e. with little or no ecological values) where a new entrance point could be established. Construction vehicles moving across the private property away from the pipeline alignment will also only cross-waterways at existing bridges or culverts.

B. Avoiding accidental loss or damage to native vegetation

Clearance of native vegetation will require a certified Forest Practices Plan, which will identify the area proposed to be cleared. These areas would be flagged clearly prior to operations commencing and maintained accordingly, in order to avoid any inadvertent damage to vegetation that is planned to be retained.
C. Development of a Vegetation Management Plan

A Vegetation Management Plan will be developed prior to the construction phase. Mitigation measures for dealing with the direct loss of any threatened EVCs will be considered, with the principles of such mitigation to be outlined in the Plan. The Plan would also incorporate aspects of weed and fire management. Development of a VMP will help to ensure that retained vegetation is appropriately managed for conservation purposes.

D. Retaining a seed bank for threatened species

Recolonisation of disturbed areas by threatened species is likely to occur for disturbance-tolerant species such as *Pimelea flava* subsp. *flava*. However, for species intolerant of soil disturbance, or for species whose tolerance to disturbance is unknown, alternative mitigation measures will be employed.

In areas proposed to be disturbed where there are known populations of threatened species, and the area is proposed to be rehabilitated following disturbance, topsoil should be carefully scraped from the surface (5-10 cm depth) and stockpiled, in order to retain as much of the soil seed bank as possible, particularly seed of threatened species. Retained topsoil should then be used for rehabilitation works. Soil should be stockpiled for the shortest possible time to prevent ‘premature’ germination prior to use in site rehabilitation works. Where threatened species are known to not typically recruit from soil-stored seed, seed should be collected prior to vegetation clearing, in order to be used in rehabilitation works.

E. Minimising the introduction and spread of environmental weeds

To prevent the establishment of new environmental weeds or the spread of existing environmental weeds, a Weed Management strategy will be developed and incorporated in the Vegetation Management Plan. The strategy will be developed prior to construction and will include a specific program to monitor and control any weed invasions arising from the proposed works. Any environmental weeds that establish following the works will be eradicated as a matter of high priority. Vehicle wash-down points will be established (at the same location as the *Phytophthora* wash down point) to remove weed seeds from material attached to earth-moving equipment.

F. Minimising the spread and reducing the impact of *Phytophthora cinnamomi*

A series of measures will be undertaken to prevent the introduction and/or minimise the spread of *Phytophthora cinnamomi* within the pulp mill site. These include the following:

- Undertaking a formal assessment of the presence and extent of *Phytophthora cinnamomi* within the study area;
- Establishing wash-down points for vehicles and earthmoving equipment entering and departing the site, in order to prevent/minimise the spread *Phytophthora cinnamomi*;
- Avoiding the use of *Phytophthora*-infected gravel in track construction works;
- Minimising the area of soil disturbance and new road/track development where possible;
- Coordinating construction activities over summer (where practicable) when soils are dry and least likely to facilitate the spread of the pathogen; and
- Minimising vehicular movement between any infected and uninfected areas, and/or closely monitoring access to infected areas.
Management of *Phytophthora cinnamomi* will be in accordance with DPIW Interim *Phytophthora cinnamomi* Management Guidelines (Rudman 2005).

G. Development of a fire management strategy

Not applicable.

H. Minimising the width of firebreaks

Not applicable.

I. Maintenance of native herbivore grazing regimes

Not applicable.

J. Rehabilitation of disturbed areas

Any revegetation/landscaping of temporarily disturbed areas should be undertaken using locally indigenous species appropriate to the position in the landscape. Detailed rehabilitation measures will be outlined in the Environmental Management Plan.

K. Timing of construction activities

The likelihood of impacts upon ecological values can be reduced through appropriate timing of construction activities.

L. Development of an Environmental Management Plan

An Environmental Management Plan (EMP) will be developed prior to the construction phase. The EMP will incorporate the recommendations made within this report. The EMP will also include dust suppression measures to minimise the impact of dust upon plant growth and reproduction.

Offsets

Offsets are planned to compensate for the potential loss of up to 7.2 ha of ‘*Eucalyptus amygdalina* forest and woodland on sandstone’ (DAS), up to 3.4 ha of ‘*Eucalyptus ovata* forest and woodland’ (DOV) and up to 5.9 ha of ‘*Melaleuca ericifolia* swamp forest’ (NME). All of these EVCs are threatened at the state level. Gunns has committed to reserve and covenant (on title) remnant DAS, DOV and NME from within the Gunns’ estate in the northeast region of Tasmania, as close as practical to the water supply pipeline. A total of three times the area proposed to be cleared (i.e. up to 21.6 ha of DAS, up to 10.2 ha of DOV and up to 17.7 ha of NME) will be set aside as an offset for the EVCs to be lost. These offsets would then potentially be incorporated into the statewide reserve system. The final area of offsets will be determined based on the actual areas impacted.

5.9.3 Summary of Assessment Of Impacts and Management Measures

A summary of the likelihood and consequence of occurrence for each potential impact, together with the significance of the impact, is outlined in Table 5-14. A range of potential mitigation measures to minimise the impact are also provided in this table, and an overall cost-benefit rating has been determined, assuming that all mitigation measures will be implemented.
Table 5-14 Summary of potential flora-related impacts and mitigation measures, including the overall rating if mitigation measures are fully implemented, Water Supply Pipeline

<table>
<thead>
<tr>
<th>Impact</th>
<th>Description of nature and extent of impact</th>
<th>Likelihood of impact</th>
<th>Consequence of impact</th>
<th>Significance of impact</th>
<th>Proposed mitigation</th>
<th>Overall Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Native vegetation loss (threatened EVCs)</td>
<td>Loss of up to 1.1 ha of ASF (this represents up to 10% of ASF in the bioregion and &lt;0.1% of ASF in Tasmania)</td>
<td>Possible</td>
<td>Substantial</td>
<td>Very high</td>
<td>A, B, C</td>
<td>Insignificant to Major negative impact (depending on option)</td>
</tr>
<tr>
<td></td>
<td>Loss of up to 7.2 ha of DAS (this represents up to 0.2% of DAS in the bioregion and &lt;0.1% of DAS in Tasmania)</td>
<td>Almost certain</td>
<td>Substantial</td>
<td>Very high</td>
<td>A, B, C</td>
<td>Major negative impact</td>
</tr>
<tr>
<td></td>
<td>Loss of up to 3.4 ha of DOV (this represents up to 0.3% of DOV in the bioregion and &lt;0.1% of DOV in Tasmania)</td>
<td>Almost certain</td>
<td>Substantial</td>
<td>Very high</td>
<td>A, B, C</td>
<td>Major negative impact</td>
</tr>
<tr>
<td></td>
<td>Loss of up to 0.4 ha of NAL (this represents up to 0.8% of NAL in the bioregion and &lt;0.1% of NAL in Tasmania)</td>
<td>Possible</td>
<td>Substantial</td>
<td>Very high</td>
<td>A, B, C</td>
<td>Insignificant to Major negative impact (depending on option)</td>
</tr>
<tr>
<td></td>
<td>Loss of up to 5.9 ha of NME (this represents up to 7% of NME in the bioregion and up to 0.1% of NME in Tasmania)</td>
<td>Likely</td>
<td>Substantial</td>
<td>Very high</td>
<td>A, B, C</td>
<td>Insignificant to Major negative impact (depending on option)</td>
</tr>
<tr>
<td></td>
<td>Loss of up to 0.4 ha of WVI (this represents up to 0.1% of WVI in the bioregion and &lt;0.1% of WVI in Tasmania)</td>
<td>Possible</td>
<td>Substantial</td>
<td>Very high</td>
<td>A, B, C</td>
<td>Insignificant to Major negative impact (depending on option)</td>
</tr>
<tr>
<td>Impact</td>
<td>Description of nature and extent of impact</td>
<td>Likelihood of impact</td>
<td>Consequence of impact</td>
<td>Significance of impact</td>
<td>Proposed mitigation</td>
<td>Overall Rating</td>
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</tr>
<tr>
<td>2. Native vegetation loss (general)</td>
<td>Loss of up to 66.7 ha of non-threatened EVCs (excludes 59.4 ha of FPE and FRG)</td>
<td>Almost certain</td>
<td>Substantial</td>
<td>Very high</td>
<td>A, B, C, J</td>
<td>Major negative impact</td>
</tr>
<tr>
<td></td>
<td>Potential loss of species richness in local area</td>
<td>Unlikely</td>
<td>Minor</td>
<td>Low</td>
<td>A, B, C, J</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>3. Fragmentation of native vegetation</td>
<td>Potential increased barrier to seed dispersal and subsequent loss of long-term genetic fitness in certain species</td>
<td>Unlikely</td>
<td>Minimal</td>
<td>Low</td>
<td>A, B, J</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td></td>
<td>Increased edge effect – greater likelihood of weed invasion</td>
<td>Almost certain</td>
<td>Moderate</td>
<td>Very high</td>
<td>A, E</td>
<td>Moderate negative impact</td>
</tr>
<tr>
<td>4. Loss or damage to a population of a nationally significant flora species</td>
<td>Potential loss of unrecorded species due to vegetation clearing</td>
<td>Highly unlikely</td>
<td>Major</td>
<td>Moderate</td>
<td>A, B, C, D</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>5. Loss or damage to a population of a state significant flora species</td>
<td>Loss of up to 3,100 individuals of <em>Arthropodium strictum</em></td>
<td>Almost certain</td>
<td>Major</td>
<td>Very high</td>
<td>A, B, C, D</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td></td>
<td>Loss of up to 100 individuals of <em>Bolboschoenus caldwellii</em></td>
<td>Possible</td>
<td>Major</td>
<td>High</td>
<td>A, B, C, D</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td></td>
<td>Loss of up to 100 individuals of <em>Calystegia sepium</em></td>
<td>Possible</td>
<td>Major</td>
<td>High</td>
<td>A, B, C, D</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td></td>
<td>Loss of up to 100 individuals of <em>Epilobium palidiflorum</em></td>
<td>Possible</td>
<td>Major</td>
<td>High</td>
<td>A, B, C, D</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td></td>
<td>Loss of up to 7,400 individuals of <em>Hypoxis vaginata var. brevistigmata</em></td>
<td>Likely</td>
<td>Major</td>
<td>Very high</td>
<td>A, B, C, D</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td></td>
<td>Loss of up to 490 individuals of <em>Juncus amabilis</em></td>
<td>Possible</td>
<td>Major</td>
<td>High</td>
<td>A, B, C, D</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td></td>
<td>Loss of up to 30 individuals of <em>Pimelea flava</em> subsp. <em>flava</em></td>
<td>Almost certain</td>
<td>Major</td>
<td>High</td>
<td>A, B, C, D</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td>Impact</td>
<td>Description of nature and extent of impact</td>
<td>Likelihood of impact</td>
<td>Consequence of impact</td>
<td>Significance of impact</td>
<td>Proposed mitigation</td>
<td>Overall Rating</td>
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</tr>
<tr>
<td></td>
<td>Loss of up to 2 individuals of <em>Prostanthera rotundifolia</em> (near Dilston) and unknown number (near Lake Trevallyn)</td>
<td>Possible</td>
<td>Major</td>
<td>High</td>
<td>A, B, C, D</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td></td>
<td>Loss of small number of individuals of <em>Pultenaea mollis</em></td>
<td>Possible</td>
<td>Major</td>
<td>High</td>
<td>A, B, C, D</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td></td>
<td>Loss of up to 100 individuals of <em>Ranunculus pumilio var. pumilio</em></td>
<td>Possible</td>
<td>Major</td>
<td>High</td>
<td>A, B, C, D</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td></td>
<td>Loss of up to 10 individuals of <em>Rumex bidens</em></td>
<td>Possible</td>
<td>Major</td>
<td>High</td>
<td>A, B, C, D</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td>6.</td>
<td>Introduction of environmental weeds</td>
<td>Almost certain</td>
<td>Minor</td>
<td>High</td>
<td>E</td>
<td>Moderate negative impact</td>
</tr>
<tr>
<td>7.</td>
<td>Spread of existing environmental weeds</td>
<td>Possible</td>
<td>Minor</td>
<td>Moderate</td>
<td>E</td>
<td>Moderate negative impact</td>
</tr>
<tr>
<td>8.</td>
<td>Introduction and spread of <em>Phytophthora cinnamomi</em></td>
<td>Possible</td>
<td>Substantial</td>
<td>Very high</td>
<td>F</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td></td>
<td>Potential for spread of existing infestation of <em>Phytophthora</em> via infected machinery</td>
<td>Unlikely</td>
<td>Substantial</td>
<td>High</td>
<td>F</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>11.</td>
<td>Erosion and/or sedimentation</td>
<td>Possible</td>
<td>Minor</td>
<td>Moderate</td>
<td>K, L</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td></td>
<td>Potential damage to retained vegetation through removal of habitat by soil erosion</td>
<td>Possible</td>
<td>Minor</td>
<td>Moderate</td>
<td>K, L</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>12.</td>
<td>Altered surface runoff into waterways</td>
<td>Possible</td>
<td>Minor</td>
<td>Moderate</td>
<td>L</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>13.</td>
<td>Inhibition of plant photosynthesis and reproductive capability due to dust</td>
<td>Possible</td>
<td>Minor</td>
<td>Moderate</td>
<td>L</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td>Impact</td>
<td>Description of nature and extent of impact</td>
<td>Likelihood of impact</td>
<td>Consequence of impact</td>
<td>Significance of impact</td>
<td>Proposed mitigation</td>
<td>Overall Rating</td>
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</tr>
<tr>
<td>15. Altered hydrology</td>
<td>Potential long-term impact on community structure and composition</td>
<td>Possible</td>
<td>Minimal</td>
<td>Low</td>
<td>None available</td>
<td>Minor negative impact</td>
</tr>
</tbody>
</table>

* Impact would not occur given current works footprint, but may occur if development strays outside this footprint
* Impact dependent upon presence of threatened species, which has not been found during intensive surveys

Based on TASVEG 1.0 data provided by Sib Corbett (DPIWE). It should be noted that bioregional and statewide extent of non-forest EVCs given here is usually a significant underestimate of the actual extent, owing to the scale at which TASVEG mapping has been undertaken (1:25,000). This mapping scale effectively excludes many highly localised non-forest EVCs (particularly ephemeral wetlands) from being mapped at a scale of 1:25,000, consequently resulting in an underestimate of total extent.

ASF  Freshwater aquatic sedgeland and rushland
DAS  *Eucalyptus amygdalina* forest and woodland on sandstone
DOV  *Eucalyptus ovata* forest and woodland
NAL  *Allocasuarina littoralis* forest
NAV  *Allocasuarina verticillata* forest
WVI  *Eucalyptus viminalis* wet forest
5.9.4 Summary of Potential Impacts and Management Measures

A significant area of native vegetation will be lost as a result of clearing the pipeline easement. The extent of this loss is in part subject to consideration of route alternatives. The loss includes areas of threatened vegetation communities. Related impacts include fragmentation, the introduction or spread of pests, erosion, dust and impacts on waterways and associated vegetation communities.

Some of these impacts will be successfully addressed by preservation of suitable offsets elsewhere in Tasmania. Such sites will be identified in consultation with DTAE.

A range of management strategies have been identified which will form part of the Construction EMP which will be developed prior to any construction activities. Details of the requirements of this plan are outlined in the Mitigation Management Plans in Volume 4.

### Table 5-15 Summary of potential impact rating and mitigation measures – terrestrial flora

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Impact Rating</th>
<th>Proposed Mitigation</th>
<th>Management Impact</th>
<th>Combined Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Native Vegetation Loss</td>
<td>Major negative impact</td>
<td>Offsets</td>
<td>Minor positive impact</td>
<td>Moderate negative impact</td>
</tr>
<tr>
<td></td>
<td>Minor negative impact</td>
<td>Construction EMP</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>Fragmentation of vegetation</td>
<td>Moderate negative impact</td>
<td>Construction EMP</td>
<td>Minor positive impact</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td>Impacts on significant species/communities</td>
<td>Moderate negative impact</td>
<td>Construction EMP</td>
<td>Minor positive impact</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td>Introduced pests</td>
<td>Moderate negative impact</td>
<td>Construction EMP</td>
<td>Minor positive impact</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td>Erosion and Sedimentation</td>
<td>Minor negative impact</td>
<td>Construction EMP</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>Dust impacts on vegetation</td>
<td>Minor negative impact</td>
<td>Construction EMP</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>Changes in hydrology</td>
<td>Moderate negative impact</td>
<td>Construction EMP</td>
<td>Minor positive impact</td>
<td>Minor negative impact</td>
</tr>
</tbody>
</table>

Overall, the impacts on terrestrial vegetation are considered to be minor if appropriate offsets can be identified to compensate for loss of vegetation and fragmentation of vegetation communities and if
preferential route selection minimises loss of threatened EVCs. Without appropriate offsets, impacts would be considered moderate.

5.10 Terrestrial Fauna

For the purpose of the water supply pipeline impact assessment, it is assumed that all habitats within the water supply pipeline corridor will be removed. Consequently, potential impacts may be overestimated by up to 50%, because there often are two (and sometimes four) potential pipeline options for considerable lengths of the corridor.

The scope of works for the waterway pipeline was to conduct a habitat assessment to provide information on the quality of habitat for fauna within the proposed and alternative routes. Pipeline options were not compared to define a preferred route. The habitat assessment gives ratings of habitat types in terms of the considered value of each habitat for native fauna. It is recommended that the route be preferentially sited along lower quality habitat. In some sections of the route there is more than one choice of low quality habitat in which to site the route.

A number of assumptions have been made in assessing potential ecological impacts. It has been assumed that when using the preferred method of pipeline installation (i.e. trenching), the width of disturbance for construction of the water supply pipeline generally be 20 metres, although this distance may be able to be reduced across narrow areas of ecological sensitivity. Within the impacts component of this report, it is also assumed that trenching will be used for the entire length of the water supply pipeline. It is unknown at this stage how long the trench will be open for, how wide it will be and how deep.

5.10.1 Impacts

The most significant impacts relate to the construction of the pipeline, with the need to clear vegetation and undertake earthworks in order to construct and lay the pipeline, as well as construct associated infrastructure for maintenance purposes, such as access tracks. As well as the resultant impacts through habitat loss and fragmentation, there are also the potential impacts associated with construction such as noise, vibration, and air pollution. Once operational it is expected that the impacts on-going will be minimal with the pipeline corridor accessed only for maintenance, safety and emergency purposes, however long-term impacts to species through loss of habitat and resources may occur.

A total of 10 potential ecological impacts have been identified in relation to the proposed water supply pipeline. These impacts are briefly described below. For more detailed descriptions of individual impacts, refer to Appendix 30, Volume 13.

1. Habitat Loss (loss of native vegetation) - general

The clearance of native vegetation is listed as a threatening process under the Tasmanian Threatened Species Strategy 2000. The development of the water supply pipeline will result in the loss of up to 249.39 ha of area, of which approximately 88 ha are considered to represent moderate to high values for native fauna. The remaining 162 ha are considered low quality habitat, mainly comprising
agricultural grassland (92.5 ha). The maximum potential area to be cleared for each habitat type is outlined as follows:

- Grassland – low value – 92.5 ha
- Grassland bordered by woodland species in road verge – low value – 5.6 ha
- Weed dominated – low value – 1.6 ha
- Permanent easement – low value – 28.7 ha
- Parkland and gardens - low value – 17.8 ha
- Riparian weed infestation – low value – 15.4 ha
- Drainage lines – moderate value – 10.2 ha
- Woodland – moderate to high value – 38 ha
- Tall forest – high value – 38.8 ha
- Creeks and wet gullies – high value – 0.79 ha

The majority of intact native vegetation occurs between the East Arm of the Tamar River and the Bell Bay pulp mill site, within the Trevallyn Nature Recreation Area and as scattered/fragmented areas of native vegetation between Dilston and Batman Highway.

The section of the alignment between Dilston and the Tamar River flats in Launceston is highly modified and largely comprises introduced species. In addition, large sections of the Tamar River flats are dominated by major infestations of woody weeds such as *Rubus fruticosus* (blackberry) and *Salix* spp. (willow) – classified as the habitat type - riparian weed infestation.

Most of the pipeline route is situated adjacent to the alignment of the East Tamar Highway, as such, whilst habitat may be considered of high value in terms of the structure, the disturbance from the road and edge effects associated with it are considered to render the habitat values low to moderate. Considerable areas of the alignment along the East Tamar Highway (including the edges of habitats mapped as tall forest and woodland) are either frequently slashed or occur underneath powerlines. These areas are often invaded by weeds to varying extents depending on the degree of disturbance and surrounding land use.

However, despite the high level of disturbance that these habitats are subjected to, the high and moderate value habitat types are still considered to provide ecological values and provide habitat for native species

Loss of this habitat is considered to constitute both a short term and long term impact. In the short term, the disturbance to small, less motile fauna (such as reptiles, amphibians and small mammals) for which the area constitutes a home range will be severe, with loss of nest/den sites, forage resources, home ranges and territories. In the long term the loss of these habitat features translates to an impact through the loss of breeding and foraging resources, reducing the local carrying capacity for many species and possibly translating into changes in species richness and community composition. The impact on larger, mobile species is likely to be minor, as it is likely that the edge effects and the levels of
disturbance effected from the road would preclude the use of the habitat as a preferred nesting/denning site. It is also expected that the pipeline corridor, once constructed will have little on-going human disturbance allowing some open grassland fauna species to utilise the area as a foraging habitat.

2. Habitat Fragmentation

The water supply pipeline corridor is already highly fragmented and subjected to edge effects along most of its route, owing to land clearing for agriculture, urban development, roads, rail, pipelines and powerlines. Construction of the water supply pipeline would slightly increase the already high level of fragmentation within the local landscape, with a higher level of impact most likely arising in the northern section near the Bell bay Site, where the vegetation is most intact.

Given the current level of fragmentation throughout the majority of the water pipeline route, further fragmentation is considered to represent a minor impact of moderate significance overall, as linkages to remnant vegetation will remain across the pipeline easement.

3. Loss of or damage to the habitat of native species – general

Clearance of native vegetation and earthworks is likely to result in a minimal short and long-term local reduction in species richness, especially for less motile species, or species with small home ranges, such as native murids, antechinus and reptiles. In the absence of mitigation, ground-dwelling animals could be directly impacted as a result of death or injury by falling into open trenches and other construction activities. Habitat loss may also impact on bird species through reduction in nesting sites such as hollows and branches of mature trees and reduction in prey species through loss of ground-dwelling species habitat.

Although sections of the water supply pipeline intersect the Tamar River, impacts on the river-beds from the water supply pipeline, and the subsequent impacts on aquatic fauna are not considered in this section (refer Section 5.8).

4. Loss of or damage to threatened fauna species

Fourteen Commonwealth and/or State listed threatened fauna species have been identified or are predicted to occur in the vicinity of the water supply pipeline corridor.

The construction of the pipeline corridor is unlikely to cause any significant impact to the threatened species recorded, as the site does not currently provide core habitat for these species and suitable impact will remain intact in the surrounding area and be accessible across the corridor. The water supply pipeline is also unlikely to impact species associated with Cataract Gorge and Trevallyn Dam (i.e. the Cataract Gorge spider and snail) as the operation of the pipeline is not anticipated to have any significant impact on water volumes or flows.

The likelihood of these species being present in this section of the study region and any potential impact upon these species are discussed in Section 5.8.
5. **Loss of or damage to conservation significant fauna species**

Thirty-five fauna species considered of conservation significance have been identified or are predicted to occur in this section of the study region. Thirty-four of these species have been recorded within this section of the study region.

It is expected that the most significant impact on these species would be the short and long-term impacts as a result of habitat loss and fragmentation from vegetation clearance. Species specific impacts assessments are provided in Appendix 30, Volume 13.

6. **Loss of or damage to migratory species**

An additional five birds protected for their migratory status have been previously identified in this section of the study region. The proposed works will result in a small loss of habitat for these species, which are all relatively common and widespread in the study region. Nonetheless, it is still considered possible that the proposed works could constitute a minor impact to these species.

7. **Erosion and/or sedimentation**

Soil erosion occurs to varying degrees at a number of locations within the water supply pipeline corridor. The development of the pipeline may result in an increase in on-site erosion, with a corresponding increase in levels of sedimentation within waterways flowing through the site and into the Tamar River. In the absence of mitigation measures, increased erosion may damage or destroy localised areas of retained habitat (on- and off-site), while sedimentation may have a deleterious effect on aquatic, semi-aquatic and riparian fauna. This could occur both during construction (short term), and also later (long term) if not properly rehabilitated.

8. **Altered surface water runoff and quality into wetlands and waterways**

**Short term**

Following rainfall events, surface water runoff may be altered into wetlands and waterways flowing through the site. In the absence of mitigation measures, any such runoff may collect chemicals/pollutants spilled at the site during the construction phase and eventually deposit these materials resulting in deleterious impacts upon aquatic, semi-aquatic and riparian indigenous fauna.

9. **Changes in noise levels**

Construction vehicles, equipment and activities have potential to create a noise in the study area and immediate surrounds. Noise can impact fauna by impeding communication, masking the sounds of predators and increasing stress, and in the extreme case cause hearing loss (Environment Australia, 1998). Impacts vary between species and individuals. Behavioural changes caused by noise may alter survival and reproduction due to relocation from favourable habitat at the noise source, and change in time spent feeding (especially for nocturnal species) resulting in potential energy depletion (Larkin, 1996). The impact of noise is considered to mainly affect any locally nesting and breeding animals. No confirmed nest sites for threatened species are known from the water pipeline route. As the majority of habitat along the route is disturbed due to edge effects and the East Tamar Highway, it is considered a low possibility, that the areas to be impacted would be preferred nest sites. In addition, given the minimal and linear nature of the area to be impacted and availability of surrounding habitat of a similar character, it is considered likely that construction noise will only constitute a minimal impact.
10. Changes in air quality

Depending on winds and weather conditions, there is potential for generation of dust. In addition, large volumes of traffic (particularly heavy machinery) are likely to use temporary gravel and dirt roads at the site, also facilitating dust generation. In the absence of mitigation measures this has the potential to directly affect resident fauna by reducing the amenity of habitat affected by dust fall. Dust has also been shown to deleteriously affect the physiological process of plants, blocking stomata and slowing growth (Spellerberg; 1998). This may have a short-term effect on the carrying capacity of dust-affected areas.

5.10.2 Management Measures

A number of mitigation measures will be undertaken to minimise the impact of the proposed development. Mitigation measures are listed below.

   A. Minimising or altering the footprint of disturbance

   - Where options exist to site the pipeline in both low quality and moderate or high quality, it is recommended that the low quality habitat option be preferentially selected.

   - At the southern end of the alignment within the Trevallyn Nature Recreation Area, and at the northern end where the pipeline will join the water storage facility, passing through woodland and tall woodland will be unavoidable. In these areas, micro-siting the alignment to avoid or minimise loss of any large habitat trees is recommended to reduce the impact of works in these larger, less fragmented tracts of habitat. Habitat trees should be surveyed for use by Masked Owl and avoided where possible.

   - If pipeline construction activities occur within private land, existing access points and gates should be used wherever possible from public roadways. If new access points are required into private land from public roadways, ecological advice should be sought in order to determine a route involving the lowest possible ecological impact. This ecological advice should aim to find an appropriate location along the roadside reservation (i.e. with little or no ecological values) where a new entrance point could be established.

   B. Avoiding accidental loss or damage to habitat

Clearance of native vegetation will require a certified Forest Practices Plan, which will identify the area to be cleared. These areas would be clearly identifiable on-site prior to operations commencing and maintained accordingly, in order to avoid any inadvertent damage to vegetation to be retained.

   C. Development of a Fauna Management Plan to mitigate against loss of or damage to significant species

A Fauna Management Plan should be developed prior to the construction phase for the areas classified as having moderate to high habitat value. The management plan for the pipeline should incorporate measures to monitor the pipeline trenches while they are open to prevent mortality of ground-dwelling animals that may fall into the trenches and be unable to escape.
D. Minimising the introduction and spread of environmental weeds

To prevent changes in existing habitat from the establishment of new environmental weeds or the spread of existing environmental weeds, a Weed Management Strategy should be developed and incorporated in the Vegetation Management Plan (see flora report). The strategy should be developed prior to construction and should include a specific program to monitor and control any weed invasions arising from the proposed works. Any environmental weeds that establish following the works should be eradicated as a matter of high priority. Vehicle wash-down points should be established to remove weed seeds from mud and dirt attached to earth-moving equipment.

E. Rehabilitation of disturbed areas

Any revegetation/landscaping of temporarily disturbed areas should be undertaken using locally indigenous species that will mature into an approximation of the extant habitat. It is suggested that compensatory plantings to offset the losses of native habitats be considered, where practicable. Ideally these should be focused on nearby locations to link isolated areas of native vegetation.

F. Timing of construction activities

The likelihood of impacts upon ecological values can be reduced through appropriate timing of construction activities. August to February encompasses the breeding season for many of the threatened species discussed in this report, effects on these species are likely to be reduced if the majority of clearing and construction activities occur outside of these times.

G. Development of an Environmental Management Plan

An Environmental Management Plan (EMP) should be developed prior to the construction phase. The EMP should incorporate the recommendations made within this report. Measures for the protection of aquatic habitat, the management of sediment and chemical control procedures should be included to minimise the risk of damage to riparian and aquatic habitats.

H. Offsets

Offsets are planned to compensate for the potential loss of up to 7.2 ha of ‘Eucalyptus amygdalina forest and woodland on sandstone’ (DAS), up to 3.4 ha of ‘Eucalyptus ovata forest and woodland’ (DOV) and up to 5.9 ha of ‘Melaleuca ericifolia swamp forest’ (NME) (see flora report). Gunns have indicated a commitment to reserve and covenant (on title) areas of DAS, DOV and NME from within the Gunns’ estate in the northeast region of Tasmania, as close as practical to the Bell Bay pulp mill site. A total of three times the area proposed to be cleared (i.e. up to 21.6 ha of DAS, up to 10.2 ha of DOV and up to 17.7 ha of NME) is proposed to be set aside as an offset for each protected vegetation type. These offsets would then potentially be incorporated into the statewide reserve system. Within this report, areas of ‘Eucalyptus amygdalina forest and woodland on sandstone’ have been mostly categorised as ‘tall woodland’ in the fauna habitat assessment, whilst areas of ‘Eucalyptus ovata forest and woodland’ have mostly been categorised as ‘woodland’. ‘Melaleuca ericifolia swamp forest’ equates to the habitat type ‘drainage lines’.
5.10.3 Assessment of Impacts

A summary of the likelihood and consequence of occurrence for each potential impact, together with the significance of the impact, is outlined in Table 5-16. A range of potential mitigation measures to minimise the impact are also provided in this table, and an overall cost-benefit rating has been determined, assuming that all mitigation measures will be implemented.
### Table 5-16  Summary of potential fauna-related impacts and mitigation measures, including the overall rating if mitigation measures are fully implemented, Water Supply Pipeline

<table>
<thead>
<tr>
<th>Impact</th>
<th>Description of nature and extent of impact</th>
<th>Likelihood of impact</th>
<th>Consequence of impact</th>
<th>Significance of impact</th>
<th>Proposed mitigation</th>
<th>Cost/benefit rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Habitat loss (loss of native vegetation) – general</td>
<td>Loss of up to 38.8 ha³ of tall forest habitat (high habitat value)</td>
<td>Almost certain</td>
<td>Moderate²</td>
<td>High</td>
<td>A, B, H</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td></td>
<td>Loss of up to 0.8 ha³ of creek and wet gully habitat (high habitat value)</td>
<td>Almost certain</td>
<td>Moderate¹</td>
<td>High</td>
<td>A, B</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td></td>
<td>Loss of up to 38 ha³ of woodland habitat (moderate to high habitat value)</td>
<td>Almost certain</td>
<td>Moderate¹</td>
<td>High</td>
<td>A, B, H</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td></td>
<td>Loss of up to 10.2 ha³ of drainage line habitat (moderate habitat value)</td>
<td>Almost certain</td>
<td>Moderate¹</td>
<td>High</td>
<td>A, B</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td></td>
<td>Loss of up to 161.6 ha³ of habitat considered to be of low habitat value</td>
<td>Almost certain</td>
<td>Moderate¹</td>
<td>High</td>
<td>A, B, H</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td>2. Habitat Fragmentation</td>
<td>Potential increased barrier to fauna movement</td>
<td>Likely</td>
<td>Minor</td>
<td>Moderate</td>
<td>A, B</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td></td>
<td>Increased edge effects leading to habitat degradation, fauna endangerment (i.e. predator access) and reduction in functional size of habitat area</td>
<td>Likely</td>
<td>Minimal</td>
<td>Low</td>
<td>D</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td>3. Loss or damage to the habitat of native species - general</td>
<td>Loss of native species individuals or populations due to loss of breeding territory, home range, forage resource etc. through clearing</td>
<td>Likely</td>
<td>Moderate</td>
<td>High</td>
<td>A, B, C</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td></td>
<td>Loss of native species individuals due to construction activities and earthworks</td>
<td>Unlikely-Likely³</td>
<td>Moderate</td>
<td>Low-High</td>
<td>C</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>Impact</td>
<td>Description of nature and extent of impact</td>
<td>Likelihood of impact</td>
<td>Consequence of impact</td>
<td>Significance of impact</td>
<td>Proposed mitigation</td>
<td>Cost/benefit rating</td>
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</tr>
<tr>
<td>4. Loss or damage to threatened fauna species</td>
<td>Loss of threatened species individuals or populations due to loss of breeding territory, home range, forage resource etc. through clearing</td>
<td>Likely</td>
<td>Major</td>
<td>Very High</td>
<td>A, B, C</td>
<td>Moderate negative impact</td>
</tr>
<tr>
<td>5. Loss or damage to conservation significant fauna species</td>
<td>Loss of conservation significant species individuals or populations due to loss of breeding territory, home range, forage resource etc. through clearing</td>
<td>Likely</td>
<td>Major</td>
<td>Very high</td>
<td>A, B, C</td>
<td>Moderate negative impact</td>
</tr>
<tr>
<td>6. Loss or damage to migratory species</td>
<td>Loss of migratory species individuals or populations due to loss of breeding territory, home range, forage resource etc. through clearing</td>
<td>Possible</td>
<td>Major</td>
<td>High</td>
<td>A, B, C</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td>7. Erosion and/or sedimentation</td>
<td>Potential degradation of retained habitat by sedimentation of waterways (i.e. degradation of aquatic and riparian habitat)</td>
<td>Possible</td>
<td>Minor</td>
<td>Moderate</td>
<td>E, G</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td></td>
<td>Potential degradation to retained habitat by soil erosion</td>
<td>Possible</td>
<td>Minor</td>
<td>Moderate</td>
<td>E, G</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>Impact</td>
<td>Description of nature and extent of impact</td>
<td>Likelihood of impact</td>
<td>Consequence of impact</td>
<td>Significance of impact</td>
<td>Proposed mitigation</td>
<td>Cost/benefit rating</td>
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<td>--------------------------------------------</td>
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<td>---------------------</td>
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</tr>
<tr>
<td>8. Altered surface water runoff and quality into waterways</td>
<td>Loss or degradation of aquatic, semi-aquatic and riparian habitat by chemical spills, pollution etc.</td>
<td>Possible</td>
<td>Minor</td>
<td>Moderate</td>
<td>G</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td></td>
<td>Long term loss or degradation of aquatic, semi-aquatic and riparian habitats by changes in groundwater conditions and flow regimes due to infrastructure introduction</td>
<td>Possible</td>
<td>Minor-Moderate</td>
<td>Moderate</td>
<td>E, G</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>9. Changes in noise levels</td>
<td>Loss or reduction in reproduction of species due to behavioural changes caused by changes in noise levels</td>
<td>Likely</td>
<td>Minimal</td>
<td>Moderate</td>
<td>F, G</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>10. Changes in air quality</td>
<td>Potential short-term impact on resident fauna resulting in changes in forage resource for some species due to dust generation</td>
<td>Likely</td>
<td>Minimal</td>
<td>Moderate</td>
<td>G</td>
<td>Insignificant impact</td>
</tr>
</tbody>
</table>

1. This value is a maximum area and may be reduced based on the route option chosen and the width of corridor required to be cleared for the water supply pipeline.
2. The consequence of this impact will depend on the area of vegetation to be cleared. Option selection may reduce the amount to be cleared and further refinement of the alignment may lead to a reduction in the width of the corridor to be cleared.
3. The likelihood of this impact will depend on the species present and the clearing and construction methods used. Birds and larger mammals would be expected to avoid construction areas easily however other less mobile species classes such as reptiles and amphibians are potentially at greater risk of direct mortality or injury.
5.10.4 Offsets

Offsets are planned to compensate for the potential loss of up to 7.2 hectares of ‘Eucalyptus amygdalina forest and woodland on sandstone’ (DAS), up to 3.4 hectares of ‘Eucalyptus ovata forest and woodland’ (DOV) and up to 5.9 hectares of ‘Melaleuca ericifolia swamp forest’ (NME) (see flora report). Gunns’ commitment to reserve and covenant (on title) remnant DAS, DOV and NME from within the Gunns’ estate in the north-east region of Tasmania, as close as practical to the pipeline corridor. A total of three times the area proposed to be cleared (i.e. up to 21.6 hectares of DAS, up to 10.2 hectares of DOV and up to 17.7 hectares of NME) is proposed to be set aside as an offset for each protected vegetation type. These offsets would then potentially be incorporated into the statewide reserve system. The final area of offsets would be determined based on the actual areas impacted. At this stage, offsets have not been finalised, but will be subject to negotiation and approval by DPIWE.

For this fauna assessment, areas of ‘Eucalyptus amygdalina forest and woodland on sandstone’ have been mostly categorised as ‘tall woodland’, whilst areas of ‘Eucalyptus ovata forest and woodland’ have mostly been categorised as ‘woodland’. ‘Melaleuca ericifolia swamp forest’ equates to the habitat type ‘drainage lines’.

See Section 6.2.4 of Appendix 30, Volume 13 for a discussion of the benefits to threatened fauna of establishing offsets.

5.10.5 Summary of Potential Impacts and Management Measures

In comparison to the Bell Bay section of the study area, the impacts to the water supply pipeline alignment is considered to be of lower significance, due to the siting of infrastructure within existing cleared areas. Within the areas to be cleared for the water pipeline, approximately two thirds is considered to be of low habitat value, being previously disturbed, weed infested or closely associated with existing road or power-supply corridors.

A number of mitigation measures have been proposed for works in this area. In particular, the water supply pipeline can be routed so as to avoid areas of higher habitat value, and recommendations to this effect have been made. Areas of higher habitat value may still need to be cleared, however offsets will be protected in the Bell Bay vicinity that are representative of the habitat types and areas cleared. Overall, the impacts to these areas are considered to be minor at the regional level (i.e. within 5 km of the proposed works) if mitigation measures are enacted.

Some of these impacts can be successfully addressed by preservation of suitable offsets elsewhere in Tasmania. Such sites will be identified in consultation with DTAE.

A range of management strategies have been identified which will form part of the Construction EMP which will be developed prior to any construction activities. Details of the requirements of this plan are outlined in the Mitigation Management Plans in Volume 4.
Table 5-17  Summary of potential impact rating and mitigation measures – terrestrial flora

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Impact Rating</th>
<th>Proposed Mitigation</th>
<th>Management Impact</th>
<th>Combined Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Terrestrial Flora</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Habitat Loss</td>
<td>Major negative impact</td>
<td>Offsets</td>
<td>Moderate positive impact</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td></td>
<td>Moderate negative impact</td>
<td>Construction Environmental Management Plan</td>
<td>Minor positive impact</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td>Fragmentation of habitat</td>
<td>Moderate negative impact</td>
<td>Construction Environmental Management Plan</td>
<td>Minor positive impact</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td>Impacts on significant species/communities</td>
<td>Major negative impact</td>
<td>Construction Environmental Management Plan</td>
<td>Minor positive impact</td>
<td>Moderate negative impact</td>
</tr>
<tr>
<td>Erosion and Sedimentation</td>
<td>Minor negative impact</td>
<td>Construction Environmental Management Plan</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>Changes in air quality</td>
<td>Minor negative impact</td>
<td>Construction Environmental Management Plan</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>Changes In noise</td>
<td>Minor negative impact</td>
<td>Construction Environmental Management Plan</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>Changes in hydrology</td>
<td>Moderate negative impact</td>
<td>Construction Environmental Management Plan</td>
<td>Minor positive impact</td>
<td>Minor negative impact</td>
</tr>
</tbody>
</table>

Overall, the impacts on terrestrial fauna are considered to be minor if appropriate offsets can be identified to compensate for loss of vegetation and fragmentation of vegetation communities. Without appropriate offsets, impacts would be considered moderate.

5.11  Reserves and Protected Areas

The proposed water supply pipeline will have a minor negative impact on a number of reserves that are listed under the Nature Conservation Act 2002. These are:

- The Long Reach Private Sanctuary;
- The Long Reach Conservation Area;
- Trevallyn State Recreation Area; and
- Tamar River Conservation Area.
5.11.1 Long Reach Private Sanctuary/Long Reach Conservation Area

Impacts from the construction and operation of the pipeline on these reserves will be relatively minor, given disturbances will primarily be within existing cleared easements. Environmental and other values of these reserves have been recognised in the Draft IIS and specific management strategies identified to mitigate and offset potential impacts. These strategies will be primarily contained in the Construction EMP and subsidiary plans.

5.11.2 Trevallyn State Recreation Area

The pipeline alignment crosses through the Trevallyn State Recreation Area from Reatta Road to Lake Trevallyn, a distance of approximately 2 km. For the length of this section, the corridor will run within the existing cleared Hydro Tasmania easement. Limited additional clearing will be required. All access will utilise this existing corridor. The corridor lies within the western side of the Recreation Area which has had the greatest historical disturbance from clearing and grazing pressures.

Potential impacts primarily relate to disturbance during construction. These impacts will include:

- Clearing of the alignment for earthworks;
- Erosion and sedimentation of waterways;
- Introduction of weeds and pests;
- Temporary barrier to fauna movement (both the trench and cleared corridor post construction); and
- Noise and dust.

These issues have been addressed in the flora and fauna sections above. Specific management plans will be developed to manage these impacts as have been outlined in Volume 4.

As earthworks will occur within the existing easement, visual impacts will minimal and will only be visible from two locations on Reatta Road. This section of the Recreation Area is already visually influenced by the existing easement, Reatta Road and the water treatment plant.

Schedule 1 of the National Parks and Reserves Management Act 2002 lists management objectives for Nature Recreation Areas. These are listed below:

(a) to conserve natural biological diversity;
(b) to conserve geological diversity;
(c) to preserve the quality of water and protect catchments;
(d) to conserve sites or areas of cultural significance;
(e) to encourage tourism, recreational use and enjoyment consistent with the conservation of the nature recreation area’s natural and cultural values;
(f) to encourage education based on the purposes of reservation and the natural or cultural values of the nature recreation area, or both;
(g) to encourage research, particularly that which furthers the purposes of reservation;
(h) to protect the nature recreation area against, and rehabilitate the nature recreation area following, adverse impacts such as those of fire, introduced species, diseases and soil erosion
on the nature recreation area’s natural and cultural values and on assets within and adjacent to the nature recreation area;

(i) 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;

(j) to provide for exploration activities and utilisation of mineral resources.

The management objectives of the reserve will be protected given the works will be undertaken within an existing, highly modified easement and within the requirements of a detailed Construction EMP which will be developed in consultation with DTAE. Negative impacts will be largely offset by the management responses within the EMP.

5.11.3 Tamar River Conservation Area

The Tamar River Conservation Area, and more specifically the Tamar Island Wetlands, are located downstream of the proposed Tamar River crossing. As discussed in Section 5.8, direct and indirect impacts on aquatic biota from construction of the crossing are considered minor. Construction management will be based on a detailed Construction EMP which will be developed in consultation with DTAE. Impacts on the Tamar River Conservation Area are consequently minor.

5.11.4 Management Measures

A range of management strategies have been identified which will form part of the Construction EMP that will be developed prior to any construction activities. Details of the requirements of this plan are outlined in the Mitigation Management Plans in Volume 4.

Specifically these will include the preparation of a Sediment and Erosion Control Plan, Vegetation Management Plan and Fauna Management Plan.

5.11.5 Summary of Potential Impacts and Management Measures

Potential construction impacts on both the Trevallyn State Recreation Area and the Tamar River Conservation Area will be minor and can be successfully mitigated through the implementation of appropriate construction management strategies.

Table 5-18 Summary of potential impact rating and mitigation measures – reserves and protected areas

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Impact Rating</th>
<th>Proposed Mitigation</th>
<th>Management Impact</th>
<th>Combined Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Construction impacts on Long Reach Private Sanctuary/Long Reach Conservation Area</td>
<td>Minor negative impact</td>
<td>Construction EMP</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>Construction impacts on Trevallyn State Recreation Area</td>
<td>Moderate negative impact</td>
<td>Construction EMP</td>
<td>Minor positive impact</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td>Potential Impact</td>
<td>Impact Rating</td>
<td>Proposed Mitigation</td>
<td>Management Impact</td>
<td>Combined Rating</td>
</tr>
<tr>
<td>------------------------------------------------------</td>
<td>----------------------</td>
<td>---------------------</td>
<td>-------------------</td>
<td>-----------------</td>
</tr>
<tr>
<td>Construction impacts on Tamar River Conservation Area</td>
<td>Moderate negative impact</td>
<td>Construction EMP</td>
<td>Minor positive impact</td>
<td>Minor negative impact</td>
</tr>
</tbody>
</table>

Overall impacts on reserves and recreation areas are considered to be minor.

5.12 Transport Infrastructure, Traffic and Access

The impacts associated with the construction of the water supply pipeline will be localised. The activities associated with its construction will have the following potential impacts on the surrounding road network:

- Additional traffic, including heavy vehicle traffic on the surrounding road network; and
- Traffic management of road works related impacts, including general traffic disruptions and road crossings.

Construction of the water supply pipeline is estimated to take nine months (Jaakko Pöyry, 2006) and will be completed by month 17 of the project construction period.

- The pipe is likely to be shipped into the Port of Launceston, Bell Bay and stored at the port. The pipe will be transported to the area of construction on a daily basis and will result in approximately 5 to 10 truck movements per day, subject to vehicle type, the number of pipes which can be transported in a single load and the speed at which the pipeline is constructed.
- The construction of the water supply pipeline will increase the volume of heavy vehicular construction traffic along the main road network and the roads to be utilised for construction. However, the impacts to any one area will be for short periods, as the construction of the pipeline progresses along the pipeline route.

The movement of specialist construction equipment will require the use of public roads, generally for short distances. In such cases, controlled traffic conditions may be put in place for short periods.

At about 5 kilometres from the water reservoir end of the pipeline, it will cross under the rail line behind the western abutment. Consultation with the track owner and operator will be required to discuss an approach to construction for this section, to minimise impacts on the rail system.

Road closures may be required to allow construction of the pipeline under local roads. In such instances, appropriate detours or temporary access tracks will be used. Impacts in each case will only be for short periods.

Access to some properties may be restricted for short periods. Affected landowners will be consulted with regard to the provision of access during such periods. No impacts are anticipated for the operation of the water supply pipeline. Occasional access may be required for maintenance activities but this will be for limited numbers of vehicles and will not require any unusual traffic or access requirements. Protocols for accessing properties will be established with all affected landowners.
5.12.1  Management Measures


Works carried out in the State road reservation will be done in accordance with Section 16 of the Roads and Jetties Act 1935. Works carried out in the local government road network will be done in accordance with requirements of the Local Government (Highways) Act 1982. Relevant permits will be obtained for all road closures necessary for the pipeline crossing of a road carriageway.

5.12.2  Summary of Potential Impacts and Management Measures

Short-term traffic impacts are likely during the pipeline construction phase. These will primarily relate to a small number of additional vehicles (both trucks and construction equipment), temporary road closures and access restrictions. Such impacts will be for short periods as pipeline construction moves along the corridor.

Maintenance access will be required for the duration of the pulp mill operation. Access will be controlled and access protocols established with affected landowners.

Table 5-19  Summary of potential impact rating and mitigation measures – transport infrastructure, traffic and access

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Impact Rating</th>
<th>Proposed Mitigation</th>
<th>Management Impact</th>
<th>Combined Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transport Infrastructure, Traffic and Access</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Additional construction traffic and traffic management</td>
<td>Minor negative impact</td>
<td>Construction Traffic Management Plan</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>Restricted property access during construction</td>
<td>Minor negative impact</td>
<td>Construction Traffic Management Plan</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>Maintenance phase pipeline access</td>
<td>Minor negative impact</td>
<td>Access agreement with landowners</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
</tbody>
</table>

Overall, transport, traffic and access impacts are considered to be minor.

5.13  Waste Management

Waste generated during the construction and operation of the pipeline is likely to be domestic and food waste from employees on site; and construction waste such as waste pipe, surplus soil and vegetation that has been cleared.

- Potential impacts from uncontrolled waste handling and disposal include:
  - potential ingestion and/or entanglement in litter and waste by native and migratory fauna and livestock;
potential fire hazard; and
impacts upon visual amenity.

Waste will be transported to an appropriate landfill, most likely Remount Road in Launceston.

The application of the following management measures will lead to impacts from waste being insignificant.

5.13.1 Management Measures
Solid waste management will require careful monitoring and management throughout construction and to a lesser extent operation. Management measures will include:

- Consideration and implementation of the waste hierarchy;
- Induction of construction crews to include reference to waste management procedures;
- Identification of options for reuse early in the construction process;
- Maximising opportunities for recycling of materials;
- Storing any excess non-reusable soil from excavation within the construction corridor for later offsite disposal;
- Minimise the use of any hazardous chemicals to the absolute minimum required;
- Disposing any approvals hazardous waste only at appropriately licensed facilities; and
- Bunding fuel storage areas, and segregating chemicals as per AS-1940 “The Storage and Handling of Flammable and Combustible Liquids”.

A range of management strategies have been identified which will form part of the Construction EMP which will be developed prior to any construction activities. Details of the requirements of this plan are outlined in the Mitigation Management Plans in Volume 4.

5.13.2 Summary of Potential Impacts and Management Measures
Appropriate waste management of the construction areas will result in insignificant impacts. Waste management strategies will be detailed in the Construction EMP.

Table 5-20 Summary of potential impact rating and mitigation measures – waste management

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Impact Rating</th>
<th>Proposed Mitigation</th>
<th>Management Impact</th>
<th>Combined Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste minimisation and appropriate disposal</td>
<td>Minor negative impact</td>
<td>Design for waste to be placed in appropriate containers and disposed of appropriately</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>Waste management</td>
<td>Minor negative impact</td>
<td>Construction EMP</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
</tbody>
</table>
With the implementation of a Construction EMP, overall waste management impacts are considered insignificant.

5.14 Acoustic Environment

5.14.1 Pump Station

During operation, the pump station will be the main noise source from the water supply pipeline. However, the pump station building will be constructed from reinforced concrete and cavity block work. The roof will be a suspended concrete slab to attenuate noise. All doors will be acoustically rated.

The pump station is to be located adjacent to the power station water intake on the northeastern bank of the dam, close to the dam wall. An Esk Water pump station is also located on the dam wall.

Existing noise sources include the pump stations, water flows over the dam wall spillway and releases through the gates for environmental flows.

The nearest sensitive receptors are located on the opposite side of the river at Blackstone Heights. Several houses have been constructed along the ridge overlooking the dam. These houses are approximately 600 metres from the pump station location, at an elevation of 120 – 140 metres above the pump station site.

The potential for noise generation by the pumps varies according to the pumping option. Regardless of which option is ultimately selected however, it is unlikely that noise from their operation will be audible at the above locations and, even if so, it should not cause disturbance.

As the recreation area at the dam is only open to the public during daylight hours, pump noise impacts at these locations are expected to be masked by background noise and operation of the closer Esk Water pump station and transformers.

5.14.2 Pipeline Construction

Likely noise levels produced by construction plant typically used on construction sites have been sourced from Section 9 of the NSW RTA Environmental Noise Management Manual and from GHD’s internal database.

Calculations took into account sound intensity losses due to hemispherical spreading, with additional minor losses such as atmospheric absorption, directivity and ground absorption.

Noise produced by similar equipment for similar activities, as during the construction phase of the pulp mill, are shown below for a variety of distances to a typical receiver, with neither noise barriers or acoustic shielding in place and with each plant item operating at full power. As shown in the table, noise levels reduce with hemispherical spreading by 6 dB(A) with each doubling of distance.
### Table 5-21  Predicted Plant Item Noise Levels, dB(A)

<table>
<thead>
<tr>
<th>Plant Activity SWL</th>
<th>50 m</th>
<th>100 m</th>
<th>200 m</th>
<th>400 m</th>
<th>800m</th>
<th>1600m</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crane 110</td>
<td>65</td>
<td>59</td>
<td>53</td>
<td>47</td>
<td>41</td>
<td>35</td>
</tr>
<tr>
<td>Backhoe 108</td>
<td>63</td>
<td>57</td>
<td>51</td>
<td>45</td>
<td>39</td>
<td>33</td>
</tr>
<tr>
<td>Piling Impact Boring 120</td>
<td>75</td>
<td>69</td>
<td>63</td>
<td>57</td>
<td>51</td>
<td>45</td>
</tr>
<tr>
<td>Compressor 100</td>
<td>55</td>
<td>49</td>
<td>43</td>
<td>37</td>
<td>31</td>
<td>25</td>
</tr>
<tr>
<td>Compactor 110</td>
<td>65</td>
<td>59</td>
<td>53</td>
<td>47</td>
<td>41</td>
<td>35</td>
</tr>
</tbody>
</table>

Construction activity will generally include clearing (bulldozer), excavation (by excavator or trench digger), fitting and laying of pipes (pipe laying machinery) and backfilling (excavators, bulldozers). The clearing, trenching, pipelaying and backfilling will be done sequentially and progressively. Any particular area of the construction site will experience raised noise levels for only short periods. Rock breaking and blasting, (similar to that employed for preparation of house foundations), will be avoided if possible. Investigations during detailed design will include geotechnical assessment to minimise the alignment through extensive rock areas. Where rock is encountered and cannot be avoided, rocks will be broken using a standard excavator mounted rock breaker or blasting as required. This will be the noisiest equipment used for pipelaying.

Construction hours will be limited to typically 7 am to 5 pm. Work hours may be restricted in areas where sensitive receptors means construction works are likely to cause nuisance.

Based on the above, and given that the equipment used is typical of that used in an urban environment for general infrastructure construction, detailed noise assessment is not warranted and has not been undertaken for pipeline construction. Residential areas in proximity to the alignment will experience some daytime noise impact but this will be temporary, and spread out over a short period. Should rock breaking or blasting be required, residents would be consulted because they may experience a high level of daytime noise, but this would be temporary. Overall, noise impacts from construction of the pipeline are expected to be low.

Construction activity can result in varying degrees of ground vibration depending on the equipment and methods employed. Operation of construction equipment and blasting causes ground vibration, which diminish in strength over distance. Buildings founded on the soil in the vicinity of construction sites can respond to these vibrations with varying results, ranging from no perceptible effects at the lowest levels, low rumbling and perceptible vibrations at moderate levels and slight building damage at the highest levels.

Ground vibrations from construction activities very rarely reach the levels that can damage structures.

#### 5.14.3 Management Measures

Construction hours will be limited to those detailed in the approved Construction EMP.
To minimise noise emissions, construction equipment will be in good condition. All combustion engine plant, such as generators, compressors and welders will be checked to ensure that they produce minimal noise with particular attention to residential grade exhaust silencers. Where practical, machines will be operated at low speed or power and will be switched off when not being used rather than left idling for prolonged periods. Machines found to produce excessive noise compared to industry best practice will be removed from the site or stood down until repairs or modifications can be made.

A dilapidation survey will be carried out if construction activity is to occur in close proximity to buildings.

A range of management strategies have been identified which will form part of the Construction EMP which will be developed prior to any construction activities. Details of the requirements of this plan are outlined in the Mitigation Management Plans in Volume 4.

5.14.4 Summary of Potential Impacts and Management Measures

Construction works will generate short-term noise as activity moves along the pipeline corridor. There is potential to cause noise impacts, particularly in residential areas where proximity to residences may be close. Other than rockbreakers, machinery will be typical of equipment used to undertake municipal works. If rockbreakers are required adjacent to residential areas, they will cause high, short-term noise impacts.

Noise impacts will be managed by restricting work hours to daytime weekdays, and restricted weekend work. Appropriate maintenance of equipment will also help reduce impacts.

Table 5-22 Summary of potential impact rating and mitigation measures – acoustic environment

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Impact Rating</th>
<th>Proposed Mitigation</th>
<th>Management Impact</th>
<th>Combined Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acoustic Environment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Noise impacts at sensitive receptors</td>
<td>Moderate negative impact</td>
<td>Restricted construction hours</td>
<td>Minor positive impact</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td></td>
<td>Minor negative impact</td>
<td>Construction EMP</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
</tbody>
</table>

Noise impacts will be moderate at sensitive receptors adjacent to the construction activity. The extent of works is however expected to be short term and as such, overall noise impacts are considered minor.

5.15 Visual Amenity

Visibility Assessment

Construction of the pipeline will involve clearing up to a 20 metre wide corridor (subject to site conditions), excavation of the trench, stockpiling of soil, stringing and joining the pipes, refilling the
trench, construction of an access track(s) and rehabilitation of the disturbed area. Rehabilitation will primarily consist of sowing appropriate low growing vegetation commensurate with the surrounding vegetation. Trees and large shrubs will be prevented from growing over the pipeline, in order to avoid potential damage from roots.

Pipeline markers / warning signs will be installed in accordance with AS 2566 requirements. They are required to be double sided and be located along the pipeline route as described below (Hargrave, 2005):

- both sides of road crossings;
- both sides of railway crossings;
- both sides of significant river and stream crossings;
- at all fences;
- at all utility crossing (electricity, water, telecommunications, etc);
- at all bends in the pipe;
- elsewhere as identified in the risk assessment;
- Signs are to be erected at intervals no greater than 500 metres and must be within line of sight. Where the pipeline closely parallels a road or power line the spacing will be no greater than 200 metres; and
- Markers will be visible from an approach along the Right of Way (ROW) in either direction.

Examples of similar rehabilitated areas are shown in Photographic Sheet 5-1 and Photographic Sheet 5-2 of the Tasmanian Northern Gas Pipeline and the Basslink corridors. The Basslink photograph was taken approximately 3 months after rehabilitation works.

As there will be few structures visible, the visual impact of the pipeline is primarily related to the land use and vegetation cover on any given section and the viewshed (that is, where the section can be seen). Visible structures will include the pump station at Trevallyn Dam, the balance tank adjacent to the Reatta Road WTP and the pipeline where it crosses over key waterways along the alignment.

Spatially, the viewshed of the pipeline along the East Tamar Highway presents the greatest visual exposure. The view will also tend to be of short duration as the vehicle passes a particular site. The number of viewers however, will be higher closest to, and within, Launceston, and the views will tend to be (but not always) longer as viewed from residences, when walking or driving through the neighbourhood.

The level of intrusion will be lower along existing easements (road, transmission lines) and greatest in areas of higher visual values such as the Trevallyn State Recreation Area.

There are five broad landscapes through which the pipeline will traverse. These are:

- Cleared grazing land;
- Road and transmission line easements;
- Residential areas;
- Vegetated woodlands; and
- Beside Lake Trevallyn.
The visual assessment considers the rehabilitated easement (rather than the freshly disturbed construction area) as this represents the long-term impact.

The rehabilitated easement within cleared grazing land and existing easements will have little visual impact. As shown in Photographic Sheet 5-1 and Photographic Sheet 5-2, the grassed areas are consistent with the surrounding landscape, even after a few months. Whilst in some locations a gravel access track will be maintained adjacent to the alignment, such features are not inconsistent with surrounding features. The main distinguishing feature of the easement, particularly in the short term, will be the homogenous vegetation cover. While this blends well with grazing paddocks, it will be more obvious within easements until other plants, weeds and features establish over time. Visual impacts in these landscapes are considered low.

The pipeline alignment utilises existing road and transmission line easements through the majority of its length within Launceston. As a consequence, there will be limited construction through residential areas. The pipeline will however traverse road corridors within residential and rural residential areas, particularly towards Trevallyn Dam. Visual impacts will be similar to those detailed above.

The easement will be most obvious where it traverses woodlands and it is cleared of all tall vegetation. Whilst having the greatest visual impact, the exposure of these landscapes is limited in that most viewers will be looking from existing road networks, and the East Tamar Highway in particular. Unless the clearing is undertaken directly adjacent to the Highway, such impacts will most likely be screened from the viewer. In areas where the alignment is at an angle to or perpendicular to the road, visual impacts will be greater as the loss of tall vegetation will be more apparent.

The construction of the pump station at Trevallyn Dam will introduce new structures. Such structures are not inconsistent with views from the dam and ridges to the south. The proposed site is adjacent to the Hydro Tasmania power station water intake (Photographic Sheet 5-2) and is one of a number of structures including the Esk Water pump station and transformer. The Option 2 pump station will include the station structure as well as six surface mounted pipes to the Lake. The site will only be visible from certain vantage points within the adjacent recreation area and will not dominate views, particularly the longer views over the Lake. From the walking track the view of the pump station will be fleeting through the trees and will be consistent with existing visuals, including the buttress of the dam and power lines. Visual impacts in this landscape are considered to be low.

The balance control tank will be located in the vicinity of Reatta Road WTP and will be consistent with the characteristics of this plant. Views of the site will only be of short duration as viewers travel by car past the site and will be readily visible from the walking track. This is consistent with the current visual environment which includes the Way FM radio tower, the WTP and power and communication lines. Visual impacts for this site are considered to be low.

The pipeline may be visible over certain waterway crossings. At over 1 metre in diameter for parts of the alignment, the pipe will be highly visible when exposed. The crossings will primarily be visible at major waterway crossings and would typically be located adjacent to bridge structures. As such, visual obtrusiveness will be minimised. Visual impacts from pipeline structures are considered to be minor.
TNGP Gas Pipeline as seen from the air. Easement is centre of photo

Basslink underground cable during construction

Photosheet 5-2
5.15.1 Management Measures

Management measures that will be implemented include:

- Maintaining existing native vegetation screening where possible around the balance control tank and pump station;
- Landscaping around the pump station with indigenous vegetation species;
- Painting the pump station and pipes with matt colours to best blend into the background;
- Minimising the clearing width of the construction corridor where practicable;
- Maintaining screening vegetation between the corridor and the East Tamar Highway;
- Removing construction equipment from the corridor as soon as practicable after works have been completed; and
- Commence rehabilitation as soon as possible after construction.

A range of management strategies have been identified which will form part of the Construction EMP which will be developed prior to any construction activities. Details of the requirements of this plan are outlined in the Mitigation Management Plans in Volume 4.

5.15.2 Summary of Potential Impacts and Management Measures

Construction of the pipeline will typically require clearing of all vegetation within the construction corridor. Visual impacts within cleared areas and road easements will be minor. In areas where woodland vegetation needs to be cleared, visual impacts will be most noticeable, particularly in areas adjacent to the East Tamar Highway and closer to Lake Trevallyn. Impacts in these areas will be moderate where the corridor is exposed to high viewer numbers. Impacts of visible structures including the pump station, balance control tank and pipeline at waterway crossings are considered minor with appropriate mitigation.

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Impact Rating</th>
<th>Proposed Mitigation</th>
<th>Management Impact</th>
<th>Combined Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visible impact of cleared easement</td>
<td>Moderate negative impact</td>
<td>Minimise clearing and maintain screening</td>
<td>Minor positive impact</td>
<td>Minor negative impact</td>
</tr>
<tr>
<td></td>
<td>Minor negative impact</td>
<td>Construction EMP</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>Visible impact of structures</td>
<td>Minor negative impact</td>
<td>Maintain screening, painting and landscaping</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
</tbody>
</table>
Visual impacts along some sections of the alignment will be moderate, however overall, with appropriate mitigation, visual impacts are considered minor.

5.16 Aboriginal and Historic Heritage

5.16.1 Aboriginal Heritage

It is anticipated that no Aboriginal Heritage sites identified will be impacted by the pipeline.

The location of sites TASI 6589, TASI 8473 and TASI 4008 are known and will not be impacted by the water supply pipeline.

- TASI 6589 - This site is an artefact scatter located near East Arm and is located outside the area to be developed. No impacts on this site are anticipated.
  
  The area containing this site will be maintained as a restricted area, ensuring no accidental damage to the site.

- TASI 8473 - This site is an isolated artefact located near Mt Direction and is located outside the area to be developed. No impacts on this site are anticipated.

- TASI 4008 - This site is an isolated artefact located near the Tamar River at Alanvale. This site is located within the area to be developed for the pipeline, however, owing to the moveable nature of the pipeline alignment, this site will be protected from impacts.

- TASI 0220 - This site is a quarry located near Dilston and is located outside the area to be developed. This site was not located during survey activities (Stone and Stanton 2006). However, no impacts on this site are anticipated.

- TASI 0224 is an artefact scatter located near the Australian Maritime College, near the Tamar River, and is located outside the area to be developed.
  
  This site was not located during survey activities (Stone and Stanton 2006). However, no impacts on this site are anticipated.

- Subsurface monitoring - the pipeline alignment between Coulsons Creek and Station Creek at Dilston, a distance of approximately 4.7km, has been suggested to have the potential to contain subsurface artefacts (Stone and Stanton 2006).

5.16.2 Historic Heritage

The water supply pipeline has been located to avoid impact on identified historic heritage sites.

All sites identified as part of the heritage studies will not be impacted by the water supply pipeline route.

The Lake Trevallyn Hydro footings are located close to the proposed pump station site. It is expected this site is well outside the construction footprint for the pump station. Specific strategies will be identified to protect the site once detailed design has confirmed the location of the pump station and associated infrastructure.
5.16.3 Management Measures

Aboriginal Heritage

The following management measures were developed in consultation with the Aboriginal Heritage Office (DTAE), the Tasmanian Aboriginal Land and Sea Council and Office of Aboriginal Affairs.

A Cultural Heritage Management Plan will be prepared prior to the construction phase for the management of Aboriginal heritage sites.

The area containing TASI 6589 and 8473 will be maintained as a restricted area, ensuring no accidental damage to the site.

TASI 4008 - The artefact will remain in situ and be protected during construction activities. A reserve of minimum 1m x 1m will be applied with the boundary to be indicated clearly by temporary fencing for the duration of construction activities. Maintenance activities of the easement will be undertaken to ensure the continued protection of this site.

The area containing TASI 0220 and 0224 will be maintained as a restricted area, ensuring no accidental damage to the site.

Subsurface monitoring, of the pipeline alignment between Coulsons Creek and Station Creek at Dilston, a distance of approximately 4.7km, will have subsurface monitoring undertaken.

Subsurface testing of the organic soil horizon will be undertaken by stripping of the topsoil along the pipeline alignment to determine if any artefacts are present. This activity will be controlled by an Aboriginal Heritage Officer. If subsurface Aboriginal heritage values are identified the following will be applied:

- A permit will be required to undertake a full heritage and archaeological examination to recover as much information as possible from the site. All information will be provided to the Tasmanian Aboriginal Land and Sea Council.

- A permit will be required to relocate any identified artefacts. Any relocated artefacts will be protected maintained in the local area.

Historic Heritage

A Cultural Heritage Management Plan will be prepared prior to the construction phase for the management of historic heritage sites.

The potential impacts, and therefore the management measures, will be assessed following the detailed design phase.

The following procedure will be incorporated into the Cultural Heritage Management Plan, for the event that further Aboriginal or historic heritage sites are located during clearing and construction activities.

- Cease works immediately;
- Contact Heritage Tasmania immediately;
- Assess the significance of the site;
Arranging a site visit for a staff member of Heritage Tasmania, if necessary, to determine the significance of the site; and

Depending on the significance assessment, determining appropriate actions with regard the continuation of works, including, as appropriate, approval from the Tasmanian Heritage Council.

5.16.4 Summary of Potential Impacts and Management Measures

A number of Aboriginal and historic heritage sites have been identified within or adjacent to the proposed water supply pipeline corridor. None of these sites will be impacted by construction activities. Site specific management strategies have been developed in conjunction with the Aboriginal Heritage Office (DTAE), the Tasmanian Aboriginal Land and Sea Council and Office of Aboriginal Affairs.

Table 5-24 Summary of potential impact rating and mitigation measures – Aboriginal and historic heritage

<table>
<thead>
<tr>
<th>Potential Impact</th>
<th>Impact Rating</th>
<th>Proposed Mitigation</th>
<th>Management Impact</th>
<th>Combined Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aboriginal and Historic Heritage</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potential impacts on Aboriginal heritage sites</td>
<td>Minor negative impact</td>
<td>Cultural Heritage Management Plan</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td>Potential impacts on historic heritage sites</td>
<td>Minor negative impact</td>
<td>Cultural Heritage Management Plan</td>
<td>Minor positive impact</td>
<td>Insignificant impact</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Minor negative impact</td>
<td>Assess risk to sites after detailed design</td>
<td>Minor positive impact</td>
</tr>
</tbody>
</table>

Potential impacts to known Aboriginal and historic heritage sites from construction and operation of the pipeline are considered insignificant.
5.17 Health

Overall health impacts from the pulp mill have been addressed in Volume 2 of the Draft IIS.

The water supply pipe is unlikely to result in adverse or beneficial impacts for human health.

5.18 Greenhouse Gas and Ozone Depletion

Overall greenhouse gas and ozone depletion from the pulp mill have been addressed in Volume 2 of the Draft IIS.