AN ABORIGINAL SITE SURVEY FOR THE PROPOSED GUNNS PULPMILL AND ANCILLARY INFRASTRUCTURE BETWEEN FOUR MILE BLUFF AND LAUNCESTON, NORTHERN TASMANIA

VOLUME 1

A report to Gunns Limited

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EXECUTIVE SUMMARY

Gunns Limited proposes to construct a pulpmill on the eastern side of Long Reach near Bell Bay in northern Tasmania. Proposed ancillary infrastructure for the pulpmill includes port facilities, pipelines for effluent and water supply, a solid waste disposal site, quarry, reservoir, car park and a temporary accommodation camp. The main pulpmill site is contained within a 432 ha area adjacent to Gunns’ existing Long Reach chip mill. The proposed effluent pipe runs from here to Four Mile Bluff on the north coast. The proposed water supply pipe runs in the opposite direction to Lake Trevallyn in Launceston.

Archaeologist Tim Stone and Aboriginal Heritage Officer Steve Stanton investigated the potential impact on Aboriginal heritage values resulting from the proposed development. The key objectives of this Aboriginal site survey were to:

1. locate and record any Aboriginal sites in the proposed pulpmill construction area and in areas to be impacted by ancillary development;
2. recommend measures to mitigate any potential damage to Aboriginal sites;
3. liaise with representatives of the Tasmanian Aboriginal community to ascertain their views on the proposed development.

A total of 30 previously recorded Aboriginal sites were located in the survey areas and corridors proposed for development. Most were stone artefact sites (scatters, isolated artefacts or stone sources), with one being a shell midden. However, cultural material could only be confirmed at nine of the TASI-registered site locations (TASI 6589, 8473, 9675, 9713, 9896, 9900, 9903, 9905 and 10001). Consequently, the Aboriginal Heritage Office of the DTPHA is de-registering those sites that should not have been listed.

Two previously unknown Aboriginal stone artefacts were also located during the survey. One is an isolated stone artefact (TASI 9942) located in the swale of a dune ridge behind Four Mile Bluff. The other was located in the proposed pulpmill site and is considered to be a part of the previously recorded TASI 9896. A third isolated artefact that was part of a site to be de-registered was re-recorded as TASI 9900. In all, ten Aboriginal sites were confirmed during the survey, with two (TASI 6589 and 9675) outside the area of impact.

The largest Aboriginal site recorded during the survey is TASI 9903, located at the head of Big Bay close to the proposed pulpmill site. It was adjudged to be of low-moderate scientific significance. Six other Aboriginal sites (TASI 8473, 9900, 9905, 9713, 9942 and 10001) that could be impacted by the proposed development were assessed as being
of low scientific significance. An eighth site, TASI 9896, located in the middle of the proposed pulpmill site was not given a formal assessment of scientific significance because it is covered by thick vegetation and more information is needed about the site.

All of the Aboriginal sites located during this survey are significant to the Tasmanian Aboriginal community including the landscape surrounding these sites. Accordingly, they should not be disturbed by the proposed development. The proponents have an opportunity to address this concern and to recognize Aboriginal interests in the area. The sites and landscapes that have been identified should be protected and, in future, managed in a manner that is consistent with the aspirations of the Tasmanian Aboriginal community.

Additional areas for investigation arose during the course of the survey. These included variations of previously surveyed corridors and new areas proposed for development within Gunns’ existing Long Reach chip mill. The survey located no Aboriginal sites in these areas and the TASI lists none in these areas also.

Management recommendations were formulated for the Aboriginal sites identified during the investigation in close consultation with the Tasmanian Aboriginal Land and Sea Council (TALSC). The following is a summary of the key recommendations:

- Care should be taken to avoid any further disturbance to TASI 9896, 9900, 9903, 9905 and 10001 (proposed pulpmill site); TASI 8743, 9675, 9713 and 9942 (proposed effluent pipe) and TASI 4008, 6589 and 8473 (proposed water supply pipe).

- The part of the ridgetop containing TASI 9896 should be investigated further by archaeological test-excavation to determine its contents, stratigraphy, extent and significance prior to the commencement of pulpmill construction.

- Gunns Limited should avoid disturbing the three Aboriginal sites in the area proposed for a solid waste disposal site and quarry (TASI 7485, 7486 and 7487). If this is not feasible, Gunns Limited should obtain from the Minister permission for a suitably skilled and experienced Aboriginal Heritage Officer to re-locate the artefacts in these sites to a culturally appropriate, alternative site.
• Should the proposed water supply pipe route that passes through TASI 0220 and 0224 be selected for pipe installation, Gunns Limited should apply to the Aboriginal Heritage Office of the DTPHA to have these sites de-registered from the TASI prior to installation commencing. This study has established that these registered localities do not contain anything of Aboriginal interest and recommends that the “sites” be removed from the TASI.

• Monitoring for subsurface Aboriginal cultural material should be undertaken by an Aboriginal Heritage Officer and archaeologist between Coulsons Creek and Dilston and at the crossing of Station Creek south of Dilston. The monitoring should be undertaken during the initial vegetation removal and trench excavation phase of pipeline installation. Any other ground disturbance works in these areas should also be monitored. Monitoring of trench excavations should continue until the Aboriginal Heritage Officer and archaeologist are satisfied that culturally sterile horizons have been reached. In the event that cultural material is identified at depth in the excavated trench, the alignment of the pipeline may need to be altered in order to ensure that such material is avoided.

• Those areas along the proposed effluent and water supply pipe routes that could not be accessed because of land owner issues should be surveyed for Aboriginal sites once permission to enter this land has been obtained. Further Aboriginal consultation would also be a requirement.

• Gunns Limited should establish dialogue and consult with the Tasmanian Aboriginal Land and Sea Council on all matters pertaining to Aboriginal site management throughout the course of the proposed pulpmill development. This would best be achieved if Gunns Limited were to invite representatives of the TALSC to be involved in any relevant meetings/discussions regarding the proposed pulpmill. Gunns Limited should also keep the TALSC appraised of developments with the project and ensure that any other areas it might impact are similarly surveyed for Aboriginal sites.
1. INTRODUCTION

Gunns Limited proposes to construct a pulpmill on the eastern side of Long Reach near Bell Bay in northern Tasmania (Figure 1). Proposed ancillary infrastructure for the pulpmill includes port facilities, pipelines for effluent and water supply, a solid waste disposal site, quarry, reservoir, car park and a temporary accommodation camp. The main pulpmill development site is contained within Survey Areas 1 and 2, with pipelines running from these to Four Mile Bluff on the northern coast and Lake Trevallyn in Launceston.

In order to investigate the potential impact on Aboriginal heritage values resulting from the proposed development Tim Stone Pty. Ltd. was engaged by Gunns Limited to conduct an Aboriginal site survey of the areas to be impacted. The key objectives of the Aboriginal site survey were to:

1. locate and record any Aboriginal sites in the proposed pulpmill construction area and in areas to be impacted by ancillary development;

2. recommend measures to mitigate any potential damage to Aboriginal sites;

3. liaise with representatives of the Tasmanian Aboriginal community to ascertain their views on the proposed development.

Preparation of this statement involved collation of relevant archaeological and environmental information and the use of topographic and geological maps to identify potential Aboriginal site locations. Fieldwork was undertaken by Tim Stone (archaeologist) and Steve Stanton (Aboriginal Heritage Officer) from September to November, 2005. Suzette Weeding and Greg Stanford (Gunns Limited) met with the team and provided orientation. Emily Tys (Gunns Limited) provided maps of the survey areas and the proposed pipeline routes.

Additional areas for investigation arose toward the end of the project. These were either variations of surveyed corridors or concerned new works proposed for Gunns’ existing chip mill at Long Reach. The results of the additional Aboriginal site survey are contained in a supplementary report at the back of this report (see appendix).

A second volume has also been produced as a confidential addendum. This volume contains detail about the Aboriginal sites discussed in the text including location maps and photographs. Such information is culturally sensitive and should not be made publicly available without Aboriginal consent.
2. PROPOSED WORKS AND POTENTIAL IMPACTS

Gunns proposed pulpmill project has eight key components. Five of these are associated with the main pulpmill development site and are contained within Survey Areas 1 and 2. The other three are the external effluent and water supply pipelines and the temporary accommodation camp, which is proposed for the outskirts of George Town. Figure 2 shows a “footprint” of the proposed development at the main pulpmill site. Below is a description of the works proposed and their potential local impact.

2.1 Pulpmill and port facility

The proposed pulpmill site and port facility cover an area of approximately 55 ha within the 195 ha area that is Survey Area 1 (Figure 2). Preparation for construction of the pulpmill and port facility will require clearing of vegetation, excavations and some blasting to level and re-align the site.

2.2 Temporary concrete batch and prefabrication plant

The proposed concrete batching and prefabrication plant adjoins the proposed pulpmill site (Figure 2). It covers an area of approximately 13 ha within Survey Area 2, which has a total area of 237 ha. The plant will produce concrete and prefabricated concrete for the pulpmill. Preparation for construction of the plant will require clearing of vegetation, excavations and some blasting to level and re-align the site.

2.3 Solid waste disposal site and quarry

A solid waste disposal site of approximately 14 ha is proposed for Survey Area 2 (Figure 2). It will be used to store solid waste, including boiler ash and liquor dregs of high pH. A road will be constructed to the solid waste disposal site. Vegetation will be cleared. An electricity transmission line will also run from the pulpmill site to the solid waste disposal site. This will require a 10 m wide cleared easement. A quarry may be opened nearby to source construction materials for the pulpmill.
2.4 Local water reservoir

A local water reservoir is also proposed for Survey Area 2 (Figure 2). It will be used as a temporary storage for water that is pumped from Lake Trevallyn. It will also act as an auxiliary water supply in the event that supply from Lake Trevallyn is interrupted temporarily. The capacity of the reservoir will be approximately 670 megalitres. Excavation works will be required to construct the dam wall. Materials for the dam wall will be sourced from the pulpmill site and the local vicinity.

2.5 Mill Site Car Park

A car park will be constructed in Survey Area 1 under powerlines adjacent to the proposed pulpmill site (Figure 2). The car park will hold 900 cars and 40 buses. Excavation works will be required for the construction of the car park.

2.6 Effluent pipeline

The effluent pipeline will transport treated effluent, resulting from the pulping process, from the pulpmill to Bass Strait, a distance of approximately 17 km (Figure 3). In addition, an area of 219 ha behind the proposed outfall at Four Mile Bluff may be used to assemble the pipeline for offshore installation.

Onshore installation will require clearing of vegetation and blasting of rocks where necessary. The disturbance corridor proposed for the pipeline is 20 m wide to allow for vehicular access and temporary storage of fill from the trenches. The permanent pipeline easement will be 15 m wide in most cases.

The pipeline will be 1 m in diameter and constructed of Polyethylene or Fibreglass Reinforced Plastic (FRP). It will be laid in trenches typically 2 m wide and buried at depths of 1.7-3 m. The trenches will be dug using excavators.

2.7 Water supply pipeline

The water supply pipeline will be used to transport water from Lake Trevallyn to the local water reservoir in Survey Area 2, a distance of approximately 52 km (Figure 4). The corridor proposed for disturbance is 20 m wide to allow for vehicular access and temporary storage of fill from the trenches.
Legend
- Proposed Water Supply Pipeline Route
- Land Parcels where Access for Special Values Surveys was Denied

Figure 4 (continued), Proposed Water Supply Pipeline Route from Long Reach to Lake Trevallyn.
The pipeline will be 1 m in diameter and constructed mostly of concrete-lined steel. It will be laid in trenches typically 2 m wide and buried to a depth of 1.7 m.

Vegetation will be cleared from the disturbance corridor and some rock may be blasted. Excavators will be used to dig the trenches.

2.8 Temporary accommodation camp

A temporary accommodation camp is proposed for 18.86 ha of mostly vacant industrial land on the southeastern outskirts of George Town (Figure 5). The camp is expected to accommodate up to 800 workers during the peak construction phase of the project. The 800 residents will be housed in clustered layouts, with ensuite accommodation complete with site-contained services and amenities. When the need for the temporary accommodation has ceased at the end of the construction project, the area will be sold off as blocks in an industrial subdivision.

3. TYPES OF SITES

The types of Aboriginal site which have been recorded previously in northern Tasmania and which might, therefore, be expected to occur in the areas proposed for development of the pulp mill are described below.

Open campsites

Open campsites are one of the most commonly occurring types of Aboriginal site in the region. These sites are represented by scatters of stone artefacts lying on the ground surface. The remains of fire hearths may also be associated with the artefacts. In rare instances, open campsites which were used over a long period of time may accumulate sediments and become stratified. That is, there may be several layers of occupation buried one on top of another.

Open campsites are almost invariably located near permanent or semi-permanent water sources. Local topography is also important in that campsites tend to occur on level, well-drained ground elevated above the local water source. In northern Tasmania they are commonly located along rivers and creeks or around lakes and lagoons.
Figure 5. Proposed Temporary Accommodation Camp Site on the Outskirts of George Town
Shell middens

These range in thickness from thin scatters to stratified deposits of shell and sediment up to 2m thick. In addition to shell which has accumulated as food refuse, shell middens usually contain other food remains such as bone from fish, birds and terrestrial animals and humus from the decay of plant and animal remains. They also commonly contain charcoal and artefacts made from stone, shell and bone.

On the coast of northern Tasmania the major shellfish species likely to be represented in middens are the edible mussel *Mytilus edulis*, the rock whelk *Cabestana spengleri*, the turbo or warrener *Subninella* sp. and abalone *Notohaliotis ruber*.

Rockshelter sites

Caves or shelters in clifflines and beneath boulder overhangs were often used by Aboriginal people as campsites. Because of the confined area in these shelters and because of repeated Aboriginal occupation of such sites, the occupation deposits that they contain are often richer than open campsites and are usually stratified.

Rockshelters will only be found where suitable geological formations are present. They may occur as sandstone overhangs, shelters beneath granite tors or as limestone caves.

Rock art sites

Rock art consists of paintings, drawings and/or engravings on rock surfaces. In most instances rock art is related to the distribution of rockshelters but it may also be found on free-standing rocks.

Quarry sites

These are locations where Aboriginal people obtained raw material for their stone tools or ochre for their art and decoration. Materials commonly used for making flaked stone tools include chert, chalcedony, silcrete, quartz and quartzite. These materials were obtained from exposed sedimentary rock formations or picked up as cobbles on the surface. Stone quarries may also be associated with volcanic or metamorphic rock outcrops.

Burial grounds

Aboriginal burial grounds may consist of a single interment or a suite of burials. Along the Tasmanian coastline skeletal material is regularly found eroding from calcareous sand deposits but in the mountainous terrain of the hinterland burial sites are rarely
found because conditions for the preservation of bone are usually poor. Burial sites are extremely important to the Tasmanian Aboriginal community and under revised coronial legislation the Tasmanian Aboriginal Land and Sea Council must be contacted immediately a suspected Aboriginal burial is located.

**Stone arrangements and special places**

Tasmanian Aboriginal stone arrangements may be stones aligned along the surface or excavated hollows in cobble beaches. Some stone arrangements were probably used for ceremonial purposes. Others were constructed in the intertidal zone and probably functioned as traps for marine animals such as fish or seals. Sites of special significance to Tasmanian Aboriginal people are also present in the landscape. These need not show any archaeological traces.

4. **STATUTORY PROTECTION AND THE BURRA CHARTER**

All registered and unregistered Tasmanian Aboriginal sites are protected by the State Aboriginal Relics Act 1975 and the Commonwealth Aboriginal and Torres Strait Islander Heritage Protection Act 1984. These Acts prohibit the wilful destruction or disturbance of any cultural heritage site, place or object, whether on private or public land. These places are considered to have significance according to the guidelines of The Burra Charter.

The DTPHA is the Tasmanian State Government instrumentality that administers the Aboriginal Relics Act 1975, through the Aboriginal Heritage Office. All legislation relevant to the discovery of human remains is subordinate to the Coroners Act 1995.

4.1 *Aboriginal Relics Act 1975*

In Tasmania, the *Aboriginal Relics Act 1975* provides legislative protection for all Aboriginal cultural heritage sites, places and objects. Section 14 (1) of this Act states:

> no person shall, otherwise than in accordance with the terms of a permit granted by the Minister on the recommendation of the Director -

(a) destroy, damage, deface, conceal or otherwise interfere with a relic.
Section 20 of this Act states:

A person who is guilty of an offence against this Act for which no other penalty is expressly provided elsewhere in this Act is liable to a fine not exceeding 10 penalty units or imprisonment for a term not exceeding 6 months.

It is a defence against prosecution if the defendant was unaware of the existence of the relic.

Site protection provisions are also included in this Act. Section 7 provides that subject to the written consent of the owner or occupier of the land, the Minister may, on the recommendation of the Director, declare an area of land containing an Aboriginal relic to be a protected site.

Section 8 of this Act provides that the landowner is entitled to any compensation arising from the establishment of the protected site.

4.2 Aboriginal and Torres Strait Islander Heritage Protection Act 1984

This Commonwealth Act provides for the blanket protection of all Australian Aboriginal and Torres Strait Islander Aboriginal sites, places and objects whether privately or publicly owned. Whereas the State provides legislative protection for all physical evidence of past Aboriginal occupation, the Commonwealth Act also protects Aboriginal cultural property in the wider sense so as to include contemporary and ancient traditions and folklore.

This Commonwealth Act was passed to protect Aboriginal heritage in circumstances where such protection was not available at State level, or where State provisions were not enforced (Pearson and Sullivan, 1999:53). It may be used to override State legislation but this is rarely done because the threat of Commonwealth intervention usually has the effect of facilitating a negotiated settlement. In any case, the Act does not have a strong administrative or operational framework to support its provisions. It is effective in preventing or mitigating short-term dramatic damage or destruction but it does not provide for the ongoing, on-the-ground management of heritage places since it is difficult for the Commonwealth to exercise such ongoing jurisdiction in the States and Territories (Pearson and Sullivan, 1999:55).
4.3 The Burra Charter

The Australian Burra Charter was adopted at a conference at the historic mining town of Burra, South Australia, in 1979. This charter defines the procedures and basic principles to be followed in the preservation of all types of sites. For example, Aboriginal shell middens, ancient campsites represented by stone artefact scatters, or historic mining shafts. These places are considered to have cultural significance either to Aboriginal people or to Australians in general. Cultural significance is a term used to encompass all the meanings and values that a particular place may have to people, beyond its utilitarian value. It refers to ‘aesthetic, historical, scientific or social value for past or present generations, or for its likely value to future generations’ (Marquis-Kyle and Walker 1992:73).

Under the guidelines of The Burra Charter all Aboriginal sites found in Tasmania will have social value. According to the charter, social value is defined as:

… the qualities for which a place has become a focus of spiritual, political, national, or other cultural sentiment to a majority or minority group (Marquis-Kyle and Walker 1992:73).

Some sites found in the State may also have scientific value. This is assessed according to each particular site’s research or scientific potential to provide information about past Aboriginal culture, the environment, or human behaviour generally. According to the Burra Charter:

The scientific or research value of a place will depend upon the importance of the data involved or its rarity, quality or representativeness and on the degree to which the place may contribute further substantial information (Marquis-Kyle and Walker 1992:73).

While the scientific or research value of a place may vary, the Tasmanian Aboriginal community considers all Aboriginal archaeological sites to be significant. The Aboriginal people of the State have a very ancient and unique culture, which is still very much alive today. These sites are important to the local Aboriginal people, and others, because they are a link to their ancestral lands and help keep their culture alive.
5. ENVIRONMENTAL SETTING

The region between Four Mile Bluff and Launceston is dominated by the estuary of the Tamar River and Port Dalrymple. The estuary is a “ria” or drowned river valley formed by coastal submergence ~6,000 years ago. The coastline of the Tamar Estuary is characterized by rolling dolerite hills, Tertiary basalt flows and sedimentary deposits. The hills are dissected by creeks that flow into muddy embayments. Some are fringed by sandy beaches but most are eroded with rocky shores.

The open Bass Strait coast in the vicinity of Four Mile Bluff is a high-energy wave environment, with frequent storms and severe coastal erosion. Shingle beaches are backed by steep sandy cliffs cut by wave-action. The hinterland is a relict continental dunefield formed under Quaternary climatic conditions. The dunefield is stable except where it is exposed to wind and waves from Bass Strait.

European invasion has greatly altered the original landscape of the Tamar River region. Most of the tree cover of the region has been felled for building material and fuel or to create pasture. Swamps have been drained to further enhance agricultural capacity. The development of urban hubs such as George Town and Launceston has also transformed the region with suburban sprawl, roads and other infrastructure. The Bell Bay Thermal Power Station on the outskirts of George Town and Gunns’ Long Reach chip mill are major developments associated with this industry.

5.1 Setting of the proposed pulpmill survey areas

Survey Area 1

Survey Area 1 is located on the eastern side of the Tamar Estuary between Big Bay and the Long Reach chip mill (Figure 6). It covers an area of 195 ha, from the shore of Long Reach to the inland powerline easement. A secondary easement runs from the powerline easement to the Long Reach shore. This has vehicle tracks across the area but no other infrastructure. A network of access tracks has also been created between the secondary easement and Big Bay to facilitate geotechnical investigations.

Geologically, Survey Area 1 is composed of Jurassic dolerite. This outcrops along the rocky shore and inland as boulders, sheet rock and rubble. The higher slopes are mantled by sand sheets (or drifts) of more recent origin. These could be relict Tertiary deposits or aeolian coversands of late Quaternary age. Either way, the sand deposits are relatively thin (<1 m) and patchily developed.
Figure 6. Setting of Survey Area 1 at Long Reach.
Weathering of the dolerite has produced rolling terrain, with two prominent ridgetops overlooking the Tamar Estuary. The dolerite ridges are drained by a series of westerly-flowing ephemeral creeks that debouch into the small tidal inlets of Big Bay, Dirty Bay and an un-named bay close to the chip mill. The Big Bay shore appears badly eroded. Much of the intertidal zone has been colonized by Pacific oysters.

Most of Survey Area 1 appears to have been disturbed in the past, possibly by clearing or fire. The area currently supports *Eucalyptus amygdalina* dominated by dry sclerophyll forest. The sandier soils support Casuarinas with an understorey of lomandra bushes and bracken fern. Marine grasses grow in Big Bay.

*Survey Area 2*

This survey area adjoins Survey Area 1 on the eastern side of the powerline easement (Figure 7). It is land-locked apart from a small stretch (~600 m) of coast along Big Bay. The area extends to the upper catchment of Williams Creek, covering a u-shaped area of 237 ha. Additional to this area is a proposed easement ~700 m long, running downslope from the Williams Creek watershed to the East Tamar Highway.

Survey Area 2 is much more developed than Survey Area 1. The East Tamar Highway and railway from Launceston to George Town have been constructed through the area, leaving a series of road and rail cuttings. Secondary roads have also been constructed through the area, particularly in the Williams Creek catchment, presumably for logging. The powerline easement between the two survey areas continues through Survey Area 2 behind Big Bay. The Tasmanian Natural Gas Pipeline also traverses this area, which comes close to the Bell Bay Thermal Power Station.

The geology of Survey Area 2 is similar to Survey Area 1 being dominated by Jurassic dolerite. However, surficial sand sheets appear to be absent. The dolerite ridges of the Williams Creek catchment are steep and rugged, with abundant rock outcrop. These form the lower slopes of the Tippogoree Hills, which are the backdrop to the area. The slopes closer to Survey Area 1 and Big Bay are more undulating. Steep-sided ephemeral creeks feed into Big Bay through Survey Area 2.

Like Survey Area 1, this area also appears to have been disturbed in the past, possibly by clearing or fire. The area currently supports *Eucalyptus amygdalina* dominated by dry sclerophyll forest, which was probably its natural cover.
Figure 7. Setting of Survey Area 2 at Long Reach.
5.2 Setting of the proposed effluent pipe corridor

The proposed effluent pipe corridor extends from the most northern tip of Survey Area 2 (near the entrance to the Bell Bay Thermal Power Station) to Four Mile Bluff on the open Bass Strait coast (Figure 3). From its origin near the power station to George Town, it follows the East Tamar Highway, mostly on the north east side of the highway. It then skirts the eastern side of George Town to link up with Aerodrome Road, which it follows in the direction of Four Mile Bluff.

The terrain between Survey Area 2 and George Town is undulating, having developed on lower dolerite slopes blanketed by Tertiary deposits. Dolerite outcrops in the foothills traversed by the proposed corridor and along the rocky shore of Donovans Bay where there is a steep, gravelly beach close to the highway. This is the only part of the proposed effluent pipe close to the Tamar Estuary shore.

The creeks crossed by the proposed effluent pipe corridor between Survey Area 2 and George Town are short, steep-sided and ephemeral. Some have been dammed to create reservoirs such as Lauriston Reservoir, which supports an extensive area of parkland. The only significant waterway traversed by the proposed corridor along this section is York Creek on the outskirts of George Town.

North of Georgetown, the proposed effluent pipe corridor has a distinctly late Quaternary setting (Figure 8). The dominant landform between George Town and Four Mile Bluff is a relict continental dunefield, which formed during periods of aridity and low sea level when Tasmania was joined to the Australian mainland. Bowden (1983) mapped east-west linear dunes contiguous with these as the Ainslie Sand Formation. The dunes are thought to originate from aeolian reworking of shallow marine sands deposited during the last interglacial period. The dune sands extend up the flanks of bedrock hills and interdigitate with angular slope deposits produced by cold climate conditions. The soils of the dunes are strongly podsolised.

Luminescence dating of the Ainslie Sand Formation by Duller and Augustinus (1996) suggested that construction of these dunes happened between 45,000 and 30,000 years ago. With improvements to the luminescence dating technique, it is now believed that the dune ridges of the Ainslie Sand Formation were emplaced ~20,000 years ago at the height of the last ice age (Duller and Augustinus, in press).
Figure 8. Late Quaternary setting of proposed effluent pipe corridor near Four Mile Bluff
The proposed effluent pipe corridor runs alongside Aerodrome Road from George Town roughly perpendicular to the strike of the east-west linear dune ridges. Wetlands have formed in the swales between the dune ridges (Figure 8). Most of these swamps have been drained by artificial channels. Cimitiere Creek is the only natural watercourse recognizable. The proposed outfall on the east side of Four Mile Bluff is backed by a 219 ha zone proposed for pipe installation work. This area is also dominated by the dune ridges and swales of the Ainslie Sand Formation.

The vegetation between Survey Area 2 and George Town is predominantly dry sclerophyll forest (or regrowth) except where cleared for pasture and parkland. The Quaternary landscape north of George Town is mostly cleared, with pine plantations and other exotics such as gorse taking the place of native species.

### 5.2.1 The proposed temporary accommodation camp setting

The 18.86 ha site proposed for a temporary accommodation camp is located in an industrial area on the outskirts of George Town (Figure 5). The area is located south of the intersection of Victoria Street and the East Tamar Highway. SPV Industries have a warehouse at this corner inside the proposed temporary accommodation camp area. Access is via an unmade road (Agnes Street), which runs past a Home Timberland Hardware Store.

The proposed temporary accommodation camp site has a gentle slope developed on low-lying Tertiary or Quaternary deposits. No drainage lines or swamps have formed in the area. The surface has been cleared of vegetation, with pushed-over trees lying in scattered rows. This has exposed extensive areas of sandy sub-soil.

The exposed surface of the proposed temporary accommodation camp site is littered with industrial and domestic waste, suggesting that it may have once been a rubbish pit. The dumped waste includes bricks, concrete rubble, rusted metal, broken glass and dumps of scallop shells. These are strewn throughout the area.
5.3 Setting of the proposed water supply pipeline route

The proposed water supply pipeline route runs south of Survey Area 2 to Lake Trevallyn in the hills behind Launceston (Figure 4). For most of this distance, it runs alongside the East Tamar Highway, skirting the Launceston suburbs of Alanvale and Newnham. It crosses the Tamar River at three possible locations either side of the Tamar Cut. The cut is a straight channel dredged through recent point bar deposits.

Steep dolerite slopes dominate the proposed pipeline route between Survey Area 2 and the head of East Arm. The creeklines traversed are steep-sided and ephemeral. Fourteen Mile Creek, which flows into East Arm is the first major waterway. It is deeply incised and tidal where crossed by the proposed pipeline route. From here, the dolerite is mantled by Tertiary sediments and basalt flows.

Most of the drainage between Survey Area 2 and Dilston is controlled by the jointing of the dolerite. Creeks typically flow NE-SW across the proposed pipeline route. Major creek crossings between East Arm and Dilston include the Macquarie Rivulet, Faheys Creek and Swan Bay Creek. At Coulsons Creek near Dilston, the drainage is impeded forming a large, linear swamp close to the Tamar Estuary.

The terrain between Dilston and the outer northern suburbs of Launceston is more open. Dolerite continues to dominate the landscape, although deeper soil profiles appear to have developed, with reduced rock outcrop and rubble. Two major creek crossings along this section are Station Creek and Barnards Creek. The first has a relatively wide valley whereas the other is more v-shaped.

Upon entering the urban environs of Launceston, the proposed pipeline route takes a course alongside the modified banks of the Tamar River. These are lined by reeds, willow trees and gorse. The Tamar Cut crossing points have been heavily modified by urban and industrial development. From Tailrace Park on the west side of the Tamar River, the proposed pipeline route ascends steep, dolerite hills along a powerline easement before its final descent to the artificial Lake Trevallyn.
6. BACKGROUND ARCHAEOLOGY

Archaeological excavation of limestone cave deposits in the Maxwell Valley of southwest Tasmania has demonstrated Aboriginal occupation dating back 35,000 years (Cosgrove, 1995). This period of occupation includes the Last Glacial Maximum or “Ice Age” of 20,000 years ago. It was during this period that cooler temperatures reduced the forest cover of the region (Kiernan et al., 1983). Late Pleistocene cave sites are also known in the valley of the Weld River, the Cracroft Valley and the Ida River karst (Jones et al., 1988; Cosgrove, 1989; McGowan, 1990). Some of these caves have paintings preserved on the cave walls.

Aboriginal people also occupied the Tasmanian Highlands during the Last Glacial Maximum (LGM) when ice sheets covered most of the Central Plateau. This is demonstrated by the site of ORS 7 in the upper valley of the Shannon River, which drains the plateau (Cosgrove, 1995a). Beginners Luck Cave in the Florentine River Valley is another significant Ice Age site. It has stone artefacts and the remains of butchered animals dating back 20,000 years (Murray et al., 1980).

The LGM lowered sea levels by 150 m causing a land bridge to form between Tasmania and the Australian mainland. In northern Tasmania, Aboriginal people occupied rockshelters on Hunter Island and King Island when the islands were joined to the mainland (Bowdler, 1977; Sim, 1994). The Parmerprar Meethenar rockshelter in the Forth Valley was also occupied at this time (Cosgrove, 1992). Another early Aboriginal site in northern Tasmania is the Warragarra rockshelter in the Upper Mersey Valley below the Great Western Tiers (Lourandos, 1983). This shelter contains evidence of Aboriginal hunting from before 9,000 years ago.

Most coastal sites in Tasmania (and the Australian mainland) date from 6-7,000 years ago when global sea levels stabilized following the melting of the glaciers and ice-caps. Shell middens in the Furneaux Group of islands are the oldest dating to 9,000 years ago (Sim, 1994). The Carlton Bluff midden in the Derwent region began forming 8,000 years ago (Brown, 1986; 1991).

One of the longest, continuous cultural sequences in Tasmania has been excavated at Rocky Cape, some 20 km east of Smithton (Jones, 1971). Rockshelters containing stratified midden material show Aboriginal occupation dating back 8,000 years. About 3,500 years ago, the people at Rocky Cape seemed to have stopped eating fish. Stone tool technology also changed during this period of occupation. Bone points and undifferentiated quartzite flakes characterize the early assemblages but around 5,500 years ago bone points disappear from the tool kit to be replaced by stone artefacts made from a wider range of raw materials.
6.1 Studies of the Tamar Estuary region

Ethnohistoric observations made in the 18th and 19th centuries suggest that the Aboriginal people of the Tamar Estuary region were members of a distinct group referred to as the North Midlands Tribe (Jones, 1974). This 'tribe' is estimated to have been composed of between 300 and 500 people. In 1799 the English explorer John Bass wrote of the Aboriginal population of the north coast of Tasmania:

This country is inhabited by men; and if any judgement could be formed from the number of huts which they met; in about the same proportion as New South Wales (Collins, 1971:168).

One of the earliest reports of an Aboriginal site on the Tamar River was that of David (1923) who located ~100 stone artefacts in a loosely cemented raised beach deposit at Regatta Point on the east bank of the river. Sutherland (1972) re-interpreted this site as a stone quarry or raw material source. According to Kee (1990), the site has since been obscured by residential development.

Brimfield (1968) went about the region collecting stone artefacts mostly from coastal sites in the north. He described a bipolar technology whereby the raw material was anvil-rested before being reduced. Sutherland (1972) recognized that the raw materials used by Aborigines for stone artefact manufacture reflected the local geology and that “exotic” stone was also used suggesting networks of trade. He also concluded that west of Bridport these raw materials were procured largely from local beach deposits as many of the artefacts retained their waterworn cortex.

Gill (1968) obtained the first (and only) radiocarbon date for the region. This was an age of 7,080 years Before Present (BP), which was obtained on charcoal from a fossil bone bed found in a limestone cave at Flowery Gully south of Beaconsfield. According to Gill, the deposit was a midden formed by human agency. He claimed that one of the bones was actually an Aboriginal bone implement.

The wider distribution of Aboriginal sites in the region remained poorly understood until systematic surveys undertaken by Kee (1990, 1991) and Bourke (1998) identified the general site pattern. Shell middens were located in coastal dunes and along estuarine shorelines near the mouth of the Tamar River. Open campsites and rockshelters were found inland along rivers and creeks and around freshwater lakes. Stone quarries followed the distribution of suitable stone sources. The most commonly used raw material for stone tools was cherty hornfels. Overall, site density is highest in coastal areas and around lowland lakes and lagoons.
The results of Stone and Stanton’s (1998) survey of the Stony Head Training Area (SHTA) near Beechford are also relevant because this landscape is dominated by the Ainslie Sand Formation. Their survey located twelve Aboriginal sites within 400 m of the Bass Strait coastline. These were mostly stone artefact scatters located in the linear dune field close to wetlands. Stone and Stanton determined that Aboriginal sites would be encountered in the SHTA wherever the dune podsol of the Ainslie Sand Formation was exposed. The much younger coastal dunes of the Waterhouse Sand Formation appeared less likely to contain Aboriginal sites on the surface.

The sites recorded by Stone and Stanton displayed a variety of artefact types. These included worked beach cobbles with cortex, straight-edge scrapers, steep-edge scrapers, round-edge scrapers, notched scrapers, a small stone ‘pick’, basalt ‘pounders’, possible grinding or anvil stones and hammerstones. Many of the flaked tools were retouched or had delicately trimmed edges. These were made from a wide range of raw materials including quartz, quartzite, chert, silcrete, jasper, petrified wood, siltstone, breccia and basalt. Three of the sites contained pieces of ochre.

The stone artefact assemblages recorded in the SHTA are large and diverse with evidence of microblade technology, which contradicts Mulvaney’s (1975:161) claim that delicate blade production is unknown in Tasmania. The microblades of the SHTA were mostly quartz but one chert and one quartz crystal microblade were also recorded. However, none of the blades had any clear evidence of backing. A small quartz core with three parallel blade scars was also recorded.

**6.2 Aboriginal sites in the proposed pulpmill survey areas**

The Tasmanian Aboriginal Site Index (TASI) lists 14 Aboriginal sites in Survey Area 1 and eight in Survey Area 2 (Table 1, Figure 9 in Volume 2). Of this total of 22 sites, 14 are stone artefact scatters and the remainder isolated artefacts. Most of these sites were located along vehicle tracks where ground surface visibility was high. One (TASI 9904) was located below the high water mark in Big Bay.
### Table 1

Registered Aboriginal Sites in Proposed Pulpmill Survey Areas 1 and 2

<table>
<thead>
<tr>
<th>Site</th>
<th>Locality</th>
<th>Site Type</th>
<th>Recorder</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>TASI 7485</td>
<td>Tippogoree Hills</td>
<td>Stone Artefact Scatter</td>
<td>Moore</td>
<td>1997</td>
</tr>
<tr>
<td>TASI 7486</td>
<td>Tippogoree Hills</td>
<td>Isolated Artefact</td>
<td>Moore</td>
<td>1997</td>
</tr>
<tr>
<td>TASI 7487</td>
<td>Tippogoree Hills</td>
<td>Stone Artefact Scatter</td>
<td>Moore</td>
<td>1997</td>
</tr>
<tr>
<td>TASI 9896</td>
<td>Powerline Easement</td>
<td>Isolated Artefact</td>
<td>Graham</td>
<td>2005</td>
</tr>
<tr>
<td>TASI 9897</td>
<td>Vacant Easement</td>
<td>Stone Artefact Scatter</td>
<td>Graham</td>
<td>2005</td>
</tr>
<tr>
<td>TASI 9898</td>
<td>Vacant Easement</td>
<td>Isolated Artefact</td>
<td>Graham</td>
<td>2005</td>
</tr>
<tr>
<td>TASI 9899</td>
<td>Vacant Easement</td>
<td>Isolated Artefact</td>
<td>Graham</td>
<td>2005</td>
</tr>
<tr>
<td>TASI 9900</td>
<td>Dirty Bay Upslope</td>
<td>Isolated Artefact</td>
<td>Graham</td>
<td>2005</td>
</tr>
<tr>
<td>TASI 9901</td>
<td>Powerline Easement</td>
<td>Isolated Artefact</td>
<td>Graham</td>
<td>2005</td>
</tr>
<tr>
<td>TASI 9902</td>
<td>Big Bay Upslope</td>
<td>Stone Artefact Scatter</td>
<td>Graham</td>
<td>2005</td>
</tr>
<tr>
<td>TASI 9903</td>
<td>Big Bay</td>
<td>Stone Artefact Scatter</td>
<td>Graham</td>
<td>2005</td>
</tr>
<tr>
<td>TASI 9904</td>
<td>Big Bay</td>
<td>Stone Artefact Scatter</td>
<td>Graham</td>
<td>2005</td>
</tr>
<tr>
<td>TASI 9905</td>
<td>Powerline Easement</td>
<td>Stone Artefact Scatter</td>
<td>Graham</td>
<td>2005</td>
</tr>
<tr>
<td>TASI 10001</td>
<td>Off East Tamar Hwy</td>
<td>Isolated Artefact</td>
<td>Graham</td>
<td>2005</td>
</tr>
<tr>
<td>TASI 10002</td>
<td>Off East Tamar Hwy</td>
<td>Isolated Artefact</td>
<td>Graham</td>
<td>2005</td>
</tr>
<tr>
<td>TASI 10003</td>
<td>Off East Tamar Hwy</td>
<td>Stone Artefact Scatter</td>
<td>Graham</td>
<td>2005</td>
</tr>
<tr>
<td>TASI 10004</td>
<td>Powerline Easement</td>
<td>Stone Artefact Scatter</td>
<td>Graham</td>
<td>2005</td>
</tr>
<tr>
<td>TASI 10005</td>
<td>Powerline Easement</td>
<td>Stone Artefact Scatter</td>
<td>Graham</td>
<td>2005</td>
</tr>
<tr>
<td>TASI 10006</td>
<td>Powerline Easement</td>
<td>Stone Artefact Scatter</td>
<td>Graham</td>
<td>2005</td>
</tr>
<tr>
<td>TASI 10007</td>
<td>Powerline Easement</td>
<td>Stone Artefact Scatter</td>
<td>Graham</td>
<td>2005</td>
</tr>
<tr>
<td>TASI 10008</td>
<td>Powerline Easement</td>
<td>Stone Artefact Scatter</td>
<td>Graham</td>
<td>2005</td>
</tr>
<tr>
<td>TASI 10009</td>
<td>Williams Creek</td>
<td>Stone Artefact Scatter</td>
<td>Graham</td>
<td>2005</td>
</tr>
</tbody>
</table>

**Notes**
1. The site details are those used by the Aboriginal Heritage Section of the DTPHA.
2. The set of sites is derived from the digitised TASI database.
3. The first three and TASI 10001-10003, 10007 and 10009 are in Survey 2.

The Tippogoree Hills was one of 29 “Recommended Areas for Protection” (RAPs) surveyed by Moore (1997) for Forestry Tasmania. Moore and Aboriginal Heritage Officer Dean Summers located TASI 7485-7487 along a vehicle track crossing of Williams Creek (Figure 9, Vol. 2). TASI 7487 contains four quartz artefacts, TASI 7485 two artefacts and TASI 7486 one artefact. Unfortunately, Moore’s (1997) report and the individual site recording forms contain little more information than this. For TASI 7487, Moore and Summers entertain some doubt about their finds:
One of the quartz artefacts is clearly cultural. No quartz occurs naturally here, so the other three quartz pieces are probably cultural also (TASI 7487 Site Recording Form).

Graham (2005) located a further 19 sites in Survey Areas 1 and 2 (Figure 9, Vol. 2). The 19 in the TASI are either stone artefact scatters or isolated finds. Most were located along the edge of the transmission line easement or along the cleared, vacant easement running perpendicular to the sea. The artefacts appear to be flakes made from quartz, quartzite and chert. Two large cobbles were also recorded as artefacts.

Three of these sites (TASI 10004, 10005 and 10006) have the same, or very similar, grid references, in which case they seem to be multiple listings of the one site. TASI 9905 and TASI 10008 are also close and may be duplicate recordings.

### 6.3 Aboriginal sites along the proposed effluent pipe corridor

The regional surveys undertaken by Kee (1990) and Bourke (1998) covered the coastal strip entered by the proposed effluent pipe corridor. Significant Aboriginal sites were located along Bell Buoy Beach (substantial midden deposits) and Five Mile Bluff but none in the vicinity of Four Mile Bluff. The sites at Five Mile Bluff are badly eroded middens associated with dense scatters of stone artefacts. These were listed on the Register of the National Estate but have since been de-registered.

Bourke (1998) estimated the density of Aboriginal sites between Low Head and Pipers River to be 0.9 sites/km of coast compared to 1.9 sites/km for the coast between Pipers River and St. Patricks Head. The relative paucity of Aboriginal sites along the strip of coast proposed for the effluent pipe has been confirmed by surveys undertaken for the Basslink Project (Stanton, 1999; Stanton, 2000; Stanton, 2001) and the Tasmania Natural Gas Project (Stanton and Painter, 2001).

Table 2 lists the Aboriginal sites known along the proposed effluent pipe corridor. The two at Four Mile Bluff are located on dune ridges that overlook the Basslink outfall. The isolated artefact recorded by Stanton (2000) was a large pebble chopper flaked on one side (TASI 8743). The midden recorded by Graham during monitoring of the Basslink Project consists of a few small fragments of shell and a beach cobble described as a manuport (TASI 9675). He also recorded an isolated grey quartzite flake ~1 km to the south east (TASI 9714) and an isolated quartz flake at Lauriston Park near Bell Bay on the outskirts of George Town (TASI 9713). Figures 10 and 11 (Vol. 2) show the locations of these sites in relation to the proposed effluent pipe route.
### Table 2

Registered Aboriginal Sites along the Proposed Effluent Pipe Corridor

<table>
<thead>
<tr>
<th>Site</th>
<th>Locality</th>
<th>Site Type</th>
<th>Recorder</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>TASI 8743</td>
<td>Four Mile Bluff</td>
<td>Isolated Artefact</td>
<td>Stanton</td>
<td>2000</td>
</tr>
<tr>
<td>TASI 9675</td>
<td>Four Mile Bluff</td>
<td>Shell Midden</td>
<td>Graham</td>
<td>2004</td>
</tr>
<tr>
<td>TASI 9714</td>
<td>Long Flat</td>
<td>Isolated Artefact</td>
<td>Graham</td>
<td>2004</td>
</tr>
<tr>
<td>TASI 9713</td>
<td>Lauriston Park</td>
<td>Isolated Artefact</td>
<td>Graham</td>
<td>2004</td>
</tr>
</tbody>
</table>

**Notes**
1. The site details are those used by the Aboriginal Heritage Section of the DTPHA
2. The set of sites is derived from the digitised TASI database.

### 6.4 Aboriginal sites along the proposed water supply pipelines

According to the TASI, a total of five Aboriginal sites are located in, or very close to, the corridor(s) proposed for the water supply pipeline (Table 3, Figures 12-15, Vol. 2). Of these, the East Arm site (TASI 6589) is particularly significant because of its size (~400 m X 100 m) and the number and variety of stone artefacts represented. These include horse hoof cores, scrapers and flakes (with or without retouch) and hammerstones. The raw materials utilized were cherty hornfels, mudstone, petrified wood, quartz, quartzite and a range of different coloured cherts. The site was located by Ross et al. (1992) as part of an investigation for widening of the East Tamar Highway.

### Table 3

Registered Aboriginal Sites along the Proposed Water Supply Pipeline Routes

<table>
<thead>
<tr>
<th>Site</th>
<th>Locality</th>
<th>Site Type</th>
<th>Recorder</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>TASI 6589</td>
<td>East Arm</td>
<td>Stone Artefact Scatter</td>
<td>Ross et al.</td>
<td>1992</td>
</tr>
<tr>
<td>TASI 8473</td>
<td>Mount Direction</td>
<td>Isolated Artefact</td>
<td>Hamilton</td>
<td>1999</td>
</tr>
<tr>
<td>TASI 4008</td>
<td>Alanvale</td>
<td>Isolated Artefact</td>
<td>Kee</td>
<td>1990</td>
</tr>
<tr>
<td>TASI 0224</td>
<td>Newnham</td>
<td>Stone Artefact Scatter</td>
<td>Sutherland</td>
<td>1972</td>
</tr>
<tr>
<td>TASI 0220</td>
<td>Dilston</td>
<td>Raw Material Source</td>
<td>Sutherland</td>
<td>1972</td>
</tr>
</tbody>
</table>

**Notes**
1. The site details are those used by the Aboriginal Heritage Section of the DTPHA
2. The set of sites is derived from the digitised TASI database.
TASI 0224 is thought to be the location of a stone artefact site first described by David (1923). Sutherland (1972) placed it overlooking the Tamar River in what are now the grounds of the Launceston campus of the University of Tasmania. It is doubtful whether any traces of the site remain, as concluded by Kee (1990). She did, however, locate an isolated artefact in the neighbouring suburb of Alanvale (TASI 4008). This was a “single platform cherty hornfels core located on the Tamar floodplains”. An isolated cherty hornfels flake (TASI 8473) was also located by Hamilton (1999) on the lower slopes of Mount Direction adjacent to the East Tamar Highway.

Sutherland (1972) also attempted to re-locate an Aboriginal stone source at Dilston, known from 19th century and early 20th century records. This resulted in the registration of an area north of Dilston as TASI 0220. The early records of both TASI 0220 and 0224 place these sites at the edge of the Tamar River. The registered site localities are well inland, which is at odds with their early descriptions.

7. PROJECT DESIGN AND SURVEY METHODOLOGY

7.1 Site predictive model

Previous Aboriginal heritage studies indicate that the most frequently recorded Aboriginal sites in the Tamar Estuary region are open campsites represented by stone artefacts. Isolated stone artefacts are also common. The stone used to manufacture these artefacts was procured from quarries or other raw material sources, which are also recognized as important site types. Closer to the shoreline, shell middens may be the dominant site type. Based on these observations of Aboriginal site types and their landscape setting, the following predictions can be made of Aboriginal site locations within the areas proposed for the Gunns development.

Open campsites and isolated artefacts are possible in all of the proposed development areas. They are typically found on well-drained, level ground within 300 m of water sources, so are most likely to be encountered on the margins of the Tamar River and its tributaries and around wetlands such as those formed in the swales of the east-west dune ridges.

Stone quarries and raw material sources may be encountered wherever there is rock outcrop or loose stone suitable for the manufacture of stone artefacts. In the Tamar Estuary region, the type of stone preferred included chert, quartzite, quartz and cherty hornfels. However, most of the areas proposed for development are composed of dolerite or Tertiary/Quaternary sand. Therefore, the chance of finding a stone quarry is probably low.
Shell middens are restricted to locations along the shoreline where there is ready access to shellfish and other marine or estuarine resources. Shell middens are possible anywhere along the shore of the Tamar Estuary and the Bass Strait coast. Usually they have an associated fresh water source.

Burials may be possible in the soft, easily-dug sand close to Four Mile Bluff but this would depend on preservation factors such as the acidity of the sandy soil.

The chance of encountering rockshelter sites with or without rock art in any of the proposed development areas is low because of the absence of sandstone formations and granite overhangs.

7.2 Field methodology

7.2.1 Logistics

Fieldwork was undertaken between August and October, 2005 by archaeologist Tim Stone and Aboriginal Heritage Officer Steve Stanton. The team met with Gunns planner Suzette Weeding at regular intervals throughout the project to be appraised of survey requirements and land access issues.

7.2.2 Survey methods

The archaeologist and Aboriginal Heritage Officer inspected all of the proposed development areas and linear disturbance corridors on foot. The team generally walked ~10 m apart, examining the ground surface for Aboriginal archaeological traces such as stone artefacts and shells. Figures 16 and 17 show the transects surveyed across Survey Area 1 and 2 and the proposed work area behind Four Mile Bluff. The corridors and areas proposed for development shown in Figures 3-5 received similar close attention. Very high coverage was achieved for all of these areas given the time spent in the field and the intensive nature of the investigation.

Areas with high ground surface visibility such as cleared easements, vehicle tracks and sheet-eroded areas were paid particular attention. Creek bank collapse and road cuttings afforded subsurface visibility. The team members also examined the wave-cut cliff sections at Four Mile Bluff and the dune blowouts behind these.
Figure 16. Transects surveyed across Survey Areas 1 and 2
Figure 17. Transects surveyed in proposed work area behind Four Mile Bluff
7.2.3 Access to survey areas and weather conditions

Access was available to all of Survey Area 1 and 2 and the proposed temporary accommodation camp site. However, some small sections of the proposed effluent pipe corridor and water supply pipe routes were off-limits because of land-owner issues.

The sections off-limits along the proposed effluent pipe corridor were:

- ~100 ha of a property between Long Flat and Aerodrome Road (see Figure 3);
- ~1.35 km long section through the Ruyter and Parish property on the northern outskirts of George Town (see Figure 3);

Those off-limits along the water supply routes were:

- ~600 m long section through the Westwood Holdings and Costello properties along Egg Island Creek (see Figure 4).
- ~1 km long section through the Taylor and Unwin properties near Saltwater Creek (see Figure 4).
- ~1 km section through the Doaks property at Dilston (see Figure 4).
- ~500 m long section through the Lee property overlooking the Tamar Cut (see Figure 4).
- ~200 m long section through a small Local Government Authority area in the Launceston suburb of Trevallyn (see Figure 4).

Weather conditions during the survey were highly variable, ranging from flooding to fine.

7.3 Recording methods

For this investigation Aboriginal sites were defined as any location where evidence of Aboriginal activity was exposed. When an Aboriginal site was located the following variables were recorded:

Site designation: sites were allocated names according to the area that they were located in e.g. Dirty Bay 1-n in Survey Area 1.

Site type: open campsites represented by scatters of stone artefacts and isolated artefacts were recorded.
Grid co-ordinates: this information was derived from a hand-held Global Positioning System (GPS). GDA was the grid reference system used in recording sites. 

Environmental setting: This describes the sites environmental context including such features as geomorphology, vegetation and local hydrology. 

Aspect: direction at which the site faces. Aspect is often thought to be a key determinant of site location. 

Site size: refers to the dimensions over which artefacts are visible. 

Visibility: a measurement of the conditions of ground surface visibility in the survey area. Ground visibility conditions will affect whether sites are detected and whether their full extent has been recorded. 

Site contents: This is a description of the artefacts at the site. With stone artefact scatters the features recorded included raw material, artefact type, artefact dimensions, presence of retouch or use wear and any general comments considered relevant. It is important to realise that these artefact measurements are only preliminary descriptions, as more detailed recording is considered to be more appropriate if a mitigation phase is undertaken for this or other regional projects. 

Site condition: describes the condition of the site in terms of factors which may have disturbed it (such as roadworks, tree clearing etc.) or which have the potential to disturb. 

Management considerations: This details the potential threat to the site specifically in terms of the proposed development. In addition, specific ameliorative measures are recommended if warranted. In some cases the recommendation is simply that no active management is necessary apart from avoiding the site. Where active measures are deemed necessary, these have been discussed with the representatives of the Tasmanian Aboriginal Land and Sea Council. 

8. SURVEY COVERAGE DATA 

8.1 Conditions of visibility 

Conditions of ground surface visibility will affect how many sites are located. Visibility may also skew the results of a survey. If, for example, conditions of ground surface visibility vary dramatically between different environments, then this in turn will be reflected in the numbers of sites reported for each area. The area with the best visibility may be reported as having the most sites (because they are visible on the ground) while another area with less visibility but perhaps more sites will be reported as having very little occupation. It is important therefore to consider the nature of ground surface visibility as part of any archaeological investigation.
Conditions of ground surface visibility (Table 4) were typically 10-20 %, although this was much higher (80 %) at the proposed temporary accommodation camp site because heavy machinery had scraped clear the surface. Visibility of 10-20 % was largely the result of patchy vegetation caused by soil saturation, grazing or other disturbances. Much higher visibility was afforded locally by wave-cut sections and dune blowouts along the open coast and vehicle tracks and cuttings further inland.

### Table 4

**Conditions of Visibility in the Proposed Development Areas**

<table>
<thead>
<tr>
<th>Work Area</th>
<th>Landforms</th>
<th>Vegetation</th>
<th>Visibility (%)</th>
<th>Exposures</th>
<th>Survey method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulpmill Survey Area 1</td>
<td>Coastline, creek sides, hillslopes, ridgetops, sand sheets</td>
<td>Dry sclerophyll forest, casuarinas, lomandra, bracken fern, tussocks</td>
<td>15</td>
<td>Vehicle tracks, sheet erosion, wave-cut sections, road-cuttings, upturned trees</td>
<td>Pedestrian</td>
</tr>
<tr>
<td>Pulpmill Survey Area 2</td>
<td>Coastline, creek sides, valley, hillslopes, ridgetops</td>
<td>Dry sclerophyll forest, casuarinas, lomandra, bracken fern, tussocks</td>
<td>10</td>
<td>Vehicle tracks, sheet erosion, wave-cut sections, road and rail cuttings</td>
<td>Pedestrian</td>
</tr>
<tr>
<td>Effluent pipe corridor</td>
<td>Coastline, dunes, swamps, creek sides, valleys, hillslopes</td>
<td>Dry sclerophyll forest, introduced pines, bracken fern, gorse, tussocks, pasture</td>
<td>20</td>
<td>Wave-cut cliffs, dune blowouts, vehicle tracks, sheet erosion, road-cuttings</td>
<td>Pedestrian</td>
</tr>
<tr>
<td>Water supply pipe routes</td>
<td>Coastline, swamps, creek sides, valleys, floodplains, hillslopes, ridgetops</td>
<td>Dry sclerophyll forest, lomandra, bracken fern, tussocks, pasture, willows, gorse</td>
<td>10</td>
<td>Vehicle tracks, sheet erosion, road cuttings, animal pads, industrial activity</td>
<td>Pedestrian</td>
</tr>
<tr>
<td>Temporary accommodation camp</td>
<td>Sand plain</td>
<td>Dry sclerophyll forest</td>
<td>80</td>
<td>Dozer activity</td>
<td>Pedestrian</td>
</tr>
</tbody>
</table>

### 8.2 Coverage analysis

Coverage analysis is a useful measurement to allow cultural resource managers to assess surveys from adjacent areas and it also allows some meaningful calculation of the actual sample size surveyed. The actual or *effective* area surveyed by a study depends on the conditions of ground surface visibility. Conditions of surface visibility are determined by vegetation cover, geomorphic processes such as sedimentation and erosion rates and the abundance of natural rock that may obscure cultural material.
Approximately 10% of the proposed work areas were inspected on foot, with an effective coverage of 1.5% (Table 5). While this figure may seem low, it is in fact a significant proportion of the total subject area, more so given that each surveyor could view (though not intensively) about 20 m around the surveyed lines and thus could target features likely to contain cultural material.

### Table 5

**Effective Coverage of the Proposed Development Areas**

<table>
<thead>
<tr>
<th>Work Area</th>
<th>Total Area (m²)</th>
<th>Visibility (%)</th>
<th>Coverage (m²)</th>
<th>Effective Coverage (m²)</th>
<th>Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulpmill Survey Area 1</td>
<td>1,950,000</td>
<td>15</td>
<td>114,400</td>
<td>17,100</td>
<td>1</td>
</tr>
<tr>
<td>Pulpmill Survey Area 2</td>
<td>2,370,000</td>
<td>10</td>
<td>121,600</td>
<td>12,160</td>
<td>0.5</td>
</tr>
<tr>
<td>Effluent pipe corridor</td>
<td>3,006,000</td>
<td>20</td>
<td>267,200</td>
<td>53,440</td>
<td>1.75</td>
</tr>
<tr>
<td>Water supply pipe routes</td>
<td>4,000,000</td>
<td>10</td>
<td>640,000</td>
<td>64,000</td>
<td>1.6</td>
</tr>
<tr>
<td>Temp. accomm. camp</td>
<td>188,600</td>
<td>80</td>
<td>14,400</td>
<td>11,520</td>
<td>6</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>11,514,600</strong></td>
<td><strong>1,157,600</strong></td>
<td><strong>158,220</strong></td>
<td><strong>18</strong></td>
<td></td>
</tr>
</tbody>
</table>

9. **RESULTS**

A total of 30 previously recorded Aboriginal sites were located in the survey areas and corridors proposed for development, which is all of those listed in Tables 1-3 but one (TASI 9714). Most were stone artefact sites (scatters, isolated artefacts or stone sources), with one being a shell midden. However, stone artefacts could only be confirmed at nine of the registered site locations. In some cases, there was nothing diagnostic (e.g. negative flake scars, bulb of percussion) about the stone recorded and in others the registered site was not near the locality described in the TASI record. On this basis, the Aboriginal Heritage Office re-allocated some of the TASI numbers to fit the pattern of site distribution determined here.

Two previously unknown Aboriginal stone artefacts were also located during the survey. One is an isolated find (TASI 9942) and the other is considered to be part of a previously recorded site (TASI 9896). A third isolated artefact that was part of a
Previously recorded scatter (the multi-listed TASI 10004/10005/10006) is now TASI 9900. These new recordings, and four previously located sites that were re-recorded, are described fully in Volume 2.

9.1 Survey Area 1

9.1.1 Previously identified Aboriginal sites

Archaeological survey of Survey Area 1 was problematic. Graham had (2005) recorded 14 sites in this area, although four of these are multiple or duplicate site listings (Figure 9, Vol. 2). The multiple listing is TASI 10004, 10005 and 10006, which is really one site. TASI 10008 duplicates the previously recorded TASI 9905.

The 11 actual sites previously recorded had been flagged in the field with yellow tape, usually tied to a wire stake. When re-located by this survey team, the stone artefacts at five of these sites (TASI 9896, 9900, 9903, 9905/10008 and 10004/10005/10006) were found in clumps adjacent to the yellow flags, and sometimes under slabs of dolerite. These clumps typically ran alongside a track, with seven clumps at the largest site, which is TASI 9903 (designated Big Bay 1, Vol. 2).

Piles of stone, or single pieces, had also been flagged at TASI 9897, 9898, 9899, 9901, 9902 and 9904). The stone pieces at these sites were predominantly quartz fragments or small cobbles. It was presumed that these were also meant to be artefacts but no diagnostic properties of worked stone could be identified. Unlike the five sites where stone artefacts were clearly visible, these sites were not optimally-located for camping or fresh water and one was actually in the intertidal zone.

The difficulty with identifying stone artefacts at these six sites was not due to poor ground surface visibility. Five of the sites (TASI 9897, 9898, 9899, 9901 and 9902) were supposed to be located on vehicle tracks running down the side of cleared easements. Ground surface visibility on these ~2 m wide (sometimes braided) vehicle tracks was close to 80% and off-track usually >50% because of sheet erosion. The site in the intertidal zone (TASI 9904) had no cover.

The Aboriginal Heritage Office of the DTPHA determined that TASI 9897, 9898, 9899, 9901, 9902, 9904, 10004, 10005, 10006 and 10008 should be removed from the TASI database. TASI 9900 and 9896 were re-allocated to fit the results of this survey.
9.1.2 Newly identified Aboriginal sites

Figure 18 and Plates 1 and 2 (Vol. 2) show the results of this survey of Survey Area 1. In summary, Survey Area 1 contains three open campsites represented by scatters of stone artefacts (TASI 9896, 9903 and 9905) and one isolated artefact (TASI 9900, see also Vol. 2). The isolated artefact had originally been recorded as part of the TASI 10004/10005/10006 stone artefact scatter. An additional find is a broken quartzite blade now considered to be part of TASI 9896.

No site types such as stone quarries or rockshelters were located in Survey Area 1 because suitable rock outcrop is lacking. No shell middens were located along the Tamar shore, with coastal erosion possibly a contributing factor.

The four recorded sites could possibly be described as a site complex, with TASI 9903 being the focal point for Aboriginal occupation in the local area. This site is the most extensive in the area and was probably used by Aboriginal people over many generations. The smaller sites (TASI 9896, 9900, and 9905) were probably linked to this site by pathways, with the ridgetop site (TASI 9896) possibly providing a good local vantage point. The site complex probably arose in this area because land suitable for Aboriginal occupation between the Tamar River and the Tippogoree Hills is constrained. The sites that were chosen for camping are ideally located for access to the Tamar Estuary and fresh water sources.

9.2 Survey Area 2

9.2.1 Previously identified Aboriginal sites

Archaeological survey of Survey Area 2 was similarly problematic. Graham (post-draft report) recorded five sites in this area (TASI 10001, 10002, 10003, 10007 and 10009, Figure 9, Vol. 2), four of which were re-located adjacent to yellow flagging. The exception was TASI 10007, where no stone artefacts or flagging could be seen at the grid reference supplied. Nor was there a match between this grid reference and the photograph of the site contained in the TASI site recording form.

Of the four re-located sites, a stone artefact could only be positively identified at one of them. This is the TASI 10001 isolated artefact, which is a silcrete flaked piece (4 cm X 3 cm) displaying three negative flake scars, some cortex and an unambiguous bulb of percussion. A photograph of this site and the artefact is contained in the TASI 10001 site recording form completed by Graham.
Stone pieces matching photographs in the original site recording forms were re-located at TASI 10002 and 10003 but were adjudged not to be artefacts because of the lack of any diagnostic properties. Stone artefacts were expected at the TASI 10009 scatter, which is located adjacent to Williams Creek. However, despite the 100% visibility along the creek edge, where the artefacts were supposed to be, not a single piece of any kind of stone was found. The creek edge is, in fact, the floor of a swampy depression that has been incised in recent times. It is unlikely that Aboriginal people would have chosen to camp in the middle of a swamp.

The survey team also attempted to re-locate the three sites recorded by Moore (1997) in the upper reaches of Williams Creek (TASI 7485, 7486 and 7487). The quartz artefacts comprising these sites were located by Moore on the main vehicle track through the area, close to the creek crossing. Despite the very high visibility along this track and in wide, sheet-eroded areas adjoining the creek, no quartz artefacts could be identified. Non-artefactual quartz fragments, however, were commonplace. These probably originated from a stockpile of quartz rubble dumped at the track entrance, presumably for road-building or surfacing of the track. Chipped or broken quartz from this pile would be easy to mistake for quartz artefacts.

The Aboriginal Heritage Office of the DTPHA determined that TASI 10002, 10003, 10007 and 10009 should be removed from the TASI database. This leaves a total of four known Aboriginal sites in Survey Area 2 (Figure 19, Vol. 2). All are stone artefact sites but the only stone artefact that could be identified was at TASI 10001.

9.2.2 Newly identified Aboriginal sites

No new Aboriginal sites were located in Survey Area 2. Most of this area is steep, dolerite hillsides, with Aboriginal site potential mostly confined to the shore of Big Bay and the corridor of Williams Creek. This negative result is unlikely to be a factor of poor ground surface visibility. The Big Bay shoreline is steep, rocky and eroding and any possible midden material would be clearly visible. The Williams Creek corridor is cut by a vehicle track, with several more branching from it in the upper catchment. These tracks expose potential Aboriginal campsites along the creek but no stone artefacts were recorded.
9.3 The proposed effluent pipe corridor

9.3.1 Previously identified Aboriginal sites

Three previously recorded Aboriginal sites were re-located along the proposed effluent pipe corridor (Figures 10 and 11, Vol. 2). Two of these (TASI 8743 and 9675) overlook the proposed effluent pipe outfall at Four Mile Bluff. The third (TASI 9713) is located in Lauriston Park south of George Town. A fourth site (TASI 9714, Table 2) was not re-located because it is outside the proposed disturbance corridor.

TASI 8743 recorded by Stanton (2000) was re-located but the isolated artefact he described (a large pebble chopper) was missing from the site (Plate 3, Vol. 2). TASI 9675 consists of shell, as described by Graham on the TASI site form. The shell consists of a small and diffuse scatter of warrener buttons, limpet and whelk, which extends up the blown-out face of a dune (Plate 3, Vol. 2). A small, unworked cobble from the high-energy shore below is also present. Flaked stone artefacts are absent.

The Lauriston Park site recorded by Graham (TASI 9713, Vol. 2) was re-located in a highly disturbed context beneath powerlines. The site is an isolated quartz flake, which was found adjacent to a star picket tied with yellow tape (Plate 3). The whole area has been heavily impacted by the construction of transmission line towers and is strewn with fractured quartz and dolerite rubble.

9.3.2 Newly identified Aboriginal sites

One Aboriginal site was newly identified in the proposed effluent pipe corridor (Figure 20, Plate 3, Vol. 2). This site (TASI 9942) is represented by an isolated quartzite flake that had been left in the broad swale between two east-west dune ridges of the Ainslie Sand Formation (see Vol. 2 for details).

In summary, a total of four Aboriginal sites have been located in, or close to, the proposed effluent pipe corridor. Three are isolated stone artefacts and one is a shell midden. No other site types such as stone quarries or rockshelters were located because of the absence of suitable rock outcrop. Thick midden deposits are also absent in the vicinity of Four Mile Bluff, possibly because of the stresses imposed by the high-energy conditions and the severity of wave-attack.
9.4 The proposed water supply pipeline routes

9.4.1 Previously identified Aboriginal sites

Two of the five Aboriginal sites recorded previously along the proposed water supply pipeline routes (Table 3) were able to be re-located. These were TASI 6589 (the East Arm site) and TASI 8473, an isolated artefact near Mount Direction. Figures 12 and 13 and Plate 4 (Vol. 2) show the locations of these sites.

Two of the previously recorded sites listed in Table 3 (TASI 0220 and TASI 0224) could not be re-located because their whereabouts are based on historical approximations rather than precise location. These sites are remembered as being “at the edge of the Tamar River” but the TASI actually shows them along proposed water supply pipeline routes, far-removed from the Tamar shore (Figures 14 and 15, Vol. 2).

No Aboriginal cultural material was recorded at the registered sites of TASI 0220 and 0224. The former is in a swampy paddock near Dilston while the latter is located on a grassy verge in the grounds of Launceston campus of the University of Tasmania, overlooking the East Tamar Highway. Neither of these registered localities have any potential to contain Aboriginal cultural material.

A fifth site previously recorded along one of the proposed water supply pipeline routes is TASI 4008 (Table 3). This site is represented by a single core located by Kee (1990) on a rise adjacent to the Tamar River (Figure 15, Vol. 2). Although the landform containing this site could be re-located, no Aboriginal cultural material could be detected. It was assumed that the artefact is still present beneath the thick grass cover.

9.4.2 Newly identified Aboriginal sites

No new Aboriginal sites were located along any of the proposed water supply pipeline routes. This may be attributable to the poor conditions of ground surface visibility encountered during the survey but it is also important to note that site types such as stone quarries and rockshelters are definitely not represented along the proposed routes as suitable rock outcrop is lacking. Furthermore, urbanization and industrial expansion around Launceston has heavily modified the Tamar shore and hinterland, which would have destroyed any pre-existing Aboriginal sites.

Two areas were noted where Aboriginal sites might still be present beneath the grass cover. One is the slopes overlooking the large, linear swamp between Coulsons Creek and Dilston. The other is the Station Creek crossing south of Dilston. Both areas have the potential to contain subsurface Aboriginal sites.
9.5 The proposed temporary accommodation camp

No Aboriginal sites were located in the area proposed for a temporary accommodation camp on the outskirts of George Town, despite the exceptionally high (80%) ground surface visibility. The area appears to have once been used as rubbish pit and thus presents a highly modified surface. Furthermore, most of the vegetation of the area has been leveled, leaving little of the original ground surface.

In all likelihood, Aboriginal sites were never present in the area because it is not near any significant watercourses or swamps and there is no rock outcrop suitable for stone quarries or rockshelter formations.

10. DISCUSSION

The results of the survey confirm that proximity to the coastline (either open coast or sheltered estuary) is a prime determinant of Aboriginal site location in the Tamar Estuary region. A pattern emerges of large stone artefact scatters located at bay heads with reliable sources of freshwater close by. Such sites include Big Bay 1 (TASI 9903) and the East Arm site (TASI 6589). Smaller stone artefact scatters and isolated artefacts are associated more with ephemeral drainage lines (e.g. TASI 9905 and 9900), hinterland swamps (e.g. TASI 9942) and the high-energy coast (e.g. TASI 8743). Other sites are of less certain origin (e.g. TASI 9713).

TASI 9903 at the head of Big Bay was the largest site encountered. It is optimally located next to a creek fed by three drainage lines, overlooking Big Bay. The stone assemblage at this site contains a diverse assortment of raw materials (quartz, quartzite, chert and siltstone) but little variety in artefact type. All were waste flakes or flaked pieces <3 cm. No cores were recorded. This suggests that the imported stone was highly valued and reduced with maximum efficiency.

Previous surveys by Moore (1997) and Graham (2005) resulted in the recording of a large number of exclusively quartz artefact sites, quite different to TASI 9903 (Table 1). These artefacts could either not be re-located or when found showed no diagnostic features of worked stone. The common denominator with these quartz artefact sites is their location on tracks used by light and heavy vehicles. Few quartz pieces, worked or otherwise, were observed off these vehicle tracks.

Plate 5 shows a possible origin for these quartz ‘artefacts’. The quartz outcrop protrudes through a track in Survey Area 1. It has been fractured by machinery, which has
produced sharp pieces of quartz that could be easily mistaken for artefacts. Examples of this were also seen in Survey Area 2 where there is actually a mullock heap of quartz rubble used for surfacing the tracks. It is considered here that the previously diagnosed quartz artefacts may instead be ‘dozerfacts’. Moore and Summers have already entertained such doubts about their finds (see Section 6.2).

Only one site in Survey Areas 1 and 2 breaks with the pattern of location adjacent to drainage lines. This is TASI 9896 located on an elevated ridgetop overlooking Dirty Bay and Big Bay in the distance. Although only three stone artefacts were recorded at this site, it is suggested that these are the visible signs of a possibly more extensive site that covers all of the north side of the ridgetop. It is this northerly aspect that would have made it favourable for Aboriginal occupation. Sub-surface excavation is required to test this hypothesis because of the thick vegetation at the site.

Few Aboriginal sites were located (or re-located) in the vicinity of the proposed effluent pipe outfall at Four Mile Bluff, which is consistent with the results of previous surveys in the area (see Section 5.3). One explanation for the low numbers of sites may be the retreat of coastal cliffs due to wave-attack. The precarious position of some fencelines at Four Mile Bluff suggests that these cliffs have retreated some distance since the European invasion. If any Aboriginal sites were located along this retreating shore, they probably would have been removed long ago.

Only one Aboriginal site was located in the shelter of the dune ridges of the Ainslie Sand Formation (TASI 9942). The paucity of Aboriginal cultural material in this relict dune ridge system suggests that it was largely unoccupied. A barrier to occupation may have been the impeded drainage, which formed an extensive network of swamps in the swales of the dune ridges. Modern drainage works have emptied these swamps but in the Aboriginal past they may have been filled with thick, impenetrable vegetation making occupation undesirable. In effect, the waterlogged conditions (and lack of other resources) could have created an unwelcoming “wet desert”.

The negative result at the Launceston end of the survey is due largely to the impact of urbanization, in particular the modifications to the Tamar Estuary and floodplain. This urban development probably destroyed TASI 0220 and 0224 and any others associated with occupation of the Tamar shore. Away from the estuary shore, the likelihood of Aboriginal sites decreases. The steep-sided approaches to the artificial Lake Trevallyn present few potential Aboriginal site locations.
11. ASSESSMENT OF SIGNIFICANCE

The significance of archaeological sites such as those found during this study are usually assessed in terms of their importance to archaeologists (i.e. their scientific significance) and their importance to Aboriginal people. Once the significance of a site has been assessed it can be ranked against others and specific recommendations formulated. Criteria for assessing scientific significance are set out below. The values used in this assessment have been the subject of some discussion in the archaeological literature and the information provided is drawn from a number of sources (e.g. Bowdler, 1983). In making each assessment it should be noted that degrees of significance are a guideline only and may vary between site types.

Seven Aboriginal sites are the subject of this assessment of scientific significance. They are TASI 9900, 9903, 9905 (Survey Area 1), 10001 (Survey Area 2), 9713 (Lauriston Park), 9942 (Four Mile Bluff) and 8473 (Mount Direction). These are all the sites where it was possible to identify Aboriginal cultural material either in, or close to, areas of proposed impact. Another is TASI 9896, located in Survey Area 1. The scientific significance of this site is not assessed at this stage because not enough is known about the site. Others identified could not be re-located (TASI 0220, 0224, 4008, 7485, 7486, 7487, 8743) or will not be impacted (TASI 6589, 9675).

11.1 Scientific Significance

A number of criteria are used to assess the scientific significance of a site. These include the integrity of a site, its structure and contents. All of these criteria combine to give a site its value as a research tool for archaeologists. In addition to the above criteria a site may also be of scientific significance because of its representativeness. It is a basic tenet of archaeology that any site which is not represented elsewhere is ipso facto of great value because archaeologists are concerned with preserving a representative sample of all site types for future generations.

Site Integrity refers to its state of preservation or condition. A site can be disturbed through a number of factors including natural erosional processes, destructive land use practices or repeated use of a site in the past by both humans and animals.

<table>
<thead>
<tr>
<th>Scale</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>low</td>
<td>highly disturbed or poorly preserved with little research potential.</td>
</tr>
<tr>
<td>moderate</td>
<td>some disturbance but remaining cultural material allows for some research potential.</td>
</tr>
<tr>
<td>high</td>
<td>little or no disturbance to site, good preservation and considerable research potential.</td>
</tr>
</tbody>
</table>
In terms of site integrity, all seven of the Aboriginal sites would rate low. The three in Survey Area 1 (TASI 9900, 9903 and 9905) have been severely damaged by construction of the transmission line easement and access tracks, with the integrity of TASI 9903 and 9905 being further compromised by collection of the artefacts. The remainder, which are isolated artefacts, have been disturbed by agricultural practices (TASI 8473 and 9942), transmission line construction (TASI 9713) and the construction of a secondary road (TASI 10001). These sites have little research potential, although the largest, TASI 9903, may be of some interest.

*Site structure* refers to the physical dimensions of a site i.e. its area and depth or stratification. A large site or a site with stratified deposits usually has more research potential than a small site or surface scatter. In some instances, however, specific research questions may be aimed at smaller sites in which case they would be rated at a higher significance than normal.

- **low** small surface scatters with no stratified deposit.
- **moderate** medium to large surface scatters with or without stratification.
- **high** large *in situ* surface scatters, any site with stratified deposit.

The stone artefact scatter TASI 9903 would rate moderate according to the site structure criterion. This is because it is a medium to large surface scatter albeit without stratification because it is on an erosional surface. However, the other stone artefact scatter (TASI 9905) and the five isolated artefacts (TASI 8473, 9713, 9900, 9942 and 10001) rate low because all are small sites, with no sign of stratification in any of the exposures. In fact the surfaces of all these sites are degrading and the artefacts in them are present at or near the surface.

*Site contents* refers to the range and type of occupation debris found in a site. Generally, sites that contain a large and varied amount of organic and non-organic material are considered to have greater research potential than those sites with small, uniform artefacts.

- **low** small amount and low diversity of cultural material.
- **moderate** medium amount and diversity of cultural material.
- **high** large and diverse amount of cultural material.

The stone artefact scatter TASI 9903 contains a medium amount of cultural material, with a limited range of artefact types (flakes and flaked pieces) struck from a wide variety of raw materials. It therefore rates moderate by the site contents criterion. Conversely, the other six stone artefact sites contain only small amounts of worked stone and little variety in artefact type. For this reason, these sites rate low according to this criterion.
Representativeness refers to how often a particular site type occurs in an area and requires some knowledge of the background archaeology of the area in which the study is being undertaken. Sites that are representative of the local and regional archaeological record may have value for that reason and if a site is rare or unique in some way then it is *ipso facto* significant (Bowdler, 1983).

- low: many of the same site type occurring in a single area or region.
- moderate: site type occurs elsewhere but not in great quantity or with good preservation.
- high: site type is rare or unique.

On the basis of the results of previous archaeological investigations (e.g. Kee, 1990; Kee, 1991; Moore, 1997) and information held in the TASI it is clear that stone artefact scatters and isolated artefacts are common in northern Tasmania, particularly along the coast and inland waterways. The stone artefact sites located during this study therefore are not unique and are well represented outside the study area.

### 12. STATEMENT OF ABORIGINAL SIGNIFICANCE

All land, irrespective of its current tenure or the presence of Aboriginal sites and other values, has high cultural significance, for individual Aboriginal people and for the Aboriginal community collectively.

The northern region of Tasmania is widely recognized as having very high cultural significance for the Tasmanian Aboriginal community. The region contains a wealth of Aboriginal sites, special places, and areas of cultural importance to Aboriginal people. The Aboriginal community in conjunction with the Tasmanian government, and private landowners and developers, is actively involved in the management of many of these culturally significant areas.

Aboriginal sites and other landscape values help to strengthen the links between Aboriginal people and the land. For this and other reasons all Aboriginal sites are significant irrespective of their size or the integrity of the landscape in which they are currently located. Long term Aboriginal use of the Tamar River is clearly evident in Survey Area 1. This is shown by the presence of extensive camp sites such as TASI 9903, which result from Aboriginal use of the area and its resources over many generations. Due to the Aboriginal significance of these sites and the surrounding landscapes in which they occur, and of other Aboriginal sites which have been identified during this study, they should not be disturbed by the proposed development.
The proponents of the proposed development should recognize Aboriginal interests by ensuring that these sites are avoided and protected.

The ongoing modification and disturbance of the Tasmanian land mass, when considered as a whole, is a matter of concern to the Aboriginal community. These changes have the potential to destroy Aboriginal values and conflict with Aboriginal associations with land. The proponents have an opportunity to address some of these concerns and to recognize Aboriginal interests in the area of the proposed development by ensuring that those Aboriginal sites and landscapes that have been identified are protected and, in future, are managed in a manner that is consistent with the aspirations of the Tasmanian Aboriginal community.

European invasion of the Tasmanian land mass has resulted in the destruction of many Aboriginal sites, special places and whole landscapes. The sites identified during this study remain as clear evidence of Aboriginal use of, and association with, land. They provide highly important and tangible links to the land for past, present and future generations of Aboriginal people and should, therefore, be protected and maintained. A crucial step in this direction would be for the proponents of the proposed development to engage the TALSC in meaningful discussions, not only to recognize Aboriginal interests but also to facilitate this process.

13. ABORIGINAL COMMUNITY CONSULTATION

There is a recognized need to inform and consult with the Tasmanian Aboriginal community on all matters concerning Aboriginal cultural heritage. The TALSC, as Aboriginal community representatives, have established protocols to ensure that the cultural heritage interests of the Aboriginal community are maintained and protected. These protocols also assist in ensuring that matters pertaining to Aboriginal cultural heritage are dealt with in a culturally appropriate manner, in compliance with the relevant State and Commonwealth legislation.

The TALSC were informed of the study and authorized access to the TASI prior to the commencement of fieldwork. The results of the assessment were discussed with the Manager of the TALSC at a meeting held on the 30th November, 2005. The recommendations in this report were developed in close consultation with the TALSC Manager and accord with those discussions.
As per established protocols and in order to facilitate the process of close consultation with the Aboriginal community, two copies of this report should be provided to the TALSC.
14. RECOMMENDATIONS

Based on the results of this investigation and consultation with the Tasmanian Aboriginal Land and Sea Council it is recommended that:

1. Care should be taken to avoid any further disturbance to the large TASI 9903 site. This could be achieved by incorporating the area of the site into a reserve or buffer zone and by ensuring that works associated with the construction and operation of the proposed pulpmill and effluent pipe do not impact on the site. Gunns Limited should negotiate with the TALSC and AHO an appropriate size for the buffer zone to protect the identified Aboriginal heritage.

2. Similar care should be taken to avoid any further disturbance to TASI 9896, 9900, 9905 and 10001, which may also be impacted by the construction and operation of the proposed pulpmill. Gunns Limited should negotiate with the TALSC and AHO appropriate sizes for buffer zones to protect the identified Aboriginal heritage. A small reserve will have to be created within the proposed mill site car park to ensure that the part of TASI 9896 located in the transmission line easement is not disturbed further.

3. The part of the ridgetop that contains TASI 9896 should be investigated further by archaeological test-excavation to determine the contents, stratigraphy, extent and significance of the site. Any cultural material recovered should be analyzed and returned to the Tasmanian Aboriginal community through the Aboriginal Heritage Office of the DTPHA. Management recommendations for this site can only be formulated once more is known about the scientific and Aboriginal significance of the site. A permit application will be required for the recommended archaeological test-excavation. This may require investigation of feasible site management alternatives.

4. Gunns Limited should avoid disturbing the three Aboriginal sites in the area proposed for a solid waste disposal site and quarry (TASI 7485, 7486 and 7487). This could be achieved by incorporating these sites into reserves or buffer zones. Appropriate sizes for the buffer zones to protect the identified Aboriginal heritage should be negotiated with the TALSC and AHO. If site avoidance is not feasible, Gunns Limited should engage a suitably skilled and experienced Aboriginal Heritage Officer to re-locate the artefacts contained in these sites to a culturally appropriate, alternative site. A permit application will be required for removal of the artefacts beforehand, if this option is pursued. This may require investigation of feasible site management alternatives.
5. Care should be taken in Lauriston Park to avoid any further disturbance to the isolated artefact (TASI 9713), which is located close to the proposed disturbance corridor for the effluent pipe. This could be achieved by incorporating this site into a reserve or buffer zone. Gunns Limited should negotiate with the TALSC and AHO an appropriate size for the buffer zone to protect the identified Aboriginal heritage. The isolated artefact has been marked with a star picket and should be easy to avoid.

6. Care should also be taken to avoid any further disturbance to the Aboriginal sites located close to the proposed effluent pipe outfall at Four Mile Bluff (TASI 8743, 9675 and 9942). This could be achieved by incorporating these sites into reserves or buffer zones. Gunns Limited should negotiate with the TALSC and AHO an appropriate size for the buffer zones to protect the identified Aboriginal heritage. If any of these sites are to be disturbed by the proposed development, a permit application will be required beforehand. This may require investigation of feasible site management alternatives.

7. Care should also be taken that installation of the proposed water supply pipeline does not further disturb the East Arm site (TASI 6589) and the isolated artefact (TASI 8473) near Mount Direction. This could be achieved by incorporating these sites into reserves or buffer zones. Gunns Limited should negotiate with the TALSC and AHO an appropriate size for the buffer zone to protect the identified Aboriginal heritage. The East Arm site is just outside the proposed disturbance corridor whereas the isolated artefact is located inside a proposed disturbance corridor. If disturbance to the isolated artefact (TASI 8473) cannot be avoided, Gunns Limited should engage a suitably skilled and experienced Aboriginal Heritage Officer to re-locate the artefact to a culturally appropriate, alternative site. A permit application will be required for removal of the artefact beforehand, if this option is pursued. This may require investigation of feasible site management alternatives.

8. Care should also be taken not to disturb TASI 4008, which is located close to proposed water supply pipeline routes for the Tamar River crossing. This could be achieved by incorporating this site into a reserve or buffer zone. Gunns Limited should negotiate with the TALSC and AHO an appropriate size for the buffer zone to protect the identified Aboriginal heritage.

9. Should the proposed water supply pipe route that passes through TASI 0220 and 0224 be selected for pipe installation, Gunns Limited should write to the AHO seeking confirmation that these registered sites are not within the proposed
The study has established that the registered site locations do not contain any Aboriginal heritage items.

10. Monitoring for subsurface Aboriginal cultural material should be undertaken by an Aboriginal Heritage Officer and archaeologist between Coulsons Creek and Dilston and at the crossing of Station Creek south of Dilston. The monitoring should be undertaken during the initial vegetation removal and trench excavation phase of pipeline installation. If results are inconclusive after removal of vegetation, shovel-testing is recommended prior to trench excavation. Any other ground disturbance works in these areas should also be monitored. Monitoring of trench excavations should continue until the Aboriginal Heritage Officer and archaeologist are satisfied that culturally sterile horizons have been reached. In the event that Aboriginal cultural material is identified at depth in the excavated trench, the alignment of the pipeline may need to be altered in order to ensure that such material is avoided.

11. Those areas along the proposed effluent and water supply pipe routes that could not be accessed because of land owner issues should be surveyed for Aboriginal sites once permission to enter this land has been obtained. Further Aboriginal consultation would also be a requirement.

12. Gunns Limited should establish dialogue and consult with the Tasmanian Aboriginal Land and Sea Council on all matters pertaining to Aboriginal site management throughout the course of the proposed pulpmill development. Gunns Limited should invite TALSC representatives to any relevant meetings/discussions regarding the proposed pulpmill. Gunns Limited should also keep the TALSC appraised of developments with the project and ensure that any other areas it might impact are similarly surveyed for Aboriginal sites and associated landscape values.
REFERENCES


APPENDIX

Supplementary Report
BACKGROUND

Towards the end of the Aboriginal site investigation, Gunns Limited requested that the archaeological survey team of Tim Stone and Steve Stanton also survey some additional areas proposed for development. These additional areas were either variations of previously surveyed corridors or new areas proposed for the expansion of Gunns existing chip mill at Long Reach. This supplementary report details the results of Aboriginal site survey of these additional areas.

The additional areas investigated were:

- Two 20 m wide corridors running from the western boundary of Survey Area 1 to the transmission line substation adjacent the George Town golf course, a total distance of approximately 1.5 km.
- A 100-150 m wide corridor centred on the road that runs from the East Tamar Highway to the Long Reach chip mill, a distance of ~1.8 km.
- The shoreline of the Long Reach chip mill, which is proposed for a conveyor belt, a distance of ~500 m.
- A proposed Outside Chip Storage (OCS) located between existing OCSs.
- An additional 20 m wide corridor ~200 m long near the intersection of the East Tamar Highway and Windermere Road.

These areas are shown in the four maps at the end of the supplementary report.

According to the Tasmanian Aboriginal Site Index (TASI), no Aboriginal sites have been located previously in any of these additional investigation areas.

RESULTS

Survey Area 1 – George Town golf course substation corridors: No Aboriginal sites were located along the two corridors that link Survey Area 1 with the transmission line substation. Most of this distance follows existing transmission line easements through heavily modified rolling terrain. Ground cover was mostly grass, blackberry bushes and low scrub with ground surface visibility limited to vehicle tracks and disturbed patches of soil. The potential for Aboriginal sites along these two corridors is very low because of the extent of disturbance to the original landscape.
Long Reach chip mill: No Aboriginal sites were located along the road corridor that enters the Long Reach chip mill, or along the Long Reach shoreline including proposed OCS site. The road corridor straddles steep, dolerite hillsides where evidence of Aboriginal occupation would be extremely unlikely. The shoreline of the chip mill proposed for a conveyor belt is also highly unlikely to contain Aboriginal sites because it is has been completely modified by the construction of breakwater walls, access roads and wharves. The proposed OCS site, which is set back from the shoreline, has a sealed road running through it and is also an unlikely Aboriginal site location.

East Tamar Highway/Windermere Road corridor: No Aboriginal sites were located along this small length of corridor. The area traversed is a lightly-timbered ridgetop with a cover of grass and bracken. Ground surface visibility was available through patches of sheet-eroded soil and estimated at ~10%. The absence of Aboriginal sites on this ridgetop probably reflects its distance from potable water.

RECOMMENDATION

Notwithstanding principal comments in relation to land contained in the Statement of Aboriginal Significance (see Section 12, main body of the report), there can be no objection on archaeological grounds to development proceeding in the areas described above. It is recommended, therefore, that proposed developments be allowed to proceed without further Aboriginal site investigation.