

Port of Hastings Development Project Aboriginal Cultural Heritage Desktop Assessment



Aboriginal Cultural Heritage Desktop Assessment

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In May 2016 the Special Minister of State asked Infrastructure Victoria to provide advice on the future capacity of Victoria's commercial ports. Specifically, the Minister has asked for advice on when the need for a second container port is likely to arise and which variables may alter this timeline. The Minister has also asked for advice on where a second container port would ideally be located and under what conditions, including the suitability of, and barriers to investing in, sites at the Port of Hastings and the Bay West location.

In undertaking this task, Infrastructure Victoria reviewed work that was completed as part of the Port of Hastings development project before it was cancelled in 2014. This document forms part of the initial work undertaken for the proposed port development at Hastings. Infrastructure Victoria considers that much of the previous Hastings work, although preliminary in nature, is relevant and suitable for informing a strategic assessment. Therefore, Infrastructure Victoria has made the reports previously commissioned for the development project part of the evidence base on which Infrastructure Victoria will use in providing the Minister with advice.

The opinions, conclusions and any recommendations in this document are based on conditions encountered and information reviewed at the date of preparation of the document and for the purposes of the Port of Hastings Development Project.

Infrastructure Victoria and its consultants have used the information contained in these reports as an input but have not wholly relied on all the information presented in these reports.

Draft for discussion purposes

Port of Hastings Development Project

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Executive Summary

Glossary of Terms

Term	Description
Authority	Port of Hastings Development Authority
Transport infrastructure development area	Road and provision for rail corridors and associated rail marshalling staging areas to connect the port with the state and national transport networks.
Marine development area	Marine components of the project including shipping channels, swing basins, anchorage and aids for navigation connecting the port to Bass Strait as well as dredging and dredge material management.
Port landside development area	Port precinct and port environs within the area zoned as Special Use Zone 1 (SUZ1) for port related activities, and the container terminal at Long Island Point which extends into the intertidal area of Western Port. Also includes the SUZ1 area at Crib Point and the Stony Point jetty.
Project	Port of Hastings Development Project
Project area	Area where the project is located
Study area	Area considered by this assessment

1.0 Introduction

1.1 Background

The Victorian Government has identified the Port of Hastings as the preferred site for the state's next major container port. This port is essential for the long-term economic growth of Victoria as container trades are increasing and the Port of Melbourne is expected to reach capacity.

The Port of Hastings Development Authority (the Authority) is progressing staged planning of the Port of Hastings Development Project (the Project) from 2014 to 2018, culminating in the development of a rigorous business case and a full environmental and social impact assessment.

The Authority has selected a team of specialists to undertake detailed environmental, social and economic studies that will form part of a strict approval process. Specialists will also plan the conceptual design of new port infrastructure including wharf facilities and a logistics precinct, with road and rail access to the Port. Involvement of community and industry will be a critical part of the success.

By the mid-2020s it is envisaged that a world-class sustainable container port facility will begin operations at Hastings, handling up to 3 million twenty foot equivalent units (TEUs) each year, increasing to around 9 million TEU by 2060.

The Project would include the following components:

- **Port landside development area** - includes the port precinct and port environs within the area zoned as Special Use Zone 1 (SUZ1) for port related activities, and the container terminal at Long Island Point which extends into the intertidal area of Western Port. The development area also includes the SUZ1 area at Crib Point and the Stony Point jetty.

- **Transport infrastructure development area** - road and provision for rail corridors and associated rail marshalling staging areas to connect the port with the state and national transport networks.
- **Marine development area** - marine components of the project would include shipping channels, swing basins, anchorage and aids for navigation connecting the port to Bass Strait as well as dredging and dredge material management.

1.2 Purpose of this Report

The Port of Hastings Development Authority (the Authority) requires desktop assessments to be undertaken for the part of the port landside development area comprising the SUZ1 at Hastings and the transport infrastructure development area to the south of Ballarto Road.

The desktop assessments are required to identify issues and constraints affecting the potential Project area and assist VicRoads and the Authority in meeting obligations required under applicable acts. These assessments will also inform the strategic assessment for the transport infrastructure development area that is currently being undertaken to determine the preferred transport corridor. The desktop assessments will include a review and incorporate the previous desktop studies completed on the Western Port Highway.

The aims of the desktop assessment for the current study area are as follows:

- to determine the level of previous archaeological investigation of the study area and the surrounding region;
- to determine the presence of registered Aboriginal cultural heritage places within the study area; and
- to determine the environmental context of the study area with regard to landform and geomorphology.
- reviewing and analysing this information to identify or characterise the Aboriginal cultural heritage site types and locations likely to be present within the activity area.

1.3 Scope

The scope of this report includes an evaluation of likely impacts to registered and potential VAHR places. This included an assessment of all known VAHR places and a review of relevant heritage assessments within the study area. A preliminary predictive model was developed to provide an understanding of the likely patterns of occupation and use of the landscape in the past.

The study area for this assessment is shown in Figure 1 and includes the Hastings SUZ1 component of the port landside development area and the transport infrastructure development area to the south of Ballarto Road. The Crib Point SUZ1, Stony Point jetty and transport infrastructure development area to the north of Ballarto Road are outside the scope of this assessment.

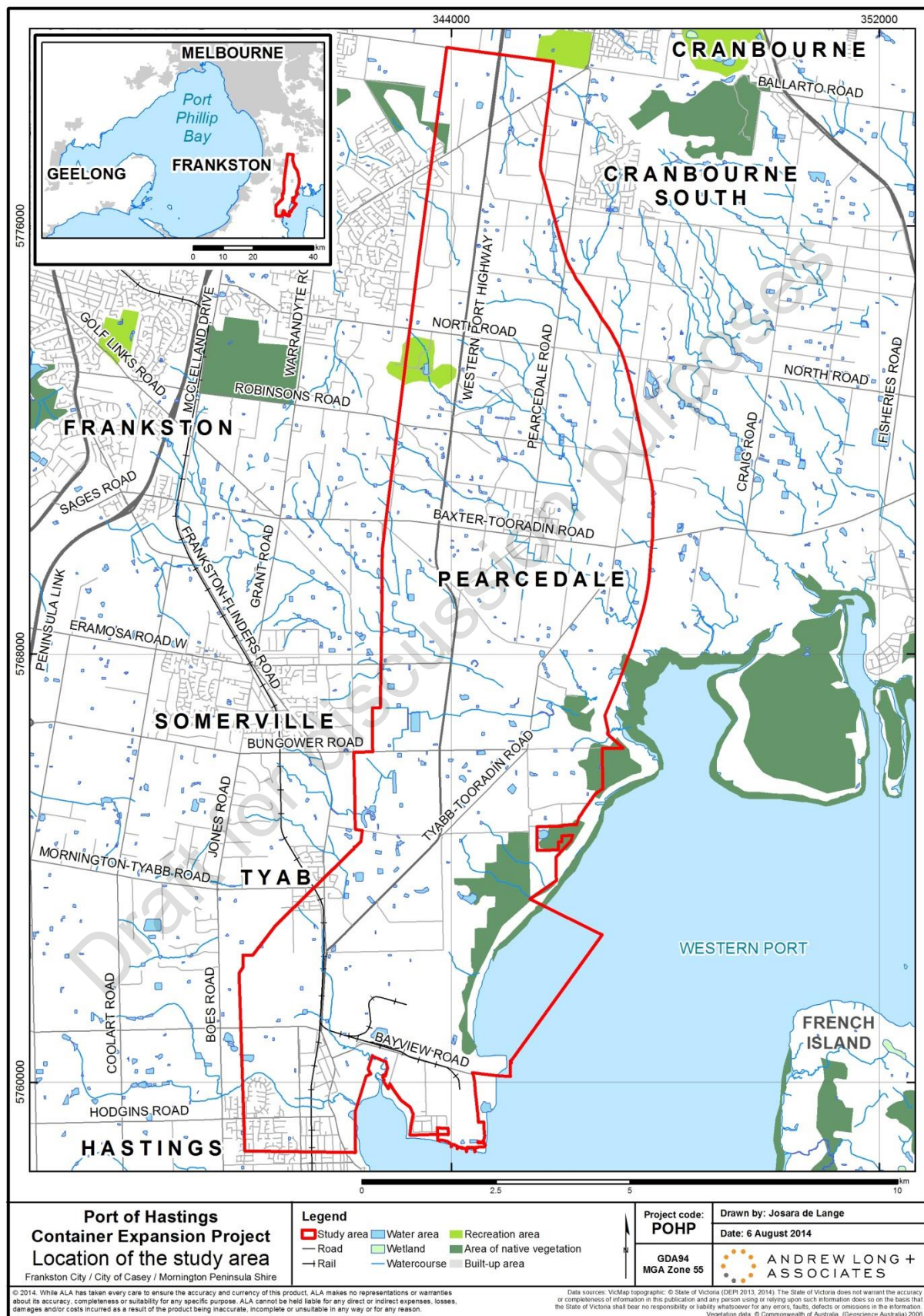


Figure 1: Location of the Study Area

Port of Hastings Development Project – Aboriginal Cultural Heritage Desktop Assessment

The contents of this document reflect Andrew Long + Associates Pty Ltd current position on the subject matter of this document. It is provided for discussion or information purposes and is intended to be a guide only. The contents of this document should not be relied upon as representing Andrew Long + Associates Pty Ltd final position on the subject matter, except where stated otherwise. Any views expressed by Andrew Long + Associates Pty Ltd in this document may change as a consequence of Andrew Long + Associates Pty Ltd finalising formal technical studies or specifications, or legislative, or procedure and regulatory developments. Any figures provided are indicative only, are subject to change and are dependent upon a number of factors.

2.0 Legislation, Policy and Guidelines

The following legislation, policies and guidelines detail the requirements of this cultural heritage assessment and future investigations regarding Aboriginal cultural heritage.

2.1 Commonwealth

Burra Charter

The Burra Charter and its accompanying guidelines define the basic principles, processes and practices upon which statutory assessments of heritage significance in Australia are based. In most cases the wording of the various sets of criteria will differ slightly: for example, the criteria used by the Victorian Heritage Council are worded differently from those used by the Australian Heritage Commission. All, however, are based on the same principles and incorporate general criteria such as the following:

- Association with special events, developments or phases;
- Rarity due to association with a distinctive way of life, custom, process, land use, function or design no longer practiced;
- Importance for demonstrating principal characteristics of a particular type or class of human activities (for example stating a stone quarry is a classic example of its type as it has all the features typically associated with utilised stone sources in good condition);
- Aesthetic value to the local community (for example as a landmark);
- Value for demonstrating a particular technical or creative process;
- Strong or special association with a particular community or ethnic group for social, cultural or spiritual reasons; and
- Special association with a famous person or group of people.

Generally these criteria can be grouped into three main categories: social (I), scientific (II) and historical (III), depending on the nature of a given place or item.

Native Title Act 1993

The purpose of the *Native Title Act 1993* is to provide recognition and protection of native title for Aboriginal and Torres Strait Islanders. Essentially, this act covers the following topics:

- (a) Acts affecting native title;
- (b) Determining whether native title exists and compensation for acts affecting native title.

The kinds of acts affecting native title are:

- (a) Past acts (mainly acts done before the commencement of the Native Title Act on 1 January 1994 that were invalid because of native title); and
- (b) Future acts (mainly acts done after the Native Title Act's commencement that either validly affect native title or are invalid because of native title).

2.2 State

Aboriginal Heritage Act 2006 and Aboriginal Heritage Regulations 2007

The Victorian *Aboriginal Heritage Act 2006* forms the framework within which Aboriginal heritage assessment is undertaken in Victoria. The Aboriginal Heritage Act provides for the protection and management of Victoria's Aboriginal heritage with processes linked to the Victorian planning system. Cultural Heritage Management Plans (CHMPs) and Cultural Heritage Permits are processes to manage activities that may harm Aboriginal cultural heritage. The *Aboriginal Heritage Regulations 2007* set out the circumstances in which a CHMP is required and the standards for the preparation of a CHMP. The Regulations also prescribe standards and set fees and charges.

The act recognises Aboriginal people as the primary guardians, keepers and knowledge holders of Aboriginal cultural heritage. Registered Aboriginal Parties (RAPs) are the organisations of Aboriginal people responsible for the management and protection of Aboriginal cultural heritage. RAPs have responsibilities relating to the management of Aboriginal cultural heritage under the act.

At the time of preparation of this report there were no RAPs for the activity area. There is currently two RAP applications for land that includes the activity area; *Boon Wurrung* Foundation Ltd (BWF) (30 December 2013) and the *Bunurong* Land and Sea Association Inc (BLASAI) (4 April 2014). The Victorian Aboriginal Heritage Council (VAHC) is yet to make a determination on the status of the BLASAI. The *Bunurong* Land Council Aboriginal Corporation (BLCAC) and the *Wurundjeri* Tribe Land and Compensation Cultural Heritage Council (WTLCCHC) had submitted applications for RAP status; however the applications they submitted were declined. Nevertheless the VAHC acknowledged that the WTLCCHC and BLCAC represent traditional owner groups for the areas of their former application and where no RAP is appointed, are to be consulted in relation to cultural heritage matters.

The triggers and issues which will affect the proposed project in relation to the Aboriginal Heritage Act and Aboriginal Heritage Regulations is the requirement to undertake a CHMP.

A CHMP is required if an environment effects statement is required (Part 4 Div 2 s49) -

- (1) This section applies if a proponent or other person is required to prepare an Environment Effects Statement under the *Environment Effects Act 1978* in respect of any works.
- (2) The proponent or other person must, before commencing the works, also prepare a cultural heritage management plan for the area in which the works are to be carried out.
- (3) In this section—
 - "Environment Effects Statement" and "proponent" have the same meanings as in the *Environment Effects Act 1978*;
 - "works" includes "public works" within the meaning of the *Environment Effects Act 1978*.

Victorian Aboriginal Heritage Register (VAHR) listings

The Victorian Aboriginal Heritage Register (VAHR) established by the Aboriginal Heritage Act is the administrative tool for the management of Aboriginal cultural heritage. The VAHR holds the details of all registered Aboriginal cultural heritage places and objects within Victoria, including their location and description. The Register also holds information of each RAP, their area of responsibility and contact details.

Traditional Owner Settlement Act 2010

The purposes of the *Traditional Owner Settlement Act* 2010 are to advance reconciliation and promote good relations between the State and traditional owners, and to recognise traditional owner groups based on their traditional and cultural associations to certain areas in Victoria. This includes recognising traditional owner rights and conferring rights on traditional owner groups as to access to, ownership or management of certain public land, as well as decision making rights and other rights that may be exercised in relation to the use and development of the land or natural resources on the land. At the time of writing, no recognition and settlement agreement has been entered into with any traditional owner group entity for the area of land where the project is to be located.

3.0 Methodology

The Desktop Assessment for the current study area was conducted between 4 -6 August 2014.

This investigation was undertaken by searching the Victorian Aboriginal Heritage Registry (VAHR) through the Aboriginal Cultural Heritage Register and Information System (ACHRIS). This search was undertaken on 4 August 2014.

Background research was also undertaken into the Aboriginal cultural heritage context and the environmental history of the study area. This involved reviewing existing information on the study area including:

- Geology, geomorphology and landforms within the study area as presented on GeoVic interactive mapping and resources available on Department of Environment and Primary Industries website;
- Biodiversity information as presented on Biodiversity interactive mapping, resources available on Department of Environment and Primary Industries websites and also relevant published works about environment and vegetation.
- Any reports regarding previous archaeological heritage investigations undertaken within or in the vicinity of the study area; and
- Any published works about the Aboriginal cultural heritage, historical and ethno-historical accounts of Aboriginal occupation and land use history of the study region;

Any conclusions that have been presented within the desktop assessment are based on information from the above sources.

The predictive model considered various existing spatial datasets including:

- Modelled 1750s Ecological Vegetation Classes
- Geological units
- Distance from water
- Elevation
- Slope

The specific data sets used and the relevant attributes are listed in Table 1.

Data set	Origin/custodian	Attribute
Modelled 1750s Ecological Vegetation Classes	NV1750_EVC; DEPI	X_GROUPNAME
Geological units	GeolUnit_250k_py (seamless); DEPI	FORMATTED_
Distance from water	Derived, from HY_WATER_AREA_POLYGON, HY_WATERCOURSE, Wetland_1788 and VICMAP_BOUNDARY (DEPI)	Distance
Elevation	DTM, derived, from VMELEV_CONTOUR (DEPI)	ALTITUDE
Slope	Slope surface, derived, from Elevation	ALTITUDE

Table 1 Data sets used in the construction of the predictive model

Two of the data sets used in the modelling are existing data sets (modelled 1750s EVCs and geological units; see Table 1), while the other three were derived from existing data sets. These derivative data sets are the distance from water data set, the elevation data set and the slope data set. The elevation data set was derived from the 10m contour lines (see Table 1) using the ArcGIS Spatial Analyst Interpolation tool. The slope data set was derived from the elevation data set using the ArcGIS Spatial Analyst Slope tool. The distance from water dataset was constructed by applying a multi-ring buffer on a merge of the following:

- Water areas: lake, watercourse area and wetland only; not origin = 2; within 10 kilometres of study area
- Watercourses: 50cm buffer on river, stream only; not origin=2; within 10 kilometres of study area
- Wetlands (1788): all wetlands within 10 kilometres of study area
- Vicmap boundary: all sea areas within 10 kilometres of study area

The coastal strip of semi-permanent saline wetlands, as represented in the Wetlands_1788 data set, was then clipped out of the multi-ring buffer and added as a separate polygon.

A selection of the most relevant attributes was assessed. These attributes were selected on the basis that the environmental features they represented would have had a modifying influence on the Aboriginal occupation and use of the study area and that this influence may be detectable in variations in the distribution and density of sites in the proposed road reserve.

Within each of the relevant attributes, ratings were assigned based on the relative distribution and density of Aboriginal places in each attribute unit and considering environmental factors within the study area.

The assumptions and limitations associated with the development of this report and the analysis of relevant data are identified below:

- VAHR cultural heritage place data can consist of anything from a single discarded stone tool to large-scale stratified cultural deposits containing hundreds of thousands of artefacts and spanning tens of millennia. As can their reporting range from short formulaic statements to complex, detailed research and analysis. A challenge for this assessment is that in some data sets single artefacts and large scale accumulations are undifferentiated and yet both are termed 'sites'. The available data is suitable for quantitative analysis, but has limited value for qualitative analysis.

All VAHR place spatial information has been presented as point data only, so it is not possible to represent place extent in relation to the area of land in which it is contained (i.e. an Aboriginal cultural heritage place may be illustrated as registered outside the study area but its extent may actually fall within the project area).

A practical implication of these limitations is that it is not always possible to develop an accurate understanding of the type, purpose and importance of each place for qualitative analysis and interpretation. There is very limited confidence in the ability of the available VAHR site data within the study area to accurately portray Aboriginal cultural heritage significance in the landscape.

In addition to the inherited limitations, there are a number of additional assumptions and limitations of the predictive model:

- Other relevant data sets not considered in this model exist were not accessible for various reasons.
- Absolute elevation data was of limited value without consideration of relative elevation from point to point.
- The outputs are models of the predicted occurrence of specific Aboriginal activities in the landscape and the resulting formation of particular types of Aboriginal cultural heritage places.
- The assumption inherent in the use of the parent data sets is that these data sets adequately reflect the class of phenomena they purport to reflect for the time period during which Aboriginal people were present in the area.
- Expert knowledge of Aboriginal activities in the study area and their surroundings is based on knowledge of what is a highly incomplete archaeological record. As a result of this incompleteness there are limitations to the expert assessments.
- The predictive models are limited by the fact that they represent a single modelling iteration, and have not benefited from systematic ground-truthing.
- Gaps occur in the existing datasets that will likely require ground-truthing.
- The influence of land use and the subsequent preservation of Aboriginal cultural heritage places were considered.
- Modelling for likelihood of specific Aboriginal heritage site types was not considered.

4.0 Results

4.1.1 Introduction

The study area for the current desktop assessment focuses on Dandenong-Hastings Road and land to the east and west of this road, extending in a southward direction from Ballarto Road in Skye/Cranbourne South to just south of Hodgins Road, Hastings. For the purposes of the proposed development, the study area has been divided into two sections – Transport infrastructure development area and Port Landside Development area. Transport infrastructure development area incorporates the majority of the study area from Ballarto Road to around Bungower Road, as well as land on the western side of Dandenong-Hastings Road at Tyabb, to Hastings. Port Landside Development area focuses on the remainder of the study area- the land around Ballarto Road to the Old Tyabb area and the Blue Scope Steel site (see Figure 1). Much of the background research for the wider study area is relevant for both the Port Landside and

the Transport infrastructure development areas, and is presented below in Section 4.0.2 – 4.0.5. Previous archaeological investigations and Victorian Aboriginal Heritage Registrations (VAHR) for both of these areas have been summarised separately in Sections 4.1 and 4.2.

4.1.2 Landforms, Geology and Geomorphology

The study area lies within the Southern Uplands geomorphic unit. The Southern Uplands unit in this area is characterised by (see Figure 2).

- Red Bluff Sandstone (Nbr)
- Inland dune deposits (Qd1)
- Murrindindi Supergroup (Sm)
- Swamp and Lake deposits (Qm1)
- Monbulk Volcanic group (Nuo)
- Alluvium and colluvium (Qb)
- Coastal lagoon deposits (Qg)
- Coastal dune deposits (Qdl1)

The study area passes through a mosaic of landforms, each of which would have comprised a distinct set of resources available to Aboriginal people in the past. In the south, the study area traverses the coastal lowlands to the east of the plateau of the Bellarine Peninsula. The landform in this area is characterised by low hills and plains to the west of Westernport. The study area rises to the north, particularly from Pearcedale northwards, ascending the slopes and hills of the Bellarine Peninsula before terminating at the Cranbourne Massif. Numerous unnamed waterways intersect the study area, with named waterways limited to the southern third of the study area, which contains Kings Creek and Olivers Creek. The geomorphological units within the study area are:

- Red Bluff Sandstone (Nbr) – These deposits date from the Miocene to Pliocene (5.3 to 2.6 million years ago), comprising sedimentary, fluvial: sandstone, conglomerate, siltstone and ironstone.
- Inland dune deposits (Qd1) – These deposits date from the Pleistocene (2.6 million to 11.600 years ago), comprising sedimentary, aeolian dune deposits, sand, clay and calcareous sand. This Unit, formerly referred to the ‘Cranbourne Sands’ is a geological formation comprising Pleistocene sand dunes and sheets overlying Miocene (‘Baxter’) sandstones. In the Late Pleistocene, during a low sea level phase when the climate was more arid, quartzose sand dunes, characterised by elongated ridges and parabolic dunes trending south eastward, formed in the region (LCC 1973, Map 3; LCC 1991, 53; Bird 1993, 193). It is important to note that many localised occurrences of ‘Cranbourne Sands’ are more widely distributed than indicated on existing geological maps. Elements of the ‘Cranbourne Sands’ formed during a period when Aboriginal people had already long inhabited Victoria, and are considered sensitive.
- Murrindindi Supergroup (Sm) – Siltstone, shale, sandstone rare conglomerate and limestone dating from Late Ordovician to Middle Devonian (440-460 million years ago to approx. 380-393 million years ago)
- Swamp and Lake deposits (Qm1) Qm1 – Dating from the Pleistocene to Holocene (2.6 million years ago to present) and comprising grey to black carbonaceous mud, silt, clay, and minor peat
- Monbulk Volcanic group (Nuo) –These comprise basaltic lava flows dating from the Miocene.
- Alluvium and colluvium (Qb)- These date from the Pleistocene to Holocene, comprising sedimentary, fluvial: alluvium, gravel, sand, silt.
- Coastal lagoon deposits (Qg) - These date from the Holocene comprising silt clay dark grey to black

- Coastal dune deposits (Qd1) - These date from the Holocene (11,600 years ago to present), comprising sand, silt and clay.

The study area occurs within the geomorphological area of very low relief (very low elevation, generally <100m), with Port Phillip Bay to the west and Western Port to the east.

Port Phillip Bay is a marine embayment, which has regularly become inundated during sea level rises over the last 30 million years. Port Phillip Bay occupies part of a fault-bounded structural depression (or sunkland) between Rowsley Fault, to the west and Selwyn Fault, to the east. On the east coast of the bay there are swampy lowlands behind sandy barrier beaches (Carrum and Tootgarook Swamps). The present form of Port Phillip Bay and the Mornington Peninsula became established c. 6,000 years ago during the most recent sea level rise, which flooded the Port Phillip basin.

The geology of Western Port is dominated by a complex history of volcanic activity, tectonic movements and changing sea levels. In the Late Pleistocene, during a low sea-level phase when the climate was more arid, quartzose sand dunes, characterised by elongated ridges and parabolic dunes trending south eastward, formed across the upland ridge at Cranbourne (LCC 1973, Map 3; LCC 1991, 53; Bird 1993, 193). Swamps formed in the low lying coastal plains, with the margins of Carrum and Koo Wee Rup Swamp occurring in close proximity to the study area (Bird 1993, 194).

Apart from the soils that are found on the sands, most of the soils in the study region comprise mottled yellow and brown texture contrast soils that are occasionally sodic. Sandy soils are strongly acidic with bleached sandy subsoil and a hard dark brown B Horizon of 'coffee rock' composed of organic matter with aluminium and/or iron compounds¹.

In summary, the geographic nature of the study area can be seen as having undergone change even within the relatively recent period of human habitation. Such changes include the formation of coastal and inland dune complexes, and extensive swamplands. The study area incorporates a wide range of terrains and would have held a correspondingly wide variety of floral, faunal, water and lithic resources. These resources would likely have rendered the region an attractive location for Aboriginal habitation and therefore the study area should therefore be considered archaeologically sensitive.

4.1.3 Environment and Vegetation

The current climate of the region containing the current study area is generally described as temperate with warm dry summers and cool winters (LCC 1991, Map 9). Average maximum temperatures at Stony Point, located to the south of the study area, are 12.9°C in July and 24.1°C in February. Average minimum temperatures are 7.1°C in July and 16°C in February.

in February. The area has a mean annual rainfall of 760.6 mm.² These climatic conditions constitute a region that was suitable for year-round habitation by Aboriginal people in the past. Consequently, the density of archaeological material in the study region would be expected to be higher than in areas only suited to seasonal occupation. Similarly, given the differences between seasonal subsistence activities, the range and variety of activities undertaken in the study region in the past would be expected to be of greater variety and may result in a more intensive utilisation of land, than in areas only inhabited for discrete seasons. It must be added that climatic conditions have changed markedly in the more than 30,000 years of Aboriginal occupation of Victoria. This indicates that Aboriginal land use in the study region during earlier periods, particularly prior to the Holocene (11,600 years ago to present) may have drastically differed to that of later periods. Resultantly, older archaeological material may be present in locations not indicated as sensitive based on current landform modelling.

¹ http://vro.depi.vic.gov.au/dpi/vro/vrosite.nsf/pages/landform_geomorphological_framework_3.3.1 - accessed 04-08-2014

² Bureau of Meteorology: http://www.bom.gov.au/climate/averages/tables/cw_086306.shtml - accessed 04-08-2014.

Vegetation across the majority of the study area prior to 1750 would most likely have consisted of Heathy Woodland and Grassy Woodland, with smaller areas of Swamp Scrub, Damp Sands Herb-rich Woodland and Swampy Riparian Woodland, Coastal Saltmarsh and Mangrove shrub land of the Gippsland Plain bioregion (see Figure 3).³ This vegetation would have comprised a richly varied environ, providing habitats of a wide range of flora and fauna, and therefore representing an attractive location for human habitation. Aboriginal occupation often focused on coastal land, waterways, and areas adjacent to water sources, including swamps, and these areas would have provided a wide range of food and material resources for Aboriginal people.

Water rushes and marsh vegetation as well as a number of plant-food resources important to Aboriginal people would have grown in nearby watercourses and swamps. The rivers, creeks, lagoons and swamp areas, would have supported various species of fish, eel, frogs, tortoises and other aquatic species as well as various birds, kangaroos, wallabies, wombat, possums and emu inhabiting the plains of the wider study area. Plants were used for non-culinary purposes; such as making nets, baskets, and ornaments. Grasses such as Kangaroo Grass (*Themeda triandra*), were used in the manufacture of fishing nets (Zola and Gott 1992, 58), while Tussock grass fibres were used to make string for bags, baskets and mats.

4.1.4 Ethno-history

In this section the available ethno-historical and historical information relating to Aboriginal people in the study region is briefly reviewed. This information can assist in formulating a model of Aboriginal subsistence and occupation patterns in the study areas. In conjunction with an analysis of the documented archaeological record of the region, the ethno-historical information also assists in the interpretation of archaeological sites in the wider area, and in predicting the potential location of archaeological site types.

The lives of Aboriginal groups in the study region were severely disrupted by the establishment and expansion of a European settlement in nearby Melbourne. As a result little information is available regarding the pre-contact lifestyle of Aboriginal people in the region. A full ethnographic search was outside the scope of this assessment and the following section summarises major syntheses previously undertaken on Aboriginal associations with the Westernport area in general in the pre-contact and post-contact period (i.e. Gaughwin & Sullivan 1984; Massola 1974).

The ethno-historical information presented within this report is based on the observations and writings of men from the nineteenth century, and certain contextual limitations should be considered when reading these accounts. As pointed out by Barwick (1984, 103), "...their jealousies, ambitions, loyalties and roles in colonial society shaped their inquiries and the content of their publications".

These nineteenth century authors were writing from an Anglo-centric and gender biased viewpoint for a colonial audience who had a very limited and generally negative view on Aboriginal life, heritage, and culture. Despite these shortcomings, nineteenth century ethnographical accounts are a useful resource; the information has often been provided to the author by Aboriginal informants or by first-hand observations and experience. Such information may include knowledge regarding regional Aboriginal stories, life, culture and beliefs, and this data has been utilised to inform the ethno-historical section of this report.

A language group consisted of independent groups of closely related kin, or 'clans', who were spiritually linked to designated areas of land through their association with topographic features connected to mythic beings or deities. Clan lands were inalienable and clan members had religious responsibilities (e.g. conducting rituals) to ensure 'the perpetuation of species associated with the particular mythic beings associated with that territory' (Berndt 1982, 4).

According to Barwick (1984, 118) and Clark (1990, 364) clans from the *Bun wurrung* language group, in particular, the *Bun wurrung balug*, are thought to have occupied land in the study area at the time of European contact. The *Bun wurrung balug* (spelling according to Clark 1990, 364, however numerous variants exist) occupied land at Point Nepean and Cape Schanck.

3 http://er-info.dpi.vic.gov.au/sd_weave/registered.htm - accessed 04-08-2014.

Some observations were made of Aboriginal groups, likely to be *Bun wurrung*, by explorers who entered the Western Port region in the early 1800s. In 1802 Bowen, the first mate on the *Lady Nelson*, briefly met a group of Aboriginal people at Settlement Point (20 kilometres south west of Lang Lang). Three months later Captain Milius from the *Le Naturaliste* expedition also met an Aboriginal group around Settlement Point, whom he described in terms of their temperament and body ornamentation. He also described following the group and an encounter with a 'family who were eating shell fish around a little fire' (Horton & Morris 1983, 21-25).

William Thomas, an Assistant Protector of Aborigines, recorded most of the little documented information regarding the lifestyle of the Aboriginal people in Western Port. He observed clans living a hunter-gatherer lifestyle, moving within their lands to make use of seasonal plant and animal resources (i.e. he noted that coastal clans used to travel by canoe to French Island to obtain eggs), trading opportunities and to meet ritual and kinship obligations. Whilst travelling through Western Port with an Aboriginal group he observed that:

...all are employed; the children in getting gum, knocking down birds etc.; the women in digging up roots, killing bandicoots, getting grubs etc.; the men in hunting kangaroos, etc., scaling trees for opossums etc. They mostly are at the encampment about an hour before sundown – the women first, who get fire and water, etc. by the time their spouses arrive...In warm weather, while on tramp, they seldom make a miam – they use merely a few boughs to keep off the wind, in wet weather a few sheets of bark make a comfortable house. In one half hour I have seen a neat village begun and finished. (Thomas in Gaughwin & Sullivan 1984, 93-94).

Inter-tribal relationships varied throughout the region. While the *Bun wurrung* were closely affiliated with *Woi wurrung* groups to the north, they had a long-standing dispute with the *Kurnai* in Gippsland, with many references to periodic raids carried out by both groups. In 1840 a *Bun wurrung* group arrived at Yallock station (8 kilometres north west of Lang Lang) on their way to carry out a reprisal raid in Gippsland. The women, children and old men of the group remained at the station 'hunting and fishing' until the raiding party returned five weeks later (Gunson 1968, 6).

By 1812 European seal hunters were visiting Western Port on a seasonal basis and by 1826 they were permanently settled at Phillip Island exploiting the seal colony at Seal Rocks (Gaughwin & Sullivan 1984, 82). The relationship between local Aboriginal groups and the sealers is not well documented however it has been reported that sealers carried out raids on Aboriginal territory, murdering men and stealing women (Massola 1974, 45).

The development of the township of Melbourne resulted in the loss of traditional lands and resources, the spread of disease, social breakdown and removal of both groups and individuals to reserves and mission stations. Aboriginal people from other clans and language groups were attracted to Melbourne for a variety of reasons, making it difficult to identify and document the ethno-history and post-contact history of specific Aboriginal clan groups after the period of initial settlement.

In 1835 land began being settled by European colonists with Aboriginal resources depleted by the introduced cattle. From 1839-1843 the Aboriginal people living in the Western Port region sought refuge in various stations set up by William Thomas (Barwick 1998, 31). Thomas hoped that the stations would encourage Aboriginal people to take up an agricultural lifestyle but spent most of his time unsuccessfully trying to keep Aboriginal people out of Melbourne. An 1839 census of Aboriginal people living in and around Melbourne recorded 12 Boonwoorong people (Lakic & Wrench 1994, 112-113). In 1847 an influenza epidemic further depleted their population. By 1866 most of the remaining Aboriginal people in the Port Phillip region, including *Bun wurrung*, were removed from their lands to Coranderrk Aboriginal Station (Clark & Heydon 1998).

Some Aboriginal people in the Western Port region were able to live outside of Aboriginal Missions in the latter half of the 1800s. Thomas managed to secure 832 acres of land at Mordialloc in 1852 at a location where Aboriginal people had camped since 1835. Thomas spent years trying to 'defend the interests of the *Bunurong*' who had strong attachments to the Mordialloc Reserve, by preventing its cancellation. Despite his efforts the Mordialloc Reserve was eventually revoked and sold in 1863, with some of the Aboriginal residents moved to Coranderrk Aboriginal Station, and the remainder staying in camps at Mordialloc and Cranbourne where the last of them died in 1877 (Barwick 1998, 35, 52, 66). Ben Brett, a European settler who arrived in Western Port in 1863, reported another Aboriginal camp in the region from around this time period. Brett recalled that three

or four Aboriginal people ‘...had a mia-mia at Tooradin, and used to come as far as Red Bluff’ and observed that the group shot ducks and caught eels in the Tooradin Creek which they would then sell (Brett in South Gippsland Development League 1966, 380).

The outcome of this brief review is that Aboriginal people in the study area were predominantly if not totally, swiftly removed from their traditional lands. Much traditional knowledge including that of previous areas of preferred habitation, were lost, with the result that archaeological investigation is currently frequently the only means of establishing historical Aboriginal activity patterns in the study area. The study area occupies lands for which little ethnographic information is available beyond the indication that at European contact it was inhabited by Aboriginal people practising traditional, frequently mobile lifestyles. Archaeological evidence of such habitation will likely be preserved in the form of lithic tools and the remains resulting from their production.

4.1.5 Land use history

The preservation or destruction of archaeological places within the study area is largely dependent upon the nature of use to which land within the study area has been put over the past two centuries. It is useful therefore, to briefly summarise the nature of European land-development in estimating the likely preservation of archaeological places within it:

The first permanent European occupation in the region occurred in the late 1830s with squatters taking up of large tracts of land across the wider area. These early pastoral runs were subdivided, amalgamated and reconsolidated to such a degree that tracing the precise locations of run boundaries is generally imprecise.

From the 1850s closer settlement of Victorian land was encouraged at the expense of pastoral leases formerly held throughout the state. Legislative attempts to ‘unlock the land’ continued through the 1860s. The majority of selections taken up in this period were relatively small blocks although a number of larger holdings were maintained and in places consolidated and expanded (Muir 2003, 16). Many selectors planted orchards throughout the regions while others combined fruit growing with dairying and sheep grazing (Butler and Associates 2001, 9).

Pastoral runs that were centred on present day Cranbourne appear to have concentrated on sheep as opposed to cattle, with cattle more common in the lower and wetter areas.

Hastings was one of the earliest settlements in the Mornington Peninsula region. In the 1840s fishermen settled at Kings Creek, which later became known as Hastings (Butler and Associates 2001, 14). The township of Hastings was not gazetted until 1889, although prior to 1866 the town location had been surveyed and many blocks of land were sold (Butler and Associates 2001, 50).

The Frankston-Stony Point railway line was completed in 1889, being constructed primarily for defence purposes as opposed to improving the transport of primary products and passengers (Butler and Associates 2001, 36). Nevertheless, the construction of the line provided significant advantages to communities situated along the route, accelerating the growth of towns such as Tyabb and Somerville (Butler and Associates 2001, 37).

Prior to the 1860s passengers and produce were predominantly transported overland to either Frankston or Mornington and then by ship or coach from these towns. However, from the 1860s, a number of jetties were constructed, including the Hastings jetty which resulted in a greater reliance on sea transport for the movement of passengers and goods (Butler and Associates 2001, 37). Despite the recognition of the advantages of Hastings as a port location no real attempt was made to develop the area as a port until the 1960s.

Within the Cranbourne region, horticultural activities initially served the local market, with the establishment of railway communications to Cranbourne and beyond in the late 1880s permitting the expansion of the market garden and orchard industries by guaranteeing a reliable transport system to the Melbourne and Dandenong markets. In later years market gardening expanded resulting in the extensive development of the Cranbourne Sands. In addition the Cranbourne sands have been and are continuing to be subjected to sand mining.

The southern section of the study area overlaps with what was once Bunguyan Run. The run was gazetted in 1850 and was originally 15,000 acres but was later subdivided. The Longwaring Run overlaps with the central section of the study area. This run was gazetted in 1850 and comprised 8,320 acres. The northern part of the study area was once the Tomoque Run (Spreadborough & Anderson 1983, 155, 170).

Within the Hastings section of the study area, the land has remained largely rural in character with grazing and dairying comprising the principal rural activities in the west. In the mid to late 20th century heavy industrial development and petrochemical storage facilities began to dominate much of the land to the north and south of Bayview Road.

The remainder of the study area throughout Cranbourne South and Pearcedale is largely rural in character with grazing, dairying and market gardens comprising the principal rural activities. The northern section of the study area also contains a degree of tree cover.

The development of pastoral properties as well as market gardens would have involved the wide scale clearance of native vegetation as well as the drainage of swamps and other low-lying flood prone areas. Other previous and current land uses of the study area and geographic region include the construction of the Western Port Highway which has resulted in the modification of the original ground surface. Drains, culverts and driveways have been excavated adjacent to the road and electricity poles and other service trenches installed.

The land use history of the geographic region can be summarised as consisting of three main phases:

- Phase 1 – predominantly pastoral occupation characterised by extensive runs used for the grazing of cattle and sheep with residential units scattered throughout this landscape, although dependent upon rises and elevations above surrounding swampy and flood prone areas.
- Phase 2 – ongoing pastoral use with increasingly more intensive use of the land through market gardening and the development of extractive industries such as sand mining. This phase was accompanied by increasing efforts to drain swamp and other wetland areas.
- Phase 3 – continuation of earlier uses to a reduced extent with a corresponding expansion of residential housing developments, roads, as well as the development of large areas for recreational facilities (i.e. golf courses and race courses).

In conclusion, the majority of the study area is currently predominantly of pastoral or agricultural nature, with relatively limited more intensive development ranging from extractive industries to residential development. The latter more intensive land uses are likely to have significantly negatively impacted on the Aboriginal archaeological record. Nevertheless, the vast majority of the study area, being pastoral, agricultural and other areas of open land holds high potential to contain in-situ archaeological remains.

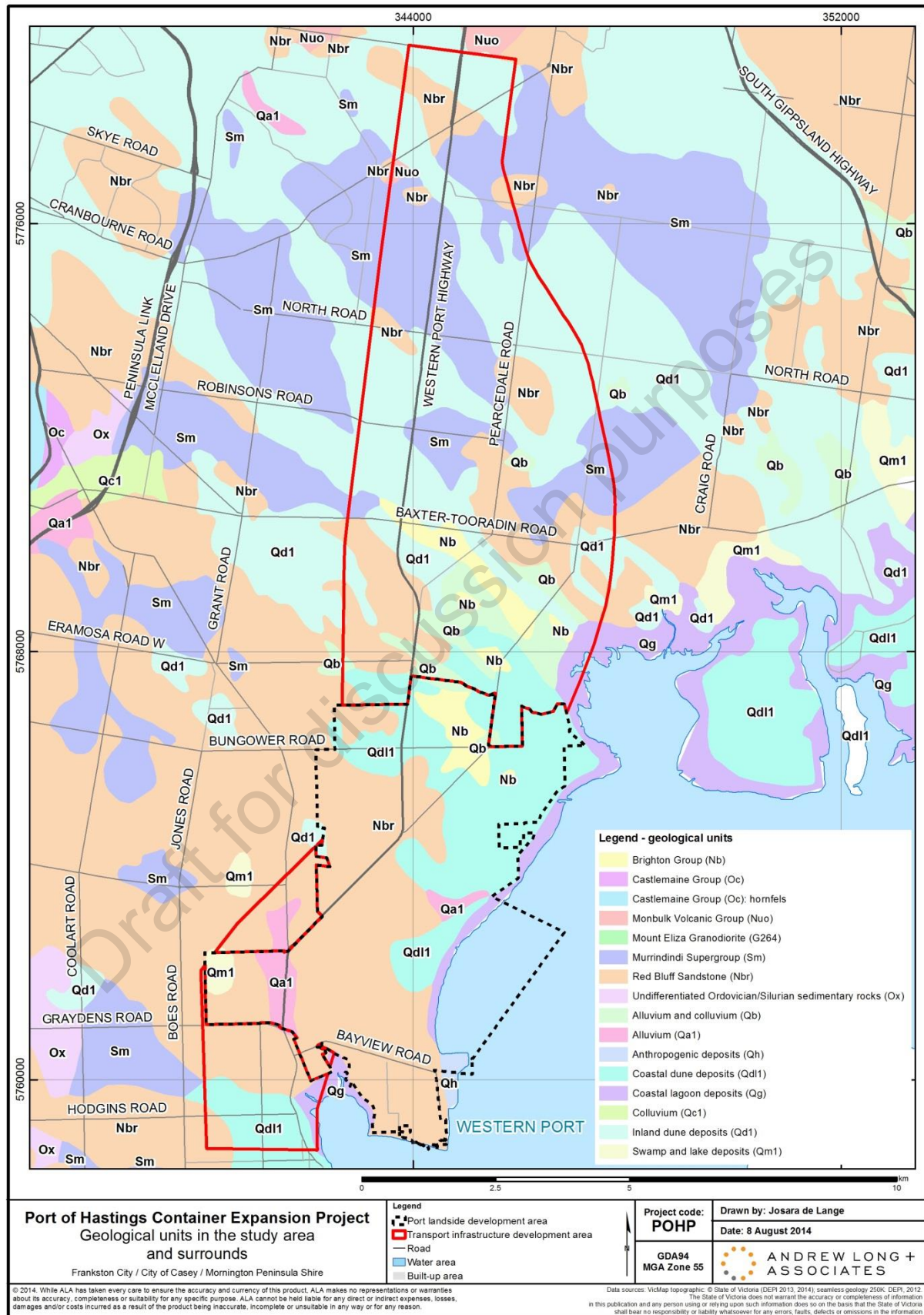


Figure 2: Geology in the study area

Port of Hastings Development Project – Aboriginal Cultural Heritage Desktop Assessment

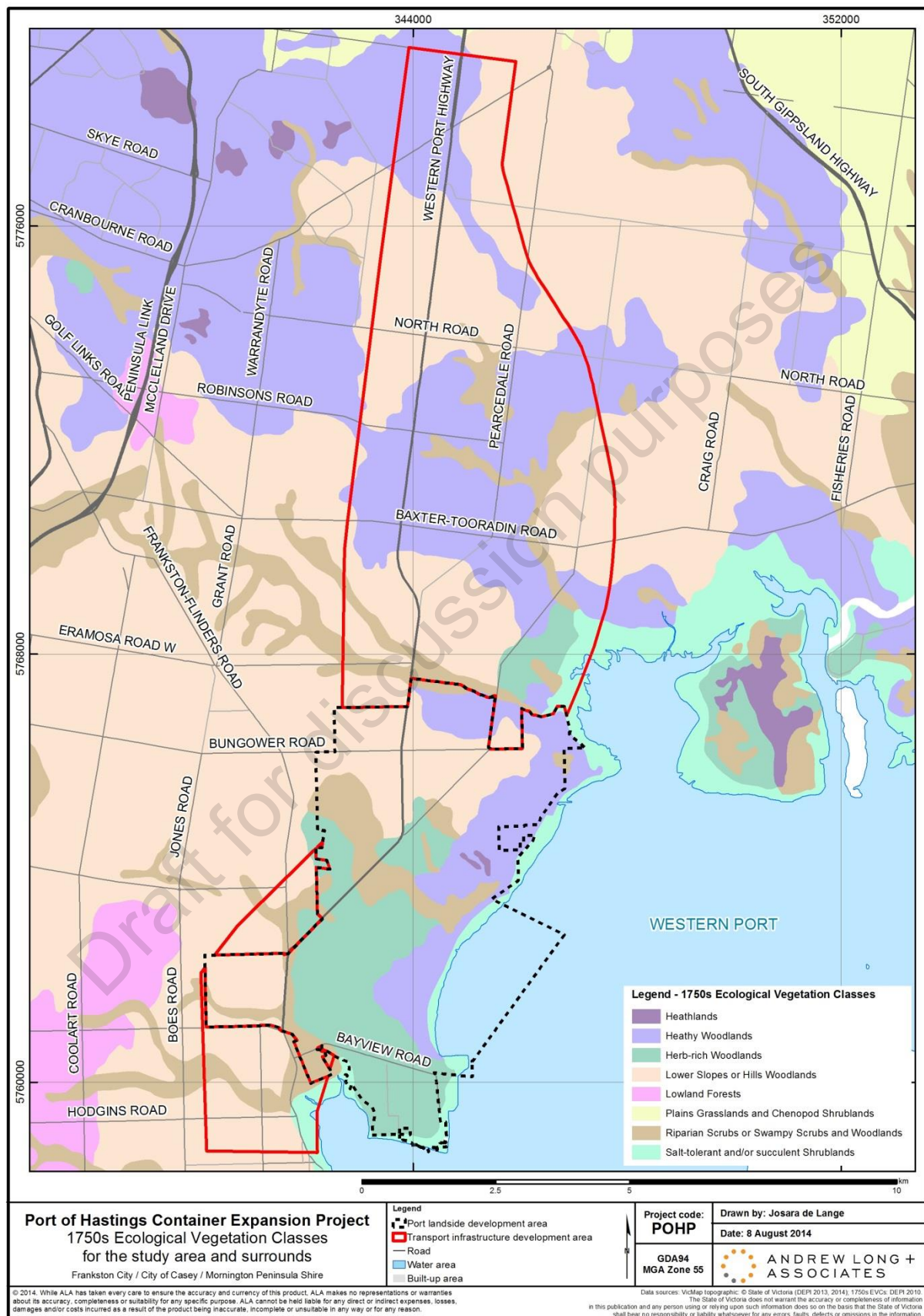


Figure 3: 1750s EVC for the study area

4.2 Port Landside Development Area (SUZ1)

4.2.1 Geomorphological units within Port Landside Development area

- Coastal dune deposits (Qdl1)
- Red Bluff Sandstone (Nbr)
- Alluvium and colluvium (Qb)
- Inland dune deposits (Qd1)
- Coastal lagoon deposits (Qg)

Pre1750s EVC information for the development area

The following Gippsland Plain bioregion EVCs are present in the Port Landside Development area:

- Swamp scrub
- Heathy woodland
- Grassy woodland
- Coastal saltmarsh
- Damp sands herb-rich woodland
- Damp heathland
- Mangrove shrubland

For detailed information about the geology, geomorphology, landforms, environment and vegetation present within this development area, please see Section 4, as well as Figure 2 and Figure 3.

4.1.2 Victorian Aboriginal Heritage Register Search

VAHR	Place Name	Primary Component	Approximate Dimensions	Surface/ Subsurface	Subsurface depth range (mm)	Contents (number of stone artefacts)	Raw Material	Contents	Landform	Topography
7921-0006	BUNGUYAN WATER HOLES BUNGUNYAN KINGS STATION	Artefact Scatter	20x35	Surface	-	-	(F/C)	Mollusc shell	-	Valley bottom, Swale, Hollow
7921-0007	SHOOTERS CAMP LAGOON	Shell Midden	-	-	-	-		"Midden: numerous small implements found"	-	-
7921-0036	LYSAGHT 1	Artefact Scatter	3500x1000	Surface/Subsurface	600	265	(S), (Q), (Qt), (F/C)	Other fine grained rocks. Hammer stones/pitted stones/grinding stones, worked flakes, broken blade, cores, backed artefacts	Hill/Plain	Side or base of hill, rise, knoll, dune
7921-0112	O'NEILS RD	Artefact Scatter	-	-	-	1	(S)	Blade core	Lowland plain	Flat, level
7921-0463	TYABB 1	Artefact Scatter	-	Surface	-	1	(F/C)	Unretouched/waste flake	Floodplain	-
7921-0841	BUNGOWER RD IA 1	Artefact Scatter	-	Subsurface	-	1	(Q)	Quartzite flake	Lowland plain	Level flat ground

S = Stone, (S) = Silcrete; (Q) = Quartz, (Qt) = Quartzite, (CQ) = Quartz Crystal, (F/C) = Flint/Chert; (FG) = Fine Grained Siliceous, (In) = Indeterminate; (Gl) = glass; (H) = Hornfels; (B) = Basalt; (BG) = Basalt/Greenstone; (BC) = Black Cobble; (C) = Chert; (J) = Jasper; (M) = Mudstone; (O) = Ochre; (Si) = Siliceous; (SS) = Siltstone, (I) = Ironstone; (IG) = Igneous, (U)=Unknown, (T/B) = Trachyte/Basalt, (MG) = Microgranite

Table 2: Aboriginal Cultural Heritage Places located within the Port landside development area at the time of the desktop assessment

The six registered Aboriginal cultural heritage places in the Port landside development area comprise Aboriginal stone artefact scatters and also a shell midden which may also contain Aboriginal stone artefacts. Several of these artefact scatters are represented by a single stone artefact and these places were all located on flat land and floodplain landforms. There is at least one artefact scatter (7921-0036) with higher densities of stone artefacts, and this artefact scatter is represented by 265 silcrete, quartz, quartzite and flint/chert lithics. This Aboriginal place is represented by hammer stones, grinding stones, worked flakes, a broken blade, cores and backed artefacts found on the side or base of an elevated landform in surface and subsurface contexts. The most predominant raw material types found in surface and subsurface artefact scatters are silcrete, quartz and quartzite. Less frequent raw materials include flint and chert.

Site cards for several of these Aboriginal cultural heritage places registered within the study area indicate that additional subsurface Aboriginal cultural heritage material representing these Aboriginal places is predicted in the area. This is particularly the case with the Aboriginal places 7921-0841 and 7921-0036.

Apart from the areas associated with registered Aboriginal cultural heritage places the study area lies across several known areas of cultural heritage sensitivity including:

- Sandsheet
- Dunes
- The Koo Wee Rup Plain;
- Parks and nature conservation reserves
- Named waterbodies, former swamps and lagoonal deposits (Koo Wee Rup, Tobin Yallock, Bass River Delta and Carrum Downs)
- Named watercourses and land within 200m of named water courses (including Kings Creek, Olivers Creek and Watson Creek)
- Western Port Ramsar Site – a declared Ramsar Wetlands
- Coastal Land

Many of the registered Aboriginal Places within the study region have been located on these known areas of cultural heritage sensitivity (see Figure 4 and Figure 5).

On the basis of the nature of the known archaeological record in the wider region and the landforms present in the study area, it has been determined that there is a high potential for Aboriginal cultural heritage places to be present in the study area. These potential Aboriginal cultural heritage places will most likely comprise artefact scatters with a high concentration of Aboriginal cultural heritage material occurring within sandy dune deposits and elevated landforms, with a close proximity to fresh water sources.

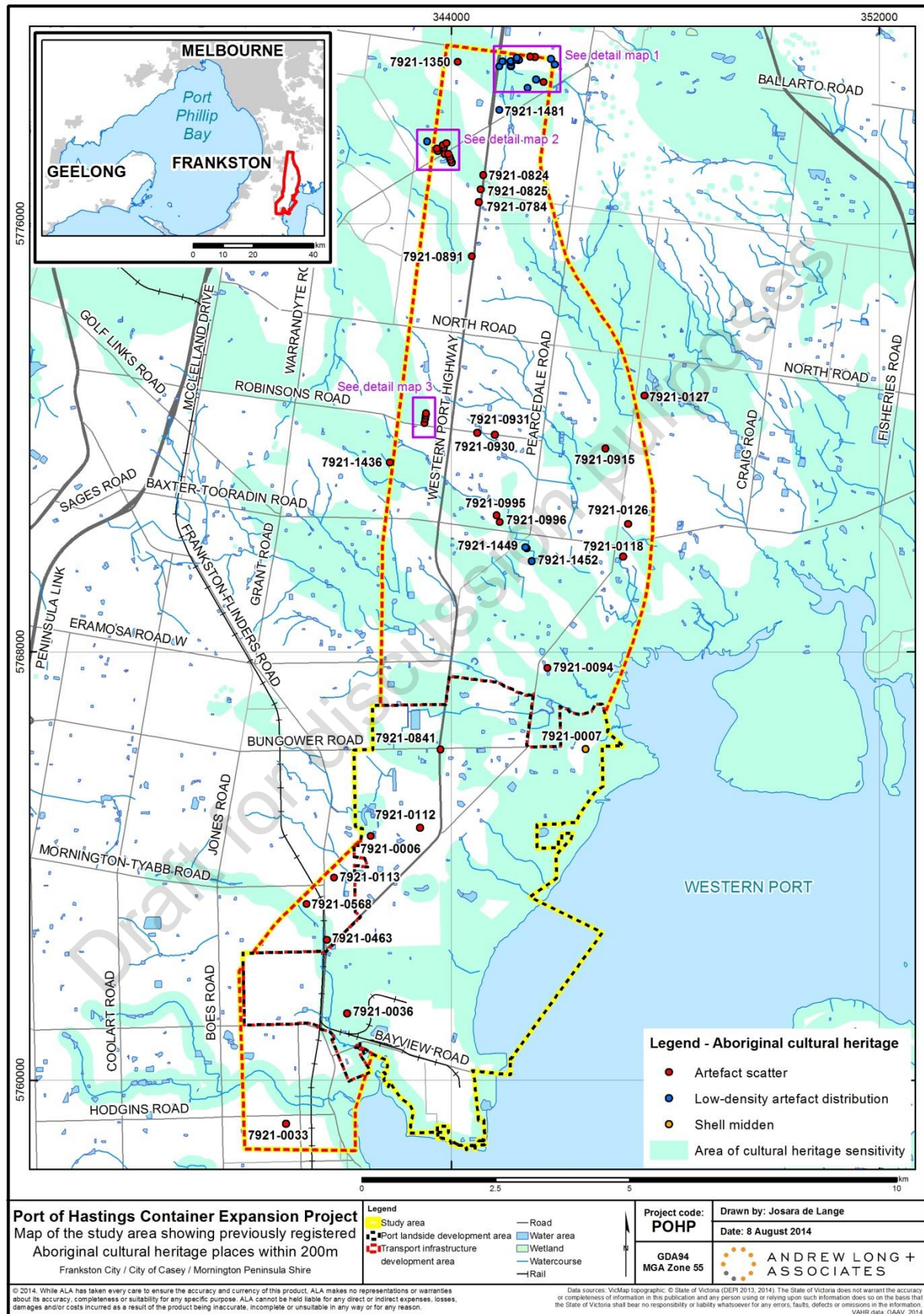


Figure 4: Previously registered Aboriginal heritage places and areas of cultural heritage sensitivity in the study area.

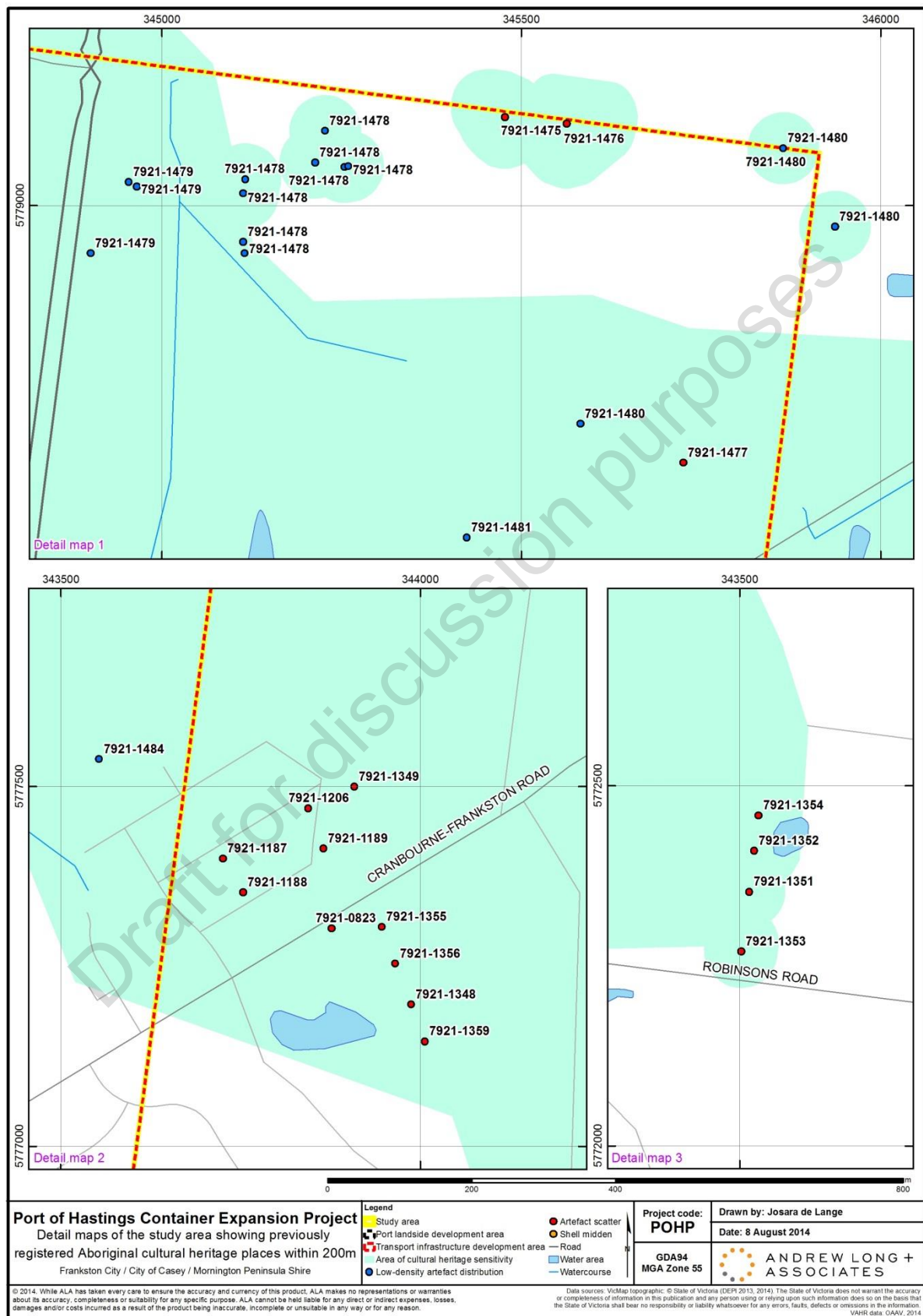


Figure 5: Detailed sections of the previously registered Aboriginal heritage places and areas of cultural heritage sensitivity in the study area.

4.2.2 Summary of Previous Archaeological Reports

A total of 26 regional and localised archaeological assessments have been undertaken within the study region. These assessments provide some comparative data on the range and distribution of Aboriginal archaeological places in the study area. These studies have been analysed in detail, and a summary of each is presented below, divided into both regional and localised studies. The outcome of this analysis indicates that the following landforms within the study area are potentially archaeologically sensitive:

- Elevated ground within close proximity to wetlands, fresh water sources and swamps are highly sensitive landforms for Aboriginal cultural heritage material
- Landforms situated on the interface between higher ground lying adjacent to wetlands and swamps also have archaeological potential
- Elevated landforms located on high-energy coastlines have high levels of potential archaeological sensitivity.
- Elevated areas located on low-energy coastlines are of lower archaeological sensitivity.
- Inland plains and less elevated areas adjacent to wetlands and water sources also have high archaeological potential
- Ridgelines and terraces within minor creek valleys are highly sensitive for Aboriginal cultural heritage material
- Remnant sand dunes and scarred trees in low-lying sandstone areas are highly sensitive for Aboriginal cultural heritage
- Urbanised areas and areas that have been subject to development and other significant disturbances have a lower likelihood of containing *in situ* Aboriginal cultural heritage material
- Low lying plains and swamp areas subject to inundation are of lower archaeological sensitivity
- Aboriginal subsistence resources and utilisation in the region was primarily found on the coastal plains, particularly plains adjacent to wetlands.

Regional Studies

Previous archaeological research consists of *regional studies*, which assist in characterising the general pattern of archaeological site distribution across a broad region, and *localised studies*, which assist in developing an understanding of archaeological sensitivity and the extent and scope of prior investigation in a relatively limited area or environment.

The following studies have examined the archaeology of study region within a regional, rather than a localised context.

Mornington Peninsula Geological Study

Between 1921 and 1927, R. A. Keble undertook a detailed geological study of the Mornington Peninsula, during which Keble noted the location of archaeological sites. Keble identified two areas of archaeological site concentration; the northern hinterland of Westernport Bay where sites were associated with freshwater swamps, and the sand dunes of the Nepean Peninsula.

Keble observed that *Haliotis*, limpet and periwinkle shells have been found around the edges of Tootgarook Swamp, Sailors (De Sele's) Lagoon and other permanent waters around the Bass Strait shore, suggesting that Aboriginal people carried their shellfish to permanent water, often some distance from where these shellfish were procured (Keble 1928, 152).

In a road cutting on the Boneo (or Boniyong) pre-emptive right near the State School, approx. 21-31 inches below the surface of a grass consolidated dune, resting on what was probably the residual soil of the underlying limestone deposit, flakes and chips mixed with *Mytilus* shells, fragments of axes, bones and other material were located (Keble 1928, 156). Keble believed that this midden was newer than the underlying limestone, and probably more recent than Tootgarook Swamp, however it is still of considerable antiquity.

Keble stated that there is evidence of Aboriginal occupation around the Tootgarook Swamp, with stone flakes and chips and shellfish deposits. Keble believed that some of these shells were carried from Bass Strait, and contained rock forms such as limpets attached. Keble also stated that the swamp was formerly tidal and that some of the oysters found within its vicinity actually came from the swamp (Keble 1928, 156).

On the northern shore of Mornington, Keble also observed that middens on the raised beaches that had been destroyed by people collecting the deposits (Keble 1928, 158).

Mornington Peninsula Regional Study

An Aboriginal archaeological study of the Mornington Peninsula was undertaken in 1979-1981 (Sullivan, 1981). The study area was divided into three zones: the northern hills and plains, the uplands, and the south west peninsula. The northern hills and plains zone of this study encompasses land in the current activity area.

The northern hills and plains zone was sample surveyed by Sullivan with 291ha examined with effective survey coverage calculated at 2.3 per cent of the entire zone (Sullivan 1981, 62-63). While Sullivan (1981, 57, 64) identified 289 Aboriginal cultural heritage places on the Mornington Peninsula during her survey, only 15 of these were situated within the northern hills and plains. These sites comprised 14 stone artefact scatters and one shell midden, mostly located in association with swamps and at distances of up to 500m from the nearest water sources (Sullivan 1981, 71-73).

On a regional basis Sullivan argued that the results of the survey indicated that Aboriginal people exploited shellfish and other resources on the Port Phillip Bay and south western peninsula coastal margin, potentially from base camps in the adjacent hinterland. In comparison, the Westernport coastline was less intensively utilised with sites concentrated around swamps in the hinterland. It was argued that the nature of sites on the Mornington Peninsula was consistent with the ethno-historical data, which pointed to the regular movement of Aboriginal people between the south west Peninsula (Bass Strait coastline) and large swamps in the Western Port plains (Sullivan 1981, 96).

Westernport Catchment

The archaeological survey of the Western Port Catchment undertaken by Gaughwin (1981, 1983) provides useful information on the regional distribution of Aboriginal places. Gaughwin used data on site location, site contents, landforms, and subsistence resources in conjunction with historical records to develop a subsistence model for the Western Port Catchment.

Gaughwin (1983, 33) sample surveyed the three landforms which made up the catchment: coastal margins, coastal plains and upland hills (which encompass the current study area).

Gaughwin (1983, 109-110) surveyed an area of 439 ha within the coastal margins landform. A total of 247 sites were identified within this area, consisting of shell middens and stone artefact occurrences. The majority of sites were located on high-energy coastlines with 37 sites recorded on medium-energy coastlines and 7 on low-energy coastlines.

Within the coastal plains, Gaughwin (1983, 109-114) surveyed an area of 266 ha, with most of this area consisting of inland areas of Phillip Island, French Island and the northern sections of Western Port Bay. A total of 14 sites were identified comprising stone artefact occurrences and a single quarry. The majority of sites were located on the interface between higher ground in proximity to wetlands and swamps.

A total of 122 ha within the upland hills landform were surveyed, with ploughed paddocks at Gembrook providing some surface visibility (Gaughwin, 1983: 98-110). A total of four sites were identified within the upland hills landform, consisting of stone artefact scatters including cores and grinding stones (Gaughwin, 1983: 153). The sites were situated in a range of localised contexts from ridgelines to sloping ground and valleys. Gaughwin (1983: 153) did not propose any model of land-use for this landform citing the lack of ground coverage achieved and absence of clear site variation.

Using the results of her studies, including ethnographic information, Gaughwin (1983: 158) proposed that Aboriginal subsistence in the Western Port Catchment was based primarily on the coastal plains, particularly plains adjacent to wetlands, and that the coastal margin was relatively unimportant in terms of subsistence resources and utilisation.

Localised Studies

Numerous localised archaeological surveys have been undertaken in the study region, a reflection of the increased residential and industrial developments and installation of associated infrastructure. This section reviews only those studies that have relevance to the study area.

Dandenong-Hastings Road Archaeological Survey and Subsurface Testing

In 1996, Lane undertook an archaeological survey and subsurface testing programme at Dandenong-Hastings Road. A single artefact was noted from the previously registered 7921-0182, on the ploughed section of land within market garden outside of the study area.

During the field survey, a section of land within the western road reserve immediately south of Bayliss Road was assessed to be of potential archaeological sensitivity. This area contained Cranbourne Sands, and following on from the survey, was subject to a subsurface testing programme. A series of 130 shovel probes were excavated across this area, and no Aboriginal cultural material was located during the testing (Lane 1996, 16). Soil deposits were relatively uniform and comprised sandy soil sediments. Three shovel probe transects were excavated to an average depth of 40cm. Soil deposits consisted of dark brown and dark grey sandy clay (Transect A) and dark brown and dark grey sandy soil (Transects B and C).

Frankston-Flinders Road and Denham Road Intersection, Tyabb

In 2002, an archaeological survey was undertaken on a parcel of land at the intersection of the Frankston – Flinders Road and Denham Road. An isolated artefact, a chert flake (7921-0463), was located in a small area with ground surface visibility. The artefact was located immediately adjacent to the western boundary of the current activity area. Ground surface visibility was generally poor and additionally, there was evidence of considerable disturbance in the area (Muir 2002, 14). This disturbance related to significant land modification including ploughing, ripping, earth movement from the construction of a bicycle path, railway lines and roads that cross the area. Muir suggested that land close to waterways and with fewer disturbances could have moderate potential to contain Aboriginal sites (Muir 2002, 15). Muir concluded that the lower levels of disturbance on a property (Country Cottages Pty Ltd) located between Frankston-Flinders Road and Dandenong-Hastings Road indicate that this area might have greater potential to contain Aboriginal archaeological sites, with ground surface visibility within this area at the time of the survey inhibiting the identification of surface Aboriginal artefacts.

Archaeological survey at the intersection of Bungower Road and Westernport Highway, Somerville

Matic (2007) conducted an archaeological survey for the proposed roundabout at the intersection of Bungower Road and Western Port Highway which can be located within the north east boundary of the current activity area. A high degree of disturbance was identified in this area and Matic did not locate any Aboriginal cultural heritage material during the field survey. However areas of potential archaeological sensitivity were noted. These areas included road reserve at the north-eastern, south-eastern and south-western corners of the intersection, with moderate potential to contain Aboriginal cultural heritage material. Matic recommended that subsurface testing be carried out in these areas.

Marine Parade, Hastings

Minos *et al.* (2008a) conducted a cultural heritage management plan of a block of land at 260 Marine Parade, Hastings, immediately adjacent to the western boundary of the current activity area. No Aboriginal cultural material was located during either the standard assessment or the complex assessment although the study area was in an archaeologically sensitive area, due to the close proximity to a creek. The consultants put this down to disturbance across the majority of the ground surface due to industrial study of the study area in the past (Minos *et al.* 2008a, 21).

A cultural heritage management plan was conducted by Minos *et al.* (2008c) on land in Marine Parade, Hastings. No Aboriginal cultural heritage material was identified during the standard assessment. As the study area was within an area of archaeological sensitivity, due to the close proximity of Olivers Creek, it was determined that a complex assessment was needed (Minos *et al.* 2008c, 21). However, no Aboriginal cultural heritage material was located within the complex assessment. The consultants concluded that this was due to the study area having been used for industrial purposes over the last 50-60 years (Minos *et al.* 2008c, 25).

A further two archaeological assessments (Vines & Patton 2008a; Vines & Patton 2008b) were conducted in close proximity to each other in Marine Parade Hastings. In both cases, there was no Aboriginal cultural material located during either the standard or complex assessments. This was due to both areas being subject to filling for land reclamation purposes (Vines & Patton 2008a, 23; Vines & Patton, 2008b, 29).

Barclay Crescent, Hastings

A cultural heritage management plan was conducted on land at Barclay Crescent, Hastings (Minos *et al.* 2008b). No Aboriginal sites were located during the standard assessment or the complex assessment. Minos *et al.* (2008b, 19) concluded that although the study area was in an area of archaeological sensitivity, the land was disturbed with areas of fill and that any cultural heritage which had been present may have been washed away by flooding of the nearby creek. It was also suggested that prior industrial use of the land may have also impacted on cultural heritage in the area.

Factory Redevelopment 260 Marine Parade, Hastings

Minos *et al.* (2008a) conducted a cultural heritage management plan of a block of land at 260 Marine Parade, Hastings. No Aboriginal cultural material was located during either the standard assessment or the complex assessment although the activity area was in an archaeologically sensitive area, due to the close proximity to a creek. The consultants put this down to disturbance across the majority of the ground surface due to industrial activity of the study area in the past (Minos *et al.* 2008a, 21).

Industrial Factory Subdivision – 290 Marine Parade, Hastings

A cultural heritage management plan was conducted by Minos *et al.* (2008c) on land situated at Marine Parade, Hastings. The activity area was located on the corner of Marine Parade and Bayview Road. No Aboriginal cultural heritage material was identified during the standard assessment. As the activity area was within an area of archaeological sensitivity, due to the close proximity of Olivers Creek, it was determined that a complex assessment was needed (Minos *et al.* 2008c, 21). However, no Aboriginal cultural heritage material was located within the complex assessment. The consultants concluded that this was due to the activity area having been used for industrial purposes over the last 50-60 years (Minos *et al.* 2008c, 25).

Westernport industrial subdivision, Hastings

Wheeler (*et al.* 2009) was commissioned by Lefta Corporation Pty Ltd to undertake a voluntary CHMP for a proposed industrial subdivision approximately 2 kilometres north of Hastings. There were two previously registered Aboriginal cultural heritage places located within the study area prior to the commencement of the CHMP assessment. These sites were two artefact scatters, 7921-0036 (Lysaght 1) and 7921-0037 (Lysaght 2) which were located in the south western portion of the study area (Wheeler *et al.* 2009, 104). Aboriginal place

7921-0036 is located within the south west region of the current study area. A pedestrian field survey of the study area found that most of the area had been cleared of native vegetation. There was low ground surface visibility noted during the field survey, and two surface artefacts were located. A complex assessment was then undertaken, which sample tested all of the landforms present within the study area. This testing programme utilised a combination of manual and mechanical excavation, with a series of 5mx1.2m test trenches excavated along linear transects with a total of 42 trenches excavated. The surface artefact scatters found during the survey were investigated through the excavation of a series of four 1x1m trenches to determine the nature and extent of these sites. The excavations undertaken during the complex assessment identified 265 Aboriginal stone artefacts, located within 29 of the 42 test trenches, with a range of raw material represented within the artefact assemblage including silcrete (75 per cent of assemblage), mudstone/chert (9 per cent), quartz (6 per cent), quartzite (6 per cent) with smaller quantities of fine-grained basalt, flint, crystal quartz and conglomerate. Wheeler *et al.* concluded that a continuous artefact scatter extends over most and possibly all of the study area, with variable and generally low artefact densities. Wheeler *et al.* also surmised from the results of the subsurface testing programme that it was unlikely that *in situ* or stratified archaeological deposits exist within the study area due to the land use history of the area, and the effects of bioturbation on soil deposits. The low-density artefact scatter identified by Wheeler *et al.* (2009) was registered as Bluescope Western Port 1: 7921-0036, and incorporates the previously registered sites Lysaght 1 and Lysaght 2 (7921-0036 and 7921-0037). This site was assessed as having a low level of scientific significance (Wheeler *et al.* 2009, 173). The proposed development was modified to retain a portion of the study area in conservation which included the least disturbed land within the study area that likely contains the most intact Aboriginal archaeological deposits (Wheeler *et al.* 2009, 184). Wheeler *et al.* (2009) made several recommendations including; impact minimisation methods during construction; salvage excavation of two areas of the recorded site; the engagement of a CHA during the project; and cultural induction for all contractors and consultants.

4.3 Transport Infrastructure Development Area

4.3.1 Geomorphological units within Transport Infrastructure Development area

- Monbulk Volcanic group (Nuo)
- Murrindindi Supergroup (Sm)
- Alluvium and colluvium (Qb)
- Red Bluff Sandstone (Nbr)
- Coastal dune deposits (Qdl1)
- Inland dune deposits (Qd1)
- Swamp and Lake deposits (Qm1)
- Coastal lagoon deposits (Qg)

Pre1750s EVC information for the development area

The following Gippsland Plain bioregion EVCs are present in the Transport Infrastructure Development Area:

- Heathy woodland
- Grassy woodland
- Swampy riparian woodland
- Swampy woodland
- Swamp scrub
- Damp sands herb-rich woodland
- Coastal saltmarsh

- Mangrove shrubland

For detailed information about the geology, geomorphology, landforms, environment and vegetation present within this development area, please see Section 4, as well as Figure 2 and Figure 3.

Draft for discussion purposes



4.3.2 Victorian Aboriginal Heritage Register Search

VAHR	Place Name	Primary Component	Approximate Dimensions	Surface/ Subsurface	Subsurface depth range (mm)	Contents (number of stone artefacts)	Raw Material	Contents	Landform	Topography
7921-0094	TYABB WATERHOLES	Artefact Scatter	50x50	Surface	-	-	(Q), (Qt), (F/C)	Worked flakes, microliths	Hill	Side or base of hill, rise, knoll, dune
7921-0105	ERAMOSA RD EAST 1	Object Collection	-	-	-	-	(S)	8 Stone axes, 3 additional artefacts	-	Sloping irregular land
7921-0107	ERAMOSA RD EAST 2	Object Collection	-	-	-	-	(S)	1 stone axe	-	Sloping irregular land
7921-0113	THE CRESCENT	Artefact Scatter	-	Surface	-	2	(S), (F/C)	1 blade core of banded chert. 1 silcrete flake	Lowland Plain	Flat, level land
7921-0118	DEVON MEADOWS 1	Artefact Scatter	30x20	Surface	-	-	(Q), (Qt)	Other fine grained rocks. Worked flakes, worked cores, microliths, unspecified	Cranbourne Sand Ridge	Top or edge of hill, rise, knoll, dune
7921-0126	SMITHS LANE 1	Artefact Scatter	30x25	Surface	-	-	(Q)	Other fine grained rocks. Unspecified chipped stone artefacts, Microliths	Dune Ridge	Top or edge of hill, rise, knoll, dune
7921-0568	TYABB ORCHARD 1	Artefact Scatter	-	Surface	-	1-4	(S)	Unretouched/waste flake	Hill slope	-
7921-0841	BUNGOWER RD IA 1	Artefact Scatter	1x1	Subsurface	500	1	(Qt)		Sandsheet/Drift	Flat ground
7921-0784	WESTERN PORT HIGHWAY IA 1	Artefact Scatter	-	Surface	-	1	(S)	1 silcrete flake	Dune	Gentle incline
7921-0823	MONTERFORDLAND 1	Artefact Scatter	10x5	Surface	-	4	(S)	1 silcrete waste flake. 3 silcrete scrapers	Dune	Undulating
7921-0824	WESTERN PORT HIGHWAY 2	Artefact Scatter	1x1	Surface	-	2	(S), (Q)	1 silcrete flake. Quartz flake	Dune	Undulating
7921-0825	WESTERNPORT HIGHWAY 3	Artefact Scatter	-	Subsurface	600	3	(S), (Q)	1 silcrete blade. 2 quartz flakes	Dune	Moderate incline
7921-0891	WESTERNPORT HWY 4	Artefact Scatter	9x1	Subsurface	10	2	(S)	Silcrete flake. Silcrete medial flake	Plain	Gentle incline

VAHR	Place Name	Primary Component	Approximate Dimensions	Surface/ Subsurface	Subsurface depth range (mm)	Contents (number of stone artefacts)	Raw Material	Contents	Landform	Topography
7921-0915	ROBINSONS ROAD 1	Artefact Scatter	-	Surface	-	1	(Qt)	Retouched flake	Crest	Level flat ground
7921-0930	ROBINSONS ROAD 2	Artefact Scatter	-	Subsurface	80	6	(S)	4 flakes. 2 flaked pieces	Lowland Plain	Level flat ground
7921-0931	ROBINSONS ROAD 3	Artefact Scatter	1x1	Subsurface	300	3	(S)	1 distal flake. 2 flaked pieces	Lowland Plain	Level flat ground
7921-0995	BAXTER-TOORADIN 1	Artefact Scatter	-	Subsurface	70	5	(S), (Qt)	5 cores	Dune, Sandsheet/Drift	Undulating
7921-0996	BAXTER-TOORADIN 2	Artefact Scatter	1x1	Surface	50	9	(Q), (Gl)	1 glass and 8 quartz cores	Floodplain	Undulating
7921-0127	SMITHS LANE 2	Artefact Scatter	-	-	-	-	(Q)	Worked flakes. Microliths	Lowland/Dune	Sloping/irregular land
7921-1188	BOGGY CREEK 2	Artefact Scatter	-	Subsurface	-	3	(S)	3 angular fragments	Dune	Very gentle incline
7921-1189	BOGGY CREEK 3	Artefact Scatter	-	Subsurface	-	2	(S), (Q)	1 flake. 1 retouched flake	Lowland/Dune	Very gentle incline
7921-1206	BOGGY CREEK 4	Artefact Scatter	-	Surface	-	1	(Q)	Quartz flake	Lowland/Dune	Very gentle incline
7921-1348	Cranbourne/Frankston Road South AS3	Artefact Scatter	0.5x0.5	Subsurface	-	4	(S), (Q)	2 angular fragments. 2 complete flakes	Crest of dune	-
7921-1349	Cranbourne/Frankston Road North AS1	Artefact Scatter	1x1	Subsurface	-	1	(S), (Q)	1 split flake	Lower slope dune	-
7921-1350	Ballarto Road AS1	Artefact Scatter	1x1	Subsurface	-	4	(S), (Q)	2 flaked pieces. 2 angular fragments	Mid slope dune	-
7921-1351	Robinsons Road AS3	Artefact Scatter	0.5x0.5	Subsurface	-	3	(S), (Q)	2 angular fragments. 1 complete flake	Upper slope dune	-
7921-1352	Robinsons Road AS2	Artefact Scatter	-	-	-	3	(S), (Q)	-	Upper slope dune	-

VAHR	Place Name	Primary Component	Approximate Dimensions	Surface/ Subsurface	Subsurface depth range (mm)	Contents (number of stone artefacts)	Raw Material	Contents	Landform	Topography
7921-1353	Robinsons Road AS4	Artefact Scatter	-	-	-	11	(S), (Q)	-	Upper slope dune	-
7921-1354	Robinsons Road AS1	Artefact Scatter	-	-	-	30	©, (S)	-	Mid slope dune	-
7921-1355	Cranbourne/Frankston Road South AS1	Artefact Scatter	-	-	-	10	(S), (Q)	-	Lower slope	Ephemeral drainage line
7921-1356	Cranbourne/Frankston Road South AS2	Artefact Scatter	-	-	-	5	(S), (Q), (Qt)	-	Lower slope	Ephemeral drainage line
7921-1359	Cranbourne/Frankston Road South AS4	Artefact Scatter	-	-	-	17	(S), ©, (Q), (Qt)	-	Upper slope dune	-
7921-1436	Langwarrin South Dunes IA1	Artefact Scatter	-	-	-	2	(Q)	Angular fragments	-	-
7921-1449	Terry Street LDAS	Low Density Artefact Distribution	-	Subsurface	800-900	6	(S), (Q), (Qt)	Crystal Quartz. Flakes, 1 angular fragment	-	-
7921-1452	Hastings Street 1	Low Density Artefact Distribution	-	Subsurface	800	1	(S), (Q), (Qt), (F/C)	Angular fragment	-	-
7921-1475	Cranbourne West 112	Artefact Scatter	-	Subsurface	-	83	(CQ), (Q), (S)	-	Crest dune	-
7921-1476	Cranbourne West 113	Artefact Scatter	-	Subsurface	-	18	(C), (S), (Q)	-	Crest dune	-
7921-1477	Cranbourne West 114	Artefact Scatter	-	Subsurface	-	14	(C), (S), (Q), (Qt)	-	Crest dune	-
7921-1478	Cranbourne West 115	Low Density Artefact	-	Subsurface	-	8	(S), (Q), (Qt)	3 complete flakes. 2 distal flakes. 2 medial flakes. 1 proximal flake	-	-

VAHR	Place Name	Primary Component	Approximate Dimensions	Surface/ Subsurface	Subsurface depth range (mm)	Contents (number of stone artefacts)	Raw Material	Contents	Landform	Topography
		Distribution								
7921-1479	Cranbourne West 116	Low Density Artefact Distribution	-	Subsurface	-	3	(S), (Q)	2 complete flakes. 1 medial flake	-	-
7921-1480	Cranbourne West 117	Low Density Artefact Distribution	-	Subsurface	-	7	(S), (Q)	3 complete flakes. 2 angular fragments. 2 distal flakes	-	-
7921-1481	Cranbourne West 118	Low Density Artefact Distribution	-	Subsurface	-	5	(S), (Q), (F)	3 angular fragments. 2 complete flakes	-	-
7921-1484	160 Potts Rd LDAD 1	Low Density Artefact Distribution	-	-	-	3	(Q), (S), (Qt)	Quartz angular fragment. Complete silcrete flake/flat-edged scraper. Proximal quartzite flake	-	-

S = Stone, (S) = Silcrete; (Q) = Quartz, (Qt) = Quartzite, (CQ) = Quartz Crystal, (F/C) = Flint/Chert; (FG) = Fine Grained Siliceous, (In) = Indeterminate; (Gl) = glass; (H) = Hornfels; (B) = Basalt; (BG) = Basalt/Greenstone; (BC) = Black Cobble; (C) = Chert; (J) = Jasper; (M) = Mudstone; (O) = Ochre; (Si) = Siliceous; (SS) = Siltstone, (I) = Ironstone; (IG) = Igneous, (U)=Unknown, (T/B) = Trachyte/Basalt, (MG) = Microgranite

Table 3: Aboriginal Cultural Heritage Places Located within the Transport Infrastructure Development area

There are a total of 43 previously registered Aboriginal cultural heritage places located within the Transport Infrastructure Development Area section of the study area (see Table 3). The majority of these Aboriginal places (n=33) are artefact scatters containing silcrete, quartz, chert and/or flint, quartzite and crystal quartz raw materials. Silcrete and quartz are the dominant raw materials represented. There are also two object collections consisting of a number of stone axes as well as additional artefacts (7921-0105 and 7921-0107). There are also seven low density artefact distributions within the study area. These registered Aboriginal places have generally been identified on elevated sandy landforms such as dunes and rises, although several Aboriginal places have been located on the flat plain landform. Most of the Aboriginal places within the study area contain low densities of Aboriginal cultural heritage material, although there are Aboriginal artefact scatters of much higher densities present within the wider study region. Site cards for several of the Aboriginal cultural heritage places registered within the study area indicate that additional subsurface Aboriginal cultural heritage material representing these Aboriginal places is predicted in the area. This is particularly the case with the Aboriginal places 7921-1353, 7821-1359 and 7921-1477.

Apart from the areas associated with registered Aboriginal cultural heritage places the Transport Infrastructure development area lies across several known areas of cultural heritage sensitivity including:

- The Cranbourne sandsheet
- Dunes
- Parks and nature conservation reserves
- The Koo Wee Rup Plain;
- Named water courses (Kings Creek, Watson Creek, Langwarrin Creek and Boggy Creek)
- Land within 200m of the Eastern Contour Drain, Olivers Creek and Kings Creek
- Western Port Ramsar Site – a declared Ramsar Wetlands
- Coastal Land

Many of the registered Aboriginal Places within the study region have been located on these known areas of cultural heritage sensitivity.

On the basis of the nature of the known archaeological record in the wider region and the landforms present in the study area, it has been determined that there is a high potential for Aboriginal cultural heritage places to be present in the study area. These potential Aboriginal cultural heritage places will most likely comprise artefact scatters with a high concentration of Aboriginal cultural heritage material occurring within sandy dune deposits and elevated landforms.

4.3.3 Summary of Previous Archaeological Reports

A total of 69 regional and localised archaeological assessments have been undertaken within the general region containing the study area. These assessments provide some comparative data on the range and distribution of Aboriginal archaeological places in the study area. These studies have been analysed in detail, and a summary of each is presented below divided into both regional and localised studies. The outcome of this analysis indicates that the following landforms within the study area are potentially archaeologically sensitive:

- Elevated landforms and sand bodies located in close proximity to wetlands, water sources and swamps
- Landform features adjacent to water courses such as creek flats, terraces, levee banks, hill slopes, dunes and other sand bodies are highly sensitive landforms for Aboriginal cultural heritage material
- Inland sand drifts and/or elevated points on the landscape are of high archaeological potential
- Scarred trees are most likely to be found in creek margins, ridgelines, terraces, low-lying sandstone and in areas of remnant native vegetation
- Plains and less elevated areas adjacent to wetlands and water sources also have archaeological potential

- Alluvial fans and outwash fans associated with creeks have potential to contain Aboriginal cultural heritage material
- Urbanised areas and areas that have been subject to development and other significant disturbances have a lower likelihood of containing *in situ* Aboriginal cultural heritage material
- Low lying floodplains and swamp areas subject to inundation are of lower archaeological sensitivity
- Marsh and swamp areas lacking in higher ground have low archaeological potential for Aboriginal cultural heritage.
- Murrindindi Supergroup soils are unlikely to contain Aboriginal cultural heritage material.
- Plains away from the Cranbourne Massif and Cranbourne sands with no localised sandy deposits or features are of lower archaeological sensitivity
- Sandy rises and sand dunes within the Cranbourne Sands – particular the higher ground (upper slopes and tops) of these landforms, are highly sensitive for Aboriginal cultural heritage material
- High density artefact scatters will occur in areas containing Cranbourne Sands Deposits

Regional Studies

The following studies have examined the archaeology of study region within a regional, rather than a localised context.

Frankston City Council Aboriginal Cultural Heritage Assessment

Marshall (1998) conducted an Aboriginal cultural heritage assessment for the Frankston City Council to assist the development of policies on the conservation and protection of places of Aboriginal cultural heritage. The Frankston municipality covers an area of 131 square kilometres and is bounded by major arterials: Thompsons Road to the north, Dandenong-Hastings Road to the east, Baxter-Tooradin Road and Humphries Road to the south. The only areas that were surveyed on foot related to those that were poorly represented in previous archaeological surveys. Ground surface visibility was generally poor due to previous developments, such as road surfaces, thick vegetation and a lack of eroded surfaces. No new Aboriginal places were identified during the survey (Marshall 1998, 28-30). Marshall concluded that the likely landforms for Aboriginal cultural heritage places were lithic scatters on remnant sand dunes and scarred trees in low-lying sandstone areas.

Melbourne 2030 Casey-Cardinia Growth Area

Feldman and Long (2006) were commissioned by the Built Environment Group to conduct an archaeological desktop study for the Casey-Cardinia growth area. This study aimed to identify, review and analyse the existing Aboriginal cultural heritage information from this growth area. The consultants found that the Casey-Cardinia growth area contained a complex pattern of site distribution due to differences in local landscapes. The consultants proposed six landscape zones with discrete archaeological characteristics which included:

- Zone 1 Major drainage corridors including the foothills and plains drained by Cardinia and Toomuc Creeks, Deep/Pakenham Creek and Ararat/Back Creek. The creek margins are associated with a range of dense artefact scatters and scarred trees
- Zone 2: Intermediate Plains including the slightly elevated band of flat or undulating land bordering the northern foothills and Koo-Wee-Rup Swamp. This zone is dominated by agriculture and urban development. Stone artefact scatters occur on the alluvial flats and outwash fans associated with creeks that drain the foothills. Buried deposits may occur at depths of approximately 800mm. Scarred trees may occur within stands of native vegetation
- Zone 3: Urban areas including areas around Hallam, Narre Warren and Berwick, Officer, Pakenham and Cranbourne. Archaeological sites may occur within open spaces, with limited scope for identifying high integrity sites.

- Zone 4: Koo-Wee-Rup Swamp including reclaimed low-lying swampland. Stone artefact scatters may occur as buried deposits associated with former drainage channels or as shallow surface deposits on raised alluvial landforms, or around the margins of the depression
- Zone 5: Northern Foothills includes the steep dissected foothills to the Great Dividing Range. This area is characterised by agricultural land and regrowth forests. The archaeological values of this area are uncertain as the area is largely unassessed. Surface scatters may occur on ridgelines, terraces, in minor creek valleys, and scarred trees may also occur in areas of remnant native vegetation.
- Zone 6: Cranbourne massif and surrounding plains. This is an area of undulating plains cantered on an elevated ridge of volcanics and sedimentary rock, characterised by widespread sand drifts (the Cranbourne Sands). The archaeology of this zone comprises localised dense scatters of stone artefacts associated with sand drifts, ridgelines and drainage lines, and diffuse scatters of isolated artefacts that occur widely across the landscape. Burials may also occur in the sand deposits.

The current study area is located within several zones, including Zone 6 (Cranbourne massif and surrounding plains) Zone 2 (Intermediate plains) and Zone 3 (Urban Areas). According to the Feldman and Long's findings (2006) it is possible that Aboriginal cultural heritage material may be present on less disturbed open spaces within this area.

Localised Studies

Numerous localised archaeological surveys have been undertaken in the study region, a reflection of the increased residential and industrial developments and installation of associated infrastructure. This section reviews only those studies that have relevance to the study area.

825 Cranbourne-Frankston Road (Murphy 1999; 2000; 2002)

An archaeological survey, sub-surface testing and monitoring programme were undertaken at 825 Cranbourne-Frankston Road (Murphy 1999; 2000; 2002). The study area comprised 57 hectares of undulating land, located on the western margin of the former Carrum Swamp. This area is characterised by elevated sections of remnant dune systems (Cranbourne Sands), dominated by box gum (Murphy 2002, 3) on the southern edge of the Cranbourne Massif.

The archaeological survey of the property (Murphy 1999) was hindered by extensive ground cover with <5 per cent of the study area providing surface visibility. While no Aboriginal cultural heritage places were identified, Murphy (1999, 19-20) was able to determine, on the basis of background information and the results of the field survey, that one area of moderate archaeological potential occurred in the study area. This comprised a sand hill in the south east section of the property. A subsurface testing programme was undertaken on the property (Murphy 2000). This involved inspecting 20 recently excavated 1x3 m trenches, sieving the associated spoil heaps and excavating 68 shovel test pits. A total of 30 stone artefacts were identified during the testing programme; all artefacts were located within the spoil. No concentrations of artefacts were identified, with only 1-2 stone artefacts located in each trench (2000, 4). The stone artefact assemblage was registered as a single artefact scatter.

Monitoring of ground disturbing development works was also undertaken by Murphy (2002), which involved the inspection of shallow scraping of the ground surface and excavation works associated with sand quarrying in the area of archaeological sensitivity. The sand quarrying allowed a better understanding of soil profiles in the areas of archaeological sensitivity, demonstrating that 25 cm sandy humic topsoil overlay 2-3 m of sterile unconsolidated sand. At around 3 m below the ground surface compacted heavy orange clay was present. Over 500 stone artefacts were identified during the monitoring programme and in all cases derived from the top 25 cm topsoil layer. No *in situ* deposits were associated with this site, however Murphy (2002, 5-9) highlighted that previous land use practices were likely to have destroyed any intact deposits associated with this site.

Quartz, including milky quartz and crystal quartz, was the most common raw material, although silcrete, chert and quartzite were also present. Stone artefact types comprised flakes, blades, cores, waste flakes, microliths and manuports. Formal flaked tool types were present and comprised geometric microliths, bondi points, and scrapers. Murphy (2002, 9-11) also identified grinding stone fragments. The presence of bondi points, geometric microliths, and scrapers indicate that the manufacture of hunting and wood working items was being undertaken at this site. Murphy (2002, 13) determined that the site was likely to relate to Aboriginal occupation of the area within the last 4,000 years and the density and variety of stone artefacts reflected the importance of this location as an elevated dune campsite on the edge of Carrum Swamp. Murphy noted the swampy nature of the floodplain surrounding the Cranbourne Massif, the extent of elevated landforms associated with the Cranbourne Sands on the southern side of the Cranbourne Massif, and the likely fluid nature of the south eastern margin of Carrum Swamp.

Cranbourne – Frankston Road Duplication, Langwarrin

Murphy and George (2002) conducted a cultural heritage assessment for a section of the Cranbourne–Frankston Road duplication between Warrandyte Road and Homestead Road, Langwarrin. The study area was approximately 2.7 kilometres in length and comprised the majority of the road reserve. A comprehensive survey was undertaken and no Aboriginal cultural heritage places were identified (Murphy and George 2002, 21). Ground surface visibility was generally poor and previous disturbance caused by road construction and maintenance and adjacent residential developments had significantly reduced the heritage values of the study area. One area was nominated to have potential for containing stone artefact scatters. It was recommended that disturbance to the area at a tributary of Boggy Creek, adjacent to Union Road, should be monitored by an archaeologist and an Aboriginal community representative (Murphy and George, 2002: 35).

Hyett (2002) conducted an additional archaeological survey of the Cranbourne–Frankston Road duplication between McClelland Drive and Warrandyte Road, Langwarrin. Ground surface visibility was generally poor and previous disturbance caused by road construction and maintenance and adjacent residential developments had significantly reduced the heritage values of the study area (Hyett 2002: 7). Two quartz artefacts were identified among numerous non-artefactual quartz pieces that were derived from machinery used in earlier road construction. The site, located on a low rise within the Cranbourne Sands landform, was registered as an isolated artefact occurrence (7921-0440) comprising two quartz flakes and was given a low scientific significance rating (Hyett 2002: 8-12). No additional constraints to development within the study area were listed.

Archaeological Survey of a Property at Tyabb

An archaeological survey (Thomson & Matthews 2003) was conducted at Tyabb, on land to the north of Hastings. There was poor ground surface visibility at the time of the survey, with dense grass cover across most of the area (Thomson & Matthews 2003, 18). No Aboriginal cultural material was identified during the survey; however, an area of archaeological sensitivity, a prominent rise, was identified within the study area (Thomson & Matthews 2003, 23).

Eastern Irrigation Scheme Archaeological assessment

In 2004 Long *et al.* conducted an archaeological assessment for the proposed eastern irrigation scheme near the Ballarto Road and Western Port Highway intersection. A field survey of the study area was carried out, and a total of 8 Aboriginal places were identified (7821-0620, -0621, -0622, -0623, -0624, MRI, -0626 and -0656). All of these Aboriginal places comprised artefact scatters that were found in association with sand drifts and/or elevated points on the landscape. The consultants recommended that subsurface testing be undertaken to determine the presence or absence of any Aboriginal cultural heritage material prior to the proposed development. The area of highest priority for the proposed testing programme was the Cranbourne Massif where a number of previously recorded Aboriginal places are located.

Cranbourne-Frankston Road & Western Port Highway

Di Fazio (*et al.* 2005) undertook an archaeological survey of two sections of road reserve near Cranbourne, including sections adjacent to the current study area from North Road to Cranbourne-Frankston Road. There were two registered Aboriginal places located in the Hall Road section of the study area, 7921-0624 and 7921-0656, the latter of which was noted as destroyed during the survey. There were also two heritage sites present in the Hall Road section of the study area. No Aboriginal cultural heritage places were located during the field survey. The consultants concluded that the potential for Aboriginal places to be identified during the proposed works was moderate to high as the study area is situated on the Cranbourne Sands, a culturally sensitive landform unit. Di Fazio (*et al.* 2005, 35) identified a tall exposure of sand dune on the south western corner of McKay's Road and the Highway of particular archaeological sensitivity for Aboriginal places. There is some vehicular disturbance to this area.

An archaeological survey of Western Port Highway between Cranbourne-Frankston Road to North Road

In 2006 Matic conducted an archaeological survey of the Western Port Highway between Cranbourne-Frankston Road to North Road, Cranbourne South. The surveyed area included gently undulating sand hills utilised for pastoral and residential purposes, with areas to the west of the Highway seemingly more intact and less developed than areas to the east. The study area comprised Baxter Sandstone and Cranbourne Sand deposits. At the commencement of this survey there were no registered Aboriginal places in the study area. Matic identified the following landforms as potentially archaeologically sensitive: landform features adjacent to water courses in particular creek flats, terraces, levee banks, hill slopes and the top of valley escarpments; and dunes and other sand bodies associated with the Cranbourne Sands. There was one historical place, H7921-0071 (Cranbourne Swamp house site) situated on the Cranbourne-Frankston road at the northern end of the study area (Matic 2006, 17). One Aboriginal place was recorded during the survey, 7921-0784, a silcrete flake found in a disturbed context associated with the Cranbourne sands (Matic 2006, 25). Matic concluded that it was likely for additional Aboriginal cultural heritage material to be present in the vicinity of this Aboriginal place. Matic identified the sandy rises to be of archaeological potential, in particular those on the western side of the highway. The land on the east of the highway was flatter than the land on the west, and has been subject to more prior disturbance. The south-western corner of McKay's Road and the Highway was suggested to be of particular Aboriginal sensitivity, with a prominent sand dune also identified by Di Fazio and Ellis (2005) as being sensitive (Matic 2006, 26).

Westernport Highway Duplication Works, North Road to Cranbourne-Frankston Road

Barker (2007) carried out archaeological investigations for the Westernport Highway Duplication. The study area is located on the Cranbourne Sands – aeolian sand dunes. Matic (2006) had previously surveyed sections of the Western Port Highway including the study area, and recommended that subsurface testing be undertaken across sections of Barker's study area. A single surface artefact was recorded by Matic (7921-0784), located on a sandy dune. Barker carried out an archaeological survey of the area. Due to thick ground cover, 7921-0784 was not relocated during the survey. Barker recorded a small artefact scatter located in a disturbed context (7921-0824). Subsurface testing then took place and twelve 5m x 0.25m transects were excavated across the sand dunes within the study area. Subsurface Aboriginal cultural heritage material represented by two quartz flaked pieces and a silcrete distal blade found at a depth range of 400-600mm in grey and light grey sand overlying coffee rock (7921-0825). Barker concluded that it was likely for Aboriginal cultural heritage material to be present within the undeveloped bushland located in the study area.

Westernport Highway Duplication Cranbourne South

Tucker conducted archaeological investigations for the western side of the Westernport Highway duplication at Cranbourne South. The study area is located in the Cranbourne Sands landform unit comprising sandy dunes. There were three registered Aboriginal places located in the study area (7921-0784, 7921-824 and 7921-0825) included the two sites identified by Barker (2007). Subsurface testing involved the excavation of 1x1m test pits,

25x25cm shovel probes and a single machine transect (Tucker 2008, 16). In total 129 shovel probes and 19 1x1m test pits were excavated. Shovel probes were positioned around the previously registered Aboriginal places 7921-0825 and 7921-0784. Due to the disturbed nature of 7921-0824, no subsurface testing took place within this area. The results for the subsurface testing programme indicated that two soil profiles are located in the study area comprising dune deposits and hard silt. The dune deposits contained more artefactual material from the previously registered Aboriginal places 7921-0784 and 7921-0825, however a previously unrecorded Aboriginal place (7921-0891) was located in the hard silt deposit. Within the study area the dune is located at the corner of Westernport Highway and McKays Road, containing a soil profile of deep grey sand overlying cream sand which overlies the coffee rock and clay. The silt deposit is compact grey silt overlying yellow gravel and clay, and is much shallower than the dune deposits. Tucker concluded that it is likely that Aboriginal cultural heritage material from 7921-0794 and -825, located on the sandy dune, extends west outside of the study area. A charcoal sample was taken from the grey sand associated with 7921-0825 at 300mm. This sample returned a C14 date of 6646 +/- 45BP. Tucker indicated that this charcoal sample cannot be conclusively attached to Aboriginal occupation of the area as there was little relationship between the Aboriginal artefacts and the charcoal sample. Tucker concluded that although high densities of Aboriginal artefacts were not identified during the archaeological assessment, this result may relate to the limited extent of the study area as well as prior disturbances within the areas adjacent to the Westernport Highway.

Cranbourne-Frankston Road, Langwarrin

Murphy and Dugay-Grist (2007a) undertook a survey assessment of land along Cranbourne-Frankston Road to be affected by proposed road widening works. Ground surface visibility across the study area was very low (<2 per cent) and as a consequence the effectiveness of the survey was compromised. Nevertheless, one previously unregistered Aboriginal cultural heritage place was identified, 7921-0823. Two areas of high archaeological potential were identified within the study area associated with dune features. One of these sensitive areas comprises an extensive sand dune that extends north west to south east between Kelvin Grove and Homestead Road. Sections of this large dune complex have been subject to quarrying to the north with the southern section (south of Cranbourne-Frankston Road) assessed to contain high archaeological values. The artefact scatter 7921-0823 was recorded on a soil exposure within this dune complex. Murphy and Dugay-Grist assessed the top and upper slopes of the dune to be the most sensitive locations for Aboriginal cultural heritage material.

In 2007 (2007b) Murphy and Dugay-Grist undertook subsurface testing within the road reserve to the south-east of Cranbourne-Frankston Road between Kevin Grove and Homestead Road, as per their recommendations in the 2007a assessment. A total of four machine transects were excavated on the sandy dune landform to a sterile clay deposit at a depth range of 1.5-2.7m. A total of 149 stone artefacts were recovered from these excavations, generally concentrated within the white-grey sandy soil sediments immediately above the coarse orange sand at depths of 30-60cm. Evidence of post-depositional activities within the 30cm horizon indicated that prior disturbances have impacted upon the intact nature of this Aboriginal cultural heritage material. The location of these artefacts extended the boundaries of 7921-0823 for approximately 150m across the sand dune, and the consultants assessed this Aboriginal place to be of moderate scientific significance.

In 2008, Murphy and Dugay-Grist conducted additional subsurface testing at 7921-0823, with the hand excavation of six 1x1m test pits excavated to depth of 300mm to 1.10m. A total of 77 Aboriginal stone artefacts were recorded, generally found in the white-grey sandy soil sediments immediately above the coarse orange-brown sand at depths of 30cm to 90cm, with concentrations of artefacts between 40cm to 70cm. The consultants stated that the area where this Aboriginal cultural heritage material was located was highly likely to contain additional Aboriginal cultural heritage deposits.

Cranbourne-Frankston Road Duplication

Murphy (2008) undertook a CHMP for the proposed Cranbourne-Frankston Road Duplication. The majority of the activity area is within the Cranbourne Sands landform unit. There were no registered Aboriginal places within the activity area at the commencement of this CHMP. Murphy identified two areas of sensitivity

comprising dune features in the northern and central sections of the activity area. A standard assessment was carried out and poor ground surface visibility was noted. The majority of the activity area was assessed as containing a level of prior disturbance with land adjacent to recent housing estates, modified by construction. One low density artefact scatter (7921-0821) was identified in a drainage line adjacent to the existing road alignment on a dune feature at the central western end of the activity area (Murphy 2008, 38). During the complex assessment a total of five 1x1m test pits and seven 50x50cm shovel test pits, and one mechanical excavation were undertaken. These pits were excavated to a maximum depth of approximately 1m. There was no Aboriginal cultural heritage material identified. All of the areas tested exhibited a high level of disturbance brought about by prior development of the area.

Robinsons Road, Pearcedale

A 3 kilometre section of Robinsons Road between the Western Port Highway and Smiths Lane, Pearcedale, was investigated by Feldman in 2008. The investigation located three Aboriginal heritage sites (7921-0915, 7921-0930 & 7921-0931) comprising an isolated stone artefact and two diffuse stone artefact scatters. Feldman (2008) concluded that it is unlikely that any Aboriginal sites of higher significance occur elsewhere within the study area, and that the artefacts recorded at these sites probably represent the majority of the archaeological deposits at those locations, given the extent of systematic test excavation undertaken in the vicinity to detect further, associated material.

The three sites comprise diffuse artefact scatters located within close proximity to localised sandy rises. The stone material assemblage comprised largely of silcrete, with quartzite and quartz also represented. No other cultural material was identified, such as animal bone, shell or charcoal, and it was presumed from the soil profile that the deposits had experienced significance disturbance from previous land use, such as road construction and service installation. No scarred trees or other obtrusive site types are present within the study area.

Morrah Street Hastings residential subdivision

Mitchell and Loizou (2009) conducted a standard CHMP for a proposed residential division in Hastings. The activity area is located approximately 500m north west of the Western Port Bay shoreline at Morrah Street Hastings. The consultants conducted a pedestrian survey of the properties, which contained a residential dwelling and associated sheds and car port, a hobby farm and a horse enclosure. The landform of the activity area was relatively flat with short exotic grass species. Mitchell and Loizou concluded that the properties comprising the activity area have been cleared of all original vegetation, levelled and revegetated with a mixture of exotic grasses and native trees (Mitchell and Loizou 2009, 25). There was a high degree of ground disturbance, with modern European materials such as concrete and rubbish strewn across the ground surface. No Aboriginal cultural heritage material was located during the field survey. Mitchell and Loizou determined that due to the high degree of ground disturbance brought about by the previous land use activities of the properties, that the activity area was unlikely to contain any Aboriginal cultural heritage material (Mitchell and Loizou 2009, 37).

Ballarto Road Envestra Augmentation Lyndhurst to Skye gas pipeline

In 2009 Murphy and Morris undertook a CHMP for the proposed Lyndhurst to Skye gas pipeline at Ballarto Road. The proposed pipeline alignment traversed mainly agricultural land, with the southern section located in a former sand quarry. Landforms present in the study area included the southern slope of a hill north of Thompsons Road, low-lying pastures south of this hill, a former sand quarry and a small dune. A standard assessment took place, and one Aboriginal cultural heritage place was identified, a scarred tree (7921-1155) assessed to be of moderate scientific significance. The consultants identified two units within the study area that were assessed as having moderate archaeological potential. These units comprised the elevated slopes north of Thompsons Road (Survey unit 1) and the elevated sand dune north of Ballarto Road (Survey unit 4).

The low-lying floodplains (Survey unit 2) were assessed as having low archaeological potential, as was the former sand quarry (Survey unit 3). A complex assessment then took place and three 1x1m test pits and 38 shovel probes were excavated. No Aboriginal cultural heritage material was identified during the subsurface testing programme. The Survey unit 4 showed evidence for levels of disturbance with imported fill present. The consultants recommended that sturdy temporary fencing be placed around 7921-1155 during the proposed activity to avoid harm to this scarred tree.

715 Baxter-Tooradin Road, Pearcedale

Adams (et al. 2009) conducted a cultural heritage management plan at 715 Baxter-Tooradin Road, Pearcedale. A standard assessment was undertaken, identifying a dune formation as an area of archaeological potential. The lower lying sections of the activity area were also assessed as having potential for subsurface Aboriginal cultural heritage material. One surface artefact was located in the mid-section of the property. During the complex assessment, two 1x1m test pits and a series of shovel probes were excavated across both landforms. A total of 15 Aboriginal stone artefacts were identified comprising two Aboriginal places (VAHR 7921-0995 and -0996). One of these sites was located on the dune formation (7921-0995) and the other was found on a depressed landform. Both of these Aboriginal places were assessed as having low scientific significance with a high degree of previous disturbance noted across the activity area.

Thornhill Street Sewerage Pump Station Upgrade, Tyabb

Jakovljevic and Prideaux (2010) conducted a mandatory CHMP for a proposed sewerage pump station within road reserves of Hastings. A pedestrian survey was undertaken of the study area, with some obstacles encountered in the form of thick swampy vegetated areas that could not be accessed (Jakovljevic and Prideaux 2010, 52). The overall ground surface visibility was about 5 per cent at the time of the survey due to high grass and dense vegetation, and no Aboriginal cultural heritage material was located. There was a small rise noted in the eastern portion of the study area, considered by the consultants to be potentially sensitive for Aboriginal cultural heritage material (Jakovljevic and Prideaux 2010, 55). Seven auger holes were excavated across two different landforms, showing evidence for flooding with some natural ground above the flood level on the small rise (Jakovljevic and Prideaux 2010, 56). Jakovljevic and Prideaux concluded that the study area contained low archaeological potential for Aboriginal cultural heritage places, due to the fact that the area was marshy and was lacking in higher ground. A complex assessment was then conducted, with a 1x1m test pit excavated on the small rise and one 50x50cm test pit within the Lyall Street reserve (Jakovljevic and Prideaux 2010, 64). Both of these test pits displayed high subsurface water levels, and there were no Aboriginal cultural heritage places identified during the subsurface testing programme. Jakovljevic and Prideaux recommended a cultural heritage induction for all construction workers prior to the commencement of the activity. The consultants also recommended that the topsoil not be removed from the study area but stockpiled and utilised on site to avoid the risk of removing any isolated Aboriginal cultural heritage material (Jakovljevic and Prideaux 2010, 71).

Western Port Highway Upgrade

Whincop and Howell-Meurs (2010) conducted a cultural heritage assessment for the Western Port Upgrade. The study area comprises Cranbourne Sands and Baxter Sandstone, swamp and lake deposits. The consultants identified seven previously recorded Aboriginal places within the study area (7921-0215, -0620, -0621, -00623, -1160, -1161 and -1196). These Aboriginal places comprise three scarred trees (7921-0215, -1160 and -1161), two isolated artefacts and two artefact scatters (7921-0620 and -1196). A field survey of the study area was undertaken, and variable ground surface visibility was noted, with thick surface grass across much of the study area especially along the east and west road verge (Whincop and Howell-Meurs 2010, 42). Despite these sections of the study area containing a thick cover of surface grass, several Aboriginal cultural heritage places were located. Three of the seven registered Aboriginal places were re-identified during the field survey. Limited access to certain private properties, whose owners failed to give the consultants permission to enter, prevented the identification of the remaining Aboriginal places. The three Aboriginal places that were re-identified comprised the scar trees, two of which were re-recorded in more detail. Whincop and Howell-Meurs noted that significant grass cover and restricted access to some properties were obstacles encountered during the standard assessment (2010, 42). The consultants divided the study area into individual Survey Areas

(Survey Areas 1 to 32) based on location, and these were further sub-divided into Survey Units according to landform and areas of exposure present within each Survey Area. Survey Units were assessed in terms of their archaeological sensitivity and their level of prior disturbance. The following Survey Units were assessed to be of moderate and moderate-high archaeological sensitivity:

- Survey Unit 4a: Flat ground of road verge 50m south of creek, heavily disturbed by railway lines and road over pass (moderate archaeological sensitivity – Bayliss Road)
- Survey Unit 8c: Very gently inclined sandy rise cleared of vegetation with several surface artefacts evident on rise (moderate-high archaeological sensitivity – between Glassocks Road and Thompsons Road, west of Highway)
- Survey Unit 23: Gently inclined rise assessed by previous CHMP 10404 with registered artefact scatters located on this rise (moderate archaeological sensitivity – east of highway and north of intersection of highway and Hall Road)
- Survey Unit 24: Very gently inclined rise with VAHR listing registered artefact scatters on this rise (moderate archaeological sensitivity – east of highway and south of intersection of highway and Hall Road)
- Survey Unit 27: Very gently inclined sandy rise cut by Ballarto Road roundabout (moderate archaeological sensitivity – west of highway and south and west of intersection of highway and Ballarto Road)
- Survey Unit 28: Very gently inclined sandy rise cut by Ballarto Road (moderate archaeological sensitivity – east of highway and south and east of intersection of highway and Ballarto Road)
- Survey Unit 30a: Gently inclined sandy rise (moderate archaeological sensitivity – west of highway and southwest of intersection of highway and Cranbourne-Frankston Road)

The remaining survey units were assessed to be of low or low-moderate archaeological sensitivity. A total of two previously unregistered Aboriginal artefact scatters were identified during the standard assessment (335 Dandenong Hastings Road 1 – represented by an isolated quartz flake found on a low rise in a disturbed context and 335 Dandenong Hastings Road 2 – represented by six silcrete, quartz and quartzite artefacts found on a sandy rise). Whincop and Howell-Meurs also assessed several historic sites within the study area, with five registered historic sites located within the area. A total of two of these sites were re-identified during the standard assessment; the Lyndhurst primary school (HO22) and an historic homestead near the corner of Glasscock's and Dandenong-Hastings Roads (HO128, H7921-0049). Whincop and Howell-Meurs recommended that due to the presence of Aboriginal cultural heritage material within the study area, that further archaeological investigation was required. The consultants stated that subsurface testing as part of a cultural heritage management plan would identify the nature, extent and significance of potential Aboriginal cultural heritage material (2010, 71).

Proposed subdivision former Burdett's Quarry Langwarrin

Day conducted a cultural heritage management plan at the former Burdett's Quarry Langwarrin. A standard assessment was undertaken and two surface artefacts were located on exposed, degraded dunes at the south and eastern edges of the activity area. A degree of previous ground disturbance was noted. During the complex assessment, a 1x1m test pit and a series of shovel test pits were excavated, and the results showed that there was a degree of previous ground disturbance within the activity area, although the remainder of the excavations revealed relatively intact soil deposits. A total of four Aboriginal places were recorded (VAHR 7921-1187, -1188, -1189 and -1206) and the previously registered site 7921-0823 was reassessed. A total of 16 Aboriginal stone artefacts were found, predominately cores, flakes and tools. The proposed activity can avoid harm to the sand dune rise present within the activity area, and harm will also be avoided to parts of 7921-0823, -1189 and -1206.

415 Warrandyte Road, Langwarrin Residential Subdivision

Walther and Wheeler (2010) produced a CHMP (10899) for a proposed 9ha residential subdivision at 415 Warrandyte Road, Langwarrin South. The study area was characterized by a high crest to the east, with two spur lines both oriented east-west and separated by a shallow valley. A natural drainage line runs from the northeast corner to the southwest corner, which then joins with a first order drainage line running north-south.

The desktop assessment for this CHMP indicated that there were three registered Aboriginal places within the study area comprising two isolated artefacts and a diffuse artefact scatter that had been located during a previous survey undertaken by Bell in 2005. The 2005 study (cited in Walther and Wheeler, 2010, 81-86) concluded that the three sites were likely part of a single extensive site, but that ground disturbance had resulted in the movement of artefacts from their original location.

The complex assessment undertaken by Walther and Wheeler (2010) was designed to determine the extent, nature and significance Aboriginal cultural heritage places within the study area. The complex assessment consisted of two 1x1m hand excavated test pits and a series of 2x1m mechanical scrapes at 80m intervals; in total 17 2x1m trenches were excavated. The subsurface investigation located seven stone artefacts across the study area, at densities of less than 0.2 artefacts/m².

Walther and Wheeler (2010) concluded that the three previously recorded sites located in 2005 were part of one large site, which they recorded as 7921-0705 (subsuming the two isolated artefacts, 7921-0704 and 7921-0706), and that the seven stone artefacts located by them during subsurface testing were also part of the same site. The consultants found that the low density scatter is typical of those recorded in the Mornington Peninsula, and due to the level of disturbance across their study area the Aboriginal Place identified during the assessment has low integrity and limited research potential. Walther and Wheeler (2010) rated the site as being of low scientific significance.

The place extent defined for 7921-0705 by Walther and Wheeler (2010: 138-140) located its southern boundary directly along the fence line at 415 Warrandyte Road. This linear southern boundary was defined on the basis of the inability to further investigate the extent of the Aboriginal place beyond the boundaries of the CHMP study area, and it is anticipated that 7921-0705 extends into the adjacent property.

Ballarto Road Skye to Robinsons Road, Langwarrin

In 2011, Murphy and Morris conducted a CHMP for stage 3 of the proposed gas pipeline from Ballarto Road Skye to Robinsons Road, Langwarrin. Murphy and Morris predicted that stone artefact scatters were the most likely site type to be identified within the study area. A standard assessment took place and occasional areas of good ground surface visibility were noted, particularly along fence lines and along a drainage line that traverses the study area. An artefact scatter was identified (7921-1350). The consultants assessed sections of the study area as having moderate archaeological potential, including sandy rises and Cranbourne Sands dunes that are situated south of Ballarto Road to south of Cranbourne-Frankston Road, and south of Victory Road to Robinsons Road. The land between these rises was assessed as having low archaeological potential due to the presence of Murrindindi Supergroup soils, and the remaining landforms were also assessed to have no potential to contain Aboriginal cultural heritage material. One Aboriginal place was identified during the standard assessment, 7921-1350 comprising a surface artefact scatter found on a sandy rise. A complex assessment was undertaken, with testing focusing on the sandy rises and elevated landforms. A total of three 2x1m test pits were excavated within the Murrindindi Supergroup soils comprising silty sand overlying red to orange sandy gravels and clays. No Aboriginal cultural heritage material was located within these test pits. A total of three 1x1m test pits and fifty-five 50x50cm test pits were excavated on the sandy rise/dune landform resulting in the identification of nine Aboriginal cultural heritage places (7921-1349, -1355, -1356, -1348, -1359, -1352, -1351, -1353) all assessed to be of low scientific significance. The artefact scatter 7921-1350 was also subject to subsurface testing and is represented by a total of five artefacts. This Aboriginal place was assessed to be of low scientific significance.

50 Aqueduct Road, Langwarrin

Mitchell *et al.* 2012 conducted a CHMP for a proposed residential subdivision at 50 Aqueduct Road, Langwarrin. The study area is located in the Cranbourne Sands, and the consultants assessed sections of this area as being of high archaeological potential, with a sandy rise located across the south eastern portion of the study area.

The remainder of the study area was assessed to be of low archaeological potential. A total of two 1x1m test pits and thirteen 50x50cm shovel test pits were excavated during the complex assessment testing. A total of two Aboriginal cultural heritage places were identified, comprising an artefact scatter of low scientific significance represented by 9 artefacts (7921-1317) and an artefact scatter of moderate scientific significance represented by 16 stone artefacts (7921-1312). The artefacts representing these Aboriginal places were located on the sandy rise where soil sediments comprised dark brown silt overlying light grey sands with yellow sand and rock layer overlying a dry clay base. The Aboriginal cultural heritage place 7921-1317 will be avoided by the proposed activity; however 7921-1312 will likely be harmed.

4-6 Terry Street, Pearcedale

In 2013 Burch conducted a CHMP for a three allotment subdivision in Pearcedale, located to the south east of the intersection of Baxter-Tooradin Road and the Western Port Highway. The study area consists of relatively flat land on a sandy plain containing a slight rise along the north western property boundary, possibly as a result of activities from adjacent residential developments. A standard and complex assessment were undertaken and one test pit, seven shovel test pits and six radial shovel test pits were excavated. One low density artefact distribution was identified, 7921-1449, represented by five artefacts found at a depth range of 800-950mm in brown compact dry sandy deposits (Burch 2013, 30)

Brompton Lodge, Cranbourne South

Orr (2014) conducted a CHMP for a proposed residential subdivision at Brompton Lodge, corner of Dandenong-Hastings Road and Cranbourne-Frankston Road, Cranbourne South. A desktop assessment indicated that there were no previously recorded Aboriginal Places in the study area, however further assessment was required. A surface archaeological survey located eleven artefacts in the north of the study area. A tree with a scar was also identified but the scar was assessed as being culturally insignificant and non-Aboriginal in origin (Orr 2014, 37-38). Very high levels of disturbance as a result of past land use activities were evident in areas such as the quarry, egg farm and horse training complex (Orr 2014, 32). Due to poor surface visibility, it was impossible to properly assess the nature, extent and significance of Aboriginal cultural heritage in the area through a standard assessment alone.

The complex assessment involved excavation of nineteen 1x1m test pits and twenty 0.4x0.4m shovel test pits. Single test pits were excavated in each rise and hill within the study area. Aboriginal cultural heritage material was found at nine out of thirty-nine excavation locations. Three of these consisted of artefact scatters in sub-surface context (7921-1475 to 1477) and four of these (7921-1478 to 1481) consisted of Low Density Artefact Distributions in both surface and sub-surface contexts (Orr 2014, 60). Orr recommended a salvage collection of surface artefacts and that salvage excavations would be carried out at two Aboriginal places: VAHR 7921-1475 and VAHR 7921-1476.

160 Potts Road, Langwarrin

A CHMP for a proposed residential subdivision located at 160 Potts Road in Langwarrin was undertaken by Dugay-Grist and Cowled in 2014. A desktop assessment found low potential for archaeological material in areas where quarrying activities had taken place and moderate potential in less disturbed contexts throughout the study area. While there were no registered Aboriginal Heritage Places within the study area; a review of previously registered places indicated that the geographic region contained a dense concentration of sites, predominantly stone artefact scatters, which had been located along creek lines, swamp margins, and sandy dune contexts. The most common raw material types found in artefact scatters were silcrete and quartz, although quartzite and chert artefacts had also been found (Dugay-Grist and Cowled 2014, 17).

Throughout the standard assessment, ten stone artefacts were located on sandy rises within the activity area. Dugay-Grist and Cowled also found that the study area had been subject to high degrees of disturbance from past activities (2014, 56). Due to poor ground surface visibility the consultants conducted subsurface

testing in areas of potential sensitivity that were to be subject to further disturbance by the proposed development.

One 1x1m test pit and sixty-two 40x40cm shovel test pits were excavated during the complex assessment. The results of the testing indicated that the majority of the activity area had very little to no potential of containing Aboriginal cultural heritage material. A total of five subsurface artefacts were found within two shovel test pits (7921-1484 and 1485. A total of two Aboriginal Places 7921-1484 and 1485 (160 Potts Rd LDAD 1; 160 Potts Rd Artefact Scatter 1) were identified within the activity area (Dugay-Grist and Cowled 2014, 66).

Dugay-Grist and Cowled recommended that Aboriginal Place 7921-1484 be avoided and the artefacts representing this place were to be reburied at the completion of the activity. Harm to Aboriginal Place 7921-1485 could not be avoided due to the design requirements of the subdivision and the low scientific significance of the registered place (Dugay-Grist and Cowled 2014, 83).

5 Barclay Crescent, Hastings

Hislop (2014) conducted a CHMP for the proposed development of two flammable liquid storage tanks and associated plant works in Hastings, Victoria. A desktop assessment indicated that there were no previously recorded Aboriginal Places in the activity area. Due to the location of Aboriginal material less than 200m from the activity area, there was a medium probability that Aboriginal cultural heritage would be found (Hislop 2014, 41).

The activity area was divided into two areas throughout the standard assessment, these comprised of the existing storage tank facility located in the eastern half of the activity area and the undeveloped western half. No Aboriginal cultural heritage was identified during the field survey. No caves or rock shelters were also found. Ground surface was poor and severely limited the effectiveness of the survey (Hislop 2014, 48).

The complex assessment involved excavation of one 1x1m test pit, fourteen shovel test pits and fourteen back-hoe transects. No Aboriginal cultural heritage was located during the complex assessment and it was found that the vast majority of the activity area had suffered from severe disturbance. As no Aboriginal cultural heritage was recorded during the standard and complex assessments, no specific cultural heritage recommendations were required (Hislop 2014, 82).

5.0 Predictive Model

5.1 Methodology

The attribute states within each of the base data sets were rated depending on the likelihood that they are associated with Aboriginal cultural heritage places. For the purposes of this model, no distinction was made between different types of Aboriginal cultural heritage places. The ratings were based on earlier work in the region by Andrew Long and Associates, where appropriate adjusted to account for the specific nature of the current study area.

The ratings and their explanations are outlined in Table 4. The rated attribute states are listed in Table 5.

Rating	Interpretation
1	Highly likely
5	Likely
10	Neutral
20	Unlikely
40	Highly unlikely
999	No data/disturbed

Table 4: Ratings applied to the base layers, and their interpretation

Data set	Attribute state	Rating
1750s EVCs	Heathlands	5
	Heathy Woodlands	5
	Herb-rich Woodlands	5
	Lower Slopes or Hills Woodlands	10
	Lowland Forests	20
	No EVCs recorded	999
	Plains Grasslands and Chenopod Shrublands	10
	Riparian Scrubs or Swampy Scrubs and Woodlands	5
	Salt-tolerant and/or succulent Shrublands	1
Geological units	Brighton Group (Nb): generic	5
	Red Bluff Sandstone (Nbr): generic	5
	Monbulk Volcanic Group (Nuo): generic	5
	alluvium (Qa1): generic	5
	alluvium and colluvium (Qb): generic	5
	colluvium (Qc1): generic	10
	inland dune deposits (Qd1): generic	5
	coastal dune deposits (Qd11): generic	5
	coastal lagoon deposits (Qg): generic	10
	anthropogenic deposits (Qh): generic	999
	swamp and lake deposits (Qm1): generic	10
	Murrindindi Supergroup (Sm): generic	5
	No geology recorded	999
Distance from water	0m (in water; semi-permanent saline wetland 1788)	1
	0m (in water; all water except semi-permanent saline wetland 1788)	40
	1-500m	1

	500-700m	5
	700-1100m	10
	1100-1500m	20
	>1500m	40
Elevation	≤80m	10
	>80m	10
Slope	0-5 degrees	1
	5-10 degrees	5
	10-15 degrees	10
	15-20 degrees	20

Table 5: Base layer data sets, attribute states and ratings used in the predictive modelling

The rated base layers were then converted to rasters (Figure 6 to Figure 10) and geoprocesed using the ArcGIS Spatial Analyst Raster Calculator. This geoprocesing involved adding up the rating values for each raster cell in a weighted fashion, resulting in a normalized predictive value for each cell. The weightings for the five base layers were constructed by expert comparison of each layer against each other layer, in each case determining which layer was deemed the more influential one in affecting Aboriginal cultural heritage occurrence. The resulting weightings are given in Table 6.

	EVC1750	Geol250K	Water	Elevation	Slope	Score		Weighting
EVC1750	1	0	0	1	1	3	3/15=	0.2
Geol250K	1	1	1	1	1	5	5/15=	0.333333
Water	1	0	1	1	1	4	4/15=	0.266667
Elevation	0	0	0	1	0	1	1/15=	0.066667
Slope	0	0	0	1	1	2	2/15=	0.133333
Total						15		1

Table 6: Scores and normalized weightings for the five base layer data sets

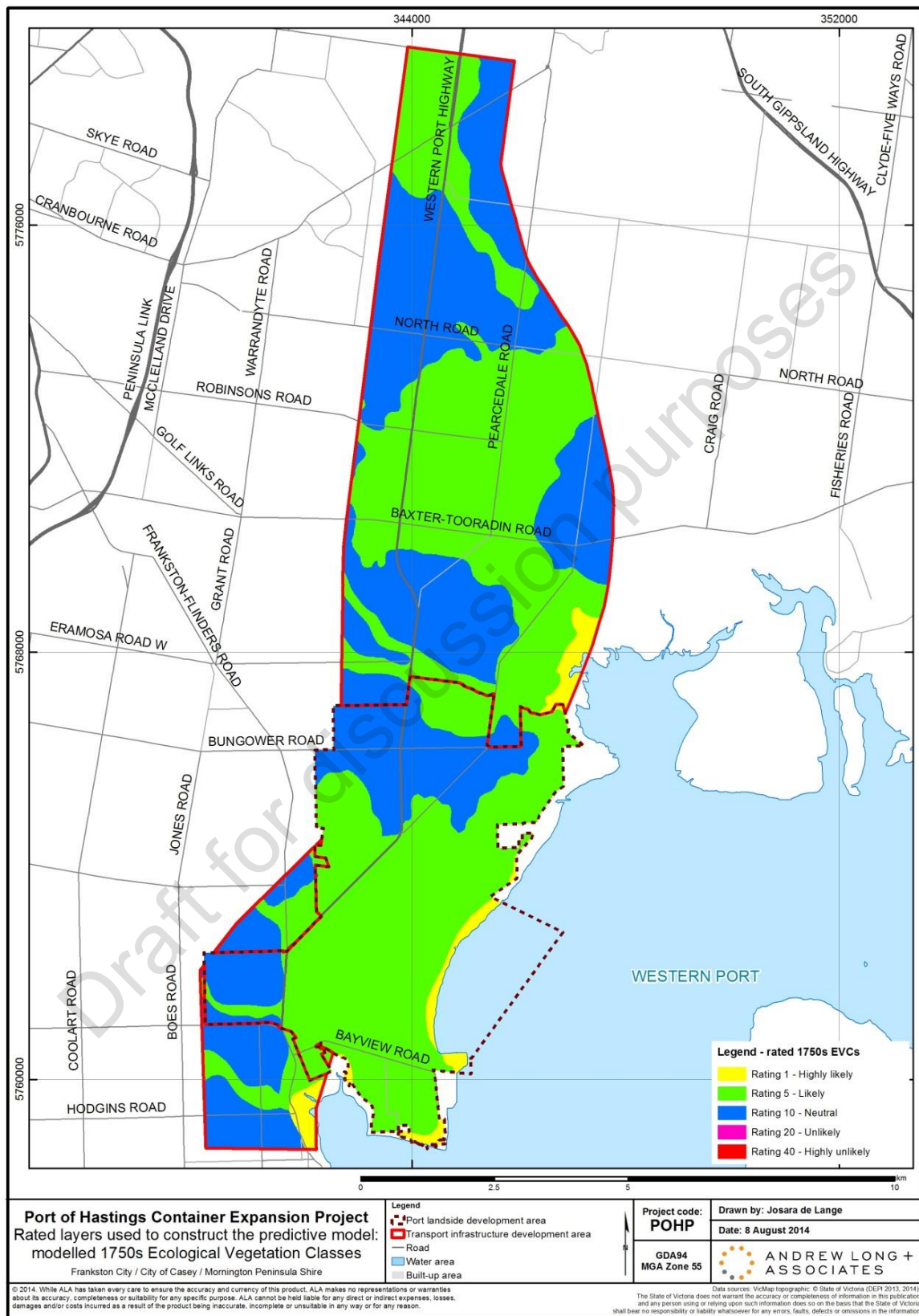


Figure 6: Modelled 1750s Ecological Vegetation Classes: rated

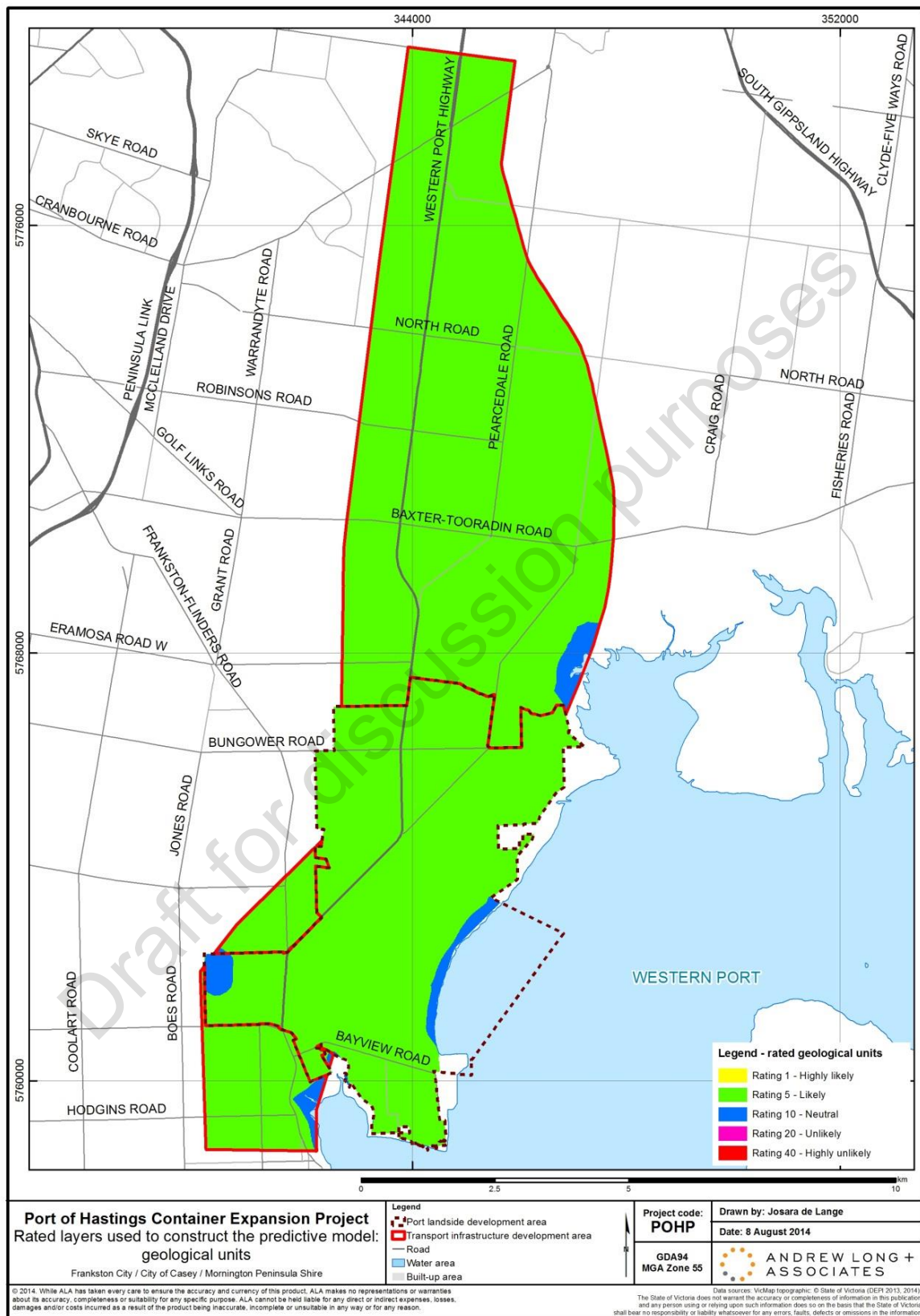


Figure 7: Geological units: rated

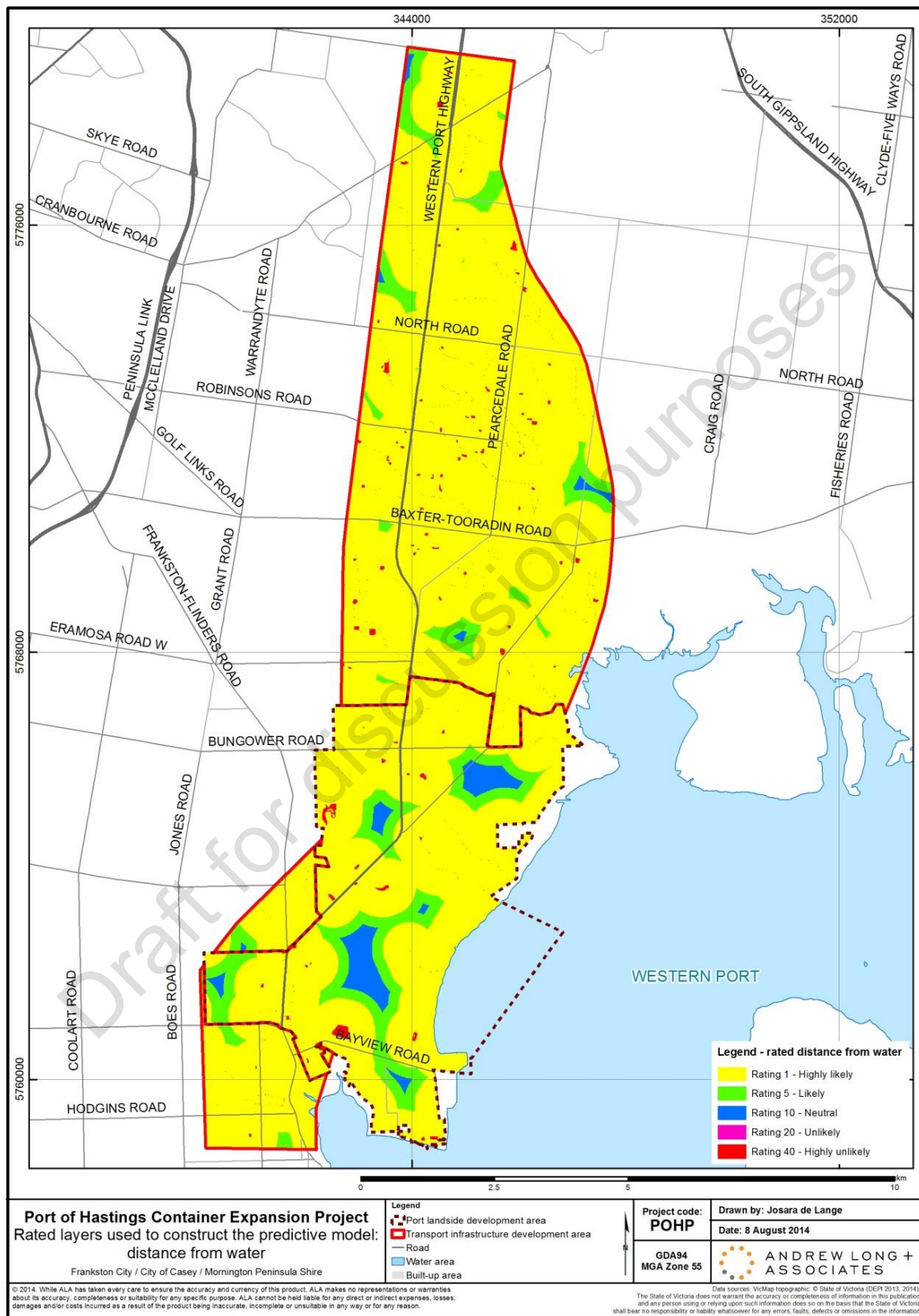


Figure 8: Distance from water: rated

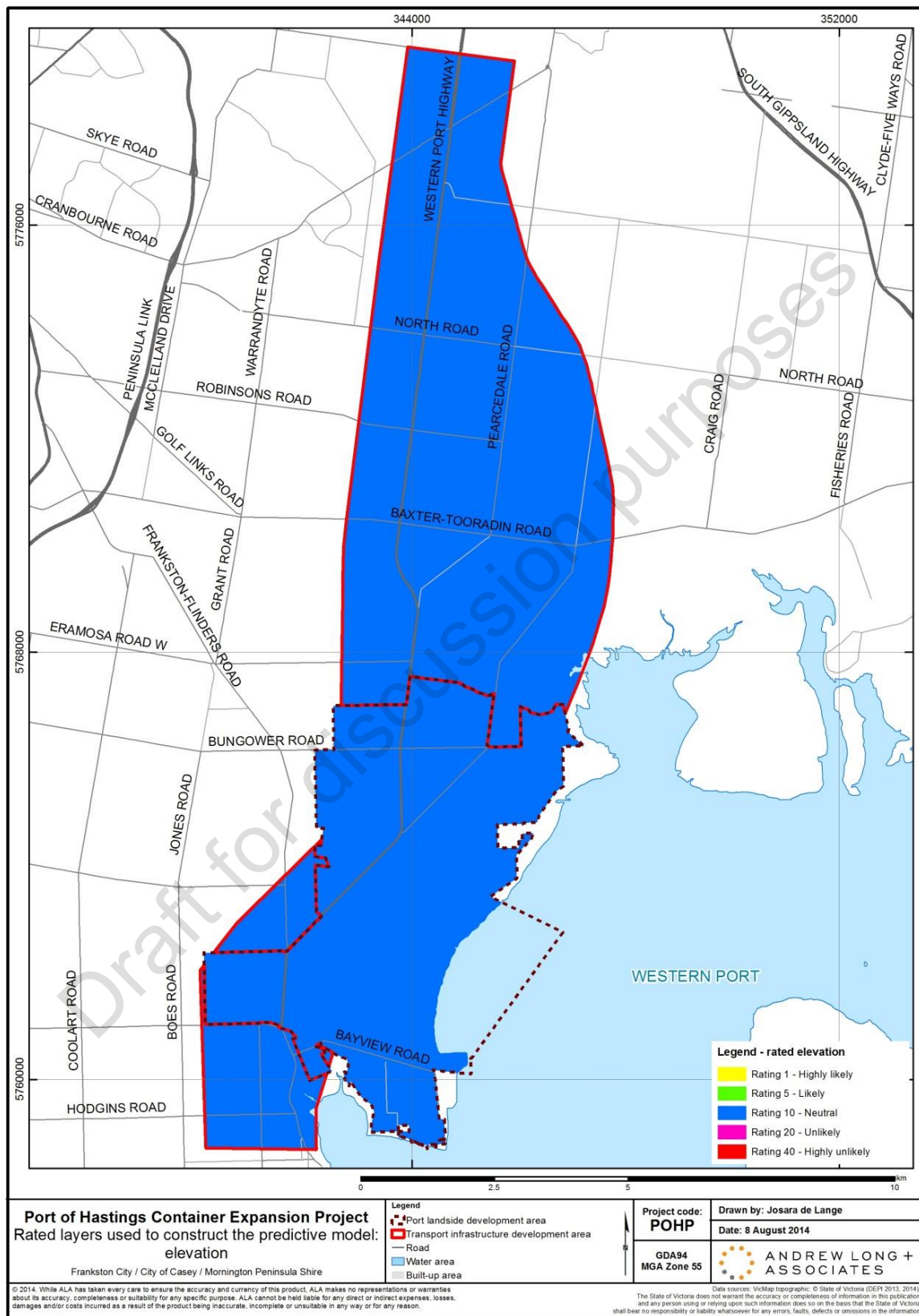


Figure 9: Elevation: rated.

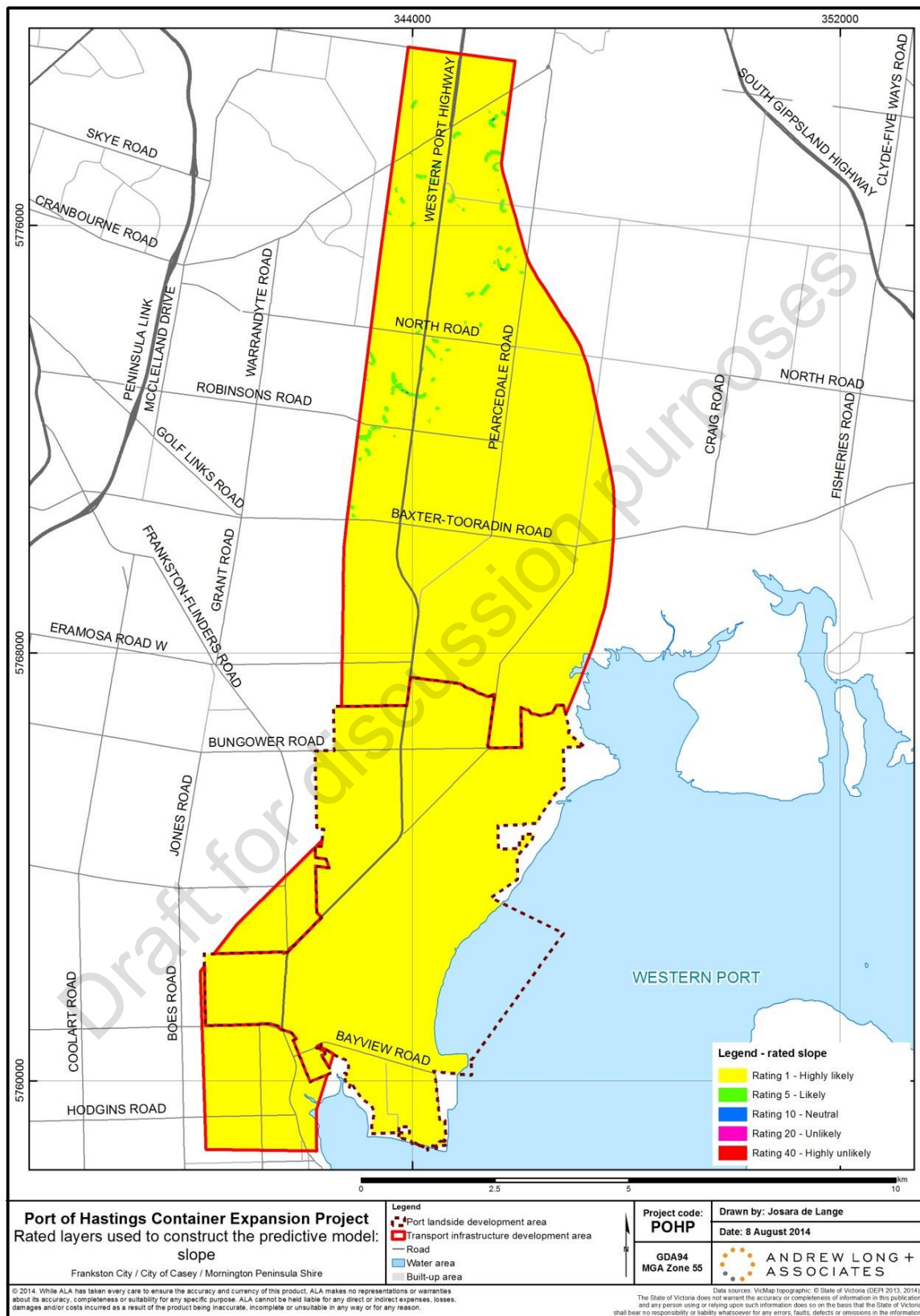


Figure 10: Slope: rated.

The output data set, the values of which range from 2.93 to 536.27, was then reclassified into four classes, three of which have predictive value. These classes are outlined in Table 7.

Predictive model value range	Interpretation
2.933335066 - 4.7	Aboriginal cultural heritage most likely
4.700000001 - 5	Aboriginal cultural heritage moderately likely
5.000000001 - 40	Aboriginal cultural heritage least likely
40.00000001 - 544.2664185	No predictive value (area not represented in data, or disturbed)

Table 7 Classification of the predictive model values.

5.2 Results

The proportions of the overall study area covered by the three predictive model classes are shown in Table 8. As can be seen from this table, roughly half of the study area falls in the class of highest likelihood. Comparing this to the Aboriginal cultural heritage sensitivity layer of the OAAV, the proportion is similar, with 48.4 per cent of the study area falling in an area of sensitivity. However, the distribution of the cultural heritage sensitivity and the class of highest likelihood of the predictive model only partially correspond, with 55.1 per cent of the area of cultural heritage sensitivity overlapping with this class.

Predictive model class	Area (ha)	Proportion of study area	Number of registered heritage locations	Proportion of registered heritage locations
Aboriginal cultural heritage most likely	4244.91	50.57%	47	66.20%
Aboriginal cultural heritage moderately likely	3123.34	37.21%	23	32.39%
Aboriginal cultural heritage least likely	623.98	7.43%	1	1.41%
No predictive value	401.16	4.78%	0	N/A

Table 8: Proportion of the overall study area covered by the predictive model classes, and the number of previously registered Aboriginal cultural heritage places in each class area.

Overlaying the locations of previously registered Aboriginal cultural heritage onto the classified predictive model suggests that in particular the model class of highest likelihood has substantial predictive value, capturing 66.2 per cent of the known Aboriginal cultural heritage locations whilst representing 50.6 per cent of the study area. The classified predictive model showing registered Aboriginal cultural heritage places are presented in Figure 11 and Figure 12.

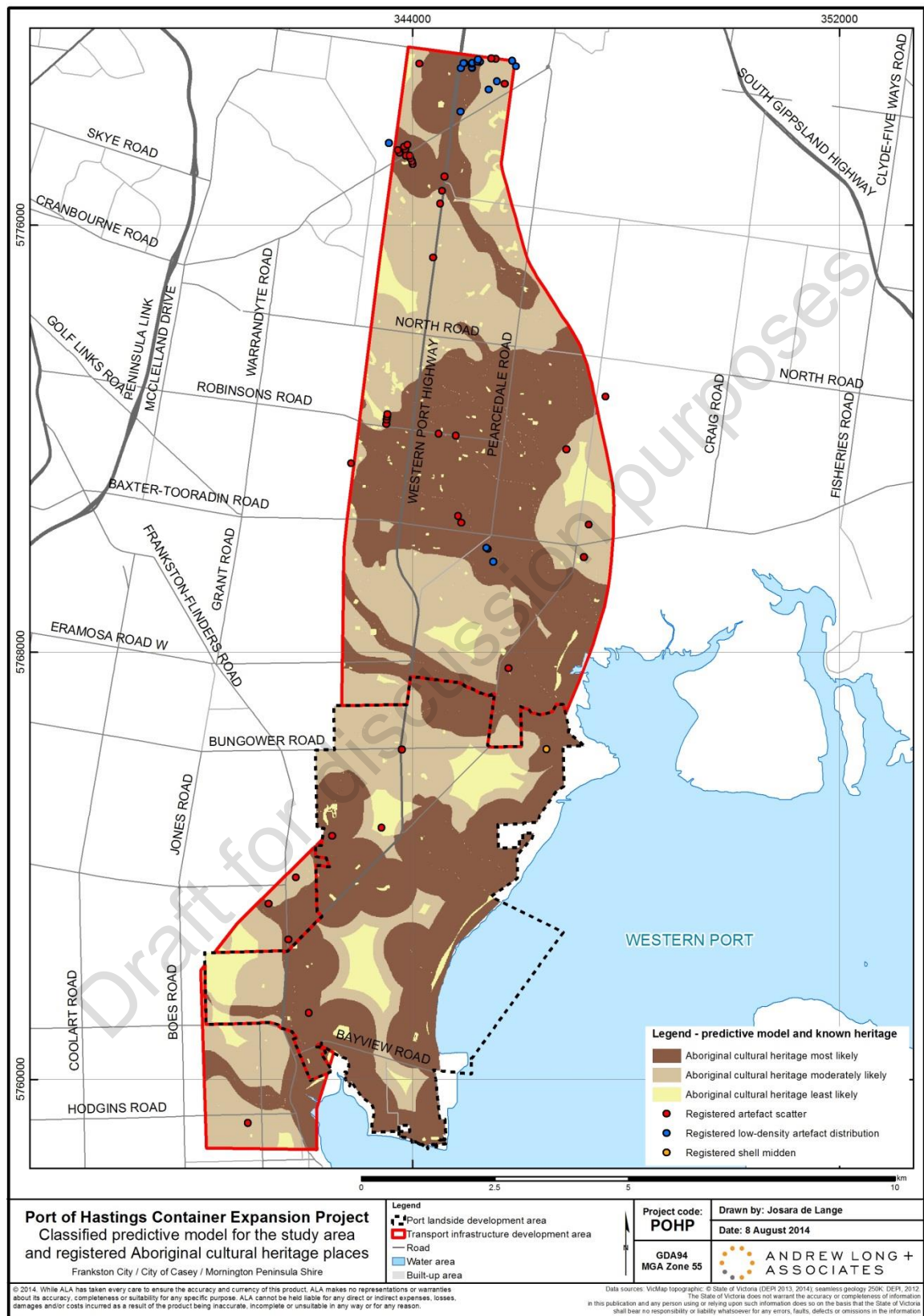


Figure 11: Classified predictive model showing registered Aboriginal cultural heritage places.

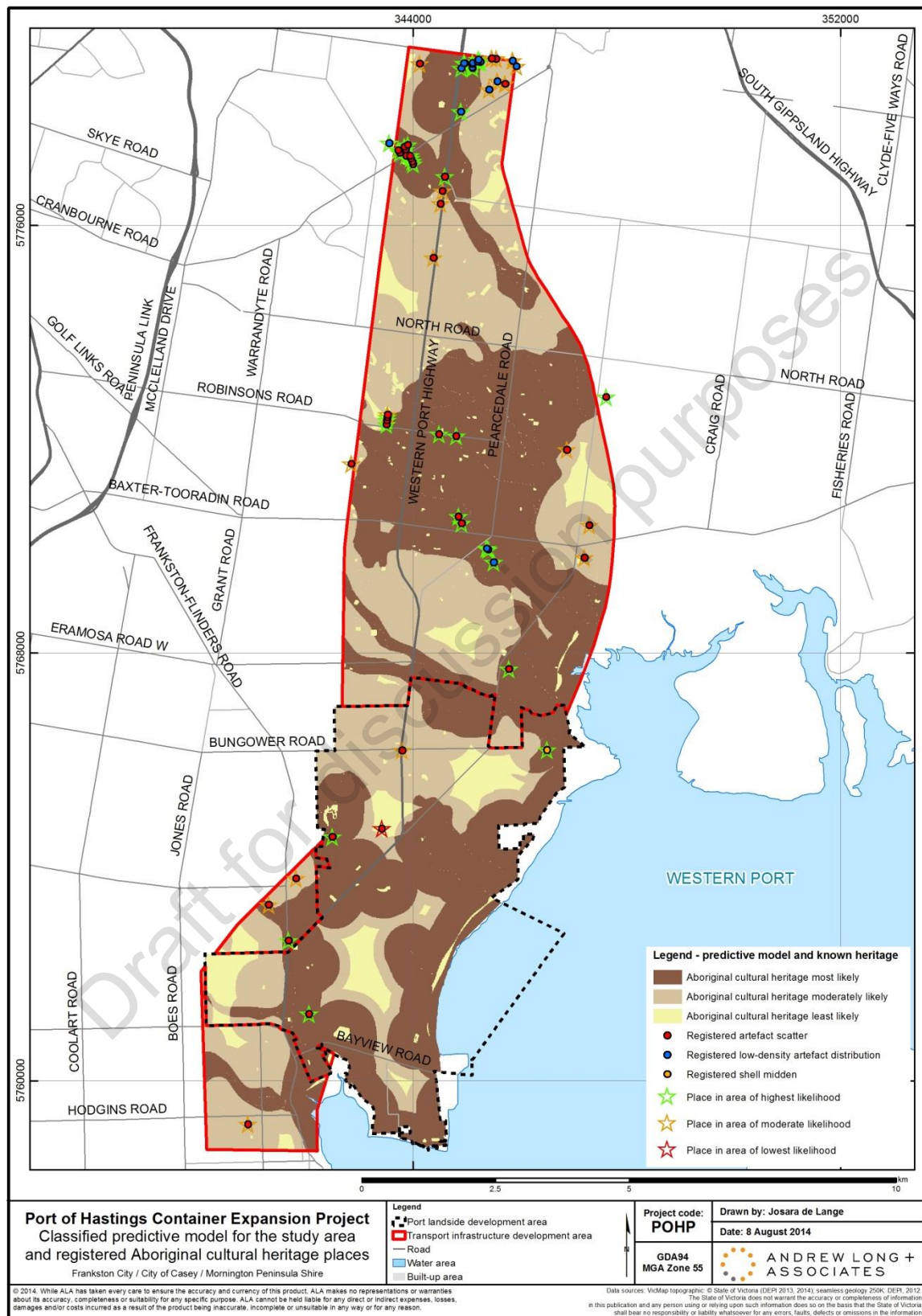


Figure 12: Classified predictive model showing registered Aboriginal cultural heritage places highlighted by classification.

6.0 Preliminary Recommendations

The preliminary recommendations of this report are as follows:

- On the basis of the above assessment the proposed activity will require that a mandatory CHMP be prepared pursuant to Section 46 of the *Aboriginal Heritage Act* 2006. The key issues influencing this finding is the fact that the proposed works intersect areas of cultural heritage sensitivity, as defined in Division 3 of the *Aboriginal Heritage Regulations* 2007 and will constitute a high impact activity as defined in Division 5 of the *Aboriginal Heritage Regulations* 2007.
- The Project can be staged and divided into two separate CHMPs accordingly, one covering the port landside development area, and the other the transport infrastructure development area. This takes into consideration the differing nature of the project components, stages of project development and practicalities of land access. The CHMP for the transport infrastructure development area should commence once the preferred transport corridor is identified.
- For a detailed assessment of the potential Aboriginal heritage values of the study area, an advanced predictive model will be required to incorporate a site specific approach, i.e. considering the likelihood of burials, earth features, shell midden, artefact scatter etc.
- The preparation of a CHMP would typically involve:
 - Notification and Consultation – a notification form will be submitted to the RAP and OAAV of your client's intention to prepare a CHMP, followed up by preliminary consultation with the RAP or relevant Aboriginal stakeholder groups.
 - Desktop Assessment – an assessment of previous studies will be undertaken to verify the existing conditions, review any subsequent changes and develop a provisional methodology to evaluate the site.
 - Standard Assessment (Field Survey) – the activity area will be the subject of a field survey in collaboration with representatives of the RAP or relevant Aboriginal stakeholder groups to meet the requirements of a Standard Assessment.
 - *Complex Assessment (Test Excavation)* – a testing programme to provide an indicator of the presence/absence of archaeological deposits at priority locations will be undertaken. This may include shovel test pits, sample controlled hand excavation (cf. 1m² test pits), mechanical excavation or any other works that are determined to be a condition of proceeding to the approval of the CHMP. Representatives from the RAP or relevant Aboriginal stakeholder groups will be involved in this process.
 - Reporting – a CHMP will be prepared according to the *Aboriginal Heritage Regulations* 2007, the OAAV approved form and Guide to Preparing Aboriginal Cultural Heritage Management Plans (May 2007). An appropriate management response and contingency find protocol will be established for all Aboriginal cultural heritage places.

7.0 Conclusion

Cultural heritage places are the physical manifestation of human occupation and utilisation of the landscape, normally relating to cultural groups, processes and activities in the past. The term 'place' is somewhat arbitrary, being used to define limits or foci of activity for interpretational or management purposes. In fact they are elements of a wider cultural landscape, which are representative of activities practised in the past. Given the degree of disturbance through landscape clearance, intensive modern farming techniques, urban

development and natural erosion, evidence of earlier Aboriginal activities comprise an increasingly diminishing component of the wider cultural landscape.

A total of 49 registered Aboriginal heritage places are located within the study area. Apart from the areas associated with registered Aboriginal cultural heritage places, the study area lies across several known areas of cultural heritage sensitivity including:

- The Cranbourne sandsheet;
- The Koo Wee Rup Plain;
- Named water courses (Kings Creek, Watson Creek, Langwarrin Creek and Boggy Creek)
- Creek crossings (Eastern Contour Drain, Olivers Creek and Kings Creek),
- Land within 200m of the creeks (Kings Creek and Olivers Creek, and Boggy Creek)
- Declared Ramsar Wetlands (Western Port Ramsar Site)
- Coastal Land

Many of the registered Aboriginal Places within the study region have been located on these known areas of cultural heritage sensitivity.

On the basis of the nature of the known archaeological record in the wider region and the landforms present in the study area, it has been determined that there is a high potential for additional Aboriginal cultural heritage places to occur within the study area. There is a high concentration of Aboriginal cultural heritage material occurring within sandy dune deposits, and these deposits are present within the current study area. The results of the desktop assessment indicate the following:

- Subsurface artefact scatters are the site type most likely to be located within the study area.
- The following environmental features are more likely to contain archaeological potential for Aboriginal cultural heritage places:
 - Elevated sandy dune deposits and Cranbourne Sands geology
 - Upper slopes and tops of sandy rises and dunes
 - Elevated ground inland from the coast located in proximity to wetlands, water sources and swamps
 - Alluvial fans and outwash fans associated with creeks
- The level of prior disturbance within the study area will have an effect on the likelihood of identifying intact, *in situ* Aboriginal cultural heritage material.
- Less developed rural land within the study area will most likely provide the best opportunities to locate intact Aboriginal cultural heritage material.

The modifications that have occurred to the study area will have substantially impacted the survival of intact archaeological deposits, although the presence of registered Aboriginal cultural heritage places within the study area indicates that the potential for archaeological materials to be present within the study area cannot be discounted.

In general terms the study area has been subject to various impacts since early European settlement, dominated by the clearance and agricultural use of the landscape, with a range of urban impacts (including drainage works, roads, residential development and utility infrastructure) effecting the preservation of soils and landforms in parts of the study area. The best opportunities for advantageous preservation conditions exist in the less developed, rural land holdings within the study area.

In consideration of the predictive model, it is important to recognise the distinction between the overall model, represented in this report, which represents the quantum of issues that can potentially be managed within the context of a Cultural Heritage Management Plan (CHMP), and the models of specialised sites types and

community values that are proposed to follow this investigation, which may represent 'show stoppers' for the selection of particular options. Although this is an early stage in the Aboriginal heritage assessment process, in combination they can provide a clear insight into the implications and potential consequence of the selection of activities at one location over another.

A complex assessment as part of an approved CHMP for the preferred locations will include a programme of subsurface investigation in order to identify the nature, extent and significance of existing and potential Aboriginal cultural heritage in accordance with Regulation 60 (1b). Testing areas for the complex assessment should be preferentially selected based on investigation areas with higher archaeological sensitivity resulting from the site predictive model. Additionally a sample of investigation areas with lower archaeological sensitivities should also be investigated to provide quantitative support of the assumptions and rationale behind the site predictive model.

Draft for discussion purposes

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