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**GHD Pty Ltd (April 2016) Wonthaggi North East Growth Area Planning Studies – Contaminated Land Investigation, Prepared for Bass Coast Shire Council (document reference 31/33577/248148)**

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## **1.6 Limitations**

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**Bass Coast Shire Council**  
**Wonthaggi North East Growth Area Planning Studies**  
**Contaminated Land Investigation**

April 2016

# Executive summary

Bass Coast Shire Council (Council) engaged GHD Pty Ltd (GHD) in December 2015 to undertake a desktop Contaminated Land Investigation (CLI) (herein referred to as '*the study*') for the Wonthaggi North East Growth Area (herein referred to as the '*study area*'), to inform the development of a Precinct Structure Plan for the study area which will be incorporated into the Bass Coast Planning Scheme.

## **Purpose**

The purpose of this study is to undertake a Phase 1 Environmental Site Assessment (ESA) of the study area to assess the potential for land contamination to be present based on historic and current land uses. This information will be used to identify areas requiring further investigation by developers, and will inform the Precinct Structure Plan for the area. This study is considered a preliminary risk screening activity.

## **Site description**

The study area is an area of land located to the northeast of the township of Wonthaggi. A Site location plan is provided as Figure 1.

The study area consists of 113 properties, and includes approximately 640 ha of land. The properties are numbered 1- 113 according to the study area property numbering system devised by Council.

The study area is currently used for mixed agricultural uses, with predominating grazing paddocks and farm buildings/homesteads, with areas of low density residential and commercial/industrial land use in the northwest and south respectively.

## **Site history information**

The results obtained from the site history review indicate that the study area and surrounding areas have predominantly been used for residential purposes, mining (Wonthaggi State Coal Mine located to the southwest of study area and associated mullock heaps on Property 113), agricultural and stock grazing purposes (in particular for dairy farming) from 1889 to the present day. The State Coal Mine operations ceased in 1968.

The agricultural activities associated with the properties located within the study area predominantly involved grazing paddocks or the growing of stock feed; however properties 26 and 34 were identified as potentially used for market gardening during the historical aerial photograph review.

It is understood that at least one abattoir is likely to have existed within the study area, however the location could not be confirmed. It is considered possible that an abattoir was located on one or two of the following properties: 34,35,36,37, 38, 39, 40.

Likely commercial / industrial land use activities were noted on Properties 34-36, 41 (electrical terminal/substation), 51-103 and 112, with a possible automotive repair activities noted on Properties 56, 60-65 and 67.

Other Potential Areas of Concern (PAoC) recognised during the aerial review were earthworks (including potential introduced fill or stockpiled soil) at Properties 1, 4, 5, 8, 10, 17, 35, 36, 39, 42, 48, 106, 108 and 113 (potential mine waste). General storage of waste material or scrap was identified on properties 13, 35, 39, 59-65, 72-77, 100-103, 106 and 112.

### ***DSE 2005 assessment***

The assessment of potentially contaminated land completed in accordance with DSE 2005, Potentially Contaminated Land, General Practice Note, identified the following:

- **High PFC Rating – 16 properties**
- **Medium PFC Rating – 70 properties**
- **Low PFC Rating – 27 properties**

As the study area is proposed for predominantly sensitive uses (residential development) these PFC ratings translate directly to the following Assessment Levels (in accordance with the DSE 2005, *Potentially Contaminated Land*, General Practice Note):

- **High PFC Rating = Assessment Level ‘A’ required**
- **Medium PFC Rating = Assessment Level ‘B’ required**
- **Low PFC Rating = Assessment Level ‘C’ required.**

### ***Recommendations***

Following the conclusions made in this study and based on the information collected in the study area history and desktop reviews, GHD recommends that additional studies be completed for the properties identified as having high or medium potential for contamination. Council may wish to implement planning controls such as requiring additional assessment phases on these properties to confirm the findings of this assessment, prior to implementing the advice of the DSE 2005, *Potentially Contaminated Land*, General Practice Note outlined below:

- **Assessment Level ‘A’ properties** - An Environmental Audit Overlay (or equivalent planning mechanism) should be applied to these Properties to ensure an environmental audit is carried out at the site prior to redevelopment to sensitive residential or associated land use. The need for an environmental audit may be either confirmed or the PFC rating reduced if additional assessment is conducted and findings warrant the modification.
- **Assessment Level ‘B’ properties** – a Phase 1 environmental site assessment (ESA) (including comprehensive site inspections with access to locked structures) should be completed on these properties, specifically in those areas identified in the Study as containing specific PAoC. It is noted that a targeted ESA of these properties to evaluate the identified PAoC could be required and may either increase or reduce the PFC ratings and consequently the requirement for additional intrusive investigations.

If a Phase 2 ESA was recommended following completion of the Phase 1, the level of investigation required could vary significantly between properties across the study area, depending on their size and identified potential contamination issues.

- **Assessment Level ‘C’ properties** – no further works are recommended for these properties, unless evidence of potentially contaminating activities or sources of contamination are identified at a later date. However, the site owner still retains a general duty under Section 12(2)(b) and Section 60(1)(a)(iii) of the Planning and Environment Act 1987.

### **General study area recommendations**

There is the potential for accumulation and/or concentration of contaminants (associated with agricultural land use) in drainage channels. As such, it is recommended that sampling of sediments within drainage channels within Properties 1, 8, 38, 40, 42 and 111 (from locations located up, down and mid gradient of the study area) to assess accumulation of contaminants in these channels.

As described in Section 2.7, the largest area of intact vegetation at the study site appears to centre on the Wonthaggi Bushland Reserve, on the western side of Carneys Rd, either side of the Bass Hwy, and areas east of Sharrock Rd and along the McGibbonys Rd road reserve. Native grasses commonly occur along road reserves. If any impacts occur to areas of vegetation, these impacts should be assessed to determine whether listed ecological communities are impacted.

As described in Section 2.7, the results of the MNES Desktop Review provide *some* advance direction as to the likelihood of referral requirements under the EPBC Act being triggered. However, further ecological investigation of the site should be considered, particularly if any of the areas of intact vegetation, which are the more likely places for listed species to occur, are likely to be impacted.

*This report is subject to, and must be read in conjunction with, the limitations set out in Section 1.6 and the assumptions and qualifications contained throughout the Report.*

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# 1. Introduction

Bass Coast Shire Council (Council) engaged GHD Pty Ltd (GHD) in December 2015 to undertake a desktop Contaminated Land Investigation (CLI) (herein referred to as '*the study*') for the Wonthaggi North East Growth Area (herein referred to as the '*study area*'), to inform the development of a Precinct Structure Plan for the study area which will be incorporated into the Bass Coast Planning Scheme.

The study area is a parcel of land comprising approximately 640 hectares (ha) incorporating 113 properties that bound the township of Wonthaggi to the north and east. A study area location plan is provided as Figure 1.

## 1.1 Background

The study area is located in the Bass Coast Shire in south east Victoria. It is identified as a future residential precinct and a significant expansion of the Wonthaggi Township which will comprise approximately 2,000 dwellings.

The Department of Environment, Land, Water and Planning (DEWLP) requires that the Department of Sustainability and Environment (DSE), Ministerial Direction No. 1 - Potentially Contaminated Land of the Planning and Environment Act 1987 (Ministerial Direction No.1 1987) is addressed. The requirement is driven by the need to:

*“ensure that potentially contaminated land is suitable for a use which is proposed to be allowed under an amendment to a planning scheme, and which could be significantly adversely affected by any contamination” [Planning and Environment Act 1987; Section 12 (2) (a)].*

The DSE, *Potentially Contaminated Land - General Practice Note, 2005* (DSE 2005, *Potentially Contaminated Land, General Practice Note*) requires that:

*“planning authorities must satisfy themselves that the environmental conditions of land proposed to be used for a sensitive use (designed as residential, child-care centre, pre-school centre or primary school), agriculture or public open space are, or will be, suitable for that use”.*

## 1.2 Purpose of this report

The purpose of this study is to undertake a Phase 1 Environmental Site Assessment (ESA) of the study area to assess the potential for land contamination to be present based on historic and current land uses. This information will be used to identify areas requiring further investigation by developers, and will inform the Precinct Structure Plan for the area. This study is considered a preliminary risk screening activity.

## 1.3 Objective

The main objective of this project is to evaluate the need for further assessment of properties within the study area as part of the development process, and to identify constraints to development.

## 1.4 Scope of work

In order to achieve the objective, GHD completed the scope of works, as defined by Council in the Consultant Brief BCSC TRIM Ref. ED15/145531 dated 23 October 2015, which was designed to assess historical and present land-uses. The scope of works included:

- Desktop review of published soil, geology and hydrogeology conditions, including survey, mapping and other base data as available from relevant authority and agency data sets and maps.
- Review of current and historical aerial photography records for the study area and surrounds (where available) to assist in establishing the physical patterns of development over time.
- Review of historical land titles for selected properties.
- Consultation with Wonthaggi Historical Society and completed a limited review of the Pioneers on the Powlett River and at Wonthaggi (1878-1910) (Barbara Moyle).
- Compilation of known groundwater borehole locations and use as listed on the Victorian groundwater database.
- Review of Wetlands databases and sites of National Environmental Significance.
- Review of Australian Heritage Databases specifically for historic uses.
- Consultation with relevant agencies as required including:
  - Environment Protection Authority (EPA) for review of records including the 'Priority Sites Registry' and the list of issued 'Certificates and Statements of Environmental Audit.
  - Council regarding known land uses and previous planning permits in the study area as well as surrounding properties, where relevant.
  - Council to obtain copies of relevant information relating to current ownership and any other relevant data.
- Preparation of a report detailing the findings of the Desktop Study and assessing the findings against the criteria within Tables 1 and 2 in the DSE 2005, *Potentially Contaminated Land*, General Practice Note with respect to the need for application of an EAO to all or parts of the study area.

This investigation was a risk screening activity with limited scope and does not include, hazardous goods searches, cathodic protection searches, collecting of soil or groundwater samples or interviews with site owners. The limited scope completed is considered sufficient to meet the objective detailed in Section 1.3 with due consideration to the limitations set out in this report.

The information collected during the desktop review was assessed according to to the DSE 2005, *Potentially Contaminated Land*, General Practice Note. Using Table 2 of this Practice Note, GHD was able to:

- Indicate where key potential areas of concern (PAoC) may exist and the chemicals of potential concern (CoPC).
- Allocate all properties within the study area with an initial high, medium or low Potential for Contamination (PFC) rating in relation to land contamination; and
- Provide recommendations on the need for further assessment of land within the study area, guided by the initial PFC rating.

## 1.5 Applicable guidelines

The overall methodology of the study was carried out in general accordance with the following guiding documentation:

- National Environment Protection (Assessment of Site Contamination) Measure (NEPM) 1999 as amended 2013
- Australian and New Zealand Environmental and Conservation Council (ANZECC), Guidelines for the Assessment and Management of Contaminated Sites, 1992 (ANZECC 1992)
- Ministerial Direction No. 1 – Potentially Contaminated Land (made under Section 12(2)(a) Planning & Environment Act 1987)
- Planning & Environment Act 1987
- Environment Protection Act 1970
- Standards Australia, Australian Standard AS4482.1 - Guide to the investigation and sampling of sites with potentially contaminated soil, 2005 (AS4482.1 2005)
- Victorian Environmental Protection Agency (VIC EPA), State Environment Protection Policy – Prevention and Management of Contamination of Land, 2002 (Land SEPP)
- Victorian Environmental Protection Agency (VIC EPA), State Environment Protection Policy - Groundwaters of Victoria, 1997
- Victorian Department of Sustainability and Environment (VIC DSE), Potentially Contaminated Land - General Practice Note, 2005 (DSE 2005, *Potentially Contaminated Land*, General Practice Note).

## 1.6 Limitations

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## 1.7 Assumptions

GHD notes that the information provided in this report are based on the following assumptions and limitations:

- GHD relied on information supplied by others, which may not have been independently verified.
- This investigation was limited in scope and does not include Royal Historical Society of Victoria (RHSV) searches, hazardous goods searches, cathodic protection searches or interviews with site owners. Intrusive investigations for the purpose of observing sub-surface conditions, soil or groundwater sampling, analytical testing and geological logging were not undertaken during the compilation of this report. It is noted that evidence of soil contamination is not always obvious by desktop assessment.
- It is assumed that disturbed ground observed to be present on properties within the study area is either reworked soil, sourced from the property on which it was observed, or fill imported from an offsite location. If fill material has been imported onto these properties at any time, or if any buildings constructed prior to 2003 have been demolished on these properties, it is considered that contaminants including (but not limited to) lead and asbestos or asbestos containing material (ACM) may be present.
- Image resolution issues that may have led to uncertainties in interpretation are mostly stated in the historical aerial photograph review presented in Section 3.1.
- Geological and hydrogeological understanding is based on previously completed geological mapping and information provided by DELWP and others, and is assumed to be reasonably accurate.
- Council has informed GHD that they do not have access to and/or are not aware of any previous contamination studies completed on properties in the study area. Therefore no review of previous reports was conducted as part of this assessment.
- GHD has assumed that all data provided by Council is accurate and obtained with appropriate licensing including: Current title and proprietor information, DSE, 2012 aerial imagery, spatial data including study area and property boundaries.
- GHD was not able to gain access to any part of any of the properties within the study area. Inspection of the properties was undertaken from publicly accessible roads and tracks only.
- The use of the book *Pioneers on the Powlett River and at Wonthaggi (1878-1910)* (Barbara Moyle) was limited. While chapters considered likely to be relevant to the study area were reviewed, GHD did not read the book in its entirety. As such, relevant information from the book may not have been considered as part of this assessment.
- The final PFC rating is based on GHD's interpretation and assessment of all of the data reviewed for each property.

## 2. Study area characterisation

### 2.1 Study area location and description

The study area comprises land located to the north and east of the township of Wonthaggi. A Site location plan is provided as Figure 1.

The study area consists of 113 properties, and includes approximately 640 ha of land. The properties are numbered 1- 113 according to the study area property numbering system devised by Council. It is noted that the study area includes the eastern portion only of property 113. Whilst we have considered the entirety of property 113 for the purpose of site history investigations, only the portion within the Study area is considered as part of the assessment area.

A Site layout plan showing property numbers (as allocated by Council) is provided as Figure 2

The study area is currently used for mixed agricultural uses, with predominating grazing paddocks and farm buildings/homesteads, with areas of low density residential land use in the northwest and commercial/industrial land use in the south..

The properties located within the study area, including the property number and property description are summarised in Appendix I.

### 2.2 Planning zones

A review of the planning zones provided by Council and accessed from publicly available sources indicated that the majority of the study area is currently zoned as Farming Zone (FZ) and General Residential Zone (GRZ1). A pocket of Low Density Residential (LDRZ) is located in the northwest of the study area and Industrial and Commercial Zones (IN1Z and C2Z) exist in the south adjacent to the Bass Highway. Property 113 in the south west of the site is zoned Public Park and Recreation (PPRZ). The planning zones that are applicable to the properties within the study area are shown in Figure 3 and summarised in Table 1 below.

Table 1 Study area planning zones

Zone	Property Number
Farming (FZ)	1, 6, 7, 8, 38, 39, 40, 43, 44, 45, 46, 49, 50, 108, 109, 110, 111,
General Residential (GRZ1)	2, 3, 4, 5, 32, 33, 34, 35, 36, 41, 42, 47,
Low Density Residential (LDRZ)	9 - 31
Commercial (C2Z)	48, 104, 105, 106
Industrial Zone (IN1Z)	51 – 103, northwest and northeast corners of the Property 113.
Public Park and Recreation (PPRZ)	Majority of Property 113

Planning zones in areas surrounding the study area include:

- To the north, Farming Zone (FZ)
- To the south, Rural Living (RLZ), Public Park and Recreation (PPRZ), Farming (FZ), and Commercial (C2Z)
- To the east, Public Park and Recreation (PPRZ), and Farming (FZ)
- To the west, General Residential (GRZ1), Low Density Residential (LDRZ). Public Park and Recreation (PPRZ), Industrial (IN1Z), Farming (FZ), Public Use (PUZ1, PUZ2, PUZ3), Public Conservation & Resource (PCRZ) and Commercial (C1Z, C2Z)

### 2.3 Bass Coast Shire Council planning schemes

A review of the planning scheme overlays provided by Council indicated that a number of overlays exist within the study area. The planning scheme overlays that are applicable to the properties within the study area are shown in Figure 4 and summarised in Table 2 below.

Table 2 Planning scheme overlays applicable to the study area

Planning Scheme Overlay	Properties Subject to Overlay
Environmental Significance	46, 50, 106, 108, 109, 110, 111
Land Subject to Inundation	6, 8, 38, 39, 40
Development Plan	2, 3, 4, 5, 32-37, 42, 47, 48, 51-107

### 2.4 Geology

Table 3 summarises the study area stratigraphy obtained from a review of the Geological Survey of Victoria, 1:250,000 Scale, *Warragul SJ 55-10 Edition 2 Map Sheet, 1977*.

Table 3 Study area stratigraphy

Study Area	Period	Sub-Period	Formation	Description
Eastern Side	Quaternary	Holocene	-	Fluvial: alluvium, gravel, sand, silt (Qra).
Some southern parts of study area	Quaternary	Holocene	-	Fluvial: alluvium terraces : gravel, sand, silt (Qrt).
Western Side	Cretaceous	Lower	Strezelecki Group (Wonthaggi Formation)	Fluvial: lithic sandstone, siltstone, minor conglomerate, and coal (Kls)

### 2.5 Hydrology

Typically, local drainage patterns follow surface topography, with local drainage patterns, and flows from higher elevations towards lower elevations.

Across the study area the elevation varies from a maximum of 42 metres above Australian Height Datum (m AHD) along the south-west boundary, to 18-20 m AHD in the low-lying areas to north-east and adjacent to watercourses. The topography of the study area appears to be part of a valley formed by fluvial and alluvial processes, with the study area being moderately depressed relative to the surrounding topography. A line of higher elevation straddles the north and north-western boundaries of the study area.

Approximately 650 m north of the site, the Powlett River and associated unnamed streams and drainage channels, run in an east to west direction towards Bass Strait. The presence of these and other nearby surface water courses suggest that shallow groundwater beneath the study area is likely to flow in a west to north-westerly direction, toward Powlett River and Bass Strait. Also associated with the Powlett River are drainage channels and streams extending into the northern portion of the study area traversing Properties 1, 8, 38, 40 and 42.

The study area contains low-lying areas listed as being at risk of flooding by inundation, listed in the planning zone overlays relating to inundation (refer to Section 2.3 and Figure 4).

#### 2.5.1 Wetlands

The area falls in the Powlett River catchment, within the jurisdiction of the West Gippsland Catchment Management Authority (CMA).

Four current wetlands are recorded in the DELWP Victorian Biodiversity Interactive Map (Version 3.2) as located within or immediately adjacent to the study area (Refer to Appendix A). Each of these four wetlands are naturally occurring, temporary freshwater swamps, that are periodically inundated. These wetlands have very low connectivity with waterways in the Powlett catchment and the contribution from groundwater is unknown.

The Victorian Biodiversity Atlas contains no records of aquatic or semi-aquatic fauna (eg. amphibians, reptiles, fish) from within the four wetlands. Although threatened aquatic species have not been recorded within the study area, species listed in the Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act, Victorian Flora and Fauna Guaranteed (FFG) Act, or Victorian Advisory list are recorded within 10 km of the WNEGA. These include species such as Southern Toadlet, Growling Grass Frog and Eastern Snake-necked Turtle.

## 2.6 Hydrogeology

Based on data obtained from the DSE's *Visualising Victoria's Groundwater* map, the depth to groundwater in the majority of the study area ranges from less than 5.0 m below ground level (m bgl) to between 10.0 and 50.0 m bgl. The regional upper aquifer groundwater salinity range is listed as ranging between 1000 and 3500 mg/L across the study area; with a small southern segment of the study area listed as ranging between 500 and 1000 mg/L.

The DSE *Victorian Groundwater Resource Reports Map* indicated that the site is located within the Tarwin Basin. Regional salinity in the northern portion of the study area falls within Segment A2 of the Victorian State Environment Protection Policy, *Groundwaters of Victoria*, 1997 (Groundwater SEPP). The southern extent of the study area falls within Segment B. The protected beneficial uses for groundwater within Segment A2 and B are shown in Table 4. The Victorian EPA may determine that these beneficial uses do not apply to groundwater where:

- There is insufficient yield;
- The background level of a water quality indicator other than TDS precludes a beneficial use;
- The soil characteristics preclude a beneficial use; or
- A groundwater quality restricted use zone has been declared.

Table 4 Protected beneficial uses of groundwater

Beneficial Uses	Segments (mg/L TDS)				
	A1 (0-500)	A2 (501-1000)	B (1001-3500)	C (3501-13,000)	D (>13,000)
Maintenance of ecosystems	✓	✓	✓	✓	✓
Potable water supply					
Desirable	✓				
Acceptable	✓	✓			
Potable mineral water supply	✓	✓	✓		
Agriculture, parks & gardens	✓	✓	✓		
Stock watering	✓	✓	✓	✓	
Industrial water use	✓	✓	✓	✓	✓
Primary contact recreation (e.g. Bathing, swimming)	✓	✓	✓	✓	
Buildings and structures	✓	✓	✓	✓	✓

### 2.6.1 State groundwater database

GHD conducted a search of the Victorian Groundwater Database for registered groundwater bores within a 1.0 km radius of the perimeter of the study area. The registered groundwater bores are shown in Figure 5.

The database search identified the presence of a total of 41 registered bores within a 1 km radius of the study area, five of which were located within the study area itself.

The bores that were located within the study area include:

- 4066752 –Property –installed in 1910 and registered for non-groundwater purposes. The database search indicated that no depth, screen interval, lithology or chemistry is available for this bore. The bore elevation is listed as 26.52 m AHD;
- 4066769 –Property - installed in 1910 and registered for non-groundwater purposes. The database search indicated that no depth, screen interval, lithology or chemistry is available for this bore. The bore elevation is listed as 24.68 m AHD;
- 4067267–Property - installed in 1916 and registered for non-groundwater purposes. The database search indicated that no depth, screen interval, lithology or chemistry is available for this bore. The bore elevation is listed as 23.65 m AHD;
- 4066991 –Property - installed in 1913 and registered for non-groundwater purposes. The database search indicated that no depth, screen interval, lithology or chemistry is available for this bore. The bore elevation is listed as 24.48 m AHD;
- 4066822–Property - installed in 1911 and registered for non-groundwater purposes. The database search indicated that no depth, screen interval, lithology or chemistry is available for this bore. The bore elevation is listed as 22.88 m AHD.

Given the former mining use of the area, the bores registered for non-groundwater purposes can be considered to be likely installed for mining purposes.

The remaining 36 registered bores outside of the study area included:

- One bore registered for domestic purposes.
- One bore registered for unknown purposes.
- 34 bores registered for groundwater investigation purposes.

No Groundwater Restricted Use Zones were identified within the study area.

### 2.6.2 Waterways

The study area lies within the Powlett River catchment. An unnamed tributary of the river flows north from McGibbonys Road, across land currently used as pasture, crosses Korrumburra-Wonthaggi Road north of the study area and enters the Powlett River north of Wonthaggi township. Based on the catchment area of this first order stream, it is likely that this waterway is ephemeral.

Based on the Victorian Government's Biodiversity Interactive Map (3.2), there are no floodways within the study area. The study area is outside the 1 in 100 year flood level for the Powlett River.

The Index of Stream Condition assessment has not been undertaken in these waterways. However given the high degree of land modification, and minimal riparian vegetation, it is considered unlikely that these small streams contain high value ecosystems.

The wetlands and waterways desktop assessment is provided as Appendix A.

### 2.6.3 Acid sulphate soils

The Australian Soil Resource Information System (ASRIS 2015) contains an Atlas of Australian Acid Sulfate Soils (ASS; prepared by CSIRO, Fitzpatrick and Shand 2008) for use in hazard assessment.

The ASRIS database states the following for the Site location:

- National Acid Sulfate Soils Class C4, which refers to an extremely low probability of occurrence and very low confidence; and
- National Acid Sulfate Soils Class B4, which refers to a low probability of occurrence and a very low confidence apply.

Based on the above, ASRIS mapping shows the study area to have a low to extremely low probability of having ASS impact. The low confidence in the results of the search is typically allocated where there is very little existing data available. While a low probability of Acid Sulfate Soil occurrence was reported, without sampling and analysis of soils this finding cannot be confirmed.

## 2.7 Matters of national environmental significance

A search using the Protected Matters Search Tool (PMST) was undertaken to determine if any matters of national environmental significance (MNES) listed under the EPBC Act may occur on site.

The results of the PMST search (Appendix B) identify four MNES within 10 km of the study site, namely:

- Wetlands of International Importance
- Listed Threatened Ecological Communities
- Listed Threatened Species
- Listed Migratory Species

All of the MNES should be considered in any future assessment of the area, particularly in terms of construction or any clearing of the study site. A number of MNES have been listed above and addressed in Appendix B. However this should not be considered a detailed assessment of the ecological values of the site, as the report outlines the results of a desktop assessment and aerial photography inspection without a site visit. A site assessment would confirm the details of the desktop assessment.

### **Wetlands of international importance**

Western Port was designated as a wetland of international importance under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention).

This wetland is considered in this assessment because it occurs within 10 km of the site and is therefore picked up by the PMST search, as described above.

There are small water courses and drainage lines in the area but they are minor and discharge to the Powlett River which discharges to Bass Strait, to the east of Western Port. Additionally, appropriate sediment and erosion control at the site, during any construction or works will minimise impacts on these small drainage lines and water courses.

Given the distance to the wetland, topography and site management, works will not impact on wetlands of national significance.

### **Listed threatened ecological communities:**

The Natural Damp Grassland of the Victorian Coastal Plains - The grassland is generally dominated by tussock grasses, notably *Themeda triandra* (Kangaroo Grass) on drier sites, or *Poa labillardierei* (Common Tussock-grass) on wetter sites. The range of grasses and forbs present includes species associated with damp sites.

The largest area of intact vegetation at the study site appears to centre on the Wonthaggi Bushland Reserve, on the western side of Carneys Rd, either side of the Bass Hwy, and areas east of Sharrock Rd and along the McGibbonys Rd road reserve. Native grasses commonly occur along road reserves. If any impacts occur to areas of vegetation, these impacts should be assessed to determine whether listed ecological communities are impacted.

### **Listed threatened species and migratory species**

The PMST results indicate the potential for 49 Listed Threatened Species and 43 Migratory Species to occur within a 10 km buffer of the study area. It is difficult to make an assessment of the likelihood of occurrence of all species until a site visit and assessment can be undertaken. However the habitat requirement for the following species are well known:

- Eastern Dwarf Galaxias (*Galaxiella pusilla*) – listed as Vulnerable
- Growling Grass Frog (*Litoria raniformis*) – listed as Vulnerable
- Giant Gippsland Earthworm (*Megascolides australis*) – listed as Vulnerable
- Eastern Spider Orchid (*Caladenia orientalis*) – listed as Endangered
- Clover Glycine (*Glycine latrobeana*) – listed as Vulnerable
- Maroon Leek-orchid (*Prasophyllum frenchii*) – listed as Endangered
- Dense Leek-orchid (*Prasophyllum spicatum*) – listed as Vulnerable
- Leafy Greenhood (*Pterostylis cucullata*) – listed as Vulnerable
- Bird Species

The results of the MNES Desktop Review provide *some* advance direction as to the likelihood of referral requirements under the EPBC Act being triggered. However, further ecological investigation of the site should be considered, particularly if any of the areas of intact vegetation, which are the more likely places for listed species to occur, are likely to be impacted.

Refer to Appendix B for the EPBC Matters Report for the study area including details of the above listed species.

## 3. Study area history

GHD completed a review of available historical data for the properties located within the study area including the following:

- Current and historical aerial photographs;
- Australian Heritage Databases records;
- Consultation with the Wonthaggi Historical Society;
- Limited review of Pioneers on the Powlett River at Wonthaggi (1878-1910) (Barbara Moyle); book;
- Selected historical titles; and
- Victorian EPA records.

We note that Council had no relevant reports for review regarding contamination for properties within the study area.

GHD understands that all of the properties within the study area have historically been used for agricultural and stock grazing purposes, predominantly for dairy farming and more recently grazing cattle.

The following sections outline the results of the review of current and historical data completed by GHD for the study area.

### 3.1 Historical aerial photographs

Six sets of historical aerial photographs dating from 1950 to 2015 were reviewed for the Study Area. The photographs from 1950 to 1991 were obtained from DELWP, Aerial Photography Register, Victorian Records Office. Aerial Imagery for the period between 1950 and 1970 was missing from the record office at the time of this assessment. As such no visual review of historical site activities during this period could be undertaken. In all cases the aerial imagery available from the DELWP Aerial Photography Register was of a large scale and poor resolution, which provided limited detail to identify landscape features. Available imagery from Google Earth Pro was also reviewed for 2010 and 2015. A detailed review of historical aerial imagery is provided in Appendix C and a summary of the key findings is included in Section 3.1.1.

A further six historical aerial photographs dating from 2006 to 2015 focusing on Property 34 were provided Council on 13 March 2016. A review of the historical aerial photographs provide by Council is presented in Section 3.1.2 and these historical aerial images are provided in Appendix C.

#### 3.1.1 Summary of historical aerial photograph review

##### ***The study area***

The review identified that the study area has remained in use for predominantly agricultural and stock grazing purposes land since the first available aerial imagery from 1950. Areas of residential and industrial development were also noted in the northwest and southeast of the site respectively.

An electrical substation/ transformer yard was observed on Property 41 from at least 1970 (not present in 1950). Potential market gardening was observed at Properties 26 and 34 in more recent imagery (2010).

The majority of features identified during the review consisted of residential/farm buildings and dams which were progressively developed from pre-1950 onwards. In some instances this included the development of residential and/or farm buildings. Potential infilling of dams and/or earthworks were identified on Property 2, 4, 6, 8, 17, 38, 59, 106, 108 109, 110, 113. Two buildings were also noted to have been demolished between 2010 and 2015 on Property 42. Mounding and tracks were visible on Property 113 from 1970 onwards considered to be potentially associated with the earthworks adjacent and the mining further to the southwest. Ground disturbance was also noted on properties 8, 106 and 108.

**Land surrounding the study area**

Ongoing development of the township of Wonthaggi to the north, south and west of the study area occurred progressively from pre-1950 to 2015, eventually encroaching up to the boundary of the study area.

The Wonthaggi coal mine was identified approximately 600 m to the southwest of the study area from pre -1950 (although this area is not visible in Figures C1-C6). Earthworks were also noted adjacent to the west of Property 113 from pre-1950 with expansion of the earthworks and tracks leading onto Property 113 in the 1991 imagery. Mounding and tracks were visible on Property 113 from 1970 onwards considered to be potentially associated with the earthworks adjacent and the mining further to the southwest.

An industrial estate was observed to the southwest of the study area (north of Property 113) in more recent imagery (1985 onwards)

A landfill (listed on the EPA Priority sites register) was identified approximately 2 km to the southwest of the study area which is visible in the 1950 imagery.

3.1.2 Review of historical aerial photographs provided by Council

Historical aerial photographs of Property 34 and surrounding area provided by Council were reviewed for the period 2006 to 2015. A copy of the aerial photographs are provided in Appendix C and summarised in Table 5 below.

Table 5 Review of historical aerial photographs provided by Council

Year	Observations
2006	<p><u>Property 34</u></p> <p>Property 34 appeared be used predominately for commercial / industrial purposes. Construction of a potential plant nursery and apparent soil stockpiles covered the south western portion. Two buildings (possible sheds), apparent farming machinery and stockpiles of soils / materials were observed to be scattered across the northern portion. A residential building and a swimming pool where observed in the south eastern corner of the property. Soils in the south eastern corner of the property appeared to have been disturbed. The eastern half of the property was partially covered by vegetation (trees, shrubs and grasses). An unsealed track (driveway) ran along the southern boundary of the site and connected with the residential building and sheds.</p> <p><u>Surrounds</u></p> <p>The land surrounding Property 34 were observed to be predominantly agricultural, with large areas of unoccupied vegetated land. Scattered residential dwellings were observed to the west and south.</p>
2009	<p><u>Property 34</u></p> <p>Construction of the apparent plant nursery in the south western portion of Property 34 appeared to have been completed and in use. Five apparent water tanks were observed at the eastern end of the plant nursery in the central portion of the property. A large number of vehicles, both trucks and cars, were observed in the north eastern portion of the site. A number of potential large skip bins were located through the central and south eastern portions of the property. The building (possible shed) in the north eastern portion of the site had been extended to the east. What appeared to be potential waste materials and disturbed soils were observed in the north eastern corner. A concrete pad and structure (potentially shipping containers) had been constructed on the central eastern boundary. The swimming pool in the south eastern corner had been removed.</p>

Year	Observations
	<p>The unsealed track (driveway) along the southern boundary of the site has been extended and surrounded the residential building the south eastern corner.</p> <p><u>Surrounds</u></p> <p>The surrounding land appeared relatively unchanged.</p>
2012	<p><u>Property 34</u></p> <p>The apparent plant nursery in the south western corner, the shed in the northern portion and the residential building in the south eastern corner of Property 34 appeared to have been demolished and the area had overgrown with vegetation (grasses). Vegetation (trees and shrubs) had been removed from the south eastern corner of the property. Apparent waste material in the north east corner had increased. The unsealed track (driveway) along the southern boundary of the site has been extended to the north east corner of the property.</p> <p><u>Surrounds</u></p> <p>A number of apparent large sheds had been constructed on properties to the west. Residential development had increased to the south west.</p>
2013	<p><u>Property 34</u></p> <p>Property 34 appeared relatively unchanged. Two apparent water tanks in the central portion of the site had been removed. Vegetation growth (grasses) in the eastern portion of the property had occurred.</p> <p><u>Surrounds</u></p> <p>The surrounding land appeared relatively unchanged. Residential development to the south west had continued.</p>
2014	<p><u>Property 34</u></p> <p>A large elongated shed had been constructed along the north eastern boundary of the property. Waste material in the north eastern corner had increased. Apparent soil stockpiles were scattered across the north western portion and the central south portion with a large stockpile in the centre of the property. The number of large apparent skip bins had increased across the south eastern portion of the property.</p> <p><u>Surrounds</u></p> <p>The surrounding land appeared relatively unchanged.</p>
2015	<p><u>Property 34</u></p> <p>The large elongated shed along the north eastern boundary had been demolished. An apparent riding circle had been constructed in the south eastern portion of the property.</p> <p><u>Surrounds</u></p> <p>The surrounding land appeared relatively unchanged.</p>

### 3.2 Historical titles search

A historical title search was conducted on behalf of GHD by Feigl & Newell Title Searches for the following Properties: 2, 5, 7, 8, 26, 34, 55, 56, 59, 60, 61, 62, 63, 64, 65, 67, 68, 72, 73, 74, 75, 76, 77 and 112.

The properties were selected based on the review of the preliminary site history tasks (predominantly aerial photography) where the select properties were found to have been either occupied by buildings of non-residential appearance or have a use other than general agricultural use.

A list of the registered proprietors for each of the selected properties, as well as copies of the historical titles are provided in Appendix C and a summary of the key findings is included in Section 3.2.1 below.

### 3.2.1 Summary of historical title review

#### *The study area*

Table 6 summarises the possible uses of land identified for properties (or part thereof) selected for historical title searches based on the listed occupations of the registered proprietors.

Table 6 Possible land uses based on occupation of historical proprietors

Property	Possible Use	Date*
2	Farming	1972-2001
	Dairy farming	1933-1972
5	Farming	1972-2010
	Dairy farming	1933-1972
7	Farming	1974-2015
	Dairy farming	1925-1952
8	Farming	1974-2015
	Dairy Farming	1941-1952
26	Farming	1954-1980
34	Farming	1974-1980
	Dairy farming	1963-1974
	Farming	1948-1963
	Dairy farming	1921 - 1947
	Butcher	1920 - 1921
	Farming	1889-1919
55	Farming	1976-1978
	Wholesale butcher	1972-1976
	Farming	1962-1972
	Farming	1941-1945
56	Freight services	2008-2015
	<b>Motor mechanic</b>	1956-1987
	Farming	1935-unknown
59	Freight services	1994-2015
60	<b>Automotive body, paint and interior repair and maintenance</b>	2000-2015
	<b>Service station/depot (owned by Mobil Oil)</b>	1987
	<b>Service station/depot (owned by BP Australia)</b>	1976
	Wholesale butcher	1972-1976
	Farming	1962-1972

Property	Possible Use	Date*
	Farming	1941-1945
61, 62, 63, 64, 65	<b>Automotive body, paint and interior repair and maintenance</b>	2000-2015
	Farming	1976-1978
	Wholesale butcher	1972-1976
	Farming	1962-1972
	Farming	1941-1945
67	<b>Motor mechanic</b>	1945-1979
	Farming	1932-1945
68	<i>Unknown</i>	-

Property	Possible Use	Date*
72, 73, 74, 75, 76 77, 112	<i>Unknown</i>	1984-2015
	Farming	1976-1978
	Wholesale butcher	1972-1976
	Farming	1962-1972
	Farming	1941-1945

NOTES:

- Where there are gaps in the dates listed or the possible use is 'unknown', the occupation of the proprietor was either not listed or did not provide indication of land use.
- Land uses in **bold** flagged as potentially High PFC rating / land use.

### 3.3 Wonthaggi Historical Society

Faye Quilford (President of the Wonthaggi Historical Society) was consulted on 17 December 2015 regarding information they may have for the study area. The following anecdotal information was provided verbally:

- The area is prime farming land;
- No known industries or market gardens have existed in the area and it has mainly been used for dairy farming;
- More recently the area has been used for cattle grazing;
- The area includes a mix of agricultural and residential properties;
- Residential subdivisions have commenced in the area; and
- No mining has occurred within the study area.

It was noted that while the Wonthaggi Historical Society did not believe that coal mining had occurred within the study area, it is known to have occurred in the vicinity of the study area (State Coal mine to southwest of study area, operational until 1968). Further, mining activities within the study area could not be ruled out. Wonthaggi Historical society had very little information on land ownership prior to coal mining commencing in the Wonthaggi region.

#### 3.3.1 Pioneers on the Powlett River and at Wonthaggi

Pioneers on the Powlett River at Wonthaggi (1878-1910) (Barbara Moyle) was provided to GHD on loan from Council. A limited review was completed as part of the historical desktop assessment.

The method used to review the book included review of a map titled "South of the Powlett River Part of Parish of Wonthaggi to Boundary with Kirrak (Page 43). This map and associated sections of the book provided names of the initial settlers of the land within the study area. Chapters relating to each of the names listed on the map were then reviewed and any indication of potential land uses noted. Table 7 summarises the findings of the limited review.

Table 7 Pioneers on the Powlett River and at Wonthaggi - Review

Proprietor	Allotment*	Acreage	Relevant Properties	Year	Comments
Llewellen Davies- Griffith	CA20 32A		38, 39, 40 34, 35, 36, 37	1889	From his home he ran the first Wonthaggi Post office (opened 1887). Four acres of cultivated orchards and gardens, stockyards sheds and two watering holes were listed on their home (allotment 32A). Licence granted to conduct an abattoir on CA20 (incorporating properties 38, 39, 40) in 1883. Dies 1918 and Wonthaggi property sold to Wonthaggi Butcher Alex Thomson.
John Hollins Senior	CA31	-	113	1886	1886 Hollins family arrive in area. Sons are William John, George and Harry/Henry. John Hollins Senior was a bootmaker by trade, but there is no mention of boot making at the family home/s. Had boot shop in town.
Harry Hollins	CA34	910	41-50	-	No relevant entries found
	CA34B		-	1912	No relevant entries found
Edgar Beard	Portion of CA 34	291	-		No relevant entries found
Edgar Beard and John Henry (Harry) Evans	34D	208	-	1940	Purchased 291 acres of what was Harry Hollin's (followed by James Greaves Jr's) land Had a dairy farm and began an abattoir (St Clair Abattoir) across the road (does not mention which Rd), to supply meat to his butchers shops
Hollins Family	CA31, CA32, CA34	~3200	113		At some point Hollins land was resumed for Wonthaggi State Coal Mine purposes (p.27), state requisitioned most of their land but didn't use it all.
Mary G Heslop (Robert Heslop)	35A		51-112	1909	No relevant entries found

Proprietor	Allotment*	Acreage	Relevant Properties	Year	Comments
Elizabeth Daly (PJ Daly)	CA16/33A	206	6, 7, 8,		Daly created a subdivision of 'his land' next to his mine on the outskirts of North Wonthaggi, and sold several blocks but his housing development didn't take off (p.87).
Emily Hull & Fanny Aldridge	32B and 32C		32, 33,		No entries relevant.
Alexander Cadee	CA15		1-5,	1910	Sold land to Henry Kitley (no record).

Pioneers on the Powlett River at Wonthaggi indicated earlier settler activity and land use was generally agricultural and or mining related in the area. The establishment of abattoirs was mentioned on two instances (pages 61 and 193), with one reportedly located within the then crown allotment 20 (Properties 38, 39, 40) and one "across the road" from the then crown allotment 34 (thought possibly to have been located on then crown allotment 32A (Properties 34, 35, 36, 37). The information obtained from this book is broadly consistent with the historical titles information, however titles indicated that Property 34 was owned by Llewellyn Davies-Griffiths but was also sold to butcher named Alexander Thomson (consistent with the description of the original crown allotment 20 in Table 7). It was not possible to confirm the presence of the abattoir(s) during this assessment.

As described, the use of this book was limited. GHD did not review this text in its entirety, and as such, relevant information from the book may not have been considered as part of this assessment.

### 3.4 EPA Victoria priority sites register search

Priority Sites are sites for which EPA has issued a Clean-up Notice pursuant to section 62A, or a Pollution Abatement Notice (PAN) pursuant to section 31A or 31B (relevant to land and/or groundwater) of the Environment Protection Act 1970 ('the Act'). Typically these are sites where pollution of land and/or groundwater presents an unacceptable risk to human health or to the environment.

GHD conducted a search of the priority sites register on 9 December 2015. The search identified that none of the properties within the study area were listed on the Register. A former landfill located approximately 2 km southwest of the southern tip of the study area (1 Cameron Street, Wonthaggi) is listed on the register. However no registered sites were identified within a 1 km radius of the study area boundary. A copy of the priority sites register extract is provided on Appendix E.

### 3.5 Statements and certificates of environmental audit search

Statements and certificates of environmental audits are issued after a statutory environmental audit has been conducted on property under Part IXD of the Environmental Protection Act 1970.

GHD conducted a search of the list of Issued Certificates and Statements of Environmental Audit on 9 December 2015. The search identified that none of the properties within the study area have been issued with either a Certificate or Statement of Environmental Audit.

Additionally, no sites were identified within a 1 km radius. An extract of the Victoria EPA Audit Register search result is provided in Appendix F.

### 3.6 Australian heritage database

A review of the Victorian Heritage database found that there were no sites within the study area. Two historic mining sites that were of heritage significance were identified to the west of the site. One (H0198) was the Wonthaggi State Coal Mine (Eastern Precinct) located approximately 350 m southwest of the study area (the visible extent of this was noted on historical aerials in Section 3.1 to be approximately 600 m from the study area).. The other (H1778) was the Wonthaggi State Coal Mine Central Precinct, located approximately 2 km west of the study area.

Two additional heritage sites (one courthouse and one railway station) were also located to the west of the study area. A copy of the Heritage database search map and extracts for HO198 and H1778) are provided in Appendix G.

### 3.7 Summary of study area history information

#### *The study area*

The results obtained from the site history review indicate that the study area and surrounding areas have predominantly been used for residential purposes, mining (Wonthaggi State Coal Mine located to southwest of study area and associated mullock heaps on Property 113), agricultural and stock grazing purposes (in particular for dairy farming) from 1889 to the present day. The State Coal Mine operations ceased in 1968.

The agricultural activities associated with the properties located within the study area predominantly involved grazing paddocks or the growing of stock feed; however property 26 and 34 were identified as potentially used for market gardening during the historical aerial photograph review.

It is understood that at least one abattoir is likely to have existed within the study area, however the location could not be confirmed. It is considered possible that an abattoir is located on one or two of the following properties: 34,35,36,37, 38, 39, 40.

Likely commercial / industrial land use activities were noted on Properties 34-36, 41 (electrical terminal/substation), 51-103 and 112, with a possible automotive repair activities noted on Properties 56, 60-65 and 67.

Other Potential Areas of Concern (PAoC) recognised during the aerial review were earthworks (including potential introduced fill or stockpiled soil) at Properties 1, 4, 5, 8, 10, 17, 35, 36, 39, 42, 48, 106, 108 and 113 (potential mine waste). General storage of waste material or scrap was identified on properties 13, 35, 39, 59-65, 72-77, 100-103, 106 and 112.

#### *Land surrounding the study area*

A number of PAoCs were identified immediately surrounding the study area including:

- An Industrial area to the west of the southern portion of the study area (to the north of Property 113) which was developed between 1985 and 1991 and operated through to the present day.
- The State Coal Mine located approximately 650 m to the southwest of the study area.
- An area of earthworks adjacent to the west of Property 113 from pre-1950, with tracks visible in later aerial imagery leading onto Property 113, where mounding of soil was identified, indicating potential depositing of soil.

## 4. Study area inspection

GHD conducted an inspection of the study area on 2 December 2015 to identify possible contaminating activities and to confirm land use identified as potentially contaminating during the study area history review. Due to access constraints the inspection of the properties in the study area included only visual inspections from publicly accessible property boundaries and roadways.

PAoC's observed during the study area inspection are summarised in Table 8. Study area inspection photographs are provided in Appendix G.

Table 8 Potential areas of concern

Property	Location	Observations
1	North-west corner	Dam and disturbed soils
2	Central portion	Dam
	Eastern boundary	Farmstead including sheds and cattle yard
	Southern portion	Vegetation change
4	South-west corner	Buildings (cattle yard), dead trees, fill material and excavations
5	North-west corner	Cattle yard, soil stockpile, land development commenced
6	Eastern boundary	Shed
	Central portion	Dam
7	North-east corner	Dam
	South-west corner	Aboveground storage tanks, dairy and house
8	Eastern boundary	Fill material
	Western boundary	Shed house, cattle yard
10	Eastern boundary	Soil stockpile
13	Northern boundary	Cars and scrap in yard.
33	North-west	House
34	Entire site	Fill material, rubbish, scrap metals, soil stockpiles, aboveground storage tanks and trucks.
36	Central portion	Snow pea packaging facility and trucks
37	Western boundary	Concrete tank
38	Central portion	Cattle yard and cropping
39	Entire property	Residential buildings, scrap material, fill material
40	Southern boundary	Dam (potential fill material)
41	Entire site	Electrical substation
42	Central	Shed and fill material
	South eastern portion	Cropping
46	Central portion	Concrete watering tanks scattered across property
47	Eastern boundary	Disturbed vegetation
	North-west corner	Developers shed
	South-east corner	Water tanks
48	North-east corner	Fill material
49	Western boundary	Disturbed vegetation
	South-east corner	Dairy and house

Property	Location	Observations
51-58	Off site at south-west boundary	Light industrial area
59	South	Light industrial area
60-65	South	Light industrial area; mechanical repairs, scrap and wreckers
66-83	South	Light industrial area
84-99	South	Light industrial area
100-103	South	Light industrial area; building storage yard
106	South-east boundary	Stockpiled soil
113	Northern portion	Mullock heaps and treed area

## 5. Potential for contamination summary

Based on the site history review, the PAoC identified on the properties located within the study area are generally consistent with the known historical use for farming and grazing purposes and associated human occupation. Areas of commercial / industrial use were also noted particularly in the southwest of the site. Potential depositing of soil (including possible mine waste) was identified in the south west of the study area at Property 113. The identified PAoCs in the study area are summarised in Appendix I. Those properties with no PAoCs identified have not been included in the table however are included in the full assessment provided in Appendix I.

Based on the PAoC identified in Sections 3 and 4 and summarised in Appendix I, the main potential contaminants of concern within the study area could include:

- Petroleum Hydrocarbons (TPH) – associated with fuels and lubricants (oil, grease, etc.) stored and used for farm machinery, industrial process machinery cars and trucks;
- Benzene, toluene, ethylbenzene and xylenes (BTEX) – associated with fuel use and storage;
- Polycyclic Aromatic Hydrocarbons (PAH) – associated with burning of waste, farm machinery, fuel storage, mine waste and fill materials;
- Phenols – associated with the use of pesticides, fuels and lubricants and mine waste;
- Volatile organic compounds (VOC) – associated with the use of various chemicals, solvents (including associate with coal mine waste) and degreasers and paints/coatings;
- Heavy metals (e.g. lead, mercury, nickel, etc.)– associated with stock dipping, machinery, burn piles, soil and rubble stock piles fill material, agricultural chemicals and mine waste;
- Acids, carbon, creosote, lignins and styrene associated with mine waste;
- Inorganics – associated with animal wastes, septic tanks and fertilisers;
- Microbial and nutrient contamination – associated with cattle sheds, dairy farming, slurry pits and septic systems for the treatment of farmhouse waste water;
- Organochlorine and organophosphate pesticides (OC/OP pesticides) – associated with agriculture livestock and market gardens;
- Potential Asbestos Containing Materials (ACMs) – a complete ACM survey was not completed for the buildings in the study area. However, fill materials and buildings constructed prior to 2003 may contain asbestos or asbestos containing material (ACM).

## 6. Assessment of potentially contaminated land

### 6.1 Background

The Victorian Government, *Ministerial Direction No.1*, 1987 document outlines the requirement that an environmental audit must be conducted on potentially contaminated land which is designated for a sensitive use to determine the suitability of the property. The mechanism provided in the Victoria Planning Provisions used to ensure that the requirement for the environmental audit is adhered to prior to the commencement of a sensitive use is the EAO. The application of an EAO enables the assessment and approval of planning scheme amendments whilst ensuring that the requirements of the EAO will be met in the future.

The DSE 2005, *Potentially Contaminated Land*, General Practice Note gives advice on the identification of contaminated land, the appropriate level of assessment of contamination for planning and circumstances where an EAO should be applied.

The PFC rating for properties within the study area was assessed in line with Tables 1 and 2 of DSE 2005, *Potentially Contaminated Land*, General Practice Note to assess the appropriate level of assessment for the properties located within the study area in light of the historical uses. Table 2 from DSE 2005, *Potentially Contaminated Land*, General Practice Note, has been reproduced as Table 9.

It is noted that this study was preliminary in nature (with no detailed site inspections or intrusive investigations). Accordingly, prior to application of an Environmental Audit Overlay, Council may wish to implement planning controls (such as requiring additional assessment phases to confirm the findings of this assessment). This may involve the use of a planning scheme trigger(s) for further assessment of properties identified as having high or medium potential for contamination.

The Environmental Protection Authority Victoria, Environmental Audits Overview (Publication 1609, December 2015) is provided in Appendix J.

It is understood that all properties within the study area, excluding fully developed industrial properties, have the potential to be considered for residential development. Properties 51-103 are currently zoned as commercial or industrial, however, as agreed with Council, these properties are not considered fully developed (no hardstand cover extending across properties characteristic of commercial/industrial developments). As such they have been treated as having the potential to be used for sensitive land use in future development plans. Should these properties remain as commercial/industrial in development plans the Assessment Levels could be revised down.

Property 41 has been identified as an electrical terminal/substation. As such it is considered a fully developed commercial property that is not considered to have the potential for future sensitive land use and has been assessed as such. For the purposes of this assessment all other properties within the study are considered to have proposed sensitive land use (residential).

Table 9 DSE 2005 - Table 2 - assessment matrix

Proposed Land Use	Potential for Contamination		
	High	Medium	Low
<b>Sensitive Uses</b>			
Child care centre, pre-school or primary school	A	B	C
Dwellings, residential buildings, etc.	A	B	C
<b>Other Uses</b>			
Open Space	B	C	C
Agriculture	B	C	C
Retail or office	B	C	C
Industry or warehouse	B	C	C
Notes			
A: Require an environmental audit as required by Ministerial Direction No. 1 or the Environmental Audit Overlay when a planning scheme amendment or planning permit application would allow a sensitive use to establish on potentially contaminated land. An environmental audit is also strongly recommended by the SEPP where a planning permit application would allow a sensitive use to be established on land with 'high potential' for contamination.			
B: Require a site assessment from a suitably qualified environmental professional if insufficient information is available to determine if an audit is appropriate. If advised that an audit is not required, default to C.			
C: General duty under Section 12(2)(b) and Section 60(1) of the Planning and Environment Act 1987.			

## 6.2 DSE 2005 assessment

This section outlines the results of the assessment of each of the properties within the study area in accordance with Tables 1 and 2 of DSE 2005, *Potentially Contaminated Land*, General Practice Note.

The assessment is summarised in Table 10 and incorporates the identified potential sources of contamination, the relevant historical or current activities and provides the appropriate assessment level for each property. Full details of the assessment for all properties are included in Appendix I and presented in Figure 6.

The assessment of potentially contaminated land completed in accordance with DSE 2005, *Potentially Contaminated Land*, General Practice Note, identified the following:

- **High PFC Rating – 16 properties**
- **Medium PFC Rating – 70 properties**
- **Low PFC Rating – 27 properties**

As the study area is proposed for predominantly sensitive uses (residential development) these PFC ratings translate directly to the following Assessment Levels (in accordance with the DSE 2005, *Potentially Contaminated Land*, General Practice Note):

- **High PFC Rating = Assessment Level 'A' required**
- **Medium PFC Rating = Assessment Level 'B' required**
- **Low PFC Rating = Assessment Level 'C' required.**

The 29 Low PFC / Assessment Level 'C' properties are not included in Table 10. However, a full list of the Assessment Levels assigned to each property is provided in Appendix I.

Table 10 DSE 2005 assessment for properties in the study area

Property Number	Site Activities	Table 1 –Potential for Contamination	Table 2 - Assessment Level
1	Dam and disturbed soils in north west corner of property Possible earthworks	<b>Medium</b>	<b>B</b>
2	Infilled dam, agricultural use, farmstead, dairy, cattle yard	<b>Medium</b>	<b>B</b>
4	Infilled dam, agricultural use, farmstead, cattle yard, fill material and excavations	<b>Medium</b>	<b>B</b>
5	Agricultural use, dairy, cattle yard, stockpiles	<b>Medium</b>	<b>B</b>
6	Infilled dam, crops,	<b>Medium</b>	<b>B</b>
7	General storage, agricultural, dairy, ASTs	<b>Medium</b>	<b>B</b>
8	Earthworks Agricultural, fill material. Cattle yard, farmhouse, general storage shed	<b>Medium</b>	<b>B</b>
10	Fill material / stockpiles	<b>Medium</b>	<b>B</b>
13	General storage, scrap, cars	<b>Medium</b>	<b>B</b>
17	Earthworks (maybe residential construction)	<b>Medium</b>	<b>B</b>
18	Infilled dam	<b>Medium</b>	<b>B</b>
20	General storage /shed	<b>Medium</b>	<b>B</b>
26	Agricultural, market gardening	<b>Medium</b>	<b>B</b>
34	Orchards (1883-1920), dairy, Industrial use, Market gardening, plant nursery, possible abattoir Fill material, general waste, scrap metals, soil stockpiles, above ground storage tanks (possible bulk fuel storage) trucks on entire property, possible abattoir	<b>High</b>	<b>A</b>
35	Large warehouse style building, possible abattoir,	<b>High</b>	<b>A</b>
36	Agricultural/commercial – Snow pea packaging facility and trucks, possible abattoir Earthworks adjacent off-property at roadside to south	<b>High</b>	<b>A</b>
37	possible abattoir	<b>High</b>	<b>A</b>
38	Agricultural, infilled dam, crops across property, cattle yard, possible abattoir	<b>High</b>	<b>A</b>
39	Agricultural, farmhouse/shed, scrap material, general waste storage fill material , possible abattoir	<b>High</b>	<b>A</b>
40	Possible abattoir	<b>High</b>	<b>A</b>
41	Industrial – Electrical terminal/substation	<b>High</b>	<b>A</b>
42	Demolished building x 2, general storage shed, fill material, crops in southeast portion of property	<b>Medium</b>	<b>B</b>
46	Demolished building	<b>Medium</b>	<b>B</b>

Property Number	Site Activities	Table 1 –Potential for Contamination	Table 2 - Assessment Level
47	Disturbed vegetation, developers shed and water storage tanks in northwest corner of property	Medium	B
48	Fill material in northwest corner of property, demolished building	Medium	B
49	Demolished building, disturbed vegetation, agricultural- dairy and farmhouse	Medium	B
51-55	Agricultural use, light industrial use	Medium	B
56	Agricultural use, light industrial, possible automotive maintenance (based on titles 1956-1987)	Medium	B
57	Light industrial use	Medium	B
58	Light industrial use	Medium	B
59	Infilled dam, light industrial use, machinery/scrap storage	Medium	B
60	Light industrial use, Possible fuel storage (based on titles 1976-1990), machinery/scrap storage	High	A
61-65	Agricultural use, light industrial use, mechanical repairs including spray painting, scrap and wreckers, machinery/scrap storage	High	A
66	Agricultural use, light industrial use, mechanical repairs, scrap and wreckers, machinery/scrap storage	Medium	B
67	Agricultural use, light industrial use, possible automotive repair (based on titles 1979-2004)	High	A
68-71	Light industrial use	Medium	B
72-77	Agricultural use, butcher, light industrial use, trucks, general waste/machinery/scrap storage	Medium	B
78-99	Light industrial use	Medium	B
100-103	Light industrial use, building storage yard in south of property, general storage	Medium	B
106	Agricultural, general storage, soil stockpiles/filling	Medium	B
108	Earthworks (1950)	Medium	B
109	Disturbed vegetation (1985), infilled dam	Medium	B
110	Infilled dam	Medium	B
111	Possible drainage channel leading south from Inverloch Rd to dam. Potential for fill an accumulation of contaminants	Medium	B
112	Agricultural use, light Industrial use, butcher, general storage, trucks	Medium	B
113	Earthworks (1950,1970, 1985, 1991), disturbed vegetation and soil mounds and tracks (1970-1991) possible mullock heaps, cattle yard at west boundary	High	A

Property Number	Site Activities	Table 1 –Potential for Contamination	Table 2 - Assessment Level
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NOTES:

Properties 51-103 are currently zoned as commercial/industrial. Although not fully developed (no hardstand cover extending across properties characteristic of commercial/industrial developments. As such they have been treated as having the potential to be used for sensitive land use in future development plans.

Table 11 outlines the changes to property assessment levels should properties 51 to 103 be developed for less sensitive land uses (e.g. public open space, commercial or industrial)

Table 11 Assessment levels for properties for non-sensitive land use development

Property Number	Site Activities	Table 1 –Potential for Contamination	Table 2 - Assessment Level*
51-55	Agricultural use, light industrial use	<b>Medium</b>	<b>C</b>
56	Agricultural use, light industrial, possible automotive maintenance (based on titles 1956-1987)	<b>Medium</b>	<b>C</b>
57	Light industrial use	<b>Medium</b>	<b>C</b>
58	Light industrial use	<b>Medium</b>	<b>C</b>
59	Infilled dam, light industrial use, machinery/scrap storage	<b>Medium</b>	<b>C</b>
60	Light industrial use, Possible fuel storage (based on titles 1976-1990), machinery/scrap storage	<b>High</b>	<b>B</b>
61-65	Agricultural use, light industrial use, mechanical repairs including spray painting, scrap and wreckers, machinery/scrap storage	<b>High</b>	<b>B</b>
66	Agricultural use, light industrial use, mechanical repairs, scrap and wreckers, machinery/scrap storage	<b>Medium</b>	<b>C</b>
67	Agricultural use, light industrial use, possible automotive repair (based on titles 1979-2004)	<b>High</b>	<b>B</b>
68-71	Light industrial use	<b>Medium</b>	<b>C</b>
72-77	Agricultural use, butcher, light industrial use, trucks, general waste/machinery/scrap storage	<b>Medium</b>	<b>C</b>
78-99	Light industrial use	<b>Medium</b>	<b>C</b>
100-103	Light industrial use, building storage yard in south of property, general storage	<b>Medium</b>	<b>C</b>

Notes:

\*Assessment level assumes non-sensitive land use as defined in Table 9.

GHD notes that a degree of qualitative assessment has been applied to the assessment resulting in some properties being either demoted or elevated to assessment levels other than those prescribed in the DSE 2005, *Potentially Contaminated Land* General Practice Note.

It should be noted that GHD has adopted a conservative approach when classifying the various properties within the study area. This approach applies to the allocation of a Medium PFC rating to properties where general farming and non-residential-structures have been observed. This approach was adopted as all agricultural property structures are considered as potential fuel or minor chemical storage areas. However vacant paddocks with no non-residential structures have been allocated a Low PFC rating.

## 7. Recommendations

Following the conclusions made in this study and based on the information collected in the study area history and desktop reviews, GHD recommends that additional studies be completed for the properties identified as having high or medium potential for contamination. Council may wish to implement planning controls such as requiring additional assessment phases on these properties to confirm the findings of this assessment, prior to implementing the advice of the DSE 2005, *Potentially Contaminated Land*, General Practice Note outlined below:

- **Assessment Level 'A' properties** - An Environmental Audit Overlay (or equivalent planning mechanism) should be applied to these Properties to ensure an environmental audit is carried out at the site prior to redevelopment to sensitive residential or associated land use. The need for an environmental audit may be either confirmed or the PFC rating reduced if additional assessment is conducted and findings warrant the modification.
- **Assessment Level 'B' properties** – a Phase 1 environmental site assessment (ESA) (including comprehensive site inspections with access to locked structures) should be completed on these properties, specifically in those areas identified in the Study as containing specific PAoC. It is noted that a targeted ESA of these properties to evaluate the identified PAoC could be required and may either increase or reduce the PFC ratings and consequently the requirement for additional intrusive investigations.

If a Phase 2 ESA was recommended following completion of the Phase 1, the level of investigation required could vary significantly between properties across the study area, depending on their size and identified potential contamination issues.

- **Assessment Level 'C' properties** – no further works are recommended for these properties, unless evidence of potentially contaminating activities or sources of contamination are identified at a later date. However, the site owner still retains a general duty under Section 12(2)(b) and Section 60(1)(a)(iii) of the Planning and Environment Act 1987.

### **General study area recommendations**

There is the potential for accumulation and/or concentration of contaminants (associated with agricultural land use) in drainage channels. As such, it is recommended that sampling of sediments within drainage channels within Properties 1, 8, 38, 40, 42 and 111 (from locations located up, down and mid gradient of the study area) to assess accumulation of contaminants in these channels.

As described in Section 2.7, the largest area of intact vegetation at the study site appears to centre on the Wonthaggi Bushland Reserve, on the western side of Carneys Rd, either side of the Bass Hwy, and areas east of Sharrock Rd and along the McGibbonys Rd road reserve. Native grasses commonly occur along road reserves. If any impacts occur to areas of vegetation, these impacts should be assessed to determine whether listed ecological communities are impacted.

As described in Section 2.7, the results of the MNES Desktop Review provide *some* advance direction as to the likelihood of referral requirements under the EPBC Act being triggered. However, further ecological investigation of the site should be considered, particularly if any of the areas of intact vegetation, which are the more likely places for listed species to occur, are likely to be impacted.

## 8. References

Australian and New Zealand Environmental and Conservation Council (ANZECC), *Guidelines for the Assessment and Management of Contaminated Sites*, 1992 (ANZECC 1992)

Department of Economic Development, Jobs, Transport and Resources, Victoria – Earth Resources, Geological Survey of Victoria, 1:250,000 Scale, *Warragul SJ 55-10 Edition 2 Map Sheet*, 1977

Department of Environment, Land, Water & Planning, *Aerial Photography Register Office Laverton, Victoria*, accessed November 2015

Department of Environment, Land, Water & Planning, *Biodiversity Interactive Map*, accessed December 2015

Environmental Protection Authority Victoria, Publication 1609, Environmental Audits Overview December 2015 <http://mapshare2.dse.vic.gov.au/MapShare2EXT/imf.jsp?site=bim> (accessed 16/12/2015)

<http://nvim.depi.vic.gov.au/> (accessed 16/12/2015)

Department of Transport, Planning and Local Infrastructure, Heritage Database accessed January 2016

[http://vhd.heritage.vic.gov.au/vhd/heritagevic/?timeout=yes#search:advanced:user:map:databases:=scope=database=address=baranduda=agency\\_id=75=style\\_id==group\\_id==category\\_id==act\\_id=:1](http://vhd.heritage.vic.gov.au/vhd/heritagevic/?timeout=yes#search:advanced:user:map:databases:=scope=database=address=baranduda=agency_id=75=style_id==group_id==category_id==act_id=:1)

Federation University Australia, *Visualising Victoria's Groundwater*, accessed December 2015, <http://maps.ubspatial.com.au/vvg.php?agreement=Agree+and+Continue#>

National Environment Protection (Assessment of Site Contamination) Measure (NEPM) 1999 as amended 2013

Pioneers on the Powlett River at Wonthaggi (1878-1910) (Barbara Moyle, *(No publication date provided)*)

Shineldecker, C.L. *Handbook of Environmental Contaminants: A Guide for Site Assessment*, 1992

Standards Australia, *Australian Standard AS4482.1 - Guide to the investigation and sampling of sites with potentially contaminated soil*, 2005 (AS4482.1 2005)

Victorian Environmental Protection Authority (VIC EPA), *Priority Sites Register*, 30 November 2015

Victorian Environmental Protection Authority (VIC EPA), *State Environment Protection Policy – Prevention and Management of Contamination of Land*, 2002 (Land SEPP)

Victorian Department of Sustainability and Environment (VIC DSE), *Potentially Contaminated Land - General Practice Note*, 2005

Victorian Government, State Environment Protection Policy (Groundwaters of Victoria). Victorian Government Gazette No. S160 December 1997

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