Echin Pty Ltd

Waurn Ponds Buffer Study

March 2018

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1. Introduction

1.1 Context

GHD was engaged by Echin Pty Ltd (Echin) (represented by Taylors Pty Ltd (Taylors)) to conduct a buffer constraint assessment for the sites located at 35 & 69-93 Hams Road, Waurn Ponds, Victoria (the 'subject site').

Taylors, on behalf of the landowners seek to rezone the land located at the subject site from Farming Zone (FZ) to General Residential Zone (GRZ). Boral Quarry and Boral Concrete occupy the land directly to the south and west of the subject site, straddling the Geelong Ring Road to the west of Anglesea Road, and south of Baanip Boulevard.

Taylors has requested a buffer assessment be undertaken to assess any buffer constraints arising from quarrying operations at Boral.

This report utilises Clause 52.10 of the Victorian Planning Provisions (VPP) 'Uses with Adverse Amenity Potential' and the EPA separation distance guideline, Publication 1518 dated March 2013, as part of this assessment.

Note that the terms 'buffer distance' and 'separation distance' have been used interchangeably in this report – the former is the commonly understood term while the latter has been introduced in the latest (2013) guideline. The purpose of a buffer (separation distance) as defined in EPA Publication 1518[1] is to provide sufficient separation between sensitive land uses (such as residences) and industries that have the potential to generate emissions of dust and/or odour so that on the occasion of an upset or malfunction, the off-site disamenity or nuisance is minimised. The guideline does not apply to noise, vibration, or ambient and hazardous air pollutants.

The findings, conclusions and recommendations of this buffer assessment should be read in conjunction with the limitations presented in section 1.3 of this Report.

1.2 Purpose of this report

The purpose of this assessment is to assess any potential buffer constraints to 35 & 69-93 Hams Road, Waurn Ponds.

1.3 Limitations

This report: has been prepared by GHD for Echin Pty Ltd (represented by Taylors Pty Ltd) and may only be used and relied on by Echin Pty Ltd and Taylors for the purpose agreed between GHD and the Echin Pty Ltd and Taylors as set out in section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Echin Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

[1] Environment Protection Authority Victoria, Publication 1518 Recommended Separation Distances for Industrial Residual Air Emissions – Guideline, March 2013

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in section 1.5 of this report. GHD disclaims liability arising from any of the assumptions being incorrect. The results of the analysis presented in this report are also subject to the limitations of the AERMOD modelling software package.

GHD has prepared this report on the basis of information provided by Echin Pty Ltd and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

The assessment in this report was based in part on an onsite inspection undertaken by GHD in February 2018. Note that it is the nature of environmental assessment that all variation in environmental conditions as well as the existing facility's operating conditions cannot be assessed and all uncertainty concerning the conditions of the ambient air quality environment cannot be eliminated. Also, it is not the intention of the assessment to cover every element of the air quality environment, but rather to conduct the assessment with consideration to the prescribed Scope of Works. Professional judgement must be expected in the investigation and interpretation of observations.

1.4 Scope of works

The scope of works for the buffer constraint assessment, required as part of the application for rezoning the land located at 35 & 69-93 Hams Road, Waurn Ponds, was as follows:

- Conduct a site visit to inspect the local area and the land surrounding the Boral operation.
- Obtain from the EPA a record of complaints regarding dust and odour from the past five years, to establish if there are potential air quality issues from nearby industries.
- Assess any constraints on the subject site from existing industry, and plot the relevant separation distances.
- If possible based on existing industry sizing and any known or estimated throughputs, review any options for de-rating the default buffers.
- Undertake an assessment of local meteorology from the BoM station at Geelong Airport for the five-year period (2006-2010).
- Characterise meteorology at the subject site by means of wind roses and stability roses. This enables directions of good and poor dispersion to be understood.
- Use site-representative meteorological data and dispersion modelling to develop directional buffers for identified industries and plot on an aerial image.
- Provide conclusions as to any buffer constraints that may apply and the general amenity of the area.
- Should any constraints be identified, an assessment of the probability that elevated dust levels would occur as a consequence of an upset at the plant will also be conducted.

1.5 Assumptions

The following assumptions were made during the preparation of this report:

- The most site representative meteorology that is available is from Geelong Airport
- This assessment has addressed emissions of dust from the Boral site and has not addressed noise, vibration or flyrock as it has been determined that these effects sit outside the EPA recommended separation distances for the site.
- The Boral site boundary (works approval and predicted future boundary) as presented in figures within this Report are based on planning maps and descriptions provided to GHD by Taylors whom GHD understand were provided the information from Boral.
- The rehabilitation blasting area as presented in figures within this report is based on imagery provided to GHD by Taylors whom GHD understand were provided the information from Boral.
- GHD have presented results for the scenario where the Boral land east of Anglesea Road is considered as a transitioning industry and consequently where the current separation distances are not applicable. GHD understands that Boral have indicated to Taylors that quarrying no longer occurs on this land. GHD does not consider that this transition is a certainty.

2. Project description

2.1 Location and land use

The landowners seek to rezone the land located at 35 & 69-93 Hams Road, Waurn Ponds from Farming Zone (FZ) to General Residential Zone (GRZ). The subject site is located north of Baanip Boulevard, adjacent the intersection of Geelong Ring Road/Princes Freeway, Anglesea Road and Baanip Boulevard. An aerial photograph of the subject site is provided in Figure 3.

The subject site is subject to the provisions the City of Greater Geelong (Council) Planning Scheme and is currently zoned Farming. The Boral site located directly to the west and south of the site is zoned Special Use 7. Properties to the immediate north and east of the subject site are zoned General Residential Zone 1 and Urban Growth Zone (UGZ). The sites to the southeast of the subject site are zoned for Urban Growth Zone (UGZ) and Urban Growth Zone 3 (UGZ3) and to the northwest Rural Living Zone (RLZ), respectively.

2.2 Sensitive land uses

The definition of a sensitive receptor or sensitive land use is defined by the EPA[2] as:

> *'any land uses which require a particular focus on protecting the beneficial uses of the air environment relating to human health and well-being, local amenity and aesthetic enjoyment, for example residential premises, child care centres, pre-schools, primary schools, education centres or informal outdoor recreation sites'.*

The nearest current sensitive land uses in relation to the subject site are residences located directly north and east of the site, within the General Residential 1 Zone, along Hams Road and Ghazeepore Road, respectively.

2.3 Site inspection

GHD conducted a site inspection on 2 February 2018. The following observations were made during the inspection:

- Boral land east of Anglesea Road and south of Baanip Boulevard did not appear to be currently used for any activities relating to quarrying or cement manufacture. A number of animals were observed on the land. Trees and a body of water were also observed on the land. Please refer to Figure 1. Information was later provided to GHD from Taylors (via Boral) that this land us currently being used for agricultural purposes with no future intention for extraction to occur.
- The Boral land to the south of the subject site is separated from the subject site by Baanip Boulevard. Baanip Boulevard is situated on an embankment approximately 7 m above the surrounding ground level. To the north of Baanip Boulevard a strip of vegetation was observed. The trees planted ranged between 0.5 m and approximately 3 m in height, and it is expected that these heights will increase with plant age. Please refer to Figure 2.
- Both the elevated embankment and strip of vegetation will lead to some reduction of transmitted dust from the quarry operations to the subject site. As the height and density of vegetation increases, the efficiency of dust capture by the vegetation will increase.

[2] EPAV 2013 "Recommended separation distances for industrial residual air emissions" Publication. 1518, March 2013

Figure 1 Boral land south of Baanip Boulevard

Figure 2 Baanip Boulevard embankment

1:20,000

0 200 400 600

Metres (at A4)

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 55

N

LEGEND

Site boundary

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Site location

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Figure 3

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3. Relevant buffer guidelines

3.1 Amenity buffers

Two classes of buffer/separation distance guidelines are relevant in the context of planning in Victoria, namely Threshold Distances and Buffer (or separation) Distances.

Threshold distances

The purpose of 52.10 – *Uses with Adverse Amenity Potential* as defined in provisions of Clause 52.10[3] is to define those types of industries and warehouses, which if not appropriately designed and located may cause offence or unacceptable risk to the neighbourhood. So in effect, where there is an industrial use proposed on a land parcel, then the provisions of Clause 52.10 in the planning scheme apply. If the industry is specified in the Table to the Clause, then the corresponding threshold distance to the nearest Residential Zone, Business 5 Zone, Capital City Zone or Docklands Zone must be met, otherwise a planning permit must be sought.

EPA buffer distances

In the case of an existing industrial use, EPA recommends buffer distances should be considered when preparing a planning scheme, planning scheme amendment or planning permit application. A buffer distance is a planning instrument used to provide separation of existing or proposed sensitive land uses (i.e. residential, schools, hospitals) from premises (existing or proposed) with the potential for off-site emissions from odour or dust that can cause disamenity in the event of an upset/malfunction. Under routine operations, the odour or dust impact should be confined on-site so that an external buffer is not required.

The purpose of the EPA separation distance guidelines are to provide recommended minimum separation distances between odour or dust emitting industrial land uses and sensitive land uses. Accordingly, the relevant sections of the guideline for this assessment are to:

- Provide clear direction on which land uses require separation
- Inform and support strategic land use planning decisions
- Prevent new sensitive land uses from impacting on existing industrial uses
- Prevent new or expanded industrial land uses from impacting on existing sensitive land uses
- Identify compatible land uses that can be established within a separation distance area

The buffers are to be scribed as per EPA Guidelines Method 1 (Urban method). This method requires that the separation distance be measured from the activity boundary of the industry to the property boundary of the sensitive land use, i.e. the activity boundary of the industry is a polygon containing the activities of the industry.

In the case of this buffer constraint assessment for the proposed rezoning of 35 & 69-93 Hams Road, Waurn Ponds the EPA recommended separation distance guidelines that apply to existing industries surrounding the subject site are the relevant current guidelines.

[3] Victorian Planning Provisions, Clause 52.10 “Uses with Adverse Amenity Potential”

3.2 EPA buffer guidelines

The EPA has published[4] recommended buffer distances for selected industry categories (EPA Guidelines). Buffer distances can define zones of land off-site from the industrial premises which are constrained from development for sensitive land uses.

3.2.1 EPA default buffers from Boral

The particular activities attracting buffers from Boral are listed in Table 1.

From the EPA guideline, an active quarry with blasting has a recommended buffer of 500 m, while an active quarry without blasting would have a buffer of 250 m. Though not specified in the guideline, the 250 m increase in separation distance for blasting and auxiliary activities, has been interpreted to account for dust particles associated with the blast being transported further distances and is not related to flyrock.

Under the EPA guideline, cement manufacturing has a recommended buffer distance of 1,000 m. GHD understand that at present Boral does not manufacture cement at the Waurn Ponds site. Despite this, the Boral EPA licence still allows for cement manufacturing to occur and therefore GHD has included this buffer in the study. It is also noted that cement clinker grinding occurs at the Boral site and requires a separation distance of 500 m for a throughput of greater than 150,000 tonnes per year under the EPA guideline. The licensed cement manufacturing and clinker grinding throughputs are not known, and it is therefore assumed that the rate is greater than 150,000 tonnes per year.

Table 1 Default buffers for Boral operations

Industry type	Industry action/definition	Scale and industry description	Recommended separation distance (m)
Quarry	Quarrying, crushing, screening, stockpiling and conveying of rock	Without blasting	250
		With blasting	500 (from resource extent[5])
Cement manufacturing	Production of cement from clays or limestone in either a furnace or a kiln to produce cement clinker	> 150,000 tonnes per year	1,000
Cement clinker grinding	Grinding of cement clinker, clays or limestone materials	> 150,000 tonnes per year	500

[4] EPA Recommended Separation Distances for Industrial Residual Air Emissions, Publication 1518, March 2013

[5] The activity boundary for blasting is considered to be the extent of the resource (basalt) as defined by geological surveys conducted by Terrock, see Appendix A.

3.2.2 Application to site

GHD has derived the Work Authority boundary for Boral, and the quarry buffers from information supplied by Taylors[6]. The Boral Work Authority boundary is derived from the Greater Geelong Planning Scheme – Local Provision (see Appendix A), modified to account for the 20 m landscape set back, as confirmed by Ian McLeod of DEDJTR[7]. The two activity boundaries for blasting were taken as:

1. The extent of the resource (basalt), based on geological surveys, which is presented in Appendix B.
2. The extent of the area of possible blasting during quarry rehabilitation as provided by Andrew Bondini of Boral[8] to Taylors, presented in Appendix C.

Boundaries provided to GHD were provided from Planning Scheme maps and scaled aerial photography but were not georeferenced and as such the accuracy of the buffer distances presented is subject to the limitations of the aerial imagery and information provided.

Figure 4 and Figure 5 show the Boral activity boundaries and default buffers as identified above, with respect to the site for quarrying activities and cement activities, respectively. From Figure 4 and Figure 5 it can be seen that sufficient separation distance exists for blasting (from the basalt boundary), cement manufacturing and clinker grinding activities.

The 250 m buffer applied to the envelope of the possible quarrying activities i.e. the Works Authority boundary, slightly constrains the subject site, as shown in Figure 4 and Figure 6 (quarrying only). This buffer extends to constrain the subject site by an area of approximately 44,000 m^2, extending approximately 120 m onto the subject site.

The 500 m blasting buffer from the area of rehabilitation does not constrain the subject site (see Figure 6), however due to the low separation distance between the buffer and the site boundary (approximately 70 m), this buffer is investigated further.

Site-specific variation to the default buffers are investigated for both the 250 m buffer from the Works Authority boundary and the 500 m blasting buffer from the rehabilitation area.

3.3 Site specific variation to the default buffer

The EPA allows for site-specific variation to the default buffer distance for a given industry and identifies six criteria to consider in Table 4 of the guideline. These criteria are addressed below:

1. **Transitioning of the industry** – If an industry has plans to transition out of the area in the foreseeable future then a reduced or zero buffer may be negotiated for those industries.

In an email from Judy McKittrick of Boral to Taylors[9], it was stated that the eastern portion of the Boral property (east of Anglesea Road) is “no longer used for quarrying purposes” and therefore no extraction is occurring in this area of land. It was also stated that this portion of the Boral site is currently used by a “farmer who crops the land.”

GHD has also been advised by Taylors that Boral are considering transitioning to a new land use for this eastern portion[10].

[6] Email with Roger Cooper (Taylors) on 30 January 2018

[7] Email from Ian McLeod (DEDJTR) to Roger Cooper (Taylors) on 29 December 2017

[8] Email from Andrew Bondini (Boral) to Roger Cooper (Taylors) on 6 February 2018

[9] Email from Judy McKittrick (Boral) to Roger Cooper (Taylors) on 13 March 2018

[10] Email with Roger Cooper (Taylors) on 16 January 2018

GHD has presented the scenario under which Boral ceases operation to the east of Anglesea Road as part of this assessment [11]. Figure 7 shows the default 250 m quarrying buffer, excluding the Boral land east of Anglesea Road. The 250 m default quarrying buffer shown in Figure 7 extends to constrain the subject site boundary by an area of approximately 1,800 m^2, extending approximately 70 m onto the subject site.

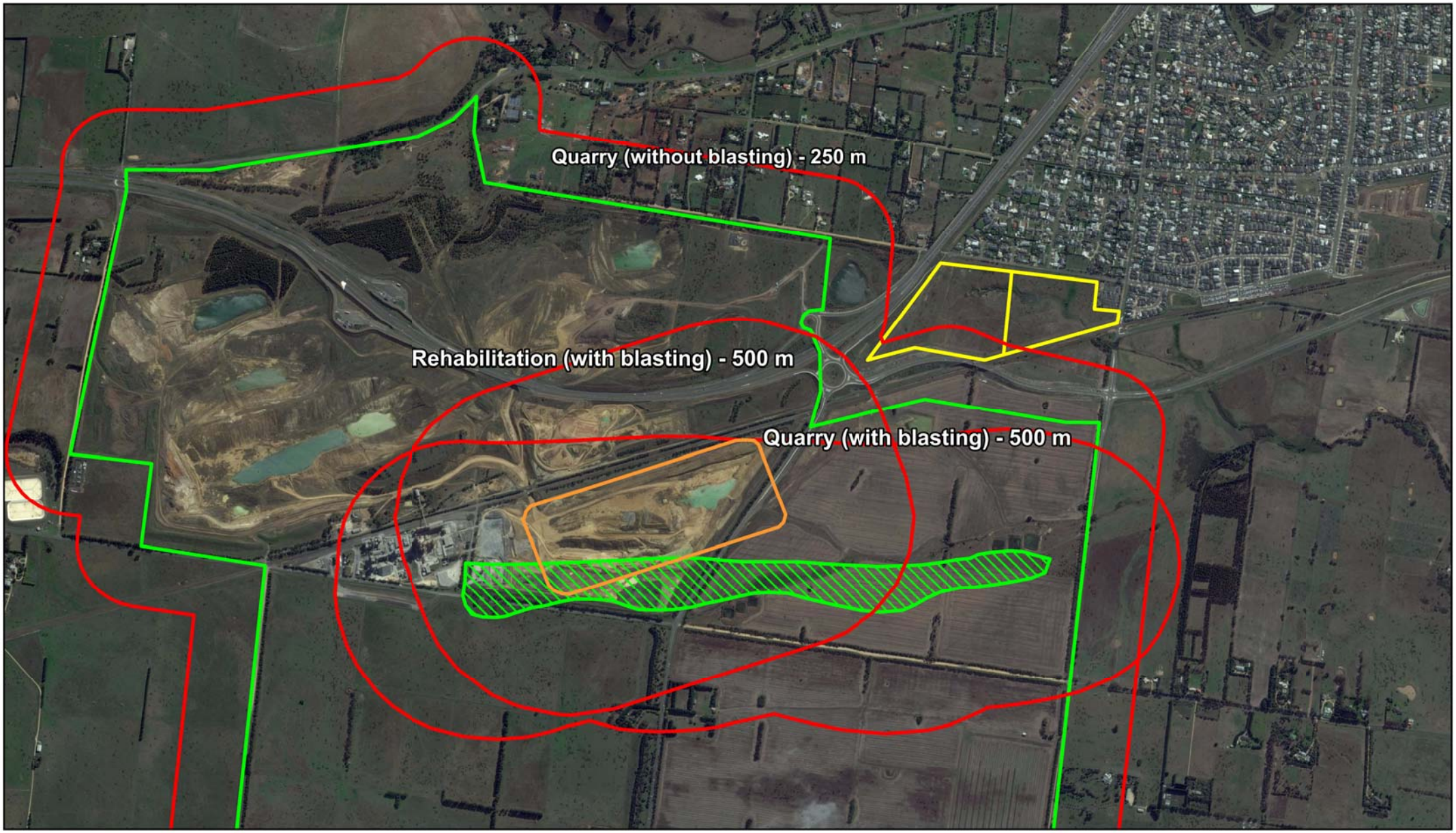
2. **Plant equipment and operation –** If the plant has a high standard of emission technology or has evidence of no upset or malfunctions occurring then a reduced buffer may be more appropriate. GHD does not have sufficient information/evidence to consider this in this assessment.
3. **Environmental risk assessment (ERA) –** An ERA would need to be completed to assess this option, this would require specific knowledge of process operations and emission rates. This assessment does not consider site-specific operations and emission rates.
4. **Size of the plant –** If the throughput is small compared to large examples within the same industry then it would be possible to de-rate the buffers based on throughput. GHD does not have sufficient information/evidence to consider this in this assessment.
5. **Topography or meteorology –** This has been assessed in Section 4 to produce directional buffers for all the identified industries nearby.
6. **Likelihood of IRAEs –** The likelihood of residual emissions from the identified industries would need to be assessed once specific operational information was obtained regarding their operations including how frequently upset conditions occur. The assessment would also rely on a detailed complaint history from the residential area encompassed within the default buffer. According to EPA records (see section 3.4) there have been no confirmed dust or odour complaints from the nearby residential area.

3.4 Complaint history

GHD made a request to EPA for the latest complaint history for the Boral site and surrounding area of interest. GHD requested all odour and dust complaints for the last 5 years including complaint location, type of complaint (dust or odour), date and time of complaint and whether it was verified. In response[12] EPA informed GHD that there have only been "a couple of dust reports in the last 5 years in the area of interest neither of which were confirmed".

[11] Boral have not confirmed if the eastern portion of their site is currently required or intended for future extraction. In an email from Andrew Bondini (Boral Property Group) on 6 February 2018 it was stated that Boral reserves the right to access all reserves in accordance with its approval until such time the operation is no longer viable across the site

[12] Email from EPA (Alison Muscroft, Team Leader - Field Operations South West Region) dated 8 February 2018



1:20,000

0 200 400 600

Metres (at A4)

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 55

N

LEGEND

- Site boundary
- Boral boundary
- Default buffer
- Area of rehabilitation
- Bassalt rock

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Boral quarry default buffers

Figure 4

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1:20,000

0 200 400 600

Metres (at A4)

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 55

N

LEGEND

- Site boundary
- Boral boundary
- Default buffer
- Cement operations

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Boral cement default buffers

Figure 5

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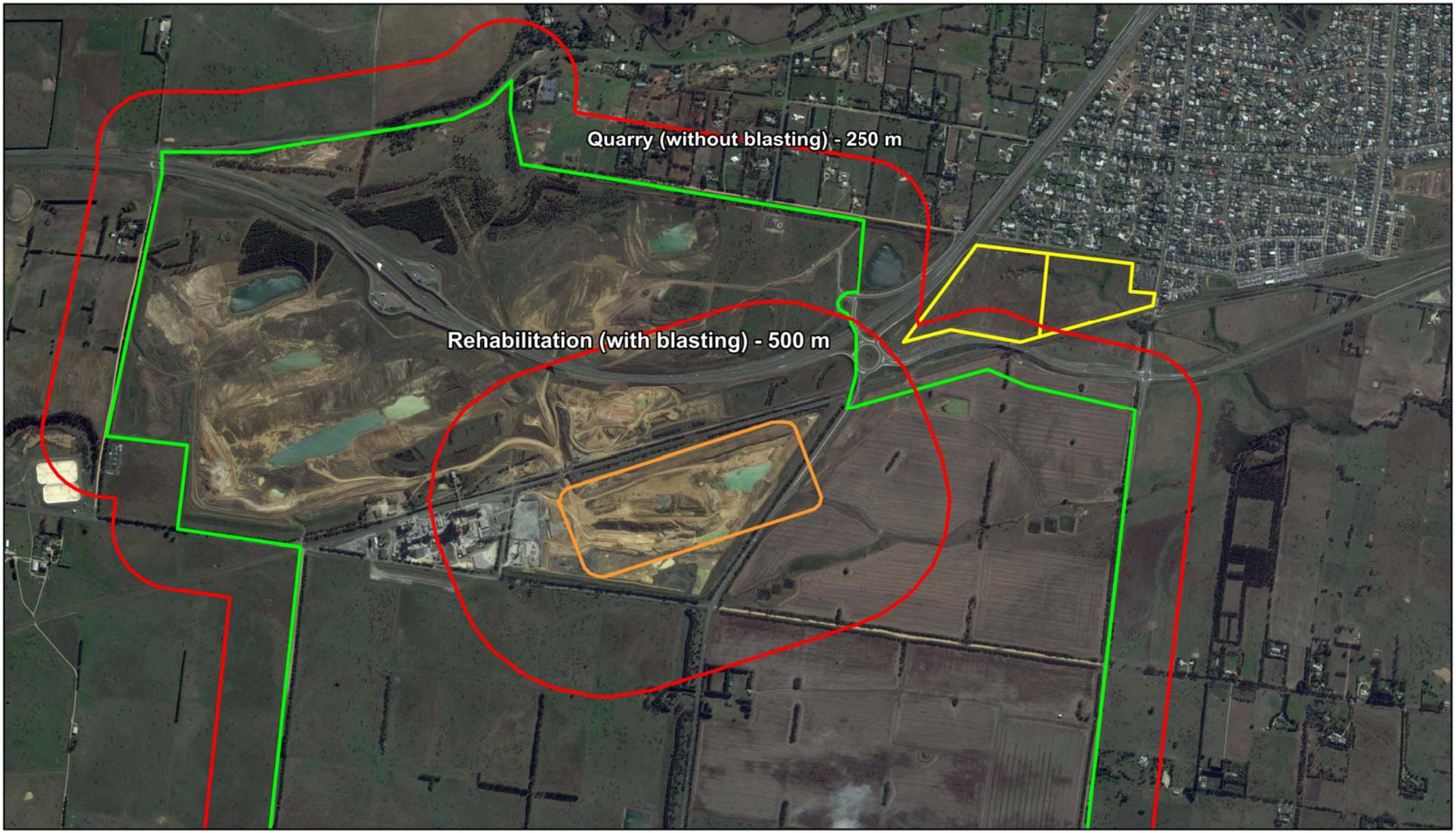

1:20,000

0 200 400 600

Metres (at A4)

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 55

N

LEGEND

Site boundary

Boral boundary

Default buffer

Area of rehabilitation

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Default buffers from Work Authority boundary and area of rehabilitation

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Figure 6

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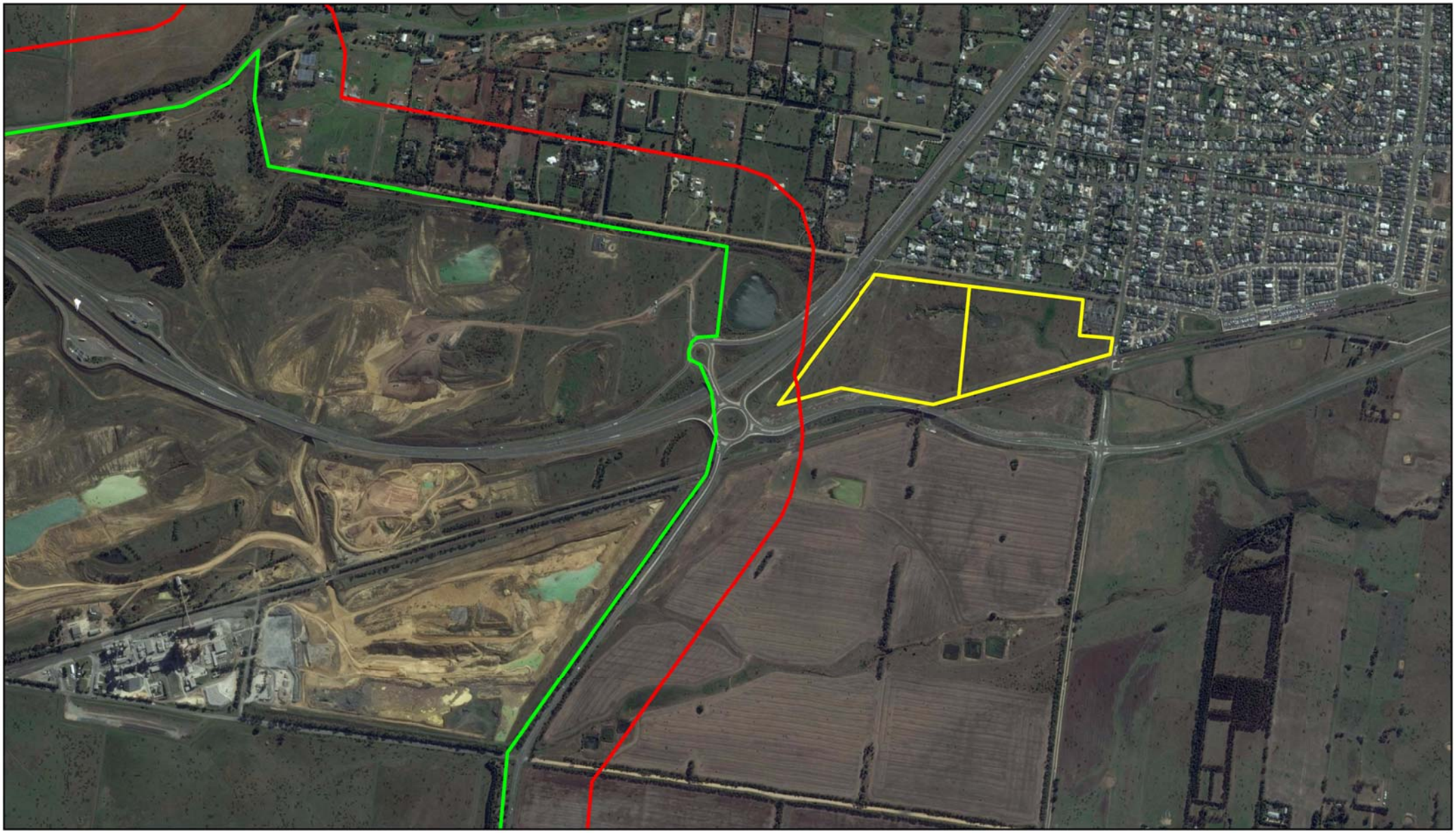

1:15,000

0 150 300 450

Metres (at A4)

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 55

N

LEGEND

Site boundary

250 m default buffer

Boral boundary - excluding eastern portion

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Default quarrying buffer excluding eastern portion of site

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Figure 7

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4. Meteorology

4.1 Wind pattern

The local meteorology largely determines the pattern of off-site odour and dust impact. The characterisation of local wind patterns requires accurate site-representative hourly recordings of wind speed and direction over a period of at least 12 months (one year).

GHD has access to high quality meteorological data (five years at 30-minute intervals) from the Geelong Airport automatic weather station (AWS), operated by the Australian Bureau of Meteorology (BoM). The Geelong Airport AWS was operated from October 1983 to August 2011 and was located approximately 3 km from the subject site. GHD has also accessed the Avalon Airport AWS for cloud data.

GHD selected the years 2006 – 2010 as it was the most recent period with a complete record from the Geelong Airport AWS.

The effect of wind on dispersion patterns can be examined using the general wind climate and atmospheric stability class distributions. The general wind climate at a site is most readily displayed by means of wind rose plots, giving the incidence of winds from different directions for various wind speed ranges.

The features of particular interest in this assessment are: (i) the prevailing wind directions and (ii) the relative incidence of more stable light wind conditions and (iii) good dispersion conditions winds over 5 m/s.

A distinction can be made for fugitive deposited dust entrained into strong winds, as opposed to dust emissions from process sources where the emission rate is independent of local wind conditions. The ‘worst case’ in the former class is wind speed greater than 5 m/s, while ‘worst case’ in the latter is light, stable winds.

4.1.1 Long term patterns in wind

The average wind rose for the entire data period is shown in Figure 8 and shows the following features:

- The predominant average wind directions are from the west and south comprising 26% of the incident winds.
- The incidence of westerly component winds (~16%) is significantly higher than easterlies occurring <2% of the time.
- The average wind speed measured was 4.7 m/s.
- The observed wind speed distribution indicates that the largest proportion of high wind speeds (> 5 m/s) are from the west, while the largest proportion of light winds (<2 m/s) are also from the west.

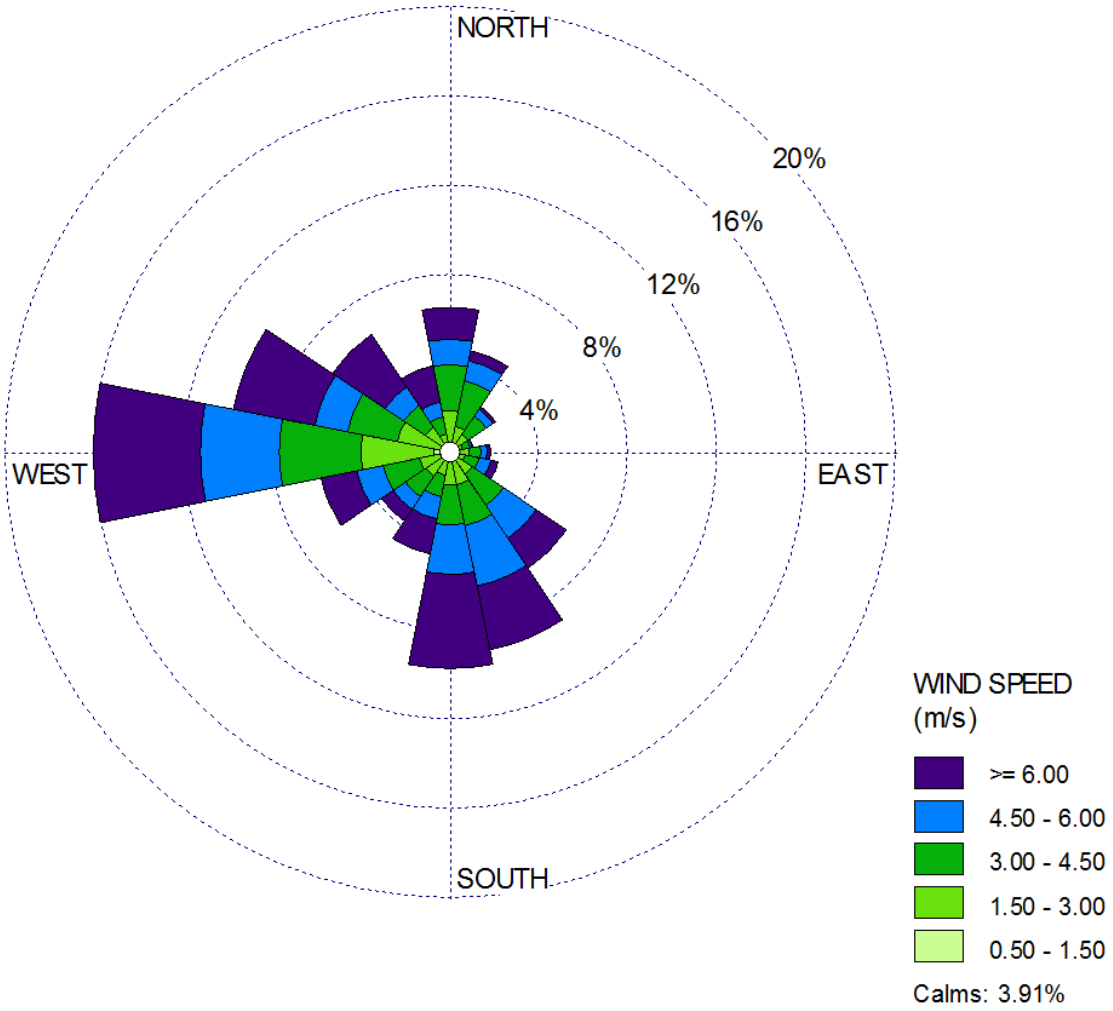


Figure 8 Wind rose (2006 – 2010) for Waurn Ponds (Geelong)

4.2 Seasonal variation in wind pattern

The seasonal wind roses for the period are presented in Figure 9 and show that:

- During the summer the influence of the sea breeze is evident in the late afternoon and evening from the coast. The predominant wind direction is southerly and south-southeasterly, which comprises of 35% of the total winds. The summer wind rose also includes winds from the west.
- During winter, westerly winds are the most dominant generated through synoptic winds and the presence of cold fronts. Westerly winds comprise ~20% of all incident winds. The wind rose also includes influences from the north and northwest directions.
- Autumn and spring are transitional periods. During these months both summer and winter patterns are observed.
- The seasonal incidence of high winds (> 6 m/s) is greatest in summer.
- The incidence of light (< 1.5 m/s) winds is greatest in autumn and winter.
- As with the annual wind rose for the period from 2006 to 2010, there is a lack of easterly winds in all observed seasons.
- Autumn and winter drainage flows are likely to be associated with high stability and can be expected to define the directions of poorest dispersion.

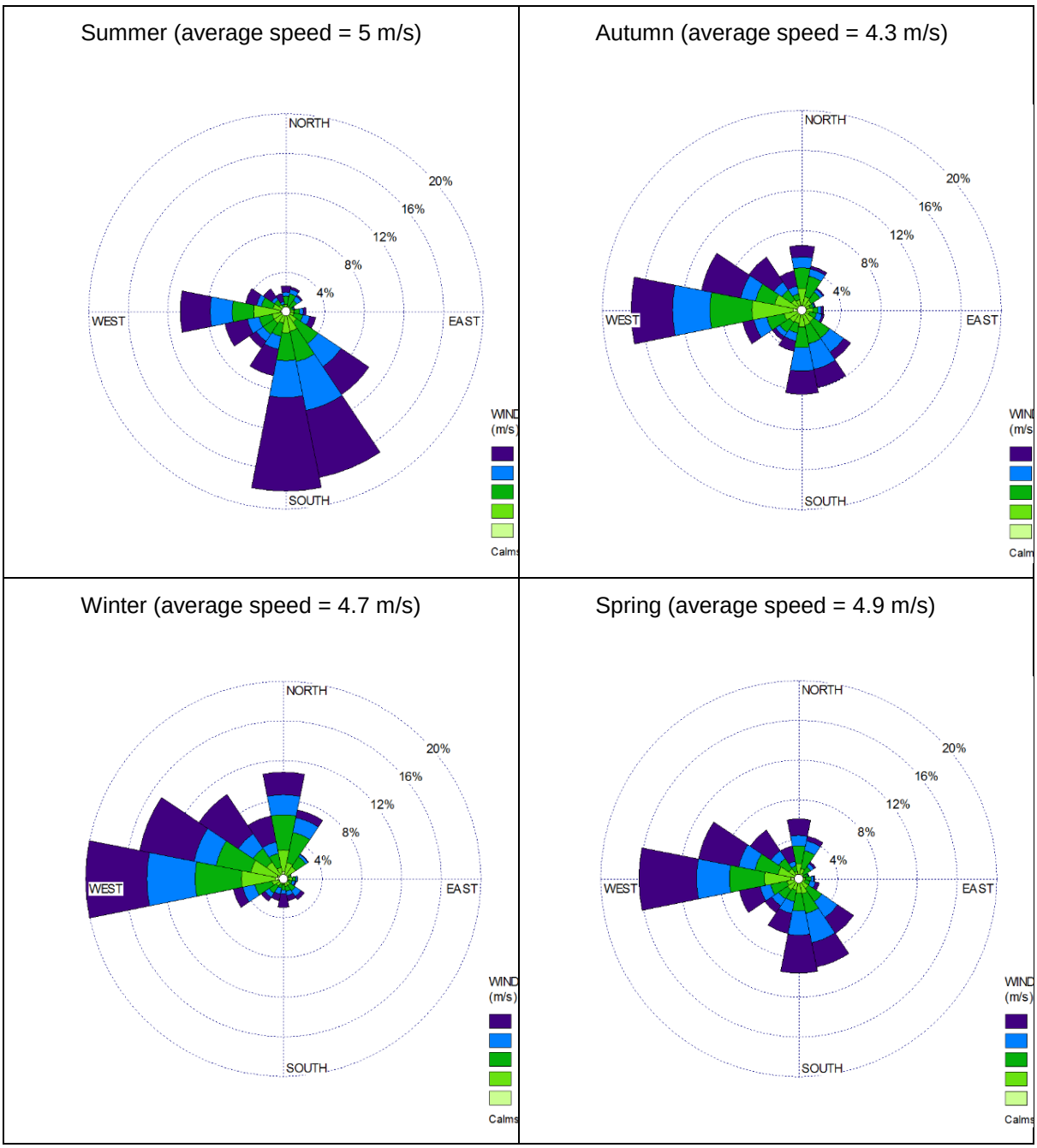


Figure 9 Seasonal wind roses (2006 – 2010) for Waurn Ponds (Geelong)

5. Directionally dependent buffer

Section 9.2 of the EPA buffer guideline 1518 allows for site-specific buffer variation on the basis of topographical or meteorological features which will affect dispersion of industrial residual air emissions. GHD has developed an approach to provide directionally-dependent buffers on the basis of the dispersive ability of the atmosphere, as assessed using atmospheric dispersion modelling.

Where site-representative meteorological data is available, the directions of good and poor dispersion can be identified as shown in Section 4. Further, if the dataset is configured into a dispersion modelling format (deriving atmospheric stability categories) then dispersion modelling can be conducted using a nominal source emission rate to assess the directional change in extent from a default radial buffer[13].

The directional buffer adapts the default radial buffer to take account of the directions of good and poor dispersion – found from the site representative meteorological data.

In the directions of poor dispersion, the buffer is extended and in the directions of good dispersion the buffer is retracted. The effect is to produce a degree of protection from exposure to impact in the event of a process upset that is independent of the direction of the residences from the specific industry.

Dispersion modelling utilising the EPA regulatory approved model AERMOD was performed using the meteorological dataset described above, and a nominal 10 m x 10 m area source with a nominal emission rate was adopted. For the two buffers, the maximum 24-hour contours were exported that provide the same enclosed area as:

- A 250 m radius circle (~196,350 m^2), for the 250 m quarrying buffer, see Table 2
- A 500 m radius circle (~785,400 m^2), for the 500 m blasting buffer (from the area of rehabilitation), see Table 3

The angular change in buffer distance is given as a function of direction in Table 2 and Table 3. This information has also been used to demonstrate the effect on the default buffer from Boral that has the potential to constrain the subject site.

From Table 2 it is seen that the extent of the contour is greater than the all-direction mean of 250 m towards the south – out to 284 m. Similarly, the extent of the contour to the southwest is significantly less than 250 m, down to 85 m. Table 3 shows the same trends as in Table 2 with a significant reduction in the direction towards the site (northeast), resulting in the 500 m radial buffer reduced to 173 m in this direction. The contour effectively gives the departure from the fixed (250 or 500 m) radius that would be required if an equal exposure to disamenity was to be given in the event of an upset/malfunction at Boral.

[13] Clarey P, Pollock T "Integrating Separation Distances with Dispersion Modelling" Enviro 04, 28 Mar – 1 April, Darling harbour, Sydney

Table 2 Directional variation in the 250 m default buffer in response to on site meteorology

Direction Sector (Degrees)		Mean Range (m)	Percent (%) of mean range	Direction Sector (Degrees)		Mean Range (m)	Percent (%) of mean range
N	0	206	82	S	180	284	114
NNE	22.5	143	57	SSW	202.5	123	49
NE	45	87	35	SW	225	85	34
ENE	67.5	121	48	WSW	247.5	167	67
E	90	182	73	W	270	247	99
ESE	112.5	283	113	WNW	292.5	200	80
SE	135	187	75	NW	315	222	89
SSE	157.5	233	93	NNW	337.5	194	78

Table 3 Directional variation in the 500 m default buffer in response to on site meteorology

Direction Sector (Degrees)		Mean Range (m)	Percent (%) of mean range	Direction Sector (Degrees)		Mean Range (m)	Percent (%) of mean range
N	0	412	82	S	180	568	114
NNE	22.5	285	57	SSW	202.5	246	49
NE	45	173	35	SW	225	171	34
ENE	67.5	242	48	WSW	247.5	335	67
E	90	363	73	W	270	494	99
ESE	112.5	565	113	WNW	292.5	400	80
SE	135	375	75	NW	315	444	89
SSE	157.5	466	93	NNW	337.5	388	78

5.1.1 Potential constraint posed by directional buffers on the subject site

Figure 10 shows the 250 m directional buffer for quarrying (excluding basting) for the Boral Works Authority Boundary. This scenario represents the existing authorised use on the land to the east of Anglesea Road.

Figure 11 shows the 250 m directional buffer for quarrying (excluding basting) where the land to the east of Anglesea Road is considered as transitioning (see section 3.3) and therefore would not be quarried.

Figure 12 shows the 500 m directional buffer for quarrying (including blasting) for the potential rehabilitation area.

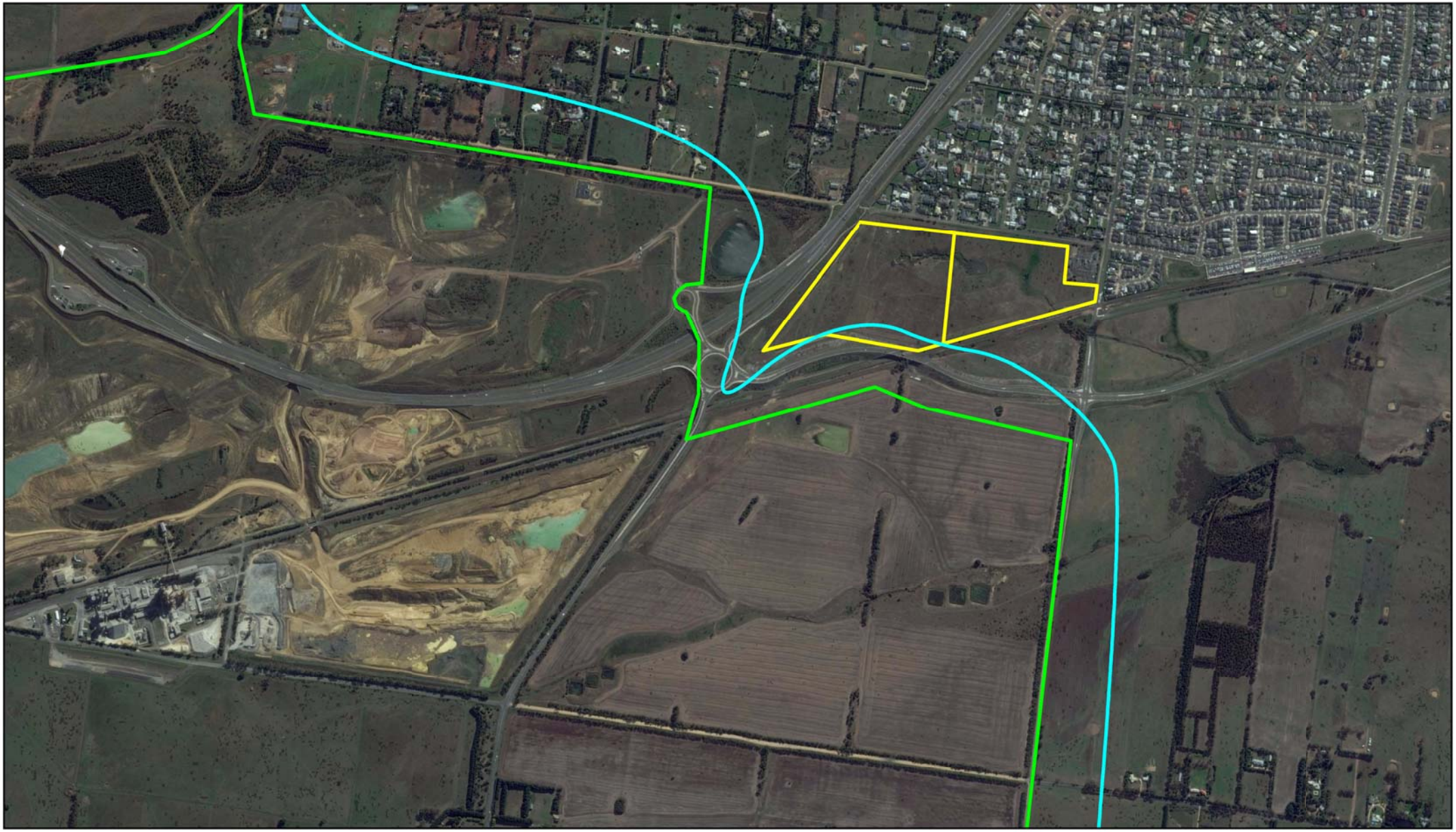
From Figure 10, Figure 11 and Figure 12 it can be seen the directional buffers are significantly reduced to the northeast (approximate 65% reduction) compared to the default radial buffers.

The results show that the 250 m directional buffer from the Work Authority boundary (see Figure 10) extends onto the subject site by a maximum distance of ~60 m (in comparison to ~115 m for the default 250 m buffer). The total area constrained for the 250 m directional buffer is estimated as ~13,000 m² compared to ~44,000 m² for the default 250 m buffer.

Figure 11 and Figure 12 show that both the 250 m (excluding the eastern portion of the site) and the 500 m quarrying directional buffers do not extend to constrain the subject site.

Information provided by Boral Property Group[14] stated that the quarry is required to be operational for 24 hours a day in order to meet the cement manufacturing plant requirements and to cover equipment breakdown and maintenance needs. Therefore, the directional buffers have been generated for all hours of the day.

[14] Email from Andrew Bondini (Boral Property Group) on 6 February 2018



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0 150 300 450

Metres (at A4)

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 55

N

LEGEND

Site boundary

Boral boundary

Directional buffer

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Directional quarrying buffer (no blasting) from Work Authority boundary

Job Number	3135904
Revision	A
Date	14/02/18

Figure 10

G:\31\35904\GIS\Maps\Working

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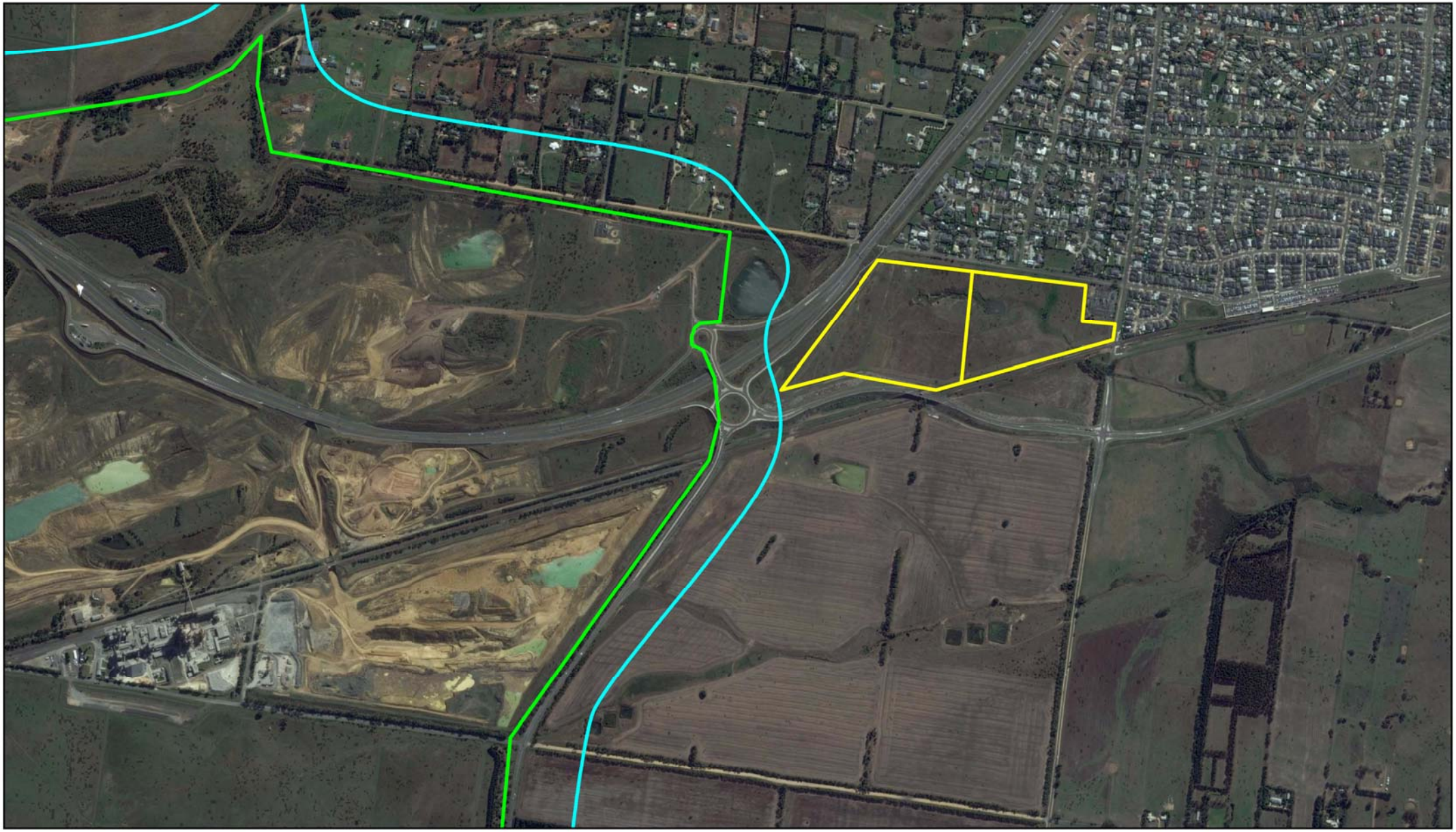

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0 150 300 450

Metres (at A4)

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 55

N

LEGEND

Site boundary

Directional buffer

Boral boundary - excluding eastern portion

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Echin Pty Ltd

Directional quarrying buffer (no blasting) excluding eastern portion of site

Job Number	3135904
Revision	A
Date	14/02/18

Figure 11

G:\31\35904\GIS\Maps\Working

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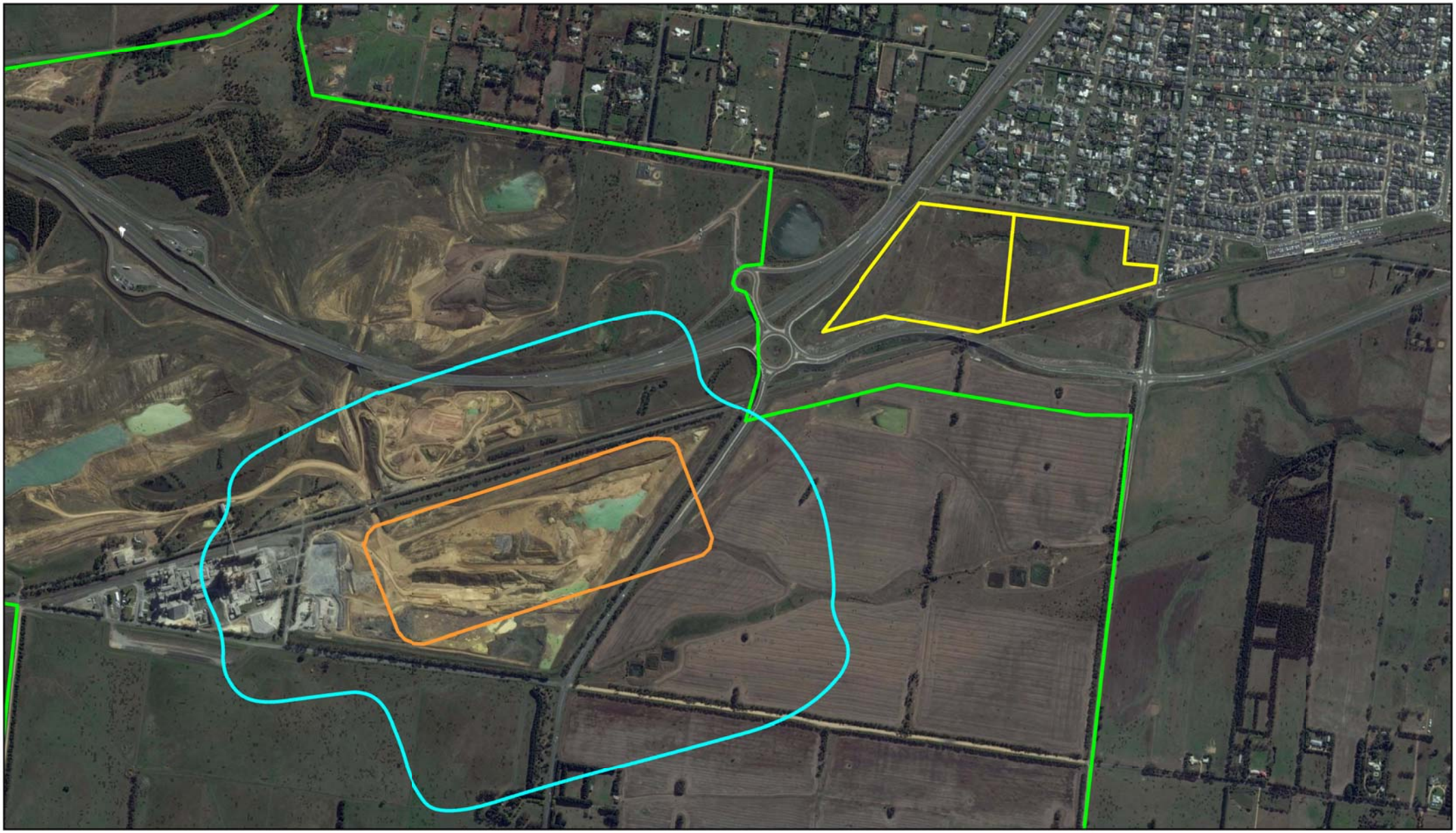

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0 150 300 450

Metres (at A4)

Map Projection: Universal Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia 1994
Grid: Map Grid Of Australia, Zone 55

N

LEGEND

- Site boundary
- Boral boundary
- Area of rehabilitation
- Directional buffer

Echin Pty Ltd

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Directional quarrying buffer from rehabilitation area (including blasting)

Figure 12

Job Number	3135904
Revision	A
Date	20/03/18

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Google Earth Imagery 2018. Created by: SM

6. Conclusion

- GHD was engaged by Echin Pty Ltd (represented by Taylors) to conduct a buffer constraint assessment for the proposed rezoning of the land located at 35 & 69-93 Hams Road, Waurn Ponds.The relevant separation distances to be met for existing industrial uses are those agreed with by EPA.
- The default 250 m quarrying buffer from the existing Boral Work Authority boundary extends to constrain the proposed development. This buffer extends to constrain the subject site by an area of approximately 44,000 m^2, extending approximately 120 m onto the subject site. We note however, Boral (via Taylors) have indicated that there no current or future extraction planned to the east of Anglesea road and as such, this constraint may not be applicable to the site.
- The default 500 m quarrying buffer (including blasting) from the area of rehabilitation does not constrain the subject site.
- Default buffer distances for cement manufacture (1,000 m) clinker grinding (500 m) and blasting from the basalt resource extent of 500 m do not constrain the subject site when plotted from their respective activity boundaries.
- The EPA guidelines outline a number of factors where a site-specific buffer variation may apply to Boral and result in a reduced buffer – in particular *'transitioning of the industry'*. Boral have indicated to Taylors that the eastern portion of their site (east of Anglesea Road) is "no longer used for quarrying purposes". Consequently, GHD considers it reasonable that this portion of the Boral Work Authority boundary be considered as a transitioning industry.
- The default 250 m quarrying buffer, excluding the land east of Anglesea Road, extends to constrain the subject site by an area of approximately 1,800 m^2, extending approximately 70 m onto the subject site.
- Local meteorology was used to assess the directions of good and poor dispersion of pollutants from the Boral site. From this assessment, a directional buffer was developed for the 250 m quarrying buffer and 500 m quarrying buffer (including blasting).
- The directional buffer shows a large reduction of the default buffer distance towards the northeast.
- Based on the Boral Work Authority boundary the 250 m directional quarry buffer extends to constrain the subject site by an area of approximately 13,000 m^2, representative of an approximate 70% constraint reduction from the default buffer. We note however, Boral (via Taylors) have indicated that there no current or future extraction planned to the east of Anglesea road and as such, this constraint may not be applicable to the site.
- The 250 m directional quarrying buffer, excluding the land east of Anglesea Road does not extend to constrain the subject site.
- The 500 m directional quarrying buffer (including blasting) from the area of rehabilitation does not extend to constrain the subject site.
- Both the elevated embankment and strip of vegetation at Baanip Boulevard will lead to some reduction of transmitted dust from any quarry operations to the subject site as well as reducing any visual and noise impacts.
- Should Boral apply for a new land use for the land east of Anglesea road, based on the directional buffer assessment, the subject site may no longer be constrained by any separation requirement and could be developed for residential purposes with the consent of the responsible authority.

This report is subject to, and must be read in conjunction with the limitations presented in Section 1.3 and the exclusions, assumptions and qualifications contained throughout this report.

Appendices

Appendix A – Public Acquisition Overlay – Greater Geelong Planning Scheme – Local Provision

GREATER GEELONG PLANNING SCHEME - LOCAL PROVISION

This map should be read in conjunction with additional Planning Overlay Maps (if applicable) as indicated on the INDEX TO MAPS.

Overlays

- PA03 Public Acquisition Overlay 3
- PA07 Public Acquisition Overlay 7
- PA09 Public Acquisition Overlay 9

Municipal Boundary (If shown)

500 0 500 m

AUSTRALIAN MAP GRID ZONE 55

PREPARED BY: Planning Mapping Services

Printed: 5/2/2018

AMENDMENT C377

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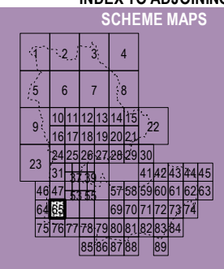
INDEX TO ADJOINING SCHEME MAPS



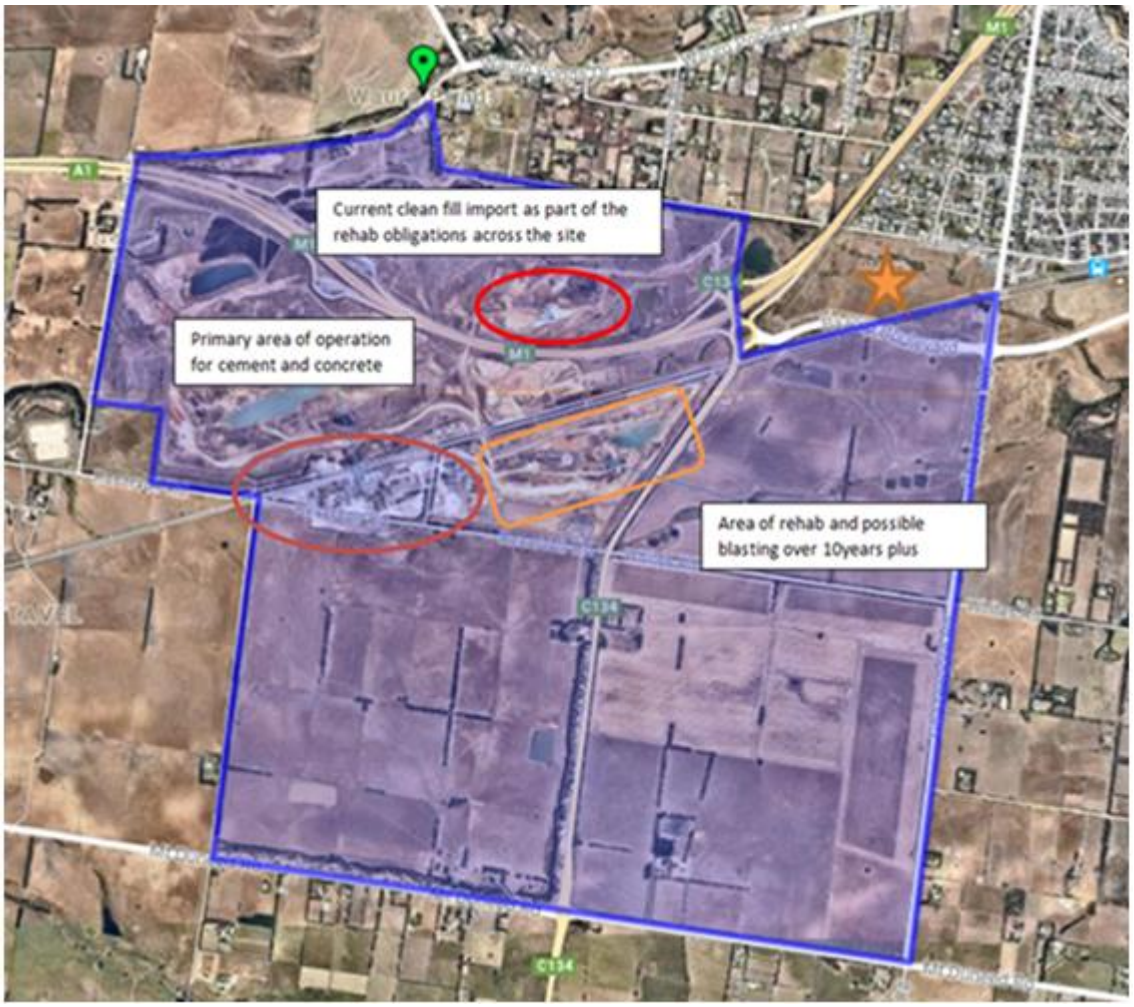
PUBLIC ACQUISITION OVERLAY

MAP No 65PAO

Appendix B – Terrock – Map 1. Quarry Buffers 7/8/2013

Map 1. Quarry Buffers 7/8/2013

Appendix C – Boral – Map of Boral site showing area of rehabilitation and possible blasting



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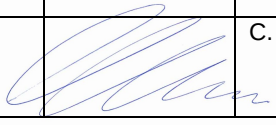
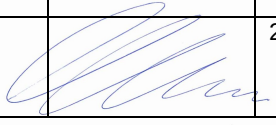
Rev0	D. Craggs	C. McVie		C. McVie		27.03.18

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