Wallan/Beveridge Extractive Resources Analysis (2017)

Coffey Services Pty Ltd, for DEDJTR

The following report titled **Wallan/Beveridge Extractive Resources Analysis (2017)** was prepared by Coffey Services Pty Ltd for the Department of Economic Development, Jobs, Transport and Resources (now the Department of Jobs, Precincts and Regions – DJPR).

The report was produced to inform the preparation of departmental advice to the Victorian Planning Authority concerning extractive resources in the vicinity of the proposed Beveridge North West Precinct Structure Plan.

Level 1, 436 Johnston Street
Abbotsford
VIC 3067 Australia

t: 03 9290 7000

coffey.com

15 November 2017

Our ref: MELGE212432

Mineral Development Victoria, Earth Resources Policy and Programs,
Department of Economic Development, Jobs, Transport and Resources
Level 17, 1 Spring Street Melbourne 3001

Attention: Fiona Clarke

Dear Fiona,

Wallan/Beveridge Extractive Resources Analysis (Geology)

1. Introduction

The proposed Beveridge North Precinct Structure Plan (PSP) covers land that is the subject of Work Authority Application 1473 by Conundrum Holdings. This area forms part of the Northern Growth Corridor within the Plan Melbourne.

To inform the Victorian Planning Authority's delineation of land uses within the PSP, a more detailed evaluation of the quarry proposal (WA1473) was requested by the Mineral Development Victoria (MDV) group - Earth Resources Policy and Programs section of the Department of Economic Development, Jobs, Transport and Resources (DEDJTR).

MDV requested that Coffey undertake an analysis of the evidence to support development of WA1473 within the Mitchell Shire. This analysis seeks to identify the importance of the resource from WA1473 to meet future demand in the market to supply construction materials for housing, infrastructure and other developments in the northern growth corridor, relevant adjoining areas and the inner Melbourne area.

2. Scope

The study scope included:

1. **Geological assessment: Analysis & commentary on:**
    - The resource proposed to be extracted from WA1473 – characteristics, uses, any rare/unique features, degree of substitutability (noting any implications this may have (i.e. greater cost, reduced scope of uses etc.)

- Alternative supplies of hard rock (existing and future supply) in the region outlining issues of scarcity and/or access to the same resource elsewhere, and equivalency/ substitutability of the resource proposed to be produced by WA1473, under 2 geographic scenarios:
    i. within approximately 25km and
    ii. approximately 50km of WA1473.

2. **Threshold issues associated with amended quarry proposal:**
    - Identification and commentary regarding possible options for the proposed quarry (WA1473) that would support being accommodated within the proposed Precinct Structure Plan (e.g. co-existence with residential housing development). This could include matters such as expedited extraction, shorter quarry life, sequencing options, shallower or deeper quarrying etc.
        i. Commentary particularly sought about buffers and sequencing of production to maximise available surrounding land for residential development (e.g. options for minimisation of buffers, potential geotechnical and/or other impacts of doing so etc.)
        ii. Commentary also sought around what implications any of these options have for the overall commerciality of the proposed quarry, including implications for on-site infrastructure.

3. **Threshold issues - impacting end of life uses:** identification and commentary regarding the proposed quarry's potential post-closure land forms (community assets), including progressive rehabilitation, and the geological/hydrology parameters relevant to the WA1473 proposal that could limit potential post-closure land forms (note: the options would not include as a landfill site).

3. Geological Assessment

The proposed quarry proposed in the WA1473 application will extract Newer Basalt from basalt flows originating from the adjacent Spring Hill volcano. That volcano is one a series of volcanoes (Figure 1) that mark the eastern extremity of the Newer Volcanics (Basalt) flows that cover much of western Victoria. Figure 2 shows the latest geological map of the region, produced by the Geological Survey of Victoria and available through the GeoVic mapping software as the geological Unit 250K layer. That geological map places the WA area on a basalt flow defined as belonging to a "stony rise" sub-group. This sub-group is generally a younger grey iddingsite basalt flow occurring as tongues and stony rises which is above the groundwater table and with little weathering and soil development and consequently of a higher stone quality, than other Newer Basalts.

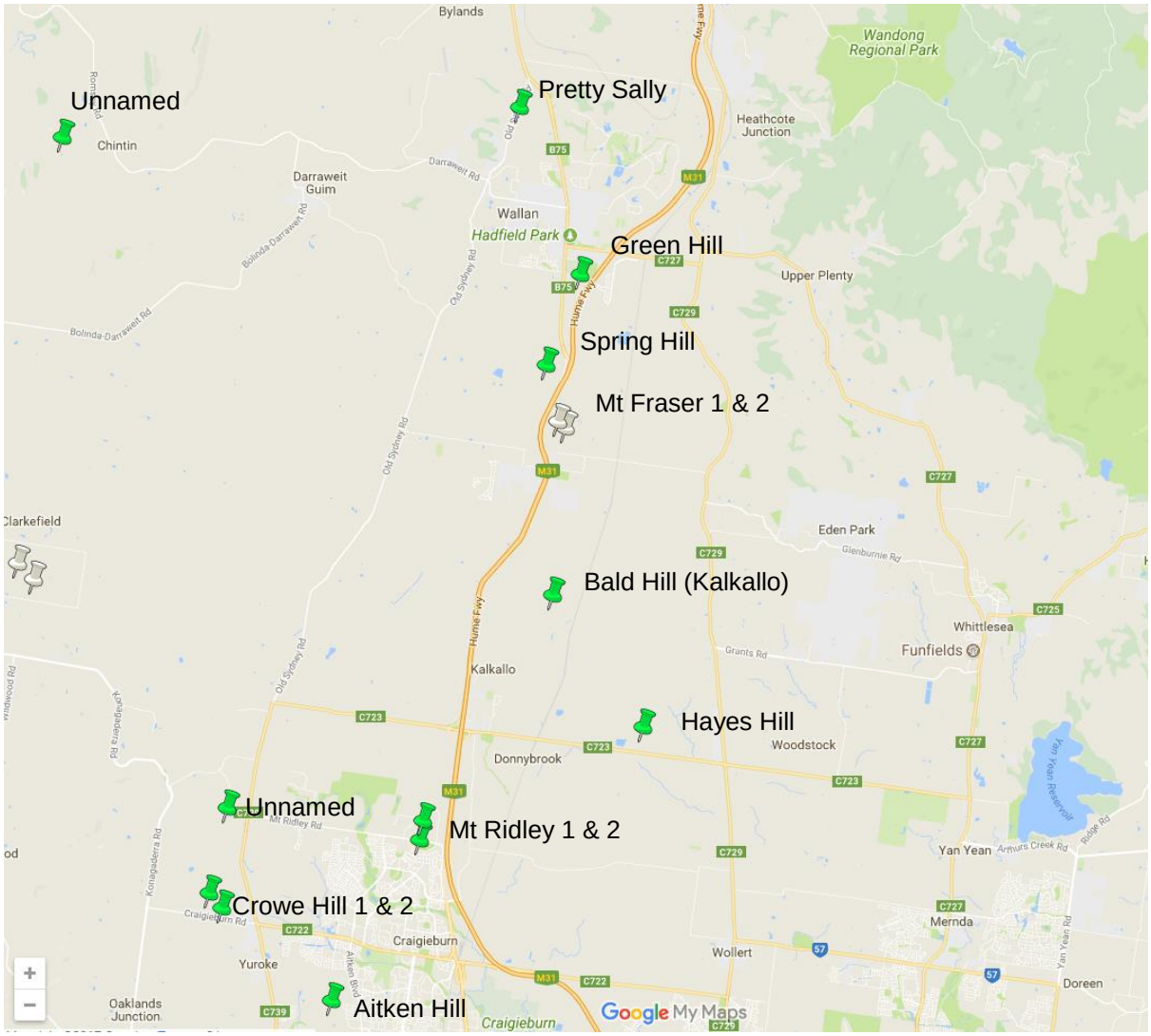

Figure 1 Volcanoes in Northern Corridor

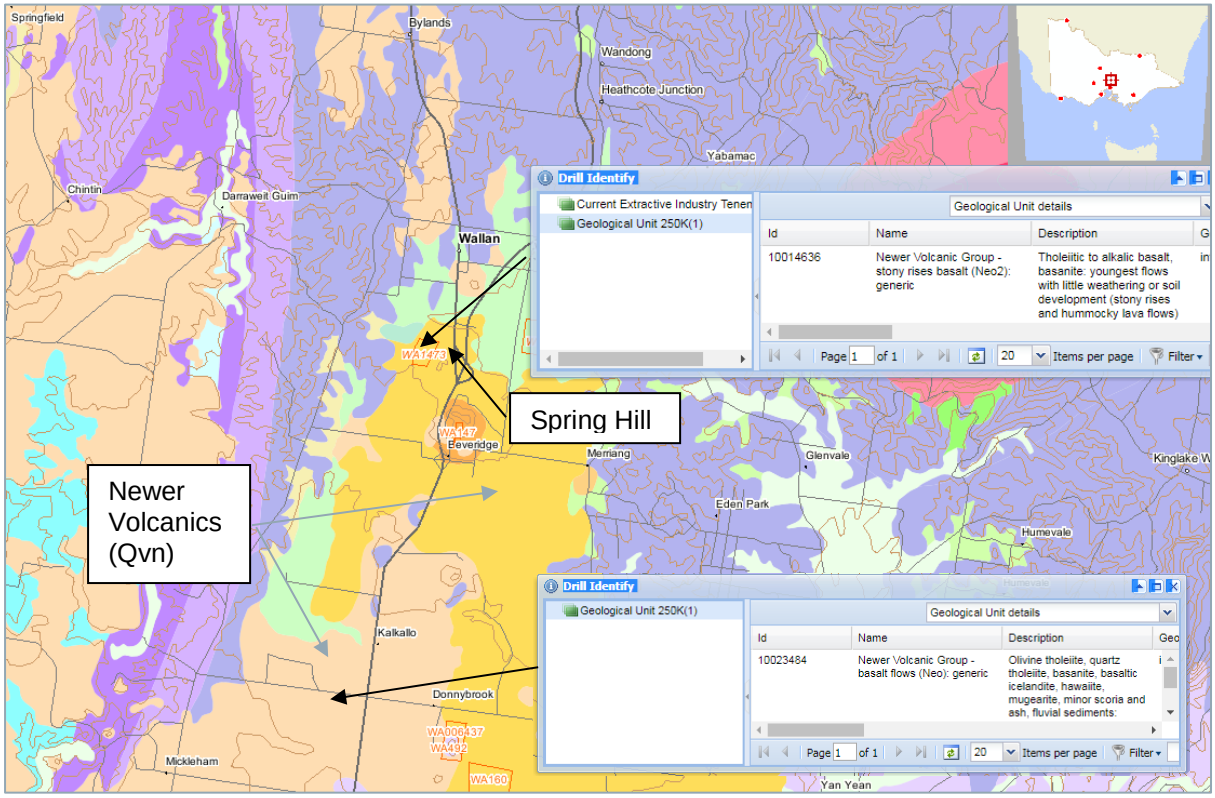

Figure 2 Geological Map (Source: GeoVic - Geological Unit 250K seamless layer)

The basalt flows to be accessed by WA1473 remain as one of the last available undeveloped resource for Newer Basalt, and particularly the “stony rises” sub-group, in the northern development corridor between Craigieburn and Broadford. Within this corridor proposed quarries at Donnybrook have been recently relinquished, Mt Ridley is now an extensive residential development area, the Mt Fraser (Beveridge) quarry has exhausted its reserves, Green Hill is within Wallan and Pretty Sally, has been identified by regional drilling as weathered and consequently of poorer quality. Further north at Kilmore the Bald Hills quarries extract Older Basalt flows and are believed to have a life exceeding 25 years.

Thus, as a result of the sub-surface geology and residential development there are no significant stone resources (operating or planned) north of Craigieburn, in the northern development corridor other than at WA1473. Other suppliers of Newer Basalt outside the corridor, and within 50 km of WA1473, are dealt with in section 4.4.

WA1473 remains the only significant resource that is available to service this development corridor and the northern half of the Greater Melbourne region. Its location and proximity to the major transport routes suggests that this quarry should be able to produce stone for concrete, road base, rail ballast, for use within the northern development corridor, with lower transport costs compared with competing quarries as identified below.

4. Alternate supply sources

WA1473 will extract Newer Basalt. This rock type is a common source rock for a wide a variety of stone products used within the Melbourne region. Annual returns data held by DEDJTR indicates that Newer Basalt supplies some 28% of all stone products used are made from Newer Basalt (2013/2014 annual returns data). Those products include (in order of tonnage supplied) aggregate, road sub-base, and road base class1, as shown in Figure 3. These three product types make up 89% of all the products that Newer basalt is used for.

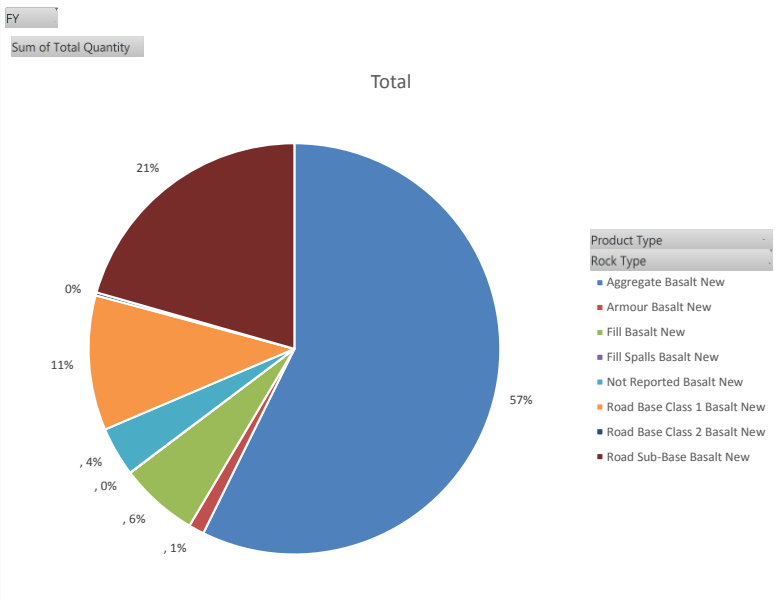

Figure 3 Newer Basalt Products (2013/2014)

The WA1473 application and supporting reports indicates that this quarry will be able to produce all those major products as well as rail ballast and sealing and concrete aggregates.

These products can, however, be produced from other sources (rock types). Figures 4, 5 and 6 show which rock types contribute to each of the three major product types highlighted above.

4.1. Aggregate

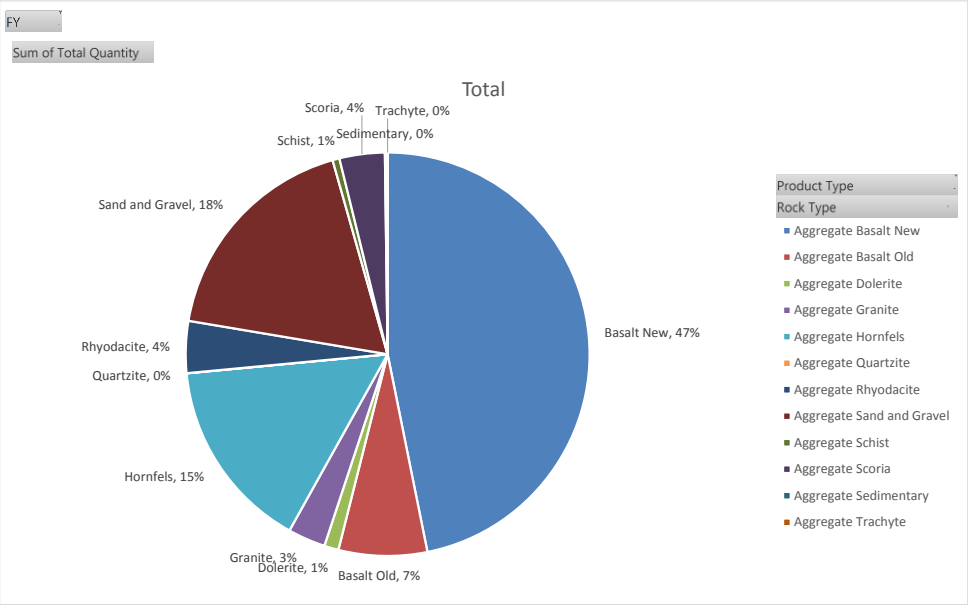

Figure 4 Alternate rock types for aggregate

So for Aggregate, 47% is sourced from Newer Basalt but it can be replaced by a number of other rock types, predominantly hornfels (a local competitor exists some 50 km away but is reported as having a restricted life). Sand and gravel quarries can produce aggregate however, there are no significant (that is, able to produce large tonnages of aggregate) suppliers within 50 km of WA1473.

4.2. Road Sub-Base

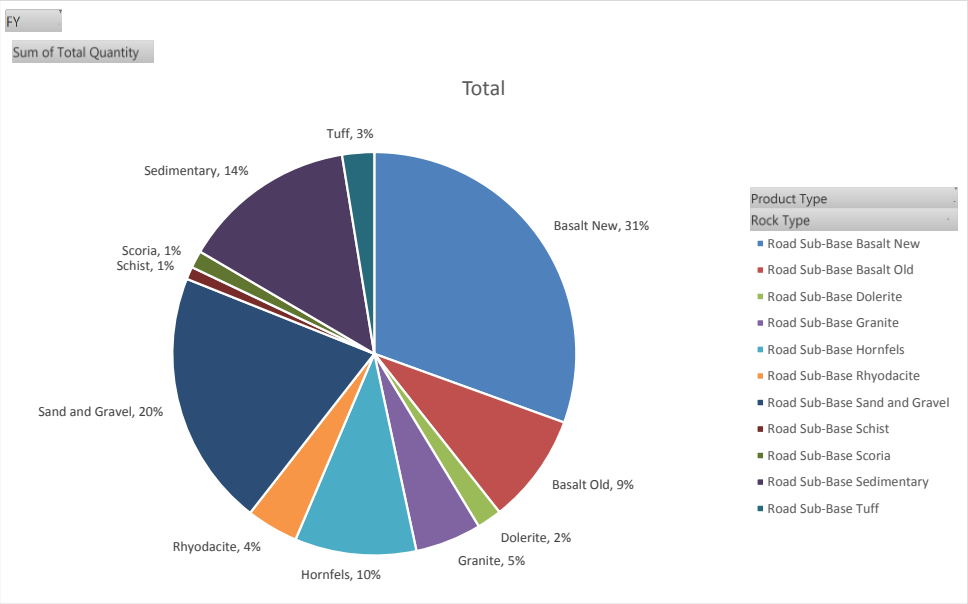

Figure 5 Alternate sources for road sub-base

Road sub-base is a lower value product with wider product specifications. Whilst Newer Basalt makes up the largest rock type (31%) it can be substituted by: Sand and Gravel (20%); Sedimentary (14%);

Hornfels (10%) and Older Basalt (9%). There are now only 4 significant suppliers with long term reserves of the latter three rock types within 50 km of WA1473.

4.3. Road Base Class 1

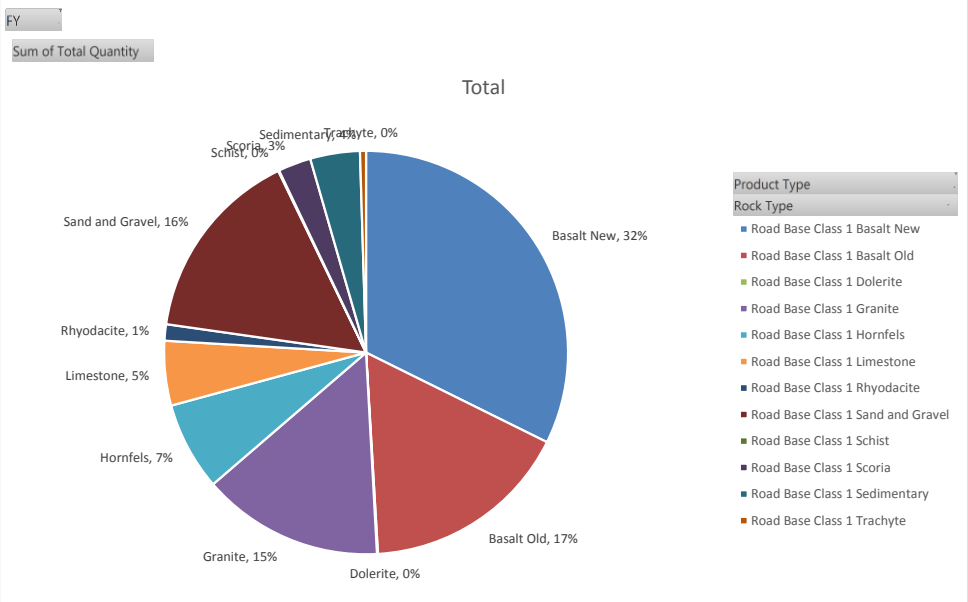

Figure 6 Alternate sources for road base Class 1

Road Base Class 1 is a high value product. Whilst Newer Basalt makes up the largest rock type (32% it can be substituted by: Older Basalt (17%); (Sand and Gravel (16%); Granite (15%). There are only local competitors with these rock types within 50 km of WA1473.

4.4. Location of alternate sources

Given the rock types identified above there are only a small number of significant quarries that can supply these materials in the northern development region.

It is assumed that for a significant quarry to be viable supplying hard rock products that it needs to be have a WA area of at least 15 ha. Such a quarry area, if around 25 metres deep, should usually be able to support a production rate around 300,000 tpa and to produce for 25 years.

4.4.1. 25 km search radius

Within 25 km radius of WA1473 there are some twenty three extractive WAs. Of these, there are fifteen WA areas that currently or recently supplied hard rock equivalents (as identified above). These WAs are listed in Table 1.

Table 1 Alternate Extractive Resources within 25 km of WAQ1473

Tenement No	Primary Owner	Work Authority Area (ha)	Rock Type
WA176	**Holcim**	**316**	**Granite; Hornfels**
WA384	**Hanson Construction Materials**	**457**	**Older Basalt**
WA393	**Hanson Construction Materials**	**308**	**Newer Basalt**
WA400	**Galli Quarries/Hanson**	**504**	**Older Basalt**
WA492	**Barro Group**	**42**	**Sedimentary**
WA102	Boral Resources	98	Hornfels
WA1123	Hi-Quality Quarry Products	261	Sand and Gravel
WA147	Aurora Construction Materials	10	Scoria
WA149	Helen Love	36	Newer Basalt
WA160	Holcim	212	Sand and Gravel
WA361	Douglas Newman	78	Sand and Gravel
WA381	North West Melbourne Recycling	72	Newer Basalt
WA416	Macedon Ranges Shire Council	24	Sedimentary
WA445	Conundrum	39	Newer Basalt
WA969	Graeme Wright	2	Hornfels

Of these fifteen WA holders there are only five suppliers of a size and capability to supply large tonnages (>300,000 tpa) of hard rock for the next 25 years. These are highlighted at the top of the table above. Two of these suppliers have recently combined (WA393 and WA400) resulting in only four significant suppliers within 25 km of WA1473.

Of these five suppliers, three are closer to the Melbourne region, the main consumer of the products.

The locations of these five WAs is shown in Figure 7 with WA1473 shown with a green marker.

4.4.2. 50 km search radius

There are currently fifty eight WAs (including twelve applications) between 25 km and 50 km from WA1473.

Of these, there are thirty two WA areas that currently or recently supplied hard rock equivalents (as identified above. These WAs are listed in Table 2.

Table 2 Alternate sources within 25 km to 50 km of WA1473

Tenement No	Primary Owner	Area (ha)	Rock Type
WA92	**Boral resources**	**191**	**Sand and Gravel**
WA97	**Boral Resources**	**987**	**Newer Basalt**
WA962	Mitchell Shire Council	3	Sand and Gravel
WA96	Boral resources	31	Rhyodacite?
WA806	Anglopac Construction	12	Sedimentary
WA657	Highfield Quarries	10	Sand and Gravel
WA522	McMillan Ventures	92	Hornfels
WA515	Holcim (Australia)	81	Older Basalt
WA463	Fulton Hogan Construction	16	Newer Basalt
WA45	Yea Sand & Gravel	39	Sand and Gravel
WA440	Stella Farm	84	Newer Basalt
WA44	Malcolm Sinclair	11	Sand and Gravel
WA428	Seymour Quarries	58	Newer Basalt
WA377	Hanson Construction Materials	216	Sand and Gravel
WA360	Kenneth Newman	9	Sand and Gravel
WA35	Barro Properties	69	Sand and Gravel
WA346	Keilor-Melton Quarries	44	Newer Basalt
WA343	Excel Quarries	123	Scoria
WA342	Excel Quarries	115	Sand and Gravel
WA214	Douglas Drysdale	3	Sand and Gravel
WA209	City of Manningham	16	Quartzite
WA199	Hume Lilydale	101	Limestone

Tenement No	Primary Owner	Area (ha)	Rock Type
WA1443	Yea Sand and Gravel	5	Sand and Gravel
WA1399	Mustey's Earthmoving	5	Sand and Gravel
WA1349	Chris Ryan	2	Sand and Gravel
WA1305	Mustey's Earthmoving	4	Sand and Gravel
WA1189	E B Mawson	78	Sand and Gravel
WA1188	Scotts Sand and Soil Supplies	19	Sand and Gravel
WA1144	Barro properties	3	Sand and Gravel
WA1138	Murrindindi Shire Council	22	Sand and Gravel
WA1047	Mustey's Earthmoving	80	Sand and Gravel
WA1022	Parker Brothers Earthmoving	19	Sand and Gravel

Of these thirty two WAs, two would be considered significant (production > 300,000 tpa and life >25 years). These are highlighted at the top of the table above and also shown in Figure 7. Some twenty four reported "nil" production in 2013/2014. It is assumed the quarries have closed but their WA remains current.

4.4.3. Summary

Given a criteria for a significant quarry of a production rate >300,000 tpa and a life time of >25 years, there are six significant suppliers that lie within 50 km of WA1473 which can produce substitute products for that expected to be produced from WA1473.

Of these six WAs, two are operated by Holcim (one), Hanson (three) and Boral (two).

In terms of spatial distribution of the six suppliers most are located 10 km to 50 km south of WA1473 and serve the Melbourne and Geelong regions. Two quarries (operating as one supplier) are some 20 km to the north. WA1473 is located closest to a region of recent and strong residential development in the areas of Wallan, Whittlesea and Donnybrook and should, by virtue of this, have the lowest transport cost to those areas for concrete and road, rail and building products.

Thus WA1473 represents a strategic long term resource that is well placed to serve the northern development corridor for many years into the future. The quarry will also be able to supply the northern half of the Greater Melbourne region as this lies within 50 km of the quarry, a reasonable estimate of the maximum transport distance for the products the quarry will produce.

There are significant proposals for residential and commercial development in the northern corridor within the next 10 years. The long time frames for Work Authority approvals currently experienced in Victoria, would suggest, in this time frame, that WA1473 is critical to serving these developments.

In the list of significant suppliers to the northern development region all but the proponent are large vertically integrated suppliers. The proponent remains the only independent supplier, (that is independent of cement suppliers). This may be a significant factor in supporting local and associated business developments and reducing costs of building.

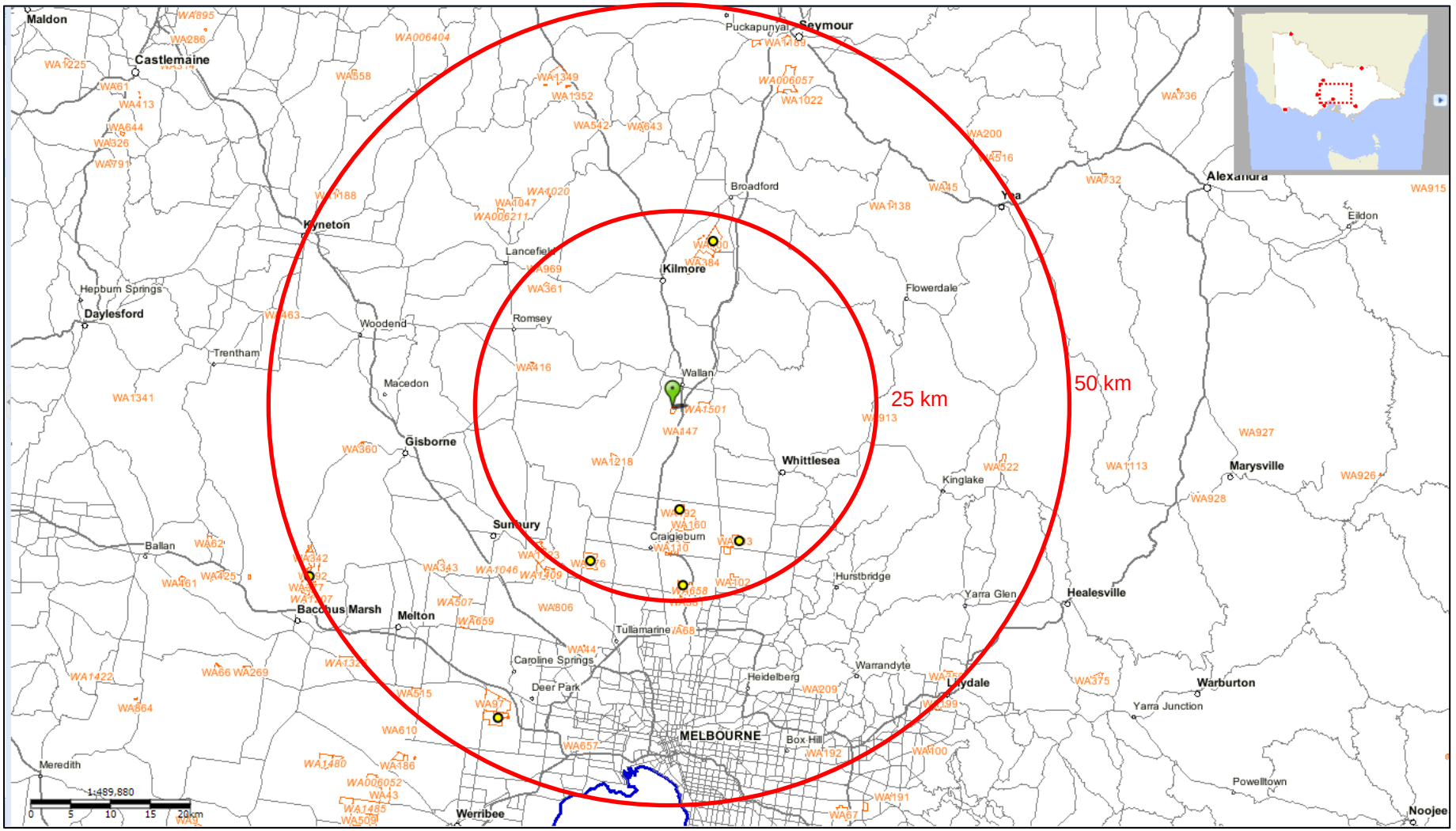

Figure 7 Significant alternate suppliers within (approx) 25 km and 50 km of WA1473 (Source: GeoVic Extractive Licence areas)

5. Quarry design issues

5.1. Quarry footprint

The WA sets out the extraction area as some 32.1 ha within a total Work Authority boundary of 49.7 ha. The quarry depth is on average some 27 metres deep and is extracting from a basalt flow that the proponent estimates is high quality from near surface down to some 11 metres above the base of the flow, which one drill hole has estimated at around 48 metres below the surface. The current design has 3 benches generally each nominally 10 metres high. There is thus some potential to deepen the quarry but only by one more bench assuming that groundwater is not intercepted. This deepening would recover sufficient stone that the southern boundary of the quarry could be moved some 100 metres north. This would have a minor influence in terms of the impacts of the quarry on the proposed development plan given the assumed 500 metre EPA buffer separation for industrial residual air emissions. It would, however, move the EPA 500 metre separation boundary further north of the proposed commercial development centre.

5.2. Quarry location

The quarry footprint currently is elongate north-south. Newer Basalt can be reliably predicted under the whole region adjacent to Spring Hill so there is the potential to move the quarry subject to land availability/ownership agreements. However, the proponent has advised that the extractive area cannot be moved further east as there are restrictions on developing above a nominated elevation to protect the Spring Hill cone. The quarry design is already impinging on this contour. Further, the proponent has indicated that drilling has shown poor quality stone lies to the south of the current extractive area. There is some potential to re-orient the extractive area to align it east-west but this would bring it within 200 metres of the Northern Highway easement and would impose additional restrictions due to accepted buffer distances for fly rock/noise and visibility. The proponent does not see this as a potential alternative.

6. Extraction sequence

The WA application shows a staged development for the quarry over a 40 year time period. The initial stages would see the quarry deepened at the southern boundary during the first 10 years of development. After that development would see the quarry faces advance north, further away from the proposed residential developments. This would allow that area of the quarry to be progressively rehabilitated prior to residential development occurring. This is the optimal design for this quarry within this development environment.

7. Post closure options

The proponent has indicated that an end use as a fill site has been rejected. The current end use proposed will see the quarry batters backfilled to provide an overall 2H:1V slope. This slope can be revegetated but is generally considered too steep for agricultural use. The quarry floor will be revegetated and able to support rural, community or recreational/sporting activities.

Some part of the floor area could be used for an artificial lake. There is inconclusive data relating to the depth of the natural groundwater table. Current information suggests it is below the proposed floor of the quarry.

There are few other options available. The quarry cannot support a full lake as there is no source for water to recharge the lake. The area could support housing as is seen in many quarries being redeveloped for residential use in the Melbourne region.

For and on behalf of Coffey

Don Miller

Principal Engineering Geologist