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1 INTRODUCTION

1.1 Background

Vinci Gravel Supplies Pty Ltd (the proponent) is proposing to extract and process gravel from their existing gravel quarry located at Lot 9 Brookton Highway, Karragullen. It is comprised of approximately 48 hectares (ha) and is located within the municipality of the City of Armadale, approximately 15 kilometres (km) east of the Armadale town centre. It is bounded by Rural land uses in a predominately vegetated landscape (refer to Figure 1).

The City of Armadale granted conditional approval for the operation of the gravel quarry on 29th July 2014 for the ‘Previously Approved Extraction Area’, as depicted on Appendix A. The approval was subject to several environmental conditions that relate to revegetation, weed control, and stormwater and erosion control.

Subsequently, the City of Armadale granted approval for the Stage 2 and 3 extraction areas (refer to Appendix A) on the 5th April 2016.

The proponent is now proposing to obtain approval for the Stage 4 extraction area (herein referred to as the ‘subject site’) (refer to Figure 2). A dieback investigation undertaken on the 3rd November 2014 indicated that an infected area is located within the subject site (refer to Figure 3). Further investigations (Dieback Treatment Services 2016 and 2017) did not identify the presence of the pathogen within the subject site. Nonetheless, given the ‘suspected’ presence of this pathogen, a Phytophthora Dieback Management Plan (DMP) has been prepared to reduce the risk of the spread of the disease outside of the current suspected infected area.

1.2 Purpose and Scope

The purpose of this DMP is to describe procedures that will be implemented on behalf of the proponent to comply with the environmental objectives associated with the control of Phytophthora dieback within the subject site.

The DMP is a collaborative management tool that details the methods and procedures that will be applied in order to achieve the proponent’s environmental commitments and regulatory obligations. The specific aim of this DMP is to prevent the introduction and spread of disease (Phytophthora spp.) to areas currently free from the disease.

In addition to general references, relevant recommendations and guidelines as prescribed by the City of Armadale, the following publications have also been utilised during the preparation of the DMP:

- Environmental Management of Quarries (DME 1991);
- Environmental Code of Practice - Extractive Industries (DEP 1990);
- Water Quality Protection Guidelines No. 6 (DoW 2000); and

1.3 Proposed Development

1.3.1 Gravel Extraction

The Stage 4 extraction area is comprised of approximately 1.52 ha.
It is proposed to gradually expand the pit in a south-westerly direction with ongoing rehabilitation works undertaken within completed cells. All pit operations will be confined within the subject site.

Extraction is to be undertaken on the following basis:

- Topsoil will be removed (approximately 100 mm to 300 mm thick) and stockpiled in windrows;
- A bulldozer will rip the laterite and then blade it into a raw material stockpile. No over-excavation is to be undertaken below pit finished floor levels;
- The raw gravel material will subsequently be crushed by way of a mobile (tracked) impact crusher. Trucks will enter and cart material from the cell throughout the extraction period; and
- Upon completion of extraction, the pit floor will be ripped prior to overburden replacement. The area will be rehabilitated as discussed within the prepared EMP.
- Extraction will occur in the non-infested area initially with extraction in the Phytophthora dieback infested area occurring once all works are completed in the Phytophthora dieback free area.

The approximate annual gravel removal will be 16,000 m$^3$ however, this will be dependent on demand. The removal of gravel from the pit will include the use of a bulldozer, a rock breaker, excavators, a loader and a crusher. The ultimate depth of excavation will be to a maximum of 10 m below the natural surface and batters of 1:6 (vertical:horizontal) will be maintained throughout the operation.

1.3.2 Site Access

Access to the subject site is obtained via a sealed driveway that traverses over a right-of-carriageway extending from Brookton Highway. Access to the suspected Phytophthora dieback infested area is further discussed in the management plan below. The proposed level of traffic associated with the cartage of gravel material is deemed acceptable for a rural area.
2 EXISTING ENVIRONMENT

2.1 Previous Land Use

The subject site has been exposed to a history of anthropogenic disturbances with the previous
landowners, GOMAR Pty Ltd, undertaking gravel extraction activities for many years. Within the last 30
years the subject site has been cleared of vegetation and natural regeneration within the south-eastern
portion of the subject site has been poor as evidenced by the extremely limited species diversity and a high
degree of weed incursion.

2.2 Topography and Soils

The subject site’s topography ranges from 350 m Australian Height Datum (AHD) to 265 m AHD with a
downwards slope in a westerly direction.

The subject site is consistent with the Dwellingup formation, surface expression of duri-crust in areas with
pisolitic and laterite fragments. The soil types range from lateritic soil to the Pinjarra soil association. The
laterite or ‘ironstone’ is made up of spherical pebbles cemented in a buff coloured matrix which has been
leached of silica and has a high content of iron and aluminium oxides.

The Department of Agriculture’s Land Resources Series No. 3: Darling Range Rural Land Capability Study
(King & Wells 1990) maps the soil-landform units of the subject site as follows

- Yarragil (Yg1) - Gently to moderately inclined sideslopes with moderately well drained yellow
duplex soils, and yellow and brown massive earths; and
- Dwellingup 2 Phase (DW2) - Very gently to gently undulating terrain with well drained, shallow to
moderately deep gravelly brownish sands.

The dominant soils of the area are brown lateritic sands containing abundant lateritic gravel throughout
the profile, overlying laterite and clays with weathered granite at depth. The surface is normally 100 to
200mm of grey/black to brown sands which grade into the lateritic sands.

2.3 Hydrology

2.3.1 Surface Water

The head of a tributary of the ephemeral Stinton Creek emanates from the southern boundary of the Lot
9 Brookton Hwy and flows in a south-westerly direction. No activities associated with the gravel extraction
operation are undertaken in proximity to the tributary which remains desiccated for the majority of the
year. The subject site does not contain any other surface water features.

2.3.2 Groundwater

Groundwater within the subject site is expected to be in excess of 15 m from the natural surface level and
increases in depth in an easterly direction (DoW 2011). Groundwater has not been encountered during any
of the excavation activities undertaken within the subject site and given that the proposed expansion
activities will occur in a south-easterly direction will not require further management.
2.4 Vegetation and Flora

2.4.1 Vegetation

Bioregions are large, geographically distinct areas of land with common characteristics such as physiography, climate, vegetation and animal communities. They represent a regional order of resolution between different flora and fauna habitats. There are 89 bioregions and 419 sub-regions in Australia which are described in the Biodiversity Audit for Western Australia (DEC 2002).

Mapping for the Interim Biogeographic Regionalisation for Australia (IBRA) programme indicates that the subject site lies within the Jarrah Forest bioregion. This bioregion generally occurs on the duricrusted plateau of the Yilgarn Craton and is characterised by Jarrah- Marri (Corymbia calophylla) woodlands on laterite gravels, bordered by Wandoo (Eucalyptus wandoo)- Marri woodlands on clayey soils to the east, Darling Scarp shrublands to the west and Karri (Eucalyptus diversicolor) forests to the south.

The subject site is located within the Northern Jarrah Forest sub-region of the Jarrah Forest bioregion. Within this sub-region, vegetation comprises Jarrah - Marri forest in the west with Bullich and Blackbutt in the valleys grading to Wandoo and Marri woodlands in the east with Powder bark on breakaways.

Two vegetation complexes have been mapped as currently or previously occurring on the subject site and include (Heddle et al. 1980):

- Dwellingup Complex – Open forest of Eucalyptus marginata subsp marginata - Corymbia calophylla on lateritic uplands in subhumid and semiarid zones; and
- Yarragil Complex - Open forest of Eucalyptus marginata subsp. marginata-Corymbia calophylla on slopes with mixtures of Eucalyptus patens and E. megacarpa on the valley floors in humid and subhumid zones.

Within the Stage 4 extraction area, historical anthropogenic disturbances have resulted in the removal of the majority of native vegetation and now predominately consist of pasture grasses, Xanthorrhoea preissii shrubland, with occasional emergent Corymbia calophylla.

2.5 Dieback Investigations

An initial site investigation was undertaken in November 2014 by qualified interpreter Colin Walker from Geo and Hydro Management Pty Ltd on behalf of Berry Consultants. It was concluded that Stages 1, 2 and 3 were ‘uninfected’. A portion of Stage 4 was identified as ‘suspected as infected’ due to the presence of a positive soil sample result for Phytophthora species (refer to Figure 3).

A 2016 investigation (Dieback Treatment Services 2016) reported no observed evidence of Phytophthora infestation within the proposed Stage 4 extraction area. However, evidence symptomatic of Phytophthora infestation such as Xanthorrhoea preissii and Banksia grandis deaths were observed downslope of the site in a southerly direction. Soil and plant tissue samples taken from this line were analysed and returned positive results for the presence of Phytophthora cinnamomi.

A recheck of the lines established in April 2016, conducted in March 2017 (Dieback Treatment Services) consisted of a visual site assessment in combination with soil and plant tissue samples and confirmed the presence of Phytophthora spp in the area outlined in 2016 and recorded no further spread of the disease. No evidence of the disease occurring within the Stage 4 area was recorded.
3 MANAGEMENT PLAN

3.1 Demarcation of Infested Area

To minimise the spread of the pathogen within the subject site, it is important to clearly delineate the suspected infested area.

Prior to extraction works commencing the suspected infected area will be accurately surveyed and marked using flagging tape to demarcate the boundaries of the infection. Bunding will be constructed around the entire area to contain any pathogens and stormwater within the suspected infested area. The flagging tape which demarcates the suspected infected are will be checked on operational days to ensure that the boundaries of the suspected infected area remain clearly visible.

Access to Lot 9 is obtained via a sealed driveway that traverses over a right-of-carriageway extending from Brookton Highway. Access to the uninfested area in the subject site will be through the current extraction pit, while access to the suspected infested area will be restricted to a vehicle clean on exit (CoE) point. Appropriate signage will be erected at the entrance to the site and surrounding the suspected infected area to notify staff and visitors to the area of the presence of the pathogen and the vehicle CoE point. No other access point should be established and no direct tracks between the suspected infected and non-infested area will be established. Further access to the subject site is restricted by the use of fencing and lockable gates at the entry of the property.

3.2 Hygiene

The extraction of materials from areas determined to be free of the pathogen will be undertaken prior to extracting in suspected infested areas. Once the extraction of the materials is completed in the uninfested section, equipment and vehicles can then be shifted across the hygiene boundary without cleaning. If equipment and vehicles breach the hygiene boundary, they will require cleaning before being able to return back to the uninfested area.

3.2.1 Clean on Exit Point

A CoE point will be established at the south-western boundary of the suspected infected area (refer to Figure 3) to enable the thorough cleaning of any machinery used within this area. This CoE point will consist of a hard, well-drained surface situated away from uninfected native vegetation. The use of water to remove soil and mud from equipment and vehicles will be minimised with preference being given to the removal with compressed air and stiff brushes. Any washdown effluent produced from mobile washdown equipment (i.e. high pressure cleaning) will be contained within the suspected infested area in evaporation basins.

3.2.2 Vehicles and Machinery

All machinery utilised in the excavation of the suspected infected area will be thoroughly cleaned at the CoE point when exiting this area. Access to the suspected infected area of all other light vehicles and non-essential machinery will, where possible, be restricted to reduce the risk of spreading the pathogen.

3.3 Water Management

Phytophthora spores travel through surface and subsurface water spreading the disease to other plant roots. The flow of water containing these spores to down slope areas is a major factor in the rapid spread of the pathogen. Furthermore, an increase in the moisture in the soil can increase the impact of the
pathogen on the surrounding plants, therefore it is important to contain the water from within the suspected infected area to reduce the risk of spreading the pathogen to a Phytophthora dieback free area.

3.3.1 Surface Water

The creation of bunding surrounding the suspected infested area will ensure that all surface water flow out of the area is restricted. Water will be directed to the stockpile situated down slope of the suspected infected area, on the south-western corner and evaporation basins will be used to contain surface water.

3.3.2 Water Source

Phytophthora spores may be present in surface water sources such as dams and springs, therefore the use of water from mains supply or deep water bores is recommended. Where this is not possible, disinfection of the water source should be undertaken. As the main water source for the site is fed by a spring, disinfection of this water will be undertaken before its use in dust suppression and washdown equipment.

Granulated chlorine will be used for the disinfection of the water at a rate of 6mL (0.05% NaCl) per 10L of water. Care should be taken to ensure that all manufacturer’s safety instructions are followed and any sterilisation is undertaken before the addition of fire fighting foams or detergents, if required, as these chemicals will neutralise the chlorine and reduce the effectiveness of sterilisation (Dieback Working Group 2005).

3.4 Stockpile Area

A separate stockpile area located at the southwestern corner of the suspected infested area (refer to Figure 3) will be used to store all suspected infested material, topsoil and vegetation removed from the area. This stockpile area will be constructed on a hard, well drained surface, away from any native vegetation. It will contain a detention basin to restrict the flow of stormwater runoff.

3.5 Soil Management and Rehabilitation

Topsoil from the suspected infected area will be retained within this area and stored in a separate stockpile from that removed from the non-infested area. Suspected infested topsoil will only be used in the rehabilitation of the suspected infected area. Any topsoil used for rehabilitation outside the suspected infested area will only be used if first classified as weed and disease free. The proponent is proposing to rehabilitate the area with pasture species which are resistant to Phytophthora dieback.

3.6 Customer Notification

Once gravel material from the suspected infected area has been processed and stockpiled it will be tested for Phytophthora dieback. Any positive test results will be reported to potential customers prior to the purchase of gravel. A record of any positive tests will also be included in the annual audit report.

3.7 Training

All site personnel will be inducted at the commencement of work and be made aware of the suspected presence and impact of the pathogen within the subject site along with the management measures outlined in this plan.
### 3.8 Contingency Measures

Should a breach of the hygiene procedures listed above occur (such as failing to inspect vehicle at designated CoE point, failing to washdown or clean vehicle if needed, and failing to adhere to authorised access routes), the following actions should be undertaken:

- All hygiene breaches must be reported to the site manager or representative within 24 hours.
- An environmental incident report will be completed by the person reporting the hygiene breach.
- The site manager or representative will provide the incident report to the City of Armadale.
- Discussions regarding the best course of action will be formulated (i.e. additional testing, review of hygiene requirements).
- Further training of hygiene requirements will be undertaken with onsite staff.

### 3.9 Summary

The following management actions will be implemented in order to meet the objectives of the Plan.

<table>
<thead>
<tr>
<th>Table 1. <em>Phytophthora</em> dieback Management Plan.</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Responsibility</strong></td>
</tr>
<tr>
<td>Site Manager.</td>
</tr>
<tr>
<td>Contractors</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Management Strategies</strong></th>
<th><strong>Timing</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>The site will be managed to ensure surface water does not exit the suspected infested area.</td>
<td>During all works.</td>
</tr>
<tr>
<td>All water to be used for dust abatement and for washdown will be either sourced from the mains supply or disinfected. Disinfection of water is undertaken using granulated chlorine at a rate of 6mL (0.05% NaCl) per 10L of water.</td>
<td>During all works.</td>
</tr>
<tr>
<td>Fencing and lockable gates at the entry of the property will be maintained and used to control unauthorised access to the site.</td>
<td>Prior to and during excavation works.</td>
</tr>
<tr>
<td>The suspected infested area will be surveyed and accurately delineated with flagging tape.</td>
<td>Prior to and during excavation works.</td>
</tr>
<tr>
<td>Appropriate signage will be erected at the entry to the subject site and at the border of the suspected infested site.</td>
<td>Prior to and during excavation works.</td>
</tr>
<tr>
<td>Access to the subject site during operation will be restricted to the proposed roads. No other access points should be established. The access location and CoE point should be clearly signposted.</td>
<td>Prior to and during excavation works.</td>
</tr>
<tr>
<td>The suspected infested area shall be bunded to ensure that stormwater is contained within.</td>
<td>Prior to and during excavation works.</td>
</tr>
<tr>
<td>As far as reasonable and practicable all vehicles and machinery are to be cleaned of all mud and plant material prior to exit from the suspected infested area at the CoE point.</td>
<td>Prior to and during excavation works.</td>
</tr>
<tr>
<td>Non-essential vehicle and plant movement into and within the suspected infested area will be restricted as far as possible.</td>
<td>During all excavation works.</td>
</tr>
</tbody>
</table>
### Phytophthora Dieback Management Plan

<table>
<thead>
<tr>
<th>Action</th>
<th>Timeframe</th>
</tr>
</thead>
<tbody>
<tr>
<td>• All topsoil, plant material and excavated material from the suspected infested area will remain within the area and be contained in a separate stockpile from <em>Phytophthora</em> dieback free material.</td>
<td>During all excavation works.</td>
</tr>
<tr>
<td>• Once gravel material from the suspected infected area has been processed and stockpiled it will be tested for <em>Phytophthora</em> dieback. Any positive test results will be reported to potential customers prior to the purchase of gravel.</td>
<td>Prior to sale of product.</td>
</tr>
<tr>
<td>• All staff shall be inducted and made aware of the suspected presence and impact of the <em>Phytophthora</em> dieback pathogen and the management measures outlined in this plan.</td>
<td>Prior to commencement of excavation.</td>
</tr>
</tbody>
</table>

#### Performance Indicators

- Hygiene procedures are adopted during excavation.
- Incidence of *Phytophthora* dieback pathogen is not increased.

#### Monitoring

- Project Manager will ensure disease hygiene and control measures are implemented.

#### Reporting

- Contractors to confirm that *Phytophthora* dieback management measures have been implemented.
REFERENCES


Geological Survey of Western Australia (1980). Geology and mineral resources of Western Australia, memoir 3. Geological Survey of Western Australia, Perth, WA.


Lot 9 Brookton Highway

FIGURE 3 - Suspected Dieback Infested Area

Vinci Pty Ltd

Scale 1:1000

Stage 4 Extraction Area
Area partially PC infested

Legend

Lot 9 Brookton Highway

Stockpile location

CoE point

NORTH

Local Authority: City of Armadale

PO Box 5178
West Busselton
Western Australia 6280
Telephone (08) 9755 7217
Mobile 0418 950 852
APPENDIX A – DEVELOPMENT SITE PLAN
DEVELOPMENT SITE PLAN

Proposed Extraction Areas
Lot 9 Brookton Hwy, KARRAGULLEN

[Plan details and legend contents]

LEGEND

- Approved Stage 3 Extraction Area
- Proposed Stage 4 Extraction Area
- Approved Stage 3 Rehabilitation Area
- Proposed Stage 4 Rehabilitation Area (Pasture)
- Existing Rehabilitation Area
- Additional Rehabilitation Area

[Map and diagram details]