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DEVELOPMENT APPLICATION REPORT

DARLING DOWNS SAND AND CLAY EXTRACTION
LOTS 5 & 6 (NO. 1728) GREAT NORTHERN HIGHWAY, BULLSBROOK, CITY OF SWAN

ON BEHALF OF:

BRIKMAKERS

Brikmakers

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DOCUMENT CONTROL SHEET

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Client: Brikmakers
Project: Sand and Clay Excavation
Title: Development Application - Sand and Clay Excavation, Darling Downs
Reference: 004-08
Status: Final

Report Date: 26th September 2018

Document Production Record

Issue Number	6	Name	Signature
Reporting		Ashleigh Cavanagh	
QA Review		Rod Manning	
Approval		Rod Manning	

Document Revision Record

Issue Number	Date	Revision Details
1	21 December, 2017	SERS Internal Review
2	16 January, 2018	Client Review
3	22 January, 2018	Client comments included
4	23 January, 2018	Original issue
5	20 August, 2018	Council approved amendments included
6	26 September 2018	Council requested amendments

TABLE OF CONTENTS

EXECUTIVE SUMMARY

This report has been prepared in support of a Development Application (DA) to approve the extraction of sand and clay from Lots 5 and 6 (1728) Great Northern Highway, Bullsbrook, known as Darling Downs (the site). Brikmakers are leasing the site from the landowner, MJTJ Investment Pty Ltd. Brikmakers are seeking planning approval and an extractive industry licence from the City of Swan (CoS) to extract sand and clay resources at this location. The Darling Downs site contains a large and valuable resource of sand and clay in close proximity to the Perth Central Business District (CBD). The clay resource at this location is of exceptional quality and highly regarded for the production of brick and paving products.

Brikmakers are a major brick manufacturer in the Perth metropolitan area and require ongoing clay resources for the manufacture of bricks and related products. The sand resource located at Darling Downs is required for residential and infrastructure development projects throughout Perth. The project life for sand and clay extraction at the site is estimated to be ten years. However, the duration of quarrying activities at the site will be dependent on market demand for the sand and clay resource. Extraction campaigns will therefore be market-based.

The CoS and the Bullsbrook area are located in close proximity to priority resource areas for sand and clay extraction according to Statement of Planning Policy No. 2.4 (SPP 2.4), Basic Raw Materials (WAPC. 2000). Further test pit drilling completed by Brikmakers indicated that the sand and clay resources at Darling Downs are considered vital for the continued provision of basic raw materials to the Perth metropolitan area. In particular, the clay resource at Darling Downs is a scarce and therefore valuable resource in Perth. The availability of basic raw material resources close to Perth is also declining as urban expansion continues. Many other sites which would otherwise be suitable occur in locations where planning and environmental impacts preclude or severely constrain extraction. The project activities at this location are therefore consistent with the Western Australian Government's overarching planning policy.

Progressive rehabilitation of cleared areas will be undertaken following extraction activities. The site will be reinstated to the pre-excavation landform using clean and recycled fill materials. Recontouring of the final landforms is intended as part of the rehabilitation regime, entailing the redistribution of overburden and topsoil material followed by the planting (with native species) atop of the rehabilitated and filled pits. Following rehabilitation, the site may be used for agricultural or pastoral use. A Closure Plan has been developed to outline the requirements for rehabilitation and closure of the site. Further to this, it is intended that a site-specific rehabilitation and revegetation plan be submitted to the council as a condition of granted development approval.

Closure of the site will ensure that the proposed development will be consistent with the long-term planning objectives of the Landscape zoning required by the CoS. The project site will be suitable for rural-residential activities and rural development. Rehabilitation of the site with indigenous flora following closure of the site will also ensure that the environmental and landscape characteristics of the area are not compromised. The proposal will not be detrimental to future land uses at the site.

1. INTRODUCTION

1.1 THE PROPONENT

Brikmakers (a division of BGC Australia Pty Ltd) are a major brick manufacturer in the Perth metropolitan area and require ongoing clay resources for the manufacture of bricks and related products. Brikmakers are leasing the site from MJTJ Investment Pty Ltd. Brikmakers are seeking planning approval and an extractive industry licence from the CoS to extract sand and clay resources at this location.

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1.2 CONSULTANT

Site Environmental Remediation Services (SERS) is an Environmental Consultancy specialising in development approvals, environmental approvals, ground and water testing and site remediation. SERS are assisting Brikmakers in the preparation of the relevant development reports to gain approval for a sand and clay extraction operation within Bullsbrook.

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1.3 NEED FOR EXTRACTION SITES WITHIN BULLSBROOK

The availability of basic raw materials, such as sand and clay, close to Perth has declined following urban expansion (WAPC, 2000). Areas which would otherwise contain suitable raw materials, occur in locations where planning and environmental impacts preclude or severely constrain material extraction (WAPC, 2000). The proposed extraction area at Darling Downs is indicated within the Western Australian Planning Commission (WAPC) Statement of Planning Policy No. 2.4. Basic Raw Materials, policy area (WAPC, 2000) as being adjacent to an "Extraction Site" and a series of "Priority Resource Locations". Further drilling investigations completed by Brikmakers indicated that there was a large supply of valuable and rare resources beneath the site.

The Darling Downs site contains an abundant and valuable resource of sand and clay in close proximity to the Perth Central Business District (**Figure 2**). It is estimated that approximately 100,000 to 150,000 tonnes of sand and 100,000 to 150,000 tonnes of clay is to be extracted from three locations at the site (**Figure 3**) annually. The clay resource at this location is of exceptional quality and highly regarded for the production of brick and paving products. This particular clay type is considered to be scarce within the metropolitan area and is therefore a valuable resource.

1.4 SUMMARY OF PROPOSED DEVELOPMENT

The extraction activities will be undertaken periodically and in two components. Initially, topsoil and overburden will be extracted and utalised in the development of site bunding. Following this, the sand resource will be extracted, loaded onto trucks and transported from the site. Approximately 2000 tonnes of sand will be extracted and hauled from the site per day during contract dependent campaigns. No sand will be stockpiled on site. Secondly, the clay resource will be extracted and stockpiled on site. The clay resource will be extracted over several years, in four stages behind a series of bunds (**Figure 3**). The clay resource will be extracted in short campaigns for approximately 2-3 months per year. Approximately 4000 tonnes of clay will be hauled offsite per day (during haulage campaigns). Clay stockpiles will be stockpiled onsite prior to transportation to Brikmakers brick manufacturing facility in South Guildford. Transport of the clay will occur approximately 2-3 days a month throughout the year. No crushing or screening activities are proposed to be undertaken onsite. The site will be one of several sites from which Brikmakers will source clay resources in the Perth metropolitan area. The project activities will be managed in accordance with Brikmakers operational management procedures used on similar extraction sites. These management strategies have been developed to meet leading practice industry standards.

1.5 PROJECT STAGES

Subject to the approvals process, it is expected that the project will follow the timeframes outlined in **Figure 1A.** The clearing and pre-excavation works will be completed in approximately 6 months dependent on the success of each campaign. Excavation of sand and clay will be completed over a period of 10 years subject to approvals. Remediation is expected to be implemented progressively. When an extraction pit has been fully exhausted it will be subject to remediation, except for parts of the sand extraction areas where clay stockpiling will occur. Transport of materials will be subject to market demand and success of campaigns but is expected to take place throughout the ten-year extraction period. The closure plan and overall site remediation will take place over a period of 2 years and aims to restore the sites original contours with recycled and clean fill materials.

Activity	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Approvals Process														
Clearing and Pre-Excavation														
Sand Excavation														
Clay Excavation														
Progressive Remediation														
Transport of Materials														
Closure Plan Completion and Site Remediation														

FIGURE 1A: PROPOSED OPERATIONAL TIMEFRAMES

1.6 PROJECT BACKGROUND

This report has been prepared by Site Environmental and Remediation Services (SERS) on behalf of Brikmakers. This report is needed to support a Development Application (DA) and Extractive Industries licence application to approve material extraction from Lots 5 and 6 (1728) Great Northern Highway, Bullsbrook, known as Darling Downs **(Figure 1)**. Brikmakers are leasing the site from MJTJ Investment Pty Ltd **(Appendix C).** Brikmakers are seeking planning approval and an extractive industry licence from the CoS to extract sand and clay resources at this location. The Darling Downs site contains an abundant and valuable resource of sand and clay in close proximity to the Perth Central Business District. It is estimated that approximately 100,000 to 150,000 tonnes per year of clay and 100,000 to 150,000 tonnes per year of sand are proposed to be extracted from the site **(Figure 3).** The clay resource at this location is of exceptional quality and highly regarded for the production of brick and paving products. Sand extraction will occur as opportunities arise.

Brikmakers are a major brick manufacturer in the Perth metropolitan area and require ongoing clay resources for the manufacture of bricks and related products. The sand resource located at Darling Downs is required for residential and infrastructure development projects throughout Perth. The project life for sand and clay extraction at the site is estimated to be ten years. The duration of quarrying activities at the site will be dependent on market demand for the sand and clay resource. Extraction campaigns will therefore be market-based. Brikmakers is seeking an extractive industry licence for a period of ten years to facilitate quarrying of sand and clay at Darling Downs.

The extraction activities will be undertaken periodically and in two components. Initially the sand resource will be extracted, loaded onto trucks and transported from the site concurrently. Approximately 2,000 tonnes of sand will be extracted and hauled from the site per day. No sand will be stockpiled on site. Secondly, the clay resource will be extracted and stockpiled on site. The clay resource will be extracted over several years, in four stages behind a series of bunds **(Figure 3).** The clay resource will be extracted in short campaigns for approximately 2-3 months per year. Approximately 4,000 tonnes of clay will be hauled offsite per day during haulage campaigns depending on the demand for the resource and availability of storage within the Brikmakers manufacturing facility. Stockpiles will be located on site prior to transportation to Brikmakers brick manufacturing facility in South Guildford. Transport of the clay will occur approximately 2-3 days a month. No crushing or screening activities are

proposed to be undertaken onsite. The site will be one of several sites from which Brikmakers will source clay resources in the Perth metropolitan area. The project activities will be managed in accordance with Brikmakers operational management procedures used on similar extraction sites. These management strategies have been developed to meet leading practice industry standards.

The extraction of the sand and clay resources must be economical. A significant portion of the cost of basic raw materials is often generated through transportation. The proximity of the site to the Perth metropolitan area and a major traffic corridor (Great Northern Highway) will significantly reduce the cost of transportation of the resources.

Presently almost 15% of the site contains native vegetation. Approximately 7 hectares of native vegetation is proposed to be cleared as part of the project activities. The vegetation consists of isolated Casuarina and Banksia trees and stands of Marri trees. The remaining vegetation on the site is described as cleared paddock grasses with planted Pine and Casuarina trees. Trees on the boundary of Lot 5 will be retained to maintain visual amenity from the western area of the site. An application to clear native vegetation will be submitted to the Department of Water and Environmental Regulation (DWER) prior to clearing of native vegetation required as part of the project activities.

Progressive rehabilitation of cleared areas will be undertaken following extraction activities. The site will be reinstated to the pre-excavation landform using clean fill (sand) or recycled construction and demolition (C&D) materials. The clean fill material will consist of surplus sand to be sourced from residential developments. The C&D material will be sourced from DWER licenced recycling facilities in Perth. An application for a works approval and operating licence will be submitted to DWER prior to accepting clean fill and waste material or reinstating the existing landforms. Recontouring of the final landforms will then be undertaken and the site will be completely rehabilitated prior to future on sale. Following rehabilitation, the site may be used for agricultural or pastoral use. A Closure Plan has been developed to outline the requirements for rehabilitation and closure of the site.

1.7 PURPOSE OF REPORT

The purpose of this report is to provide the relevant planning and environmental information in support of a development application and extractive industry licence for sand and clay extraction at Lots 5 and 6 (1728) Great Northern Highway, Bullsbrook.

The report details the project activities, land use planning, assessment of the environmental impacts, environmental management strategies, closure requirements and supporting information for the proposed development.

1.8 REGULATORY APPROVALS REQUIRED

The following planning and environmental approvals are required prior to the commencement of project activities:

- Development Application (CoS),
- Extractive Industry Licence (CoS),
- Native Vegetation Clearing Permit (DWER),
- Works Approval and Operating Licence* (DWER).

*The exception being approval of the works approval and operating licence. The works approval and operating licence may be applied for during the final operational stages and prior to closure of the extraction activities when fill material is needed to reinstate the excavation landforms.

Application forms for development within the City of Swan and Extractive Industries License are attached as **Appendix A** and **Appendix B.**

2. PLANNING CONSIDERATIONS

2.1 METROPOLITAN REGIONAL SCHEME

Under the provisions of the Metropolitan Region Scheme (MRS), the subject site is zoned 'Rural' and abuts a Primary Regional Road, namely Great Northern Highway. Surrounding MRS land zoning is displayed in **Figure 4.**

Zones and reservations in the MRS are broad categories. They are not precisely defined or limited, the following is used to describe the "Rural" zone "land on which a range of agriculture, extractive and conservation uses are undertaken." The proposal to extraction sand from the site is in accordance with this broad policy zoning.

2.2 LOCAL PLANNING SCHEME

According to the CoS, LPS No. 17 the site is zoned 'Landscape'. The objectives of the Landscape Zone are to:

a) provide for low density rural residential development and associated rural-residential activities, recognizing the visual characteristics of the landscape;
b) ensure as far as practicable, that the environmental and landscape characteristics of the area are not compromised by development and use of the land for either rural or residential purposes; and
c) encourage the rehabilitation of degraded areas through selected replanting of indigenous flora.

Under the CoS, LPS No. 17, extractive industry use within the Landscape zone is classified as an 'A' use. An 'A' classification means 'that the use is not permitted unless the local government has exercised its discretion by granting planning approval after giving special notice in accordance with clause 9.4'.

This development proposal seeks to extract sand and clay. Extraction of the sand and clay resources will be staged over a ten-year period. All extraction areas will be progressively rehabilitated with locally endemic flora species once the extraction areas are exhausted and no longer required. Section 7 details the closure and rehabilitation requirements of the site. The use of the site for resource extraction is considered to be a short term and temporary use of the land.

In addition, Brikmakers will retain the existing native trees and vegetation along the western and eastern boundary of the site which will provide a visual screen to the project activities at the site. This will be consistent with the intent of the City's zoning objectives. The southern portion of the site has been previously cleared of native vegetation. Brikmakers will retain native trees at the site, as far as is practicable. Earth bunds of 4 - 6 metres in height, will also be used along the boundaries of the site so as not to cause a detrimental visual impact on the surrounding landscape or neighbouring landowners.

While there may be short term landscape impacts on the site as part of the project activities, it is unlikely that the development will be contradictory to the City's intent of the landscape zoning in this area in the long term. During and following the development, the land will not be compromised and may be used in the future for either rural or residential purposes. The proposed development will ultimately be compatible with the long-term planning requirements of the CoS for the site.

Given the reasoning above, Brikmakers respectfully request that the use of the site for resource extraction purposes is considered favourably by the CoS.

3. PREMISES DETAILS

3.1 SITE DETAILS AND HISTORY

The site is located 30 kilometres from the Perth CBD and is bounded by Walyunga Road to the north and Great Northern Highway to the west. Vehicle access to the site is via Great Northern Highway and Walyunga Road **(Figure 2).**

The site was historically used for the grazing of cattle. Therefore, the majority of the site has been previously cleared of vegetation. Several stands of native trees are located mostly to the west of Lot 5 and to the north of Lot 6. The remainder of the site consists of cleared paddock (grassed) areas. Several trees have been planted in the southern portion of the site. One small dam is located near the western boundary of the site. However, this dam does not contain surface water and will not be used as part of the project activities. There is a shed with a building attached which is located in the southern part of the site. The shed and building will be retained for use by a caretaker **(Figure 3).**

Relevant details regarding the land tenure are provided on the respective certificates of title for Lots 5 and 6 which are provided in **Appendix C.**

3.2 SURROUNDING LAND USE

The surrounding land is zoned as rural, parks and recreation and residential in the Metropolitan Region Scheme **(Figure 4)**. Furthermore, the land directly adjacent (north) of the site is used for sand and clay extraction and as a recycling facility for C&D material. There are also 7 residential properties/rural lots within 500 m of the site. The nearest residential dwelling (a caretaker's residence) is located approximately 105 metres from the northern boundary of the site. Proximity of sensitive receptors to the site can be found in **Figure 5.** Note that the distance to operational areas are greater than those measuring proximity to the cadastral boundary, these can be found in Table 1.

TABLE 1: SENSITIVE RECEPTORS PROXIMITY TO SITE

Receiver	Description	Location	Proximity to site boundary	Proximity to operations
1	Residential	1849 Great Northern Highway, Bullsbrook WA 6084	350m	620m
2	Residential	1825 Great Northern Highway, Bullsbrook WA 6084	200m	440m
3	Residential	1799 Great Northern Highway, Bullsbrook WA 6084	270m	380m
4	Residential	1763 Great Northern Highway, Bullsbrook WA 6084	400m	530m
5	Residential	1721 Great Northern Highway, Bullsbrook WA 6084	180m	270m
6	Residential	1683 Great Northern Highway, Bullsbrook WA 6084	470m	610m
7	Residential	151 Walyunga Road, Bullsbrook WA 6084	485m	650m
8	Industrial*	91 Walyunga Road, Bullsbrook WA 6084	105m	170m
9	Commercial	1686 Great Northern Highway, Upper Swan 6069	270m	330m

*1686 Great Northern Highway, Upper Swan operates as a commercially run business recycling and reselling materials with a caretaker residing in the centre of the property.

*91 Walyunga Road, Bullsbrook operates as an industrial site with sand and clay extraction similar to the proposed project.

Due to the nature of operations on these lots the residences within are considered to be caretakers.

3.3 PROJECT CHARACTERISTICS

Approximately 26 hectares of land will be disturbed as part of the project activities. The disturbance area includes stands of trees and areas of previously cleared pasture. Three areas within the site will be utalised in the extraction of clay and sand. Initially, the sand resource will be extracted to aid in the creation of bunding and make way for proposed clay stockpiling activities. The sand resource is located at two separate locations, one area being located on the northern portion of the site and the other being located on the south-western portion of the site. Sand extraction will be undertaken over an intensive campaign within a short period of time. The intensive rate at which the extraction of sand will be completed is dependent on the contract acquired. Clay extraction onsite will be in campaigns during the summer months where clay extraction activities are more plausible. Clay extraction will be undertaken on the south-eastern portion of the site. The project activities will be contained entirely within the project site. All equipment, machinery and vehicles will be mobilised to site as required. A summary of the project site and relevant details can be found in **Table 2.**

TABLE 2: SUMMARY OF THE PROJECT SITE AND RELEVANT INFORMATION

Aspects	Characteristics	
Street Address	Lots 5 and 6, No. 1728 Great Northern Highway, Bullsbrook	
Land Area	51.6 hectares (combined land area of Lots 5 and 6)	
Landowner	MJTJ Investment Pty Ltd	
Lessee	Brikmakers	
Certificate of Title	Lots 5 and 6: Volume 1273 Folio 132, Diagram 47584	
Local Government Authority	City of Swan	
Metropolitan Region Scheme (MRS) Zoning	Regional Land Zoning: Rural	
Local Government Authority (LGA) Land Zoning	Local Planning Scheme (LPS) No. 17: Landscape	
Land Use	Lots 5 and 6 have been previously cleared of native vegetation except for small stands of trees. Historically, Lots 5 and 6 were used for agricultural purposes. Lots 5 and 6 are not currently used for any purpose.	
Site Access	Great Northern Highway (Main Road) is located to the west and Walyunga Road (Local Road) is located directly to the north of the site. Access to the site will be located at the entrance to Lot 5, from Walyunga Road. The access is to be located directly opposite the existing landfill facility at Lot 5, No. 91 Walyunga Road, Bullsbrook.	
Neighbouring Properties	North: East: South: West:	Lot 5, No. 91 Walyunga Road, Bullsbrook Lot 7, No. 104 Walyunga Road, Bullsbrook Lot 19, No. 1686 Great Northern Highway, Bullsbrook Great Northern Highway road corridor

4. PROJECT SUMMARY

A summary of the project activities and relevant details are provided in **Table 3** below:

TABLE 3: SUMMARY OF THE PROJECT ACTIVITIES

ASPECT	PROPOSAL CHARACTERISTIC
VEGETATION CLEARING	
Native Vegetation Clearing	• 7 ha of clearing
PRE-EXCAVATION	
Overburden/Topsoil removal	• 0-2.0m of topsoil will be stripped from the site initially to aid in bund creation. • Primarily sourced from the northern sand extraction pit and the southern sand extraction pit as the clay extraction pit has a limited coverage of overburden available for stripping.
Bunding	• Formed from the topsoil and overburden of extraction pits. • Bunds will range from 4-6m in height shielding the extraction pits. • Bunds have been proposed to achieve both visual amenity requirements (Shielding the site from surrounding road network users and properties) and *Environmental Protection (Noise) Regulations 1997* (Providing a noise barrier around activities). • Bunds will be vegetated with fast-growing and stabilising A*cacia* species.
EXCAVATION	
Total Excavation Area	• 26 ha – Total area disturbed onsite. • 17 ha – Area of northern sand extraction and clay stockpiling pit. • 10 ha – Clay stockpiling area within northern extraction pit. • 6 ha – Area of south-eastern clay extraction pit. • 3 ha - Area of south-western sand extraction pit.
Resource Extraction Quantity	• Sand: 100,000 – 150,000 tonnes per year. • Clay: 100,000 – 150,000 tonnes per year.
Haulage	• Up to 4000 tonnes/day of clay per day during haulage campaigns • Up to 2000 tonnes/day of sand per day subject to acquired contracts
Operational Time	• Sand extraction will be undertaken over an intermittent period (market-based campaigns). • Clay excavation will be instigated over a 2 – 3-month period.
Life of Project	• ~ 10 years (commencing 2018 dependent on approval period)
Extraction Area Per Year	• Excavation of each pit will commence with cuts of approximatley 2ha each. This area will expand to enable excavators to access the site and for the provision of benches.
Dewatering Requirements	• No dewatering is required. • A drain and low bund will be graded above the excavation area east of the clay and sand pits. This will divert flows away from the extraction area to the drainage line that bisects the lots
Surface / Ground Water	• All surface water will drain internally and be retained on site. • A groundwater bore is not required. • Water needed for dust suppression will be sourced from the adjacent water retention pit located at Lot 5 (91) Walyunga Road.
Maximum Depth of Excavation	• Sand: 10m dependent on resource and grade • Clay: 26m (variable depths of 5m – 26m)

PROCESSING	
Resources	• No processing of sand is required. • The clay will be stockpiled in grades. • No crushing or screening operations are proposed for the site.
Stockpiling	• Stockpiling will solely occur in the northern sand extraction pit once sand has been extracted from the area. It is proposed that stockpiling occurs in the eastern portion of the pit as per the submitted Site Plan. • Only clay materials will be stockpiled. Sand materials are expected to be hauled offsite after extraction (as sand extraction will occur as contracted).
Water Requirements	• Minimal. The access road shall be regularly watered via the use of a water cart which will be available during operations. During dry, windy conditions the water cart will be utalised at a higher frequency which will be employed by direction of the site manager.
Water Supply	• Sourced from the water retention pit located on Lot 5 (91) Walyunga Road in agreement with adjacent land owner.
INFRASTRUCTURE	
Equipment / Machinery	• No equipment will be permanently stored on site. • All equipment will be mobilised to site as required. • Mobile fuel tanks will be utalised onsite but will not remain onsite overnight. • The water cart will remain onsite overnight during periods where the site is operational. The water cart will be removed from site and stored elsewhere when the site is non-operational. • A wheel wash will be installed at the entrance of the site to assist in weed management, dieback management and dust suppression onsite. All trucks will be required to go through the wheel wash once entering the site.
Fuel Storage	• No fuel will be stored on site. • Refuelling will occur with a mobile fuelling truck.
Access Roads	• An unsealed, access road will be used for vehicle movements within the site. • A new crossover is proposed to be used as the site entrance. • The crossover will be developed using asphalt materials. • The internal haul roads will be developed as free draining, hard surfaces.
TRANSPORTATION	
Vehicle Movements	• Variable, in campaigns of approximately 2-3 days per month for clay. • 100 inbound unladen trucks and 100 outbound laden trucks will be utalised during clay haulage campaigns (200 movements per day). • Clay movements during campaigns equate to 17 movements per hour. • 50 inbound unladen trucks and 50 outbound laden trucks will be utalised during sand haulage campaigns (100 movements per day). • Sand movements during campaigns equate to 8 movements hour.
Vehicle Access	• Great Northern Highway, then Walyunga Road. Both sealed roads.

WORKFORCE	
Construction	• 2 – 6 persons
Operation	• 25 persons (including truck drivers) • Caretakers will remain on site
Closure	• 2 - 4 persons
Hours of Operation	• 7:00am to 7:00pm, Monday to Saturday inclusive. • No project activities will occur on Sundays or public holidays.

4.1 MATERIAL EXCAVATION PROCESS

- The sand and clay resource are to be excavated in campaigns. Initially, part of the sand resource will be extracted to create a stockpile area for clay.
- Excavation will remove the topsoil by scraping and pushing to the perimeters to form earth bunds. The earth bund material will be used later for rehabilitation activities.
- A drain and low bund will be graded above the excavation area east of the clay and sand pits to divert flows away from the extraction area to the drainage line that divides the lot.
- Opening the pit will be completed by a dozer (Komatsu 375-5 or similar) and a 45-tonne excavator (PC 450 or similar).
- The overburden, which is encountered to depths of approximately 0 – 2.0 m will be pushed towards the perimeters to form earth bunds along the boundary of the site. Another earth bund will be located to the western part of the clay extraction area to ameliorate noise impacts and provide an amenity screen from surrounding land users. The earth bunds will be 4 to 6 m in height and approximately 15 m in width. The earth bunds will be designed to assist in minimising noise transmission from the active working areas and shielding the extraction areas from surrounding road networks. The overburden and earth bund material will be used at the completion of the excavation activities to cover the excavated surface. The site layout, infrastructure and locations of the bunds are provided in **Figure 3.**
- The sand will be extracted, loaded onto road trucks and transported off site concurrently. The maximum depth of excavation is up to 10 m. No stockpiles of sand will be located on site and no on-site processing of the sand material is needed.
- The excavation of clay will commence as a relatively small pit of about 2 hectares but will expand to cover an area of approximately 6 ha of the footprint to enable all the clay resource to be obtained. The maximum depth of the excavation is anticipated to be up to 26m, in a benched operation based on geological examination and drilling of the resource.
- The methods of excavation, benches and pit walls will comply with the *Mines Safety and Inspection Act 1994* and the guidelines produced by the Department of Mines, Industry Regulation and Safety (DMIRS) for safe excavation of weathered to partially weathered materials. The angle of the pit wall will be dependent on the quality of the material being excavated at any location in the pit.
- The excavation will be undertaken by a combination of mobile plant depending on the quality of the resource as it changes and the progressive alterations to the staging and design of the pit. An excavator will be used in each of the three extraction pits to extract sand and clay.
- Dump trucks will be used to carry clay material from the pit to the stockpiles. The clay resource will be stockpiled in the north-eastern part of the site. The clay material will be

loaded onto trucks and transported off site to Brikmakers manufacturing facility according to demand.

- Reforming the landform will normally be carried out using a bulldozer, but a scraper or excavator may also be used to push the topsoil and overburden over the site.
- All surface water will be retained on site. During excavation water will collect in the base of the pit. Additional water needed for dust suppression activities will be sourced from the drainage retention basin located opposite the project site at Lot 5 Walyunga Road, Bullsbrook. Brikmakers have an agreement with the landowner at the adjacent site to utilize the excess water located in the retention basin.
- Vehicles will normally work on the floor of the excavation as much as possible to reduce noise.
- To ensure a continuous supply of clay throughout the year, clay will be excavated in the drier months and stockpiled for use during the wetter months when excavation is more difficult. Stockpiles are required because there is insufficient space to store all clay resources at the South Guildford Brikmakers manufacturing site. The clay material will be separated into stockpiles according to grade.
- Clay will be recovered from the stockpiles using rubber tyred loaders loading road trucks. Onsite processing of the clay material should not be required.
- Mobile fuel tanks will not be parked onsite overnight. There will be one watercart utalised onsite during periods where the site is operational for either sand or clay extraction campaigns. During operational periods, which will be campaign and contract dependent, the watercart will be parked onsite overnight.

5. PROJECT MANAGEMENT

5.1 SITE CLEARING

The proposal requires the clearing of up to 7ha of native vegetation for the purpose of extraction activities **(Figure 6).** The native vegetation will be cleared over a short period of time and immediately prior to the commencement of project activities. The proposed method of clearing is by bulldozer with excavators used for stump removal.

Under the *Environmental Protection Act 1986* and Environmental Protection (Clearing of Native Vegetation) Regulations 2004, native vegetation can only be cleared with a clearing permit or clearing exemption. A clearing permit application will be prepared and submitted to DWER prior to the commencement of native vegetation clearing. No clearing of native vegetation will be undertaken until a native vegetation clearing permit has been granted for the project activities.

Several stands of Marri trees will be retained on the western edge of the site (Lot 5, bordering Great Northern Highway) and along the eastern boundary of the site (Lot 6). Several planted Casuarina and Pine trees will also be retained in the southern portion of the site **(Figure 6).**

5.2 TOPSOIL/OVERBURDEN REMOVAL AND STORAGE

Approximately 0-2.0m of topsoil and overburden will be stripped and separated during site preparation. The overburden and topsoil material will be used to construct the earth bunds. Topsoil and overburden material will be sourced primarily from the sand extraction pits located on the northern portion of the site and the south-western portion of the site. The south-western extraction pit will be stripped of topsoil and overburden when the northern pits topsoil and overburden have been exhausted. Additionally, the south-western pits overburden and topsoil will be utalised for bund creation to the west of the south-eastern clay extraction pits, due to the close proximity of the two pits to each other. There is limited topsoil and overburden cover atop of the clay extraction area within the south-eastern portion of the site, therefore bunding surrounding the clay extraction area will be sourced from the sand extraction areas.

Fast growing native flora, primarily *Acacia* species, will be planted to stabilise the top of the bunds. Native flora species that establish on the bunds will be encouraged to grow and irrigated during summer and autumn. It is not proposed that tall standing trees that require long periods of time to establish will be planted onsite nor near the bunding, until rehabilitation works have been initiated. It is considered that the height of the bunds should suffice screening requirements.

Following extraction works, any overburden material remaining will be utilised to construct the final levels following completion of the project activities. Bunds will be deconstructed and spread across the site to assist in the recontouring associated with rehabilitation of the site. The topsoil that has been retained within the bunding will be used to establish native vegetation during rehabilitation and closure.

5.3 SITE ACCESS

Access and egress of road trucks, vehicles, equipment and machinery will be via Walyunga Road (a local road). It is proposed that an asphalted crossover is established near the commencement of the existing firebreak access track **(Figure 2).** The sealed crossover will need to conform to the City's crossover and road standard requirements. This location has been chosen as it is close to the Great Northern Highway (GHN) (a primary regional road) intersection. Additionally, the location has been chosen as further north on Walyunga Road a steep decline exists. Positioning the driveway further south on Walyunga road allows for the cars travelling south on Walyunga Road to reduce their speed prior to reaching the site.

The intersection of GNH and Walyunga Road was upgraded in 2015 to accommodate trucks and vehicles exiting and entering Walyunga Road via GNH. Access and egress to the project site will allow for safe movements of vehicles to and from the site at this location. An existing crossover to Lot 6 is located on the GNH. Access and egress at this location is unsafe for heavy vehicles and it is proposed that this crossover will only be used for minor access to the sheds by the caretaker, no heavy vehicles will access the site from this crossover.

Currently the traffic on Walyunga Road is primarily from the adjacent sand and Brikmakers clay extraction site, recycling facility, landfill facility and the those travelling to and from Walyunga National park. Traffic movements from Walyunga Road will be right-turn into the site and left-turn out of the site only. A Transport Impact Assessment (TIA) report has been prepared to evaluate the traffic movements as a result of the project activities. The TIA is provided in **Appendix E**. More detail on traffic movements is discussed in section 5.4.

5.4 ESTIMATED TRAFFIC MOVEMENTS

The intersection of Great Northern Highway and Walyunga Road is configured with a standard "T" junction. In 2015, the intersection was upgraded to include a significant left (south) acceleration lane to accommodate high traffic flows out of the site.

A TIA report was completed by traffic consultants Shawmac Pty Ltd, Transport Impact Assessment 2017 (Appendix E). The TIA evaluated the performance of the surrounding road network considering the additional vehicle movements proposed as part of the project. In preparing the TIA a worst-case scenario has been employed to simulate the effect of the project activities. The TIA report confirms that the widths of Great Northern Highway and Walyunga Road are sufficient in meeting the minimum requirements of Austroads Guidelines. It was also found that the roads have sufficient capacity to accommodate for the traffic generated by the site and adjacent Walyunga Quarry. Shawmac indicated that for the driveway to provide the relevant site distances compliant with Austroads guidelines, roadside vegetation clearing would need to occur. In addition to this, the site access will be designed to accommodate the swept path of RAV 4 trucks.

As the project activities are of a relatively small scale and the transportation of clay material occurs over 2 - 3 days a month, the worst-case scenario developed for the site is unlikely to occur. Table 4 below indicated the predicted traffic movements as a result of the proposed operations.

TABLE 4: TRANSPORT OPERATIONS

	Approx. tonnes / year	Estimated. Cartage Days / month	Estimated Tonnes/day	Average truck movements / day*	Average trucks / hour
Clay	100,000-150,000	2-3	4000	200	17
Sand	Market dependant 100,000-150,000	30	2000	100	8

*Truck movements are calculated based on the to and from journey from the project site.

Traffic movements associated with the rehabilitation of the site are expected to be reflective of the movements associated with the extraction of the site, whereby the volume of materials that have been extracted and on-sold are to be replaced with clean and recycled fill material.

All traffic volumes as listed within this section are reflective of operation hours from 7am to 7pm. This indicates that it is expected during operations that the first unladen truck will arrive onsite for 7am and the last laden truck will leave the site at or prior to 7pm. Light vehicle movements (the 25-site staff) will likely arrive prior to 7am, but there are only 25 vehicle movements these are considered to have negligible road impacts.

5.5 MATERIAL STAGING OF PROPOSAL

5.5.1 STAGES

Material staging is specific for each extraction pit which have been illustrated in **Figure 3** (Site Plan).

Initially, the extraction areas will be stripped of topsoil and overburden to aid in the development of site bunding (4-6m in height). Bunding will be developed as illustrated in **Figure 3** to ensure the shielding of the extractive works from surrounding receptors, including the users of both Walyunga Rd and Great Northern Highway. There is limited topsoil atop of the clay extraction area on the south-eastern portion of the site, therefore the majority of the topsoil and overburden will be sourced from the sand extraction areas (north and south-west portions of the site).

Sand extraction staging within the two sand extraction pits (northern extraction pit and south-western extraction pit) is to be entirely dependent on the contract acquired. It is proposed that the sand materials will be utalised and on-sold as bulk fill and base materials for surrounding developments. Given the extensive developments in the area it is expected to be in high demand. Once a contract is acquired it is expected that initial extraction will occur within the northern pit, primarily to make way for the clay stockpiling area. Once that has been established, the western portion of the northern pit will be extracted from. When materials are exhausted within the northern sand extraction pit, operations will migrate to the south-western sand extraction pit. As discussed in **Section 5.5.2** it is proposed that progressive rehabilitation and recontouring is implemented throughout the works to comply with the land zoning of the site (landscape).

Once the clay stockpiling area within the northern extraction pit has been extracted to make way for the stockpiling operations, the clay extraction works within the proposed south-eastern pit will commence. Initially, clay extraction will be implemented in the southernmost cell (Cell 1). Extraction and closure of cells will work from Cell 1 to Cell 4 throughout the duration of the pending approval (ten years). Clay will be extracted in intensive campaigns for 2-3months within a year. Throughout the extraction campaigns clay will be stockpiled within the northern extraction pit for later haulage campaigns depended on market demand for the resource and availability of space within the Brikmakers manufacturing facility. Intensive haulage campaigns will take place over 2-3 days within a month. As discussed within **Section 5.5.2** it is proposed that progressive rehabilitation and recontouring is implemented throughout the works to comply with land zoning (landscape), meaning that at the closure of each cell it will be rehabilitated prior to the extraction commencement in the following cell.

5.5.2 REHABILITATION STAGING

The clay stockpile area within the northern pit is the only area onsite that will remain as an open pit until the operations on site are complete (expected to be ten years). The area within the northern pit, which is not indicated as a clay stockpile area, will be progressively rehabilitated as materials are extracted based on contractual arrangement acquired. The south-western sand extraction pit will additionally be rehabilitated as materials are extracted. As the materials from the sand extraction pits will be dependent on the contract acquired, it is impossible to grant timing on the rehabilitation and extraction of these areas. It is expected that 100,000 – 150,000 tonnes of sand will be extracted per year from the two sand pits as indicated within the Site Plan within the ten-year period. Reflective of the volumes extracted will be the volumes used to fill the extracted pits. It is proposed within this application that progressive rehabilitation will be implemented onsite, so as sand extraction campaigns are completed (apart from in the clay stockpiling area) the area will be rehabilitated, recontoured and revegetated.

The clay extraction pit has a more structured stage of works whereby each area of the proposed pit is indicated with a specific cell to be extracted from (Cells 1-4). Once approval is granted it is proposed that extraction commences in the most southern cell, Cell 1. Once the clay materials within Cell 1 have been exhausted and no more extraction can take place within that area, the cell will be rehabilitated prior to extraction works commencing in Cell 2 (directly north of Cell 1). This will be continued until the operations reach Cell 4. At the exhaustion of Cell 4, final rehabilitation of the clay extraction pit will be implemented whereby all cells will have been rehabilitation including the recontouring and revegetating of the area.

Where rehabilitation is taking place onsite, whether it be the sand extraction pits or clay extraction cells, recontouring will additionally occur.

6. ENVIRONMENTAL MANAGEMENT PLAN

A summary of the environmental factors and relevant details are provided in Table 4 below:

TABLE 5: SUMMARY OF ENVIRONMENTAL AND HERITAGE FACTORS

Environmental Factors	
Flora	Lots 5 and 6 have been previously cleared of native vegetation. Lot 5 consists mostly of large grassed areas with 3 stands of trees. Most of Lot 6 consists of extensive grassed areas. Five stands of medium to large sized Eucalyptus and Casuarina trees are located to the north and east of Lot 6. Several trees (Casuarina and Pine trees) have been planted in the southern portion of Lot 6. None of these planted trees will be cleared. No Threatened or Priority flora are recorded on the site.
Fauna	No threatened or Priority fauna have been identified on the site. As the site has been previously cleared of native vegetation, the site provides little fauna habitat. Large Eucalyptus (Marri and Jarrah) and Casuarina trees may provide roosting habitat for birds. One Marri tree had a diameter at breast height (DBH of approximately 50 cm. However, none of the trees contained hollows. Five emus (adults) were recorded during the site visit.
Wetland	The closest wetland is Ellen Brook which is located approximately 700 metres to the south-west of the site and adjacent to the Great Northern Highway. A minor, ephemeral watercourse is located in the centre of Lot 6 and moves in a westerly direction through the site. No riparian vegetation will be cleared as part of the project activities. A 50m buffer has been allocated to the ephemeral watercourse. Bunding and extractive operations have been located accordingly. It is proposed that a haul road will intercept the watercourse on the mid-eastern portion of the block. It is not expected that this action will have a high impact as the watercourse has already been disrupted where the site meets Great Northern Highway on the western boundary.
Conservation Areas	Walyunga National Park (NP) is located approximately 640m to the east of the site. The Walyunga NP is a large reserve (1,838.51 hectares) and is not expected to be impacted by the proposed development. The Walyunga NP is also a Bush Forever site and listed on the Register of the National Estate.
Depth to Groundwater	22m AHD on the south of the site to 25m AHD on the north of the site (Perth Groundwater Atlas). These figures relate to the sane only as the clay exists in a separate groundwater regime.

Environmental Factors	
Public Drinking Water Source Areas (PDWSAs)	The site is not within a proclaimed public drinking water catchment area but lies east of the Priority 1 Gnangara Underground Water Pollution Control Area (DoW, 2017).
DAFWA Sensitive Sites Database	The closest indicated Sensitive sites are located 8km south of Bullsbrook in Baskerville and Millendon. These sites practise Viticulture and Organic Farming. There is one Aquaculture site 14km east of the proposed project in Gidgegannup (DAFWA, 2017).
Topography	The site slopes naturally downwards towards the west. The highest point being in the south-eastern corner of the site, the lowest point is on the western boundary near Great Northern Highway.
Elevation	The site currently has an elevation of approximately 60 metres AHD on the eastern side of Lot 6 to an elevation of approximately 25 metres AHD on the western side of Lot 5. The highest elevation is on the south-eastern corner.
Sensitive Receptors	The nearest sensitive receptor is a residential property located to the north of the site at Lot 5 (No. 91) Walyunga Road, Bullsbrook. There are 8 residential/rural properties located within 500 m of the boundary of the site.
Aboriginal Heritage	1 Registered Aboriginal Site (Site ID 3525) is located over Lots 5 and 6. Site ID 3525 is a mythological site associated with Ellen Brook. Ellen Brook is located approximately 700 km to the south of the proposed development. As the site is not disturbing the banks of the Ellen Brook watercourse there will be no impacts to the Aboriginal Heritage site. Lots 5 and 6 have been previously cleared and any archaeological sites of significance that may have existed at this location have therefore been removed.
Native Title	Native Title has been extinguished on Freehold land.
European Heritage	No European heritage sites exist in or near the site.
DFES Bushfire Prone Areas	Approximately 30% of the lot is considered a bushfire prone area on the DFES Bushfire Prone Areas Map (DFES, 2017)

6.1 FLORA AND VEGETATION

The site has been previously cleared of native vegetation. The remaining native vegetation at the site consists of approximately nine stands of Marri trees (*Corymbia calophylla*), approximately five individual Casuarina trees, eight *Banksia grandis* trees and one Nuytsia tree. Three of the stands of trees consisting mostly of Marri trees will be retained. Several trees (Casuarina and Pine trees) have been planted in the southern portion of Lot 6. None of these planted trees will be cleared **(Figure 6).** No Threatened or Priority flora are recorded on the site.

The buffer area of a Threatened Ecological Community (TEC) occurs over the site **(Figure 7).** The TEC is associated with vegetation in the Walyunga NP. The native vegetation located in the site is not consistent with the TEC. The majority of the native vegetation within the site has also been previously cleared.

Further details regarding native vegetation clearing required for the project is discussed in **Section 5.1**.

Vegetation clearing is proposed as part of this application. A series of measures will be implemented onsite to protect the retained vegetation including stands of trees on the north-western boundary of the site and the mid-eastern portion of the site. The following methods are intended to be implemented onsite in order to ensure protection of these retained trees:

- Site staff are to be inducted on the use of haul roads to navigate the site.
- A sign is to be installed at the site entrance indicating the use of haul roads.
- Staff meetings are to include the discussion of the appropriate use of internal haul roads and that access off of haul roads is only to be instigated in the maintenance and installation of fire breaks.

A series of high bunding exists between the northern pit and the north-western retained vegetation which will aid in their protection. The trees on the mid-eastern portion of the site are approximately 70m from the clay extraction pits and the proposed haul road. Site staff navigating the site will be required to stay within the haul roads (unless undertaking maintenance on fire breaks, therefore it is not expected that the retained vegetation will be at risk during operations where the above methods are instigated.

6.2 CONSERVATION AREAS

Walyunga National Park (NP) is located approximately 640 m to the east of the site **(Figure 2).** The Walyunga NP is a large reserve (1,838.51 hectares in size) which is also a Bush Forever site (Site 412) **(Figure 7).** Walyunga NP is also listed on the Register of the National Estate. The proposed development will not have an impact on the Walyunga NP.

6.3 FAUNA

As the site has been previously cleared of native vegetation, the site contains little to no fauna habitat. Large Eucalyptus (Marri) and Casuarina trees may provide roosting habitat for birds. One Marri tree had a diameter at breast height (DBH of approximately 50 cm). However, none of the trees observed on site contained hollows suitable for Black Cockatoo species. It is unlikely that Black Cockatoo species would rely on these trees given the proximity to Walyunga NP. The Walyunga NP consists of a large area of remnant vegetation containing suitable fauna habitat including breeding, roosting and foraging habitat for Black Cockatoo species.

Five emus (adults) were observed moving freely through the site during the site visit. Emu's additionally have free access to the vast Walyunga NP adjacent to the site and were not witnessed during a second site visit. No threatened or Priority fauna have been identified on the site. The majority of the site consists of paddock grasslands. Therefore, the site does not contain significant fauna habitat.

6.4 WETLANDS AND WATERCOURSES

The closest wetland is Ellen Brook which is located approximately 700 metres to the south-west of the site and adjacent to the Great Northern Highway. The wetland at Ellen Brook is also a listed Environmentally Sensitive Area (ESA) and Bush Forever site (Site No. 301) **(Figure 7).**

A minor, ephemeral watercourse is located within the site (near the centre of Lot 6) and moves in a westerly direction through the site. Historically, surface water from this ephemeral watercourse, would have flowed in winter and spring into the nearby Twin Swamps watercourse, located to the west of Great Northern Highway. However, following urbanisation, changes to the surrounding water catchment including the construction of the adjacent highway, surface water can no longer drain freely into the Twin Swamps watercourse **(Figure 8).**

Project activities have been positioned to give a 50m buffer to the ephemeral watercourse. The vegetation within the ephemeral watercourse consists of paddock grasses. No riparian vegetation will be cleared as part of the project activities. The proposed development will not have an impact on wetlands or watercourses within or surrounding the project area.

It is proposed that an internal haul road will be installed intercepting the watercourse on the northern part of the site. Given that the watercourse was previously been interrupted by the construction of Great Northern Highway, it is not expected that this interception will have a large effect on the watercourse and its dependents. An application has been submitted to DWER for *permission to interfere Beds or Banks of a watercourse permit.*

6.5 SURFACE AND GROUNDWATER

All surface water will be contained on site. Several bunds will be constructed around the site and the extraction areas which will control the movement of surface water. Surplus surface water will drain internally into the extraction pits. Given the sandy and free draining soils of the project area, it is unlikely that flooding would occur in extreme rainfall events.

Stormwater flow generated from the scarp above the site will be controlled by the following measures:

- A drain and low bund will be graded above the excavation area east of the clay and sand pits. This will divert flows away from the extraction area to the drainage line that bisects the lots.
- The drainage line that runs through the lots (between the clay and north sand pit) will be retained and this has sufficient capacity to cope with flows. This drainage line runs into the existing dam along the western boundary of the property.
- Bund walls are designed so that extreme storm events will breech them and flow directly into the operating pit, which will serve as a detention and sedimentation pond
- All operational areas will be internally drained and capture water.

- Water collected in the sand pits will naturally permeate into the surrounding area, in addition to water collected against the bunding.
- A small amount of water may collect above the clay pit (below the graded drain and above the safety bund) this will permeate into the soil.

Refer to **Figure 9** for water management flows, with comparison to excavation depths. Refer to **Figure 10** for groundwater levels within the lot, with comparison to proposed extraction depths.

The site has two distinct groundwater areas. The sand is part of the swan coastal plain and is related to the adjacent Ellenbrook and surrounding sand plain. The figures presenting in Figure 10 only relate to this part of the site. The clay forms part of the Darling Range and is not directly connected to the Swan Coastal Plain in regard to groundwater. This area is composed of a weathered profile over parent rock and as such any ground water exists as localised perched water above the parent rock (that is largely impermeable) and in fractures. Drilling of the clay deposit did not intersect groundwater at the depths proposed to be mined.

6.6 TOPOGRAPHY AND ELEVATION

The site slopes naturally downwards towards the west. The highest point being in the south-eastern corner of the site **(Figure 11).** The lowest point is on the western boundary near Great Northern Highway.

The site currently has an elevation of approximately 60 metres AHD on the eastern side of the site (Lot 6) to an elevation of approximately 25 metres AHD on the western side of the site (Lot 5**) (Figure 11).** The highest elevation is on the south-eastern corner.

6.7 SOILS

The site is located within the Pinjarra Zone (Map Unit 213) (DPIRD, 2017). The Pinjarra Zone consists of alluvial deposits between the Bassendean Dunes Zone and the Darling Scarp, colluvial and shelf deposits adjacent to the Darling Scarp. Soils of the Pinjarra Zone are often described as clayey to sandy alluvial soils with wet areas (DPIRD, 2017).

Soils in the project area are part of the Forrestfield System (Map Unit 213Fo) (DPIRD, 2017). The Forrestfield System is described as undulating foot slopes of the Darling and Whicher Scarps. The soils of the project area are described as duplex, sandy gravels, pale deep sands and grey, deep sandy duplexes (DPIRD, 2017). These soils are sometimes considered to be alkaline (DPIRD, 2017). Soils in the project area may also be described as semi-wet to wet soils, with grey deep or pale deep sands and loams (DPIRD, 2017). As the majority of the overlying soils are sandy and free-draining, there is an extremely low probability of occurrence of acid sulphate soils (**Figure 1B**)(CSIRO, 2017).

Landforms of the Bullsbrook area are described as coastal plain with swamps and low slopes of <10% gradient (DPIRD, 2017). The geology of the site consists of unconsolidated sediments over sedimentary rocks (DPIRD, 2017).

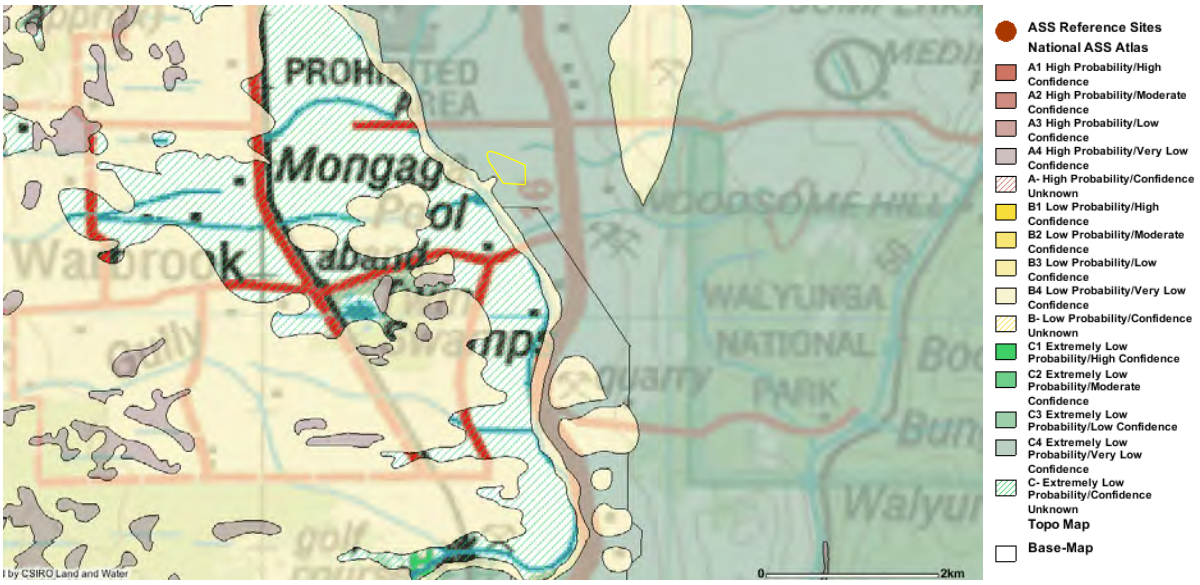

FIGURE 1B: ACID SULFATE SOILS MAP (CSIRO, 2017)

6.8 SEISMIC ACTIVITY

The surrounding area, and Bullsbrook itself, is an area of negligible seismic activity in Western Australia. A search of the Geoscience Australia Earthquake Database (14/12/2017) presented no evidence of earthquakes within the Perth region over 57 years of data (**Figure 1C**). The yellow circles in **Figure 2** present the most recent earthquakes that have occurred on the outskirts of Perth. The three earthquakes north of Brookton were of small scale (1.5 – 1.6) occurred within November 2017. The earthquake on the north of Aldersyde occurred on the 16th of December 2017 with a magnitude of 2. The record north-west of Pumphreys Bridge was a magnitude of 2 and occurred around the same time as the ones north of Brookton. Seismic Activity in this case presents a very minimal risk to the project.

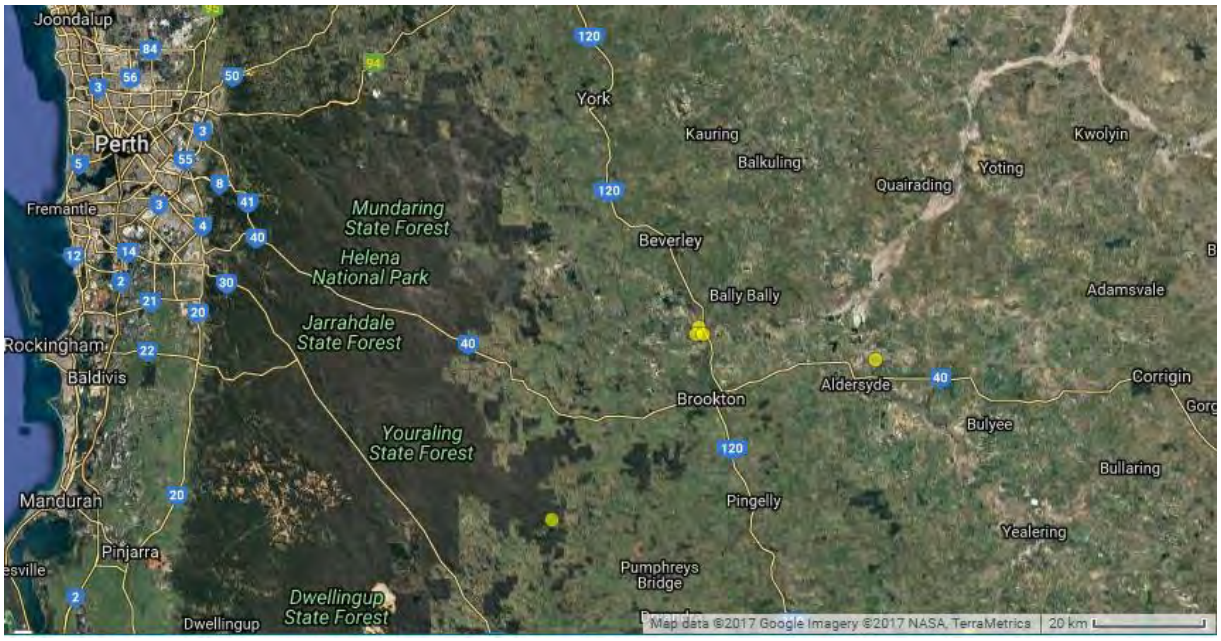

FIGURE 1C: SEISMIC ACTIVITY IN SOUTH-WESTERN AUSTRALIA

6.9 VISUAL AMENITY

Prior to the commencement of material excavation, topsoil and overburden material will be removed from the extraction areas and used to create several earth bunds (4-6 m in height and 15 m in width). Resource extraction will occur behind these bunds. The bunds will surround the sand and clay extraction areas providing a visual amenity screen. Native vegetation will also be encouraged to establish on the earth bunds. Visual amenity will be further maintained by retaining the Marri trees on the western boundary, adjacent to the Great Northern Highway. Trees on the eastern boundary will also be retained. The project activities should not be visible to most of surrounding land users. Further details regarding the earth bunds are provided in Section 4.1 and 5.2.

The excavation of the clay material will also be staged and incorporate bunding. Excavation and loading activities will be completed behind these bunds. These measures will reduce the visual impact from clay extraction activities. Closure of the site will require the site to be recontoured to maintain the existing landforms. The proposed development is unlikely to cause a detrimental impact to surrounding land users with regards to visual amenity.

6.10 HERITAGE

One Registered Aboriginal Site (Site ID 3525) is located over Lots 5 and 6 (DPLAH, 2017). Site ID 3525 is a mythological site associated with Ellen Brook (DPLAH, 2017). Ellen Brook is located approximately 700 km to the south of the proposed development. As the site is not disturbing the banks of the Ellen Brook watercourse there will be no impacts to this Aboriginal heritage site. Lots 5 and 6 have been previously cleared and any archaeological sites of significance that may have existed at this location are likely to have been removed. The proposed development will not impact any Aboriginal heritage sites of significance.

Native Title has been extinguished on Freehold land (DPLAH, 2017). Therefore, Native Title does not pose any restrictions on the proposed development.

No European heritage sites exist in or near the site (DPLAH, 2017).

6.11 AIR QUALITY

Dust may be generated as a result of the project activities and may impact air quality. The sources of dust that are associated with the excavation of sand and clay include:

- Removal of native vegetation;
- Earthmoving activities;
- Stockpiling of clay materials;
- Vehicle movements on unsealed roads;
- Quarrying activities; and
- Material extraction, transfer (loading), storage and transportation.

Dust has the potential to impact local amenity and cause a nuisance to surrounding land users. In extreme situations, when dust is suspended in the atmosphere, it may reduce visibility, settle on native vegetation and effect human health. It is unlikely that dust will become problematic as result of the proposed development given the small size of the project operations. The main factor influencing dust as part of the project activities is the suspension and dispersal of dust in the wind. Once dust enters the atmosphere, it may transfer to the surrounding environment and impact surrounding landowners. To manage potential impacts associated with dust, a Dust Management Plan (DMP) has been prepared and is provided in Appendix F. The DMP will be implemented as part of the project activities.

6.12 NOISE

There are two main sources of noise from the proposed development. These include the extraction of resource materials (digging, loading, transfer and stockpiling) on site, and the transportation of material via vehicles within and away from the site.

Seven sensitive receptors are located within 500 m of the site. The sensitive receptors include residential homes and rural properties **(Figure 4).** As noise may impact sensitive receptors located nearby an acoustic survey was required. An Environmental Noise Assessment and subsequent report was undertaken by Lloyd George Acoustics. The assessment evaluated the impact of noise from the project activities and determined a number of management strategies to be implemented to mitigate noise impacts. The acoustic assessment confirmed that noise impacts can be managed on site to comply with the Environmental Protection (Noise) Regulations 1997.

A Noise Management Plan (NMP) has been prepared to manage noise impacts associated with the project activities. The Environmental Noise assessment can be found within this management plan. The NMP is provided in Appendix G. The NMP will be implemented as part of the project activities.

6.13 DIEBACK MANAGEMENT PLAN

Dieback of vegetation is often attributed to *Phytophthora Cinamomi* even though there are other Phytophthora species and other diseases such as *Armillaria* that can cause dieback like symptoms. Microscopic soil-borne fungi of the genus Phytophthora kill a wide range of native plants and can cause severe damage to many vegetation types, particularly those from the families *Proteaceae Epacridaceae, Xanthorrhoeaceae* and *Myrtaceae.*

In most cases dieback is caused by a pathogen which infests the plant and causes it to lose vigour, with leaves dying, and over time may kill the plant. As such the management of Dieback is essentially related to plant hygiene when coming onto a site and within a site.

There are several guides to the management of Dieback:

- Department of Environment and Conservation CALM Dieback Hygiene Manual 1992 is a practical guide to Dieback management.
- Department of Environmental and Conservation CALM Best Practice Guidelines for the Management of *Phytophthora Cinamomi,* draft 2004.
- Dieback Working Group 2000, Management of Phytophthora Dieback in Extractive Industries.

As the site is mostly cleared (20% midstory coverage over the lot), the dieback risk is minimal. The risk will become increasingly nominal as the excavation activities are completed. No adverse dieback conditions appear to have been introduced into the site.

Dieback management is particularly important for this site as it neighbours a Bush Forever site, Walyunga NP (Bush forever site 412). The spread of dieback to the NP could be detrimental to the flora within, emphasizing the importance of strenuous management methods to reduce the risk of dieback within the site.

However, as a matter of good environmental practice management Brikmakers will use practices that will minimise the introduction of weeds or plant pathogens. The aim of dieback management during excavation is to minimise the risk of entry of dieback into the site.

In many ways the management of site for dieback is similar to that for the management of weeds, and the two management practices should be considered together.

The other management is to ensure that all excavation equipment and road transport vehicles are clean and free from soil and vegetation matter prior to entering the site. This is normal practise by Brikmakers who strive for high levels of resource hygiene to minimise any potential for dieback spread.

The following actions will be taken on this site to reduce to risk of dieback spread:

- Excavation will be undertaken using practices recommended by DWER
- Vehicles are to be prohibited from entering remnant vegetation
- The pit will be designed to be internally drained to retain all surface water and direct excess to detention basins
- Illegally dumped rubbish is to be removed promptly.
- No contaminated or suspect soil or plant material is to be brought onto the site.
- Seedlings for rehabilitation will be sourced from certified dieback free nurseries.

- Topsoil is to be stored separately from overburden, in low dumps ready for covering the completed areas of the excavation.
- When clearing land or firebreaks vehicles are to work from dieback free areas towards dieback areas, or in situation where dieback interpretation is not possible, from areas of higher quality vegetation to areas of lower quality vegetation.
- A wheel wash will be installed at the entrance of the site, all trucks will be required to enter the wheel wash before picking up or dropping off (rehabilitation) materials. This will reduce the risk of transfer onto the site.
- A sign will be installed at the site entrance directing the sole use of haul roads when navigating the site, as to not spread any plant pathogens into the retained vegetation.

The successful implementation of these methods is expected to reduce the risk of dieback spreading through the site and into Walyunga NP.

6.14 WEED MANAGEMENT PLAN

The management of weeds is essentially similar to that for plant diseases. Weeds have a high potential to spread to surrounding localities, therefore it is important to ensure they are controlled as processes occur. It is desirable that the site does not become a haven for environmental weeds and therefore a management and control program is warranted.

Weeds can be declared under the *Agriculture and Related Resources Protection Act 1976* which requires that declared weeds are eradicated. Other weeds are not declared but may be classified as Environmental Weeds because they are well known for impacting on vegetation.

Generally, the application of methods to prevent the spread of Dieback are applied which will usually ensure the control of environmental weeds in the process. The extraction area was previously used for the grazing of cattle. There are no significant weeds that currently require treating. However, like all other rural properties weed monitoring and treatment is routinely undertaken.

The management of weeds will employ the following principles:

- All vehicles and equipment to be used during site preparation, excavation and closure will be cleaned and free from soil or plant material when arriving at site
- Vehicles are to be prohibited from entering remnant vegetation, apart from normal travel along made firebreaks and maintenance activities
- Illegally dumped rubbish is the major source of weeds and is to be removed promptly
- No weed contaminated, or suspect soil or plant material is to be brought onto the site
- When clearing land or firebreak vehicles are to work in conjunction with dieback principles and push from areas of better vegetation towards areas of lower quality vegetation
- Weed management shall work from the least affected areas to most affected
- Declared weeds or environmental weeds will be treated promptly by digging out or spraying
- Weeds will be treated promptly no matter how few there are.
- Ongoing monitoring of weeds will be undertaken at least annually in autumn, prior to winter rains
- All materials to be used in revegetation will be sourced from certified weed free locations and businesses.

- A wheel wash will be installed at the entrance of the site, all trucks will be required to enter the wheel wash. This will reduce the risk of transfer onto the site.
- A sign will be installed at the site entrance directing the sole use of haul roads when navigating the site, as to not spread any plant pathogens into the retained vegetation.

6.15 BUSHFIRE PRONE AREAS

The site is located within Department of Fire and Emergency Services Bushfire Prone Areas map. Approximately 30% of the site is considered to be prone to bushfires due to its vegetation cover and proximity to Walyunga NP. **Figure 1D** shows the area of the lot that is considered Bush Fire prone, with the site boundary is outlined in yellow. Due to the nature of the proposed project, it is expected that no bushfire risks will be associated as the extraction areas will be cleared of vegetation. It is expected that the cleared area for excavation activities will act as a buffer in the event of a bush fire.

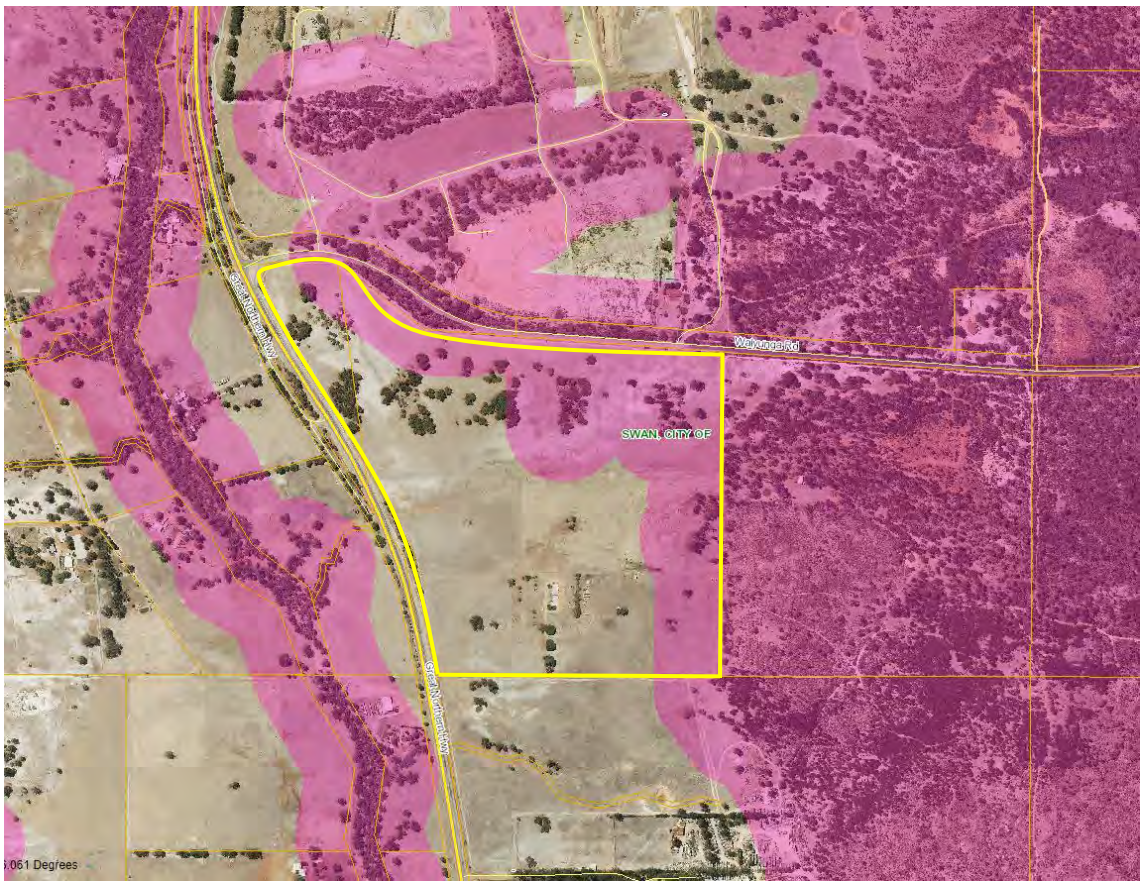

FIGURE 1D: DFES BUSHFIRE PRONE AREAS MAP (DFES, 2017)

Usually it is a requirement of the City of Swan to provide a Bushfire Attack Level (BAL) assessment or BAL Contour Map in areas where Bushfires are prone, but as the scheme of the lot is deemed Industry within a rural zone it is expected the project will fall under a Western Australian Planning Commission (WAPC) Exception. The WAPC posted a Planning Bulletin (111/2016) which stated that:

"Exemptions may apply to infrastructure including roads, telecommunications and dams; and to rural activities, including piggeries and chicken farms which do not involve employees on site for a considerable amount of time" (WAPC, 2016)

Regarding the occupation of site for considerable amounts of time, works will be intermittent depending on market demand for extracted materials. It is expected that the majority of time employees will be working within the extraction pits and the only hardstand area will be the pre-existing house on the southern part of the block between the sand extraction pit and clay extraction pits.

6.16 COMPLAINTS MANAGEMENT

A complaints register will be established for the site in the event of any complaints in relation to the operation. All complaints shall be treated promptly by Brikmakers and will be dealt with in accordance with the complaints management system and issue resolution procedure. The procedure for managing complaints shall be as follows:

- Site signage displaying the contact details of the site manager will be positioned at the entry of the site at all times (during operations and in times where the site is unmanned).
- Any complaints made to the site manager shall be documented and dealt with expeditiously.
- Any complaints received either directly from the complainant or via the City of Swan will be reviewed by the site manager and interested parties to assess:
    - The legitimacy of the complaint;
    - The aspects of the operation that triggered the complaint;
    - Management actions required to address the issues raised to bring operations into line with conditions imposed on the extractive operation by the City of Swan under Development Approval and the future Extractive Industries Licence.
- Actions deemed necessary to bring operations into line with relevant legislation, regulations and licence conditions will be undertaken immediately and before works are recommenced.
- Summaries of complaints and actions taken to address each specific issue will be recorded in the Complaints Register.
- A record of all complaints shall be retained onsite for inspection by the City of Swan as necessary.
- Amendments to the complaints management process will be implemented reflective of conditions within the development approval as issued by the City of Swan and the WAPC.

6.17 ROLES AND RESPONSIBILITIES

Brikmakers and the site manager will be responsible for the implementation of the management methods listed throughout this document and those listed within the appendices. The site manager will be more so responsible for implementation of management methods of the operational processes, whilst Brikmakers will be responsible for, but not limited to, pre-operational and remediation processes. It is the responsibility of all employees to report environmental incidents immediately to their shift supervisor, who will alert the site manager of the occurrence for immediate response.

7. CLOSURE PLAN

7.1 END USE

City of Swan's Draft Local Rural Planning Strategy (2016) indicates that this area is purposed for Rural Landscape zoning within an extractive industries buffer. Once the resources are exhausted within the lot it will be rehabilitated to suit the zoning.

7.2 CLOSURE COMMENTS

The key commitments of the excavation closure are to ensure that the site and its environmental surroundings, including local flora, fauna, surface and groundwater, topography and local aesthetics are returned, as far as is reasonably practicable, to the sites pre-excavation conditions.

7.3 LANDFORM RECONSTRUCTION AND FINAL CONTOURING

Landform reconstruction and final contouring will reflect those of pre-excavation conditions **(Figure 12).** It is expected that during the closure of the excavation project the following objectives will be followed;

- Equipment and machinery will be removed from site;
- The final landform will be reflective of pre-excavation site conditions;
- The land surface will be contoured, to match as closely as possible the existing landform;
- The land surface will be formed to the requirements of the Mines Safety and Inspection Act 1994 and Regulations 1995 as a final land surface; and
- Over burden will be spread over the surface where available to provide a substrate for agricultural soils, followed by topsoil.

7.4 REHABILITATION OF EXCAVATION AREA

The rehabilitation of the sand and clay extraction areas will take place following the course of the extraction. Although there will be a portion of the sand excavated area reserved for clay stockpiling as campaigns are progressed. Brikmakers seeks to implement an extensive rehabilitation programme on the site which will return the landform to its pre-excavation form. It is proposed that appropriately classified recycled and clean fill materials from a DWER licenced facility will be utalised in the rehabilitation of the site.

It is not the goal of Brikmakers to rehabilitate a degraded landscape, but rather re-establish the pre-excavation landforms, by using a mixture of aggregates and clean fill material. Topsoil will be retained onsite and used as the top layer of the rehabilitated area which will encourage the re-establishment of flora within the site. This is expected to visually return the site to its pre-excavation form and in the long term, create an environment capable of sustaining flora and fauna.

Rehabilitation of excavation pits will take place on a progressive basis as sand and clay are extracted from the site. This will ensure that the site is rehabilitated along the way and will not be left in an unsightly condition at the end of the project.

The vegetation species proposed to re-populate the site are *Eucalyptus marginata*, *Eucalyptus wandoo*, *Corymbia calophylla* and *Dryandra sessilis*, these tree species are currently present within the vicinity of the site and are native to the local area. A planting density of 1 tree per 100 m^2 is proposed in tree belts to allow for rural developments. This planting density will be more than what is currently existing on the lot (pre-excavation conditions), as the site was cleared for historical rural purposes.

The selected plant species will be planted or seeded in early autumn to ensure they benefit from winter rains. Following the placement of topsoil on the site, planting will not be delayed for a period of greater than a calendar year as this can lead to compaction/ settlement of the topsoil, resulting in it being harder for plants and seeds to establish. Where progressive rehabilitation will be implemented (all pits excluding the clay stockpile area) the above seasons will be utalised for planting where possible, but the replanting will be mostly dependent on the time periods the material exhaustion occurs.

The clay stockpile area within the northern pit is the only area onsite that will remain as an open pit until the operations on site are complete (expected to be ten years). The area within the northern pit, which is not indicated as a clay stockpile area, will be progressively rehabilitated as materials are extracted. The south-western sand extraction pit will additionally be rehabilitated as materials are extracted. As the materials from the sand extraction pits will be dependent on the contracts acquired, it is impossible to grant timing on the rehabilitation and extraction of these areas. It is expected that 100,000 – 150,000 tonnes of sand per year will be extracted from the two sand pits throughout the ten-year duration of the project. Reflective of the volumes extracted will be the volumes used to fill the extracted pits. It is proposed within this application that progressive rehabilitation will be implemented onsite, so as sand extraction campaigns are completed (apart from in the clay stockpiling area) the area will be rehabilitated, recontoured and revegetated.

The clay extraction pit has a more structured stage of works whereby each area of the proposed pit is indicated with a specific cell to be extracted from (Cells 1-4). Once approval is granted it is proposed that extraction commences in the most southern cell, Cell 1. Once the clay materials within Cell 1 have been exhausted and no more extraction can take place within that area, the cell will be rehabilitated prior to extraction works commencing in Cell 2 (directly north of Cell 1). This will be continued until the operations reach Cell 4. At the exhaustion of Cell 4, final rehabilitation of the clay extraction pit will be implemented whereby all cells will have been rehabilitation including the recontouring and revegetating of the area.

Where rehabilitation is taking place onsite, whether it be the sand extraction pits or clay extraction cells, recontouring will additionally occur.

7.5 TOPSOIL AND OVERBURDEN REMOVAL REPLACEMENT

Wherever possible topsoil and overburden will be transferred directly from an area onsite being cleared to an area onsite being rehabilitated. Recovered topsoil will be distributed around a rehabilitation area to increase total organic carbon fractions and improve soil properties such as water resistance, wind erosion and moisture retention. If topsoil cannot be sourced directly from an area being cleared, topsoil will be retrieved from a stockpile or bund.

Where overburden exists, subject to the excavation, it will be pushed to assist the visual and noise screening. Topsoil bunds will be erected at the beginning of the project and progressively reconstructed as excavated pits become exhausted. Excavation processes will follow the staging outlined in **Figure 3.** If possible, topsoil clearing, and excavation will be undertaken in months with more rainfall, to reduce dust impacts associated with the movement of soil. Otherwise a water cart will be utilised to prevent dust.

7.6 PRE-PLANTING/SEEDING WEED CONTROL

Pre-seeding weed control will be required if topsoils contain weed species. As no weed species have been identified on the lot, pre-seeding weed control will not be implemented. Weed control will be conducted after overburden and topsoil have been spread and germination has begun. Although broad scale weed treatment can be detrimental to the development of other plant species, it may be required if the weed load is noticeably large and needs to be eradicated/reduced. It is required that the site is checked during May, following autumn rains. A check for broad-leaf germination will be undertaken at this point.

The Weed Management Plan will form a basis for the treatment of weeds but, in addition to this weed management will be integrated with normal practises on site. If weeds are identified onsite during the extraction processes the Site manager will be notified and appropriate and immediate eradication will follow.

7.7 REHABILITATION OF THE ROAD RESERVE

Proposed within the application is the clearing within a road reserve adjacent to the proposed crossover location to achieve line of site requirements. As a requirement of the City of Swan assets team, the driveway option would need to achieve a 158m Safe Intersection Site Distance (SISD) which entails the clearing of approximately 400m^2. Once all resources from the site have been exhausted and no more rehabilitation is to be initiated onsite, the road reserve is to be rehabilitated to its state prior to the works beginning.

Species of *Eucalyptus marginata*, *Eucalyptus wandoo*, *Corymbia calophylla* and *Dryandra sessilis* will be planted within the road reserve area at a high density reflective of its conditions prior to the works. Topsoil from the site will be utalised in the replanting as to encourage the growth of the planted species.

8. CONCLUSION

In conclusion, SERS, on behalf of Brikmakers, have developed this application to apply for the relevant licenses and approvals to conduct extraction works at lots 5 & 6 (No. 1728) Great Northern Highway, Bullsbrook.

The resources onsite (sand and clay) are considered vital for the continued provision of basic raw materials to the Perth Metropolitan Area. Many other sites which would otherwise be suitable, occur in locations where planning and environmental impacts preclude or severely constrain the extraction processes. The lot is located within a priority resource zone, further emphasizing its suitability for the project.

The extraction of resources must be economical, with often the significant portion of the cost of basic raw materials generated through transportation. This close proximity of the subject site to the Perth Metropolitan Area and a major traffic corridor (Great Northern Highway) will significantly reduce the cost of transportation.

The proposal to extract sand and clay from the site is accompanied with various environmental management measures which will ensure that the proposed development has minimal impact on the surrounding natural and human environment.

With the assistance of Lloyd George Acoustics, it was reported that the proposed project complies with regulations outlined in the *Noise Regulations 1997.* Methods outlined in the SERS noise management plan and the Environmental noise report (Lloyd George, 2017) will be followed to ensure no exceedances are seen throughout the duration of the project. The TIA completed by Shawmac presented data supporting the compliance of the project with Austroads Guidelines, as well as the suitability of Walyunga Road and GNH in regard to carting materials. The roads were found suitable in all accounts. The driveway will be constructed in a way to ensure compliant line of site for trucks entering and leaving the site.

A progressive rehabilitation program is proposed for the site as the resources (sand and clay) are removed over the life time of the project. Brikmakers intends to rehabilitate the site with clean fill material and aggregate products (sourced from a DWER licensed facility), with the objective of creating landforms similar to those of the pre-excavation.

It is in the opinion of SERS, in consultation of Brikmakers, that with the above management plans risks associated with the proposed project will not cause harm to its surrounding environment.

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END OF REPORT

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