EXCAVATION – REHABILITATION MANAGEMENT PLAN

GRAVEL EXTRACTION

LOT 7 TOY ROAD, BINDOON

BINDOON HILL GRAVEL SUPPLY
(operated by Hall-Grav Pty Ltd)

SHIRE OF CHITTERING

MARCH 2022

Bindoon Hill Gravel Supply

The Development Application and application for Extractive Industry Licence is made by J Dwyer the land owner

Mr J Dwyer
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Bindoon, WA 6502
Phone 0427 962 031
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The pit is operated by;

Bindoon Hill Gravel Supply as the Trading name of
C/- HALL GRAV PTY LTD

PO Box 96 Muchea WA 6501
Phone 8571 4362
hall_all2@bigpond.com

Prepared by

Landform Research

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Summary

J Dwyer is applying for renewal of Planning Consent and Extractive Industries Licence for the taking of laterite gravel from the eastern part of Lot 7 Toy Road Bindoon. Hall-grav Pty Ltd, operate Bindoon Hill Gravel Supply, on behalf of J Dwyer.

The Shire of Chittering Town Planning Scheme 6, Agricultural Resource Zone has the objective of allowing for the extraction of basic raw materials as well as providing for environmental protection and agricultural production. The proposal has been designed to comply with the objectives of the zone.

The soils are to be reconstructed to enable the agricultural areas to be retained and not lost from production at the completion of extraction, with the soils to be improved.

The area of the existing approval is approximately 39.3 hectares which is unchanged. However in order to protect this valuable basic raw material the eastern future excavation area of 19.2 hectares is added to the application, to provide planning protection by way of nomination on approved plans.

Clearing Permit CPS 5843/3 is current until 1 February 2029. The length of term of the permit was extended to 2029 in 2020.

The portion of land lies in the east of Lot 7, adjacent to Great Northern Highway, with a bitumen crossover and access to Great Northern Highway already constructed to Main Roads standard and approved by them.

The quarry is used to extract and manufacture road making materials such as natural gravel and laterite duricrust and manufactured gravel for local Government, Main Roads and public construction.

The proposal has been designed to comply with Section 5.16 of the Town Planning Scheme which provides for the extraction of materials, provided adequate buffers and environmental management are in place. The quarry is listed as a Gravel Resource in Figure 9 of the Shire of Chittering Local Planning Strategy.

The site lies within Special Control Area 6.2 Landscape Protection Area (See 6.2 Aesthetics) and has been designed to comply with this policy with the operations unlikely to be seen from outside Lot 7 or from local roads. The proposed quarry renewal complies with the aims of 7.3 Landscape Protection of the Local Planning Strategy.

The quarry is compatible with the Shire of Chittering Local Planning Strategy settlement patterns and does not lie within a nominated settlement area.

The soils are to be remanufactured in compliance with the Local Planning Strategy 7.2, to enable the agricultural areas to be retained and not lost from production.

The site is cleared broad acre farmland used for cropping and grazing. Clumps of Jarrah and Marri trees occur on site. Most of the resource can be taken without a Clearing Permit, but where trees are to be taken these will require a Clearing Permit which is in place under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*,

The existing approval is for 20 metres setbacks along internal boundaries. Since the current approval the Shire of Chittering Local Law has introduced a 50 metre boundary setback relating to Extractive Industry Licensing. That setback can be varied and it is requested that the 20 metre setback to adjoining properties be maintained and extended to the east.

From aerial photography there are no dwellings at distances less than 500 metres.

A licence for crushing and screening of materials has been approved by the DWER. DWER Licence L8530/2011/1, DWER File Number 2012/384-1, held by Hall-Grav Pty Ltd.

It is expected that up to 100,000 tonnes of crushed products and gravel will be removed each year.

It is possible that if large contracts are won, such as for Main Roads, that gravel will be able to be supplied to Main Roads for the Bindoon Bypass.

With an anticipated 100,000 tonnes of gravel anticipated to be produced per year, (excluding supply to the Bindoon Bypass), and say an average of 30 tonnes per truck, that amounts to around 11 laden truck movements per day over a 300 day operating year. With larger trucks and an average load of say 40 tonnes, the number of laden truck movements drops down to around 8 per day.

Topsoil and overburden will be removed and stored separately in bunds to improve visual screening. Both the gravel and the underlying laterite/duricrust will be excavated, with the ferricrete being crushed by portable crushing equipment located on the floor of the excavation.

There will need to be at least 6 – 8 hectares open at any one time for stockpiles, processing and active excavation. The amount of active excavation is dependant on the volumes of gravel required for sales and is normally less than 4 hectares.

Following excavation, the surface will be re-contoured to match the existing land surface, and then seeded with pasture species. Revegetation of the land surface will be progressively undertaken. Clumps of local native trees in parkland pasture and cropping will be returned.

Extraction, processing and carting will be restricted to 6.00 am to 6.00 pm Monday to Saturday. There will be no work on Sundays or Public Holidays.

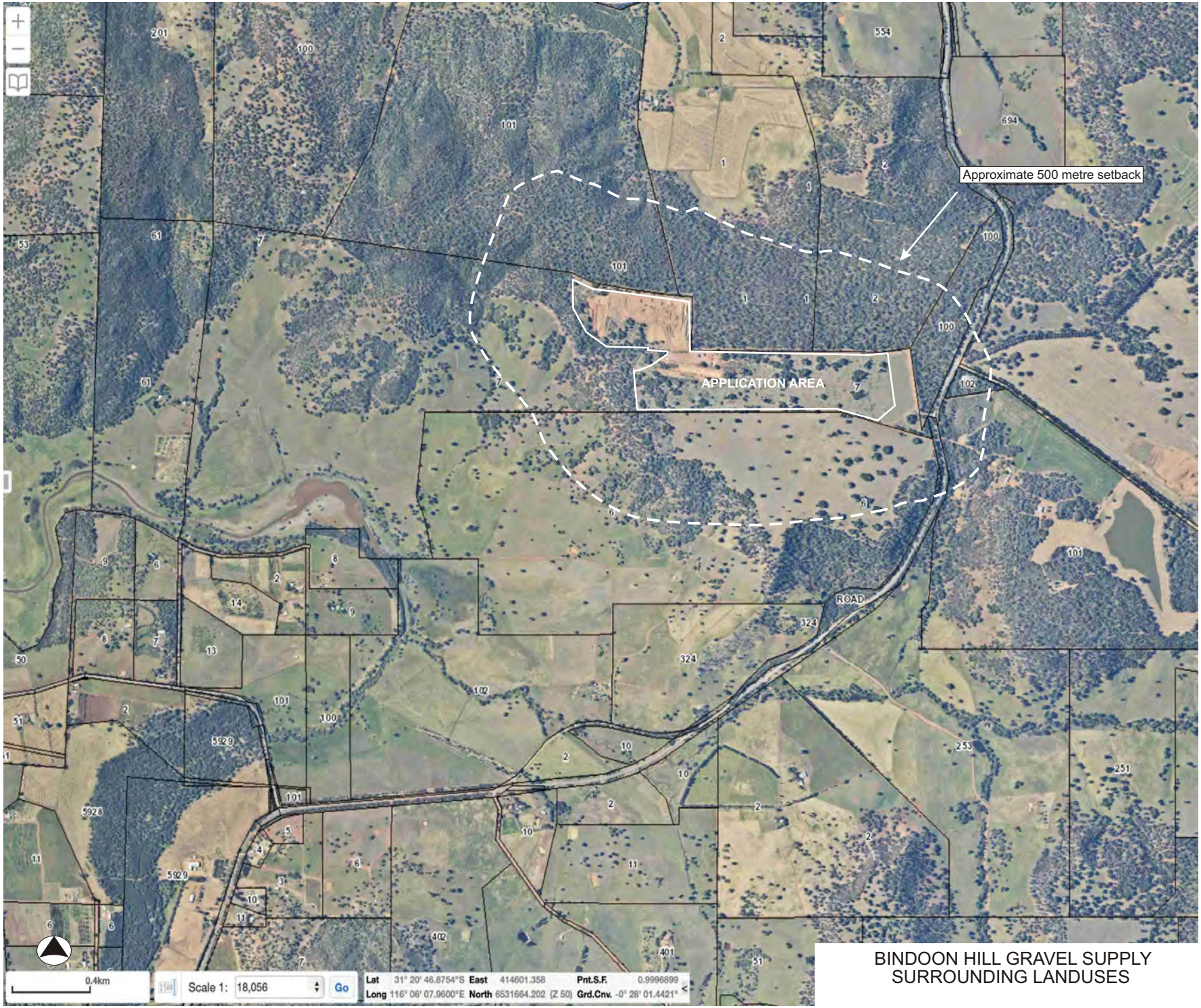
Safety of the excavation and processing will be to *Mines Safety and Inspection Act 1994*.
A Development Approval and Extractive Industries Licence is sought for twenty (20) years. That will provide protection of the resource from a planning perspective.

If required the Extractive Industry Licence can be issued for a shorter time frame and combined with annual reporting. The DWER Licence will provide control of the environmental and operational factors during the life of the quarry.

PROJECT SUMMARY

ASPECT	PROPOSAL CHARACTERISTIC	COMPARISON WITH CURRENT APPROVAL
EXCAVATION		
Total area of excavation applied for, including the land already open	39.3 hectares (approx.)	No change to the current approval of 39.3 hectares. Addition of 19.2 hectares of eastern resource to provide planning protection of this significant laterite gravel resource.
Resources	Finer surface laterite gravel over deeper heavy duricrust which requires crushing and screening.	No change
Rate of excavation based on average anticipated volumes.	Dependent on contracts and whether supply will be made to the Bindoon Bypass. 100,000 tonnes laterite gravel per year without Main Roads requirements for the Bindoon Bypass which will be additional.	No change.
Ground open at any one time	6 – 8 hectares including 4 hectares of active excavation.	No change
Depth of excavation	2 – 4 metres with minor deeper areas in the north western corner.	No change
Life of project	20 plus years	No change
Clearing	Clearing Permit CPS 5843/3 current until 1 February 2029.	No change
Area mined per year	Variable. Depends on contracts. To extract 100,000 tonnes of gravel will require 2 - 4 hectares of resource.	No change
Dewatering requirements	None required Water collecting in the pit is retained in the pit.	No change
Depth of excavations	2 - 4 metres with small pockets in the north eastern corner of deeper resource.	No change
Buffers and setbacks	Complies with the buffer setback guidelines. The excavation is located over 750 metres from the closest sensitive premises to the south. Other buffer distances are 1000 metres and potentially down to 600 metres across Great Northern Highway for a dwelling to the west, and 950 metres for a dwelling to the north and 1400 metres for a dwelling to the north north west.	No change
PROCESSING		
Crushing and screening	Located on floor of pit.	No change
Stockpiles	Located on floor of pit where possible or in a dedicated stockpile area.	No change

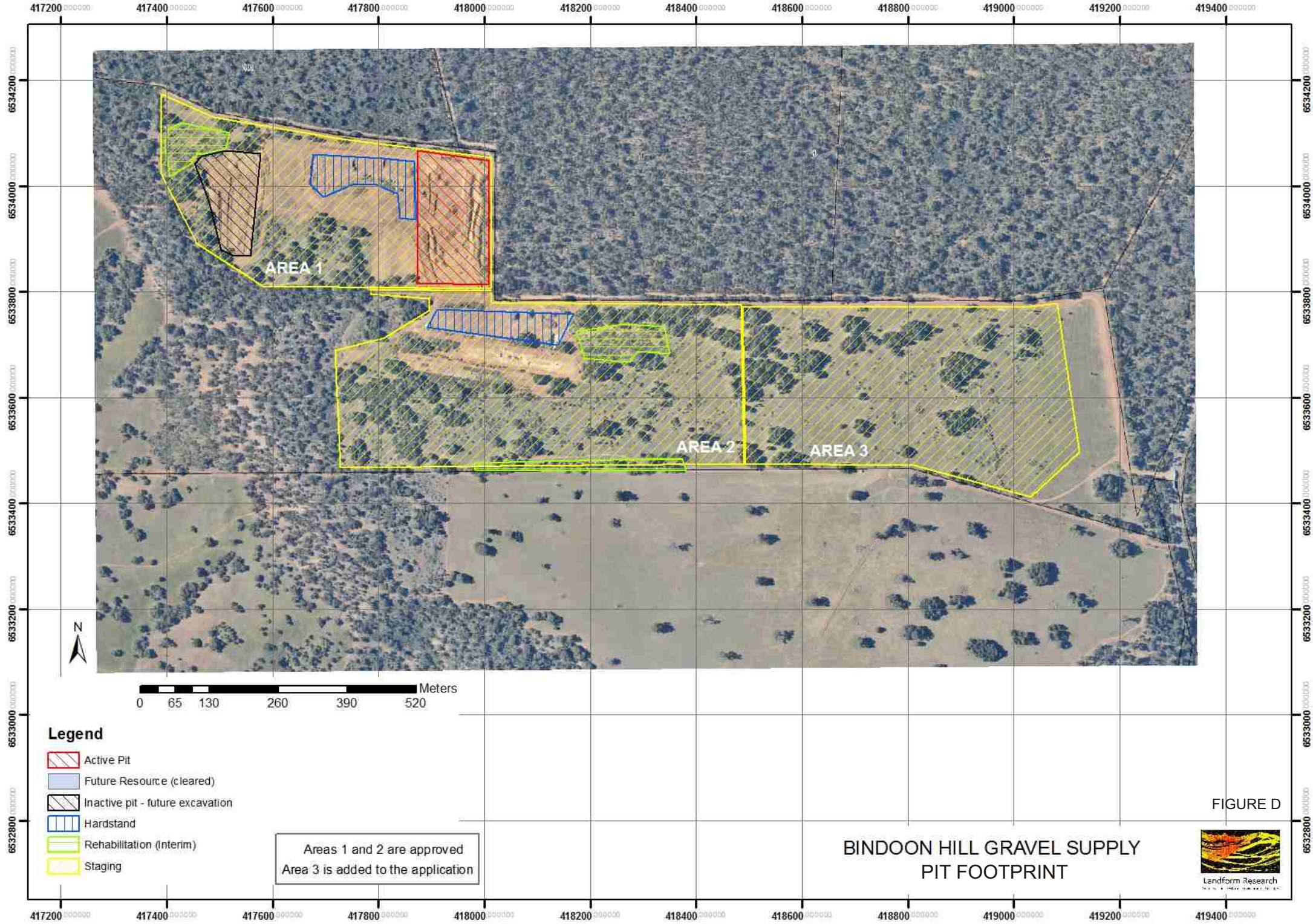
Water requirements	30 kL approx, per day in dry conditions, for an anticipated 200 work days when soils, gravel and road are potentially dry.	No change
Water supply source	Supplied from farm dams or brought to site as required in tanker trucks.	No change
INFRASTRUCTURE		
Total area of plant and stock	Located within laterite gravel pit.	No change
Site structures	Storage container and lunchroom plus serviced portable toilet system.	No change
Fuel storage	Mobile refueling with small approved double skinned onsite storage used for large contracts.	No change
TRANSPORT		
Truck movements	Variable but average 6 – 11 laden truck movements per day entering directly to Great Northern Highway.	No change
Access	Existing access road to Great Northern Highway approved by Main Roads.	No change
WORKFORCE		
Construction	Mobile operation with no specific construction.	No change
Staff	2 – 4 persons	No change
Hours of operation	Hours of operation, will be 6.00 am to 6.00 pm Monday to Friday inclusive, and 6.00 am to 1.00 pm Saturday, excluding Public Holidays and Sundays.	No change



BINDOON HILL GRAVEL SUPPLY
SURROUNDING LANDUSES

Landform Research

FIGURE A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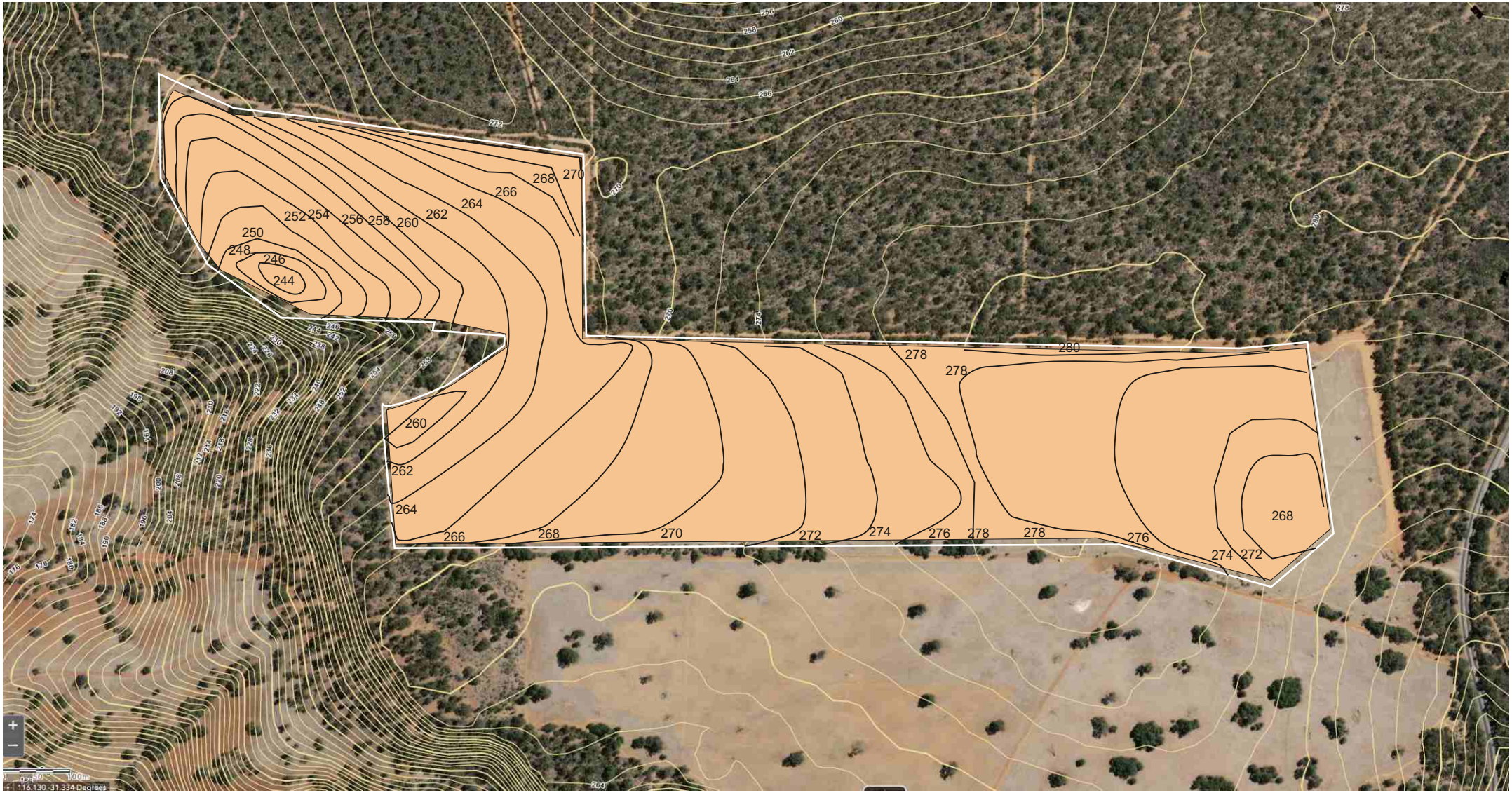
AREA 1
AREA 2
AREA 3
N
0
65
130
260
390
520
Meters
Legend
Active Pit
Future Resource (cleared)
Inactive pit - future excavation
Hardstand
Rehabilitation (Interim)
Staging
Areas 1 and 2 are approved
Area 3 is added to the application
FIGURE D
BINDOON HILL GRAVEL SUPPLY
PIT FOOTPRINT
Landform Research

BINDOON HILL GRAVEL SUPPLY
PRE EXCAVATION CONTOUR PLAN

Landform Research

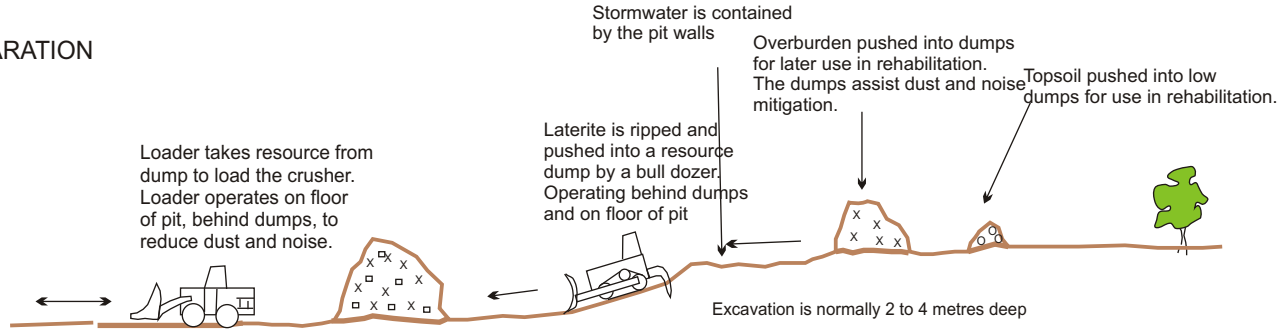
FIGURE B



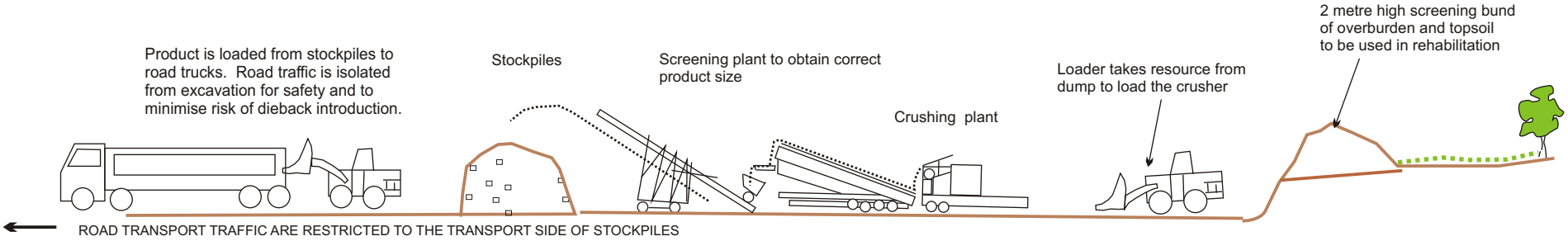
BINDOON HILL GRAVEL SUPPLY
CONCEPT FINAL CONTOUR PLAN

FIGURE C

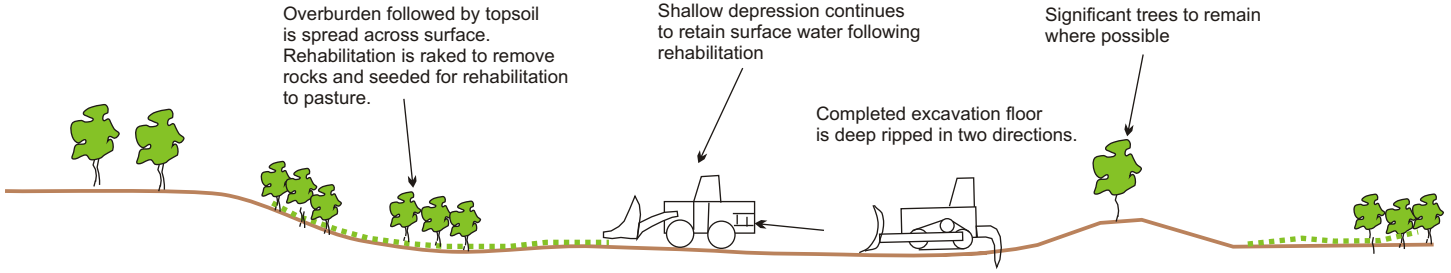
RESOURCE PREPARATION



PROCESSING



LAND RESTORATION AND REHABILITATION



Landform Research

BINDOON HILL GRAVEL SUPPLY
LOT 7 TOY ROAD, BINDOON

CONCEPT EXTRACTION AND REHABILITATION

FIGURE E

Environmental Factor - Objective	Generic Potential Environmental Checklist	Unmanaged Risk			Discussion and Proposed Management	References	Managed Risk		
		Likelihood	Consequence	Risk			Likelihood	Consequence	Risk
FLORA and VEGETATION To maintain representation, diversity, viability and ecological function at the species, population and community level.	Vegetation communities and/or biodiversity may be significantly impacted by clearing, weeds and dieback.	E	1	Low	The site is cleared, with scattered clumps of regrowth *Eucalyptus calophylla*. A small zone of regrowth *Eucalyptus marginata* occurs. The only understorey was occasional *Acacia pulchella* in one small area in the west of site. This vegetation contained scattered *Hibbertia rupicola*. *Acacia saligna* growth has occurred in the west, after having been planted as a stock feed to provide feed during times of low pasture resources. It is now self seeding in other locations and has been temporarily retained as a perennial cattle stock feed. The remainder of the site has no remnant native understorey species. Clearing Permit CPS 5843/3 is current until 1 February 2029 having been extended in 2020.	No changes to the operations on the currently approved 39.3 hectares are proposed. An additional area of resource (19.2 hectares) is added.	E	1	Low
	Threatened Communities may be impacted.	E	1	Low	None recorded.		E	1	Low
	Priority species may be affected by clearing, disturbance, weeds, dieback and other impacts.	E	1	Low	None recorded.		E	1	Low
	Threatened Species may be impacted by excavation and inadvertent impacts.	E	1	Low	None recorded.		E	1	Low
	Weeds may become established and impact on the local and on site	C	2	Med	A weed management program is in place and will be used in conjunction with normal farm management	Weed Management Plan Section 6.6	C	1	Low

	biodiversity, and revegetation.								
	Dieback disease may be present and impact on the local and on onsite and adjoining vegetation.	C	2	Med	A Dieback Management Plan is in place The site has few plants that are susceptible to or can sustain dieback, therefore its presence is unlikely even though the land is used for agricultural purposes.	Dieback Management Plan Section 6.7	C	1	Low
	The development and excavation may fragment communities, biodiversity and ecological linkages.	E	1	Low	The site is parkland pasture and does not form a natural linkage. The linkages are to the north and west of the extraction area		E	1	Low

Environmental Factor - Objective	Generic Potential Environmental Checklist	Unmanaged Risk			Proposed Management	References	Managed Risk		
		Likelihood	Consequence	Risk			Likelihood	Consequence	Risk
TERRESTRIAL FAUNA To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.	Communities and fauna and/or biodiversity may be significantly impacted by clearing, weeds and dieback.	E	1	Low	The site is a parkland pasture, with isolated to scattered, mainly Marri and some Jarrah, trees and planted and self seeding *Acacia saligna*. There are no native species in the ground cover, which is comprised of pasture species.	No changes to the operations on the currently approved 39.3 hectares are proposed. An additional area of resource (19.2 hectares) is added.	E	1	Low
	Threatened Faunal Communities may be impacted by inadvertent impacts.	E	1	Low	No Threatened Communities occur on site.		E	1	Low
	Priority Fauna species may be affected by clearing, disturbance, weeds	E	1	Low	There are no Priority Fauna Communities on site.		E	1	Low
	Threatened Fauna Species may be impacted by inadvertent impacts.	E	1	Low	The trees are likely to be visited by Black Cockatoos. This has been assessed through Clearing Permit CPS 5843/3 with large habitat trees that may contain hollows excluded from excavation. Where possible large trees will be retained. Additional tree planting has been provided and when excavated areas are completed parkland pasture will be re-established.	No changes to the operations on the currently approved 39.3 hectares are proposed. An additional area of resource (19.2 hectares) is added.	E	1	Low
SUBTERRANEAN FAUNA To maintain	The development may have an impact on an isolated	E	1	Low	The site is laterite gravel with no subterranean cavities. Small cavities and voids do occur within the duricrust, but the laterite duricrust is so widespread and adjoining		E	1	Low

representation, diversity, viability and ecological function at the species, population and assemblage level.	population of subterranean fauna or short rang terrestrial species.				that there are not likely to be any impacts on short range terrestrial species. Excavation is relatively slow at one or two hectares per year.				

Environmental Factor - Objective	Generic Potential Environmental Checklist	Unmanaged Risk			Proposed Management	References	Managed Risk		
		Likelihood	Consequence	Risk			Likelihood	Consequence	Risk
LANDFORMS To maintain the variety, integrity, ecological functions and environmental values of landforms and soils.	The local landform may be altered to a form that is not compatible with the surrounding geomorphology.	D	2	Low	The site will only be lowered by around 2 metres and the landform will not be altered. The edge of the plateau will not be impacted as the excavations are set back from the breakaway.	No changes to the operations are proposed.	D	2	Low
	The final land surface should be fit for its required end use.	E	1	Low	The end use will continued to be parkland pasture.	No changes to the operations are proposed.	E	1	Low
	The development and final landform may lead to significant visual impacts.	D	2	Low	There will be no visual impact during extraction from outside the property to the east west or south. The dense vegetation along the northern boundary provides visual protection from that direction. At the end of excavation the visual landscape will be returned to a form similar the pre-mined condition. Visual management is in place.	No changes to the operations are proposed. Section 6.1	D	2	Low
	The final landform and soils may be subject to erosion by wind, water or other processes.	C	1	Low	The gravel excavation operations are designed to minimise erosion and dust. Drainage is internal into the pit, with no release of surface water.	No changes to the operations are proposed. Section 7.0 Rehabilitation	D	2	Low
	Acid soils may be exposed or require management to ensure that there are no long term adverse effects.	E	1	Low	Not present	Section 4.4 Acid Sulfate.	E	1	Low

Environmental Factor - Objective	Generic Potential Environmental Checklist	Unmanaged Risk			Proposed Management	References	Managed Risk		
		Likelihood	Consequence	Risk			Likelihood	Consequence	Risk
HYDRO - GEOLOGICAL PROCESSES To maintain the hydrological regimes of groundwater and surface water so that existing and potential uses, including ecosystem maintenance, are protected.	The ecological functions of watercourses may be impacted.	E	1	Low	Drainage will continue to be internal with no release of surface water. There are no on site or nearby watercourses. The closest waterway is the Brockman River. 1.6 km to the south. No water from the operations flows to or could potentially flow to the Brockman River	No changes to the operations are proposed. Section 4.5 Hydrogeology	E	1	Low
	Groundwater may be impacted by changes to recharge, over-pumping, alterations to flow paths or lead to significant evaporation and water loss.	D	1	Low	The operations are based on elevated laterite gravel profile. The water table is deep, well below the base of the pit with a separation to the water table of 18 - 21 metres. All water is e retained on site in the base of the pit.	No changes to the operations are proposed. Section 4.5 Hydrogeology	E	1	Low
	Wetlands may be altered by draining or flooding, potentially changing their ecological functions and biodiversity.	E	1	Low	There are no local wetlands on the resource areas.	No changes to the operations are proposed.	E	1	Low
WATER QUALITY To maintain the quality of groundwater and	Hydrocarbons, fuels and other chemicals may be stored in a manner	C	2	Med	The methods of extraction and management will not change. There will be no changes to the scale and intensity of the operations of the last 20 years. Fuel and hydrocarbon management programs are in	No changes to the operations are proposed. Section 6.4 Water	D	2	Low

surface water, sediment and biota so that the environmental values, both ecological and social, are protected.	that they pose no risk to the environment.				place. Fuel is not normally stored on site but will be retained when supplying large contracts. Fuel storage when used will be within approved double skinned mobile tanks.	Management Section 5.4			
	Runoff from operations may contain sediment and deleterious materials.	E	1	Low	All water is to be retained on site in the base of the pit.	No changes to the operations are proposed. Section 6.4 Water Management and 7.0 Rehabilitation	E	1	Low
	Water quality during and after development and operations may be adversely affected or altered.	D	2	Low	All water is to be retained on site in the base of the pit.	No changes to the operations are proposed. Section 6.4 Water Management and 7.0 Rehabilitation	D	2	Low

Environmental Factor - Objective	Generic Potential Environmental Checklist	Unmanaged Risk			Proposed Management	References	Managed Risk		
		Likelihood	Consequence	Risk			Likelihood	Consequence	Risk
OFFSITE EMISSIONS To maintain representation, diversity, viability and ecological function at the species, population and community level.	Dust emissions may cause changes to the local amenity.	C	2	Med	There are no changes to the footprint of the gravel quarry. However an additional 19.2 hectare eastern area is proposed to secure the significant resource from future planning impacts. The methods of extraction and management will not change. There will be no changes to the scale and intensity of the operations of the last 20 years. The maximum tonnages to be extracted remain at 100,000 tonnes. The excavation is located over 750 metres from the closest sensitive premises to the south. Other buffer distances are 1000 metres and potentially down to 600 metres across Great Northern Highway for a dwelling to the west, and 950 metres for a dwelling to the north and 1400 metres for a dwelling to the north north west. The site complies with the EPA Generic Buffer distances for low impact quarries when adequately managed.	No changes to the operations are proposed Section 5.3	D	2	Low
	Dust emissions will not significantly impact on local and on site personnel health or quality of life.	E	1	Low	The methods of extraction and management will not change. There will be no changes to the scale and intensity of the operations of the last 20 years. The maximum tonnages to be extracted remain at 100,000 tonnes.		E	1	Low
	Noise levels may not comply with the *Environmental Protection (Noise)*	D	2	Low	There are no changes to the footprint of the gravel quarry. However an additional 19.2 hectare eastern area is proposed to secure the significant resource from	No changes to the operations are proposed	E	1	Low

	Regulations 1997.				future planning impacts. The methods of extraction and management will not change. There will be no changes to the scale and intensity of the operations of the last 20 years. The maximum tonnages to be extracted remain at 100,000 tonnes. The excavation is located over 750 metres from the closest sensitive premises to the south. Other buffer distances are 1000 metres and potentially down to 600 metres across Great Northern Highway for a dwelling to the west, and 950 metres for a dwelling to the north and 1400 metres for a dwelling to the north north west. The site complies with the EPA Generic Buffer distances for low impact quarries when adequately managed. The site complies with the EPA Generic Buffer distances for low impact quarries when adequately managed. Noise bunding is used with the pit worked from the floor. Noise levels are managed to comply with the Regulations.	Section 5.2			
	Noise levels may impact site personnel health and safety.	C	2	Med	The operations are designed to minimise on site noise and the potential for offsite noise. Occupational Health and safety requirements are currently met and are covered by the *Mines Safety and Inspection Act 1994* which is overseen by DMIRS.	No changes to the operations are proposed.	D	2	Low
	Emissions and gases may reduce the local amenity.	D	2	Low	There are no gaseous or other potential harmful emissions from the operations. The only emissions will be from vehicles. Great northern Highway lies to the east. The methods of extraction and management will not change. There will be no changes to the scale and intensity of the operations of the last 20 years. The maximum tonnages to be extracted remain at 100,000 tonnes.	No changes to the operations are proposed.	D	2	Low

	Potential impacts from blasting may occur. *Environmental Protection (Noise) Regulations 1997* and guidelines for ground vibration.			NA	There is no blasting.	No changes to the operations are proposed.			NA
	Greenhouse gas emissions may be excessive.	E	1	Low	The gravel extraction is located strategically next to Great Northern Highway to minimise additional generation of greenhouse gases. The product is required for local road constructions so maintaining short transport distances is desirable. This pit serves the local area. Plant is maintained in good working order, with newer more efficient plant purchased or used where applicable. Machines and plant are shut down when not in use.	No changes to the operations are proposed.	E	1	Low

Environmental Factor - Objective	**Generic Potential Environmental Checklist**	**Unmanaged Risk**			**Proposed Management**	**References**	**Managed Risk**		
		Likelihood	**Consequence**	**Risk**			**Likelihood**	**Consequence**	**Risk**
HERITAGE Known heritage sites will be protected.	Known aboriginal heritage sites may be present.	E	1	Low	No archaeological or ethnographic sites are known from or recorded on Department of Planning, Land and Heritage databases. Aboriginal sites are not likely because of the elevated position, lack of significant features and distance to watercourses and fresh water.		E	1	Low
	Sites of European heritage may be present.			NA	None known				NA

	Heritage sites may be uncovered during operations. will be independently assessed and managed through communication with the community, Government and traditional owners.	E	1	Low	If heritage sites are uncovered during operations, operations in that part of the site will be placed on hold until an independent assessment has been carried out and communication with the community, Government and traditional owners is made.	Section 2.5 Heritage	E	1	Low

Environmental Factor - Objective	Generic Potential Environmental Checklist	Unmanaged Risk			Proposed Management	References	Managed Risk		
		Likelihood	Consequence	Risk			Likelihood	Consequence	Risk
SOCIAL and HEALTH To minimise the impact on the local community	Human health and amenity may be adversely affected from dust, noise, other emissions and chemicals.	E	1	Low	Gravels such as this carry no known health impacts.	No changes to the operations are proposed.	E	1	Low
	Transport may impact on local, and regional roads or school bus routes.	E	1	Low	Transport will be directly to Great Northern Highway. The methods of extraction and management will not change. There will be no changes to the scale and intensity of the operations of the last 20 years. The maximum tonnages to be extracted remain at 100,000 tonnes.	No changes to the operations are proposed.	E	1	Low
	The operations may impact the local visual amenity.	E	1	Low	There are no changes to the footprint of the gravel quarry. However an additional 19.2 hectare eastern area is proposed to secure the significant resource from future planning impacts. The excavation is located over 750 metres from the closest sensitive premises to the south. Other buffer distances are 1000 metres and potentially down to 600 metres across Great Northern Highway for a dwelling to the west, and 950 metres for a dwelling to the north and 1400 metres for a dwelling to the north north west. The site complies with the EPA Generic Buffer distances for low impact quarries when adequately managed. The Shire of Chittering Local Law 2014 – Extractive Industries specifies the guidance for a 50 metre setback to the property boundaries. (Local Law Part 6	Section 5.1	E	1	Low

					Section 6.1). The 50 metre setback is capable of being amended by the Shire if they choose to do so as noted in Section 6.1, "Subject to any licence conditions imposed by the local Government , a person must not excavate within …..". Such a variation would prevail over the generic setbacks. • The approved excavation from 2000 has at all times had boundary setbacks of 20 metres. • The reasons for continuing the 20 metre boundary setbacks for the renewal of the Development Approval/Extractive Industries Licence are; • The long history of a 20 metre setback of 22 years. • If the 50 metre requirement of Section 6.1 (a) is applied, a substantial amount of resource will be excluded. • The closest dwelling to the boundary is 750 metres south.				

Environmental Factor - Objective	Generic Potential Environmental Checklist	Unmanaged Risk			Proposed Management	References	Managed Risk		
		Likelihood	Consequence	Risk			Likelihood	Consequence	Risk
CLOSURE AND REHABILITATION To ensure that premises are closed, decommissioned and rehabilitated in an ecologically sustainable manner, consistent with agreed outcomes and land uses, and without unacceptable liability to the State	Constructed soils should meet the term end use and long term ecological values.	C	2	Med	A void is to be retained at the end of excavation and reformed to a swale in the landscape at a depth of 2 metres lower than the pre-mine condition. Rehabilitation will be directed towards the final end land use of a return to parkland pasture and productive agricultural land. Topsoil will be transferred directly from an area being cleared and spread across the surface of the areas to be rehabilitated If direct transfer is not possible, any material stored in dumps will be respread.	Section 6.0	D	2	Low
	All infrastructure, roads, hardstand, non natural materials may be left on site.	C	2	Med	All non natural materials not required for future agricultural purposes will be removed from site. This is committed to and used by Hall-Grav Pty Ltd.	Section 5.4	D	2	Low
	Materials that may cause long term detrimental outcomes in terms of impacts to soils, water, heritage, vegetation health or other factors may not be removed.	C	2	Med	All non natural materials not required for future agricultural purposes will be removed from site. This is committed to and used by Hall-Grav Pty Ltd.	Section 5.4	D	2	Low
	Contaminated materials or soils may not be removed.	C	2	Med	All contaminated materials are to be removed from site prior to closure.	Sections 5.4 and 6.0	D	2	Low

Environmental Factor - Objective	Generic Potential Environmental Checklist	Unmanaged Risk			Proposed Management	References	Managed Risk		
		Likelihood	Consequence	Risk			Likelihood	Consequence	Risk
RESOURCE REQUIREMENTS Basic Raw Materials are required for continued use by the community and for future developments.	There is significant basic raw material on site that is suitable for community resources.			NA	The gravel extraction is located strategically next to Great Northern Highway to minimise the generation of greenhouse gases.	Figure 1			NA

Environmental Factor - Objective	Generic Potential Environmental Checklist	Unmanaged Risk			Proposed Management	References	Managed Risk		
		Likelihood	Consequence	Risk			Likelihood	Consequence	Risk
COMMUNITY CONSULTATION To provide a community consultation process commensurate with the size nature and time line of the project.	The proposal will be advertised and the nearby people will be able to comment.			NA	The Shire of Chittering will advertise for the renewal of planning consent for continuation of gravel extraction.				NA
	A complaints and improvements procedure will assist management of the site.			NA	An ongoing complaints program is in place	Complaints Procedure contained in Section 5.3			NA

Environmental Factor - Objective	Generic Potential Environmental Checklist	Unmanaged Risk			Proposed Management	References	Managed Risk		
		Likelihood	Consequence	Risk			Likelihood	Consequence	Risk
PLANNING COMPLIANCE To comply with Government Policy, planning zones and procedures.	The project is designed to comply with State and Local Planning requirements.	E	2	Low	The project is designed to comply with State and Local Planning requirements in particular SPP 2.5. The Land zoning is "Agricultural Resource". The zoning lists basic raw materials within the objectives of the zone. State Planning Policy 2.5 (SPP 2.5) requires basic raw materials to be identified, protected, used in a staged manner and not impinged by competing land uses. SPP 2.5 prevails over the Town Planning Scheme, which should reflect the intent of the State Planning Policy. Complies with Town Planning Scheme 6 and the Extractive Industries Local Law with a minor modification to enable a consistent land surface to be created at the end of excavation.	Sections 2.2 and 2.3 Land Zonings and Policies	E	2	Low
	The area of potential impacts may be large enough to significantly impact on essential or desirable land uses.	E	2	Low	The disturbance footprint will be small and low impact with a return to productive pasture. The excavation will lead to reconstructed soils of better agricultural quality.		E	2	Low
	The development may adversely impact on an area identified as having high agricultural or community values.	E	1	Low	The disturbance footprint will be small and low impact with a return to productive pasture. The excavation will lead to reconstructed soils of better agricultural quality.		E	1	Low

Environmental Factor - Objective	Generic Potential Environmental Checklist	Unmanaged Risk			Proposed Management	References	Managed Risk		
		Likelihood	Consequence	Risk			Likelihood	Consequence	Risk
SAFETY To ensure that the project provides high levels of safety to on site personnel and the community	The project should provides high levels of safety to on site personnel.	C	2	Med	The operations are designed to comply and operate to the *Mines Safety and Inspection Act 1994.* The operations are registered under the Department of Mines Industry Regulation and Safety, SRS system. A Fire Management Plan is in place in combination with normal farm fire management.		D	2	Low
	Potential impacts are retained on site and do not cause significant risk of safety to the local and wider community.	D	2	Low	Transport is unchanged as directly to Great Northern Highway. The site is fenced and installed with locked gates.		D	2	Low
	Transport along public roads is to be conducted in a safe manner.	E	1	Low	Transport is unchanged as directly to Great Northern Highway. The site is fenced and installed with locked gates. The crossover and access is sealed and was constructed by Main Roads.		E	1	Low

Environmental Factor - Objective	Generic Potential Environmental Checklist	Unmanaged Risk			Proposed Management	References	Managed Risk		
		Likelihood	Consequence	Risk			Likelihood	Consequence	Risk
GEOTECHNICS To ensure that all ground and geological materials is safe commensurate with the operations and final land surface.	The operational and final land surfaces will be made safe and not subject to subsidence, slippage or other adverse conditions.	C	2	Med	The end use is a gentle swale only 2 metres deep, and a return to pasture and productive land. Managed by DMIRS under the *Mines Safety and Inspection Act 1994.*		D	2	Low
	The quarry and operations will comply with the *Mines Safety and Inspection Act 1994.*	C	2	Med	Hall-Grav Pty Ltd, the operator, is committed to complying with the relevant Acts and Regulations. Managed by DMIRS under the *Mines Safety and Inspection Act 1994.*		D	2	Low
	The operational and final surfaces and features are designed to be not affected by extreme climate events.	E	1	Low	The end use is a gentle swale and a return to pasture and productive land. There will be no alteration to drainage or other local landforms.		E	1	Low

RISK MATRIX

			Effect / Consequence				
			1	2	3	4	5
Type			Insignificant	Minor	Moderate	Major	Severe
Environmental Impact			No discernible, adverse impact, individuals of species may be affected locally.	Discernible effect on the environment but no adverse impact, minor number of individuals of species may be affected locally	Minor adverse effect to the environment (including public amenity), moderate loss of individuals of species locally.	Moderate damage to ecosystem function, major loss of individuals of species locally, loss of public amenity.	Significant long-term damage/loss to ecosystem function, extinction of a species locally
Likelihood	A Almost Certain	Likely that the unwanted event could occur often (once per week) during the life of an individual item or system	Medium **11**	High **16**	High **20**	Very High **23**	Very High **25**
	B Likely	Likely that the unwanted event could occur several times per year during the life of an individual item or system.	Medium **7**	Medium **12**	High **17**	High **21**	Very High **24**
	C Possible	Likely that the unwanted event could occur sometime (once per year) during the life of an individual item or system.	Low **4**	Medium **8**	High **13**	High **18**	High **22**
	D Unlikely	Unlikely, but possible for the unwanted event to occur once in the life of an individual item or system.	Low **2**	Low **5**	Medium **9**	High **14**	High **19**
	E Rare	Highly unlikely that the unwanted event could ever occur in the life of an individual item or system.	Low **1**	Low **3**	Medium **6**	Medium **10**	High **15**

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1.0 INTRODUCTION

1.1 Proposal

Background

Planning Approval was originally granted by the Shire of Chittering in 2000 to J Dwyer, and a small gravel excavation opened in Stage 1. The 2000 approval was for both gravel and underlying clay. Clay extraction is not applied for.

The operation operates under the name Bindoon Hill Gravel Supply.

In 2006 an application for renewal of Planning Consent was refused by the Shire of Chittering but approved on appeal to the State Administrative tribunal for a period of 5 years.

The site is listed as Gravel Resource CH17 in *State Planning Policy No 2.4, Basic Raw Materials (2000).* This policy was reviewed by the Department of Mines Industry Regulation and Safety and the Department of Planning Land and Heritage in the revision to SPP 2.4 (2021) , and the site remains listed.

In 2011 a Licence under the *Environmental Protection Act 1986 (Part V)* was approved by the DWER. DWER Licence L8530/2011/1, DWER File Number 2012/384-1.

The Works Approval was appealed and after investigations conducted by the DWER and the Appeals Convenor, the Minister for the Environment dismissed the appeals on 19 August 2011.

In 2021 the operation of the pit was taken over by Hall-Grav Pty Ltd on behalf of Bindoon Hill Gravel Supply. The trading name Bindoon Hill Gravel Supply was transferred to Hall-Grav Pty Ltd.

A DWER Licence is in place L8748/2013/1 for 100,000 tonnes per year until 26 May 2022 and is in the process of being renewed. The DWER Licence is held by the operator Hall-Grav Pty Ltd.

The quarry will continue to provide a range of strategically placed road making and construction materials in the Bindoon Region that are used by local Authorities such as the Shire of Gingin, the Shire of Chittering and local residents.

Although there are other nearby quarries, having quarries operating north of Bindoon assists with competitive pricing.

Lot 7 is a farming property. The excavation site is predominantly cleared and rehabilitation is planned to return the site to productive pasture.

Rehabilitation is to progressively follow excavation.

1.2 Existing Approvals

There are no existing quarrying approvals on site.

- Development Approval Issued under the Shire of Chittering Town Planning Scheme expiring on 30 June 2022.

- Extractive Industry Licence issued by the Shire of Chittering under the Local Law expiring on 26 May 2022.

- DWER Licence L8530/2011/1, DEC File Number 2012/384-1 expiring on 26 May 2022. The Licence is in the process of being extended for a longer time frame.

- Clearing Permit CPS 5843/3 is current until 1 February 2029 having been extended in 2020.

- The cross over to Great Northern Highway was approved for truck transport of the product by Main Roads at the time of the first application for Development Approval.

1.3 Importance and Rationale

The importance of laterite gravel for local developments such as in the Shire of Chittering is recognised by the Western Australian Planning Commission in State Planning Policy 2.5, Rural Planning (2016) and SPP 2.4 (2021). Gravel is mainly used for road bases and construction.

Whilst gravel is common within the Shire of Chittering there are constraints on many of the resources from proximity to existing developments and conservation considerations.

The reality is that the gravel is only extracted for the community. If the community did not need the gravel there would be no extraction. Construction materials must be extracted where they are available for the wider community. In any area, construction materials and basic raw materials are exported and imported, because not all products occur locally and many are manufactured some distance away.

Whilst gravel might seem common, many resources have been sterilised by development, conservation of vegetation considerations, Local and State Government Policies and public intolerance. This can often be inadvertent or result from trying to establish a balance between the conflicting land uses. The Shire of Chittering has in place a Basic Raw Materials Policy which recognises the need for quarries such as this.

Not all gravel has the same characteristics and the best deposits are valuable community assets. The gravel on this site is a valuable community resource because it lies in an area where extraction is hidden from public roads and direct access to the Great Northern Highway is possible. The resource therefore has very high community value. It also is deep which minimises the area of disturbance to produce a nominated amount of material and the quality is highly suitable for road making.

The continued operation of the quarry will provide a strategic resource of road making material and construction materials, and ensure that Basic Raw Materials are utilised prior to sterilisation, in line with State Planning Policy No 2.4, Basic Raw Materials.

1.4 Requested Planning Approval

The proposal is seen as a temporary land use during which valuable basic raw materials are extracted and the land returned to productive pasture which will have the land capability improved.

The future gravel resources to the east are added to enable long term planning protection for that resource.

A Development Approval and Extractive Industries Licence is sought for twenty (20) years. That will provide protection of the resource from a planning perspective.

If required the Extractive Industry Licence can be issued for a shorter time frame and combined with annual reporting and the DWER Licence will provide control of the environmental and operational factors during the life of the quarry.

1.5 Proponent - Operator

The Applicant is the landholder Mr J Dwyer
71 Toy Road
Bindoon, WA 6502

The pit is operated by Bindoon Hill Gravel Supply the trading name of Hall Grav Pty Ltd.

Contact for the operator can be made through;

Manager
HALL-GRAV PTY LTD

PO Box 96 Muchea WA 6501
Phone 8571 4362
hall_all2@bigpond.com

1.6 Location and Ownership

The land is described as;

Table 1: Lot Details

LOT	ROAD	LOCATION	VOLUME	FOLIO	PLAN
7	Toy Road Bindoon		445	17A	7148
			388	18A	7148

Landholder and Applicant

Mr J Dwyer
71 Toy Road
Bindoon, WA 6502
Phone 0427 962 031
Email joc@bindoonhill.com.au

Lot 7 has two Certificates of Title generated by there being two owners with half shares previously. The current land holder owns both titles.

The land title was issued prior to 1899 and therefore Mineral rights can be held separately in the case of one aspect of the land title. Gravel for road construction is not classified as a mineral under the *Mining Act 1978* and therefore all rights to gravel are held by the current land owner J Dwyer. This was tested in the Supreme Court of Western Australia.

1.7 Description of the Resource

Laterite gravel is commonly used to describe the material extracted. Sometimes the term duricrust is used to describe the hard capping or hard pan at depth to the laterite. The term ferricrete is also used in a more scientific way to describe the material. In the literature, however, the terms are often used in place of each other.

Laterite (ferricrete) gravel and duricrust is associated with ancient erosion surfaces under which massive laterite cap rock developed. The duricrust is exposed as infrequent outcrops across the extraction area with a variable layer of overlying gravel.

The thickness of the duricrust is variable, normally 2.0 – 4.0 metres, overlain by laterite gravel of variable thickness with a deeper pocket in the north western corner.

Natural Gravel is extracted using a loader loading directly to a road truck. Sometimes a screen is used to prepare various grades of gravel.

Manufactured gravel/ferricrete is obtained by using a bulldozer and then crushing the underlying laterite duricrust with a mobile crusher and screening the products.

Crushed ferricrete is also superior to natural gravels because the particles are angular and bed down better than the rounded gravel particles. It is also superior because the manufacturing process is designed to mix the correct proportion of fines, gibbsite rich materials and clays to ensure Main Roads and other specifications for road making are exceeded. As ferricrete is manufactured from natural gravels and laterite, it is brown like the majority of the soils and local roads, and is therefore most suitable for country roads and road verges.

1.8 Aims of the Proposal

- Continue the supply of laterite gravel.
- Protect this valuable community basic raw material through the Planning Process.
- Maximise the use of basic raw materials in the local area, to enable greenhouse gases, transport, and other environmental issues associated with alternative resources, to be minimised.
- Help to keep the prices of local basic raw materials at the lowest possible levels, by maintaining small transport distances. This benefits the whole community.
- Comply with State Planning Policy No 2.5, Rural Planning (2016), and SPP 2.4 (2021) which aim to provide basic raw materials prior to sterilisation of the area by development.

- Supply gravel for the Bindoon Bypass.
- Comply with the Shire of Chittering Town Planning Scheme Agricultural Resource Zone; See 3.2 Land Zonings and Policies.
- Comply with Special Control Area 6.2 Landscape Protection Area (See 5.2 Aesthetics).

2.0 PLANNING ASSESSMENT

2.1 Current Land use

Lot 7 is a large a grazing property with the quarrying activities confined to the eastern portion of the property. Gravel extraction has occurred since 2000.

The resource lies on pasture and parkland pasture.

That land is too rough currently to provide good grazing. The excavation will tidy the site and reconstruct the soils for continued agricultural land uses.

2.2 State Government Policies

2.2.1 State Government Policies and Planning Schemes

State Planning Policy 1.0, State Planning Framework Policy

The State Planning Policy Framework provides for the implementation of a planning framework through the recognition and implementation of Regional Planning Policies above Local Planning Schemes and Policies.

Within each layer of planning there are a number of key policies and strategies to provide guidance to planning and development to enable sustainable communities to develop, expand and prosper without compromising the environment and future generations.

Planning is governed under the *Planning and Development Act 2005*. This Act enables Government to introduce State and Regional Planning Schemes, Policies and Strategies to provide direction for future planning. The State and Regional Schemes sit above Town Planning Schemes and Strategies introduced by Local Government.

Strategies and Policies provide guidance on how planning is to be undertaken and how proposed developments are to be considered. These Strategies and Policies are at the State, Regional and Local levels.

Schemes are gazetted documents that provide for consideration and approval of proposed developments. These are normally at the Regional and Local Level.

In addition to the documents produced under the *Planning and Development Act 2005*, the *Local Government Act 1995* provides Local Governments with a mechanism to prepare Local Laws to manage issues of local significance.

With respect to the supply of sand and gravel, the overarching document is the;
State Planning Policy 1.0 State Planning Framework.

A number of State Policies have been released under the State Planning Framework Policy.

State Planning Policy 2.0, Environment and Natural Resources Policy
State Planning Policy 2.4, Basic Raw Materials
State Planning Policy No 2.5, Agricultural and Rural Land Use Planning

State Planning Policy No 4.1, State Industrial Buffer Policy

These are considered in turn.

A number of other key State Government Policies are also relevant to the local regional planning such as the State Planning Strategy 2050 released in 2014.

State Planning Strategy, 2050 (2014)

State Planning Strategy 2050 comprises a range of strategies, actions, policies and plans to guide the planning and development of regional and local areas in Western Australia and assists in achieving a coordinated response to the planning challenges and issues of the future by State and Local Governments.

The approach in the strategy considers Basic Raw Materials as listed below.

Table 2: State Planning Strategy BRM Supply

ELEMENT	2050 OUTCOMES	MEASUREMENT	ASPIRATIONS
Basic raw material (BRM) supply	Accessible and affordable supplies of BRM are available close to demand	The cost of supplying basic raw materials to the building and construction industry	➢ Appropriate policies are in place to manage existing and future BRM supplies over the long term. ➢ BRM are optimally used for their highest purpose. ➢ The securing of BRM sites is managed through robust strategic sequential land use planning and development control prior to final land use ➢ Demand for BRM is partly managed through compact settlement structures that contain high-density built form.

The environmental management of the quarry has been developed to minimise short and long term impacts on the local community and environment.

The operations have been designed to continue to provide good environmental management that minimises environmental change and enables continued rural land uses.

State Planning Policy 2.0, Environment and Natural Resources Policy

This policy provides for the protection of all natural resources under a number of sections;

5.1 General Measures
5.2 Water Quality including stormwater and wetlands
5.3 Air Quality
5.4 Soil and Land Quality
5.5 Biodiversity
5.6 Agricultural Land and Rangelands
5.7 Minerals Petroleum and Basic Raw Materials
5.8 Marine Resources and Aquaculture

5.9 Landscape
5.10 Greenhouse Gas Emissions and Energy Efficiency.

In addition to recognising the importance of protecting air quality, soil and land quality, water and wetlands and landscapes, the importance of Basic Raw Materials to the community is identified with reference to *SPP 2.4 Basic Raw Materials*, *State Gravel Strategy 1998* and *State Lime Strategy 2001.* See Section 2.1 of this management plan.

Section 5.7 of SPP 2.0, deals with Minerals, Petroleum and Basic Raw Materials.

Part of Section 5.7 states;

> *Basic raw materials include sand, clay, hard rock, limestone and gravel together with other construction and road building requirements. A ready supply of basic raw materials close to development areas is required in order to keep down the cost of land development and the price of housing.*

Planning strategies, schemes and decision making should:

> *Identify and protect important basic raw materials and provide for their extraction and use in accordance with State Planning Policy No 10 (2.4); Basic Raw Materials.*
>
> *Support sequencing of uses where appropriate to maximise options and resultant benefits to community and the environment.*

The other factors of the natural environment are provided with the best protection possible, by this management plan, by selection of the site, operational staging and footprint and rehabilitation, bearing in mind the constraints of excavating and processing the resource.

State Planning Policy No 2.5, Rural Planning, 2016

SPP 2.5 Agricultural and Rural land Use Planning predominantly deals with the continued rural use of suitable land and its protection for the future. The policy was updated in December 2016 and provides strong measures to identify, protect and use basic raw materials.

SPP 2.5 does reiterate the need to protect and use basic raw materials, although SPP 2.4 (2021) is Statewide and now supersedes SPP 2.5 with respect to Basic Raw Materials.

Basic Raw Materials are included in the definitions as;

> *Sand (including silica sand), clay, hard rock, limestone (including metallurgical limestone), agricultural lime, gravel, gypsum, and other construction materials. The materials may be of State, regional or local significance depending on the resource location, size, relative scarcity, value and demand for the product.*

Amongst seeking to protect agricultural values, Policy Objective 4 (c) states

> *Outside the Perth and Peel Planning regions, secure significant basic raw material resources and provide for their extraction.*

Section 5.9 deals with Basic Raw Materials and seeks to achieve the following in an environmentally acceptable manner;

> *Protect the resources until the resource is extracted (5.9.a)*
>
> *Identify significant basic raw materials on sub-regional and local planning strategies, region and local planning schemes (5.9.b, 5.9.c, 5.9.d)*
>
> *The extraction of basic raw materials should not be generally prohibited (5.9.e)*
>
> *Provide for sequential land use (5.9.f)*
>
> *Limit sensitive land uses to locations demonstrated to not limit existing or potential extraction of basic raw materials (5.9.g)*
>
> *Provide for the consideration of native vegetation or significant biodiversity values and may require retention and protection of vegetation and environmental assets (5.9.h)*
>
> *Have regard for the potential impacts of fragmentation and connectivity of native vegetation (5.9.i)*
>
> *Maintain adequate buffers to protect water quality in public drinking water source areas (5.9j).*

SPP 2.5 also supports preventing conflicting land uses (5.12.1), supports the generic buffers recommended by other Government documents such as the EPA Guidelines for separation distances (5.12.3), and seeks to restrict subdivision from impinging on basic raw material resources.

Policy SPP 2.5 is also supported by Guidelines that seek to protect the Landscape and secure Transport Routes.

State Planning Policy No 2.4, Basic Raw Materials, 2021

The updated Basic Raw Materials policy now covers the State and takes over the functions relating to BRM from SPP 2.5. The Policy seeks to identify and protect Regionally Significant Basic Raw Materials in addition to local basic raw materials quarries that are operating or resources that have been identified.

The support for Basic Raw Materials also considers the various planning and environmental matters and considerations with establishing and operating quarries. The proposed renewal of planning approval recognizes the staged use of an identified gravel resource in line with the Policy.

State Planning Policy No 4.1, State Industrial Buffer Policy

SPP 4.1 discusses the need to consider adjoining land uses when locating buffers but does not prescribe set buffers for operations such as this. The development and processing of the resource has been designed to maintain maximum buffer distances. In situations where the buffers are less, actions such as the provision of perimeter bunding to provide visual and noise management, tree planting and operational procedures are used to mitigate and reduce impacts.

This is discussed further in *Section 2.11 Surrounding Landuses and Buffers* of SPP 4.1.

2.3 Local Government Policies and Schemes

2.3.1 Local Government Policies and Planning Schemes

Shire of Chittering Town Planning Scheme No 6.

The resource area is zoned Agriculture Resource in the Shire of Chittering Town Planning Scheme. Lot 40 is zoned Agricultural Resource.

Agricultural Resource Zone

AMD 21 GG 3/4/09; AMD 62 GG 14/02/17

The objectives of the Agricultural Resource zone are to:

a) preserve productive land suitable for grazing, cropping and intensive horticulture and other compatible productive rural uses in a sustainable manner;

b) protect the landform and landscape values of the district against despoliation and land degradation;

c) encourage intensive agriculture and associated tourist facilities, where appropriate;

d) allow for the extraction of basic raw materials where it is environmentally and socially acceptable.

The Agricultural Resource Zone has the objective of allowing for the extraction of basic raw materials as well as providing for environmental protection. The proposal has been designed to comply with the objectives of the zone.

Basic Raw Materials are covered by section 5.16 of the Town Planning Scheme. This provides for the extraction of materials provided adequate buffers and environmental management are in place. The proposal has been designed to comply with Section 5.16 Basic Raw Materials with adequate separation distances available to dwellings, and detailed environmental management proposed.

Special Control Area 6.2, Landscape Protection Area

Whilst the site lies within the Special Control Area 6.2, Landscape Protection Area, it is wholly contained within flat ground of the plateau, set back behind natural vegetation and is unlikely to be seen from outside Lot 7.

The text of the Landscape Protection Zone, taken from the Shire of Chittering Officer report, is included below.

The subject land falls within the following Special Control Area:

6.2 Landscape Protection Area

Purpose:-

(a) To secure the areas delineated on the Scheme Map from undue subdivision and development that would detract from the landscape value of the rural environment;

(b) to conserve and enhance the character of the significant landscape area; and

(c) To ensure land use and developments are compatible with the landscape values.

The Local Government may require, where appropriate, as a condition of any planning approval, additional planting of vegetation to be undertaken to ensure no net loss of vegetation or to repair any degraded landscape.

Relevant Considerations:-
In considering an Application for Planning Approval, the Local Government shall have regard to:

(a) the statement and the nature of the key elements of the landscape and its character;

(b) the conservation and enhancement of the landscape values;

(c) the impact of any buildings and associated works on the landscape due to height, bulk, colour, general appearance and the need to remove vegetation;

(d) the requirement for all roofing of any building to be a of a non-reflective nature;

(e) a change of land use where in the opinion of the Local Government the proposed development may cause a deterioration of the landscape value and/or cause an adverse effect(s) on the environment.

The text of the Landscape Protection Zone does not preclude development, but rather recommends that provisions be made to maintain visual amenity. This project has been designed to protect the local aesthetics.

The proposed quarry renewal complies with the aims Landscape Protection of the Local Planning Strategy.

From on site considerations, when working behind the perimeter bund of overburden and the existing vegetation, it is unlikely that any excavation vehicles will be able to be seen from any road or dwelling. It is possible that a glimpse of a truck through trees, when travelling on the access road, may be possible from Toy Road, 3 km to the south east.

It appears that the actual excavation will not be visible from any road or dwelling.

Shire of Chittering Local Planning Strategy – 2019

The Shire of Chittering Local Planning Strategy has a number of aims and objectives, which have been considered during the environmental management section of the proposed quarry application.

Section 3.3.6 of the Strategy discusses Basic Raw Materials, but relates mainly to the identified "significant geological supplies", but does permit extraction in other areas in locations not near the Bindoon Townsite or other sensitive locations.

The taking of the gravel and the lowering of the soils will not impact on the agricultural capability of the land as the soils can be reconstructed to their original land capability or better as the rock will be removed and the soils will be reformed to better agricultural potential.

2.3.2 Local Government Extractive Industries Licence

The **Shire of Chittering Local Law – Extractive Industries** specifies the information that is required to be submitted in relation to the application for a quarry and provides guidance with the long term management of the operations.

It is noted that, in law, Planning Consent under the Town Planning Scheme has been determined to prevail over a Local Law.

The local law also provides for buffers in Section 6.1 of the Local Law. Section 6.1 allows variations to the buffers by way of conditions imposed. The proposed quarry complies with the provisions or intent of the Local Law – Extractive Industries.

2.3.3 Current Land Zonings

Lot 7 is zoned "Agricultural Resource".

2.3.4 End Use – Sequential Planning

After gravel excavation the land will be returned to improved productive agricultural land.

The contoured surface will therefore be restored slopes and form that match the adjoining landform and land uses.

Gentle swales will be formed which will enable the soils to naturally drain and maintain the environmental flows.

2.4 Legislative Framework

There have been no significant changes to the scale and nature of the local land uses over the past few years.

2.4.1 Relevant Legislation

Table 3: Legislative Framework

Legislation	Environmental Factor regulated/affected	Discussion	Action
Aboriginal Heritage Act 1972	Aboriginal heritage sites	A database search of DPLH has been conducted and no site recorded. See Section 2.5 Aboriginal Heritage.	A commitment is made to halt activities that may impact on a site if any is found during excavation, pending assessment by consultants.
Planning and Development Act 2005.	Development approvals for on site constructions and any ensuing environmental impacts.	Planning Consent is required from the Shire of Chittering Town Planning Scheme.	A concurrent application for development approval and Extractive Industries Licence is lodged. The current operation has Planning Consent expiring on 30 June 2022.
Shire of Chittering, Local Planning Policy 2019.	The application and management of quarries is covered by the Policy.	This assessment and Management Plan has considered the issues outlined in the Policy and has addressed them and other factors as necessary.	The Excavation and rehabilitation Plan uses “Best Practise” to mitigate potential environment and social impacts. The current Extractive Industry Licence is current until 26 May 2022.
Shire of Chittering Local Law - Extractive Industries	The operations of the quarry are regulated by both the Planning Approval and Extractive Industries Licence	An Extractive Industries Licence is required.	An application for an Extractive Industry Licence is concurrently lodged.
Health Act 1911	Environmental and health impacts from waste water treatment and community health.	No matters of significance that would trigger this legislation have been identified.	The proposal complies with the Department of Health Guideline for Dust separation. (See Dust Management) No waste materials will be disposed of on site. A serviced portable waste water system is used on site.
Department of Planning, Land and Heritage Transport Impact Guidelines 2016	New developments may need to consider transport options.		Over the years discussions have been held with Shire of Chittering officers with respect to this project and the Shire has inspected the site mostly annually as a minimum. Transport will continue to be directly to Great Northern Highway via an already constructed crossover through Approval from Main Roads.

Legislation	Environmental Factor regulated/affected	Discussion	Action
Western Australian Planning Commission Planning Bulletin 111/2016	New developments may need to consider fire risk and mitigation such as a bushfire policy and BAL attack document.	This is a gravel pit with no structures that present a fire risk. The pit acts as a fire management zone as it is devoid of vegetation.	No assessment is required because there is no significant fire risk and WAPC 2016 Planning Bulletin 111/2016 does not require a BAL Attack assessment. The mobile structures are present on site located in the cleared areas, well away from fire attack. Fire Management Plan is in place.
Environmental Protection Act 1986 *Part IV* - Assessment	Referred to the EPA if the project is or may constitute a significant environmental impact.	This is a gravel pit in an area where small quarries are common.	The quarry was referred to the EPA in 2000 and was determined by the EPA as not having a "Significant Environmental Impact".
Environmental Protection Act 1986 *Part V* – DWER Licence	Environmental factors that may be significantly impacted related to Prescribed Premises- Processing and Screening	If screening or crushing in excess of 5 000 tonnes per year is conducted, the operation will require a Department of Water Environment Regulation Licence.	A DWER Licence is in place for crushing and screening which triggers the "Prescribed Premises"; 5 000 tonnes per annum. L8748/2013/1 for 10,000 tonnes per year until 26 May 2022 and is in the process of being renewed.
Environmental Protection (Noise) Regulations 1997	Noise impacts.	The proposed excavation complies with the EPA generic buffer guidelines.	Noted. See Noise Management and setback – Buffers. Sections 3.0 and 5.3. The excavation is located over 750 metres from the closest sensitive premises to the south. Other buffer distances are 1000 metres and potentially down to 600 metres across Great Northern Highway for a dwelling to the west, and 950 metres for a dwelling to the north and 1400 metres for a dwelling to the north north west.
Environmental Protection (Clearing of Native Vegetation) Regulations 2004	Clearing and disturbance of native vegetation.	*Environmental Protection (Clearing of Native Vegetation) Regulations 2004*.	A clearing Permit is in place, CPS 5843/ until 1 February 2029.
Environment Protection and Biodiversity Conservation Act 1999 (Commonwealth)	Matters listed on the EPBC database.	The matters listed under the *EPBC Act 1999* which might apply to this site such as Black Cockatoo.	A clearing Permit is in place, CPS 5843/ until 1 February 2029. That permit required the retention of a large Marri Tree that might contain suitable nesting hollows, and was amended in 2020 to extend the life of the permit.
Biodiversity Conservation Act 2016 (WA)	Provides for the protection of flora and fauna.	The *Biodiversity Conservation Act 2016* (WA) considered the legislation and protection of flora and fauna when the Clearing Permit was extended in 2020.	*Environmental Protection (Clearing of Native Vegetation) Regulations 2004.* A Clearing Permit is in place, CPS 5843/1 until 1 February 2029.

Legislation	Environmental Factor regulated/affected	Discussion	Action
Conservation and Land Management Act 1984	Parks and Reserves and issues relating to flora and fauna.	There are no known issues or nearby reserves that will trigger this legislation.	Noted.
Heritage Act 2018 (WA)	Heritage	No heritage matters are identified locally or on quarry footprint. DPLH databases were searched.	Noted.
Waterways Conservation Act 1976	Water quality and management of surface water	There are no watercourses on the extraction site or nearby. The closest watercourse is the Brockman River 1600 metres to the south.	The Water Management has been approved previously and is included All water will be retained in the pit. Section 6.4.
Rights in Water and Irrigation Act 1914	Water quality and management of surface water	See above	See above.
Country Areas Water Supply (CAWS) Act 1947	Water supplies		Water will continue to be sourced from farm dams or bore located on the northern side of the Brockman River where it can have no impact on groundwater south of the Brockman River. That is the same water source that has been used since the pit opened in 2000. If sufficient water is not available it will be brought to site as required by road tanker.
State Agreement Acts	Specific acts that relate to certain large projects that may impact on some locations.	Not applicable	
Contaminated Sites Act 2003	Contaminated materials that may arise from excavation or be used in excavation and processing.	The only factor that is likely to fall under this category is the storage and use of maintenance items and on site maintenance.	No materials are present or to be used which would trigger this legislation apart from normal fuel and maintenance. The Water Management is approved and is included in Section 6.4. It includes commitments to remove any contaminated soils or other material regularly and at the end of excavation as part of the closure actions.
Dangerous Goods Safety Act 2004	Potential for dangerous good to impact on the environment.	Refers to fuel, which is required and blasting under the *Dangerous Goods Safety (Explosives) Regulations 2007*.	The land owner, through the operator, (Hall-Grav Pty Ltd) will comply with the requirements for fuel through management plans that will be implemented. Fuel and Servicing Management Plans are included in the attached Water Management. Section 6.4.
Mines Safety and Inspection Act 1994	Safety and management of mining operations which in turn may	Compliance with the Project Management Plan when it is submitted and approved.	***Mine Safety*** The site is registered under the SRS and a Project Management Plan, Risk

Legislation	Environmental Factor regulated/affected	Discussion	Action
	impact on the environment.		Assessment and Emergency plans approved. The Project Management Plan addresses all aspects of mining. The SRS System addresses ongoing Health and Safety.

2.4.2 Stakeholder Summary

The Proposal will be advertised to the local property owners as part of the consideration by the Shire of Chittering.

A summary of the discussions with the local people is provided in Table 4, Stakeholder Register.

Table 4: Stakeholder Summary

Stakeholder	Date - Timing	Potential Considerations	Proponent Response - Outcome
Internal Stakeholders			
Internal Management	• Ongoing • Day to day management of the operations, • Future directions and ownership.		• The methods of operation are not proposed to be significantly different from other gravel quarries.
Landholder	• A number of meetings have been held with the landowner through 2020 – 2022 with respect to the proposal.		• The landholder has leased the resource to Hall – Grav Pty Ltd who will continue to extract the gravel. • Hall-Grav Pty Ltd holds the DWER Licence.
External Stakeholders			
EPA	• Excavation for clay and gravel as well as sand has occurred in the local area and is still occurring.		• The existing pit is small and does not represent a significant environmental impact that would normally be assessed by the EPA. • The EPA chose not to formally assess the project under *EP Act 1986 Part (IV).*
Department of Biodiversity Conservation and Land Management	• Manages native flora and fauna		• A clearing Permit is in place, CPS 5843/3 until 1 February 2029. That permit required the retention of a large Marri Tree that might contain suitable nesting hollows, and was amended in 2020 to extend the life of the permit.
Shire of Chittering	• Provides Planning approval and issues the Extractive Industries Licence for the quarry under the Local Law. • Regulates land zonings and planning in conjunction with the Western Australian Planning Commission • Controls the measures used to		• Hall-Grav Pty Ltd Contracting have discussed the proposal with Council officers over the years and will work with the Shire of Chittering in complying with the conditions and minimising local impacts.

	prevent bush fires.	
Main Roads	• Cross over to Great Northern Highway.	• The cross over to Great Northern Highway was approved for truck transport of the product by Main Roads at the time of the first application for Development Approval.
Nearby landowners	• The excavation complies with the EPA generic buffer guidelines.	• Nearby landowners will be notified by the Shire during advertising of the proposal. • The excavation is located over 750 metres from the closest sensitive premises to the south. • Other buffer distances are 1000 metres and potentially down to 600 metres across Great Northern Highway for a dwelling to the west, and 950 metres for a dwelling to the north and 1400 metres for a dwelling to the north north west.
Department of Lands Planning and Heritage (DAA) and traditional land holders	• Maintains heritage databases.	• Department of Planning Lands and Heritage database has been searched and no sites have been found. See Section 2.5 Heritage.
DWER	• May provide advice on aspects of environmental impact and management. • Issues clearing permits under the *Environmental Protection Act 1986*. (Not required)	• A clearing Permit is in place, CPS 5843/1 until 1 February 2029. That permit required the retention of a large Marri Tree that might contain suitable nesting hollows, and was amended in 2020 to extend the life of the permit.
	• A DWER Licence is required under *Part IV of the Environmental Protection Act 1986* for crushing or screening if the annual volumes exceed 5000 - 50 000 tonnes. (Category 70 Prescribed Premises).	• DWER Licence L8530/2011/1, DEC File Number 2012/384-1 expiring on 26 May 2022. The Licence is in the process of being extended and is issued to Hall-Grav Pty Ltd.

2.5 Heritage

A search of the Department Lands Planning and Heritage database does not reveal aboriginal sites on this portion of Lot 7.

The site has been an operating farm for many years, with ongoing soil disturbances through that time.

Should any archaeological site be uncovered, work will cease in that area pending an assessment of the site by an independent consultant, traditional owners and the Department of Planning Lands and Heritage as required.

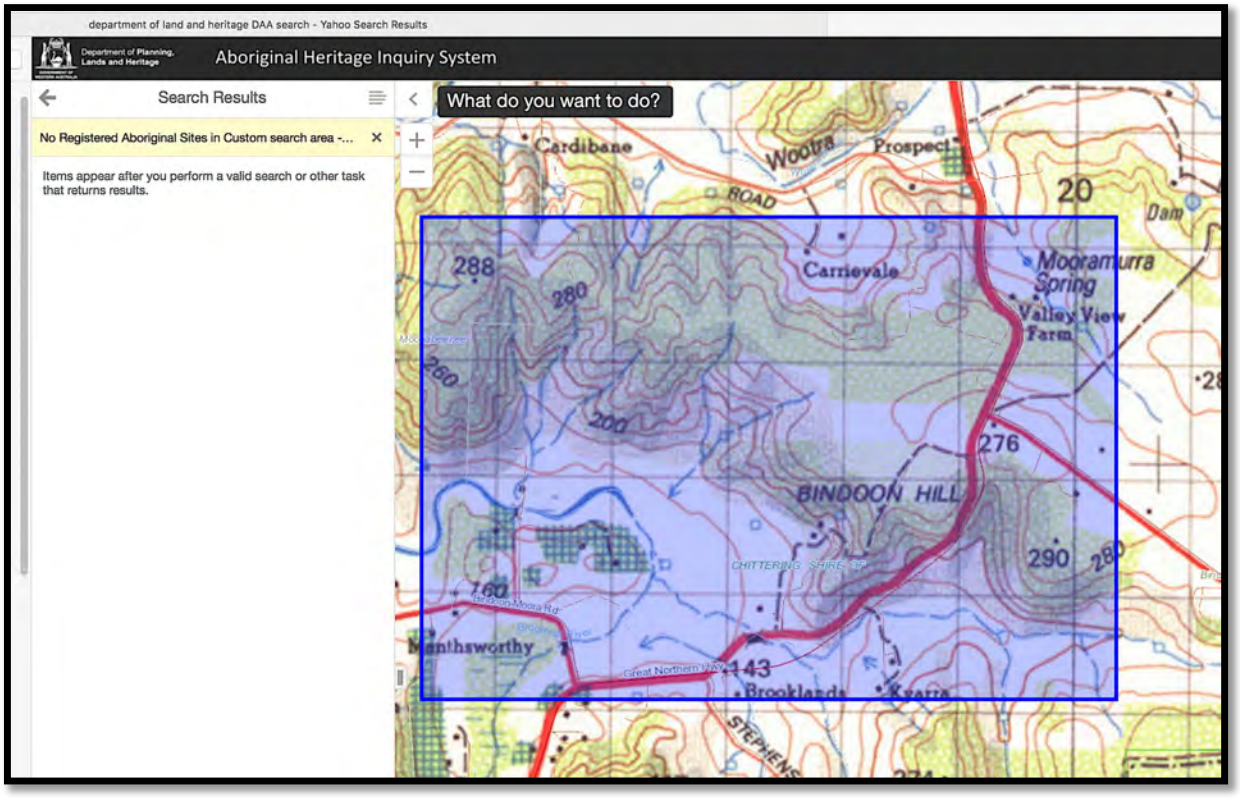


Figure 1: DPLH Heritage search

2.6 Complaints Mechanism

The following complaints mechanism is proposed. See also Section 6.3 Dust Management.

- The contact details will be displayed at the entrance to the operations.
- A complaints book is maintained.
- Upon receipt of a complaint it will be investigated and action taken if the complaint is determined to be legitimate.
- When a complaint is found to be legitimate, any reasonable actions to mitigate the cause of the complaint will be taken, to prevent a recurrence of the situation in the future.
- Details of any complaints, the date and time, means by which the complaint was made, the nature of the complaint, the complainant, investigations and any resulting actions and the reasons, will be recorded in the Complaints Book.
- The Shire of Chittering will be informed of any complaint or any other report provided to a Government Department within 3 working days.
- The complaints book will be made available for viewing or requested details made available to the City or any other official upon request.

Complaints

As far as is known, no complaints have been recorded in the past 5 years

3.0 BUFFERS AND SOCIAL IMPACTS

3.1 Consideration of nearby sensitive premises

The quarry is designed to maximise the setbacks to the closest sensitive premises.

The main environmental issues identified in relation to buffers and setbacks to sensitive premises, in addition to those generally recognised by the various Government and Published guidances, are;

- Visual amenity
- Dust management
- Noise management
- Local amenity
- Cumulative impacts of quarries

3.2 Policies

3.2.1 Generic Setbacks and Buffers

A number of Government Policies relate to buffer distances and the protection of basic raw materials. State Planning Policy No 4.1, State Industrial Buffer Policy, (draft July 2004) discusses the need to consider adjoining land uses when locating buffers but does not prescribe set buffers for operations such as this.

SPP 4.1 discusses the need to provide buffers both on site and offsite with respect to industry including extractive industries. It does not however specify any distance for the buffer, but notes that site specific studies should be prepared that will demonstrate that the extractive industry can operate in a manner compatible with nearby sensitive premises.

The State Industrial Policy 4.1 does not specify a set buffer distance, but notes that buffers are to be based on “scientific study” and are flexible. It further specifies the buffers by reference to other documentation such as the Environmental Protection Policies, EPA and DWER standards and DPLH Generic Industrial Buffer Guidelines; that is the EPA 300 - 500 metre generic buffer used in SPP 2.4 and SPP 2.5 that is used in the absence of supporting or scientific studies and information.

EPA guidance "Separation Distances between Industrial and Sensitive Land Uses", June 2005 lists the generic buffers for quarries with crushing, processing and milling on a case by case basis with the guideline for sand and limestone excavation for a generic buffer of300 – 500 metres depending on the extent of processing.

There is no generic buffer listed for gravel, but in terms of potential impact it is most similar to limestone and therefore a 500 metre generic buffer in the absence of supporting information is more than sufficient to mitigate the main potential impacts of noise and dust, based on operating gravel pits.

The Draft DWER Buffer Guidelines (DER 2015) have been withdrawn.

The buffer documents and SPP 2.4 (2021) all now defer to the EPA 2005 Guidance Statement.

The buffer referred to can be both on site and offsite although in this case only on site buffers are required.

A generic buffer relates to the distance at which there are unlikely to be any problems without some further investigations and does not mean that smaller buffers are not acceptable.

Both SPP 2.4 and 2.5 support preventing conflicting land uses, (SPP 2.5, Section 5.12.1), support the generic buffers recommended by other Government documents such as the EPA Guidelines for separation distances (SPP 2.5 Section 5.12.3), and seek to restrict subdivision from impinging on basic raw material resources.

The issue of appropriate buffers is a matter of the distance and protection measures to prevent impact on adjoining land users. This applies mainly to noise, dust and visual impact, all of which are treated separately.

The walls of the pit, and perimeter bunding, are used to reduce noise transmission. During land clearing the topsoil will be pushed to the edges of the pit to form a low bund during excavation.

Excavation will be worked from inside out on the floor of the pit, working below natural ground level with a perimeter low bund of topsoil stored to be respread at the end of mining.

Based on the nature of the operation, equipment used and excavation methods, it is proposed that the crusher and stockpiles will be located > 500 or more metres away from the closest sensitive premises, which is the service station and truck parking to the north east across Great Northern Highway. This means that the only activity within the north eastern corner of the pit will be excavation.

There are no changes to the footprint of the gravel quarry and therefore there will be no additional potential environmental impacts.

The excavation is located over 750 metres from the closest sensitive premises to the south. Other buffer distances are 1000 metres and potentially down to 600 metres across Great Northern Highway for a dwelling to the west, and 950 metres for a dwelling to the north and 1400 metres for a dwelling to the north north west.

However the footprint has been extended to the east to ensure that the whole resource is provided with protection under the planning framework as required by State Planning Policy 2.4. The area listed as future resources is now included in this renewal application.

Therefore the setback to the closest dwelling to the east will be 1000 metres for the current footprint and 600 metres for the additional eastern footprint.

The key management will continue to be noise and dust as excessive rates of those impacts could potentially be generated.

As gravel stays moist during excavation until it dries out dust risk is reduced during extraction, crushing and screening. The main potential source of dust is wheel disturbances of gravel hardstand and along the access road.

Noise is managed under the *Environmental Protection (Noise) Regulations 1997.* The Regulations must be complied with or the pit cannot operate. Based on previous excavation compliance with the Noise Regulations continue to be achieved.

The proposed pit therefore complies with the EPA Generic Buffer Guidelines when the specific site conditions are considered. The offsite impacts can be satisfactorily managed.

3.2.2 Boundary Setbacks

The **Shire of Chittering Local Law 2014 – Extractive Industries** specifies the guidance for a 50 metre setback to the property boundaries. (Local Law Part 6 Section 6.1).

The 50 metre setback is capable of being amended by the Shire if they choose to do so as noted in Section 6.1, *"Subject to any licence conditions imposed by the local Government , a person must not excavate within ….."*. Such a variation would prevail over the generic setbacks.

The approved excavation from 2000 has at all times had boundary setbacks of 20 metres.

The reasons for continuing the 20 metre boundary setbacks for the renewal of the Development Approval/Extractive Industries Licence are;

- The long history of a 20 metre setback of 22 years.
- If the 50 metre requirement of Section 6.1 (a) is applied, a substantial amount of resource will be excluded.
- The closest dwelling to the boundary is 750 metres south.

4.0 EXISTING ENVIRONMENT

4.1 Climate

The climate of the area is classified as Mediterranean, with warm to hot Summers and cool wet Winters.

Climatic data is recorded at Gingin, west of the site. Precipitation is 671 mm per annum, of which most falls in the months April to October inclusive.

Average maximum temperatures at Bullsbrook reach 33.2 degrees Celsius for the hottest months, January and February, but fall to 18.2 degrees Celsius in July. Average minima for the coldest month August, is 6.1 degrees Celsius.

The predominant summer winds are from the east at 9.00 am and from the south west at 3.00 pm.

Gingin Ap Climate

GINGIN AP LONG-TERM AVERAGES

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
Mean Max (°C)	33.2	33.2	30.7	26.7	22.7	19.6	18.2	19.1	20.6	24.4	28.0	30.5	*25.5*
Mean Min (°C)	16.6	17.1	15.3	12.1	9.1	7.3	6.1	6.6	7.4	9.2	12.0	14.3	*11.0*
Mean Rain (mm)	18.4	16.9	21.8	30.6	76.8	114.2	128.2	110.9	84.8	36.0	20.4	10.0	*671.7*
Median Rain (mm)	0.4	3.0	7.6	22.4	74.3	121.5	109.9	117.6	88.9	31.8	11.9	2.4	*612.4*
Mean Rain Days	2.3	2.0	4.5	6.8	10.8	13.3	16.3	14.8	13.9	8.4	5.2	3.3	*97.4*

GINGIN AP DAILY RECORDS

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
High Max (°C)	44.5	46.3	43.0	37.8	34.8	28.4	25.8	28.0	34.8	39.3	42.8	45.3	*46.3*
Low Max (°C)	19.1	16.7	17.6	15.7	14.4	12.1	12.6	13.5	13.5	16.6	18.3	19.5	*12.1*
High Min (°C)	29.8	29.2	27.0	22.8	21.6	17.0	16.0	16.1	18.7	21.7	23.5	27.5	*29.8*
Low Min (°C)	5.7	6.6	2.0	1.8	-1.2	-3.6	-3.7	-2.3	-1.5	-0.1	1.8	4.4	*-3.7*
High Rain (mm)	95.0	74.0	49.6	43.6	40.0	70.2	86.0	49.8	47.0	38.0	24.6	19.6	*95.0*

GINGIN AP MONTHLY RECORDS

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann
High Mn. Max (°C)	35.5	35.2	32.8	28.9	25.5	22.9	19.3	22.2	22.9	28.1	30.9	32.7	*26.3*
Low Mn. Max (°C)	30.3	30.4	28.7	23.9	20.9	18.0	16.3	17.6	18.6	21.5	24.1	25.3	*24.5*
High Mn. Min (°C)	19.3	20.6	17.5	15.0	13.3	11.2	12.1	8.8	11.0	11.8	14.3	17.0	*12.8*
Low Mn. Min (°C)	14.0	14.9	12.9	9.1	6.0	3.9	3.2	3.8	5.3	7.2	10.4	10.7	*9.7*
High Rain (mm)	96.2	152.2	106.6	94.8	139.0	236.4	213.6	172.6	161.2	93.2	82.0	57.6	*881.6*
Low Rain (mm)	0.0	0.0	0.0	0.2	27.2	23.6	42.5	26.6	23.2	8.4	0.0	0.0	*421.8*

GINGIN AP ANNUAL TEMPERATURES & RAINFALL

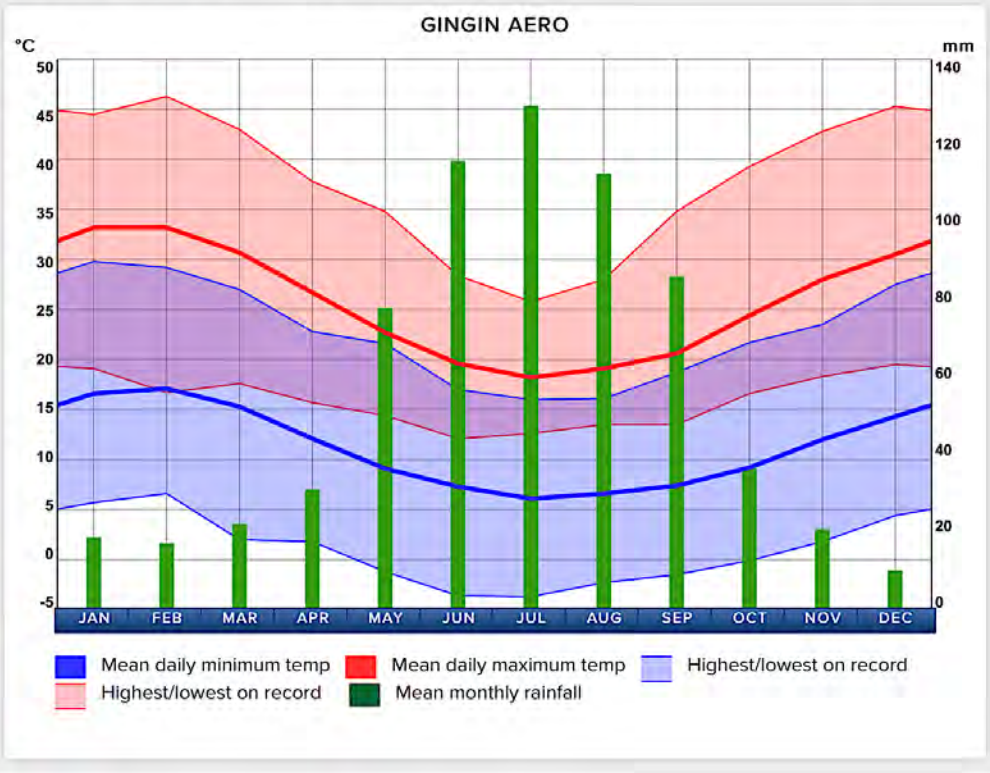
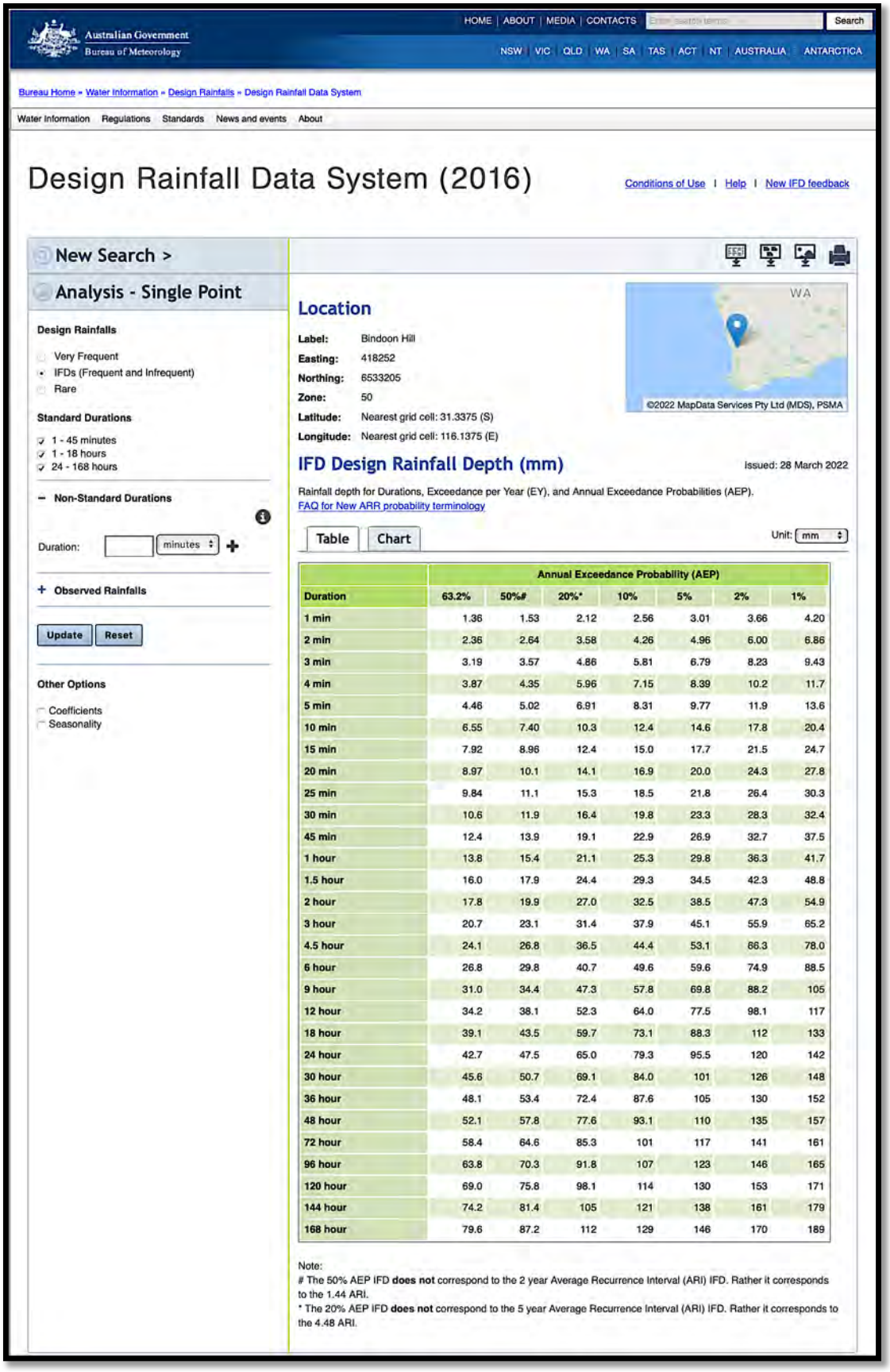


Figure 2: Climate data for



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Design Rainfall Data System (2016)

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Analysis - Single Point

Design Rainfalls

- Very Frequent
- IFDs (Frequent and Infrequent)
- Rare

Standard Durations

- 1 - 45 minutes
- 1 - 18 hours
- 24 - 168 hours

Non-Standard Durations

Duration: minutes

Observed Rainfalls

Update | Reset

Other Options

- Coefficients
- Seasonality

Location

Label: Bindoon Hill
Easting: 418252
Northing: 6533205
Zone: 50
Latitude: Nearest grid cell: 31.3375 (S)
Longitude: Nearest grid cell: 116.1375 (E)

WA

©2022 MapData Services Pty Ltd (MDS), PSMA

IFD Design Rainfall Depth (mm)

Issued: 28 March 2022

Rainfall depth for Durations, Exceedance per Year (EY), and Annual Exceedance Probabilities (AEP).
FAQ for New ARR probability terminology

Table | Chart

Unit: mm

	Annual Exceedance Probability (AEP)						
Duration	**63.2%**	**50%#**	**20%***	**10%**	**5%**	**2%**	**1%**
1 min	1.36	1.53	2.12	2.56	3.01	3.66	4.20
2 min	2.36	2.64	3.58	4.26	4.96	6.00	6.86
3 min	3.19	3.57	4.86	5.81	6.79	8.23	9.43
4 min	3.87	4.35	5.96	7.15	8.39	10.2	11.7
5 min	4.46	5.02	6.91	8.31	9.77	11.9	13.6
10 min	6.55	7.40	10.3	12.4	14.6	17.8	20.4
15 min	7.92	8.96	12.4	15.0	17.7	21.5	24.7
20 min	8.97	10.1	14.1	16.9	20.0	24.3	27.8
25 min	9.84	11.1	15.3	18.5	21.8	26.4	30.3
30 min	10.6	11.9	16.4	19.8	23.3	28.3	32.4
45 min	12.4	13.9	19.1	22.9	26.9	32.7	37.5
1 hour	13.8	15.4	21.1	25.3	29.8	36.3	41.7
1.5 hour	16.0	17.9	24.4	29.3	34.5	42.3	48.8
2 hour	17.8	19.9	27.0	32.5	38.5	47.3	54.9
3 hour	20.7	23.1	31.4	37.9	45.1	55.9	65.2
4.5 hour	24.1	26.8	36.5	44.4	53.1	66.3	78.0
6 hour	26.8	29.8	40.7	49.6	59.6	74.9	88.5
9 hour	31.0	34.4	47.3	57.8	69.8	88.2	105
12 hour	34.2	38.1	52.3	64.0	77.5	98.1	117
18 hour	39.1	43.5	59.7	73.1	88.3	112	133
24 hour	42.7	47.5	65.0	79.3	95.5	120	142
30 hour	45.6	50.7	69.1	84.0	101	126	148
36 hour	48.1	53.4	72.4	87.6	105	130	152
48 hour	52.1	57.8	77.6	93.1	110	135	157
72 hour	58.4	64.6	85.3	101	117	141	161
96 hour	63.8	70.3	91.8	107	123	146	165
120 hour	69.0	75.8	98.1	114	130	153	171
144 hour	74.2	81.4	105	121	138	161	179
168 hour	79.6	87.2	112	129	146	170	189

Note:
The 50% AEP IFD **does not** correspond to the 2 year Average Recurrence Interval (ARI) IFD. Rather it corresponds to the 1.44 ARI.
* The 20% AEP IFD **does not** correspond to the 5 year Average Recurrence Interval (ARI) IFD. Rather it corresponds to the 4.48 ARI.

Table 3: IFD Rainfall Data - Bureau of Meteorology

4.2 Geology and Geomorphology

Laterite soils and gravels cover the surface and represent the remnants of an ancient soil horizon developed on schists, gneisses and granites of the Chittering Metamorphic Belt.

The site lies on a remnant of a Tertiary erosion surface at an elevation that ranges from 250 metres in the west and east of the excavation area to 282 metres in the central north. From the plateau remnant the land drops away to the south to the Brockman River.

Laterite soils and gravels cover the surface and represent the remnants of an ancient soil horizon developed on schists of the Chittering Metamorphic Belt.

The typical profile of the deposit is very shallow grey brown sandy gravel, yellow brown pisolitic gravels and laterite cap rock. Under this is a gibbsite rich layer which in turn overlies weathered schists.

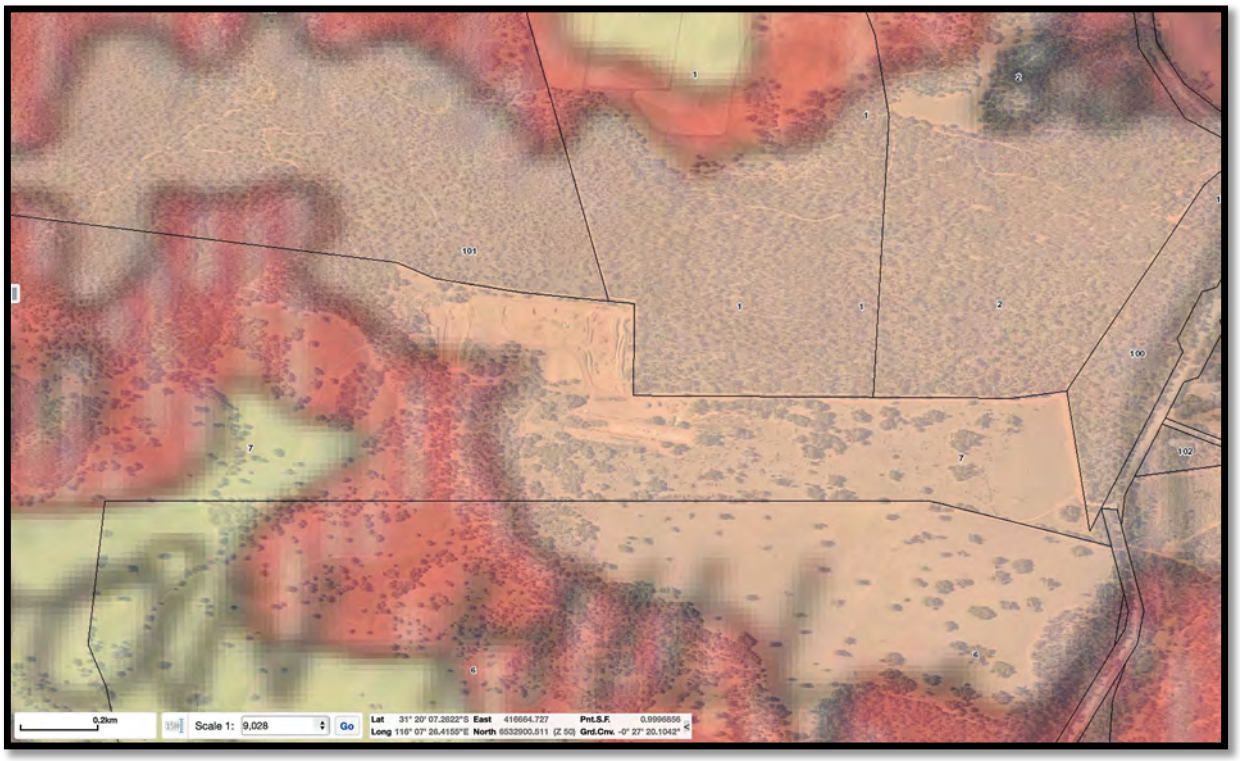


Figure 3: Resource (Orange) from GSWA (GeoView)

4.3 Soils and Regolith

The typical soil profile is a yellow brown fine gravel gravel of the Yalanbee type overlying coarser darker and red brown pisolotic laterite duricrust rock.

In the central parts of the resource the fine Yalanbee Type gravel has been removed and the duricrust regularly outcrops, significantly decreasing the agricultural capability of the land. To the west and east the Finer Yalanbee Type gravel deepens to 1 – 3 metres. In the north western corner the underlying duricrust is deeper and darker red brown gravel extends to greater depths of 4 metres and in the extreme north western corner to ober 6 metres.

Under the duricrust is a variable depth of gibbsite rich pallid subsoils developed on the deeply weathered rocks of the Chittering Metamorphic Belt.

The soil system is classified as Yalanbee (Y) in Smolinski, 1998*, Soils of the Chittering Area, South West Forest Region, Western Australia,* Department of Agriculture WA.

> ***"Yalanbee** - Gently undulating landscape dominated by fine laterite sandy gravels and loamy gravels."*

The reconstructed soils, at the completion of excavation, will be a blend of gravel and gibbsite rich materials to form manufactured gravelly loam soils of good water and nutrient holding capacity.

4.4 Acid Sulfate

There has been an increased interest in acid sulfate soils since the release of WAPC Planning Bulletin 64.

However the interest has been over-reactive, with assessments sought and risk applied in many areas where there is no geological risk or evidence of acid sulfate potential or actual conditions.

The most definitive survey procedure was produced by the Acid Sulfate Soil Management Advisory Committee NSW, 1998, in their *Acid Sulfate Manual.* This Manual formed the basis for much of the assessment procedures in Australia, including those adopted by the Western Australian Planning Commission and the Department of Water Environment Regulation.

DWER 2015 released two documents; Identification and investigation of acid sulphate soils and acidic landscapes and *Treatment and management of soil and water in acid sulphate soil landscapes.* These two documents provide the guidelines for Western Australia.

The *Acid Sulfate Manual (DPLH)* adopts the procedure of reviewing the published data followed up by field assessment, which has been completed for this site and accepted for the past assessments and approvals. If a geological risk is determined, then a Preliminary Acid Sulfate Assessment is conducted.

Lot 7 and the surrounding land has been visited by Lindsay Stephens of Landform Research, and the laterite and soils observed on many occasions and in the gravel excavations.

Materials at risk under reducing conditions are normally grey in colour or have been grey with no brown or red brown iron oxides. Where exposed to the atmosphere there is a change to brown iron oxides, with yellow jarosite and other alteration minerals that are distinctive. Further, as discussed in Nattaporn-Prakongkep, R J Gilkes, B Singh and S Wong, 2011, such materials have to occur below the water table under reducing conditions and then be exposed to the oxidising processes of the atmosphere.

This concurs with Nattaporn-Prakongkep, R J Gilkes, B Singh and S Wong, 2011, *Mineralogy and chemistry of sandy soils in the Perth metropolitan area of the Swan Coastal Plain*, Department of Environment and Conservation who concluded that there is no risk of acid sulfate soils in sands unless there is peat or organoferricrete present and excavation proceeds below the water table. In such situations no testing would be required because there is no risk.

The soils and geology are simply not the correct geological environment for these processes in the regolith to hold sulphides. The water table is deep, 18 - 21 metres beneath the land surface based on previous drilling.

The other types of materials that also carry sulphides are rocks carrying pyrite type sulfides. These rocks are normally carbonaceous shales below the water table or have extensive sulphide mineralisation in grey – black shales or granitic or other fresh igneous rocks. None of these rock types occur on site or are likely to occur. The basement granite and dolerite rock does locally not carry sulphides and the gravel resource sits at the top of a very deeply weathered laterite profile associated with an old erosion surface.

On site the soils are laterite that are oxidised and do not carry any risk of acid sulphate potential.
The soils are highly oxidised and carry extensive iron oxides, with the site lying well above the water table. Soils of this type have no risk of sulphides and no risk of developing acidic conditions.

4.5 Hydrogeology

Surface Water

There is no surface runoff of water on the gravel resource due to the porosity and permeability of the laterite, with precipitation draining to the deep water table.

The site is not subject to any watercourses or flood paths as it lies on the plateau remnant of the Yilgarn Plateau.

The surface water and superficial groundwater are the only relevant considerations for this proposal.

Groundwater

The site lies on the plateau remnant with no surface drainage apart from the extreme west and east where surface runoff can occur during storm events. Drainage is also as recharge down through the laterite profile.

There are no acid sulfate or salinity issues, with the soils and water being fresh and elevated in the landscape.

There is no surface drainage due to the porosity and permeability of the laterite, with precipitation draining to the water table. It has been estimated that 30% of the rainfall will reach the superficial aquifer with an unknown amount filtering into the deeper aquifers, based on the pasture on the sand.

Drilling on the plateau has defined the water table as being 18 – 21 metres below ground surface.

Ultimately surface and ground water ends up at the Brockman River 1.6 km to the south west, across adjoining properties.

The Department of Water Environmental Regulation Water Quality Protection Note 15 WQPN for Extractive Industries permits a final land surface of 0.5 metres above the highest winter water table.

The excavation of gravel from the site will only amount to 2 – 4 metres depth and slightly deeper in the north western corner. With the deep depth to the water table the continued extraction of gravel complies with the DWER guidelines and WQPN 15 and uses the management actions wherever there is environmental benefit.

4.6 Flora and Vegetation

The vegetation has been assessed by Lindsay Stephens of Landform Research on a number of occasions since 2000.

The site is cleared, with scattered clumps of regrowth *Eucalyptus calophylla*. A small zone of regrowth *Eucalyptus marginata* occurs.

The only understorey was occasional *Acacia pulchella* in one small area in the west of site. This vegetation contained scattered *Hibbertia rupicola*.

Acacia saligna growth has occurred in the west, after having been planted as a stock feed to provide feed during times of low pasture resources. It is now self seeding in other locations and has been temporarily retained as a perennial cattle stock feed.

The remainder of the site has no remnant native understorey species.

There are occasional mature trees and *Dryandra* (*Banksia sessilis*) where the vegetation is in better condition near the northern boundary of Lot 7. This vegetation generally lies within the 20 metre excavation buffer zone and is therefore not considered for excavation.

Some trees do exist and the clearing of these require a Clearing Permit under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*, unless subject to exemption to Section 51C Prescribed Clearing.

Clearing Permit CPS 5843/3 is current until 1 February 2029 having been extended in 2020.

Figure 4: Current vegetation. View east.

4.7 Fauna

The fauna on site will already be significantly depleted in the cleared areas.

The remnant vegetation outside Lot 7 is a more significant fauna habitat. The operations have been designed to not impact on that fauna habitat. The main potential impacts are likely to be the food resources supplied by the trees

There is no native vegetation as ground cover.

4.8 Wetlands

There are no wetlands on site. The site is elevated on top of a significant ridge.

The closest wetland is the Brockman River, 1.6 kilometres to the south west. The pit operations are located on a significant old erosion surface where the edges of the surface remain intact and so there is no potential for water from the pit to access the Brockman River.

All disturbed land is drained to the base of the pit for infiltration to the deep groundwater table.

5.0 PROJECT DESCRIPTION

5.1 Extraction and Processing

5.1.1 Controls

Excavation is to be conducted to conform to the *Mines Safety and Inspection Act (1994) and Regulations (1995).*

DWER Licence L8530/2011/1, DEC File Number 2012/384-1 provides controls on the processing, screening and stockpiles.

The operation is managed by a Registered Manager and is regularly inspected by the District Inspector of Resources Safety, DMIRS.

5.1.2 Construction Time

The operations are existing. All excavation will be completed by mobile excavation and processing equipment.

5.1.3 Excavation Procedures

The proposed quarry will provide a range of strategically placed road making and construction materials in the Bindoon Region that are used by local Authorities such as the Shire of Gingin, the Shire of Chittering and local residents, and potentially to the Bindoon Bypass.

The laterite duricrust and gravel is extracted in a sequence starting with the removal of topsoil and overburden, the extraction of gravel and then duricrust where applicable, and finally the restoration of the land surface.

- The topsoil is pushed to the side of the proposed pit to act as a screening and noise buffer.
- In later stages it may be possible for the topsoil to be spread directly onto an area of rehabilitation.
- Overburden is then scraped or pushed from the surface with the loader and transferred directly to an area being rehabilitated. If a rehabilitation area is not available the overburden is to be stored in windrows or low dumps adjacent to the edge of the excavation area, in dumps separate from the topsoil.
- The location of any topsoil and overburden dumps will be along the edge of the excavation area.
- Over time material in existing dumps and windrows will be used and new dumps created as excavation moves in a staged progression, but whilst in place the dumps will provide some screening.

- Where possible overburden is to be pushed up to form a bund along the lower edge of the excavation area to provide a separation to the pasture, water, noise and visual barrier when this does not compromise future excavation.

- Excavation of the resource is to be worked as an inside out operation. Vehicles will continue to work on the floor of the excavation and work towards the edges of the excavation.

- A bulldozer is required to rip the duricrust. The bulldozer then pushes the ripped duricrust into dumps ready for the loader to collect and feed to the mobile crushing and screening plants.

- For natural gravel a loader can excavate soft gravel, with at times an excacvator used for slightly more difficult or deeper material.

- The bull dozer is used to push the gravel into stockpiles to feed the crusher.

- The loader is also used to load the crusher and load road trucks.

- The depth of the excavation will depend on the thickness and quality of the resource, which is expected to vary from 2 to 4 metres deep, but averaging around 2 metres. The north western corner has deeper gravel which will continue to be excavated.

- Excavation will continue to be conducted in "cells" to ensure that precipitation falling in the pit is contained within the pit. The typical cell will usually be in the order of 2 - 3 metres deep over an area of around 2 hectares. In addition to the working pit, sufficient ground is required to be open to provide space for crushing and screening and the storage of stockpiles.

- The pit operations are separated from the road transport operations to provide a safer working environment.

Figure 5: Current pit. View east

Figure 6: Current pit. View west

5.1.4 Final Contours

The final profile of the excavated surface will be to *Mines Safety and Inspection Act 1994* as explained in documents such as *Guidelines on Safety Bund Walls Around Abandoned Open Pits* (DOIR 1991).

The restored surface will be overall flat but undulating at elevations of 245 – 270 metres AHD. The perimeter of the plateau will not be impacted on, so there will be no apparent change to the form of the landscape.

The final contours will be around 2.0 metres below the natural land surface with proposed batter slopes of 1 : 4 to 1 : 6 vertical to horizontal which will be established with a gently undulating floor of the pit to provide geotechnical stability. The area of deeper gravel in the north western corner will be formed to a self draining swale from which any precipitation will drain to the deep groundwater table.

Observations over the years show that the materials in the base of the pit are sufficiently porous so that no surface water is retained on site.

As the pit will average only 2.0 metres deep the final land surface will have a similar form to the existing land surface except that it will be slightly lower.

The Concept Final Contours are shown on the attached plan.

Wherever possible, rehabilitation will be progressive to ensure that the amount of ground that is open at any one time is minimised. As access is currently through the existing pit, rehabilitation of this pit is not possible at this time.

5.2 Processing

DWER Licence is in place L8748/2013/1 for 100,000 tonnes per year until 26 May 2022. The Licence is being renewed.

- All static and other equipment will be mobile. Crushers and screens are to continue to be located on the floor of the quarry to provide visual and acoustic screening.

- Stockpiles of products are retained on the floor of the pit where possible to reduce visual impact. If sufficient floor space is not made available, then the portable crushing equipment will have to be located on natural ground surface, which is not desirable for noise, dust, or water management.

- At the end of excavation the floor of the quarry is ripped, covered by a layer of overburden and top soil (if not weed affected), and rehabilitated with pasture.

- A larger floor area is required to locate the portable crushing equipment and stockpiles on the floor of the pit. When commencing operations or when there is insufficient ground open, the crushing and screening of the resource may need to be located on the natural land surface until sufficient excavated area is available.

Figure 7: Crushing laterite duricrust on the pit floor to maximise noise and dust

- Up to 4 four hectares is required of active open pit with an additional area of surface for the crushing/screening operation using a bulldozer and crusher/screen and stockpiles. The total area of ground will continue to be 6 – 8 hectares.
- Ripping results in raw product of a size suitable for feeding to the mobile crusher.
- As the excavation progresses the crusher is moved to maintain a minimum distance between the active face and the processing facility. This reduces the area of excavation open at any one time and maximise the ground that can be prepared for rehabilitation. It also reduces the travel distances for the excavation equipment and helps reduce the risk of dust generation.
- Laterite duricrust will be fed into the crusher by a rubber tyred loader.
- From the crusher the material will be screened using a mobile powered screen.

5.3 Stockpiles

Stockpiles of laterite (duricrust) boulders and the various manufactured products will be created to ensure a constant supply. Sometime oversize will be generated which if not crushed will be placed back into the pit and covered during rehabilitation.

Normally the stockpile area will be around 2 hectares and will move as excavation moves. They are mainly located on the pit floor

If a large contract is won for Main Roads a larger stockpile area will be required as Main Roads requires that the stockpiles be generated and available on site for testing prior to their consumption for road making.

A loader is used to recover product from the stockpiles and load road trucks.

Figure 8: Loading from stockpiles. Note the cover on the truck

5.4 Equipment

- All static and operational equipment will work on the quarry floor to provide maximum sound and visual screening.
- The operation will use modern equipment that is regularly serviced. In general contractors will be used.
- All equipment will be serviced onsite by mobile service vehicles for minor servicing. Major services will be conducted offsite.
- Refuelling is proposed to be from mobile tankers. At this stage there is not anticipated to be any fuel stored on site.

Figure 9: Vehicle shelter with crib room in container

Figure 10: Approved double skinned temporary storage

Table 5: Operating Equipment

Equipment	Comment
Site office and/or containers	This will be a small portable facility.
Toilet system	A serviced portable toilet is used.
Bulldozer	Used to rip and remove the duricrust/caprock
Mobile crushing plant	To crush the duricrust/caprock and produce the manufactured gravel.
Mobile screening plant	Provides the various gravel products.
Water tanker	Will be retained on site when dust is potentially generated. Used for dust suppression on the quarry floor as required. Water is to be sourced from the tank nearby which utilises water from a bore or farm dam on the northern side of the Brockman River.
Loader	Normally on site at all times. Loading and handling products and natural gravel.
Fuel Storage	Fuel is not proposed to be stored on site. Vehicles are refueled from mobile tankers. The method used is the same as most mine and construction sites as well as many farming properties.

5.5 Hours of Operation

Hours of operation will be 6.00 am to 6.00 pm Monday to Friday inclusive, and Saturday from 6.00 am to 1.00 pm, excluding Sundays and Public Holidays. This is similar to the operations of nearby quarries in the local area and a continuation of the current operations.

5.6 Access and Transport

Access is directly to Great Northern Highway at a Main Roads constructed entrance. The crossover is sealed and constructed at a location with good sight lines and approved by Main Roads.

Access from the site will be via a cross over directly onto Great Northern Highway. The cross over and access is approved by Main Roads for exit directly to Great Northern Highway.

The access point will be the existing gate.

The site will not require security fencing apart from normal farm fencing and appropriate signage.

A secured compound may be used to protect machinery.

Truck warning signs are recommended to be erected on Great Northern Highway in consultation with Main Roads.

As noted above, the pit operations are separated from the road transport operations to provide a safer working environment.

All trucks are required to transport product in covered trucks to prevent spillages on roads.

With an anticipated 100,000 tonnes of gravel to be produced per year, excluding supply to the Bindoon Bypass, and say an average of 30 tonnes per truck, that amounts to an average of around 11 laden truck movements per day over a 300 day operating year. With larger trucks and an average load of say 40 tonnes, the number of laden truck movements drops down to around 6 per day.

Transport will continue to be irregular with minimal material transported in some weeks and larger quantities when a large contract is being filled. Excavation and transport is potentially a 6 day per week operation. This is necessary to allow cartage of road bases when busy roads are being repaired and to restrict interference to traffic to short periods of time.

There will be no work on Sundays and Public Holidays. Small stockpiles will be established on the floor of the excavation to ensure a constant supply of the various products.

Where possible weekend carting will be avoided.

The only internal roads are the current access roads along the northern edge of the resource.

Figure 11: Entrance. View North

Figure 12: Entrance. View south

5.7 Seasonal or Temporary Closure

Table 3 Seasonal Closure and Campaign Closure

TEMPORARY Closure Objective	Actions for Care and Maintenance Greater than 12 months
1.0 COMPLIANCE	
All legally binding conditions and commitments relevant to closure and rehabilitation will be met.	Prior to undertaking temporary closure. ➢ Review the latest documentation. ➢ Assess compliance with the conditions and commitments ➢ Faces and the landform are to comply with DMIRS Safety Guidelines and be stable for the long term.
2.0 SAFETY	
Make the site safe.	Prior to undertaking temporary closure. ➢ Secure the site and any plant or structures to be left. ➢ Mobile plant and other equipment not required will be removed from site. ➢ The site will be cleaned, structures will be removed. ➢ Provide fencing, bunding, signage or other measures as required to provide a safe site, particularly above any faces. **Security** ➢ Complete activities to make the site safe. ➢ Provide bunding and warning signs above faces as required. ➢ Provide locked gates or log access restraints as required or maintain staff on site. ➢ Check and maintain perimeter fences. ➢ Visual audit of completed ground, to verify compliance.
3.0 HYDROGEOLOGY	
Ensure that there are no materials that could cause pollution or environmental harm.	➢ Remove fuel service materials. ➢ Remove any materials from which leaching may occur.
4.0 BIODIVERSITY	
Minimise the risk to on site or offsite biodiversity.	➢ Implement Weed Management. ➢ Inspect the site for Significant Environmental and Declared weeds. Treat accordingly,
5.0 STAKEHOLDERS	
Ensure stakeholder issues are considered.	➢ Prior to temporary closure, as necessary, consult with the relevant stakeholders. ➢ If care and maintenance continues, modify procedures in response to changes in stakeholder position, policies or conditions.

5.8 Water Supply and Use

Water is used for dust suppression as required for the access road and processing areas. It is proposed that water used on site will be drawn from a bore on the northern side of Brockman River or a farm dam also on the northern side of the river. If that water is not available, water will be brought to site as required.

The same water supply has been used for all the past gravel extraction with the bore able to supply sufficient volumes and no impact on other water resources.

Generally less than 30 kL of water/day for up to 200 production days in the drier months is expected to be used. Water is not required in the winter months or when the soils and product are moist. Water is pumped to a concrete holding tank located in the east of the operations.

Water is required in the event of dust suppression being required for the access road and processing areas. That is the main water requirement, by wetting down the access road.

Water may also be used to wet the duricrust ahead of dozing. It can be used to wet down stockpiles and to wet product that is being crushed and screened as required to minimise dust generation.

Normally during crushing and screening the resource is often sufficiently moist to not require wetting down. At other times moisture is required to assist dust mitigation. There is however a fine balance because too much water can cause the screens to stick and clog.

Drinking water will be brought to the site as needed.

5.9 Workforce

The workforce will vary, depending on the level of operation and market demands, but usually 2 – 4 persons will work on site plus truck drivers as they access the operations.

5.10 Safety

Excavation safety

Excavation will be conducted *to Mines Safety and Inspection Act 1994 and Regulations 1995.* Excavation practices, and operations procedures are in compliance with the Act. Health and safety issues are overseen by the DMIRS.

Hall-Grav Pty Ltd have in place Safety Management Plans at all their sites and a site specific Emergency Response Plan to cover operational procedures, which include workforce induction and training to ensure that all employees involved are made aware of the environmental and safety implications associated with all stages of the mining activities.

Where applicable Safe Operating Procedure Sheets are prepared and made available for hazards. Workers and staff on all sites are trained in the use of the procedures, and all employees provided with site induction and training as necessary prior to commencing work on the site.

All vehicles have two way radio capability. No light vehicles are permitted on site without registering with mobile plant on site. Full personal protection is required for all persons on site at all times.

Emergency

- The site is within mobile phone contact and all vehicles are equipped with two way UHF radios.
- The loader will excavate from the face using an in – out movement, only approaching the face from a perpendicular movement which is the safe option.
- Personal protection is to be worn by all persons on site, with a minimum of hi – viz, safety boots, long clothing, hearing and eye protection and helmets when near the face or operating machinery.
- Road trucks are separated from the operating loader or dozer. Site warning signs and directions will be installed as required to maintain safety.
- Safety bunds or temporary fences will be used above any active vertical faces.
- Warning signs are to be maintained as required.
- Emergency preparedness plans will be developed and implemented.
- Staff and contractors are to be inducted and trained as necessary and have the relevant qualifications to fulfill the tasks they are assigned to.
- Where applicable Safe Operating Procedure Sheets are made available for hazards. Workers and staff on all sites are trained in the use of the procedures and all employees provided with site induction and training as necessary prior to commencing work on the site.

Fire

A Fire Management Plan is in place however in reality the risk of fire from extractive industries is very low as the mobile plant and trucks travel on bare gravel and do not contact vegetation.

There is less potential fire risk from quarries than other land uses because quarries clear land and vehicles are restricted to cleared access roads, the pit floor, processing and stockpile areas.

These cleared areas form a natural firebreak. The main risk comes from an external fire in the surrounding vegetation, impacting on the quarry. As such the fire risk is no greater than a rural property.

Fire risk is normally controlled through the *Bush Fires Act 1954* and local authority bylaws.

Western Australian Planning Commission Planning Bulletin 111/2016 provides for an exemption of a bushfire plan requirement because there will be no structures that will burn and the open ground will form a fire break. It also provides for an exemption where the proposed activity is a continuation of existing activities. This applies to this continuation of gravelextraction.

The Department of Mines Industry Regulation and Safety, SRS and PMP systems, with the registration of all quarries, requires bushfire planning to be covered under that system.

The management actions that are used to minimise fire risk are summarised below.

- Vehicles will be restricted to operational area, particularly on high fire risk days.
- Diesel rather than petrol powered vehicles are used.
- Perimeter fire breaks will be maintained by the landowner.
- The mobile plant on site will be available to assist with emergency fire management when safe to do so.
- Water supplies are drawn from existing farm supplies or brought to site as required. There is a concrete holding tank locted at the western end of the extraction area.
- The farm fire fighting unit is available for fire management.
- The site is to be secured from unauthorised access by maintaining the existing fencing and locked gates.
- Public access is not be permitted.
- An emergency muster area is provided.
- On site communications and worker induction and training is provided by Hall-Grav Pty Ltd.
- The site is within mobile phone range, adjacent to Great Northern Highway, the surrounding area is relatively flat and any bushfire smoke will readily be noticed.
- Emergency egress is available to the east to Great Northern Highway or west to Toy Road.

6.0 ENVIRONMENTAL IMPACTS AND MANAGEMENT

The aims of the Environmental Management are to minimise the effects of gravel excavation on the local environment and return the area to a landform compatible with the surrounding area.

The environmental management is designed to reflect best practise, outlined in particular in;

> Department of Resources, Energy and Tourism (Commonwealth), 2011, *A Guide to Leading Practice Sustainable Development in Mining*, and guidelines produced by Environmental Protection Authority, Department of Water, Environment Regulation, Department of Mines Industry Regulation and Safety, Western Australia Planning Commission and the Local Authority.

The Environmental Risk Matrix in this document Summary is considered to the principles of AS/NZS ISO 140001:2004 (Environmental Management Systems) and AS/NZS ISO 19011:2014 (Guidelines for auditing Management Systems). The principles of AS/NZS 31000:2009 (Risk Management Guidelines) are also used when considering any risks.

6.1 Aesthetics

There are a number of management actions that can be taken in quarries to minimise visual impact and these will be used wherever possible.

Guidance on visual impact is contained in *Department of Planning Land and Heritage, 2007, Visual Landscape Planning in Western Australia DPLH 2007).* Guidance can also be found in *Forest Commission of Victoria, undated, Landscape Types of Victoria.*

Visual Impact can occur in a number of circumstances, by the operation being set too high in the landscape, by being too close to neighbours and by insufficient visual protection.

The existing and proposed quarry will continue to be screened from Great Northern Highway.

Whilst the site lies within the Special Control Area 6.2, Landscape Protection Area, it is wholly contained within flat ground of the plateau, set back behind natural vegetation and is not visible from outside Lot 7.

The quarry renewal complies with the aims of the Landscape Protection of the Local Planning Strategy.

For the currently approved area, the pit is set back a minimum of 600 metres from Great Northern Highway with the current operation 1000 metres from the Highway. The operations are not visible from Great Northern Highway

With approval of the additional eastern resources the setback will drop to around 100 metres.

There is a thick belt of large trees fronting Great Northern Highway and with the gentle rise of the land from the Highway no part of the operations are currently visible or will be visible in the future or during subsequent stages.

The resource is situated on top of a plateau and with excavation taking place below ground level no part of the operations are visible from the south or west. Thick native vegetation provides full visual protection from the north.

Some trees have been planted in strategic locations along the southern portion of the property to the south of the proposed excavations.

With the natural vegetation, together with the actions undertaken and to be continued, it appears that the actual excavation will not generally be visible from any road or dwelling .

In addition the following visual management is applied.

- Topsoil will be pushed into low bunds 2 metres high along the eastern side and other edges of the excavation area where visual management may be required.
- Progressive rehabilitation of all completed, excavated or disturbed areas will be implemented.
- The pit is worked on the floor, below natural ground level and behind the perimeter bunding. As the floor of the pit will be around 2 metres deep there will be four metres of landform (pit depth and perimeter topsoil bund) to provide visual protection.
- In the current pit excavation is taking place in the east, working west away from Great Northern Highway.
- Operations are staged, and the components located appropriately to minimise visual exposure.
- The components of the operations will be located in positions where they are less visible where possible, such as behind stockpiles or bunds.
- Good house cleaning practices such as orderly storage and removal of disused equipment or waste will be practised.

Light Overspill

The facility does not operate at night. The only lighting that might be required at night could be security lighting. Security lighting is located to minimise light visibility from Great Northern Highway and adjoining land.

6.2 Noise Management

Noise Management is designed to comply with Best Practise, such as Institute of Quarrying Australia/Queensland Government, Noise Management.

6.2.1 Regulatory Framework

Noise can originate from a number of operations and may impact on onsite workers, or travel offsite and impact on external sensitive premises. Both potential noise impacts are addressed by reducing the noise generated from the quarrying and processing operations.

Offsite noise is governed by the *Environmental Protection (Noise) Regulations 1997*.

The Noise Regulations, require that sensitive premises including dwellings in non industrial and rural areas, are not subjected to general noise levels (excluding blasting), during the hours 7.00 am to 7.00 pm Monday to Saturday that exceed 45 dBA. Allowable noise to 55 dBA is permitted for up to 10% of the time and to 65 dBA for 1% of the time. Noise levels are not to exceed 65 dBA during normal working hours.

Between 9.00 am and 7.00 pm on Sundays and Public Holidays, and between 7.00 pm and 10.00 pm on all days, the base level is 40 dBA.

At night, between 10.00 pm and 7.00 am Mondays to Saturday, and before 9.00 am on Sundays and Public Holidays the permitted level drops to 35 dBA.

The 10% and 1% “time above” allowances apply at night and on Sundays and Public Holidays as well.

There are penalties for tonality of 5 dB, modulation 5 dB and 10 dB for impulsiveness, that are added to the permitted levels. That is, if the noise is tonal or modulated the permitted levels drop by 5 dB. Impulsiveness is not likely to be relevant for the quarry under normal circumstances.

The Noise Regulations provide for Construction Noise exemptions to enable construction of the site such as the building of the screening bund and opening the pits.

Influencing factors that raise the allowable noise levels are activities such as external industrial noise, some nearby land uses and busy roads. These are not relevant to this site.

Under Schedule 1 of the Noise Regulations the premises on which the extraction of basic raw materials are extracted, is classified as Industrial Land for the purposes of calculating influencing factors. This was defined as the whole cadastral boundaries in State Administrative Tribunal decision {2013} WASAT 139, Bushbeach v City of Mandurah. In this case the premises is quite small and approximates the area of disturbance and will have little impact on the influencing factors.

At a distance greater than 15 metres from the sensitive premises (eg dwelling), and commercial premises, a base level of 60 dBA applies at all times, with the 10% time permitted to be up to 75 dBA and the 1% permitted to be up to 80 dBA. For industrial premises the base level is 65 dBA at all times with the 10% time permitted to be up to 80 dBA and the 1% permitted to be up to 90 dBA.

The closest sensitive premises is the service station to the north east across Great Northern Highway but that is a commercial premises. There are no dwellings within 1,000 metres of the proposed excavations.

6.2.2 Environmental Noise Management

The types of equipment proposed to be used are listed below. Not all plant will be on site at any one time and that provides for contingencies to reduce the operational noise on site if necessary at certain times.

There are no proposed changes to the operations with the current management to be continued.

Hall-Grav Pty Ltd excavates the gravel on site.

Table 6: Noise management

General Noise	Management
Objectives	**The Operations will comply with the *Environmental Protection (Noise) Regulations 1997.***
Legislation and Guidelines	*Environmental Protection (Noise) Regulations 1997.* DWER Works Approval and Licence under *Part V of the Environmental Protection Act 1986* to be applied for in relation to crushing and screening of gravel in excess of 5,000 tonnes per year.
Planning Management	**Noise Regulations** • Hall Grav Pty Ltd is committed to compliance with the Noise Regulations. **Site Selection** • The site has been selected based on the resource location, and the quarry designed to maximise the setbacks and noise impacts to the closest sensitive premises. • The access road and crossover are already in place. **Close Sensitive Premises** • There are no nearby sensitive premises. The excavation is located over 750 metres from the closest sensitive premises to the south. Other buffer distances are 1000 metres and potentially down to 600 metres across Great Northern Highway for a dwelling to the west, and 950 metres for a dwelling to the north and 1400 metres for a dwelling to the north north west.
Construction Management	**Construction of Bunding and Pit Preparation** • The first excavation will be the pushing of topsoil and overburden to the east to form an eastern perimeter bund to 2 metres high. • The pit will operate behind the bund at an excavation depth of 2 – 4 metres. • The access road is already constructed, approved by Main Roads and in use. **Design and Construction of the Quarry** • All crushing and screening is to take place on the floor of the pit behind the topsoil bunding

	where appropriate.
Operational Management	**Haul Road** • The access road is already constructed and in use with the crossover approved by Main Roads. **Quarry Operations** • All crushing and screening takes place on the floor of the pit behind the topsoil bund. • Processing consists of a mobile crusher and screening plant located on the floor of the pit in a location to maximise landform screening when road base is being produced. The solid walls of the pit perimeter will provide significant noise attenuation to the closest dwellings. • The crushing plant will be a mobile plant located adjacent to the face and bund and land form to maximise noise mitigation and noise carry to the east. • All plant will be maintained in good condition with efficient mufflers and noise shielding. • Lights or low frequency frog beepers are to be used rather than high pitched beepers to restrict noise intrusion. • No drilling and blasting is proposed. • Excavation is to be conducted using a bulldozer and loader with at times an excavator. • All equipment is fitted with noise shields and efficient silencers. • The noise suppression measures on the crushing and screening plants will be closely monitored, and appropriate signage posted. • DWER Licence is in place L8748/2013/1 for 100,000 tonnes per year until 26 May 2022. The Licence is being renewed. **Truck Movements** • Truck movements along internal roads are restricted to the existing hardstand and access road. • Trucks will enter and leave the site directly from Great Northern Highway. • Transport on Public Roads is exempt from the Noise Regulations. • Internal roads are maintained in good condition to minimise the banging of trays and other potential noise impacts. **Operational Site Code** • A site code is in place at other Hall-Grav Pty Ltd operationsand will be used on this site. **Contingencies** • Shutdown will be used to save fuel and maintenance costs in addition to noise minimisation. • There is good flexibility to plan the equipment use to reduce noise levels further even though that is not necessary for compliance with the Noise Regulations. This can include the location of the plant such as the crusher, number and type of plant operating at any one time, use of bunding or shielding, changing the mobile plant, providing better silencing etc. **Operating Hours** • Quarrying and processing operations are to be conducted during normal working hours between 6.00 am to 6.00 pm, Monday to Saturday excluding Public Holidays. • The hours between 6.00 am and 7.00 am are part of the night time assigned noise levels and therefore at that time normally only gravel will be loaded. The crushing and screening plants will not normally operate before 7.00 am.

	• Contingencies are available to reduce noise levels further such as limiting the number and type of plant operating at any one time as required to maintain compliance with the Noise Regulations.
Monitoring	**Complaints** • A complaints recording and investigation procedure is to be implemented and maintained. • All complaints are recorded, investigated and, if substantiated, action taken to correct the issue raised. • Where possible the complainant will be contacted to explain the procedures and actions taken to resolve the issue. • No known complaints have been made relating to noise in the past 5 years.

6.2.3 Occupational Noise

The management of occupational noise is normally handled by providing all necessary hearing protection, as well as conducting worker inductions and educational programs for all staff, and hearing tests which are required. Regular site audits of quarry and mining operations are normally conducted by the Department of Mines Industry Regulation and Safety.

- Hall-Grav Pty Ltd conducts site induction and training for all personnel at all their sites.

Personal Noise Protection

All staff will be regularly checked for hearing under the Mines Safety and Inspection Act, the SRS and Project Management System that are required under DMIRS safety regulation. See below under Operational Noise.

As part of its commitments, Hall-Grav Pty Ltd are pro-active with worker safety awareness;

- by providing all necessary safety equipment such as ear protection,
- identifying sections of the plant where hearing protection is required, as well as,
- conducting induction and educational programs for its staff.
- Training will be conducted under the *Mines Safety and Inspection Act 1995*, the SRS and Project Management System that are required under DMIRS safety regulation.
- All personal noise protection equipment is provided to staff.
- Warning signs are used to identify areas of potential noise associated with mobile plant.

The DMIRS conducts regular inspections of all quarries.

6.3 Dust Management

6.3.1 Nature of Quarry Dust

Most dust on a quarry site is generated;

- During vehicle movements on hard surface such as internal and hardstand.
- From crushing and screening of laterite.
- From dust lift off by wind, mainly from hardstand and vehicle movements.

The greatest proportion of dust in quarries is visible dust. Dust during quarrying operations is only a problem when there is inadequate management of the dust risk. Most management consists of wetting down the products and keeping them moist, with other management being the use of screens and curtains on processing plant.

As dust has the potential to be generated from crushing and processing, its treatment and management form an integral part of the DWER Licence that will be required for crushing and screening of laterite gravel in excess of 5,000 tonnes per year under *the Environmental Protection Act 1986 Part (V*) and is normally conditioned in that approval. DWER Licence is in place L8748/2013/1 for 100,000 tonnes per year until 26 May 2022. The Licence is being renewed.

Commonly called "dust," scientists and regulators refer to the term particulate matter (or PM) to describe the range of particles that exists in the air or in air breathed in.

Particulate matter exists naturally in the atmosphere, eg sea-salt spray and pollens. Small sized PM can be increased due to human activities such as vehicle exhaust, industrial processes, power stations, mining, farming and wood heaters, or smoke from bushfires.

Exposure to small sized PM can be associated with health and amenity impacts if the exposure is excessive.

The likely risk of these impacts depends on a range of factors including the size, structure and composition of the PM. The various dust particle size is explained in *DEC (DWER) 2011 Guideline for Managing the Impacts of Dust and Associated Contaminants from Land Development Sites, Contaminated Sites Remediation and other Related Activities. This Guideline supersedes the 1996 Guideline.*

Quarry Dust Composition

There is data specifically from mining, (predominantly coal) from New South Wales (NSW Health) where particulate levels have been measured to be;

PM <2.5 microns as 2 – 5% of emissions (One micron is 1 / 1000 of 1 mm).

PM< 2.5 are invisible and called "fine particles". They are the main health issue and are caused by vehicle emissions whether they are along roads or on private land. Vehicle emissions will not occur at night or at other times when the site is not active.

PM 2.5 – PM10 microns as 15 – 45%

PM 10 (particles between 2.5 and 10 microns) are invisible and called "coarse particles". They can be breathed in, but are removed by alveoli and mucous. (NSW Health). This dust may be generated when land is cleared and topsoil disturbed or the site is subject to traffic in summer.

PM>10 microns as 50 – 70%

PM>10 is visible dust and will, based on the resource, be the vast majority of the particles.

Normally all sizes of dust are generated together, and there will be visible dust being generated when invisible dust is being formed. Therefore any visible dust present is a good sign and an early indicator of a dust risk. A summary of the sources and proportions of dust is shown in; NSW EPA and NSW Ministry of Health Environmental Health Branch 2015, Review of the health impacts of emission sources, types and levels of particulate matter air pollution in the ambient air in NSW.

This is backed up by occupational monitoring through the Department of Mines Industry Regulation and Safety. Unpublished data from operating quarries shows quarries are compliant or can readily be made compliant with the health and safety and community standards through normal dust management practices, particularly with wetting down of at risk areas.

6.3.2 Dust Standards

To provide for air quality in populated areas an Australian Standard was established.

The Ambient Air Quality NEPM as an instrument was established in 1998 under the *National Environment Protection Act 1994* (NEPC Act) is to provide a nationally consistent framework for monitoring and reporting on six common ambient air pollutants – carbon monoxide, lead, nitrogen dioxide, photochemical oxidants (ozone), sulfur dioxide and particulate matter (PM) as the larger size fraction of PM10. It was varied in 2003 to include smaller sized particles, PM2.5.

Following much review and consultation, the Air NEPM was amended on 4 February 2016 to upgrade the PM2.5 and to add *1-year average PM10 of 25 µg/*m^3 to complement the 24-hour average PM10 of 50 µg/m^3.

An exceedance of 1-day average standards in excess of normal historical fluctuations and background levels, was also added and is directly related to bushfire, jurisdiction-authorised hazard reduction burning or continental-scale windblown dust.

Western Australia has a goal of achieving the National Environment Protection Standard for PM10 in ambient air, in line with the National Environment Protection (Ambient Air Quality) Measure (NEPM), based on the PM10 for a daily PM10 (visible dust) level that did not exceed 50 µg/m3, with an allowance only for exceedances for 'exceptional' events, such as bushfires.

The NEPM is applicable to populated areas as it has been found that at operating quarries in the Rural Area dust management is readily achieved in compliance with the NEPM standards and therefore the normal dust management involves the identification and treatment of visible dust as a very effective means of managing dust.

In 2011 the DWER released Dust Management Guidelines that acknowledged the NEPM standards but relies on visual dust management. Visual dust management is the norm for quarries in Western Australia and in DWER Licences.

6.3.3 Dust Risk

Dust management is an integral part of the extraction and processing of any basic raw material.

The dust risk assessment is based on the *DEC (DWER) 2011 Guideline for Managing the Impacts of Dust and Associated Contaminants from Land Development Sites, Contaminated Sites Remediation and other Related Activities.*

DEC (DWER) 2011 Guidelines provide for dust risk assessments to be conducted, management proposed and implemented and a visual monitoring procedure and complaints mechanism to be used.

The Guidelines are for uncontrolled sites or for sites to determine what management of dust might be necessary. Therefore two scores have been used in the risk assessment.

- From the assessment of the setbacks of the proposed operations and prevailing winds, the main risk is from the easterly winds on mornings, especially in summer when the soils, hardstand and stockpiles are at their driest.

- Note that the dust risk methodology assesses the dust risk at the closest sensitive premises such as the buildings at the service station to the north east at a distance of 300 – 1050 from the pit, across Great Northern Highway.

Table 7: Dust Risk (DWER 2011 Guidelines)

PART A Number	Item	Score	Score
		Crushing, screening and general operations **without dust management,** located > 500 metres from sensitive premises.	Crushing, screening and general operations **with dust management,** located > 500 metres from sensitive premises.
1	Nuisance potential of the material	Medium to High when trafficked and untreated - 4 to 6.	Low when treated with wetting down - 2.
2	Topography and vegetation screening	Sheltered and screened -1	Sheltered and screened -1
3	Area of site activities	Active trafficked areas at any one time are 1 - 5 hectares in area - 3	Active trafficked areas at any one time are 1 - 5 hectares in area - 3

4	Type of work being undertaken	Bulk earthworks - 9	Bulk earthworks - 9
	Summer total without dust measures	Maximum = 17 - 19	Maximum = 14

PART B Number	Item	Score	Score
		Crushing, screening and general operations **without dust management,** located > 500 metres from sensitive premises.	Crushing, screening and general operations **with dust management,** located > 500 metres from sensitive premises
1	Distance to premises	Premises between 500 – 1000 metres – 6.	Premises between 500 – 1000 metres – 6.
2	Effect of prevailing wind	Premises affected by prevailing wind - 6 (Main winds are easterly in the morning and south westerly in the afternoon)	Premises affected by prevailing wind - 6 (Main winds are easterly in the morning and south westerly in the afternoon)
	Total Part B	Maximum Premises = 12	Maximum Premises = 12

Activity	Calculated Score Part A x Part B	Allocated Risk of Dust
Crushing, screening and general operations **without dust management,** located > 500 metres from sensitive premises.	**Maximum Premises A and B = 19 x 12 = 228**	**Classification 2 Low Risk,** Dust management will be required for pit best practice and worker environment. This is provided and the assessed levels are as provided below.
Crushing, screening and general operations **with dust management,** located > 500 metres from sensitive premises	**Maximum Premises A and B = 14 x 12 = 168**	**Classification 1 Negligible Risk,** No recommended actions or contingencies required for the dwellings. Dust management will be required for pit best practice and worker environment.

Further, there have been several studies relating to the distance dust travels from quarrying activities on gravel roads in flat open ground.

Oudwater S, 2017, Modelling of dust emission in dimension stone quarry, Aalto University School of Engineering, Finland showed that for drilling and other activities associated with hard rock quarries, 95% of the dust down to PM10 settles within 20 metres of the quarrying activity. The amount of dust deposited at a distance of 30 metres was around 2% of that deposited at the source of the activity.

In addition data from Oudwater S, 2017, and Jones D N, L Bemede, A R F Bond, C Dexter and C L Strong, 2016 shows that the majority of quarry dusts are larger particles and settle quickly within less than 40 metres, further reducing the risk of dust impacts.

The study also confirmed that finer dust particles, PM5, which are the most significant for health were the result of combustion engines with little being produced by the abrading of rocks.

Jones D N, L Bemede, A R F Bond, C Dexter and C L Strong, 2016, Dust as a contributor to the road effect zone: a case study from a minor forest road in Australia, Australian Journal of Environmental Management Volume 23, No 1 p 67 – 80 noted that dust deposition at a distance of 40 metres from a gravel road in forest varied from 8% to 30% of the deposition at the roadside depending on the level of vegetation cover. They also found that mammals were not significantly impacted by the dust compared to when the road was sealed.

Because only a small proportion of the dust from quarries is PM2.5, with the majority of dust being visible dust, the management of visible dust has been found in Australian Quarries and elsewhere to provide good management of all health risks. That is readily tested when occupational dust levels are measured which are carried out regularly at quarries through DMIRS occupational health and safety measures.

If the site is safe for workers the offsite risk will be even lower through dispersion over distance.

6.3.4 Tree Belts and Buffer Management

Dust particles are readily stopped by tree belts and distance, with which the site complies. Tree belts slow the wind and allow the dust to settle.

The Queensland Guidelines predominantly relate to agricultural spray drift, but based on particle size also relates to dust.

The Guidelines provide for a buffer of 300 metres for open agricultural land, which is applicable to the proposed operations, dropping down to 40 metres where an effective tree belt is in place. The Western Australian Department of Health also uses the same guidelines. The Guidelines are based on field studies and demonstrate the effectiveness of tree belts and distance in providing screening against particulate travel.

The eastern and western sides of Great Northern Highway have dense wide tree belts and there are scattered trees across the resource area with isolated trees and pasture.

The buffer distances comply with the guidelines with dust management as prescribed by the *Department of Natural Resources Queensland (1997) and Department of Health WA, 2012*.

6.3.5 Monitoring of Excessive Dust

When dust visual trigger conditions are detected and/or alerted, relevant action is taken. This can include additional water suppression, modification of procedure, delay until more favourable conditions are present, use of alternative equipment etc.

Human monitoring can detect potential dust risks prior to, and take action prior to, significant dust being generated. They notice dust immediately such as from tyres, whereas machine monitoring has to rely on significant dust being generated, travelling to the boundaries of the premises and triggering an alarm. The operators would be negligent if they let the dust get to that level of impact prior to taking action.

Human monitoring can detect potential dust risks prior, and take action prior, to significant dust being generated. They notice dust immediately such as from tyres. The research by Sairanen M and O Selonen, 2018, *A Review of dust emission dispersions in rock aggregate and stone quarries, International Journal of Mining, Reclamation and Environment*, demonstrates that visual assessment of dust agrees with the measured concentrations of dust.

The problems associated with machine operated dust monitoring are that the monitors and samplers used do not separate the organic particles from inorganic particles. On quarry sites the continuous monitors and high volume samplers have been found to register the highest volumes from smoke with little registrations from normal quarrying operations when a site is well managed.

The samplers and particle monitors do not identify which particles actually come from the quarry and do not differentiate the inorganics from the organics. Further they do not provide instantaneous feedback from dust management. The measurements are normally added or averaged. For example an alarm may trigger when a daily limit has been reached, at which time the actual cause of the dust may well have been resolved and so the exceedance cannot be related to the actual operating conditions. There is a travel time for dust to reach the monitor even if the monitor is located at the boundary of the site. On that basis such machine sampling has not been found to be effective on quarry sites. Depositional samplers are the best non human monitoring.

The auditable condition is visible dust crossing the boundary of the premises; the lot boundary. This is the condition used on Department of Water Environmental Regulation Licences and all other quarries such as sand, limestone, gravel and hard rock quarries in Western Australia and has worked well in the past.

It is also the method used by the DMIRS and DWER to rapidly assess occupational dust on site.

The quarry manager and leading hand are ultimately responsible for site supervision of dust. They travel around the operations and pit frequently and are in two way radio contact with all mobile plant.

All operators on site are instructed to be vigilant to dust generation and management and report any excessive dust or potential dust management issues.

Visual monitoring is even more effective when complemented by an extensive reporting and complaints process and this will be used.

The dust risk assessment based on the *DEC (DWER) 2011* shows a Negligible risk when normal dust management is provided. That is confirmed by there being no know complaints relating to dust from external premises during the last five years. During past operations dust generated on site has been able to be readily controlled by wetting down.

The effectiveness of the dust management is shown by no complaints regarding dust normally being received at Hall-Grav Pty Ltd operations, within the past five years.

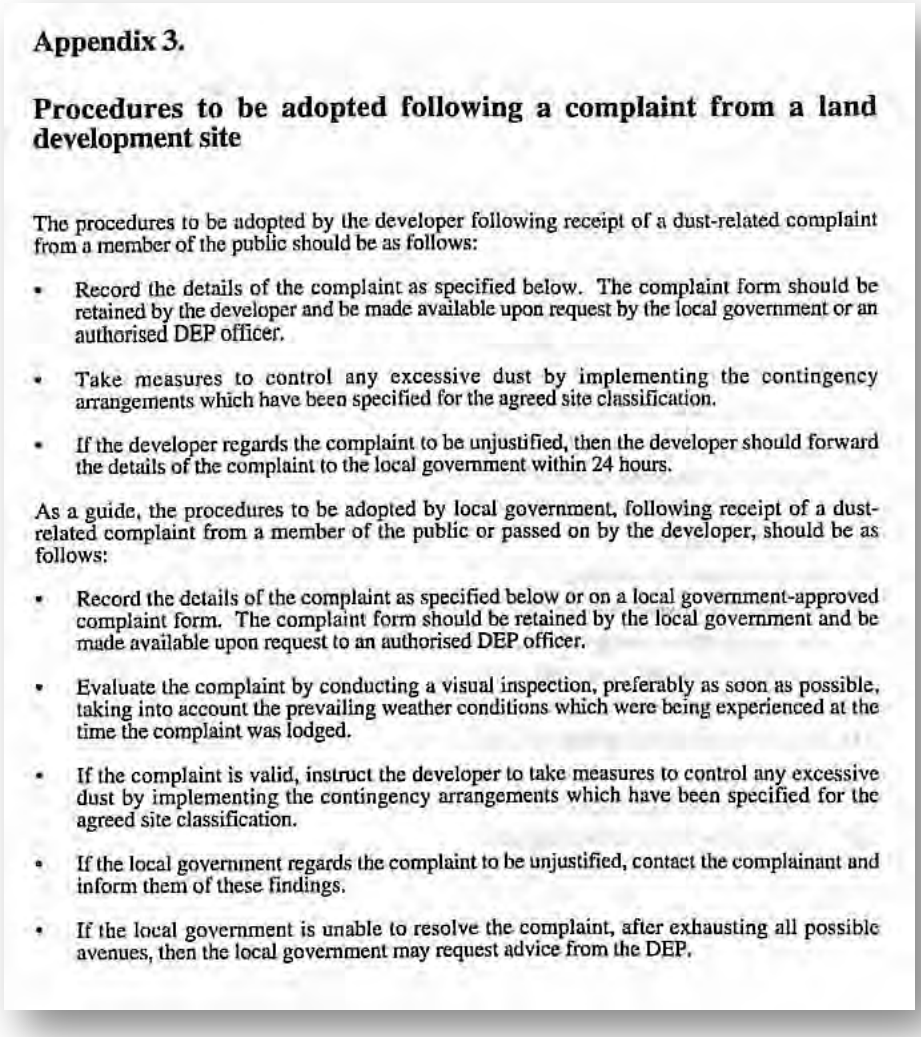
Table 8: Dust Management Actions

Activity	Dust Management
Objectives	***Minimal dust moving off site and minimum dust generated on site or from the access roads.*** ***No visible dust to cross the boundary of Lot 7.*** ***No dust impact on sensitive premises or Great Northern Highway.***
Legislation and Guidelines	*WQPN 15 Extractive Industries near sensitive water resources (2019)* *DEC (DWER) 2011 Guideline for Managing the Impacts of Dust and Associated Contaminants from Land Development Sites, Contaminated Sites Remediation and other Related Activities*
Construction - Clearing	**Land Clearing - Opening** • This involves removing the topsoil for use in revegetation and construction of the screening bunds, followed by removal of the overburden. • Construction will take place when the soils are moist. If conducted in summer water will be used to wet down the soils and overburden prior to removal if dust is generated. • Roads and traffic areas will be wetted down as required. • Clearing and reinstating pasture, topsoil and overburden will be confined to the wetter months, April to October, where possible. **Construction of the Topsoil Perimeter Bunds** • The bulldozer will form the bund first by pushing the topsoil and overburden to the perimeter in the east. • If winds are sufficiently strong, or other weather conditions are unacceptable to negate the effects of dust management, operations will cease until conditions improve and compliance can be achieved.
Operation	**Excavation** • Similar excavation methods to all other gravel quarries are proposed. • The excavation of laterite gravel is not generally dusty in itself, it is the traffic on the floor of the pit and on hard stand areas and any processing that is more likely to generate excessive dust. • Excavation will normally be undertaken by the loader or excavator loading to a haul truck or directly to the crusher. • Excavation will be undertaken as low in the pit as permitted by the quarry planning to provide maximum shelter for dust protection. • Trafficked roads and hard stand will be wetted down as required. • The loading and hard stand will be watered as required to suppress dust. In summer this will normally equate to being watered 2 to 4 times per day and in winter little or no watering is anticipated to be required. • Internal roads and hardstand surfaces will be maintained in good condition (free of potholes, rills and product spillages) and with suitable grades. • A water truck will be retained on site for road and other wetting down product and gravel as applicable. • Use of a sealant such as a polymer, chemical or emulsified oil or bitumen on the internal

Activity	Dust Management
	roads to reduce water use remains an option to supplement water treatment if required or applicable. • Misting is a contingency for the loading and tipping areas using a moderate mobile misting machine. • If winds are sufficiently strong, or other weather conditions are unacceptable to negate the effects of dust management, operations will cease until conditions improve and compliance can be achieved. **Processing** • DWER Licence is in place L8748/2013/1 for 50,000 tonnes per year until 26 May 2022. The Licence is being renewed and and is to remain the same at 100,000 tonnes per year. The increase will be achieved by using the same plant in the same manner but just for a longer portion of the working day. There will be no increase in the risk of dust from the processing apart from longer operating times. • Treatment with water will be used where required. • Sprinklers or wetting down of internal roads, traffic and loading areas. • A water truck will be located on site as necessary during operations and the active hardstand and access road treated as needed. • Processing and stockpiles will be located more than 500 metres from the service centre to the north east. • Plant location, and approach with respect to wind directions, will be used to minimise impact on operators. • All crushing and screening plant will be located on the pit floor below natural ground. • Water sprays, mists and additives to crushing and screening cycles will be added with screens covers and misters at drop points. • The mobile plant will be screened and shielded where possible and treated with misters and other dust control at other points. • Use and maintain filters on all operational plant. • Regular appropriate emptying of filter collection devices. • Face hoppers and drop points away from prevailing winds. • Reduced pressure in plant, hoppers and bins can assist in preventing the loss of dusty air. • Misting is a contingency for the loading and tipping areas using a moderate mobile misting machine. • If winds are sufficiently strong, or other weather conditions are unacceptable to negate the effects of dust management, operations will cease until conditions improve and compliance can be achieved. **Stockpiles and Loading** • Processing and stockpiles will be located more than 500 metres from the service centre to the north east. • A water truck is to be located on site as necessary during operations and the active hardstand and access road treated as needed. • The number of stockpiles will be minimised . • Stockpiles in sheltered areas located low in the landscape, well below the natural surface and behind the perimeter bunding and face. • The elevation of stockpiles will be minimised.

Activity	Dust Management
	• The drop height to stockpiles and loading will be minimised. • Finer products will be located inside or screening by stockpiles of coarse materials. • Misters and skirts will be used at drop points as appropriate . • Misting is a contingency for the loading and tipping areas using a moderate mobile misting machine. **Unattended Site** • A sign will be erected at the entrance to the pit with details and contacts of the operator who can be contacted if excess duct is generated. • The operator contacts will be provided to the closest dwellings to enable contact if excess dust is generated. • Stockpiles will be located where they are screened by the pit walls and other measures. • If dust becomes an issue when unattended during summer months dust suppression will be maintained which could include the use of a water cart, sprinkler systems on stockpiles, windbreak materials, surface stabilisation sprays and other measures as required.
External Transport	**Access and Road Transport** • The access road is gravel and the crossover is bitumen. • All loads for transport outside the pit are required to be covered. • All trucks will be required to be dust free and not carrying pebbles and other materials outside the tray. • The hardstand is to be maintained in good condition (free of potholes, rills and product spillages). • Loader drivers are instructed on the best means of loading to minimise overflow and spillage. • Trucks are to be inspected by their drivers prior to leaving the site and brushed down as necessary to remove loose materials.
Occupational Dust	**On Site Health and Amenity** • Air conditioned cabins will be maintained on all vehicles. • A readily auditable trigger of no visible dust to cross the property boundary in line with DWER Licence and best practice in WA. • The trigger for dust management is the generation of visual dust. • The leading hand or Quarry Manager is normally the loader driver who is in the best position to assess dust generation and to direct remediation. • A commitment is made that no visible dust will cross the boundary to impact on dwellings. • On site operators are instructed to visually monitor dust, report and treat any visible dust. **Mines Safety and Inspection Act** • Occupational dust associated with the quarrying processes falls under the *Mines Safety and Inspection Act 1994 and Regulations 1995* overseen by the DMIRS who regularly inspect the site. Included in the program are personal dust monitoring assessments. If on site dust is managed offsite dust risk is also managed. • Operations will cease if conditions are not favourable or when visible dust is crossing the boundary. • The latest weather conditions to increase the awareness of dust risk. • On site induction training will include observation and mitigation where possible of all dust

Activity	Dust Management
	emissions.
Rehabilitation	**Rehabilitation** • Scheduled activities such as ripping, overburden and topsoil spreading are to be undertaken at times when the materials are less likely to blow or during suitable wind conditions. • If conducted in summer and the soils are not sufficiently wet to suppress dust, water canon will be used to wet down the soils and overburden prior to removal. • Land restoration is infrequent and normally conducted only once per year. • Where possible restoration will be completed in wetter months or when winds are blowing away from sensitive premises. • If winds are sufficiently strong, or other weather conditions are unacceptable to negate the effects of dust management, operations will cease until conditions improve and compliance can be achieved.
Monitoring	**Monitoring** • The most effective dust monitoring is the sighting of visible dust. Dust can be detected as soon as it leaves the wheels of vehicles and detection is not reliant on dust travelling to a machine monitor located near the boundary. • The auditable condition is visible dust crossing the boundary of the premises; the lot boundary. This is the condition used on DWER Licences and all other quarries such as sand, limestone, gravel and hard rock quarries in Western Australia and has worked well in the past. • A comprehensive visual monitoring program is to be implemented with all workers instructed to inform the Quarry Manager/leading hand if dust levels are excessive. • The Quarry Manager/leading hand will then organize the appropriate dust management to reduce or mitigate dust. **Complaints** • All complaints relating to dust are to be investigated immediately on receipt of a complaint. • A record of all dust complaints is to be maintained together with the mitigation measures to be used to reduce the dust impacts. See the example below.

Activity	Dust Management
	

Appendix 3.

Procedures to be adopted following a complaint from a land development site

The procedures to be adopted by the developer following receipt of a dust-related complaint from a member of the public should be as follows:

- Record the details of the complaint as specified below. The complaint form should be retained by the developer and be made available upon request by the local government or an authorised DEP officer.
- Take measures to control any excessive dust by implementing the contingency arrangements which have been specified for the agreed site classification.
- If the developer regards the complaint to be unjustified, then the developer should forward the details of the complaint to the local government within 24 hours.

As a guide, the procedures to be adopted by local government, following receipt of a dust-related complaint from a member of the public or passed on by the developer, should be as follows:

- Record the details of the complaint as specified below or on a local government-approved complaint form. The complaint form should be retained by the local government and be made available upon request to an authorised DEP officer.
- Evaluate the complaint by conducting a visual inspection, preferably as soon as possible, taking into account the prevailing weather conditions which were being experienced at the time the complaint was lodged.
- If the complaint is valid, instruct the developer to take measures to control any excessive dust by implementing the contingency arrangements which have been specified for the agreed site classification.
- If the local government regards the complaint to be unjustified, contact the complainant and inform them of these findings.
- If the local government is unable to resolve the complaint, after exhausting all possible avenues, then the local government may request advice from the DEP.

6.4 Water Management

Surface Water

The site lies on a plateau remnant. Existing drainage lines that are only active in storm events will not be altered. There will be no alteration to underground ground water.

The Brockman River is 1.6 km to the south west.

All water collected from rainfall will be contained in the pit by the slope of the floor and the pit walls. Small temporary sumps will be created on the floor of the pit to retain surface water, although water from these will percolate through the subsoils.

As the pit is restricted to gravel extraction, the base of the pit will remain permeable. Past excavation and the existing pit has demonstrated that all water is retained within the pit.

There is no surface runoff of water on the gravel resource due to the porosity and permeability of the laterite, with precipitation draining to the deep water table.

Groundwater

The geology of the site is stable, and taking only the gravel resource ensures that there is no risk of contamination of surface or groundwater when the outlined management procedures are used.

Separations to the regional groundwater are very deep, between 18 - 21 metres, based on drilling completed by the landowner. In turn the actual pit is at elevations 250 metres in the west and east of the excavation area to 282 metres in the central north.

The Department of Water Environmental Regulation Water Quality Protection Note 15 WQPN for Extractive Industries permits a final land surface of 0.5 metres above the highest winter water table.
The excavation of gravel therefore complies with the DWER guidelines and WQPN 15 and uses the management actions wherever there is environmental benefit.
No dewatering is used or proposed. All water is to be retained in the pit and infiltrates into the gravel.

The excavation area has slopes of less than 1 : 20 vertical to horizontal. Excavation will be worked in cells which will be rehabilitated and designed to retain all runoff, as demonstrated by the current excavation.

The Australian Rainfall and Runoff data, Institution of Engineers, lists rainfall as 90 mm for a 12 hour period (1 : 100 year event). The rainfall for a 24 hour period 10% exceedance is 79.3 mm, but with soakage, this amount of water will last on site.

If a design precipitation of say 80 mm is considered then for 80 mm precipitation falling on each hectare, a total volume of 800 m^3 precipitation (or 0.8 metres depth assuming no seepage loss) must be allowed for per hectare, which will be totally contained within the depth of excavation of 2 - 4 metres. The capacity depth is ensured by the depth of excavation and the construction of overburden bunding on the downslope side of the pit.

There is no surface runoff of water, with precipitation draining to the water table. It has been estimated that around 15- 20% of the rainfall will reach the groundwater based on the parkland pasture on the gravel cover.

There are no acid sulfate or salinity issues, with the soils and water being fresh and elevated in the landscape. See Section 4.4 Acid Sulfate.

The materials listed in Table 9 are considered for their potential to impact on water quality.

Table 9: Materials Inventory – Characterisation

Type	Comment	Treatment	Reference
Acidic materials and drainage	Not present. Therefore there is no risk of acidic conditions developing as a result of exposure of the resource to oxidation from the atmosphere. The materials are highly oxidised laterite gravel. The water table will not be exposed.	No treatment necessary. Geological examination of the rock does not reveal any sulphides or sulphide weathering products or any at risk materials. The laterite crusts that are exposed to the atmosphere on the Darling Scarp carry no sulphides.	Field geological examination by staff. Field geological examination of the general area and other hard rock quarries in the same geological rock units by Landform Research.
Ablutions waste	The site will be serviced by an approved portable waste water system when operational.	The facilities and wastes will be removed from site on closure.	
Dangerous Goods and Services	**FUEL** The various plant will be refuelled from mobile tanker and on site tanks. ***None will remain on closure***.	Any rock, earth, soil or other materials, impacted by significant drips and spills will be removed offsite to an approved waste site or location. Fuel is discussed in the Water Management.	Table 11
	SERVICE MATERIALS Only minor lubrication will be conducted on site, such as changing a hose. On site servicing will be conducted by dedicated service truck that collects and removes waste hydrocarbons and service materials. All major servicing will be conducted offsite. ***None will remain on closure***	A Service Management Plan is provided.	Table 11
General waste	All waste will be collected	Regularly removed from	Table 11

Type	Comment	Treatment	Reference
	and removed from site on a regular basis.	site to an approved disposal area.	

Table 10: Water Management

Surface Water Volumes	
Objectives	***There will be no significant change to the quality or quantity of surface or groundwater***.
Legislation and Guidelines	*Minesite stormwater* *WQPN 15 Extractive Industries near sensitive water resources (2019)* *DWER 2003, Mine Void Water Resource Issues in Western Australia, Water and Rivers Commission (DWER) Report Hydrogeological Record Series Report HG 9.* *Read J and P Stacey, 2009, Guidelines for Open Pit Slope Design, CSIRO, CRC.* *Stormwater Management Manual for Western Australia, Department of Environment WA, 2004.*
Management	**Water Management on Closure** • At the end of excavation the land surface will be similar to the pre-mined surface except the pit area will be around 2 metres lower. The reconstructed soils will be planted to parkland pasture. • Surface water will be retained in the pit to infiltrate into the ground. • Overall the water balance at closure is anticipated to be similar to the pre- mine condition. **Refuelling** • Extraction of gravel is a clean operation and has operated for 20 years with no known pollution incidents. • Hall-Grav Pty Ltd, the operator, have safety and pollution management procedures for all their operations. They also use self contained service and recovery vehicles to undertake minor servicing in the field. • Fuel will continue to be brought to site for refuelling. **Fuel Spill Management** • Diesel fuel will be transported to site as required by mobile tanker. • Soils and gravel roadbase hardstand such as those on this site are adsorptive. The main risk of contamination is the minor drips that occur during the removal of hoses etc. Minor spills are quickly degraded by soil microbial matter. • Refuelling and lubricating activities is only be used in designated areas. Equipment for the containment and clean-up of spills is to be provided in these areas. • Any potential spillage will be contained in plant and working areas by shutting down plant or equipment if the plant or equipment is the source of the spill (provided it is

	safe to do so). • In the event of a spill or adverse incident, activities will be stopped in that area until the incident is resolved. • Any spills will be contained by the excavation or processing area. A fluid spill emergency response kit will be located at the refuelling area. For larger spills soil and resource will quickly be placed around the spill to contain it in as small an area as possible. When contained, the contaminated aggregate/loam soils will be scooped up and removed to an approved landfill or other approved site. • All significant adverse incidents (such as a fuel spill of >5 litres) in one dump, will be recorded, investigated and remediated. A record is to be kept of incidents and the shire of Chittering and Department Water Environmental Regulation notified within 24 hours. • Transport chemicals in accordance with the *Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code).* **Servicing and Maintenance** • All major servicing of vehicles will be conducted off site. • Servicing plant and equipment is conducted in accordance with a maintenance schedule. • Lubricating and minor maintenance activities occur in designated areas in the processing area and pit. Equipment for the containment and clean-up of spills is to be provided. • Any potential spillage will be contained in plant and working areas by shutting down plant or equipment if the plant or equipment is the source of the spill (provided it is safe to do so). • Waste substances and chemicals will be stored in accordance with the Site Waste Guidelines. • Self contained contractor service trucks are used that recover all waste liquids and solid materials for recycling and removal from site. • Waste oil and other fluids derived from the routine maintenance of mobile machinery, are transported off site and disposed off at an approved landfill site. Grease canisters, fuel filters, oil filters and top-up oils are stored in appropriate containers and brought to the site as required. • Vehicle washdown is not proposed. • Regular inspections and maintenance of fuel, oil and hydraulic fluids in storages and lines are carried out for wear or faults during normal maintenamce and daily inspections. • Accidental spill containment and clean-up protocol will be implemented as necessary. • Waste chemicals derived during routine maintenance activities will be stored in appropriate sealed containers within a designated storage area or taken from site and disposed of at an approved facility. • Rubbish generated is to be recycled wherever possible and periodically disposed of at an approved landfill site. **General Wastes** • The site is maintained in a tidy manner by removing all rubbish regularly offsite. Old plant has been removed and the site has been tidied by the landholder. • The potential for rubbish to be dumped relates mainly to unauthorised access from outside the site and is low as the site is set back from roads and public areas. Access restrictions such as gates or barriers will be installed when the site is unmanned and equipment retained on site. • Any illegally dumped materials are removed promptly to an approved landfill or other suitable site, depending on the nature of the material. This has not been a problem

	during past operations. • Non essential or old plant and materials will be removed from the site. Locked gates and the existing fences will be maintained to prevent illegal dumping and contamination of water. • All solid domestic and light industrial wastes are stored in commercial waste storage containers and/or removed to an approved landfill facility. There will be no waste disposal on site. Waste storage containers will be sealed so that rainfall cannot enter, therefore preventing the formation of leachates. • Wastes generated are recycled wherever possible and periodically disposed of at an approved landfill site. • Regular inspections (at least weekly) are conducted to ensure no wastes, litter and the like are present in or around the excavation and processing area. **Wastewater Disposal** • A service portable toilet system is used when the site is manned. • Serviced means they are pumped out by a licensed contractor from Perth or locally.
Monitoring	• No monitoring is required. • There is no groundwater on site that can be monitored with its depth being too deep for meaningful results.
Actions	• Maintain and upgrade as necessary the surface water management features.

6.5 Biodiversity Management

6.5.1 Flora and Vegetation

The vegetation has been assessed by Lindsay Stephens of Landform Research on a number of occasions since 2000.

The site is cleared, with scattered clumps of regrowth *Eucalyptus calophylla*. A small zone of regrowth *Eucalyptus marginata* occurs.

The only understorey was occasional *Acacia pulchella* in one small area in the west of site. This vegetation contained scattered *Hibbertia rupicola*.

Acacia saligna growth has occurred in the west, after having been planted as a stock feed to provide feed during times of low pasture resources. It is spreading in other areas, as perennial drought proof stock feed.

The remainder of the site has no remnant native understorey species.

There are occasional mature trees and Dryandra (*Banksia sessilis*) where the vegetation is in better condition near the northern boundary of Lot 7. This vegetation generally lies within the 20 metre excavation buffer zone and is therefore not considered for excavation.

Some trees do exist and the clearing of these will require a Clearing Permit under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* unless subject to exemption to Section 51C Prescribed Clearing.

Clearing Permit CPS 5843/3 is current until 1 February 2029. The length of term of the permit was extended to 2029 in 2020.

6.5.2 Fauna

The fauna on site will already be significantly depleted by the clearing as there are just scattered Eucalypts on site, which will be retained.

The potential for Black Cockatoo feeding habitat was assessed for the clearing permit application and one large tree preserved. Where possible other large Eucalypt trees will be retained with the excavation going around any retained tree, leaving a 10 metre setback

There is no native vegetation as ground cover. No management of fauna is required.

6.6 Weed Management

The management of weeds is essentially similar to that for plant diseases. The impact of weeds is really the impact within the local area and the more they are controlled the better. It is desirable that the site does not become a haven for environmental weeds and therefore a management and control program is warranted at all sites.

The weed management will form part of the normal farm management to prevent the introduction and or spread of significant environmental weeds. The applicant is the current land holder and therefore integrates weed management into normal farm activities.

Weed management is to be used to minimise impact on site remnant vegetation and on adjoining properties. Good management practices are to be used as part of the ongoing normal quarry operations. The management is based on the *Guidelines, Department of Environment and Energy, Arrive Clean, Leave Clean,* which relates to the management of weeds and plant diseases.

Generally if the actions are taken to manage weeds then the risk of spread of plant pathogens is also reduced. Not all potential impacts will apply to this quarry and the main impacts affecting this site are also listed.

The parkland pasture on which the resource lies is stocked where practicable to manage fire risk and weeds because it has been noted in other locations that once stock are removed the weed species tend to increase and spread. It is likely that the seedlings of weed species are eaten by grazing but once that pressure is removed, the weeds are able to grow to maturity and seed.

Therefore in areas where stock are removed as a consequence of excavation weed management often needs to be more diligent than it is for normal pasture management.

Inspections conducted to monitor the presence and introduction of weeds will be carried out twice per year, in spring and autumn when weeds are best treated with herbicide.

Weeds are most readily treated when actively growing before they set seed, by treating from the edges of the infestation back to the most dense infestation.

Table 11: Weed Management

WEED MANAGEMENT			
Environmental Objectives	***There will be no additional weed species or extensions or density of the existing loading of exotic plants.***		
Legislation and Guidelines	*Biosecurity and Agriculture Management Act 2007*.		
Item	**Management**	**Timing**	**Area**
Management of Weeds	**Weeds are most likely to impact on;** Disturbed areas such as overburden dumps, topsoil stockpiles. Edges of access roads and the stockpile and processing area. Pasture where stock are removed. Edges of firebreaks. **The main sources of weeds are likely to be;** Weeds spread through the movement of topsoil during land clearing and construction earthworks which produces soft moist soils where weeds can gain a fast hold. Spread of existing weeds currently on site. Rubbish dumped by the public. Materials or waste brought to site by employees. Soil and seeds from vehicles arriving at site. This often applies to trucks that have carried something else such as grain, or vehicles to be used in earthworks. Wind blown seed from surrounding land as would apply to Cotton Bush. Birds and other vectors. This is more common than is often given credit for. eg Solanum species and Blackberries..		
	Development of the Pit Conduct regular inspections to delineate weed impacted areas and devise a treatment method for each infestation. Preferably treat weeds prior to commencing earthworks. All vehicles and equipment to be used on site, are required to be clean and free from soil or plant material when arriving at site. Vehicles accessing the site, whether they be road trucks or light vehicles, are required to be clean prior to leaving developed areas. Dirty vehicles are not be permitted to enter the site.	Prior to clearing	Access road, stockpile and other construction areas.
	Operations and Closure No soil and vegetation will be brought to the site apart from that to be used in rehabilitation or normal farm operations and that material has to be weed free. A contingency of a dedicated sweep out and treatment	Operations	All areas

	station for trucks is designated where any weed germinations from the truck sweep out are able to be identified and dealt with by mechanical removal or spraying. Plants and seeds to be used in rehabilitation will be free from weeds.		
Monitoring of Weeds	**Monitoring** Inspections of clearing, disturbance activities, topsoil dumps prior to rehabilitation and revegetated areas are regularly conducted. The operational and adjoining areas and revegetation are visually inspected at least twice annually and will be inspected for at least three years following closure. These inspections will utilise experienced personnel or on site staff who have been trained in the identification of the weed species occurring on site. Inspections will included gutters, drains, access roads and surface water treatment areas where there is an increased risk of weed introductions. Edge vegetation, disturbed areas and areas of increased soil moisture are also regularly monitored and treated as appropriate.	Operations twice yearly. Prior to closure. Revegetation twice yearly for three years following closure.	All areas
Actions	**Treatment of Weed Infestations** Any significant weeds or weed infestations are treated by mechanical means or sprays. Illegally dumped rubbish is a major source of weeds and is removed promptly. Weeds are sprayed with broad spectrum spray during normal farm management and prior to planting or seeding in weed affected soils and when they occur on pasture or in revegetation. Weed management will work from least affected areas to most affected. Declared weeds will be treated promptly by mechanical action or spraying until removal.	Prior to commencement of earthworks. When weeds are present and as a minimum twice yearly.	All areas

6.7 Dieback Management

Phytophthora cinamomi is restricted to the areas greater than the 600 mm rainfall isohyets and may occur on this site, although with the lack of understorey there are limited susceptible species to lead to the spread of dieback. It is possible therefore for dieback to be introduced.

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.

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

Testing and baiting has been conducted through the years by BioScience with no evidence having been found of its presence. The testing also includes the gravel and laterite products which have also been found to be dieback free.

Dieback is normally carried by water and spore movement downslope with little or no spread upslope. As all water is retained in the pit, even if dieback was introduced into the excavations, it is likely to be contained and will not spread to adjoining properties.

Table 12: Dieback Management

DIEBACK MANAGEMENT			
Environmental Objectives	No specific dieback environmental objective is warranted because of the very low risk as there are few susceptible trees and no nearby native vegetation.		
Legislation and Guidelines	*Biosecurity and Agriculture Management Act 20*07.		
Baseline Data	*DBCA 2017, Phytophthora Dieback Management Manual,* Forest and Ecosystem Management FEM079. *Dieback Working Group 2005, Management of Phytophthora Dieback in Extractive Industries.* *Dieback Working Group, 2000, Managing Phytophthora Dieback, Guidelines for Local Government.*		
Item	**Management**	**Timing**	**Area**
Management of Dieback	Past testing by BioScience has not detected any dieback in the natural gravels of products produced. The testing programs are ongoing. When the pit is operating all water generated within the pit is captured and retained in the pit. Any topsoil and overburden storage is located in dry areas around the pit perimeter. Quarry traffic is restricted to the designated access roads, pit and stockpile areas apart from clearing land and maintaining fire breaks. As defined by best practice, Hall-Grav Pty Ltd Bindoon Hill Gravel Supply requires all vehicles used onsite or accessing the site to to be clean and free from soil or plant material prior to arriving on site from an area known or thought to be dieback infected. Cleaning is to be conducted offsite and all drivers and plant operators are to be made aware of the need to have clean trucks and plant when initially arriving on or accessing the site. The site is secured from unwanted access by maintaining the existing perimeter fencing, gates. A hygienic site is maintained by not bringing any soil or	All times	All areas

	plant material onto the site except for rehabilitation purposes or from known dieback free areas. All plants, seeds, and other materials used in rehabilitation, are sourced from dieback free areas. Illegally dumped rubbish or material is promptly removed from site. Rehabilitated surfaces are free internally draining and not contain wet or waterlogged conditions. The Weed Management Policy is complied with.		
Monitoring of Dieback	**Monitoring** Dieback monitoring is to be continued as needed based on contract and pit hygiene requirements. Product monitoring by routine testing will continue to be used to verify that the product is dieback free and that status will be available for clients and contracts depending on client requirements.	Annual review	Product testing

7.0 REHABILITATION AND CLOSURE

7.1 Background

The excavated area is cleared and will be returned to pasture with scattered Jarrah – Marri and other local species. A tree belt has been established along portion of the southern boundary of Lot 7.

Proposed Final Contours are a similar land surface to the current surface with the surface lowered by around 2 metres, (Section 5.14 Final Contours).

An audit of the potential materials that may be present from mining at closure is presented below.

Table 7 Materials Inventory

Type	Comment	Treatment	Reference
Soil	Topsoil is natural and contains no detrimental materials.	None required. To be used in rehabilitation.	
Subsoils - Overburden	Subsoil gravel is natural and contains no detrimental materials. Laterite rock is removed during excavation.	Non required. Generally taken as resource.	
Waste rock and non surface material and tailings	Not present. The pit bottoms in gravel loam subsoils which is a natural material and when mixed with the gravel topsoils is capable of growing good pasture.	None required.	
Saline surface water	There is no surface water.	No treatment necessary	
Saline ground water	Groundwater is too deep to be intersected.	No treatment necessary	
Acidic materials and drainage	Not present. The elevated laterite gravel does not carry acidic materials or any at risk materials. Concurs with *Nattaporn-Prakongkep, R J Gilkes, B Singh and S Wong, 2011, Mineralogy and chemistry of sandy soils in the Perth metropolitan area of the Swan Coastal Plain, Department of Environment and Conservation.*	No treatment necessary.	Field geological examination by Landform Research and past excavations.
Sodic or dispersive materials	There is no water on site and any water will be natural precipitation.		Field geological examination by Landform Research
Asbestos – asbestiform minerals	None present.		Field geological examination
Radioactive materials	Not present	The laterite does not contain abnormal levels of radioactive minerals.	Published WA Geological Survey radiometric mapping
Metallic or chemical materials	Not present	No metallic or sulfidic materials or minerals are present in these laterites.	Field geological examination and experience and published

			information.
Tailings storage	Not required		
Ablutions waste		Serviced portable toilet system is to be provided.	Water Management Section 6.4
Dangerous Goods and Hazardous Materials	**FUEL** The various plant are refuelled from mobile tanker. ***None will remain on closure***.	Any soil or other materials with drips and spills is removed offsite to an approved waste site or location.	Water Management Section 6.4
	SERVICE MATERIALS Only minor lubrication are conducted on site All major servicing is conducted offsite. ***None will remain on closure***	Any wastes are collected and removed from site promptly to an approved recycling or waste disposal area. Only minor servicing is conducted on site. All major servicing is conducted offsite.	Water Management Section 6.4
General waste		Regularly removed from site to an approved disposal area	Water Management Section 6.4

7.2 Closure Implementation

The closure planning will be updated from time to time as the excavation progresses forwards. This will include both anticipated costs and procedures.

The following procedures is used for final closure and rehabilitation of the stages of excavation and on completion of the gravel pit.

Maintenance and monitoring is to be conducted until completion criteria is met. A three year cut off is provided for rehabilitated soils.

Unexpected or early closure will be completed in the same way as permanent closure below but the full rehabilitation of any completed area will be completed as one operation.

Closure Objectives

- Stable post-mining landscape, and the minimisation of wind and water erosion.
- Match slopes and landform to those of the surrounding local area.
- Maximum slopes of 1 : 4 to 1 : 6 vertical to horizontal are to be provided to the batter edges of the pit will floor slopes at < 1 : 6 vertical to horizontal.
- Provide for the protection of the local groundwater resource in terms of both quality and quantity.

- Achieve weed species at levels not likely to threaten the parkland pasture end land uses.

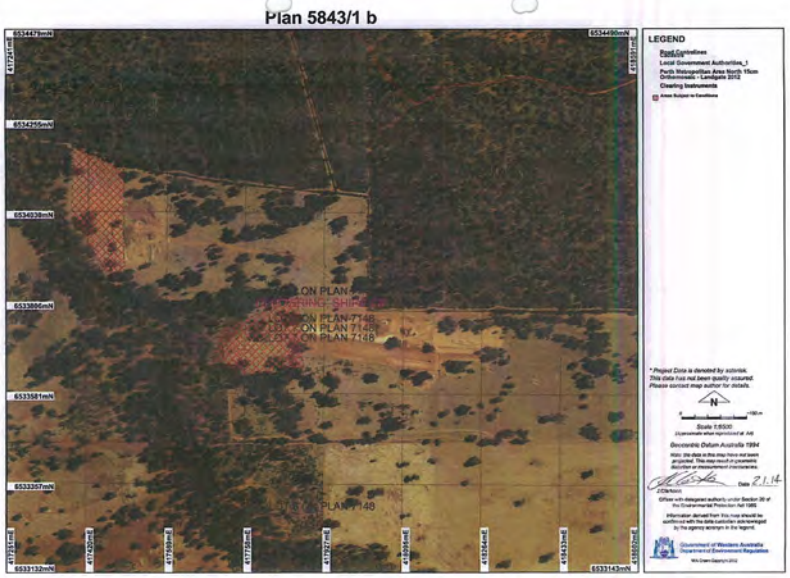
Table 13: Site Closure and Rehabilitation

Closure Stage	Methodology	Timing
GENERAL		
Compliance with all legally binding conditions and commitments.	**Legal Compliance** • Prior to closure, stakeholders (such as the land holder) will be consulted to check whether the closure planning reflects their interests and carry them out as necessary. • The latest documentation will be reviewed to determine whether there are any outstanding stakeholder issues. • All legal requirements and commitments and conditions of approval will be complied with. This includes Planning Approval, Extractive Industries Licence, DWER Licence and any other relevant legally binding conditions. • An audit table of all conditions and commitments that relate to closure will be completed each stage of rehabilitation and annually until sign off. The audit will be used to verify the closure process.	Prior to and at closure
Removal of non natural materials	**Non Natural Materials** • All non natural inert materials associated with quarrying will be collected and removed from site unless required for internal roads. This includes plant, buildings and other structures or materials not required for future farming or other uses. • The serviced portable waste water system will be removed.	At closure of each completed area and final closure
Removal of wastes from site.	**Waste Removal** • There will be no tailings, adverse soil or other materials or features on site and none are proposed during future excavations. • A visual audit of completed ground will be conducted, to verify compliance with "no contamination to be left". • Soil testing will be undertaken if there is evidence of adverse materials remaining such as fuel spills. All hydrocarbon contaminated soils will be removed offsite to an approved landfill. • Any potential contaminated areas such as refuelling zones will be assessed and sample tested as necessary and any contaminated materials removed and the area remediated. • If contaminated sites are identified, they will be treated in accordance with the *Contaminated Sites Act 2003 (WA).* • As a result of any testing remediation will be undertaken to ensure that the site is not contaminated.	At closure of each completed area and final closure
LANDFORM AND SOILS		
Geotechnical stability and safety.	**Geotechnical** • The highest faces will be around 2 metres with shallow sloping angles and will carry no geotechnical risk. • Even so the faces will be pushed down to a 1 : 4 or 1 : 6 vertical to horizontal slope.	Construction of interim or the final land surfaces.

Closure Stage	Methodology	Timing
	• Floors will be completed at less than 1 : 6 vertical to horizontal. **Safety** • Compliance with the *Mines Safety and Inspection Act 1994.* • All areas will be inspected to ensure the land surfaces and access points, are stable to erosion from wind and water. • Holes, sumps drains, ditches and the like will be filled and removed. • Visual observations of the landforms. An audit of the completed land will be made to verify compliance.	
Ground Preparation for revegetation.	**Landform Reconstruction** • Dieback and Weed Management principles will be used. • All ground once occupied such as hardstand and roads that are not required for future uses are to be deep ripped and soils reconstructed. • Subgrade rock and overburden will be used for land restoration and closure and then covered by and blended with recovered gravel topsoil. • If not required, roadbase, hardstand and any other inert materials left over from the site operations will be scraped and picked up and used to backfill the pit faces or reused. • Perimeter bunding will be pushed down into the pit and spread to recreate the soil. **Preparation for Revegetation** • The soils will be constructed from overburden and subsoils and provided with a cover of topsoils. • Fill and backfill areas will be left soft and undulating as the planting substrate. • Where available and weed free, topsoil, will be used to reconstruct the soil profile.	At closure of any completed disturbed ground or stage of operations and at final closure.
The surfaces are to be free from erosion.	**Slope Erosion** • With such low slopes water erosion will not be an issue. • The pits will retain surface water runoff. • Wind erosion is not an issue with gravel quarry reconstruction and no action is required. Dust is only generated when vehicle traffic disturbs the ground and at closure there will only be farm traffic.	Monitoring of erosion for three years or until stable.
REVEGETATION		
Weed and Dieback	**Hygiene** • Dieback Management will be implemented. • Weed Management will be implemented.	All stages of revegetation
Revegetation	**Pasture** • Any disturbed areas that are no longer required will be rehabilitated using the methods described above within 12 months of becoming available. Rehabilitation will be to parkland pasture. • The preferred method of revegetation is to use the pasture seed from existing topsoil on pasture areas. However this may be deficient and additional seed is likely to be required.	At closure of any completed disturbed ground or stage of operations and at final

Closure Stage	Methodology	Timing
	• The sowing of pasture and crop will be integrated into the normal farming systems. Seeds of pasture species will be spread by normal farm practice at rates and species determined by the land holder with advice from either a consultant or the Department of Primary Industries and Regional Development. • The pasture species will be matched to the soil types and rainfall. The location falls into the "High Rainfall Coastal" planting regime with sandy soils. Suitable perennial legumes include Birdsfoot trefoil, Lucerne, Strawberry Clover, and Sulla. Perennial pasture includes Perennial Ryegrass, Phalaris, Cocksfoot, and Summer Active Tall Fescue, Kikuyu and Rhodes Grass. Annual pasture species include Italian Ryegrass, Serradella, subterranean clover. • The actual species used will be determined by the individual season, nature of the rainfall in the preceding months and stocking/hay production proposed by the landholder which may change from time to time. • Seeding rates are 2 – 5 kg/ha depending on the species used; for example Ryegrass is seeded at 3 kg/ha whereas Rhodes Grass is seeded at 4 kg/ha. • Pre-seeding weed control will be used where topsoils contain weed species. • Any weeds likely to significantly impact on the rehabilitation will be sprayed with Roundup or other herbicide or grubbed out, depending on the species involved. Fusilade will be used where grasses present an impediment to rehabilitation. **Trees** • Hardened tube plants from the following indigenous species will be used for the revegetation of clumps of parkland pasture vegetation. • The tree belt along the southern portion of Lot 7 will be maintained and extended. • Any revegetation requirements of a Clearing Permit will be undertaken. Clearing Permit CPS 5843 requires the area hatched in red to be planted to 1000 stems per hectare. That planting has been undertaken and is progressing, but has not yet been signed off.	closure. Monitoring will be maintained until completion criteria is met and stabilised for 3 years.

Closure Stage	Methodology	Timing

	
	Potential local species for revegetation to parkland pasture.
	
	Acacia acuminata Jam Wattle
	Acacia saligna Golden Wreath Wattle
	Eucalyptus accedens Powder Bark Wandoo
	Corymbia calophylla Marri
	Eucalyptus loxophleba York Gum
	Eucalyptus marginata Jarrah
	Eucalyptus wandoo Wandoo
	Banksia grandis Bull Banksia
	Dryandra sessilis
	Hakes prostrata
	
	Monitoring
	• During late summer an assessment of the success of the rehabilitation is made to determine the rehabilitation requirements for the following winter.
	• Monitoring includes visual assessments and, where necessary, counts to determine the success of the rehabilitation and restoration, as follows;
	  • Pasture density
	  • Pasture growth
	  • Pasture regeneration
	  • Weed infestation
	• Steps will be taken to correct any deficiencies in the vegetation.
	
	Fertiliser
	• Fertiliser will be used as required and will add nutrients to the ground water. If used a fertiliser containing low nitrogen, phosphorous and potassium, and trace elements, is recommended to be only used at each tube plant.	

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