Development Services Attachments
ORDINARY COUNCIL MEETING
Wednesday, 21 June 2017

Local Planning Policy No 5

Signage

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STATUTORY CONTEXT

The Shire of Chittering, as enabled under Part 2 of *Local Planning Scheme (LPS) No 6*, hereby makes this Local Planning Policy (LPP) regarding Signage.

Any LPP prepared under this part shall be consistent with the Scheme and if any inconsistency arises the Scheme shall prevail.

An LPP is not part of the Scheme and shall not bind the Local Government in any respect of any application for Planning Approval, but the Local Government shall have due regard to the provisions of any Policy, and the objectives which the Policy is designed to achieve before making its decision.

This Policy applies to all land zoned within the Shire of Chittering. (adopted <<DATE>>).

1.0 OBJECTIVES

The objectives of this Policy are:

- To provide guidelines, which will assist in the regulation and control of signage within the Shire of Chittering.
- To ensure the type and size of the signs is appropriate for the location.
- To avoid the proliferation of signage on building facades.
- To reduce the visual clutter, driver confusion/distraction and traffic hazards caused by poor and indiscriminate signage.
- To promote a high standard of design and presentation in outdoor advertising.
- To maintain the rural character and landscape amenity of the Shire.

2.0 DEFINITIONS

The following are definitions that relate directly to the application of this Policy:

*"**Council**"* mean the elected members of the Shire.

*"**Shire**"* means Shire of Chittering.

*"**LPS No. 6**"* means *Local Planning Scheme No. 6*.

"***Above Roof Signs***" means a sign which is affixed to a building and protrudes above the eaves or parapet of the building with little or no relation to the architectural design of the building

*"**Advertisement**"* means any word, letter, model, sign, placard, board, notice, device or representation, whether illuminated or not, in the nature of, and employed wholly or partly for the purposes of, advertisement, announcement or direction, and includes any hoarding or similar structure used, or adapted for use, for the display of advertisements. The term also includes any airborne device anchored to any land or building and any vehicle or trailer or other similar object placed or located so as to serve the purpose of advertising means the same as Sign.

"***Amenity***" means all of those factors which combine to form the character of an area and shall include the present and likely future amenity.

"***Awning/verandah sign***" means an advertising sign painted or fixed to the face or return fascia of an awning and includes signs attached to the underside of an awning or verandah (other than fascia or return end), as well as signs attached above or projecting from a verandah.

"***Billboard sign***" means an advertising sign (greater than 4m^2) that may be either freestanding or attached to overhead infrastructure not normally related to the land use.

"***Created roof sign***" means a sign which is affixed to the fascia or roof of the building and compliments the architectural design of the building but does not include an above roof sign.

"*Directional sign*" means signs erected within thoroughfares or public places to indicate the direction to places, services and tourist destinations within the Shire but do not include signs erected by the Council or Commissioner of Main Roads.

"*Fence sign*" means a sign attached to a fence.

"*Fly posting*" means advertising by means of placing posters on fences, walls, trees, buildings and like structures.

"*Hoarding*" means a detached or detachable structure other than a pylon that is erected for the sole purpose of displaying an advertising device, sign or signs including a poster panel, wall panel or an illuminated panel and has an overall height less than the sign's horizontal dimension.

"*MRWA*" means a Main Roads WA.

"***Monolith sign***" means a freestanding advertisement sign which is fixed to the ground having one or more supports and portions of the sign face is within or partially within 1.2 metres above natural ground level.

"portable sign" means a portable free standing advertising sign and includes **"*Ground based*"** signage.

"Projecting Sign" means an advertisement sign which is attached to a projection or projects more than 300 millimetres from a wall of the building below the eaves or ceiling height.

"*Pylon sign*" means a sign supported by one or more piers and not attached to a building and includes sign framework supported on one or more piers to which sign infills may be added.

"***Remote sign***" means a sign located on private property but not directly related to the business being carried out on that property.

"*Sign*" means a notice, message or display by means of a freestanding or fixed sign or hoarding.

"***Sign infill***" means a panel which can be fitted into a pylon sign framework.

"***Tethered sign***" means a sign which is suspended from or tethered to any structure, pole or tree (with or without supporting framework) and made of paper, fabric, plastic or similar materials. The term includes inflatables, bunting, banners, flags and similar.

"*Wall sign*" means a sign painted on or directly affixed to the fabric of a wall.

"Window Sign" means an advertisement sign which is affixed to either the interior or exterior of the glazed area of a window or alternately, suspended from the ceiling, or which is located in the interior of a glazed area of a window set back up to 0.4 metres behind a window, with the sole purpose of advertising out onto the street

Advertisement Sign Diagram:

Advertisement Sign Types:

1. Above Roof 2. Created Roof 3. Projecting 4. Awning 5. Wall 6. Window 7. Ground Based 8. Hoarding 9. Fence 10. Monolith 11. Pylon 12. Tethered

3.0 POLICY STATEMENT

The Policy applies to all signage or advertising devices on private property located within the Shire of Chittering which can be viewed from a public place, thoroughfare or adjoining property.

This Policy works in conjunction with Schedule 6 of *LPS6* and *Activities on Thoroughfares and Trading in Thoroughfares and Public Places 2001*, and aims to:

1. Guide the design, materials and siting of advertising structures and signs in the Shire of Chittering.
2. To provide a clear direction in relation to all types of signs.

If a provision of this Policy is inconsistent with *"Local Planning Scheme No. 6"*, then the Scheme prevails.

3.1 General requirements

a) Except for those signs exempted by Clause 5.11.5 and Schedule 6 of *Local Planning Scheme No.6*, no person shall otherwise construct a sign within the Shire without first obtaining the written approval of the Shire.

b) In general advertising signs:
   (i) shall not contain any offensive material;
   (ii) shall not be erected or displayed in a position so as to obstruct access to or from a door, fire escape or window, other than a window designed for the display of goods; which shall be limited to ten percent of the total window area;
   (iii) not pose a threat to public health and safety;
   (iv) be securely fixed to any structure which supports it;
   (v) be maintained in good order and clean condition;
   (vi) be compatible with the scale and architecture of the building and character of the street; and
   (vii) are to bear relevance to the site on which they are located.

c) Signs may only contain any or all of the following information:
   (i) the name of the occupier;
   (ii) the business carried out on the property;
   (iii) the occupiers contact details;
   (iv) hours of operation of the business;
   (v) the logo of the business;
   (vi) a description of the goods sold or offered for sale on the property to which the sign is affixed or which it relates;
   (vii) any other information specific to the business or use undertaken specifically approved by the Shire; and
   (viii) in the case of a remote sign, information related to a tourism business or good or services for the travelling, where the remote sign design and content has been approved by the Shire.

d) Temporary signage must comply with the following:
   (i) real estate signs must be removed within 14 days of settlement;
   (ii) redundant business signs must be removed within three (3) months of a vacancy; and
   (iii) event signs must be removed within 7 days following the event.

e) For advertisements of a property or properties for sale, one sign per street frontage for each non-rural property relating to the sale, leasing or impending auction of the property at or upon which the sign is or the signs are displayed is permitted per clause 4.0. Rural properties which are in sum greater than five (5) hectares in size and maintain a frontage of more than 500 metres are permitted to erect two signs, one at either end of the frontage.

Notwithstanding anything contained in this Policy, Council may allow the display of advertisements at places of public worship, schools, theatres and other places of public entertainment, election notices, or advertisements of meetings or other matters of public interest upon such terms for such period as the Council may in each case decide.

3.2 Signage in the townsite/rural residential zones

a) Where signage is proposed on a non-residential property in a predominantly residential area, it is not to detract from the amenity of the area or streetscape, or cause a nuisance to residential properties.

b) In predominately residential areas the following signs will not be permitted:
   (i) above roof;
   (ii) billboard;
   (iii) hoarding;
   (iv) pylon;
   (v) monolith;
   (vi) tethered;
   (vii) illuminated; and
   (viii) home business signs shall be limited to a maximum of one sign per street frontage of the dwelling and be either a fence fixed sign and not exceed 0.5m^2 in area.

3.3 Signage in rural zones

a) Where signage is proposed in an "Agricultural Resource Zone", the sign:
   (i) is not to detract from the amenity of the area, and is not to be a hazard to rural activities or road users;
   (ii) be limited to a maximum of one sign per street frontage of the total landholding;
   (iii) be either a fence sign, wall sign or hoarding;
   (iv) not exceed 4m^2 in area; and
   (v) not be illuminated.

3.4 Design requirements for specific sign types

3.4.1 Above roof sign

a) above roof signs may be considered where the sign compliments design of the building and does not adversely affect the character or amenity of the area;
b) a maximum of one above roof sign per building may be permitted;
c) shall not project more than 2.0 metres above the top of the pitch or parapet of the building; and
d) not project laterally beyond the walls of the building.

3.4.2 Created roof sign

a) shall be affixed parallel to the fascia or portion of the building to which it is attached;
b) not be within 0.5 metres of either end of the fascia, roof or parapet of the building to which it is attached; and
c) be no more than 3.0m^2 in area.

3.4.3 Hoarding

a) hoarding may be considered in the rural and industrial zones or as remote signage;
b) it is demonstrated that there is no undue safety risk for pedestrians or conflict with vehicles accessing the site;
c) hoardings shall not exceed 6 metres in height; and
d) be no more than 10.0m^2 in area.

3.4.4 Fence sign

a) shall not exceed 2.0m^2 in area and a maximum vertical dimension of 2.0 metres;
b) shall be limited to one fence sign per frontage on each lot; and
c) shall not project beyond the fence.

3.4.5 Tethered sign

a) shall be wholly located within the boundaries of the lot;
b) not be located so as to distract the attention of motorists;
c) have no part of the sign face more than 6.0 metres above the ground level immediately below the sign; and
d) not to be within 10.0 metres of a pylon sign

3.4.6 Portable signs

Portable signs are to be located in accordance with the *Activities on Thoroughfares and Public Places Local Law 2001*.

3.4.7 Pylon signs and monolith signs

Pylon signs and monolith signs may be considered on properties on general industry and light industrial zones only.

Pylon signs and monolith signs shall be restricted to one pylon sign and one monolith sign for each frontage of the property.

Where the property has multiple tenancies or a series of businesses, the Shire may require that any proposed pylon sign or monolith sigh be designed so as to incorporate one infill, module or section, or sufficient framework to accommodate one infill, for each tenancy or business on the lot.

a) A pylon sign shall:
   i. have no part of the sign face less than 2.1 metres or more than 6m above the ground level immediately below the sign;
   ii. have a maximum width of 2.0 metres, measured horizontally across the extremities of the pylon sign structure;
   iii. have a sign face no greater than 4.5m^2;
   iv. not to be within 2.0 metres of the side boundaries of the lot on which it is erected;
   v. be supported by one or more piers or columns of brick, stone, timber or steel of sufficient size and strength to support the signs under all conditions.

   The Shire may require engineering certification of the construction of a pylon sign.

b) A monolith sign shall:
   i. have a maximum clearance of 12.0 metres from the natural ground level;
   ii. have no part of the sign face more than 8.0 metres above the natural ground level immediately below the sign; and
   iii. have a maximum width of 2.0 metres, measured horizontally across the extremities of the pylon sign structure.

3.4.8 Wall Signs

A wall sign shall:

a) not extend beyond either end of a wall, or above the top of the wall or eaves; and
b) not have an aggregate area greater than 30% of the total area of each frontage, up to a maximum of 10.0m^2 for each tenancy.

3.4.9 Directional signs

a) the Shire must be satisfied that the proposed signage will perform a necessary function and will reflect the desired effect of directing traffic and is not merely an extended form of advertising;
b) directional signage must relate to an approved land use or business;
c) name plate signs must be a maximum height of 0.15 metres with a maximum length of 0.9 metres; and
d) the only information to be contained on the directional signage is the business name.

3.4.10 Awning/verandah sign

A sign attached to the fascia of an awning or verandah is to be:

a) limited to one sign per elevation; and
b) be constrained in height by the dimensions of the awning face.

A sign attached to the underside of an awning or verandah is to:

a) not exceed 2.4 metres in length or exceed a width of 0.5 metres;
b) have relevant structural engineering certification;
c) only one such sign per tenancy;
d) no project beyond the outer frame or surround of the verandah; and
e) have a minimum clearance of 2.75 metres from the finished ground level to the lowest part of the sign.

3.4.11 Window Signs

A Window Sign is to:

a) not cover more than 50 percent of the glazed area of any one window or exceed 10 square metres in area in total per tenancy on a lot.
b) maintain an active and interactive presentation to the street for the balance of the window.

3.5 Signs in proximity to state controlled roads

a) All signs on or in the vicinity of a state road other than types exempt under *Main Roads (Control of Advertisements) Regulations 1996*, or types that can be approved by the Shire under delegation, require the approval of MRWA;
b) All signs on or in the vicinity of a state road are to comply with table 1; and
c) In assessing an application for signage under delegation from MRWA, the Shire may refer the application to MRWA for assessment and comment.

3.6 Signage Strategies

Where signage is proposed that does not meet any one or more of the above clauses, or more than two separate signs on any one property are proposed, a signage strategy is to be submitted and approved by the Shire. The strategy shall demonstrate how the signage complies with clauses 3.1(b) and 3.1(c) of this Policy.

A Signage Strategy submitted for the approval of the Shire shall contain the following minimum information:

a) clear illustrative details, including a site plan and elevation details to demonstrate where sign/s are proposed to be sited and displayed.
b) clear sign dimensions.
c) details of any existing signage proposed to be retained.
d) details of any proposed illumination.

4.0 Signs – Zoning Matrix

SIGN TYPE	LAND USE TYPE					
	Residential	Rural	Industry	Estate Subdivision	Commercial outside of Town Centre	Town Centre Commercial
ON BUILDING						
Above Roof	X	X	X	X	S	P
Part of Roof	X	X	X	X	P	P
Wall	S	X	X	X	S	P
Projecting	X	X	X	X	S	P
Window	X	X	X	X	S	P
OFF BUILDING						
Rural Business	X	P	P	X	P	X
Pylon	X	X	P	X	X	X
Portable	X	X	S	X	X	P
Panel	X	X	X	X	X	P
Hoarding	X	X	X	X	X	X
Tethered	X	X	P	P	P	P
Product Display	X	S	S	S	S	S
TEMPORARY						
Real Estate Directional	PE	PE	PE	PE	PE	PE
Real Estate Development	P	P	P	P	P	P
Real Estate "For Sale"	PE	PE	PE	PE	PE	PE
Construction Site	PE	PE	PE	PE	PE	PE
Display Home	PE	PE	X	X	X	X
Public Information	P	P	P	P	P	P
OTHER						
Business Direction	NA	S	NA	NA	NA	NA

LEGEND

X	Not permitted
P	Permitted, application needed
PE	Permitted, exempt from application – subject to clause 3.1(e)
S	Permitted, signage strategy required
NA	Not applicable

Note: It should be noted that certain particular types of signs are not permitted (X) in any zones or land uses. The Policy details every type of advertising sign so as to avoid confusion which would occur if certain types were not described. Council presently considers those listed as not permitted are not acceptable forms of signage for that zone.

Appendix 1 Table 1 REMOTE SIGNAGE ON GREAT NORTHERN HIGHWAY

Signage may be erected in the following locations within the road reservation area, subject to Clause 3.4:

Location along Great Northern Highway	Maximum sign density	Sign Content
Muchea Employment Node	Entry Statement / Monolyth type sign	• Lists businesses providing goods and services to the travelling public located within the Muchea Employment Node; • Events, community and tourism services located within the Chittering local government area
From 3km to either side of the designated Binda Place Town Centre and not at all within the Binda Place Locality	2 signs per 500m of road length	• Businesses providing goods and services to the travelling public located within the Binda Place townsite; • Events, community and tourism services located within a 10km radius of the sign

ADOPTED FOR PRELIMINARY APPROVAL by resolution 070217 of the **Shire of Chittering** at the Ordinary Meeting of Council held on 15 February 2017.

ADOPTED FOR FINAL APPROVAL by resolution <resolution no> of the **Shire of Chittering** at the Ordinary Meeting of the Council held on <insert date>.

The Common Seal of the **Shire of Chittering** pursuant to resolution <insert resolution> was affixed in the presence of:

Cr Gordon Houston _____
President

Alan Sheridan _____
Chief Executive Officer

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Shire of Chittering

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Local Planning Policy No 5

Signage

text like this	is recommended modification to re-advertised amendment
~~text like this~~	is text that was advertised for deletion and either a recommended deletion from re-advertised amendment, or a deletion that that was re-advertised

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STATUTORY CONTEXT

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This policy applies to all land zoned within the Shire of Chittering. (adopted <<DATE>>).

1 – Insert additional objective clause

1.0 OBJECTIVES

The objectives of this policy are:

- To provide guidelines which will assist in the regulation and control of signage within the Shire of Chittering.
- To ensure the type and size of the signs is appropriate for the location.
- To avoid the proliferation of signage on building facades.
- To reduce the visual clutter, driver confusion/distraction and traffic hazards caused by poor and indiscriminate signage.
- To reduce the visual clutter, driver confusion/distraction and traffic hazards caused by poor and indiscriminate signage
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2.0 DEFINITIONS

The following are definitions that relate directly to the application of this policy:

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*"**Shire**"* means Shire of Chittering.

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"*Created roof sign*" means a sign which is affixed to the fascia or roof of the building and compliments the architectural design of the building but does not include an above roof sign.

2 – Insert type font formatting emphasis and additional wording for clarity on ground based signage

"*Directional sign*" means signs erected within thoroughfares or public places to indicate the direction to places, services and tourist destinations within the Shire but do not include signs erected by the Council or Commissioner of Main Roads.

"*Fence sign*" means a sign attached to a fence.

"*Fly posting*" means advertising by means of placing posters on fences, walls, trees, buildings and like structures.

"*Hoarding*" means a detached or detachable structure other than a pylon that is erected for the sole purpose of displaying an advertising device, sign or signs including a poster panel, wall panel or an illuminated panel and has an overall height less than the sign's horizontal dimension.

"*MRWA*" means a Main Roads WA.

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"portable sign" means a portable free standing advertising sign and includes the term ***"Ground based"*** signage.

"*Pylon sign*" means a sign supported by one or more piers and not attached to a building and includes sign framework supported on one or more piers to which sign infills may be added.

"***Remote sign***" means a sign located on private property but not directly related to the business being carried out on that property.

"*Sign*" means a notice, message or display by means of a freestanding or fixed sign or hoarding.

"***Sign infill***" means a panel which can be fitted into a pylon sign framework.

"***Tethered sign***" means a sign which is suspended from or tethered to any structure, pole or tree (with or without supporting framework) and made of paper, fabric, plastic or similar materials. The term includes inflatables,

bunting, banners, flags and similar.

"*Wall sign*" means a sign painted on or directly affixed to the fabric of a wall.

Advertisement Sign Types:

1. Above Roof 2. Created Roof 3. Projecting 4. Awning 5. Wall 6. Window 7. Ground Based 8. Hoarding 9. Fence 10. Monolith 11. Pylon 12. Tethered

3.0 POLICY STATEMENT

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This policy works in conjunction with Schedule 6 of *TPS6* and *Activities on Thoroughfares and Trading in Thoroughfares and Public Places 2001*, and aims to:

1. Guide the design, materials and siting of advertising structures and signs in the Shire of Chittering.
2. To provide a clear direction in relation to all types of signs.

If a provision of this Policy is inconsistent with *"Town Planning Scheme No. 6",* then the Scheme prevails.

3.1 General requirements

a) Expect for those signs exempted by Clause 5.11.5 and Schedule 6 of *Town Planning Scheme No.6*, no person shall otherwise construct a sign within the Shire without first obtaining the written approval of the Shire.

b) In general advertising signs:
   (i) shall not contain any offensive material;
   (ii) shall not be erected or displayed in a position so as to obstruct access to or from a door, fire escape or window, other than a window designed for the display of goods; which shall be limited to ten percent of the total window area;
   (iii) not pose a threat to public health and safety;
   (iv) be securely fixed to any structure which supports it;
   (v) be maintained in good order and clean condition;
   (vi) be compatible with the scale and architecture of the building and character of the street; and
   (vii) are to bear relevance to the site on which they are located.

c) Signs may only contain any or all of the following information:
   (i) the name of the occupier;
   (ii) the business carried out on the property;
   (iii) the occupiers contact details;
   (iv) hours of operation of the business;

3 – Insert clause 'e)' relating to sale signage

(v) the logo of the business;
(vi) a description of the goods sold or offered for sale on the property to which the sign is affixed or which it relates;
(vii) any other information specific to the business or use undertaken specifically approved by the Shire; and
(viii) in the case of a remote sign, information related to a tourism business or good or services for the travelling, where the remote sign design and content has been approved by the Shire.

d) Temporary signage must comply with the following:
(i) Real estate signs must be removed within 14 days of settlement.
(ii) Redundant business signs must be removed within 3 months of a vacancy.
(iii) Event signs must be removed within 7 days following the event.

e) For advertisements of a property or properties for sale, one sign per street frontage for each property relating to the Sale, leasing or impending auction of the property at or upon which the sign is or the signs are displayed is permitted per clause 4.0.

Notwithstanding anything contained in this Policy, Council may allow the display of advertisements at churches, schools, theatres and other places of public entertainment, election notices, or advertisements of meetings or other matters of public interest upon such terms for such period as the Council may in each case decide.

3.2 Signage in the townsite/rural residential zones

a) Where signage is proposed on a non-residential property in a predominantly residential area, it is not to detract from the amenity of the area or streetscape, or cause a nuisance to residential properties.

b) In predominately residential areas the following signs will not be permitted:
(i) above roof;
(ii) billboard;
(iii) hoarding;
(iv) pylon;

(v) monolith;

(vi) tethered;

(vii) illuminated; and

(viii) home business signs shall be limited to a maximum of one sign per street frontage of the dwelling and be either a fence fixed sign and not exceed 0.5m^2 in area.

4 – formatting updated for consistency

3.3 Signage in rural zones

a) Where signage is proposed in an agricultural resource zone, the sign:
   (i) it is not to detract from the amenity of the area, and is not to be a hazard to rural activities or road users;
   (ii) be limited to a maximum of one sign per street frontage of the total landholding;
   (iii) be either a fence sign, wall sign or hoarding;
   (iv) not exceed 4m^2 in area ; and
   (v) not be illuminated.

3.4 Design requirements for specific sign types

3.4.1 Above roof sign

a) above roof signs may be considered where the sign compliments design of the building and does not adversely affect the character or amenity of the area;
b) a maximum of one above roof sign per building may be permitted;
c) shall not project more than 2000 millimetres above the top of the pitch or parapet of the building; and
d) not project laterally beyond the walls of the building.

3.4.2 Created roof sign

a) shall be affixed parallel to the fascia or portion of the building to which it is attached;
b) not be within 500 millimetres of either end of the fascia, roof or parapet of the building to which it is attached; and
c) be no more than 3m^2 in area.

3.4.3 Hoarding

a) hoarding may be considered in the rural and industrial zones or as remote signage;
b) it is demonstrated that there is no undue safety risk for pedestrians or conflict with vehicles accessing the site;
c) hoardings shall not exceed 6000 millimetres in height; and
d) be no more than 10m^2 in area.

5 – deleted clause 3.4.6 as it does not appear in most other LGA signage policies, and in any event, does not relate to land use planning.

3.4.4 Fence sign

a) Shall not exceed 2m^2 in area and a maximum vertical dimension of 2000 millimetres;
b) Shall be limited to one fence sign per frontage on each lot; and
c) Shall not project beyond the fence.

3.4.5 Tethered sign

a) shall be wholly located within the boundaries of the lot;
b) not be located so as to distract the attention of motorists;
c) have no part of the sign face more than 6000 millimetres above the ground level immediately below the sign; and
d) not to be within 10,000 millimetres of a pylon sign

~~*3.4.6 Fly posting*~~

~~a) A person shall not post any bill or paint, stencil, paste, affix or attach any advertisement bill or placard on any street, hoarding, wall, building, fence or structure whether erected on private or on a public place.~~
~~b) A person may post any bill or paint, stencil, paste, affix or attach any community event bill or placard on any street, hoarding, wall, building, fence or structure whether erected on private or on a public place for a period of no greater than one month before the event.~~

3.4.7 Portable signs

Portable signs are to be located in accordance with the *Activities on Thoroughfares and Public Places Local Law*.

3.4.8 Pylon signs and monolith signs

Pylon signs and monolith signs may be considered on properties on general industry and light industrial zones only.

Pylon signs and monolith signs shall be restricted to one pylon sign and one monolith sign for each frontage of the property.

Where the property has multiple tenancies or a series of businesses, the Shire may require that any proposed pylon sign or monolith sigh be designed so as to incorporate one infill, module or section, or sufficient framework to accommodate one infill, for each tenancy or business on the lot.

a) A pylon sign shall:
   i. Have no part of the sign face less than 2100 millimetres or more than 6m above the ground level immediately below the sign;
   ii. Have a maximum width of 2000 millimetres, measured horizontally across the extremities of the pylon sign structure;
   iii. Have a sign face no greater than 4.5m^2;
   iv. Not to be within 2000 millimetres of the side boundaries of the lot on which it is erected;
   v. Be supported by one or more piers or columns of brick, stone, timber or steel of sufficient size and strength to support the signs under all conditions.

   The Shire may require engineering certification of the construction of a pylon sign.

b) A monolith sign shall:
   i. Have a maximum clearance of 12,000 millimetres from the natural ground level;
   ii. Have no part of the sign face more than 8000 millimetres above the natural ground level immediately below the sign; and
   iii. Have a maximum width of 2000 millimetres, measured horizontally across the extremities of the pylon sign structure.

3.4.9 Wall Signs

A wall sign shall:

a) Not extend beyond either end of a wall, or above the top of the wall or eaves; and
b) Not have an aggregate area greater than 30% of the total area of each frontage, up to a maximum of 10m^2 for each tenancy.

3.4.10 Directional signs

a) the Shire must be satisfied that the proposed signage will perform a necessary function and will reflect the desired effect of directing traffic and is not merely an extended form of advertising;
b) directional signage must relate to an approved land use or business;
c) name plate signs must be a maximum height of 150 millimetres with a maximum length of 900 millimetres; and
d) the only information to be contained on the directional signage is the business name.

3.4.11 Awning/verandah sign

A sign attached to the fascia of an awning or verandah is to be:

a) limited to one sign per elevation; and
b) Be constrained in height by the dimensions of the awning face.

A sign attached to the underside of an awning or verandah is to:

a) not exceed 2400 millimetres in length or exceed a width of 500 millimetres;
b) have relevant structural engineering certification;
c) only one such sign per tenancy;
d) no project beyond the outer frame or surround of the verandah; and
e) have a minimum clearance of 2750 millimetres from the finished ground level to the lowest part of the sign.

6 – Insert clauses relating to information to be supplied in a signage strategy application

3.5 Signs in proximity to state controlled roads

a) All signs on or in the vicinity of a state road other than types exempt under *Main Roads (Control of Advertisements) Regulations 1996*, or types that can be approved by the Shire under delegation, require the approval of MRWA;

b) All signs on or in the vicinity of a state road are to comply with table 1; and

c) In assessing an application for signage under delegation from MRWA, the Shire may refer the application to MRWA for assessment and comment.

3.6 Signage Strategies

Where signage is proposed that does not meet any one or more of the above clauses, or more than two separate signs on any one property are proposed, a signage strategy is to be submitted and approved by the Shire. The strategy shall demonstrate how the signage complies with clauses 3.1(b) and 3.1(c) of this policy and any other applicable legislation.

A Signage Strategy submitted for the approval of the Shire shall contain the following minimum information:

a. Clear illustrative details, including a site plan and elevation details to demonstrate where sign/s are proposed to be sited and displayed.

b. Clear sign dimensions.

c. Details of any existing signage proposed to be retained.

d. Details of any proposed illumination.

7 – Insert additional information in the definition of a 'PE' within the legend

4.0 Signs – Zoning Matrix

SIGN TYPE	LAND USE TYPE					
	Residential	Rural	Industry	Estate Subdivision	Commercial outside of Town Centre	Town Centre Commercial
ON BUILDING						
Above Roof	X	X	X	X	S	P
Part of Roof	X	X	X	X	P	P
Wall	S	X	X	X	S	P
Projecting	X	X	X	X	S	P
Window	X	X	X	X	S	P
OFF BUILDING						
Rural Business	X	P	P	X	P	X
Pylon	X	X	P	X	X	X
Portable	X	X	S	X	X	P
Panel	X	X	X	X	X	P
Hoarding	X	X	X	X	X	X
Tethered	X	X	P	P	P	P
Product Display	X	S	S	S	S	S
TEMPORARY						
Real Estate Directional	PE	PE	PE	PE	PE	PE
Real Estate Development	P	P	P	P	P	P
Real Estate "For Sale"	PE	PE	PE	PE	PE	PE
Construction Site	PE	PE	PE	PE	PE	PE
Display Home	PE	PE	X	X	X	X
Public Information	P	P	P	P	P	P
OTHER						
Business Direction	NA	S	NA	NA	NA	NA

LEGEND

X	Not permitted
P	Permitted, application needed
PE	Permitted, exempt from application – subject to clause 3.1(e)
S	Permitted, signage strategy required
NA	Not applicable

Note: It should be noted that certain particular types of signs are not permitted (X) in any zones or land uses. The Policy details every type of advertising sign so as to avoid confusion which would occur if certain types were not described. Council presently considers those listed as not permitted are not acceptable forms of signage for that zone.

Appendix 1 Table 1 REMOTE SIGNAGE ON GREAT NORTHERN HIGHWAY

Signage may be erected in the following locations within the road reservation area, subject to Clause 3.4:

Location along Great Northern Highway	Maximum sign density	Sign Content
Within the Muchea Employment Node	6 signs in 5km of road length	• Businesses providing goods and services to the travelling public located within the Muchea Employment Node; • Events, community and tourism services located within the Chittering local government area
From 3km to either side of the designated Binda Place Town Centre and not at all within the Binda Place Locality	2 signs per 500m of road length	• Businesses providing goods and services to the travelling public located within the Binda Place townsite; • Events, community and tourism services located within a 10km radius of the sign

ADOPTED FOR PRELIMINARY APPROVAL by resolution < resolution no> of the **Shire of Chittering** at the Ordinary Meeting of Council held on <insert date>.

ADOPTED FOR FINAL APPROVAL by resolution <resolution no> of the **Shire of Chittering** at the Ordinary Meeting of the Council held on <insert date>.

The Common Seal of the **Shire of Chittering** pursuant to resolution <insert resolution> was affixed in the presence of:

Cr Gordon Houston _____
President

Alan Sheridan _____
Chief Executive Officer

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Shire of Chittering

6177 Great Northern Highway
PO Box 70 Bindoon WA 6502
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Office hours: Monday to Friday
8.30am - 4.30pm

Proposed Sand Excavation For Perth – Darwin Highway

WHITE TORO
Lots 2233 and 2238, Byrne Road, Muchea

Shire of Chittering

WA Limestone

January 2017

W.A. LIMESTONE

Landform Research
Land Systems - Quarries - Environment
ABN 29 841 445 594

Lindsay Stephens BSc (Geology), MSc (Plant Ecology) 25 Heather Road Roleystone WA 6111
Mem Aus Geomechanics Soc – MEIANZ – FIQA Tel 9397 5145, landform@iinet.net.au

SUMMARY

The proposed Great Northern Highway upgrade, passing through Muchea, is located east of a low sand ridge on the White Toro property, Lots 2233 and 2238, Muchea South Road, Muchea.

The alignment of the Great Northern Highway crosses low lying land and will require a substantial amount of sand fill which will cost a significant amount of money for cartage if it is not sourced locally.

The "White Toro" property is a productive cattle grazing property.

The soils of the sand ridge have low capability because of the lack of water holding capacity as can be seen by the lack of pasture on the aerial photography.

The proposal is therefore to provide a source of local sand to assist in minimising the cost of construction of this section of the new Great Northern Highway alignment and, by removing the sand from the ridge, lower the ridge and improve the soil capability over a substantial portion of the grazing property, covering approximately 44 hectares.

ASPECT	**DISTURBANCE**
Resource sought	Bassendean sand
Area of excavation	Approximately 44 hectares (Eastern resource, 43 hectares 1 - 3 metres deep) (Western resource, 41 hectares 1 – 15 metres deep.
Processing Infrastructure. Product stockpiles, laydown and related areas	Included in the excavated area.
Excavation	Rubber tyred loader/s Off-road haul trucks, scrapers or road trucks for transport to the new Great Northern Highway alignment. 20 tonne water truck or similar for dust suppression. Self contained maintenance and refueling vehicles to attend site as required.
Processing	A mobile screening plant may be required.
Roads, dams and related infrastructure etc	0.5 hectares additional access road to Great Northern Highway alignment.
Facilities	May require locked seatainer. Portable serviced toilet system.
Water management	Approximately 5 000 kL per year for dust suppression on the access road and pit floor as required, depending on the season.
Dewatering requirements	Nil
Total area of plant and stock	Located on the hard stand to the north. No changes.
Area of settling ponds	Not required
Wastes and tailings	There is no waste material. The only materials remaining on site will be subgrade sand and topsoil.
Fuel storage	Not proposed with fuel brought to site in mobile tanker as required.
Truck movements	Variable but approximately 4 laden trucks leaving site per hour on average, with some days having more transport and other days less. For supply to the Great Northern Highway upgrade the hourly number will rise to 10 – 20 per hour. Transport is to be directly to the Brand Highway along Byrne Road and then to the alignment of the Great Northern Highway. Any sand remaining after construction of the highway will

	be transported along an approved access road to a defined and approved intersection on the highway.
Life of project	10 years for Great Northern Highway and a contingency of 10 years to remove additional sand that was not required for the highway
Hours of operation	Hours of operation will be 6.00 am to 5.00 pm Monday to Saturday inclusive, excluding public holidays.

Potential "at risk" Inventory

Type	**Comment**	**Treatment**
Saline surface water	Not present	Surface water is fresh, like all water from the Gnangara Mound.
Saline ground water	Not present	All water on site is fresh.
Acidic materials and drainage	Not present	
Sodic or dispersive materials	Not present	All water on site is fresh. The soils are sand and are not sodic or dispersive.
Asbestos – asbestiform minerals	None present	
Radioactive materials	Not present	
Metallic or chemical materials	Not present	
Tailings storage	Not required	
Ablutions waste	Removed from site	Serviced portable facilities or an approved septic system will be used.
Dangerous Goods and Hazardous Materials	**EXPLOSIVES**	Not required There are no hazardous materials used for sand excavation.
	FUEL The various plant will be refueled from mobile tanker. ***None will remain on closure***.	Any soil or other materials with drips and spills will be removed offsite to an approved waste site or location.
	SERVICE MATERIALS Only minor lubrication will be conducted on site All major servicing will be conducted offsite. ***None will remain on closure***	Any wastes will be collected and removed from site promptly to an approved recycling or waste disposal area.
General waste	***None will remain on closure***	Regularly removed from site to an approved disposal area

APPROVAL SOUGHT

Approval is sought to remove the usable sand from Lots 2233 and 2238 over a period of 10 years to enable staged extraction and satisfy long term community needs.

MANAGEMENT OF THE OPERATIONS

The excavation, processing and environmental management proposed has been designed to reflect best practice and utilises Commonwealth and State Guidelines.

Safety Management

All quarries operate under the provisions of the *Mines Safety and Inspection Act 1994 and Regulations 1995*. These are administered by the Department of Mines and Petroleum.

The regulation is achieved through the DMP Safety Regulations and Reporting Systems (SRS).

All quarries on commencement are required to register with the SRS system. As part of the registration a Project Management Plan is required to be produced and lodged online after all planning approvals are in place and prior to commencement.

The Project Management Plan will use some material from this Management Plan and concentrate on the onsite operations as they relate to health and safety.

Officers from the Safety Division of the DMP will regularly inspect the operations in relation to health and safety.

Environmental Management

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 Environment Regulation, Department of Water, Department of Mines and Petroleum, Western Australia Planning Commission and the Local Authority.

An Environmental Risk Assessment has been developed based on the EPA Environmental Factors which have been identified by the EPA as the factors to be considered when reviewing environmental impact and outcomes in Western Australia.

The EPA Factors have been used and added to in the following table which provides for the environmental risk if not mitigated or managed and the assessed environmental risk when the proposed design and management procedures are effectively implemented.

All the EPA environmental factors, together with the other factors, are provided in the Environmental Risk Table to show that some are not relevant to this proposal. Leaving them out may lead to some uncertainty in a reviewer's mind.

The Environmental Risk Matrix was developed 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.

The Risk Table includes references to the various parts of the document to enable easy review and provides a summary of the project and its management.

The risk assessment table also forms the basis of an auditable matrix.

WA Limestone has Compliance Australia Certification.

- Environmental Certification under ISO 14001.
- Safety Certification under AS/NZ 4801
- Quallity Assurance Certification under ISO 9001

Environmental Factor - Objective	Identified Issues and Commitments	Unmanaged Risk			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, and degradation by weeds and dieback.	D	3	Med	• The eastern excavation area is pasture with regrowth vegetation consisting almost solely of *Xanthorrhoea preissii* (Grass Trees). There are occasional to isolated *Eucalyptus todtiana*, *Corymbia calophylla,* and *Jacksonia.* • The western vegetation is degraded pine plantation with reduced native species regrowth. The species are reduced in number. • Buffers will be rehabilitated on the batter slopes to the south and west to provide a buffer to the adjoining *Banksia* Woodland and compensate for the clearing. • Corridors and linkages will be maintained and established. • No wetland will be cleared. • Weed and Dieback management is proposed. • WA Limestone is a Quality Assured Company.	Biodiversity Management Plan Attachment 1. Figures 1, 2, 5, 7, 8, 9, 10.	E	2	Low
	Threatened Communities may be impacted by inadvertent impacts.	E	1	Low	• None recorded. • The site adjoins *Banksia* Woodland which will not be impacted and will be assisted by the provision of local native vegetation buffers at rehabilitation. • WA Limestone is a Quality Assured Company.	Biodiversity Management Plan Attachment 1.	E	1	Low
	Priority species may be affected by clearing, disturbance, weeds, dieback and other impacts.	E	2	Low	• None recorded.	Biodiversity Management Plan Attachment 1.	E	2	Low
	Threatened Species may be impacted by inadvertent impacts.	E	2	Low	• None recorded.	Biodiversity Management Plan Attachment 1.	E	2	Low
	Weeds may become established and impact on the local and on site biodiversity	C	3	High	• A weed management program is proposed, in conjunction with normal farm operations.	Weed Management Plan Section in Attachment 1.	C	1	Low
	Dieback disease	C	4	High	• Dieback management procedures are proposed.	Dieback Management Plan	D	2	Low

	may be present and impact on the local and onsite vegetation.				• WA Limestone is a Quality Assured Company.	Section in Attachment 1.			
	The developments may fragment communities, biodiversity and ecological linkages.	E	2	Low	• There will be no fragmentation of communities. • There is unlikely to be any net loss of biodiversity values through rehabilitation. • WA Limestone is a Quality Assured Company.	Biodiversity Management Plan Attachment 1.	E	2	Low

Environmental Factor - Objective	Identified Issues and Commitments	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, and degradation by weeds and dieback.	D	2	Low	• The site is cleared. • There will be no fragmentation of communities. • No wetlands will be impacted. • There is unlikely to be any net loss of biodiversity values through rehabilitation. • WA Limestone is a Quality Assured Company.	Biodiversity Management Plan Attachment 1	D	2	Low
	Threatened Faunal Communities may be impacted by inadvertent impacts.	E	1	Low	• No Threatened Communities occur on site or nearby.	Biodiversity Management Plan Attachment 1	E	1	Low
	Priority Fauna species may be affected by clearing, disturbance, weeds	D	2	Low	• The site has previously been cleared. The eastern resource is pasture or a monoculture of *Xanthorrhoea preissian*a. The western resource is degraded pine plantation with limited native species understorey. • There will be no fragmentation of communities. • There is unlikely to be any net loss of biodiversity values through rehabilitation. • There are no Banksias on site to be impacted and no native vegetation food resources for Black Cockatoos. • The pines will provide limited resource for Black Cockatoos and will be replaced by the buffer of *Banksia* Woodland to compensate for the loss of the pines. • Clearing will be progressive, towards the adjoining native vegetation, enabling wildlife to move to that safe refuge. • The land to the west is the Gnangara Moore River National Park which represents a very large Black Cockatoo habitat.	Biodiversity Management Plan Attachment1. Figures 1, 2, 5, 7, 8, 9, 10.	D	2	Low
	Threatened Fauna Species may be impacted by inadvertent impacts.	D	2	Low	• See above	5.1 Biodiversity Management Plan Attachment 1.	D	2	Low

SUBTERRANEAN FAUNA To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.	The development may have an impact on an isolated population of subterranean fauna.	E	1	Low	• The site is sand with no subterranean cavities.		E	1	Low

Environmental Factor - Objective	Identified Issues and Commitments	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.	C	3	High	• The eastern resource is low and will result in little impact when viewed from outside the property. • The western resource is deeper, but is narrow and adjoins *Banksia* Woodland of the National Park at a similar elevation and result in little effective change. • The final land surface will match the existing pasture land to the east on the same property. • WA Limestone is a Quality Assured Company.	Figures 1, 8, 9 10	D	2	Low
	The final land surface should be fit for its required end use.	D	2	Low	• The agricultural capability of the sand ridges will be enhanced by lowering the ridges to within 0.5 to 1.0 metres of the water table in compliance with the DOW South Western Guidelines for sand extraction. • In all around 30 plus hectares of pasture will be greatly improved.	Figures 1, 8, 9 10	E	1	Low
	The development and final landform will not lead to significant visual impacts.	E	1	Low	• The proposed excavation is set back from existing and road network and Brand Highway and will not be distinguishable for other pasture land when sown to pasture.	Figures 1, 8, 9 10	E	1	Low
	The final landform and soils may be subject to erosion by wind, water or other processes.	C	1	Low	• The final soils will be improved with better water availability and agricultural capability and greater resistance to wind erosion.	Figures 1, 8, 9 10 Closure Plan at Attachment 1.	E	1	Low
	Acid soils are not exposed or are managed to ensure that there are no long term adverse effects.	E	1	Low	• There is no evidence of acid sulfate conditions that will be disturbed during excavation. There are no peaty soils impacted and the excavation will stay above the water table. WA Limestone propose monitoring of the depth to groundwater during excavation.	Attachment Water Management Plan Attachment 2.	E	1	Low
	The project has been assessed for karst features and has been designed to mitigate impacts on known and features that may potentially be present.	E	1	Low	• There is no karst. It is the wrong geological environment.	2.1 Geology and Geomorphology	E	1	Low

Environmental Factor - Objective	Identified Issues and Commitments	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 are to be maintained.	E	1	Low	• The only watercourses lie to the east outside the proposed area of excavation. • WA Limestone is a Quality Assured Company.	Water Management Plan, Attachment 2 Figure 4	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	2	Low	• The agricultural capability of the sand ridges will be enhanced by lowering the ridges to within 0.5 to 1.0 metres of the water table in compliance with the DOW South Western Guidelines for sand extraction. • The water table will not be intersected. • There will be no use of the water from the groundwater system during or after excavation. • Recharge has been calculated to be similar and, considering the large flows and area from the Gnangara Mound to the west, will not be impacted. • The final surface of pasture will utilise no more water than the original *Banksi*a Woodland that would have occupied the site with deeper rooted species that would have utilised the water table. • Reducing the separation to the water table enables significantly greater volumes of precipitation to reach the superficial water table balancing the water use by pasture in early summer.	Water Management Plan Attachment 2 Figures 4, 9, 10	D	2	Low
	Wetlands may be altered by draining or flooding, potentially changing their ecological functions and biodiversity.	E	1	Low	• There are no proposed changes to the wetlands or their hydrogeology. • Recharge will remain similar and most hydrological support for the wetlands comes from the Gnangara Mound to the west which will not be impacted. • There will be no pumping or extraction of water	Water Management Plan Attachment 2 Figures 4, 9, 10	E	1	Low
WATER QUALITY To maintain the quality of groundwater and	Hydrocarbons, fuels and other chemicals are stored in a manner that they pose no risk to the environment.	C	L	High	• Extensive management procedures are proposed. • WA Limestone is a Quality Assured Company.	Water Management Plan Appendix 2	D	2	Low

surface water, sediment and biota so that the environmental values, both ecological and social, are protected.									
	Runoff from operations is contained and all water is either retained or treated to removed sediment and any deleterious materials.	D	2	Low	• All water is to be retained on site in the base of the pit similar to pre and post excavation.	Water Management Plan Attachment 2	E	2	Low
	Water quality during and after development and operations is not adversely affected or altered.	D	2	Low	• All water is to be retained on site in the base of the pit similar to pre and post excavation. • Extensive water management plans are proposed to protect water quality.	Water Management Plan Attachment 2	D	1	Low

Environmental Factor - Objective	Identified Issues and Commitments	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 are minimised or controlled to ensure that the local amenity is protected.	B	3	High	• There are no sensitive premises or land uses with the closest dwelling 500 metres away. • The proposal complies with the EPA and other buffer Guidelines for Dust Management such as the Department of Health Guidelines for sand excavation. • Extensive Dust Management Procedures are proposed. • WA Limestone is a Quality Assured Company.	Dust Management Plan in the Offsite Risk Management at Attachment 3.	E	1	Low
	Dust emissions will not significantly impact on local and on site personnel health or quality of life.	E	1	Low	• See above.	Dust Management Plan in the Offsite Risk Management at Attachment 3.	E	1	Low
	Noise levels will comply with the *Environmental Protection (Noise) Regulations 1997.*	E	1	Low	• Noise levels will comply with Environmental Protection (Noise) Regulations 1997. • There are no sensitive premises or land uses with the closest dwelling 450 metres away. The proposal complies with the EPA and other buffer Guidelines for sand excavation. • WA Limestone is a Quality Assured Company.	Noise Management Plan in the Offsite Risk Management at Attachment 3.	E	1	Low
	Noise levels and operational procedures will be used to protect on site personnel health and safety.	C	3	High	• The operations are designed to minimise on site noise and the potential for offsite noise. • There are no sensitive premises or land uses with the closest dwelling 450 metres away. The proposal complies with the EPA and other buffer Guidelines for sand excavation. • WA Limestone is a Quality Assured Company.	Noise Management Plan in the Offsite Risk Management at Attachment 3.	E	1	Low
	Emissions gases and other materials potentially adverse to human health will not be used or will be managed.	D	2	Low	• There are no gaseous or other potential harmful emissions from the operations.	NA	D	2	Low
	Potential impacts from blasting will comply with the *Environmental Protection (Noise)*			NA	• There is no blasting.	NA			NA

	Regulations 1997 and guidelines for ground vibration.								
	Employ procedures and design the operations to minimise the risk of excessive greenhouse emissions.	E	1	Low	• The whole purpose of this proposal is to extract sand from as close as possible to the destination, reducing emissions of greenhouse gases to the minimum. • Truck and trailer combinations and plant that are efficient will be used.	Attachment 3	E	1	Low

Environmental Factor - Objective	Identified Issues and Commitments	Unmanaged Risk			Proposed Management	References	Managed Risk		
		Likelihood	Consequence	Risk			Likelihood	Consequence	Risk
HERITAGE Known heritage sites will be protected.	Known aboriginal heritage sites will be protected.	E	2	Low	• No archaeological or ethnographic sites are known from Lots 2233 or 2238. • The studies completed for the PER on behalf of Main Roads investigated heritage issues and none were found for this excavation area. • WA Limestone is a Quality Assured Company.	Section 4.4 Heritage in the Management Plan	E	2	Low
	Sites of European heritage will be protected.			NA	• None known				NA
	Heritage sites uncovered during operations will be independently assessed and managed through communication with the community, Government and traditional owners.	D	2	Low	• A commitment is made to this.	Section 4.4 Heritage in the Management Plan 2.7 Aboriginal Sites	D	2	Low

Environmental Factor - Objective	Identified Issues and Commitments	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 is protected from adverse impacts of dust, noise, other emissions and chemicals.	E	1	Low	• Silica sand has no known health impacts. • Dust is mainly organic during land clearing and from road traffic which is to be managed through best practice environmental dust and occupational health measures that are normal at any similar working sand quarry. • WA Limestone is a Quality Assured Company.		E	1	Low
	Transport may impact on local, and regional roads or school bus routes.	E	1	Low	• The purpose of this proposal is to extract sand from as close as possible to the destination, reducing emissions of green house gases to the minimum. • There will be direct transfer of sand from the excavation area to the proposed Highway alignment and then transport along the construction footprint. There is not anticipated to be any traffic on public roads. • In the event of some sand remaining at the end of the contracts for the Great Northern Highway upgrade an access directly to the Brand Highway will be used, entering at an approved intersection that will service the continued local and on site rural land use.	5.0 Mining Operations in the Management Plan	E	1	Low
	The operations have been designed to provide sufficient buffers and visual protection.	E	1	Low	• The operations are set back from public roads with the proposed Great Northern Highway update. • The closest dwelling lies a minimum distance of 500 plus metres to the south east of the eastern resource with the majority of the resource much further away with the pit operated below ground elevation behind the face of the pit which will provide visual protection and buffers to the dwelling. • The operations are designed to minimise visual impact.	Offsite Impacts Management Attachment 3. Figures 2 and 4	E	1	Low

Environmental Factor - Objective	Identified Issues and Commitments	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	At the end of excavation the created soils should be deep enough or of sufficient quality to be sustainable to meet the long term end use or ecological values.	B	3	High	• A void is to be retained at the end of excavation, and this will be allowed to fill with water and provide an additional local water source. • Rehabilitation will be directed towards the final end land use of a return to local native vegetation and habitats around the perimeter of the pit above the water level. • Topsoil and vegetation fragments will be transferred directly from an area being cleared and spread across the surface of the areas to be rehabilitated, to provide seed sources and habitats wherever possible. If direct transfer is not possible, any material stored in dumps will be respread. • WA Limestone is a Quality Assured Company.	Biodiversity and Closure Management Plan Attachment 1	D	2	Low
	All infrastructure, roads, hardstand, non natural materials are to be removed from site progressively when not required and all removed at the end of the project.	C	2	Med	• This is committed to.	Biodiversity and Closure Management Plan Attachment 1	D	2	Low
	No materials are to be left on site that may cause long term detrimental outcomes in terms of impacts to soils, water, heritage, vegetation health or other factors.	C	2	Med	• This is committed to.	Biodiversity and Closure Management Plan Attachment 1	D	2	Low
	All contaminated materials are to be removed from site prior to closure.	C	2	Med	• All contaminated materials are to be removed from site prior to closure.	Biodiversity and Closure Management Plan Attachment 1	D	2	Low

Environmental Factor - Objective	Identified Issues and Commitments	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.				• The site is a known resource that is capable of providing fill for the proposed Great Northern Highway upgrade from a location close to the works area, saving money, time and minimizing potential environmental impacts. • Extraction of the resource complies with State Planning Policy 2.5 December 2016 and all other Government Policies.	1.0 Background Information 4.1 Planning Issues			

Environmental Factor - Objective	Identified Issues and Commitments	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	Ensure that the project provides high levels of safety to on site personnel.	C	3	High	• The operations are designed to comply and operate to the Mines Safety and Inspection Act 1994. • The operations are registered under the DMP SRS system. • WA Limestone have extensive safety management systems in place at all their operations. • Officers from the Safety Division of the DMP will regularly inspect the operations in relation to health and safety. • A Fire Management Plan will be used in conjunction with normal farm practices. • WA Limestone is a Quality Assured Company.	5.0 Project Description 7.0 Safety	D	2	Low

Environmental Factor - Objective	Identified Issues and Commitments	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	**State Planning Policies** • Extraction of the resource complies with State Planning Policy 2.5 December 2016. • The extraction of the sand complies with all other Government Policies. • WA Limestone is a Quality Assured Company. **Shire of Chittering Town Planning Scheme** • The resource area is zoned Agriculture Resource in the Shire of Chittering Town Planning Scheme. • 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. The proposal has been designed to comply with Section 5.16 Basic Raw Materials of the Town Planning Scheme with adequate separation distances available to dwellings, and detailed environmental management proposed. • Section 5.8.8 Protection of Vegetation and Tree Cover of the Scheme covers the protection of vegetation. The proposed enhancement of vegetation on site and the planning of offset, by creating a 25 metre buffer to the *Banksia* Woodland and Bush Forever site, in addition to the creation of Tumulus Spring habitat, will offset any clearing and provide greatly enhanced habitats and biodiversity which is compatible with Section 5.8.8. • The proposal does not lie within a Landscape Protection Area of the Shire of Chittering Town Planning Scheme. **Shire of Chittering Local Planning Strategy – 2001 - 2015** • The proposal complies with the intent of the Shire of Chittering Local Planning Strategy and has a number of aims and objectives which have been considered during the environmental management of the proposed quarry application.	4.1 Planning Issues	E	2	Low

					• The soils of the agricultural areas are to be retained and enhanced rather than lost from production (LPS 7.2). The pre-excavation soils on site have low agricultural capability because of the deep leached sand with very low water holding capacity. • The taking of the sand and the lowering of the soils to 0.5 to 1.0 metres from the water table will greatly enhance the agricultural capability for grazing. • In Section 10.3 of the Local Planning Strategy, Basic Raw Materials Extraction Areas, the intent is to protect appropriate buffers to extraction areas. The proposed excavation maintains large buffers to adjoining houses. **Shire of Chittering Local Biodiversity Strategy – 2010** • The Shire of Chittering Local Biodiversity Strategy shows the subject land as lying within the Muchea Precinct which is not covered by the Biodiversity Strategy with respect to vegetation protection and improvement. • Even so the amount of clearing proposed is small and will be greatly over compensated for by the buffer planting and the creation of new Tumulus Spring habitat proposed. **Shire of Chittering Local Law – Extractive Industries** • 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. • The proposed quarry complies with all the provisions of the Local Law – Extractive Industries but has modified the buffers to native vegetation slightly to enable a better environmental outcome for the sand excavation. • The proposed 25 metre buffer to the remnant vegetation to the west will allow the establishment of a permanent fence and buffer of local native vegetation and provide a much improved environmental outcome.				
	The area of potential impacts is not large enough to significantly impact on essential or desirable land uses.	E	2	Low	• 44 hectares of excavation is proposed that will improve the capability of the soils for agricultural purposes in line with the DOW South West Guidelines for sand extraction.	4.1 Planning Issues	E	2	Low

	The development will not adversely impact on an area identified as having high agricultural or community values.	E	1	Low	• Agricultural values will be improved and the site will continue to operate as a productive agricultural grazing property.	4.1 Planning Issues	E	1	Low

Environmental Factor - Objective	Identified Issues and Commitments	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.	Community consultation assists by identifying and resolving concerns before they become significant issues.			NA	• There will be extensive advertising during the assessment of the proposal by the Shire of Chittering. There has been extensive public consultation with respect to the Great Northern Highway alignment and its construction through the PER process. This sand excavation represents a part of that construction, located adjacent to the new alignment. • WA Limestone is a Quality Assured Company.				NA
	A complaints and improvements procedure will assist management of the site.			NA	• An ongoing complaints program is proposed as part of the program in place through WA Limestone central office.	See Dust Management Section 5.0 in the Offsite Impacts Management Plan			NA

Environmental Factor - Objective	Identified Issues and Commitments	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.	E	1	Low	• The end use will be a gently sloping floor with rehabilitated sloping sides in compliance with the safety considerations of the *Mines Safety and Inspection Act 1995* and the requirements and guidelines of the Department of Mines and Petroleum; for example *Guidelines on Safety Bund Walls Around Abandoned Open Pits 1991.* • The end use is a lowered land surface consistent with the local landscape and similar to existing soils and landforms. The sand ridges will be lowered by between 1 and 15 metres. • WA Limestone is a Quality Assured Company.	5.0 Project Description 7. 0 Safety Figures 1, 8, 9, 10.	E	1	Low
	The quarry and operations will comply with the *Mines Safety and Inspection Act 1994.*	C	2	High	• WA Limestone is committed to complying with all relevant Acts and Regulations. • WA Limestone is a Quality Assured Company.	5.0 Project Description 7. 0 Safety Figures 1, 8, 9, 10.	D	1	Low
	The operational and final surfaces and features are designed to be not affected by extreme climate events.	E	1	Low	• The site will be internally draining with large capacity to retain water during excavation and on completion and rehabilitation.	5.0 Project Description 7. 0 Safety Figures 1, 8, 9, 10.	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**

CONTENTS

FIGURES

APPENDICES

1.0 BACKGROUND INFORMATION

1.1 Background

The proposed Great Northern Highway upgrade, passing through Muchea, is located immediately east of a low sand ridge on the "White Toro" property, Lots 2233 and 2238, Muchea South Road, Muchea.

The alignment of the Great Northern Highway crosses low lying land and will require a substantial amount of sand fill which will cost a significant amount of money for cartage if it is not sourced locally.

The "White Toro" property is a productive cattle grazing property.

The soils of the sand ridge have low capability because of the lack of water holding capacity as can be seen by the lack of pasture on the aerial photography.

The proposal is therefore to provide a source of local sand to assist in minimising the cost of construction of this section of the new Great Northern Highway alignment and, by removing the sand from the ridge, lower the ridge and improve the soil capabability over a substantial portion of the grazing property.

1.2 Location

Lots 2233 and 2238 Byrne Road, Muchea.

1.3 Proponent

The proponent is WA Limestone, a large limestone and sand extraction company that supplies a significant part of the domestic market for limestone, sand, hard rock products and roadbase.

Contact can be made through

Manager
PMR Quarries t/s WA Limestone
41 Spearwood Avenue
Bibra Lake WA 6163

Phone 9434 7777 Fax 9434 1513

1.4 Project Objectives

The proposal is to provide a source of local sand to assist in minimising the cost of construction of this section of the Great Northern Highway alignment and to improve the land capability of the operating grazing property.

Importance and Rationale

Sand on site occurs in the Bassendean Land System. The sand is used for construction and fill sand.

The sand itself has been tested and shown that it provides high specifications for fill sand for road construction.

Should such sand not be available sand resources will have to come from another location at a substantial distance penalty because sand, although widespread to the west, is already sterilised by conservation. Using sand from further away will result in a significant greenhouse gas and transport penalty.

The land capability of the farm will also not be able to be improved.

A summary of the sand resources on the Swan Coastal Plain is shown in the documents listed below.

See;

- Western Australia, Western Australian Planning Commission*, State Planning Policy 2.4, Basic Raw Materials.*
- Chamber of Commerce and Industry, 1995 and 1996, *Managing the Basic Raw Materials of Perth and the Outer Metropolitan Region*, Parts 1 and 2.
- Chamber of Commerce and Industry, 2008, *Basic Raw Materials Access and Availability*.
- Abeysinghe P B, 2003, *Silica Sand Resources of Western Australia, Geological Survey of Western Australia*, Mineral Resources Bulletin 21.

Requested Approval

Approval is sought to remove the usable fill sand from parts of Lots 2233 and 2238 for the construction of the new Great Northern Highway alignment.

1.5 Aims of the Proposal

The aims of the proposal are to;

- Provide Planning Approval and the Extractive Industries Licence.
- Excavate sand from sand ridges, which have low agricultural capability.
- Prepare the land for a final end use of improved pasture.
- Improve the land capability of the pasture by providing a 0.5 – 1.0 metre separation to the water table.
- Strip the exotic and pasture species from a 25 metre buffer strip to the Gnangara – Moore River State Forest vegetation to the west and re-establish local native species as a 25 metre fenced permanent buffer to the Bush Forever – Threatened *Banksia* Woodland vegetation.
- Provide reserves of strategically located sand for the construction of this section of Great Northern Highway.
- Maximise the use of sand 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 sand at the lowest possible levels, by maintaining small transport distances. This benefits the whole community.
- Comply with State Planning Policy No 2.5, Agricultural and Rural Land Use Planning 2016, which states that basic raw materials should be taken prior to sterilisation of the area by development.

1.6 Site Plans

Site plans are shown in the attached Figures.

2.0 PHYSICAL ENVIRONMENT

2.1 Geology and Geomorphology

The subject land is located on the eastern edge of the Perth Basin, approximately 3 km west from the Gingin Scarp which forms the eastern edge of the Plain at this location.

The eastern portion of the site, on which the alignment of the highway is locate, is formed from a flat slightly undulating surface comprised of alluvial sands and clays of the Guildford Formation formed by the meandering of Ellen Brook and streams draining the scarps to the east.

Impinging on this plain is a sand sheet of younger Bassendean Sand, which has been blown onto the western edge of the Guildford Formation as a series of low irregular sand dunes. The sand interleaves with the alluvial clays.

The sand is of aeolian origin (formed from wind blown calcareous sands) derived from beach sands, and, over the years, has been subjected to solution of any calcium carbonate to leave behind a silica sand. The sand is likely to also have been reworked to produce the current ridge form.

See Perth Environmental Geology 1 : 50 000 Series, Muchea maps, (Geological Survey, 1982).

Drilling and soil hole testing on site show the Bassendean Sand overlying the Guildford Formation.

The sand resource is a series of sand ridges of Bassendean type sand, which by the vegetation, suggests yellow sands at depth under the core of the ridges, but which, from the limited soil auger holes, is leached white silica sand grading to light brown at depth.

The land surface drops from a higher ridge to 80 metres AHD in the west down to a swale of just above 60 metres AHD before rising to a low ridge at 64 metres AHD in the central east.

There are two main ridges; a higher ridge on Lot 2233 to nearly 20 metres above the land to the east and a lower ridge of up to four metres elevation on Lot 2238.

A layer of friable, mostly weakly goethite cemented sand known as ‘coffee rock’ is commonly present at or just above the water table or historic water table. It commonly occurs on top of the sand clay interface.

2.2 Regolith and Soils

Site investigations have been conducted by Landform Research in September 2016.

The resource of Bassendean Sand is pale grey to white, and occasionally brown, moderately-sorted, fine to medium-grained quartz sand with traces of heavy minerals.

Bassendean Sand is naturally yellow in colour due to a coating of goethite on the sand grains. The goethite has been found to originate from the weathering of iron based heavy minerals. There can also be minor amounts of clay originating from the weathering of small amounts of feldspar that occurred in the original sediment. Bastian 1996.

Over time and under the influence of organic acids the iron oxides (Goethite) are dissolved from the sand grains and deposited at the wet – dry seasonal interfaces related to the thickness of the sand, depth of groundwater and depth to clay.

The typical iron indurated material on site does not contain organic material and is better called a ferricreted bed or iron hard pan rather than attaching the word organic, where it occurs on top of the clay base.

The origin of the iron induration layer results from the goethite coating of the naturally yellow sand being dissolved under the influence of organic soil acids. The mobile iron then precipitates at the wetting- drying front at the groundwater interface. The current coffee rock may represent past or recent water tables and it is not uncommon to have several layers of iron induration.

With the removal of the iron oxide coating, the sand grains turn their natural white colour, hence the white near surface soils, explaining why yellow sand on exposure to the atmosphere for some years is gradually “bleached” white.

This is consistent with Lantzke N, 1997, *Phosphorus and nitrate loss from horticulture on the Swan Coastal Plain,* Department of Agriculture and Food Miscellaneous Publication 16/97.

The problem is that the leached white sands of the low ridges have very low land capability for agricultural purposes. A view of the aerial photography shows the sand ridges standing out as white relatively bare sand, whereas the low lying sand closer to the water table appears green and covered by substantial pasture growth.

The subject land is part of the productive cattle grazing property and the conversion of the sand ridges to productive use will lift the rural capability of this part of the property.

The land owner wants the land to be returned to productive pasture. Currently the sand ridges are too dry to hold water in summer and do not support pasture growth as can be seen on the aerial photographs.

Ideally the separation to the water table could be lowered to 0.5 to 1.0 metres and would enable better pasture growth and pasture to be maintained into summer. Lowering the sand ridge will increase the agricultural capability of the land.

Capillary action in sand is around 600 mm and root depth of pasture is in the order of 300 – 500 mm depending on the species of grass, so a separation of 0.5 to 1.0 metres is ideal for better pasture growth through summer, therefore providing significantly improved agricultural values.

This is in line with Department of Water South West Region Guideline for Extractive Industries which is more applicable as the end use will be to agricultural activities and pasture. The groundwater policies for the Metropolitan area relate more to a developed or potentially development end use.

The floor of the pit will be lowered to 0.5 to 1.0 metres above the highest known water table to enable better soil moisture in summer and better pasture growth for continued agricultural production.

In addition, by lowering the pasture land surface, capillary action will occur and the pasture will be able to gain soil moisture into summer. Capillary action allows for rises of soil moisture by 300 – 500 mm and, with root depth considered, land formed 0.5 to 1.0 metres above the groundwater will enable pasture to grow

2.3 Climate

The climate of the area is classified as Mediterranean, with dry hot summers and cool wet winters.

Climate data is recorded at Bullsbrook, (Pearce RAAF), Precipitation is 688 mm per annum, of which 89% falls in the months April to October inclusive. At Swan Research Station evaporation exceeds rainfall in all but the four wettest months, and the situation at Bullsbrook can be expected to be similar.

Average maximum temperatures at Bullsbrook reach 33.3 degrees Celsius for the hottest months, January and February, but fall to 17.6 degrees Celsius in July. Average minima for the coldest month August, is 8.2 degrees Celsius.

The climate data for Bullsbrook shows that the predominant summer winds are from the east at 9.00 am and from the south west at 3.00 pm.

In summer wind blows from the east 70% of the time at 9.00 am and from the west/south west for 60% of the time at 15.00 pm. Summer wind speeds tend to be 6 to 10 km/hour at 9.00 am and between 11 and 20 km/hour at 15.00 pm.

The winter wind directions are more even, but there is a slight predominance from the east at 9.00 am and south west at 15.00 pm. The average speeds are between 1 to 10 km/hour.

The wind roses for Pearce show that there is a pronounced easterly wind at 9.00 am on summer mornings, but this has to be balanced by the afternoon winds which blow from the south west at 3.00 pm. The data collected at Pearce has to be viewed with caution and can only be used as a general indication for this site and must be subject to interpretation.

Pearce lies at the base of the Darling-Gingin Scarp and is subject to strong katabatic winds on summer mornings. The Scarp is immediately east of Pearce and produces the easterly spike at 9.00 am. This causes the windshear at Pearce and Perth Airports.

2.4 Hydrogeology

Surface Water

The location lies within the catchment of Ellen Brook, which lies to the east of the alignment of Brand Highway.

There is no surface drainage on the sand resource, due to the porosity and permeability of the sand from the sand ridges.

Drainage in the superficial aquifer is from the Gnangarra Mound to the west, flowing east under the low ridges which represent the eastern most extensions of the mound.

When that superficial drainage touches the surface, east of the resource area, water flows commence as seasonal and permanent springs that flow east across pasture and eventually to Ellen Brook.

Examination of the aerial photography of the site shows leakage of the superficial aquifers east of the sand ridges as patches of dark green pasture in summer.

Water emanates from the ground between the two sand resources and drains south from the southern end of Lot 2233 and then east to eventually intersect Ellen Brook. A similar drainage feature drains from the northern portion of Lot 2233 and it also drains east eventually to Ellen Brook.

Both drainage lines appear to flow predominanly in winter, and during summer potentially dry up as the elevation of the groundwater lowers or are intersected by surface dams. Water flows therfore do not always reach Ellen Brook.

There are intervening low areas between the sand ridges where the water table touches the surface in winter. Some of this has been trained in constructed drains. These are at elevations that range around 60 – 61 metres AHD dropping from west to east.

See the figures showing the site elevations, existing contours, proposed future contours, section lines and rehabilitation and Attachment 2 Water Management Plan.

The site lies within Surface Water Area 34 Swan River System.

Groundwater

On this site the near surface geology and hydrogeology is relatively simple; the Guildford Formation has low vertical permeability and acts as an aquitard, sitting beneath and interfingering with the overlying Bassendean Sand.

On the subject site the Guildford Formation, with a very thin and variable sheet of sand, occupies the portion east from the resource. The resource area lies on the interfingering zone between the Bassendean Sand and the Guildford Formation and the western edge is deeper Bassendean Sand.

On the other hand the overlying Bassendean Formation is an aquifer that sits near the surface and allows lateral movement of superficial groundwater to flow through it. The Bassendean Formation being the aquifer for the Gnangara Mound.

Groundwater from the Gnangarra Mound to the west, flows east at this location to emerge at the eastern edges of Lot 2233 as two winter or permanent seepages from which water flows east.

The weak and minor ferricrete and coffee rock that sits on the interface between the sand and clay may be causing localised minor confinement of the groundwater.

Elevation of the groundwater has been determined by establishing the winter water table in a wet time during September 2016 and by the drilling of soil auger holes to groundwater. From the available data the groundwater elevations and behaviour are well known.

The groundwater elevation drops from west to east, from 62.0 - 62.5 metres AHD, to 59 metres AHD in the east, touching the surface in winter on the lower wetter areas in the dune swale.

The elevation of the winter water table is some metres below surface of the sand ridges leading to reduced soil moisture and areas of little summer pasture. The lower swale areas where the water table is closer to the surface maintain pasture into and through summer.

The moist sand allows pasture and plant growth which holds the sand and prevents its deflation by wind in dry times and in the past.

Where there is some upwards hydraulic pressure, from a confining layer, or the groundwater intersects the land surface, there is a permanent or temporary seepage or spring.

The proposed excavation will cut the floor to between 0.5 and 1.0 metres elevation of the winter maximum water table in line with Department of Water *South West Region Guidelines Water Resource Considerations for Extractive Industries.*

See the figures showing the site elevations, existing contours, proposed future contours, section lines and rehabilitation, and Attachment 2 Water Management Plan.

The land owner wants the land to be returned to productive pasture. Currently the sand ridges are too dry to hold water in summer and do not support pasture growth as can be seen on the aerial photographs.

2.5 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 forms the basis for much of the assessment procedures in Australia, including those adopted by the Western Australian Planning Commission and the Department of Environment Regulation. The *Acid Sulfate Manual* adopts the procedure of reviewing the published data followed up by field assessment, which has been completed for this site. If a geological risk is determined, then a Preliminary Acid Sulfate Assessment is conducted.

Acid sulfate only becomes a potential risk when a number of circumstances are present.

- There is rock, soil or regolith present that is carrying sulfides.
- Sulfide carrying materials from below the water table are to be exposed to the atmosphere.
- Excavation below the water table is to be carried out exposing the sulfide carrying materials to oxygen in the atmosphere.
- Dewatering of the sulfide carrying materials is proposed, exposing them to oxygen.
- Regolith conditions are already highly acidic, below pH4, under which oxidation can occur through electron exchange without the need for the presence of oxygen.

The site lies outside the mapping contained in WAPC Planning Bulletin 64.

There have been soil auger holes and site examinations which have found no evidence of peat, at risk materials or reducing soils on the resource site on the sand ridges and none would be expected.

No drains or excavation are proposed to be cut below the water table.

In some other low lying parts of the Swan Coastal Plain the iron induration zones can contain organic material which, by their reducing nature, may hold sulfide sulfur and be acid sulfate generating on exposure to the atmosphere. The iron indurated materials which may contain organic matter under reducing conditions lie outside the resource area. They occur at the water table and can only be exposed if the water table is lowered, which is not proposed.

The project has been designed to minimise or mitigate any potential impacts on groundwater elevations.

No soil or water acidity on the resource area has been observed that can be attributed to acid sulfate conditions.

Excavation will not occur below the water table, so reduced materials even if they occurred will not be exposed to the atmosphere during excavation.

3.0 BIOLOGICAL ENVIRONMENT

3.1 Vegetation and Flora

The flora is discussed in more detail in Attachment 1, Biodiversity and Closure Planning.

The vegetation on the two resource areas is different.

Eastern Dune Ridge

The eastern low dune is largely pasture with a monoculture of *Xanthorrhoea preissii* (Grass Trees) and regrowth around the lower elevations of the dunes.

There are occasional to isolated *Eucalyptus todtiana, Corymbia calophylla*, and *Jacksonia*.

Damp areas off the sand ridge are identified by green pasture and *Melaleuca preissiana* and *Eucalyptus rudis* (flooded Gum).

A well vegetated wetland lies to the west, between the two sand resources.

There are almost no other native species.

Western Dune Ridge

The western dune is high with a relatively steep eastern form.

The dune is planted to Pinaster Pines of some 20 – 40 years age and with no apparent usefulness as timber.

The understory and ground cover was cleared to plant the pines and there has been some regeneration under the sparse pines.

A flora and vegetation study was completed and showed 33 species of the original *Banksia* Woodland species. There were no Threatened or Priority species.

33 species is low for *Banksia* Woodland and probably represents around 10 – 20 % of the original vegetation community. Species richness is 4.8 species /10m^2 and plant density is 1.26 plants /m^2 both of which is very low.

Vegetation Condition is predominantly Degraded to Good.

Figure 1 Western portion of the eastern sand ridge, view west showing the regrowth monoculture of Grass Trees.

Figure 2 Pasture area on the eastern part of the eastern sand ridge, view east.

Figure 3 View of the western sand ridge from the eastern edge of the pines, view west.

Figure 4 Typical vegetation on the western sand ridge showing some native vegetation regrowth under sparse pines.

The Final Public Environment Report for the Perth – Darwin Highway Swan Valley Section February 2016 part B Response to Submissions shows the presence of an historical record of a Priority 3 species, presumably *Cyathochaeta teretifolia* some kilometres to the south, but studies for the Highway relocation did not find any evidence of the plants and none were observed during the site inspections.

State Forest

To the west is *Banksia* Woodland that is included in the Gnangara – Moore River State Forest. *Banksia* Woodland is now classified as Threatened under the *Commonwealth EPBC Act 1999.*

It is proposed to excavate sand to the fence line and batter the slope down at 1 : 4 to 1 : 6 vertical to horizontal, leaving a 50 metre buffer. That will remove the topsoil and the exotic species load from the 50 metre buffer.

The buffer will be fenced and provide a long term improvement to the protection of the Bush Forever site and the listed "Threatened" *Banksia* Woodland Community.

3.2 Fauna

Currently the fauna will be reduced because of the large areas of pasture with some perimeter vegetation. Whilst permanent springs occur to the east they are unvegetated and not providing significant habitat.

Fauna was considered by the environmental studies for the realignment of the Perth – Darwin Highway. Those studies covered the proposed extraction area.

There will be minimal clearing of the perimeter vegetation, which will largely be retained as corridors linking to the buffer and then *Banksia* Woodland to the west.

Whether referral under the *EPBC Act 2009* is required will be assessed at the time of application for the Clearing Permit, in line with *EPBC referral guidelines for the three threatened species of black cockatoo 2012*.

There are no native habitats suitable for Black Cockatoos with respect to significant feeding or roosting areas in the proposed excavation areas apart from the presence of the pines on Lot 2233.

3.3 Wetlands

The wetlands are discussed in more detail in Attachment 1, Biodiversity and Closure Planning.

There are a number of wetlands on site which were first identified in 1996 for the Wetlands of the Swan Coastal Plain Atlas. The wetlands remain on Department of Water Database.

A total of 6 wetlands are nominated on DOW mapping with two resource enhancement wetlands and four drains and drainage lines across pasture.

The two Resource Enhancement Wetlands were not studied in detail because they lie outside the resource area, but have a perimeter of *Kunzea glabrescens* grading to *Astartea* Thicket with scattered *Melaleuca preissii* and other species.

The two resource enhancement wetlands are well vegetated and are excluded from the proposed excavation.

Buffers of 50 – 150 metres are provided for all wetlands.

There will be no impact on the vegetation, no drainage changes, no excavations below the water table and no changes to recharge that might impact on the wetlands.

None of the wetlands has characteristics of Tumulus Spring Wetland vegetation.

3.4 Weeds and Plant Diseases

Weed and plant disease management plans are proposed and are included in Attachment 1 Biodiversity and Closure Planning.

4.0 SOCIAL ENVIRONMENT

4.1 Planning Issues

As the sand is to be used for construction of the Great Northern Highway re-alignment and not specifically as a sand resource for other projects, some of the planning policies are less applicable. However they all reinforce the need to identify, protect and utilise sand resources prior to sterilisation and are therefore presented as a summary here.

The proposed sand excavation complies with all policies.

4.1.1 State Planning Policies

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.

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.

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.

Some policies do have relevance such as the State Industrial Buffer Policy and Basic Raw Materials Policy.

With respect to the supply of sand, the overarching document is the;

- State Planning Policy 1.0 State Planning Framework.

Complementing this are a number of Relevant State Policies;

- State Planning Policy 2.0, Environment and Natural Resources Policy
- State Planning Policy 2.4, Basic Raw Materials
- State Planning Policy 2.5, Agricultural and Rural Land Use Planning, 2016
- State Planning Policy 4.1, State Industrial Buffer Policy
- State Planning Policy 2.8, Bushland Policy for the Perth Metropolitan Region.

- ***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*, SPP 2.5 Agricultural and Rural Land Use Planning and *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:*
>
> *ii. 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.*
>
> *iii. 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 2.4, Basic Raw Materials, 2000***

SPP 2.4 will, in future updates, be restricted to the Perth Metropolitan and Peel Regions. However the current mapping of Basic Raw Materials extends across this site and therefore the policy has relevance. SPP 2.4 requires that resources be staged and taken prior to sterilisation by other land uses.

The need for sand is also recognised by the Chamber of Commerce and Industry in their comprehensive summary of Basic Raw Materials, (*Managing the Basic Raw materials of the Perth and Outer Metropolitan Region, April 1996*).

SPP 2.4 supports the principle that basic raw materials should be taken before they become sterilised by development. It provides guidelines to local government to recognise the importance of not permitting conflicting land uses to impinge on the operation and enable the resource to be taken in a staged manner.

This policy makes many statements on the intent and actions which local authorities should use to protect and manage basic raw materials.

Section 3.4 is very specific in explaining that basic raw materials need identification and protection because of increased urban expansion and conservation measures, (3.4.1), (3.4.2) and (3.4.4). Sections 3.4.5 and 3.4.6 recognise that environmental and amenity matters need to be considered.

There are specific provisions in Section 6.2 Local Planning Scheme Provisions, such as;

No support for the prohibition of extractive industries in zones that permit broad rural land uses.

Providing an appropriate P, D or A use.

Not precluding the extraction of basic raw materials on land which is not identified as a Priority Resource Location, Key Extraction Area or Extraction Area (6.4.2).

- ***State Planning Policy No 2.5, Agricultural and Rural Land Use Planning***

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.

Basic Raw Materials are included in the definitions as

Sand (including silica sand), clay, hard rock, limestone (including metalurgical 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 drunking 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.

A major aim of the proposal is the removal of sand to lower the soil profile and improve the land capability which, combined with the preservation and use of the sand, complies with and supports the intent of the policy.

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

- ***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 5.1 Surrounding Landuses Buffers of this document.

The proposal complies with the policy.

- ***State Planning Strategy, 1997***

The Western Australian Planning Commission (WAPC) released the *State Planning Strategy in 1997*. It 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 State Planning Strategy contains the following five key principles. These are:

- Environment & resources: to protect and enhance the key natural and cultural assets of the State and to deliver to all Western Australians a high quality of life which is based on sound environmentally sustainable principles.
- Community: to respond to social changes and facilitate the creation of vibrant, accessible, safe and self-reliant communities.
- Economy: to actively assist in the creation of regional wealth, support the development of new industries and encourage economic activity in accordance with sustainable development principles.
- Infrastructure: to facilitate strategic development of regional Western Australia by taking account of the special assets and accommodating the individual requirements of each region.
- Regional Development: to assist the development of regional Western Australia by taking account of the special assets and accommodating the individual requirements of each region.

The proposal complies with the policy by providing a source of sand for the construction of the new alignment of the Great Northern Highway, therefore supporting the strategic planning of infrastructure and supporting regional areas.

4.1.2 Local Government Policies and Planning Schemes

Shire of Chittering Town Planning Scheme.

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

> **4.2.3 Agricultural Resource Zone**
>
> 4.2.3.1 Objectives:
>
> *To preserve productive land suitable for grazing, cropping and intensive horticulture and other compatible productive rural uses in a sustainable manner;*
>
> *To protect the landform and landscape values of the district against despoliation and land degradation;*
>
> *To encourage intensive agriculture and associated tourist facilities, where appropriate;*
>
> *To 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.

Town Planning Scheme 6 has some Special Control Areas for Basic Raw Materials.

Section 5.8.8 Protection of Vegetation and Tree Cover; of the Scheme covers the protection of vegetation. The proposal enhancement of vegetation on site and the planning of offset, by creating a 50 metre buffer to the *Banksia* Woodland and Bush Forever site, in addition to the creation of Tumulus Spring habitat will offset any clearing and provide greatly enhanced habitats and biodiversity which is compatible with Section 5.8.8.

The proposal does not lie within a Landscape Protection Area of the Shire of Chittering Town Planning Scheme.

Shire of Chittering Local Planning Strategy – 2001 - 2015

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

The soils of the agricultural areas are to be retained and enhanced rather than not lost from production (LPS 7.2). The pre-excavation soils on site have low agricultural capability because of the deep leached sand with very low water holding capacity.

The taking of the sand and the lowering of the soils to 0.5 to 1.0 metres from the water table will greatly enhance the agricultural capability for grazing.

In Section 10.3 of the Local Planning Strategy, Basic Raw Materials Extraction Areas, the intent is to protect appropriate buffers to extraction areas. The proposed excavation maintains large buffers to adjoining houses.

Shire of Chittering Local Biodiversity Strategy – 2010

The Shire of Chittering Local Biodiversity Strategy shows the subject land as lying within the Muchea Precinct which is not covered by the Biodiversity Strategy with respect to vegetation protection and improvement.

Even so the amount of clearing proposed is small and will be compensated for by the buffer planting and the protection of the wetlands habitat proposed.

Shire of Chittering Local Law – Extractive Industries

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 all the provisions of the Local Law – Extractive Industries but has modified the buffers to native vegetation slightly to enable a better environmental outcome for the sand excavation.

As discussed previously the taking of the 25 metre buffer to the remnant vegetation to the west and the removal of pasture in the topsoil will allow the establishment of a permanent fence and buffer of local native vegetation and a much improved environmental outcome for the *Banksia* Woodland/Bush Forever Site to the west.

4.1.3 Sequential Land Use

The site forms part of a productive agricultural property and old pine plantation. The end use is a return of the land to grazing. Pasture quality will be improved by removing the sand ridges.

The gas pipeline (Dampier – Bunbury Gas Pipeline) on the eastern edge has an easement. Excavation will be set back the required buffer distances from the easement with the permitted batter slopes installed.

Any crossing of the pipeline easement will be designed to the requirements of the gas pipeline operator.

4.1.4 Social Impacts

There are no nearby dwellings and the proposed excavation will be completed in a limited time frame.

4.1.5 Surrounding Landuses and Buffers

- **Separation to Dwellings**

State Planning Policy No 2.5, Agricultural and Rural Land Use Planning, makes provision for the extraction of basic raw materials as does State Planning Policy 2.4 Basic Raw Materials. Both policies have similar aims although with the revision of SPP 2.5 that policy applies to all land outside the Perth to Peel Region including the subject land.

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.

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.

Generic buffer requirements were developed by the Victorian Government and used by the Environmental Protection Authority as the basis for a Draft guideline on recommended buffer distances. These formed the basis of EPA Guidance Statement Number 3, Separation Distance between Industrial and Sensitive Land Uses, June 2005.

EPA guidance "Separation Distances between Industrial and Sensitive Land Uses", June 2005 lists the generic buffers for sand and limestone pits as 300 - 500 metres depending on the extent of processing. 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. EPA Guidance for the Assessment of Environmental Factors No 3 June 2005 provides for a case by case separation, based on the potential impacts.

EPA Draft Generic Buffer Guidelines 2015, applies buffers of 300 – 500 metres for sand extraction in the absence of site specific studies. The proposed excavation complies with the EPA Guideline.

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.

Sand excavation, which does not include screening or processing, would be at the lower end of the generic buffer. Buffer distances to the closest dwellings are in excess of 500 metres to the south and south east from the eastern resource, which complies with the EPA Generic Buffer Guidelines, therefore all residences comply with the 300 metre generic buffer. The western resource has a buffer in excess of 1 kilometre.

The site is set back 2 kilometres from Brand Highway.

For comparison, the majority of sand quarries across the State and within the Perth Metropolitan Area all have approvals and operate at much closer distances than 300 - 500 metres.

The excavation of sand from the site therefore complies with the generic buffer policies.

In sand excavation the only mobile plant is a loader and road trucks. The examples provided below show that the distances between the active pit and a dwelling on the proposed operation are consistent with operations in other locations.

Excavation will be worked from inside out on the floor of the pit working below natural ground level.

4.2 Land Titles and Easements

A pipeline (Dampier Bunbury Gas Pipeline) runs through the eastern ege of Lot 2238 but impacts only on the eastern edge of the sand excavation.

The gas pipeline has an easement. Excavation will be set back the required buffer distances which is 25 metres from the pipeline with the permitted batter slopes installed at 1 : 4 vertical to horizontal.

Any crossing of the pipeline easement will be designed to the requirements of the gas pipeline operator. The pipeline operator will be consulted prior to excavation commencing.

4.3 Community Consultation

The proposed excavation program and quarry will be circulated to Government Departments and Authorities by the Shire of Chittering.

Extensive research has already been undertaken through the selection and approval of the road alignment.

Main Roads and their consultants have liaised with all levels of Government and all Government Departments, including the Environmental Protection Authority, Department of Water and Department of Parks and Wildlife. The proposal has been designed to fit in and comply with all the published requirements for the highway.

Complaints Procedures

A complaints register is proposed.

Any complaints will be recorded, investigated and, if substantiated, action will be taken as required. The details of all complaints will be contained in a record keeping facility at WA Limestone Head office.

A complaints book that lists the items below will be used. The book will be available to officers from the Shire of Chittering or other Government Departments.

- The complaint,
- Nature of the complaint, time and date,
- Source of the complaint,
- Investigations of the complaint,
- Results of the investigation,
- If the complaint is valid, any mitigation actions that result,
- Any communication with the complainant.

4.4 Heritage

The database of the Sites Department of the Department of Aboriginal Affairs has no record of any aboriginal sites on the subject land. The database does show that the location has been the subject of a heritage survey

The site has been cleared, grazed, planted to pines and farmed. Therefore disturbance of the soils has been a regular occurrence over much of the land.

Should any evidence of early aboriginal occupation be uncovered, development will be stopped pending an assessment by a recognised consultant.

If the site is confirmed as a site under the provisions of *Section 15 of the Aboriginal Heritage Act 1972-1980* and Amendments operations will cease pending relevant negotiations.

4.5 Compliance and other Legislation

A number of local and state government authorities are responsible for overseeing the safety and environmental management of quarries in the area. These include;

Shire of Chittering

- Provides Planning approval under Town Planning Scheme 6.
- Issues 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 prevent bush fires.
- Issues approvals for transport vehicle owners to apply to MRWA (Main Roads) for permits to utilise oversize vehicles on specific roads.
- The subject land is zoned Agricultural Resource.

Department of Mines and Petroleum

- Supervises the safety and methods of excavation and covers the health and safety of the workers through the *Mines Safety and Inspection Act 1994 and Regulations 1995.*
- Currently undertaking a survey of the sand resources in the Perth Metropolitan Area and nearby for updated Basic Raw Material Mapping and future planning.
- A Project Management Plan will be required and approved under the Department of Mines and Petroleum SRS System.

Department of Environment Regulation

- Issues Licences for processing if required. (No screening of sand is envisiaged at this stage. In this case a DER Licence is unlikely to be required.
- Oversees the *Environmental Protection (Noise) Regulations 1997*.

- Issues Clearing Permits.

Department of Parks and Wildlife

- Overseas flora and fauna issues.
    - Has responsibility for the *Banksia* Woodland adjoining to the west which is listed as a Priority Ecological Community

Department of Water

- Has input into the use and maintenance of groundwater through guidelines and Licences.
    - Issues Water Licences. No water licence is anticipated to be required.
    - Produced the Department of Water South West Region Guideline for Extractive Industries which will be used for the final agricultural land surface and the pasture improvement program.

Main Roads

- Has input into the use of highways and issues extra mass permits for road transport vehicles.
- Responsible for the planning and construction of the new alignment for the Perth to Darwin Highway

Department of Aboriginal Affairs

- Maintains records of aboriginal sites and administers the *WA Aboriginal Heritage Act 1972.*

Western Australian Planning Commission

- Responsible for the Metropolitan Region Scheme area to the south.
- Responsible for long term regional planning
- Responsible for State Planning Policy 2.4, Basic Raw Materials Strategy and State Planning Policy 2.5, Agricultural and Rural Land Use Planning.

Department of Planning

- Responsible in conjunction with the Western Australian Planning Commission for Planning Policies such as *Directions 2031 (2010,) Draft Industrial Land Strategy Perth and Peel (2009) and Perth and Peel @3.5 Million (2015)*

Commonwealth Department of Environment and Energy

- The *Banksi*a Woodland adjoining to the west is listed as Threatened Ecological Community but will not be impacted by the proposed development.

- The proposal has been assessed for potential Black Cockatoo habitat as the Black Cockatoos are listed as a Threatened species under the EPBC 1999 Legislation.

5.0 MINING OPERATIONS

5.1 Project Summary

ASPECT	DISTURBANCE
Resource sought	Bassendean sand
Area of excavation	Approximately 44 hectares (Eastern resource, 43 hectares 1 - 3 metres deep) (Western resource, 41 hectares 1 – 15 metres deep.
Processing Infrastructure. Product stockpiles, laydown and related areas	Included in the excavated area.
Excavation	Rubber tyred loader/s Off-road haul trucks, scrapers or road trucks for transport to the new Great Northern Highway alignment. 20 tonne water truck or similar for dust suppression. Self contained maintenance and refueling vehicles to attend site as required.
Processing	A mobile screening plant may be required.
Roads, dams and related infrastructure etc	0.5 hectares additional access road to Great Northern Highway alignment.
Facilities	May require locked seatainer. Portable serviced toilet system.
Water management	Approximately 5 000 kL per year for dust suppression on the access road and pit floor as required, depending on the season.
Dewatering requirements	Nil
Total area of plant and stock	Located on the hard stand to the north. No changes.
Area of settling ponds	Not required
Wastes and tailings	There is no waste material. The only materials remaining on site will be subgrade sand and topsoil.
Fuel storage	Not proposed with fuel brought to site in mobile tanker as required.
Truck movements	Variable but approximately 4 laden trucks leaving site per hour on average, with some days having more transport and other days less. For supply to the Great Northern Highway upgrade the hourly number will rise to 10 – 20 per hour. Transport is to be directly to the Brand Highway along Byrne Road and then to the alignment of the Great Northern Highway. Any sand remaining after construction of the highway will be transported along an approved access road to a defined and approved intersection on the highway.
Life of project	10 years for Great Northern Highway and a contingency of 10 years to remove additional sand that was not required for the highway
Hours of operation	Hours of operation will be 6.00 am to 5.00 pm Monday to Saturday inclusive, excluding public holidays.

5.2 Extraction and Processing of the Resource

5.2.1 Excavation

The sand is to be used for the nearby Great Northern Highway alignment. Transport will be to the alignment along Byrne Road and then along the alignment. This will negate the need for sand to be carted along public roads.

If not all sand is used for the construction of the Great Northern Highway then transport will be along the normal access road to Lots 2233 and 2238 and then to the closest interchange.

Therefore environmental issues including dust, noise and traffic are not anticipated to be significant in their risk or impact and can be managed in such a way to minimise or eliminate any potential impact on the local community. As the extraction will be linked to the construction of the Highway all management will fall under the umbrella of Main Roads and the construction team.

Exposure of the resource

1. Prior to opening new ground an Environmental Protection Clearing Permit will be required.

2. The eastern resource is covered by *Xanthorrhoea preissii* regrowth that will have to be cleared.

3. The western resource has a private pine plantation in poor condition that will have to be removed. Firstly any useable timber will be recovered and taken from site. The pine trash will be pushed into windrows for burning to remove the potential for the European House Borer to utilise the trash. The shrubs and native vegetation will pushed with the pine trash.

4. Topsoil will be pushed to low perimeter bunds and stored for use in areas being rehabilitated. Where possible direct transfer will be used.

5. Overburden, if found, will then be removed and also stored in dumps for future use in rehabilitation. There is anticipated to be little or no overburden.

6. A loader or scraper will be used to remove any pasture and topsoil cover by pushing it into windrows, for use on the batters to minimise soil erosion and spreading on the final land surface as part of the final rehabilitation.

Extraction

Excavation will be carried out as a sequence.

1. Overburden – interburden, or subgrade sand and ferricreted material, will be removed by pushing to the perimeter of the proposed pit to form perimeter bunding to the pit. Subgrade ferricreted material will be used for rehabilitation or if suitable for road construction will be used for that purpose.

2. Sand will be excavated by loader.

3. Sand is to be excavated to 0.5 to 1.0 metres above the highest known water table as measured in water monitoring bores and piezometres during excavation.

4. The depth of excavation will be gently sloping, mirroring the water table, rising from around 60 metres AHD in the east to around 63 metres AHD in the west, but determined to be 0.5 to 1.0 metres above the winter water table based on piezomenter data during excavation. The floor will be flat to gently sloping at 1 : 5 to 1 : 10 vertical to horizontal to enable a productive agricultural end land use.

5. The batter slope to the vegetation to the west will be 1 : 4 to 1 : 6 vertical to horizontal. As this slope will form part of the native vegetation buffer to be established the slope can be 1 : 4 which will be stable and suitable for native vegetation.

6. The slopes of the buffer to the Gas Pipeline will be compliant to the requirements of the pipeline; that is slopes no steeper than 1 : 4 vertical to horizontal with a buffer to the pipeline of 25 metres. The pipleine operator will be consulted prior to comencement.

7. Water is unlikely to be used for dust suppression apart from the watering of internal access roads to enable road trucks to access the resource to be loaded. See the attached Offsite Risks Management Plan for dust management.

Details of the Rehabilitation are listed under 9.0 Mine Closure.

5.2.2 Pit Design and Staging

The volume and rate of excavation is determined by Main Roads requirements for the timing and formation of the highway.

It is expected that excavation will take up to 6 plus months to be completed as contracts for the Perth to Darwin Highway, with any sand not used retained for future contracts over an estimated 10 year period.

5.2.3 Final Contours

The end land surface will be in accordance with the safety considerations of the *Mines Safety and Inspection Act 1995* and the requirements and guidelines of the Department of Mines and Petroleum; for example *Guidelines on Safety Bund Walls Around Abandoned Open Pits 1991.*

The depth of excavation will be 1 to 5 metres. The floor will be flat to gently sloping at 1 : 5 to 1 : 10 vertical to horizontal to enable a productive agricultural end land use.

The floor of the pit will be lowered to 0.5 to 1.0 metres above the highest water table to enable better soil moisture in summer and better pasture growth for continued agricultural production. The separation distances are in line with Department of Water South West Region Guideline for Extractive Industries, which is more applicable as the end use will be to agricultural activities and pasture.

Dropping the separation of the land surface to the 0.5 to 1.0 metres above the highest known water table will not compromise a future developed land use because the pasture improvement is an integral part of this proposal.

The Dampier – Bunbury Gas Pipeline has an easement. Excavation will be set back the required buffer distances from the easement with the permitted batter slopes installed.

Any crossing of the pipeline easement will be designed to the requirements of the gas pipeline operator.

The end use is grazing.

Measurements of the water table will be completed using the on site water monitoring bores and additional piezometres installed in the floor during excavation, comparisons to the measurements collected in September 2016 and the geomorphology. The low lying non sand ridge areas are already generally at 0.5 to 1.0 metres above the winter water table and the excavated areas will be compatible with those elevations.

The existing lower lying areas are in part classified as wetlands by Department of Water Mapping. These are almost totally cleared to pasture and have no wetland species on them and no native vegetation.

The final land surface will be brought into line with those nominated wetlands which will not be impacted but will end up being enlarged.

Dropping the separation of the land surface to the 0.5 to 1.0 metres above the highest known water table means that is the elevation will be between 62.0 to 63.0 metres AHD on the eastern resource rising to 62.5 – 63.0 metres AHD in the west. See the Existing Contour Plan.

Measurements of the water table will be completed using small pits and/or piezometres installed in the floor during excavation.

Concept final batter slopes and a contour plan are attached. See the contour plans and sections.

5.2.4 Processing of the Resource

No processing of the sand is proposed. If screening was proposed the screens would be located on the floor of the pit, with distances of at least 500 metres from an external dwelling, behind the face of the pit.

If screening is used a Licence from the Department of Environment Regulation would be required and sought.

5.2.5 Stockpiles

Stockpiles of products will be retained on the floor of the pit to reduce visual impact.

If sand is to be screened relatively small stockpiles of 20 – 50 000 tonnes are proposed.

5.3 Hours of Operation

Hours of operation will be determined by the requirements of Main Roads and the time table for the construction of the highway. Times are likely to be 6.00 am to 5.00 pm Monday to Saturday inclusive, excluding public holidays, depending on the time of the year when construction takes place.

There will be no impacts on the local community from extraction and transport as the sand will be transported directly to the new Highway alignment.

5.4 Machinery and Equipment

The operation will use modern equipment that is regularly serviced.

The following equipment is likely to be used. Depending on Main Roads requirements multiples of the vehicles are likely to operate as is typical for large roads projects.

Site office/lunchroom	• A portable site office/lunchroom may be maintained on site for the management and security of small items.
Toilet system	• An approved serviced portable toilet system will be

	provided.
Storage sheds	• At this stage a storage shed is not proposed.
Fenced compound	• A fenced security compound may be required, and if so, is likely to be combined with the proposed site office.
Bulldozer	• Not required for sand excavation but may be required for specific earthworks.
Water tanker	• A 10 000 L water truck or similar may be required for dust suppression on the access road and working floors as required.
Excavator	• An excavator may to be used from time to time to mainly excavate sand from deeper holes.
Loader	• A loader (Cat 980 or similar) is to be used for the movement and excavation of sand, loading road trucks and (if required) feeding a screening plant. • At times there are likely to be two or more loaders on site depending on Main Roads requirements.
Excavator	• Not normally required but may be used for specialty work such as specific excavation of drains, trenches or other locations that are difficult to access.
Transport	• Depending on the destination, efficiencies and Main Roads requirements, the sand may be taken from site to the Highway Alignment in road truck and trailer combinations. It is possible for very short runs that scrapers or haul trucks are used.
Weighbridge	• A weighbridge is not proposed.
Mobile screening plant	• Mobile crushing plant may be used for screening sand, (licensed by DER Category 70 for 5 000 – 50 000 tonnes per year and category 12 for > 50 000 tonnes per year as applicable). • A sreening plant is likely to be electric and combined with a Genset generator. • Located on the floor of the pit 500 metres from dwellings.
Fuel Storage	• All vehicles will be refuelled from mobile tankers.

All static and operational equipment will work on the quarry floor to provide maximum sound and visual screening where possible.

5.5 Access and Transport

The quarry will be accessed from the Brand Highway, along Byrne Road and an internal haul road to the pits.

The site lies on fenced private land well back from Brand Highway. Fences will be maintained as part of normal farm practice.

Warning signs are to be maintained as required by the Department of Mines and Petroleum and Shire of Chittering, Main Roads and project management.

The number of trucks will be determined by Main Road requirements.

5.6 Workforce

The workforce will vary, depending on the level of operation, but usually 4 – 10 persons can be expected to be working on site at any one time.

5.7 Water Use

Water will mainly be used for dust suppression although this is only anticipated to be required on the internal access roads during dry summer months.

Potable water will be brought to the site as needed.

6.0 GEOTECHNICAL FACTORS

Geotechnical Design Implications

The sand is at shallow depth with minimal overburden. Extraction will commence on natural ground level and excavate down to the final floor several metres deep and then move west.

The working procedures proposed comply with normal operational procedures for small Open Pit Mines as required and described by the *Department of Mines and Petroleum Guidelines, Mines Safety and Inspection Act 1994 and Regulations 1995* and Read and Stacey 2009.

Inspectors from DMP are responsible for overseeing the Health and Safety of the operations and they will normally inspect quarries such as this from time to time.

The operator on site is nominated as the Local Site Manager.

Even though vertical faces will be produced during excavation, as far as quarries go, the structural integrity and small bench elevation to be used will minimise any risk of slope failure, unless an area was undercut which is not how the sand is extracted.

The only design implications are for the loader to approach the face and excavate in a manner (perpendicular, in – out) that does not compromise the stability of the sand. The sand will slump at the angle of natural repose and can be excavated in a safe manner, as used in all sand quarries.

Final Surface

The end use will, however, be a gently sloping floor with rehabilitated sloping sides in compliance with the safety considerations of *the Mines Safety and Inspection Act 1995* and the requirements and guidelines of the Department of Mines and Petroleum; for example *Guidelines on Safety Bund Walls Around Abandoned Open Pits 1991.*

7.0 SAFETY

All quarries operate under the provisions of the *Mines Safety and Inspection Act 1994 and Regulations 1995.* These are administered by the Department of Mines and Petroleum.

The regulation is achieved through the DMP Safety Regulations and Reporting Systems (SRS).

All quarries on commencement are required to register with the SRS system. As part of the registration a Project Management Plan is required to be produced and lodged online after all planning approvals are in place and prior to commencement.

The Project Management Plan will use some material from this Management Plan and concentrate on the onsite operations as they relate to health and safety.

Officers from the Safety Division of the DMP will regularly inspect the operations in relation to health and safety.

The site will operate to the *Mines Safety and Inspection Act 1994 and Regulations 1995,* which are administered by the Department of Mines and Petroleum. Inspectors visit the site regularly.

The proponent is committed to maintaining a safe working environment.

The site lies on fenced rural land installed with locked gates set back from public roads.

Warning signs are to be installed as necessary to the Department of Mines and Petroleum and Main Roads – Project Manager specification.

Completed faces will be left in a safe manner to the requirements of Department of Mines and Petroleum for the abandonment of small quarries.

Project Management Plans are used to cover operational procedures which include workforce induction and training to ensure that all employees involved in sand extraction are made aware of the environmental and safety implications associated with all stages of the mining activities.

Where applicable Safe Operating Procedure Sheets are in place and made available for hazards. Workers and staff will be 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.

The site is within mobile phone range.

Fire Management

The excavation area lies on rural land and will form part of the fire management of that land.

The bare areas of pit will form a natural firebreak with no fuel load.

The excavation will not introduce any additional fire risk because all plant will operate on the bare ground with sufficient distance to natural vegetation.

The provision of an access road and the availability of additional water will provide improved fire management. Water available on site can be used for fire fighting.

The safety of workers is managed through a Safety Management Plan developed through the *Mines Safety and Inspection Act 1994 and Regulations 1995.*

There are a number of management actions that can be taken in quarries to minimise fire risk and these will be used wherever possible. The general management actions are summarised below together with the potential issues that relate to this site. The actions will be used where applicable and as the opportunity presents to minimise fire risk.

These fire management actions are tied in with the normal fire management that occurs on the rural property.

- Restrict vehicles to operational area, particularly on high fire risk days
- Use diesel powered vehicles
- Maintain perimeter fire breaks as required
- Ensure fire risk is addressed and maintained through the site Safety Management Procedures
- Provide an emergency muster area, communications and worker induction and training
- Establish on site water supplies for potential use in extinguishing fire
- Secure the site from unauthorised access
- Public access will not be permitted.
- Stop work and prevent the movement of vehicles on days deemed to be high – extreme fire risk days, in line with normal farm practice.
- Establish on site water supplies for potential use in extinguishing fire
- If on site, the loader and other mobile plant can be used to assist with emergency fire breaks.

8.0 ENVIRONMENTAL IMPACTS AND MANAGEMENT

An Environmental Risk Management is included in the Summary. That Risk Management identified the main risks as being, Dust, Noise and Water.

- Vegetation, Biodiversity and Closure are considered in Attachment 1
- Visual, Dust and Noise are considered in a separate Offsite Impacts Management Plan in Attachment 3.
- Water management is considered in Attachment 2, Water Management Plan.
- Closure and Rehabilitation is considered in Attachment 1, Vegetation, Biodiversity and Closure.
- Dieback and Weed Management Plans are included in Attachment 1, Vegetation, Biodiversity and Closure.

A summary of each environmental management is considered here. See the Attachments for more details.

8.1 Biodiversity Management

See Attachment 1 Biodiversity Management and Closure Plan for details.

Flora Management

- **Eastern Sand Resource**

The eastern low dune is largely pasture with a monoculture of *Xanthorrhoea preissii* (Grass Trees) and regrowth around the lower elevations of the dunes.

There are occasional to isolated *Eucalyptus todtiana, Corymbia calophylla*, and *Jacksonia*.

Damp areas off the sand ridge are identified by green pasture and *Melaleuca preissiana* and Eucalyptus *rudis* (flooded Gum).

A well vegetated wetland lies to the west, between the two sand resources that is excluded from the excavations. See the attached Biodiversity and Closure Plan.

Vegetation Condition is predominantly Completely Degraded to Degraded.

- **Western Sand Resource**

The western dune is high with a relatively steep eastern form.

The dune is planted to Pinaster Pines of some 20 – 40 years age and with no apparent usefulness as timber.

The understory and ground cover was cleared to plant the pines and there has been some regeneration under the sparse pines.

A flora and vegetation study was completed and showed 33 species of the original *Banksia* Woodland species. There were no Threatened or Priority species.

33 species is low for *Banksia* Woodland and probably represents around 10 – 20 % of the original vegetation community. Species richness is 4.8 species /10m^2 and plant density is 1.26 plants /m^2 both of which is very low. See the attached Biodiversity and Closure Plan.

Vegetation Condition is predominantly Degraded to Good.

- No significant native plant communities or species were observed
- The excavation is designed to protect most of the remnant native vegetation on site associated with the wetlands.
- To offset the removal of the native vegetation a 25 metre wide buffer of local native species, predominantly trees and shrubs is to be provided along the western boundary as a set back and butffer to the *Banksia* Woodland remaining at that location.
- In addition the two wetlands between the proposed excavation will be protected.
- Weed and Dieback Management Plans are proposed.

See Attachment 1 Biodiversity Management and Closure Plan and the attached Figures.

Fauna Management

There will be minimal clearing of the perimeter vegetation, which will largely be retained as corridors linking to the buffer and then *Banksia* Woodland to the west.

With the planting of the 25 metre western buffer of native vegetation, and retention of corridors, there will be an increase in habitat in an area which has experienced significant clearing.

The 25 metre buffer will support the intent of the Commonwealth Conservation Advice for the Threatened Ecological Community Listing for *Banksia* Woodland and the State Government listing as a Priority Ecological Community.

Wetlands Management

There are a number of wetlands on site which were first identified in 1996 for the Wetlands of the Swan Coastal Plain Atlas. The wetlands remain on Department of Water Database but have been combined into a patch of Resource Enhancement wetlands in the west and Multiple Enhancement Wetlands in the east. See Figure 4.

Wetlands on or near the proposed excavation are sumplands, meaning that they are seasonally inundated according to the mapping.

The actual ground conditions may not now be applicable due to changes to land use and water regime over the past 20 years.

In reality there are two wetland areas with the remainder being drainage lines across pasture. The two Resource Enhancement Wetlands were not studied in detail because they lie outside the resource area, but have a perimeter of *Kunzea glabrescens* grading to *Astartea* Thicket with scattered *Melaleuca preissii* and other species.

Category	Explanation	DOW - General Description
C	Conservation	Wetlands which support high levels of attributes and functions
R	Resource Enhancement	Wetlands which have been partially modified, but still support substantial functions and attributes
M	Multiple Use Wetland	Wetlands wirth few attributes remaining which still provide important wetland functions

Wetland	ID Number	Category	Area	Comments	Management
Dr 28	39951650783	R	39.4 ha	Low lying pasture with minor scattered shrubs of native vegetation to the north of the sand resources and outside the proposed excavation. Buffer of 100 metres to the eastern excavation.	Excluded from the excavation. Buffers of 50 to 150 metres to the wetland vegetation will be provided. There will be no impact on the vegetation, no drainage changes, no excavations below the water table and no changes to recharge that might impact on the wetlands.
626			Drainage line	A surface drainage line that lies inside native vegetation that grades to wetland vegetation, between the northern ends of the two resource areas. Setback will be > 50 metres from the drainage.	
623			Drainage line	A surface drainage line that lies inside Sr 34. Surrounded by native wetland vegetation. Setback will be > 50 metres from the drainage.	
686			Drainage line	Pasture - devoid of native vegetation. A drain that lies 100 metres north from the eastern resource and drains east to Ellen Brook.	
696			Drainage line	Pasture - devoid of native vegetation. A drain that commences from the end of Sr 34, some 150 metres south east from the eastern resource and drains east to Ellen Brook.	
Sr 34	39993650669	R	16.2 ha	Well vegetatied with wetland species. Lies between the two resource areas and is excluded from excavation. Setback will be 50 metres from the wetland species.	

The management of the wetlands is summarised below. For additional information on the management proposed, see Attachment 2 Water Management Plan

Wetlands

- The final land surface will be 0.5 to 1.0 metres above the winter water table. That is 0.5 – 1.0 metes above the elevation of the wetlands.

- Groundwater flow is west to east below the proposed floor of the excavations and that flow will be maintained.

- Calculations of recharge and groundwater movements show that the groundwater flows will not be significantly impacted by the proposed excavation and the hydraulic regime of the wetlands will be maintained. See the Water Management Plan in Attachment 2.

- There will be no changes to the water table or recharge levels.

- The wetlands will not be significantly impacted but will have a 50 to 150 metre setback to the edge of the wetlands.

Tumulus Springs

- There are no Tumulus springs on site or nearby, being some 1.5 km to the south west and down groundwater gradient. (Perth to Peel Green Growth Plan. See also *DEC 2006, Assemblages of Organic Mound (Tumulus) Springs of the Swan Coastal Plain – Interim Recovery Plan.*

8.2 Water Management

A separate Water Management Plan is attached as Attachment 2

The protection of water whether groundwater or surface water is an important part of the management of quarries. Different types of quarries have different potential impacts which are listed below in general terms. Not all potential impacts will apply to this quarry and the main impacts affecting this site are also listed.

Guidance on the quality of water can be found in;

- *Western Australian Water Quality Guidelines for Fresh and Marine Waters, EPA Bulletin 711, 1993.*
- *ANZECC, 1992, Australian Water Quality Guidelines for Fresh and Marine Waters.*

A number of documents provide guidance on the management and disposal of surface water that can lead to waterways, wetlands and underground water systems. These mainly apply to urban development but the methods are also applicable to the quarrying industry.

- *Engineers Australia 2003, Australian Runoff Quality, National Committee on Water Engineering.*
- *Stormwater Management Manual for Western Australia, Department of Environment WA, 2004.*
- *Guidelines for Groundwater Protection in Australia, ARMCANZ, ANZECC, September 1995.*
- *Environmental Protection Authority Victoria/Melbourne Water, undated, Urban Stormwater, Best Practice Environmental Management Guidelines*
- *Water and Rivers Commission, 1998, Manual for Managing Urban Stormwater Quality in Western Australia.*
- *Department of Water, 2014, South West Region Guidelines, Water resource considerations for extractive industries.*

Documents specific to the mining and quarrying operations are the DOW – DMP Water Quality Protection Guidelines for Mining and Mineral Processing.

- *Overview*
- *Minestite water quality monitoring*
- *Minesite stormwater*
- *Mechanical servicing and workshop facilities*
- *Above-ground fuel and chemical storage*
- *Mine dewatering*

The Department of Water, 2014, South West Region Guidelines, Water resource considerations for extractive industries is a lead document with respect to the excavation and restoration of the pasture on the subject land.

The important thing for pasture is the retention of the pasture at an elevation of 0.5 metres to the winter water table. This enables the sand to stay moist and produce superior pasture without significant nutrient input.

Currently, with the high sand ridges, the pasture growth is poor to non existent on the sand ridges as can be seen in the attached aerial photograph where the white sand shows through as the areas delineated for excavation. Notice that it is only those areas of poor pasture that are proposed to be excavated.

The land is cattle grazing land and will continue to be used for that purpose. Hence the Department of Water South West Guideline is the most appropriate guideline even though it was written for the area further south; appropriate by way of preparing the land for productive pasture and agriculture.

The proposed drainage will not alter the groundwater entering Lot 2233 or the amount of recharge from rainfall that occurs on site, leaving the quantities of water available for irrigation through summer.

On excavation the pasture will be lowered and the land will become much more productive, nearly matching the elevation of the nominated wetlands.

The extraction of sand is a chemically free operation with the only liquids used being lubricants for machinery. Extractive Industries are one of the few industries permitted to operate in Groundwater Source Protection Areas with a separation of 2 – 3 metres to the highest known water table. In this case the land surface will be lowered in compliance with the Department of Water South Western Guideline.

Apart from lubricants, excavation methods are very clean with no chemicals being used. The same methods are to be used that have not resulted in any adverse spills or impacts on other quarries.

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 major servicing of vehicles will continue to be conducted off site. Wastes generated on site will be collected and removed off site regularly to an approved landfill site. Regular inspections (at least weekly) will be conducted to ensure no wastes, litter and the like are present in or around the excavation area.

Vehicle and plant washdown will not be required.

See the Water Management Plan at Attachment 2.

8.3 Offsite Impacts, Dust and Noise Management

Visual Management, Dust and Noise Management are identified as potentially being a low risk that requires management.

Buffer distances to the closest dwellings are in excess of 500 metres to the south and south east which complies with the EPA Generic Buffer Guidelines.

The risks and management are described in the Offsite Impacts Management Plan attached as Attachment 3.

The distances, methods of excavation, nature of the sand resource and design of the operations will minimise offsite impacts and prevent those impacts on the nearby dwelling.

The setbacks and separation distances comply with the EPA Generic Buffer Guidelines.

9.0 MINE CLOSURE and REHABILITATION

Full Explanations of the proposed closure and rehabilitation are included in the Biodiversity Management and Closure Plan included as Attachment 1.

9.1 Land Use Policies

The relevant State and Local land use policies can be summarised from the Shire of Chittering Town Planning Scheme – Agricultural Resource Zone.

4.2.3 Agricultural Resource Zone

4.2.3.1 Objectives:

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

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

To encourage intensive agriculture and associated tourist facilities, where appropriate;

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

The proposed excavation complies with the Shire of Chittering Town Planning Scheme,

- Pasture will be improved
- There will be minimal vegetation to be cleared.
- Additional native vegetation will be provided
- The sand resource will be able to be taken reducing community impacts.
- The use of the sand will minimise impacts on the community by making sand available close to the development, minimizing cost and environmental impacts.

The operations and the proposed closure are designed to comply with the relevant policies of both the Shire of Chittering and Government Departments.

The Shire of Chittering Local Law – Extractive Industries 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 all the provisions of the Local Law – Extractive Industries but has modified the buffers to native vegetation slightly to enable a better environmental outcome for the sand excavation.

As discussed previously the taking of the 25 metre buffer to the remnant vegetation to the west and the removal of pasture in the top soil will allow the establishment of a permanent fence and buffer of local native vegetation and a much improved environmental outcome for the *Banksia* Woodland/Bush Forever Site to the west.

9.2 End Use

The floor of the pit will be lowered to 0.5 to 1.0 metres above the highest known water table to enable better soil moisture in summer and better pasture growth for continued agricultural production. This is in line with *Department of Water South West Region Guideline for Extractive Industries,* which is more applicable as the end use will be to agricultural activities and pasture.

The sand resource and natural soils are leached white sand over brown or yellow sand across most of the excavation footprint. The more leached sand will be removed from the sand ridges, increasing the capability of the rehabilitated soils to retain moisture and phosphorus.

The end use will be improved grazing pasture and grazing land with significantly improved soil moisture and capability to hold nutrients and water.

The proposed drainage will not alter the groundwater entering Lot 2233 or the amount of recharge from rainfall that occurs on site, leaving the quantities of water available for irrigation through summer.

Measurements of the water table will be completed using the on site water sumps and piezometres installed in the floor during excavation.

Concept final batter slopes and a contour plan are attached.

The final land surface will be brought into line with those nominated wetlands which will not be impacted but will end up being enlarged.

Final Contours

The end land surface will be in accordance with the safety considerations of the *Mines Safety and Inspection Act 1995* and the requirements and guidelines of the Department of Mines and Petroleum; for example *Guidelines on Safety Bund Walls Around Abandoned Open Pits 1991.*

The depth of excavation will be 1 to 5 metres. The floor will be flat to gently sloping at 1 : 5 to 1 : 10 vertical to horizontal to enable a productive agricultural end land use.

The floor of the pit will be lowered to 0.5 to 1.0 metres above the highest water table consistent with *Department of Water South West Region Guideline for Extractive Industries*.

9.3 Rehabilitation Objectives, Commitments and Management

- The extraction of sand is seen as an interim use prior to reconstruction to agricultural land use.
- The extraction of sand is predominantly for the Great Northern Highway re-alignment and to provide improved soil capability on the grazing land. Some sand may be available for other projects.
- The site is to be reformed to pasture with additional planting of local native vegetation as illustrated in the figures.
- Rehabilitation will contain Dieback and Weed Management in addition to monitoring and replanting failed areas.

- Appropriate topsoil management is seen to be an important element in achieving successful rehabilitation and pasture re-establishment on the restored surface.

- Rehabilitation will progressively follow mining, with completed areas of the excavation being revegetated as soon as practicable.

- Two springs east from the proposed excavation area will be planted to Tumulus Springs vegetation.

- Rehabilitation is to take place during the first winter months to minimise compaction effects.

- To offset the removal of a small portion of the native vegetation a 25 metre wide buffer of local native species, predominantly trees and shrubs is to be provided along the western boundary as a set back and buffer to the *Banksia* Woodland remaining at that location.

- Corridors of native vegetation will be retained.

See the Biodiversity Management and Closure Plan for full details of rehabilitation which is included as Attachment 1.

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399,500mE 400,000mE 400,500mE 401,000mE 401,500mE 402,000mE

6,508,500mN 6,508,000mN 6,507,500mN 6,507,000mN 6,506,500mN

GAS PIPELINE EASEMENT

Byrne Road

Lot 2233

Lot 2364

Lot 816

Brand Highway

Lot 2238

GAS PIPELINE EASEMENT

Lot 2125

Lot 815

Energy Place

Legend

- Development Boundary
- GasPipeEasement
- Excavation Areas

Figure 5

Aerial Photograph

Lots 2233 & 2238
Energy Place, Muchea
PLAN PRODUCED: 25/10/2016
COORDINATE SYSTEM: GDA 1994 MGA Zone 50
IMAGERY SOURCE: Nearmap (April 2016)

W.A. LIMESTONE

NORTH

0 25 50 100 150 200 250 m

Scale at A3: 1:8,000

399,500mE 400,000mE 400,500mE 401,000mE 401,500mE 402,000mE

6,508,500mN 6,508,000mN 6,507,500mN 6,507,000mN 6,506,500mN

95 Sc
77 Sn
752
GAS PIPELINE EASEMENT
MULTIPLE USE
XpR
75 Sc
KgT
Br
Lot 2233
Lot 2364
96 Sc
Drain cut through sand ridge
73 Sc
686
PP
WtT
80 Sr
Lot 2238
GAS PIPELINE EASEMENT
RESOURCE ENHANCEMENT
Lot 2125
Lot 815
76 Sc
751
34 Sr
696
Bussell Highway

MULTIPLE USE

VEGETATION COMMUNITIES AND CONDITION

PP	Pine Plantation in Degraded condition over Completely Degraded to Degraded Understorey with patches of Good understorey
KgT	*Kunzea glabresens* Regrowth Thicket in generally Degraded Condition with some associated species
XpR	*Xanthorrhoea preissii* Regrowth monoculture in Completely Degraded Condition with some minor patches in Degraded Condition.
WtT	Wetland Ticket with typical wetland species such as *Melaleuca preissiana* and associated wetland species.

34 Sr Wetlands from DOW database

696

WETLANDS IDENTIFIED ON DEPARTMENT OF WATER DATABASE

Legend

- Development Boundary
- GasPipeEasement
- Excavation Areas

Figure 6

Aerial Photograph

Lots 2233 & 2238
Energy Place, Muchea
PLAN PRODUCED: 25/10/2016
COORDINATE SYSTEM: GDA 1994 MGA Zone 50
IMAGERY SOURCE: Nearmap (April 2016)

W.A. LIMESTONE

NORTH

0 25 50 100 150 200 250 m

Scale at A3: 1:8,000

399,500mE 400,000mE 400,500mE 401,000mE 401,500mE 402,000mE

6,508,500mN 6,508,000mN 6,507,500mN 6,507,000mN 6,506,500mN

GAS PIPELINE EASEMENT

Byrne Road

Lot 2233

Lot 2364

Lot 816

Brand Highway

GAS PIPELINE EASEMENT

Lot 2125

Lot 815

Energy Place

CONCEPT FINAL REHABILITATION

PROPOSED REHABILITATION

Improved pasture

25 metre wide vegetation buffer

Legend

- Development Boundary
- GasPipeEasement
- Excavation Areas

Figure 7

Aerial Photograph

Lots 2233 & 2238
Energy Place, Muchea
PLAN PRODUCED: 25/10/2016
COORDINATE SYSTEM: GDA 1994 MGA Zone 50
IMAGERY SOURCE: Nearmap (April 2016)

W.A. LIMESTONE

NORTH

0 25 50 100 150 200 250 m

Scale at A3: 1:8,000

399,500mE 400,000mE 400,500mE 401,000mE 401,500mE 402,000mE

6,508,500mN 6,508,000mN 6,507,500mN 6,507,000mN 6,506,500mN

GAS PIPELINE EASEMENT

Byrne Road

Brand Highway

Energy Place

Lot 2233

Lot 2238

Lot 2364

Lot 816

Lot 2125

Lot 815

GAS PIPELINE EASEMENT

Legend

- Development Boundary
- GasPipeEasement
- Groundwater Contours
- Excavation Areas

Figure 8A

Existing Levels

Lots 2233 & 2238
Energy Place, Muchea
PLAN PRODUCED: 25/10/2016
COORDINATE SYSTEM: GDA 1994 MGA Zone 50

W.A. LIMESTONE

NORTH

0 25 50 100 150 200 250 m

Scale at A3: 1:8,000

399,500mE 400,000mE 400,500mE 401,000mE 401,500mE 402,000mE

6,508,500mN 6,508,000mN 6,507,500mN 6,507,000mN 6,506,500mN

GAS PIPELINE EASEMENT

Byrne Road

Brand Highway

Energy Place

Lot 2233

Lot 2364

Lot 816

Lot 2125

Lot 815

Floor Elevation
to be determined
by piezometer during
excavation at 0.5 - 1.0
m above highest winter
water table

Floor Elevation
to be determined
by piezometer during
excavation at 0.5 - 1.0
m above highest winter
water table

GAS PIPELINE EASEMENT

CONCEPT FINAL CONTOUR PLAN

Legend

- Development Boundary
- GasPipeEasement
- Groundwater Contours
- Excavation Areas

Figure 8B

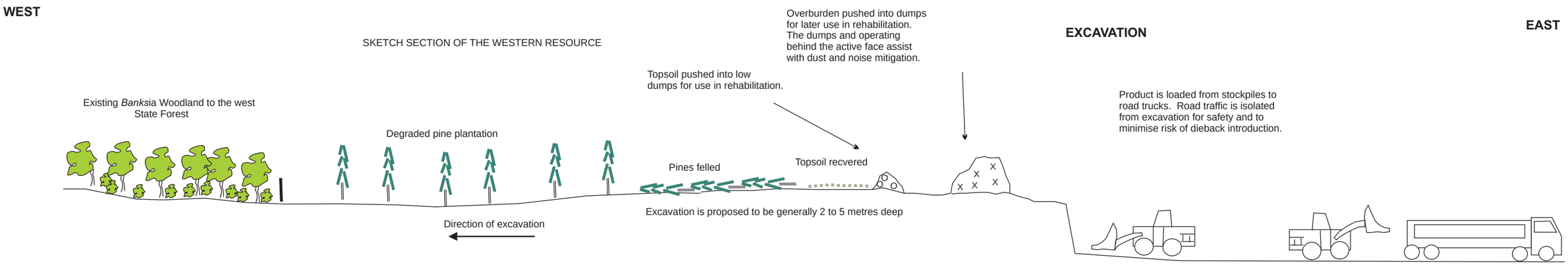
Existing Levels
Lots 2233 & 2238
Energy Place, Muchea
PLAN PRODUCED: 25/10/2016
COORDINATE SYSTEM: GDA 1994 MGA Zone 50

W.A. LIMESTONE

NORTH

0 25 50 100 150 200 250 m

Scale at A3: 1:8,000

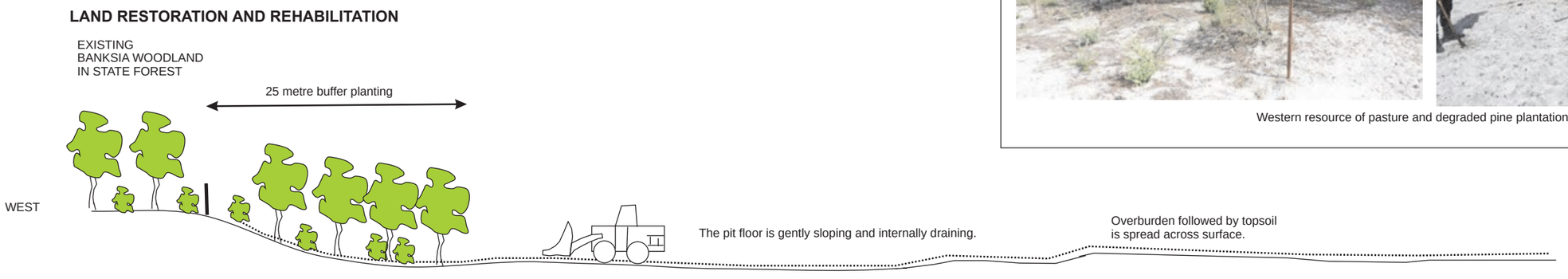


Excavating sand from a face similar to the proposed operation

Loading to a road truck in a typical sand operation

Eastern resource of pasture and monoculture of *Xanthorrhoes preissii*

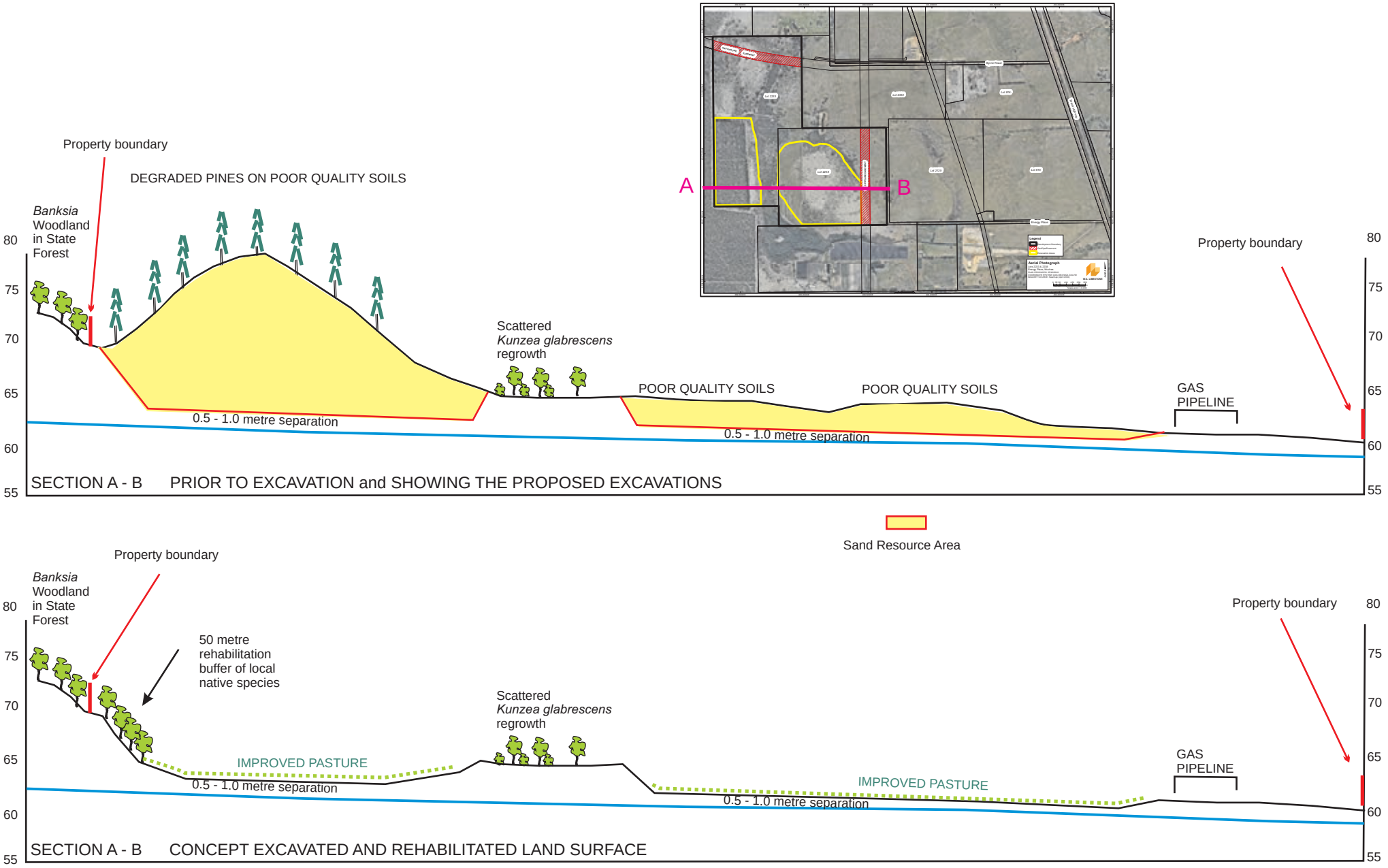
Western resource of pasture and degraded pine plantation



CONCEPTUAL PROPOSED SAND EXCAVATION - MUCHEA

Landform Research

Figure 9



SECTION LINES ALONG THE PROPOSED SAND EXCAVATION
LOTS 2233 and 2238 BYRNE ROAD, MUCHEA

Figure 10

399,500mE 400,000mE 400,500mE 401,000mE 401,500mE 402,000mE

6,508,500mN 6,508,000mN 6,507,500mN 6,507,000mN 6,506,500mN

GAS PIPELINE EASEMENT

Byrne Road

Brand Highway

Energy Place

Lot 2233

Lot 2364

Lot 816

Lot 2238

Lot 2125

GAS PIPELINE EASEMENT

59.0

61.5

60.2

54.0

60.5 - 61.0

61.0 - 61.5

61.0 - 61.5

60.5 - 61.0

60.0 - 60.5

59.5 - 60.0

59.0 - 59.5

58.0 - 58.5

59.5

59.0 - 59.5

60.0 - 60.5

59.5 - 60.0

BASE OF EXCAVATION TO BE DETERMINED BY PIEZOMETER MEASUREMENTS

ADDITIONAL SURFACE AND GROUND WATER DATA

54.0 — Elevation of winter groundwater elevation m AHD. soil auger hole, surface water observation on 31 August 2016 and aerial photography

59.0 - 59.5 — Proposed base of excavation. 0.5 to 1.0 metres above the winter groundwater elevation. (metres AHD). Elevation to be determined by piezometer during winter.

Surface water flow from spring

Surface water flow in an excavated drain

59 — Winter groundwater elevation, based on Perth Groundwater data and modified from field observations in late winter 2016.

Landform Research
Land Systems - Quarries - Environment

Legend

- Development Boundary
- GasPipeEasement
- Groundwater Contours
- Excavation Areas

Figure 11

Existing Levels
Lots 2233 & 2238
Energy Place, Muchea
PLAN PRODUCED: 25/10/2016
COORDINATE SYSTEM: GDA 1994 MGA Zone 50

W.A. LIMESTONE

NORTH

0 25 50 100 150 200 250 m

Scale at A3: 1:8,000

399,500mE 400,000mE 400,500mE 401,000mE 401,500mE 402,000mE

6,508,500mN 6,508,000mN 6,507,500mN 6,507,000mN 6,506,500mN

GAS PIPELINE EASEMENT

Byrne Road

Brand Highway

Lot 2233

Lot 2364

Lot 816

Lot 2238

GAS PIPELINE EASEMENT

Lot 2125

Lot 815

Energy Place

Concept direction of excavation

4 Concept staging

NOTE

See Figure 6 for the excavation methods

Legend

- Development Boundary
- GasPipeEasement
- Excavation Areas

Figure 12

Aerial Photograph

Lots 2233 & 2238
Energy Place, Muchea
PLAN PRODUCED: 25/10/2016
COORDINATE SYSTEM: GDA 1994 MGA Zone 50
IMAGERY SOURCE: Nearmap (April 2016)

W.A. LIMESTONE

NORTH

0 25 50 100 150 200 250 m

Scale at A3: 1:8,000

ATTACHMENT 1

Biodiversity Management and Closure Plan

Proposed Sand Excavation
For Perth – Darwin Highway

Lots 2233 and 2238,
Byrne Road, Muchea

Shire of Chittering

WA Limestone

February 2017

W.A. LIMESTONE

TABLE OF CONTENTS

Prepared by

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Mem Aus Geomechanics Soc – MEIANZ – FIQA Tel 9397 5145, landform@iinet.net.au

1.0 PROJECT OVERVIEW

BACKGROUND

The proposed Great Northern Highway upgrade, passing through Muchea, is located to the east of this property, Lots 2233 and 2238, Doyle Road, Muchea.

The property is a productive cattle grazing property and has an old private pine plantation on the western resource area.

The soils of the sand ridge have low capability because of the lack of water holding capacity as can be seen by the lack of pasture on the aerial photography.

The proposal is therefore to provide a source of local sand to assist in minimising the cost of construction of this section of the new Great Northern Highway alignment and, by removing the sand from the ridge, lower the ridge and improve the soil capability over a substantial portion of the grazing property, covering approximately 31 hectares.

OPERATIONAL INVENTORY

Summary

ASPECT	**DISTURBANCE**
Resource sought	Bassendean sand
Area of excavation	Eastern resource, 43 hectares 1 - 3 metres deep. Western resource, 41 hectares 1 – 15 metres deep.
Processing Infrastructure. Product stockpiles, laydown and related areas	Included in the excavated area.
Excavation	Rubber tyred loader/s Off-road haul trucks, scrapers or road trucks for transport to the new Great Northern Highway alignment. 20 tonne water truck or similar for dust suppression. Self contained maintenance and refueling vehicles to attend site as required.
Processing	A mobile screening plant may be required.
Roads, dams and related infrastructure etc	0.5 hectares additional access road to Great Northern Highway alignment.
Facilities	May require locked seatainer. Portable serviced toilet system.
Water management	Approximately 5 000 kL per year for dust suppression on the access road and pit floor as required, depending on the season.
Dewatering requirements	Nil
Total area of plant and stock	Located on the hard stand to the north. No changes.
Area of settling ponds	Not required
Wastes and tailings	There is no waste material. The only materials remaining on site will be subgrade sand and topsoil.
Fuel storage	Not proposed with fuel brought to site in mobile tanker as required.
Truck movements	Variable but approximately 4 laden trucks leaving site per hour on average, with some days having more transport and other days less. For supply to the Great Northern Highway upgrade the hourly number will rise to 10 – 20 per hour. Transport is to be directly to the Brand Highway along Byrne Road and then to the alignment of the Great Northern Highway.

	Any sand remaining after construction of the highway will be transported along an approved access road to a defined and approved intersection on the highway.
Life of project	10 years
Hours of operation	Hours of operation will be 6.00 am to 5.00 pm Monday to Saturday inclusive, excluding public holidays.

PHYSICAL ENVIRONMENT

- ***Site Description***

The sand is a series of sand ridges of Bassendean type sand, which by the vegetation, suggests leached white sands at depth under the core of the ridges, but which from the limited soil auger holes is leached white silica sand grading to light brown at depth.

Groundwater from the Gnangarra Mound flows east at this location to emerge at the eastern edges of the sand ridges as a series of seepages and springs at the interface with the alluvial clays associated with Ellen Brook. The sand interleaves with the alluvial clays.

There may also be ferricrete and coffee rock that may be causing localised minor confinement of the groundwater.

The sand ridges are up to 8 metres above the plain dropping from west to east.

The groundwater elevation also drops from west to east, touching the surface in winter on the lower wetter areas in the east, in low drainage areas in some dune swales and permanently at several springs.

The land owner wants the land to be returned to productive pasture. Currently the sand ridges are too dry to hold water in summer and do not support pasture growth as can be seen on the aerial photographs.

Ideally the separation to the water table could be lowered to 0.5 to 1.0 metres and would enable better pasture growth and pasture to be maintained into summer. Lowering the sand ridge will increase the agricultural capability of the land. Capillary action in sand is around 600 mm and root depth of pasture is in the order of 300 – 500 mm depending on the species of grass, so a separation of 0.5 to 1.0 metres is ideal for better pasture growth.

- ***Climate***

The climate of the area is classified as Mediterranean, with dry hot summers and cool wet winters.

Climate data is recorded at Bullsbrook, (Pearce RAAF), Precipitation is 688 mm per annum, of which 89% falls in the months April to October inclusive. At Swan Research Station evaporation exceeds rainfall in all but the four wettest months, and the situation at Bullsbrook can be expected to be similar.

Average maximum temperatures at Bullsbrook reach 33.3 degrees Celsius for the hottest months, January and February, but fall to 17.6 degrees Celsius in July. Average minima for the coldest month August, is 8.2 degrees Celsius.

The climate data for Bullsbrook shows that the predominant summer winds are from the east at 9.00 am and from the south west at 3.00 pm.

In summer wind blows from the east 70% of the time at 9.00 am and from the west/south west for 60% of the time at 15.00 pm. Summer wind speeds tend to be 6 to 10 km/hour at 9.00 am and between 11 and 20 km/hour at 15.00 pm.

The winter wind directions are more even, but there is a slight predominance from the east at 9.00 am and south west at 15.00 pm. The average speeds are between 1 to 10 km/hour.

- ***Proposed Landuse – Excavation Methods***

Sand will be removed in a sequence with vegetation cleared, topsoil pushed to the perimeter for later use and perimeter bunds formed from the small thickness of overburden.

The end use of the site will be a return to productive pasture with belts of native vegetation on the batter slopes along the southern sides of the resource areas and the western side of the western resource.

2.0 BIODIVERSITY MANAGEMENT DURING OPERATIONS AND ON CLOSURE

2.1 Flora Survey

2.1.1 Aims of the Survey

The aims of the survey are to update the vegetation reporting and re-evaluate the significance of the vegetation and to determine whether there are any Declared Rare, Priority or Significant taxa present or any significant changes.

2.1.2 Methods of Survey

Aims of the Survey

Lindsay Stephens of Landform Research conducted a vegetation assessment in terms of plant communities, vegetation condition, plant species, and the potential for Rare and Priority Species and Threatened Ecological Communities to be present on this site.

The study was undertaken on 31 August 2016 to comply with Environmental Protection Authority (2004) Guidance Statement, *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia*, No 5,1 June 2004.

However a review of the *EPA December 2016 Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* enabled the assessment to be brought into line with the new guidance.

Therefore a Clearing Permit will be required and referral to the Commonwealth under the *EPBC Act 1999* for any listed matters, namely habitat for Black Cockatoos, is considered.

Past Studies – 2002 - 2004

There are no known previous studies.

Current Study

- ***On Ground Assessment***

A site inspection of the site was carried out on 31 August 2016 by Lindsay Stephens of Landform Research.

During that inspection the whole of the land was traversed at intervals dependent on the quality of the vegetation. All native species noted during the traverses were recorded.

All native species found were recorded as were all exotics including weed species. An assessment was made of the vegetation condition and plant density through four 100 m^2 plots which included the percentage of soil cover.

As some areas had been excavated, and to give a clearer picture of the species richness and plant density remaining on the western site, five 10 m^2 plots were sampled to gain a clearer picture of the vegetation condition and communities.

10m^2 plots were used because of the paucity of vegetation and the surveys pre-dated the EPA December 2016 updated Guidance.

The methodology of the 2016 Guidance relies only on presence and absence data in plots and provides no indication of the actual vegetation condition or the contribution of those species to the vegetation on site.

To provide better, more meaningful, data the % vegetation cover for each species was provided for the five sample plots.

Specimens were collected and colour photocopied as soon as possible to preserve the features of the species. Not all species were collected and retained, but rather the less obvious species or those that may require further study were collected and retained.

Colour photocopying or digital scanning has been found to be the best means of retaining voucher material. Those specimens have also been retained as dried plants.

- ***Desktop Reviews***

The DEC (now DPaW) Rare and Priority Flora and Ecological Communities databases were searched through Florabase. The Commonwealth EPBC databases were also searched and Naturebase was searched.

The main references for plant identification were knowledge of the assessor, published texts, and Florabase.

The Protected Matters Search Tool, Commonwealth Department of Environment for a 5 km radius was searched. See attachment.

Determinations and inferences on the Vegetation Complexes and Floristic Community Types were made in a number of ways, relating to comparisons to published floristics and geomorphic and regolith matching. The following documents were used in the reporting.

- Bush Forever used the same methodology based on comparisons to published floristics and geographic information, Bush Forever 2000, Volume 2 page 310.

- Comparisons were made to published boundaries of Vegetation Complexes in Heddle et al, 1980.

- Comparisons of species were made to the descriptions of Floristic Community Types in Gibson et al 1994, pages 29 to 45. (Gibson, N, Keighery, B.J., Keighery, G.J., Burbidge, A.H. and Lyons, M.N. (1994), *A Floristic Survey of the Swan Coastal Plain.* Unpublished Report for the Australian Heritage Commission prepared by the Department of Conservation and Land Management and the Conservation Council of Western Australia).

- Comparisons of species were made to the sorted table in Gibson et al 1994, Table 12, which shows the species frequency within each Floristic Community Type. Weston 2004 states that Neil Gibson noted that such comparisons are possible.

- Comparisons were made to the descriptions of the Floristic Community Types and maps in Appendix 1 of Gibson et al 2004.

- Comparison to regolith maps such as the 1 : 50 000 Perth Metropolitan Environmental Geology Map Sheets produced by the Western Australian Geological Survey; particularly Fremantle Sheet.

- Comparisons were made to published boundaries of Landforms and Soils in Churchward and McArthur, 1980.

- Soil and regolith mapping and assessment of the geomorphology by Lindsay Stephens at the time of the site inspections. Soil and regolith mapping has been found to be very closely aligned to species composition, through extensive field mapping by Landform Research, with small changes to the clay or sesqui-oxide content being related to the introduction and deletion of particular indicator species.

- Comparisons to databases of Regolith and Vegetation Communities held by Landform Research and the field experience of Lindsay Stephens.

2.1.3 Limitations of the Survey

The surveys were conducted at an appropriate time of the year.

Considering the nature of the vegetation on site, its level of past and current disturbance, the limitations are not considered significant and the assessment is considered valid.

2.1.4 Community Types

Both resource areas have been cleared and allowed to regrow, and the eastern resource, subjected to grazing and other rural activities. Figure 1-7.

The vegetation was originally typical of the Bassendean Complex, North, as identified by Heddle et al, 1980, *Vegetation Complexes of the Darling System, Western Australia in Atlas of Natural Resources, Darling System, Western Australia*, Department of Conservation and Environment. Bassendean Complex, North which extends from Gnangara northwards to past the Moore River.

The Bassendean Complex – North is characterised by *Banksia – Eucalyptus todtiana* Shrublands to Low Woodlands.

The low intervening wetland areas grade from the *Banksia* Woodland with elements of Yanga Complex on flats subject to wet conditions, even though that vegetation complex occurred on the lower lying land to the east.

With such alteration to the vegetation and paucity of species, it is difficult to determine the original Floristic Community. The vegetation appears to have been slightly different on the lower slopes and the eastern sand ridge compared to the vegetation on the higher western sand ridge.

The vegetation was originally *Banksia* Shrubland to Woodland and probably had affinities to FCT 23a, 22, 21c and 21a. (Gibson, N, Keighery, B.J., Keighery, G.J., Burbidge, A.H. and Lyons, M.N. 1994).

The lower elevation in the wet areas probably had affinities to FCT 12 and 14. (Gibson, N, Keighery, B.J., Keighery, G.J., Burbidge, A.H. and Lyons, M.N. 1994).

Eastern Resource

The sand resource is pasture and is covered by pasture species, predominantly grasses and with some exotic species that are often contained in pasture.

Podotheca angustifolia is a native species widespread across the pasture.

The eastern resource can be seen to have large areas of cleared pasture with approximately 50% of the resource being covered by a monoculture of *Xanthorrhoes preissii*.

There are significant cleared areas with some regrowth around the lower edges of the dunes. The regrowth vegetation consists almost solely of *Xanthorrhoea preissii* (Grass Trees). There are occasional to isolated *Eucalyptus todtiana, Corymbia calophylla*, and *Jacksonia*.

Damp areas off the sand ridge are identified by green pasture and *Melaleuca preissiana* and Eucalyptus *rudis* (Flooded Gum).

There are almost no other native species. This vegetation varies from Completely Degraded to Degraded.

Figure 1 – 1 Western portion of the eastern sand ridge, view west showing the regrowth monoculture of Grass Trees.

Figure 1 – 2 Western portion of the eastern sand ridge, view west showing the regrowth monoculture of Grass Trees.

Figure 1 – 3 Pasture area on the eastern part of the eastern sand ridge, view east.

Western Resource

The western dune is high with a relatively steep eastern form.

The dune is planted to Pinaster Pines of some 20 – 40 years age and with no apparent usefulness as timber.

The understory and ground cover was cleared to plant the pines and there has been some regeneration under the sparse pines.

A flora and vegetation study was completed and showed 33 species of the original *Banksia* Woodland species. There were no Threatened or Priority species.

33 species is low for *Banksia* Woodland and probably represents around 10 – 20 % of the original vegetation community. Species richness is 4.8 species /10m^2 and plant density is 1.26 plants /m^2 both of which is very low.

Vegetation Condition is predominantly Degraded to Good.

Figure 1 – 4 View of the western sand ridge from the eastern edge of the pines, view west. Note that there is little or no understory in this part of the Pine plantation.

Figure 1 – 5 View north of the western sand ridge showing the pines on the resource to the west and pasture area and bare sand to the east.

Figure 1 – 6 Typical vegetation on the western portion of the western sand ridge showing some native vegetation regrowth under sparse pines.

Figure 1 – 7 Typical vegetation on the western portion of the western sand ridge showing some native vegetation regrowth under sparse pines.

Wetlands

There are a number of wetlands on site which were first identified in 1996 for the Wetlands of the Swan Coastal Plain Atlas. The wetlands remain on Department of Water Database.

A total of 6 wetlands are nominated on DOW mapping with two resource enhancement wetlands and four drains and drainage lines across pasture.

The two Resource Enhancement Wetlands were not studied in detail because they lie outside the resource area, but have a perimeter of *Kunzea glabrescens* grading to *Astartea T*hicket with scattered *Melaleuca preissii* and other species.

The two resource enhancement wetlands are well vegetated and are excluded from the proposed excavation.

The wetland vegetation is in Good or better condition.

- ***State Forest***

To the west is *Banksia* Woodland that is included in the Gnangara – Moore River State Forest. *Banksia* Woodland is now classified as Threatened under the *Commonwealth EPBC Act 1999.*

It is proposed to excavate sand to the fence line and batter the slope down at 1 : 4 vertical to horizontal, leaving a 50 metre buffer that can be revegetated through the placement of topsoil.

The buffer will be fenced and provide a long term improvement to the protection of the Bush Forever site and the listed “Threatened” – “Priority” *Banksia* Woodland Community.

2.1.5 Species List - Native Taxa

- The species recorded during the site investigation are listed in Table 1.
- The species observed are reduced in number and indicate the level of disturbance to the vegetation on both resources, but particularly the eastern resource where only five species were identified. Some more scattered plants of additional species are likely to be observed if every metre of the vegetation was walked. It is estimated that 75% of the species have been found and that additional species will occur as scattered plants or in low numbers.
- On the western resource the species recorded was 35.
- The species observed are all common local species.

Table 1 Native Species List August 2016

O indicates observed presence in 2016

Family	Genus Species	Eastern Resource	Western Resource
Anarthriaceae	*Lyginia barbata*		x
Asteraceae	*Podotheca angustifolia*	x	x
Dasypogonaceae	*Dasypogon bromeliifolius*		x
Dilleniaceae	*Hibbertia cuneiformis*		x
	Hibbertia hypericoides		x
	Hibbertia racemosa		x
Droseraceae	*Drosera menziesii*		x
	Drosera pallida		x
Ericaceae	*Astroloma ciliatum*		x
	Astroloma pallidum		x
	Astroloma xerophyllum		x
	Conostephium pendulum		x
Goodeniaceae	*Dampiera linearis*		x
	Anigozanthos humilis		x
Haemodoraceae	*Conostylis aculeata*		x
Iridaceae	*Patersonia occidentalis*		x
Lauraceae	*Cassytha glabella*		x
Fabaceae	*Acacia pulchella*		x
	Gompholobium tomentosum		x
	Jacksonia furcellata	x	x
Myrtaceae	*Beaufortia elegans*		x
	Calothamnus hirsutus		x
	Calytrix flavescens		x
	Eremaea pauciflora		x
	Eucalyptus todtiana	x	
	Kunzea glabresens	*x*	x
	Scholtzia involucrata		x
	Verticordia nitens		x
Proteaceae	*Adenanthos cygnorum*		x
	Banksia attenuata		x
	Banksia menziesii		x
	Petrophile linearis		x
	Stirlingia latifolia		*x*
Restionaceae	*Desmocladus flexuosus*		x

Rutaceae	*Philotheca spicatus*		x
Xanthorrhoeaceae	*Xanthorrhoea preissii*	x	
Zamiaceae	*Macrozamia riedlei*		x
	TOTAL NATIVE SPECIES	5	35

Table 2 Species Richness of 10 m^2 Sample Plots – Native Species in 2016

Named species Denotes a species identified on the site.

- The sample plots were located in the visually most rich, average and worst vegetation.

	10m^2 Plot 1	10m^2 Plot 2	10m^2 Plot 3	10m^2 Plot 4	10m^2 Plot 5
Number of species (Species richness)	3	7	4	4	6
Total number of plants (plant density)	6	11	19	17	10

Average species richness per 10m^2 plot 4.8 species
Average plant density per 10 m^2 plot 12.6 plants or 1.26 plants/m^2

2.1.6 Species List – Exotic Taxa

There appears to be little exotic species apart from the pasture species. The pasture species were not identified and only occurred outside the pine plantation. The pine plantation was almost totally weed free apart from the species listed in Table 3.

The eastern resource has a significant cover and presence of exotic pasture species.

Table 3 Species Richness of 100 m^2 Sample Plots – Exotic Species 2016

Named species Denotes a species identified on the site in 2004.
X Indicates a Declared Plant in Western Australia
O Indicates the species identified in 2016.

FAMILY	GENUS – SPECIES	EXOTIC SPECIES OBSERVED 2004 - OBSERVED 2016 (O)
Asteraceae	*Ursinia anthemoides*	X
Iridaceae	*Gladiolus spp*	X
Pinaceae	*Pinus pinaster*	X
TOTAL EXOTIC SPECIES		3

For the western resource, no environmentally significant or Threatened weeds species were recorded although *Ursinia anthemoides* and *Gladiolus* sp were recorded. Both these are widespread through *Ban*ksia Woodlands and coastal areas in the South West and have become naturalised. They do not significantly impact native vegetation. Pinaster Pines are also present in the western resource but are readily treated if they grow.

No weeds species were recorded in the eastern resource but pasture and exotic plants associated with it occur on the eastern resource.

2.1.7 Plant Density

The species recorded during the site investigation are listed in Table 2.

The plant density can be gauged by the % of cover that is also presented in Table 2.

- An indication of the plant density can be obtained from the 10 m^2 plots which provide an indication of the ground cover percentage. Exotic species outnumber significantly the local native species and almost everywhere provide greater soil cover than the native species.

2.1.8 Vegetation Structure

Photographs of the vegetation are attached above, which provide information on the vegetation structure. The show that the eastern sand resource is covered by an almost monoculture of *Xanthorrhoea preissii* regrowth and that the western resource is covered by degraded pine plantation with scattered low shrub remnant understory.

The structure of the vegetation is shown in Table 4 under 6.0 Vegetation Condition.

2.1.9 Vegetation Condition

VEGETATION CONDITION NOTES –
SOUTH WEST AND INTERZONE BOTANICAL PROVINCES

The vegetation condition mapping used is that used by EPA December 2016 Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment, modified from Keighery 1994 and Trudgen 1988.

Additional columns are added from the EPBC Guidelines for the identification of the condition of *Banksia* Woodland 2016.

 # Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) (s 266B) Approved Conservation Advice (incorporating listing advice) for the *Banksia* Woodlands of the Swan Coastal Plain ecological community.

The *EPA December 2016 Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* for the Eremaean and Northern Botanical Provinces use a slightly different scale.

Condition Score	***Vegetation Condition***	***Vegetation Descriptors***	***Indicative condition measures – thresholds (EPBC Approved Conservation Advice 2016. #***	
			Typical native vegetation composition	***Typical weed cover***
1	***Pristine***	*Pristine or nearly so, no obvious signs of disturbance*	*Native plant species diversity fully retained or almost so*	*Zero or almost no weed cover - abundance*
2	***Excellent***	*Vegetation structure intact, disturbance affecting individual species, and weeds are non aggressive species.*	*High native plant species diversity*	*Less than 10%*
3	***Very Good***	*Vegetation structure altered, obvious signs of disturbance.* *For example disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.*	*Moderate native plant species diversity*	*5 – 20%*
4	***Good***	*Vegetation structure significantly altered by very obvious signs of multiple disturbance. Retains basic structure or ability to regenerate it.* *Disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.*	*Low native plant diversity*	*5 – 50%*
5	***Degraded***	*Basic structure of the vegetation severely impacted on by disturbance. Scope for regeneration but not to a state approaching good condition without intensive management.* *For example disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.*	*Very low native plant diversity*	*20 – 70%*
6	***Completely Degraded***	*The structure of the vegetation is no longer intact and the area is completely or almost completely without native species. These areas are often described as "parkland cleared" with the flora comprising weed or crop species with isolated native trees or shrubs.*	*Very low to no native species diversity*	*>70%*

In general, the vegetation of the Eastern Resource varies from Degraded to Completely Degraded.

The Western Resource ranges from Degraded to Good vegetation condition.

The wetland remnants are in Good or better vegetation condition.

The vegetation is dominated by exotic and pasture species, even in locations where there are more native species, with the introduced species providing near >90% vegetation cover.

Under Kaesehagen 1995 the vegetation best fits into the category of Poor to Very Poor in the best vegetation. For a portion of the remainder the vegetation is classed as Degraded to Completely Degraded, having significant pasture understory.

Table 5 Vegetation Condition

VEGETATION STRUCTURE	HEIGHT	Eastern Sand Resource	Western Sand Resource	Wetlands outside the resource areas
Overstorey	> 4 m	Absent, has been	Absent, has been	Naturally absent

		removed. Completely Degraded	removed and replaced by pine plantation in poor condition. Completely Degraded	
Tall Shrub layer	2 – 4 m	Absent, has been removed. Completely Degraded	Absent, has been removed. Completely Degraded	Taller *Melaleuca* and *Kunzea* shrubs. Good to Very Good Condition.
Lower Shrub Layer	0.5 – 2 m	Replaced by *Xanthorrhoea preissii* regrowth monoculture. Completely Degraded to Degraded	Generally scattered and intermittent presence of low native shrubs Degraded to Good	Some disturbances and regrowth of shrubs and taller ground covers. Generally Good
Ground Cover	<0.5 m	Absent, has been removed and replaced by pasture. Completely Degraded	Generally absent, has been removed and inhibited by pine needles. Large areas of bare sand. Degraded	Some disturbances and regrowth of ground covers with impacts by edge and other grazing. Generally Good

- The Vegetation Condition Score used in this study is that used in EPA Guidance 2016 (see attached notes).

Exotic Taxa

The pasture species were not identified. There were no other significant exotic species identified on the eastern resource.

A total of three exotic taxa were observed during the site traverses and inspections in the western resource as listed in Table 3.

2.1.10 Significant Vegetation

Declared Rare, Priority or Significant Taxa

No plant recorded is listed as a Threatened or Priority species.

Section February 2016 part B Response to Submissions shows the presence of an historical record of a Priority 3 species, presumably *Cyathochaeta teretifolia* on Lot 1773 well to the south, but studies for the Highway relocation did not find any evidence of the plants at that location, but did locate some plants to the south on Lot 168, outside the proposed excavation.

SPECIES	STATE	EPBC	COMMENT
Eryngium pinnatifidum subsp palustre	P3		Distinctive plant that more commonly occurs in gravel
Platysace ramosissima	P3		Distinctive plant
Hydrocotle striata	P4		Aquatic plant
Chamaescilla gibsonii	P3		Distinctive plant form. No similar plants were observed
Caustis gigas	P2		Distinctive grass like herb. No similar species were observed
Cyathochaeta teretifolia	P3		Distinctive plant that grows in lower wetter soils that do not occur on site
Hibbertia helianthemoides	P4		
Drosera occidentalis subsp *occidentalis*	P4		The two *Drosera* observed were climbing common species
Drosera sewelliae	P2		The two *Drosera* observed were climbing common species

Leocopogon sp *Murdoch*	P3		No *Leucopogon w*as observed. Grows in winter wet soils which are not present.
Leucopogon squarrosus subsp *trigynus*	P2		No *Leucopogion* was observed
Acacia anomala	T	V	Occurs in on the Gingin scarp in gravel which does not occur on site.
Acacia cummingiana	P3		Occurs in laterite and hills areas.
Acacia drummondii sp *affins*	P3		Distinctive. No similar foliage was observed
Haemodorum loratum	P3		Distinctive large leafed plant which was not observed
Verticordia lindleyi subsp *lindleyi*	P4		No *Verticordia* was observed
Verticordia serrate var linearis	P3		No *Verticordia* was observed
Thelymitra stellata	T		No orchid plants or leaves were observed
Adenanthos cygnorum subsp *chamaephyton*	P3		Distinctive form of *Adenanthos cygnorum* which was not observed. Associated with gravel.
Grevillea althoferorum subsp *fragilis*	T		Distinctive. No similar plant was observed
Grevillea canolleana	P2		Distinctive. No similar plant was observed
Persoonia rudis	P3		Distinctive. No similar plant was observed. The timing of the survey was correct for flowering.
Synaphea grandis	P4		No *Synaphea* was observed.
Hypolanea robusta	P4		Distinctive. No similar plant was observed
Stylidium paludicola	P3		No *Stylidium* were observed
Stylidium squamellosum	P2		No *Stylidium* were observed
Andersonia gracilis	T	E	Grows in winter wet, and gravelly sites that do not occur on site.
Anigozanthos viridis subsp *terraspectans*	T	V	Distinctive. No similar plant was observed
Caladenia huegelii	T	E	No orchid plants or leaves were observed
Chamelaucium sp *Gingin*	T	E	Distinctive. No similar plant was observed
Conospermum densiflorum subsp *unicephalatum*	T	E	Grows in clay low lying soils further to the north east
Darwinia foetida	T	CE	No similar plant was observed
Diuris micrantha	T	V	No orchid plants or leaves were observed
Diuris purdiei	T	E	No orchid plants or leaves were observed
Eleocharis keigheri	T	V	No orchid plants or leaves were observed
Eucalyptus leprophlioia	T	E	No similar Eucalyptus was observed
Eucalyptus x balanties	T	E	No similar Eucalyptus was observed
Grevillea corrugata	T	E	Distinctive. No similar plant was observed
Grevillea curviloba subsp *curviloba*	T	E	Distinctive. No similar plant was observed
Grevillea curviloba subsp *incurva*	T	E	Distinctive. No similar plant was observed
Lepidosperma rostratum	T	E	Grows in peaty sand and clay which do not occur on site
Ptychosema pusillum	T	V	Small pea flower that grows further north. Timing of the survey matched the flowering period
Thelymitra dedmaniarum	T	E	No orchid plants or leaves were observed
Theymitra stellata	T	E	No orchid plants or leaves were observed

Threatened or Priority Ecological Communities

- ***Tumulus Springs Community***

The proposed sand excavation lies outside the general area where Tumulus Springs Community occurs which is 1.5 km to the south east (Perth to Peel Green Growth Plan Draft 2016).

EPBC Legislation

Databases held under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* were searched.

All *Banksia* Woodlands of the Swan Coastal Plain are now listed as Threatened under the *EPBC Act 1999*.

The vegetation on site is so degraded and has been cleared that it is not classified as *Banksia* Woodland.

State Legislation

All *Banksia* Woodlands are listed as Priority 3 (P3) communities. The vegetation on site does not contain any mature or taller *Banksia* and those seedlings in the understorey and ground cover are small and isolated. The seedlings are mainly located near the western boundary of Lot 2233.

The main potential impact on *Banksia* Woodland is in the adjacent State Forest to the west. Buffers and revegetation of the batter slopes to local native vegetation will be used to provide a long term vegetated buffer of 50 metres to the State Forest and *Banksia* Woodland which will assist protection of that vegetation.

2.7.11 Vegetation Representation

EPA Position Statement No 2, December 2000, *Environmental Protection of Native Vegetation in Western Australia*, specifically targets the retention of native vegetation in the Agricultural Areas in *4.1, Clearing in the agricultural areas for agricultural purposes*. In 4.3, *Clearing in other areas of Western Australia*, it is unclear what "other areas" refers to, but may refer to retention of a 30% threshold in non agricultural areas.

Section 4.3 *Clearing in other areas of Western Australia*, (EPA Position Statement No 2, December 2000) expects that clearing will not take vegetation types below the 30% of the pre-clearing vegetation as recommended by ANZECC, 1999, *National Framework for the Management and Monitoring of Australia's Native Vegetation*. The National Objectives and Targets for Biodiversity Conservation 2001 - 2005 (Commonwealth of Australia 2001) also recognise 30% as the trigger value.

The threshold for constrained areas such as the Perth Metropolitan Region is placed at 10% by Government, (*Bush Forever 2000, CPC 2682/1,* and *EPA Guidance No 10 Level of Assessment for proposals affecting natural areas within the System 6 region and Swan Coastal Plain portion of the System 1 Region page* 9).

Table 6 Status of the vegetation (WALGA 2010 and DER)

Area	% Remaining of Pre European Vegetation	% Protected in formal conservation areas or some protection
Swan Coastal Plain IBRA Region	39%	37%
Heddle Vegetation Complex Bassendean Complex – North	52.05%	62.17%

2.2 Fauna

Macrofauna

The main significant species identified were the potential for Black Cockatoo impacts, especially Carnaby's Black Cockatoo *Calyptorhynchus latirostris.*

Summary of potential Black Cockatoo habitats

Potential impacts	**Carnaby's Black Cockatoo (*Calyptorhyncus latirostris***	**Baudin's Black Cockatoo (*Calyptorhyncus baudinii)***	**Forest Red Tail Black Cockatoo (*Calyptorhyncus banksii naso*)**
Presence of breeding trees	No breeding trees were recorded. No trees with hollows were found. Carnaby's Cockatoo breeds in the wheatbelt further north but has at times increasingly been known to breed in the Perth Area.	Unlikely to lie within the breeding area.	No breeding trees were recorded. No trees with hollows were found.
Roosting habitat	Large white trunked trees are preferred but these do not occur on site. There are no large Eucalypt trees for roosting.	Large white trunked trees are preferred but these do not occur on site. There are no large Eucalypt trees for roosting.	Large white trunked trees are preferred but these do not occur on site. There are no large Eucalypt trees for roosting.
Feeding habitat	There is no Proteaceous feeding habitat on site. There are some Pines in poor condition that form part of an old plantation. The pines will be replaced by pasture with a buffer of local *Banksia* Woodland revegetation which will help compensate for the loss of feeding resources. This buffer will be planted along the western edge of the western resource and along the southern edge of both resources. The buffer will be fenced and provide a long term improvement to the protection of the Bush Forever site and the listed "Threatened" *Banksia* Woodland Community. The site adjoins *Banksia* Woodland that is included in the Gnangara – Moore River State Forest. *Banksia* Woodland.	There is no Proteaceous feeding habitat on site. There are some Pines in poor condition that form part of an old plantation. The pines will be replaced by pasture with a buffer of local *Banksia* Woodland revegetation which will help compensate for the loss of feeding resources. This buffer will be planted along the western edge of the western resource and along the southern edge of both resources. The buffer will be fenced and provide a long term improvement to the protection of the Bush Forever site and the listed "Threatened" *Banksia* Woodland Community. The site adjoins *Banksia* Woodland that is included in the Gnangara – Moore River State Forest. *Banksia* Woodland.	There is no Proteaceous feeding habitat on site. There are some Pines in poor condition that form part of an old plantation. The pines will be replaced by pasture with a buffer of local *Banksia* Woodland revegetation which will help compensate for the loss of feeding resources. This buffer will be planted along the western edge of the western resource and along the southern edge of both resources. The buffer will be fenced and provide a long term improvement to the protection of the Bush Forever site and the listed "Threatened" *Banksia* Woodland Community. The site adjoins *Banksia* Woodland that is included in the Gnangara – Moore River State Forest. *Banksia* Woodland.

The lack of suitable habitat trees for roosting and nesting combined with the lack of suitable food results in a low potential impact on Black Cockatoos.

The degraded pines on site may form irregular feeding habitat for Black Cockatoos but will be replaced by pasture on the floor of the pit and *Banksia* Woodland on the batter slopes so that over time the impact on Black Cockatoos will be minimal to nil.

The adjoining Gnangara – Moore River National Park has large areas of *Banksia* Woodland that provide alternative long term feeding habitat. These *Banksia* Woodlands are now less likely to be cleared because of the Priority Listing under State Legislation and Threatened Listing under the EPBC 1999.

Fauna Management

Clearing will be conditioned under a Clearing Permit which will be applied for. During that process the potential presence of significant fauna will be assessed under the Clearing Principles.

Clearing will be progressive, extending from the cleared land towards to west and south towards adjoining native vegetation. That will result in fauna being able to move into safe areas ahead of excavation and not be cut off.

It is noted that for the western resource the State Forest provides a very large area of local native habitat – *Banksia* Woodland that will not be impacted, enabling fauna to move and also provide long term stable habitat. For the eastern resource the wetland vegetation, combined with the buffer to be planted along the south, will also enable a fauna corridor to be maintained to the State Forest.

On the western resource where the pine plantation exists the pines will be removed first and where possible separately, which will enable any fauna to move towards the adjoining remnant vegetation as outlined above.

On the eastern resource the land is cleared in the east and occupied by scattered to clumped *Xanthorrhoea preissiana* which, because of the monoculture, will have reduced fauna species.

At the end of excavation, the planting of the 25 metre western and southern buffers of local native vegetation – *Banksia* Woodland native vegetation, and retention of the nearby wetland vegetation with appropriate setbacks, will offset for the habitat lost.

The 25 metre buffer will support the intent of the Commonwealth Conservation Advice for the Threatened Ecological Community Listing for *Banksia* Woodland and the State Government listing as a Priority Ecological Community.

The wetlands will be retained and provided with setback buffers of 50 – 150 metres.

Short Range Endemics

The widespread Bassendean sands with *Banksia* Woodland do not have isolated pockets where short range isolated species might occur. The sites adjoin State Forest and corridors to ensure that the site is not isolated.

Stygofauna and Troglofauna

EPA Guidance 54, concentrates on Stygofauna, which occur in caves and “are aquatic subterranean animals, found in a variety of groundwater systems”.

"Troglofauna occur in air chambers in underground caves or smaller voids".

The only excavation is in sand in which stygofauna or troglofauna are not normally significant because of the lack of cavities.

2.3 Wetlands and Riparian Communities

There are a number of wetlands on site which were first identified in 1996 for the Wetlands of the Swan Coastal Plain Atlas. The wetlands remain on Department of Water Database.

A total of 6 wetlands are nominated on DOW mapping with two resource enhancement wetlands and four drains and drainage lines across pasture. In current mapping the wetlands are combined into general areas of Resource Enhancement and Multiple Use. There are no Conservation Category Wetlands on site. Figure 1 - 9.

In reality there are two wetland areas with the remainder being drainage lines across pasture. The two Resource Enhancement Wetlands were not studied in detail because they lie outside the resource area, but have a perimeter of *Kunzea glabrescens* grading to *Astartea T*hicket with scattered *Melaleuca preissii* and other species.

Wetlands on or near the proposed excavation are sumplands, meaning that they are seasonally inundated according to the mapping.

The actual ground conditions may not now be applicable due to changes to land use and water regime over the past 20 years.

Category	Explanation	DOW - General Description
C	Conservation	Wetlands which support high levels of attributes and functions
R	Resource Enhancement	Wetlands which have been partially modified, but still support substantial functions and attributes
M	Multiple Use Wetland	Wetlands with few attributes remaining which still provide important wetland functions

Wetland	ID Number	Category	Area	Comments	Management
Dr 28	39951650783	R	39.4 ha	Low lying pasture with minor scattered shrubs of native vegetation to the north of the sand resources and outside the proposed excavation. Buffer of 100 metres to the eastern excavation.	Excluded from the excavation. Buffers of 50 to 150 metres to the wetland vegetation will be provided. There will be no impact on the vegetation, no drainage changes, no excavations below the water table and no changes to recharge that might impact on the wetlands.
626			Drainage line	A surface drainage line that lies inside native vegetation that grades to wetland vegetation, between the northern ends of the two resource areas. Setback will be > 50 metres from the drainage.	
623			Drainage line	A surface drainage line that lies inside Sr 34. Surrounded by native wetland vegetation. Setback will be > 50 metres from the drainage.	
686			Drainage line	Pasture - devoid of native vegetation. A drain that lies 100 metres north from the eastern resource and drains east to Ellen Brook.	
696			Drainage line	Pasture - devoid of native vegetation. A drain that commences from the end of Sr 34, some 150 metres south east	

				from the eastern resource and drains east to Ellen Brook.	
Sr 34	39993650669	R	16.2 ha	Well vegetated with wetland species. Lies between the two resource areas and is excluded from excavation. Wetland setback will be 50 metres from the wetland species.	

The two Resource Enhancement Wetlands were not studied in detail because they lie outside the resource area, but have a perimeter of *Kunzea glabrescens* grading to *Astartea T*hicket with scattered *Melaleuca preissii* and other species.

Buffers of 50 – 150 metres are provided for all wetlands. On the mapping the excavation approaches the vegetation around the wetlands which is *Kunzea glabrescens*. The wetland vegetation is located inside the perimeter of the *Kunzea glabrescens* so that in effect a minimum of 50 metres buffer to the wetland vegetation will be maintained. Where necessary to achieve the minimum of 50 metres the excavation footprint will be reduced accordingly by slight modification as shown on Figure 1 of the main report

There will be no impact on the wetland vegetation, no drainage changes, no excavations below the water table and no changes to recharge that might impact on the wetlands.

For additional information on the management proposed, see Attachment 2 Water Management Plan for information on water movements and other hydrological information.

Groundwater flow is west to east below the proposed floor of the excavations and that flow will be maintained.

There are no Tumulus Spring Communities impacted by this proposal and none within 1.5 kilometres to the south east.

2.4 Clearing

*Clearing is controlled under the **Environmental Protection (Clearing of Native Vegetation) Regulations 2004.** These regulations provide for a number of principles against which clearing is assessed.*

	CLEARING PRINCIPLE *(Schedule 5 Environmental Protection Amendment Act, 1986*
1a	*High Level of diversity*
1b	*Significant fauna habitat*
1c	*Necessary to existence of Rare flora*
1d	*Threatened Ecological Community*
1e	*Significant area of vegetation in an area that has been extensively cleared*
1f	*Wetland or watercourse*
1g	*Land degradation*
1h	*Impact on adjacent or nearby conservation areas*
1i	*Deterioration of underground water*
1j	*Increase flooding*

Although the Clearing Principles consider Biodiversity and other conservation issues, they do not specifically address the issues of the metropolitan area or resource needs. Therefore some additional principles need to be added when considering the need for Basic Raw Materials.

The *Environmental Protection ACT 1986 Section 51O* states that the "CEO may take into account other matters that the "CEO considers relevant" (*EP ACT 1986 Section 51O*). Therefore Section 51O of the *Environmental Protection Act 1986* allows the CEO to take planning matters into account when making clearing decisions, such as a State Planning Policy and community need.

Principles that have to be satisfied are apparently designed for rural regions and do not adequately address the issues of resource needs. Therefore some additional principles need to be added when considering the need for essential Raw Materials. In an attempt to provide a better balance to the clearing principles those principles have been expanded as listed in the tables below.

The issue of clearing native vegetation and fauna habitat cannot therefore be considered separately but must be considered in terms of community needs and end use of the site.

	ADDITIONAL CLEARING PRINCIPLES – EXTRACTIVE INDUSTRIES
Environmental Protection Act 1984 Section 51O Planning Matters	
1	*Planning Matters*
Environmental Protection Act 1984 Section 51O Relevant Matters	
2a	*Need for the resource*
2b	*Classification of the resource and existing approvals*
2c	*Availability of alternative resources and the impact of their use*
2d	*Proposed final land use*
2e	*Offsite Environmental impacts if the resource is not used*
2f	*Sound environmental management and rehabilitation*

Assessment against the Clearing Principles

	CLEARING PRINCIPLE *(Schedule 5 Environmental Protection Amendment Act, 1986).*	**COMMENT**
1a	High Level of diversity	• The quarry site has been assessed in the flora survey by Landform Research. • The eastern resource can be seen to have large areas of cleared pasture with approximately 50% of the resource being covered by a monoculture of *Xanthorrhoes preissii*. • Almost all the native vegetation remaining on site is to be retained. *The proposed clearing is not at variance with this principle.*
1b	Significant fauna habitat	• The predominantly pasture areas will not form significant fauna habitat. • Almost all the native vegetation remaining on site is to be retained. • The western dune is high with a relatively steep eastern form. The dune is planted to Pinaster Pines of some 20 – 40 years age and no apparent usefulness as timber. The understory and ground cover was cleared to plant the pines and there has been some regeneration under the sparse pines. A flora and vegetation study was completed and showed 33 species of the original *Banksia* Woodland species. There were no Threatened or Priority species. 33 species is low for *Banksia* Woodland and probably represents around 10 – 20 % of the original vegetation community. Species richness is 4.8 species /10m2 and plant density is 1.26 plants /m2 both of which is very low. • A 25 metre buffer area of local native vegetation will be established on the west to provide a buffer to the *Banksia* Woodland that adjoins. • The proposed mining of sand does not generate significant amounts of uncontrolled dust. *The proposed clearing is unlikely to be at variance with this principle.*
1c	Necessary to existence of Rare flora	• No Threatened (Declared Rare) or Priority Flora was found. *The proposed clearing is not at variance with this principle.*
1d	Threatened Ecological Community	• No Priority or Threatened Ecological Community occurs on the quarry site. • *Banksia* Woodland occurs on the adjoining State Forest to the west but will not be impacted. *The proposed clearing is not at variance with this principle.*
1e	Significant area of vegetation in an area that has been extensively cleared	• The Gnangara – Moore River State Forest that adjoins to the west has very large areas of *Banksia* Woodland. *The proposed clearing is not at variance with this principle.*
1f	Wetland or watercourse	• The wetlands are pasture. No wetland will be excavated and all will be provided with a 50 metre setback. *The proposed clearing not at variance with this principle.*
1g	Land degradation	• The excavation will be managed in a manner that does not lead to degradation of the soil and land integrity apart from normal development issues. • Landform values return as the excavated surface is revegetated. • A key aim of the proposal is to lower the sand ridge to enable better pasture to be grown. Currently the sand ridges grow little vegetation as evidenced by the bare white sand. At the end of excavation when the separation to the groundwater will be 0.5 to 1.0 metres the soil capability will have been improved.

		The proposed clearing is partially at variance with this principle.
1h	Impact on adjacent or nearby conservation areas	• There will be no impact on the adjoining *Banksia* Woodland. • It is proposed to form a 25 metre buffer of local native vegetation *(Banksia* Woodland) along the western and southern boundaries enhancing and protecting the adjoining *Banksia* Woodland. *The proposed clearing is not at variance with this principle*.
1i	Deterioration of underground water	• Sand excavation is one of the few activities permitted in Public Drinking Water Source Areas and is permitted on the Gnangara Mound to the west. • Groundwater flow is west to east below the base of the proposed excavation. A separation of 0.5 – 1.0 metres will be provided, in line with the DOW South West Guideline for quarries. • The excavation has been designed not to impact on the groundwater elevation, flow or direction. See Attachment 2 - Water Management Plan. *The proposed clearing is not at variance with this principle.*
1j	Increase flooding	• The sand ridge sits above the low elevation soils which will not be altered. • There will be no potential for increases in flooding which will continue to depend on the amount and distribution of rainfall. • The proposed excavations are designed to have no observable impact on water elevations. • There is no evidence of the access roads impacting on water regimes, flooding or surrounding vegetation. *The proposed clearing is not at variance with this principle.*

ADDITIONAL CLEARING PRINCIPLES – EXTRACTIVE INDUSTRIES		**COMMENT**
Environmental Protection Act 1984 Section 51O Planning Matters		
1	*Planning Matters*	• The identification, protection and use of sand resources is recognised in all Government Policies. • The excavation of sand complies with the Shire of Chittering Town Planning Scheme. • The excavation will comply with State Planning Policy No 2.4 Basic Raw Materials, and State Planning Policy 2.5, which state that basic raw materials should be taken prior to sterilisation of the area by development. *The proposed clearing is compatible with this factor.*
Environmental Protection Act 1984 Section 51O Relevant Matters		
2a	*Need for the resource*	• The resource will provide reserves of strategically located sand for the construction of this section of Great Northern Highway. • It will maximise the use of sand in the local area, to enable greenhouse gases, transport, and other environmental issues associated with alternative resources, to be minimised. • The sand from this site will help to keep the prices of local sand at the lowest possible levels, by maintaining small transport distances . This benefits the whole community. *The proposed clearing is compatible with this factor.*
2b	*Classification of the resource and existing approvals*	• The proposed excavation will support the State need for construction materials. *The proposed clearing is compatible with this factor.*
2c	*Availability of alternative resources and the impact*	• There are alternative resources but they are further away and will result in greater impact of truck movements on the community

	of their use	and greater greenhouse gas emissions. • The amount of clearing is small in relation to the large resource that can be extracted and is a very positive part of the proposed excavation. *The proposed clearing is compatible with this factor.*
2d	*Proposed final land use*	• The proposed final land use is to return the site to improved pasture, buffers of native vegetation which do not currently exist • The end result will be an increase in local native vegetation. *The proposed clearing is compatible with this factor.*
2e	*Offsite Environmental impacts if the resource is not used*	• Not taking the resource will require material to be taken from much further away. Any alternative area may not offer any better environmental impacts. • The 25 metre setback of native vegetation along the western and southern boundaries will increase the area of *Banksia* Woodland native vegetation on site. *The proposed clearing is compatible with this factor.*
2f	*Sound environmental management and rehabilitation*	• Environmental and rehabilitation management procedures are proposed. Management Plans have been prepared to minimise potential environmental impacts. • Pasture will be significantly improved. • The 25 metre setback of native vegetation along the western and southern boundaries will increase the area of *Banksia* Woodland native vegetation on site. *The proposed clearing is compatible with this factor.*

2.5 Dieback Management

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

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

There are several guides to the management of Dieback.

- Department of Parks and Wildlife (CALM) Dieback Hygiene Manual 1992 is a practical guide to Dieback management.
- Department of Parks and Wildlife (CALM) Best Practice Guidelines for the Management of *Phytophthora cinamomi*, draft 2004.
- Dieback Working Group 2005, Management of Phytophthora Dieback in Extractive Industries.
- Dieback Working Group, 2000, Managing Phytophthora Dieback, Guidelines for Local Government.

Jarrah Dieback (*Phytophthora cinnamomi*) is widespread throughout this part of the State, but in many cases such as this site the vegetation is not interpretable because of the levels of disturbance.

It is unclear whether dieback or other pathogens already occur on site. With the level of disturbance, previous activities and the degree of disturbance to vegetation it is likely that pathogens already exist on site.

However as part of normal best practice, plant disease management actions will be used, therefore the following general principles are applied to Dieback management.

The aim of dieback management during excavation is to minimise the risk of entry of any additional plant pathogens to the site.

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

There is very little risk of the operations spreading dieback onto vegetation on adjoining properties as there is no access to those properties and they are cleared.

On the other hand good management practices are used as part of the ongoing normal quarry operations.

Not all potential impacts apply to all parts of the proposed quarry operations.

- DPAW and Dieback Working Group 2005, Guidelines will be followed.

- Vehicles are to be prohibited from entering vegetation ahead of excavation, apart from normal travel along made firebreaks and roads for normal security and maintenance activities.

- Dieback diseases are more likely to be transported under moist soil conditions.

- All vehicles and equipment used during land clearing or land reinstatement, will be clean and free from soil or plant material when arriving at site.

- When removing topsoil and clearing, vehicles will run around the perimeter and then push inwards where possible.
- Remnant vegetation ahead of the stage to be excavated is proposed to be quarantined where possible to minimise vehicles from entering.
- No soil and vegetation is be brought to the site apart from that to be used in rehabilitation and that which is dieback free.
- Plants to be used in rehabilitation are to be certified as from dieback free sources.
- Unwanted access to vegetated areas is discouraged through reduced tracks, signage, site marking and/or fencing as appropriate.
- Excavation vehicles will be restricted to the excavation area apart from clearing land.
- Rehabilitated surfaces will be free draining and not contain wet or waterlogged conditions.
- Illegally dumped rubbish is to be removed promptly**.**
- When clearing land or firebreaks vehicles are to work from disturbed areas towards the pit; or, in situations where dieback interpretation is not possible, from areas of higher quality vegetation to areas of lower quality vegetation.
- Excavation will occur below ground level to the west, and south towards the better vegetation and adjoining native vegetation, which will enable excavation to occur without impacting on the native vegetation or be in contact with it.
- Roads are to be maintained as free draining and hard surfaced.
- A split operation will be worked where practicable, where the road transport vehicles only access one side of the stockpile or processing area and excavation vehicles operate on the other side of the stockpiles and processing, reducing the risk of contamination from road transport.
- DPAW has determined that material such as sand, taken from deeper in the regolith profile where there is no organic and other plant matter, carries low risk of spreading dieback. (DEC 2004).
- The Weed Management Policy will be complied with.

2.6 Weed Management Plan

Weed Management

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 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.

No environmentally significant or Threatened weeds species were recorded.

Weeds and/or exotic species are only present in the topsoil as plants, parts of plants that can revegetate or seeds. No weed material occurs in the sand below the topsoil and the issue of weeds therefore depends on the receiving environment.

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

Generally if the actions taken for Dieback are applied they will also control weeds. Not all potential impacts will apply to this quarry and the main impacts affecting this site are also listed.

Weed management will be used to minimise impact on site and on adjoining properties. Good management practices will be used as part of the ongoing normal quarry operations.

This plan utilises the most appropriate on ground measures to minimise the risk of spread of Declared and Environmental weeds. The information provided here summarises the key points of the on ground management.

There is a significant amount of exotic vegetation on site including pasture and other species that can be classified as weeds to bushland. During the vegetation studies a number of exotic species were recorded. A number of these are weed species.

Weeds are most likely to impact on;

- Disturbed areas such as overburden dumps, topsoil stockpiles.
- Edges of access roads.
- Edges of firebreaks adjacent to surrounding vegetation.
- Locations accessible to the public on which rubbish is dumped.

The main sources of weeds are;

- Naturally occurring in topsoil. There is a very high exotic plant seed load with most of the vegetation being pasture and exotic species.
- Weeds from edge effects from access and local roads.
- Gradual creep of weeds along access roads.
- Rubbish dumped by the public. This is not likely as the resource is set well back from Brand Highway.

- 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.
- Birds and other vectors. This is more common than is often given credit for. eg Solanum species.

Weed Management will consist of, but not be limited to, the following actions.

- The Dieback Management Actions will be used to assist weed management.
- Inspections are to be conducted to monitor the presence and introduction of Environmental and Declared Weeds on an annual or more frequent basis. On identification, Declared and significant environmental weeds will either be removed, buried, or sprayed with a herbicide.
- Large weed plants such as Castor Oil plants were not observed but if present are to be periodically grubbed out or spot sprayed with a herbicide.
- Rehabilitation of the final land surface will be to interim revegetation for soil stabilisation. This will not involve the elimination of exotic species, but rather provide an interim cover that stabilises the soil. Weeds that impact on that interim cover will be treated.
- Areas of grass can be sprayed with Fusilade or similar grass selective herbicide if required. This can occur over the top of rehabilitated areas without significantly setting back the broad leafed species.
- All vehicles and equipment to be used during land clearing or land reinstatement, are to be clean and free from soil or plant material when arriving at site.
- No soil and vegetation will be brought to the site apart from that to be used in rehabilitation.
- Plants to be used in rehabilitation are to be free from weeds.
- Vegetated areas ahead of excavation will be quarantined to excavation vehicles until required.
- Unwanted access to vegetated areas is to be discouraged through signage, marking, a lack of tracks, perimeter bunding and/or external fencing.
- Weed affected top soils may need to be taken offsite, used in weed affected areas, buried by 500 mm soil/overburden or taken offsite.
- Illegally dumped rubbish is the major source of weeds and will be removed promptly.
- No weed contaminated or suspect soil or plant material is to be brought onto the site.
- When clearing land or firebreaks vehicles will work in conjunction with dieback principles and push from areas of better vegetation towards areas of lower quality vegetation.
- Weeds are to be sprayed with broad spectrum spray prior to planting or seeding in weed affected soils as required.
- Weed management will work from the least affected areas to most affected.

- Ongoing monitoring of weeds should be undertaken at least annually in autumn, prior to winter rains.

3.0 CLOSURE OBLIGATIONS AND COMMITMENTS

3.1 Geotechnical

The operations will fall under the supervision of the Department of Mines and Petroleum under the *Mines Safety and Inspection Act 1994*. The site will be regularly inspected by DMP for safety and geotechnical stability during the life of the operation and at closure.

The site will be installed with final land surface slopes that are safe, sustainable and compatible with the *"Guidelines on Safety Bund walls around Abandoned Open Pits",* January 1991.

- ***Proposed Final Contours***

The proposed excavation will cut the floor to between 0.5 and 1.0 metres elevation of the winter maximum water table in line with Department of Water *South West Region Guidelines Water Resource Considerations for Extractive Industries.*

- ***Rehabilitation***

The end use will be a return of the sand resource area to;

- Improved pasture
- A 25 metre buffer of local native vegetation along the western and southern edges as a buffer to the *Banksia* Woodland.

The completion criteria are outlined below under Rehabilitation

3.2 Closure Inventory

Waste Rock and Tailings

There is no waste material. The only materials remaining on site will be subgrade sand and topsoil.

Potential "at risk" Inventory

Type	Comment	Treatment
Saline surface water	Not present	Surface water is fresh, like all water from the Gnangara Mound.
Saline ground water	Not present	All water on site is fresh.
Acidic materials and drainage	Not present	
Sodic or dispersive materials	Not present	All water on site is fresh. The soils are sand and are not sodic or dispersive.
Asbestos – asbestiform minerals	None present	
Radioactive materials	Not present	
Metallic or chemical materials	Not present	
Tailings storage	Not required	
Ablutions waste	Removed from site	Serviced portable facilities or an approved septic system will be used.
Dangerous Goods	**EXPLOSIVES**	Not required

and Hazardous Materials		There are normally no hazardous materials used for sand excavation.
	FUEL The various plant will be refueled from mobile tanker. ***None will remain on closure***.	Any soil or other materials with drips and spills will be removed offsite to an approved waste site or location.
	SERVICE MATERIALS Only minor lubrication will be conducted on site All major servicing will be conducted offsite. ***None will remain on closure***	Any wastes will be collected and removed from site promptly to an approved recycling or waste disposal area.
General waste	***None will remain on closure***	Regularly removed from site to an approved disposal area

3.3 Post Mining Landuse

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

Land Use Policies

The relevant State and Local land use policies can be summarised from the Shire of Chittering Town Planning Scheme – Agricultural Resource Zone.

4.2.3 Agricultural Resource Zone

4.2.3.1 Objectives:

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

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

To encourage intensive agriculture and associated tourist facilities, where appropriate;

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

The proposed excavation will comply with the Shire of Chittering Town Planning Scheme;

- Pasture will be improved
- There will be minimal vegetation to be cleared.
- Additional native vegetation will be provided
- The sand resource will be able to be taken reducing community impacts.

- The use of the sand will minimise impacts on the community by taking sand close to the development, minimizing cost and environmental impacts.

The operations and the proposed closure are designed to comply with the relevant policies.

End Use

The floor of the pit will be lowered to 0.5 to 1.0 metres above the highest known water table to enable better soil moisture in summer and better pasture growth for continued agricultural production. This is in line with *Department of Water South West Region Guideline for Extractive Industries,* which is more applicable as the end use will be to agricultural activities and pasture.

The sand resource and natural soils are leached white sand over brown or yellow sand across most of the excavation footprint. The more leached sand will be removed from the sand ridges, increasing the capability of the rehabilitated soils to retain moisture and phosphorus.

By lowering the pasture land surface, capillary action will occur and the pasture will be able to gain soil moisture into summer. Capillary action allows for rises of soil moisture by 300 – 500 mm and, with root depth considered, land formed 0.5 to 1.0 metres above the groundwater will enable pasture to grow through summer, therefore providing significantly improved agricultural values.

The end use is improved grazing pasture with around 70 hectares of grazing land to be significantly improved by raising the available soil moisture and capability to hold nutrients and water.

The proposed drainage will not alter the groundwater entering Lots 2233 or 2238 or the amount of recharge from rainfall that occurs on site, leaving the quantities of water available for irrigation through summer.

Measurements of the water table will be completed using the on site water sumps and piezometres installed in the floor during excavation.

Concept final batter slopes and a contour plan are attached.

Final Contours

The end land surface will be in accordance with the safety considerations of the *Mines Safety and Inspection Act 1995* and the requirements and guidelines of the Department of Mines and Petroleum; for example *Guidelines on Safety Bund Walls Around Abandoned Open Pits 1991.*

The depth of excavation will be 1 to 5 metres. The floor will be flat to gently sloping at 1 : 5 to 1 : 10 vertical to horizontal to enable a productive agricultural end land use.

The floor of the pit will be lowered to 0.5 to 1.0 metres above the highest water table consistent with *Department of Water South West Region Guideline for Extractive Industries*.

By dropping the separation of the land surface to 0.5 to 1.0 metres above the highest known water table, the elevation will be between 59.5 to 60.0 metres AHD in the east rising to 62.5 – 63.0 metres AHD in the west. See the Existing Contour Plan.

Measurements of the water table will be completed using the on site water monitoring bores and additional piezometres installed in the floor during excavation, comparisons to the measurements collected in September 2016 and the geomorphology. The low lying non sand ridge areas are already generally at 0.5 to 1.0 metres above the winter water table and the excavated areas will be compatible with those elevations.

Some of the existing lower lying areas are in part classified as wetlands by Department of Water Mapping. These are almost totally cleared to pasture and have no wetland species on them and no native vegetation.

The final land surface will be brought into line with those nominated wetlands which will not be impacted but will end up being enlarged.

Concept final batter slopes and a contour plan are attached. See the contour plans and sections. Figures 7 – 10.

3.4 Revegetation Considerations and Closure Objectives

- The extraction of sand is seen as an interim use prior to reconstruction to agricultural land use.
- The extraction of sand is predominantly for the Great Northern Highway re-alignment and to provide improved soil capability on the grazing land. Some sand may be available for other projects
- The site is to be reformed to pasture with additional planting of local native vegetation as illustrated in the figures.
- Rehabilitation will contain Dieback and Weed Management in addition to monitoring and replanting failed areas.
- Appropriate topsoil management is seen to be an important element in achieving successful rehabilitation and pasture re-establishment on the restored surface.
- Rehabilitation will progressively follow mining, with completed areas of the excavation being revegetated as soon as practicable.
- Rehabilitation is to take place during the first winter months to minimise compaction effects.
- To offset the removal of a small portion of the native vegetation a 25 metre wide buffer of local native species, predominantly trees and shrubs, is to be provided along the western and southern boundaries as a set back and buffer to the *Banksia* Woodland remaining at that location.
- Corridors of native vegetation will be retained.

For the native vegetation areas, a most important aspect when revegetating to local native vegetation is that the planting and seeding must be completed within the first year of placement of the topsoil, and that planting in compacted ground reduces the success greatly.

In those areas, if they planted to local native species, the planting of too many trees without shrubs can also lead to many deaths and thinning of the visual screen, as the plants grow or are subject to drought stress.

The methods of revegetation which have proved successful on other sites will be used.

A definitive time for seeding and the planting of tube stock should not be prescribed, but rather a commitment to establish the vegetation within the first autumn/winter following placement of the overburden/topsoil.

Seeding and planting is undertaken at the most suitable time and can vary greatly depending on individual site conditions and the season. For example planting tube plants early in a dry winter year can lead to their probable failure because of a lack of early rains. Seeding with heat treated seed is not normally suitable for late summer, but scarified seed can be spread in late summer. North facing banks are planted earlier than south facing banks, which are better planted in August. All seeds are now subjected to smoke pre-treatment.

3.5 Completion Criteria

The aim of the rehabilitation program is to form improved pasture.

- Pasture will be improved and will provide a self sustaining cover of pasture on the floor of the pit.
- There will be minimal vegetation to be cleared.
- Additional native vegetation will be provided as a 25 metre wide buffer strip along the western and southern boundaries. Planting ratio of 1 000 trees - taller shrubs per hectare.
- The excavated surface will be a flat to gently sloping floor at 1 : 5 to 1 : 10 vertical to horizontal to enable a productive agricultural end land use at 0.5 to 1.0 metres above the highest winter water table
- The post-mining landscape should be stable with a minimum of wind erosion.
- The end land form should 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 native species on batter slopes.
- Depending on the success of rehabilitation, evolving community standards, and new research, the completion criteria may be adjusted to reflect emerging trends and also adjusted in terms of cover and species richness, depending on the results achieved and emerging technologies or techniques.

3.6 Closure Implementation

3.6.1 Closure of any ground under Rehabilitation

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 will be used for final closure and rehabilitation.

The closure of completed areas of the operations will be progressive with closure of all remaining ground at the end of operations.

Maintenance and monitoring will be conducted until completion criteria is met.

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

Progressive Closure of completed Stages of the Pit

Completion Criteria	**Activity**
	To be completed as soon as site activities have been completed on any area and that area will not be required for future operations.
• All conditions of approval from any agency will be complied with.	Prior to undertaking permanent closure. • Review the latest documentation and assess compliance requirements. • Design the rehabilitation to comply with, and be able to achieve the completion criteria and commitments. • Compile an audit table of all conditions and commitments that relate to closure and conduct an audit of those items upon the completion of each stage of rehabilitation and annually until sign off. • Visually audit against all conditions.
• No non natural structures will be retained on site. • All hardstand and road making materials and non natural inert materials are to be removed or buried. • All non inert materials are to be removed from site. • All ground once occupied by structures are deep ripped and soils reconstructed.	Prior to earthworks and rehabilitation; • Remove any plant or non natural materials and structures. • Remove all hydrocarbons and other fluids. • Audit of completed ground, to verify compliance. • Remove all non inert products. • Some concrete and other inert products may be removed or buried at depth and covered by overburden.
• Faces and the landform are to comply with DMP Guidelines and be safe and stable for the long term. • The land surface is to have a stepped	Prior to rehabilitation; • Complete activities to make the site safe. • Ensure that the batters are formed to comply with the requirements. • Ensure the floor is completed and formed to the proposed final contours. • Match the landform to the adjoining excavated and non excavated surfaces. • Deep rip the floors and batter slopes along contour. • Spread the overburden followed by topsoil.

landform with some rocky outcrops and similar to the natural form.	• Use weed treatment and dieback principles as required. • Spread any local native vegetation removed from ahead of excavation. • Provide fences, bunding and warning signs above faces as required. • Provide locked gates or access restraints as required. • Audit of completed ground, to verify compliance. • Visual observations of the landforms.
• Slopes are to drain to detention basins to allow water to settle and soak into the ground.	Prior to rehabilitation and during audits; • Inspect batter slopes, access points, pools and other features and inspect drainage and provide infiltration areas as necessary. • Form small internal sumps and detention basins to ensure all water is retained on site. • Visual observations of the landforms.
• Slopes and excavated areas are to be stable and free from erosion.	Prior to rehabilitation and during audits; • Inspect all areas and ensure the land surfaces and access points, are stable to erosion from wind and water. • Check the slope angles for compliance. • Visual observations of the landforms.
• All species used in rehabilitation are to be local provenance species suited to local sand soils and sloping sites.	Prior to rehabilitation of vegetated areas; • Provide additional topsoil or seed to increase the number and diversity of plants. • Spread vegetation fragments or harvested branches capable of providing seed sources from brushing where available. • Review the vegetation and add seed or additional tube plants as required.

• Habitat values that are capable of increasing with time, measured by soil development, soil litter increases, increased plant matter, cover, vegetation, structure and habitat niches.	During rehabilitation; • Ensure rehabilitation is conducted at a suitable time to achieve success. • If timing is not suitable undertake remediation earthworks such as re-ripping. • Use Dieback and Weed prevention methods. • Collect seeds from native vegetation well in advance and retain for rehabilitation. • Complete pre-rehabilitation weed control, normally in autumn. • Undertake rehabilitation within the first year following ground preparation (Normally within 6 months). • Determine the replanting and seed rates that are likely to achieve the Completion Criteria with an allowance for deaths (Normally 20%). • Determine whether plant protection devices are required and install as necessary. • Provide additional topsoil or seed to increase the number and diversity of plants. • Spread vegetation fragments or harvested branches capable of providing seed sources from brushing. • Add additional species as seed for those that do not germinate readily from top soil such as Proteaceous and *Eucalyptus* species. • Conduct an on site audit of completed rehabilitation for species richness, diversity and structure using standard 10 or 100m^2 plots of rehabilitation and adjoining vegetation. • Check for predators such as rabbit and goat impacts and treat accordingly through control, fencing, additional planting or other measures. • Conduct audits of the completion criteria upon the completion of each stage of rehabilitation and annually until sign off. • Maintain ongoing records. **Native Vegetation Buffer Belts** • Vegetation will be provided as a 25 metre wide buffer strip along the western and southern boundaries. Planting ratio of 1 000 trees - taller shrubs per hectare. Species richness of 5 species per 100 m^2 in all areas. **Pasture** Self sustaining pasture of species suitable for cattle or other grazing.
• The vegetation is to include a mixture of species that grow in local, soil substrates and be resilient to fire or readily regenerate following fire.	Prior to and During Rehabilitation; • Ensure that the species selected and rehabilitation techniques are chosen to provide species that are suitable for the soil conditions and will in time be able to regenerate after fire and become self sustaining. • Adjust species and rehabilitation methods to enable the completion criteria to be reached.
• The soils are to be constructed from overburden overlain by topsoil where available, leaf litter, vegetation fragments as available in areas of native vegetation.	Prior to vacating and during annual inspections. • Applies to the revegetated river banks • Conduct an on site audit of completed rehabilitation for species richness, diversity and structure using standard 100m^2 plots of rehabilitation and adjoining vegetation. • Conduct audits of the key indicators upon the completion of each stage of rehabilitation and annually until sign off, using lists and photographic records. • Maintain ongoing records. • Improve existing rehabilitated areas as necessary using additional seeding,

	tube planting and weed control. • Check damage by predators or disease and take remedial action. • Maintain ongoing records.
• Absence of Declared or Environmental weeds that could compromise the success of revegetation. • Exotic species to be no greater richness or density than adjoining vegetation.	This applies to all areas. • Add topsoil or vegetation fragments by brushing and other means or by transferring material from areas being cleared. • Monitor and allow time to naturally develop and transition through initial rehabilitation to a mature habitat.
• All conditions of approval from any agency will be complied with.	Annually; • Remove or spray environmental or declared weeds. • Provide annual inspections at the appropriate time of the year. • Provide annual follow up inspections and treatment at the appropriate time of the year.

3.6.2 Land Clearing

Tree Removal and plant removal

1. The trees and plants will be progressively removed ahead of each stage of clearing.

2. The loss of vegetation will be compensated for by the planting of many more trees and *Banksia* and native vegetation on the buffers when the site is returned to local native vegetation.

3. Vegetation clearing requires that all topsoil and any overburden is to be recovered as ground is cleared and spread directly onto an area to be rehabilitated or retained for use in rehabilitation. The topsoil is stored separately from the overburden.

4. A Clearing Permit under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* is required under the Regulations for the clearing of the scattered trees, and will be applied for.

5. None of the Clearing Principles are likely to be significantly at variance with the proposed clearing, excavation and rehabilitation.

Topsoil and Overburden Removal

Clearing and soil management will vary from area to area because of variations in the quality and quantity of top soil and the areas to be rehabilitated.

The aim will be for best practice rehabilitation of each area, although the actual methods could change from year to year or stage to stage. For example clearing of one stage could occur in summer but the next might be required in winter. Similarly the depth of topsoil and overburden will vary as will the extent of dieback within the soil.

6. Vegetation will be cleared ahead of excavation. The vegetation will be pushed into windrows.

7. Topsoil will then be stripped from the area under development and where possible spread directly onto an area to be rehabilitated. This can be undertaken at any time but needs to be balanced against the potential for dieback spread.

   Summer clearing can generate dust, and winter clearing can lead to the spread of dieback through water moving spores. Dust is a highly visible issue and it is likely to be easier to manage surface runoff than dust. Therefore it is proposed, where possible, to clear during wetter months using water management procedures to prevent run off. Note that clearing may be dictated by Main Roads time lines for the Great Northern Highway.

8. When stored topsoil is used it may be diluted and mixed with fresh topsoil.

9. The floor of the pit will be internally draining to a basal sump in later stages of excavation.

3.6.3 Land Restoration

The following procedures have been used in the past to restore the disturbed ground whether at the end of excavation, as part of ongoing rehabilitation or during premature closure. In summary the methods are;

- Rehabilitation is to occur as soon as possible following the end of excavation and other activities or as soon as a part of the operation is completed or no longer required.
- Where possible any disturbed areas that are no longer required will be rehabilitated using the methods described above within 12 months of becoming available.
- Runoff will significantly reduce as a result of rehabilitation of the excavated land. The form of the concept final land surface has taken account of the runoff and has been designed to minimise runoff from storm events and therefore manage erosion risk. It also aims to maximise infiltration of smaller rainfall events.

Pit faces – Geotechnical

- The land surface will be formed to the requirements of the *Mines Safety and Inspection Act 1994 and Regulations 1995* as a final land surface.
- All structures, plant and any other foreign materials will be removed from site.
- The pit will be prepared by pushing down, reducing and backfilling the active face with a loader, scraper or bulldozer.
- Steep slopes will be pushed down, although the batter slopes that form the level areas will be retained for future use.
- Overburden followed by topsoil will be spread directly from an area being cleared or from overburden stockpiles and placed over the land surface being restored. Any vegetation fragments will be either spread on top of the topsoil or spread with the topsoil.
- The backfilled materials will be track rolled by bulldozer where possible and covered by 600 mm of overburden to ensure that all inert and non – natural materials are covered. Some parts of faces and boulders will be retained to provide fauna habitat.

Hardstand, roads and other such areas

- All buildings, plant and any other foreign materials will be removed from site.
- Roadbase, hardstand and any other inert materials left over from the site operations will be scraped and picked up and will be used to backfill the pit faces. Note that the access road will be retained for future access.
- Steep or vertical slopes will be pushed down, although the batter slopes that form the level areas will be retained for future use.
- The floor will be deep ripped and formed at slopes of 1 : 5 to 1 : 10 vertical to horizontal.
- A minimum of 100 mm of topsoil will be spread over the surface where available to provide a substrate for agriculture.

- Where possible, overburden, followed by topsoil and recovered vegetation, will be spread directly from an area being cleared to an area being rehabilitated to minimise the potential for seed loss.

- Overburden from areas of thin soil, which contains topsoil and included seed load, will be spread across the surface.

- Where separate topsoil is available it will be spread across the overburden.

- Topsoil will be spread evenly across the rehabilitated areas in summer or early autumn prior to the winter rains. Stored topsoil rapidly loses seed viability and could be expected to be less than 50% effective if stored through one winter.

Stormwater Management

- As the excavation is in sand no particular stormwater management will be required. Any water that can flow will move or seep to the lower lying pasture areas that will not be impacted.

3.6.4 Revegetation

Vegetation Establishment

- ***Pre-Planting/Seeding Weed Control***

Pre-seeding weed control is only likely to be required where topsoils are used that contain weed species such as in the existing parkland pasture areas.

If required, this is normally only conducted after overburden and topsoil have been spread and any seeds have been allowed to germinate. Broadscale weed treatment can be detrimental to the germination and growth of native species but may be required if the weed load is to be reduced.

In May, after the first autumn rains, check for grass germination. Where grass has the potential to inhibit rehabilitation, such as areas to be returned to native vegetation, use a licensed contractor to spray with Fusillade or other suitable herbicide. In areas of parkland pasture, grass cover is desirable.

1. Any weeds likely to significantly impact on the rehabilitation will be sprayed with Roundup or similar herbicide or grubbed out, depending on the species involved. Weed affected topsoil and overburden will be buried. The Weed Management Plan will form the basis of weed treatment. Depending on the nature of the planting substrate, a broad spectrum spraying program may be used. In areas where grass only is a potential problem, grass specific sprays will be used. In some areas where topsoil from cleared native vegetation is available no spraying may be required.

2. See Weed and Dieback Management Procedures (following).

- ***Western Vegetation Belt***

The trees and shrubs will be established at two rows 3 metres apart between the rows and 3 metres between the trees, planted alternately to ultimately achieve a plant density of 1 000 stems per hectare.

Planting will be in ripped lines with the pasture killed to remove competition.

The species to be used for the 25 metre wide vegetation buffer to the west will be fast growing local native species such as listed below. Others may be substituted.

Tree	*T*
Shrub	*S*
Wet site species	W

Allocasuarina fraseriana	*T*
Corymbia (Eucalyptus) calophylla	*T*
Eucalyptus marginata (sandplain)	*T*
Eucalyptus todtiana	*T*
Banksia attenuata	*ST*
Banksia menziesii	*ST*
Banksia ilicifolia	*ST*
Actinostrobus pyramidalis	*S*
Adenanthos cygnorum	*S*
Acacia pulchella	*S*
Acacia saligna	*S*
Calothamnus quadrifidus	*S*
Calistemon phoniceus	*SW*
Eremaea pauciflora	*S*
Dianella divaricata	*S*
Hakea prostrata	*S*
Hakea trifurcata	*S*
Kunzea grabrescens	*S*
Jacksonia furcellata	*S*
Jacksonia sternbergiana	*S*
Stirlingia latifolia	*S*
Viminaria juncea	*SW*

- ***Excavated Areas***

1. 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.

2. Topsoil will be spread to increase the total organic carbon fraction, improving soil properties such as resistance to water and wind erosion and moisture retention.

3. Topsoil provides a useful source of seed for rehabilitation when the correct handling of the topsoil is used, stripped and replaced dry (autumn direct return).

4. However if sufficient seed is not available or does not germinate then additional seed will be added. The establishment of pasture, including the selection of the pasture species is appended to this Management Plan. The documentation is produced by the Department of Agriculture and Food.

5. For pasture land in this situation it is essential that the species are 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.

6. 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.

7. 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.

8. Studies have shown that topsoil stripping and placement is best undertaken in summer for maximum germination, but this raises the potential for additional dust generation from the fine humus particles.

9. Any weeds likely to significantly impact on the rehabilitation are to be sprayed with Roundup or similar herbicide or grubbed out, depending on the species involved. Pasture species may need to be sprayed with a grass specific spray such as Fusilade or a broad spectrum spray such as Glyphosate to reduce the competition with the revegetation.

10. If sufficient vegetation does not germinate from the respread top soil, the area will be seeded in early Autumn with a mixture of pasture species. The species will be selected on advice from a consultant or the Department of Agriculture and Food.

Fertiliser

1. Fertiliser is not always required and will add nutrients to the ground water. If used a fertiliser containing low nitrogen, low phosphorous and potassium, and trace elements, is recommended to be spread at rates of up to 100 kg/hectare, applied to rehabilitation areas in the year of planting.

2. Further investigation will be needed to determine suitable rates and the timing of fertilisation. It may be possible to integrate seed dispersal and fertilisation into a single pass. The fertiliser will need to supply macro-nutrients, phosphorus, nitrogen and potassium, and other micro-nutrients.

Irrigation

1. Experience by Landform Research has shown that, when completed well, there is no need for irrigation of the rehabilitation. It is cheaper to use additional seed than to install irrigation.

Erosion Control

1. Soil erosion occurs when soil is exposed and disturbed by wind or water. Erosion involves soil particles being detached from areas not adequately protected by vegetation, and moved down-slope or blown by the wind.

2. The soils are very permeable and runoff is normally minimal unless surface materials become non-wetting. Even so experience shows that there is minimal non wetting and surface particle movement under such conditions.

3. Water erosion on the batter slopes can be avoided by the permeability of the materials and by leaving the surface soft, rough and undulating, with the undulations running along contour. The final machinery run should be along contour and not down slope. No evidence of current erosion is present in the excavated faces.

4. Wind erosion will be controlled by rehabilitating the disturbed ground as soon as practicable and leaving the soils between 0.5 and 1.0 metres above the maximum groundwater that results from the partial drainage.

5. If wind erosion and soil stability become an issue measures will be taken to stabilise the soils. These could include but not be limited to, fence wind breaks, spray mulching, cover crops, interim native vegetation or spreading mulch and vegetation.

6. For rehabilitation areas, revegetation will take place as soon as possible following landform and soil reconstruction.

7. Cleared vegetation will be transferred from an area being cleared, to protect against erosion, assist with habitat creation and provide a seed source.

8. Control of wind erosion potential will be assisted by spreading brush and vegetation across the topsoil on the batter slopes and reconstructed soils where local native vegetation is to be established.

Monitoring

The revegetation will be monitored at least twice annually, that is before and at the end of each excavation campaign, to determine what work needs to be undertaken and to ensure that the required work is completed.

A weed monitoring and management program will be continued annually during operations and following closure to identify and control significant environmental weeds.

The revegetation will be monitored for 3 years post closure of each part of the pit or until completion criteria are achieved.

1. During late summer an assessment of the success of the rehabilitation will be made to determine the rehabilitation requirements for the following winter. This will be undertaken to the completion criteria listed above.

2. Monitoring will include visual assessments to determine the success of the rehabilitation and restoration, as follows;

    - pasture density
    - species diversity
    - plant growth
    - plant deaths
    - regeneration
    - insect attack and disease
    - weed infestation

3. As necessary steps will be taken to correct any deficiencies in the vegetation.

4. Rehabilitation of each stage will be monitored for a period of three years to ensure that the revegetation meets the completion criteria of providing self sustaining indigenous shrub vegetation.

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399,500mE 400,000mE 400,500mE 401,000mE 401,500mE 402,000mE

6,508,500mN 6,508,000mN 6,507,500mN 6,507,000mN 6,506,500mN

VEGETATION COMMUNITIES AND CONDITION

PP	Pine Plantation in Degraded condition over Completely Degraded to Degraded Understorey with patches of Good understorey
KgT	*Kunzea glabresens* Regrowth Thicket in generally Degraded Condition with some associated species
XpR	*Xanthorrhoea preissii* Regrowth monoculture in Completely Degraded Condition with some minor patches in Degraded Condition.
WtT	Wetland Ticket with typical wetland species such as *Melaleuca preissiana* and associated wetland species.

GAS PIPELINE EASEMENT

Lot 2233

Lot 2364

Lot 816

Brand Highway

Lot 2238

GAS PIPELINE EASEMENT

Lot 2125

Lot 815

Energy Place

XpR KgT PP WtT

Legend

- Development Boundary
- GasPipeEasement
- Excavation Areas

Figure 1 =- 8

Aerial Photograph

Lots 2233 & 2238
Energy Place, Muchea
PLAN PRODUCED: 25/10/2016
COORDINATE SYSTEM: GDA 1994 MGA Zone 50
IMAGERY SOURCE: Nearmap (April 2016)

W.A. LIMESTONE

NORTH

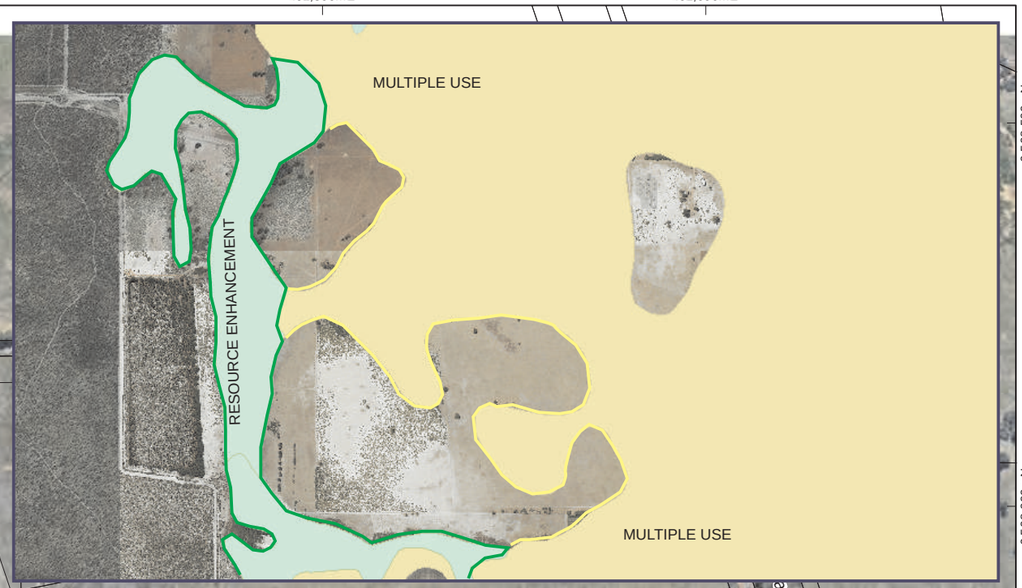
0 25 50 100 150 200 250 m

Scale at A3: 1:8,000

399,500mE 400,000mE 400,500mE 401,000mE 401,500mE 402,000mE

6,508,500mN 6,508,000mN 6,507,500mN 6,507,000mN 6,506,500mN

95 Sc
77 Sm
752
GAS PIPELINE EASEMENT
MULTIPLE USE
75 Sc
Lot 2233
Lot 2364
96 Sc
Drain cut through sand ridge
73 Sc
686
RESOURCE ENHANCEMENT
Dr
626
80 Sr
Drain cut through sand ridge
Lot 2238
GAS PIPELINE EASEMENT
Lot 2125
Lot 815
76 Sc
MULTIPLE USE
751
751
624
34 Sr
34 Sr
696
and Highway



34 Sr Wetlands from DOW database

696

WETLANDS IDENTIFIED ON DEPARTMENT OF WATER DATABASE

Legend

- Development Boundary
- GasPipeEasement
- Excavation Areas

Figure 1 - 9

Aerial Photograph

Lots 2233 & 2238
Energy Place, Muchea
PLAN PRODUCED: 25/10/2016
COORDINATE SYSTEM: GDA 1994 MGA Zone 50
IMAGERY SOURCE: Nearmap (April 2016)

W.A. LIMESTONE

NORTH

0 25 50 100 150 200 250 m

Scale at A3: 1:8,000

ATTACHMENT 2

Water Management Plan

Proposed Sand Excavation

Proposed Sand Excavation
For Perth – Darwin Highway

Lots 2233 and 2238,
Byrne Road, Muchea

Shire of Chittering

WA Limestone

February 2017

W.A. LIMESTONE

Landform Research
Land Systems - Quarries - Environment
ABN 29 841 445 694

SUMMARY OF WATER MANAGEMENT

Figures

See the Figures of the main report, listed below

HYDROGEOLOGY - WATER MANAGEMENT PLAN

1.0 Background

This Water Management Plan supports sand extraction from part of Lots 2233 and 2238 Byrne Road, Muchea and should be read in conjunction with the management plan for the proposed sand extraction.

The proposed excavation is tied to improvements in the agricultural capability of the land, and the provision of sand for the new Great Northern Highway which lies just to the east.

2.0 Water Quality Guidance Statements and Objectives

The Department of Water WQPN 15, Water Quality Protection Note "*Extractive Industries near sensitive water resources* 2009, provides guidelines for quarries within catchments.

For quarries in the south west the Department of Water *South West Region Guidelines Water Resource Considerations for Extractive Industries* provides guidance for extraction of sand from rural areas.

This land is a rural property that will continue to be operated as a cattle grazing property. The DOW Guideline is the most appropriate guideline for sand pits such as this in a rural area that will be used for agricultural purposes on completion of quarrying. The guideline recognises the need to have reduced separations to the winter water table and enables the sand to be cut lower to improve the pasture quality and agricultural capability.

The improvement of pasture is a key component of the proposed excavation. This is readily evidenced by an examination of the aerial photography of the site, which shows the existing sand ridges as having basically no pasture cover but the land of lower elevation has good quality pasture.

All facilities and procedures proposed on site are designed to comply with the DOW – DMP Water Quality Protection Guidelines for Mining and Mineral Processing and are all complied with;

- *Overview*
- *Minesite water quality monitoring*
- *Minesite stormwater*
- *WQPN 28 Mechanical servicing and workshop (2006)*
- *Mine dewatering*
- *WQPN Landuse Compatibility in Public Drinking Water Source Areas (2004)*
- *WQPN 15 Extractive Industries near sensitive water resources. (Not strictly relevant to the site but the methodology is useful).*

Guidance on the quality of water can also be found in;

- *Western Australian Water Quality Guidelines for Fresh and Marine Waters, EPA Bulletin 711, 1993.*
- *ANZECC, 1992, Australian Water Quality Guidelines for Fresh and Marine Waters.*

A number of documents provide guidance on the management and disposal of surface water that can lead to waterways, wetlands and underground water systems. These mainly apply to urban development but the methods are also applicable to the quarrying industry.

- *Engineers Australia 2003, Australian Runoff Quality, National Committee on Water Engineering.*
- *Stormwater Management Manual for Western Australia, Department of Environment WA, 2004.*
- *Guidelines for Groundwater Protection in Australia, ARMCANZ, ANZECC, September 1995.*

3.0 Geology and Geomorphology

The subject land is located on the eastern edge of the Perth Basin, approximately 3 km west from the Gingin Scarp which forms the eastern edge of the Plain at this location.

The eastern portion of the site, on which the alignment of the highway is located, is formed from a flat slightly undulating surface comprised of alluvial sands and clays of the Guildford Formation formed by the meandering of Ellen Brook and streams draining the scarps to the east.

See Perth Environmental Geology 1 : 50 000 Series, Yanchep and Perth maps, (Geological Survey, 1982 and 1986).

The sand resource is a series of sand ridges of Bassendean type sand which, by the vegetation, suggests yellow sands at depth under the core of the ridges, but which, from the limited soil auger holes, is leached white silica sand grading to light brown at depth.

The land surface drops from a higher ridge to 80 metres AHD in the west down to a swale of just above 60 metres AHD before rising to a low ridge at 64 metres AHD in the central east.

There are two main ridges, a higher ridge on Lot 2233 to nearly 20 metres above the land to the east, and a lower ridge of up to four metres elevation on Lot 2238.

A layer of friable, mostly weakly goethite cemented sand known as ‘coffee rock’ is commonly present at or just above the water table or historic water table. It commonly occurs on top of the sand clay interface.

4.0 Regolith and Soils

Site investigations have been conducted by Landform Research in September 2016.

The resource of Bassendean Sand is pale grey to white, and occasionally brown, moderately-sorted, fine to medium-grained quartz sand with traces of heavy minerals. There are minor amounts of goethite at the sand clay interface.

This is consistent with Lantzke N, 1997, *Phosphorus and nitrate loss from horticulture on the Swan Coastal Plain,* Department of Agriculture and Food Miscellaneous Publication 16/97.

The problem is that the leached white sand of the low ridges has very low land capability for agricultural purposes. A view of the aerial photography shows the sand ridges standing out as white relatively bare sand, whereas the low lying sand closer to the water table is green and covered by substantial pasture growth.

The subject land is part of the productive cattle grazing property and the conversion of the low agricultural capability sand ridges to productive use will lift the rural capability of this part of the property.

The land owner wants the land to be returned to productive pasture. Currently the sand ridges are too dry to hold water in summer and do not support pasture growth as can be seen on the aerial photographs.

Ideally the separation to the water table could be lowered to 0.5 to 1.0 metres which is proposed, and would enable better pasture growth and pasture to be maintained into summer. Lowering the sand ridge will increase the agricultural capability of the land.

In addition, by lowering the pasture land surface, capillary action will occur and the pasture will be able to gain soil moisture into summer. Capillary action allows for rises of soil moisture by 300 – 500 mm and, with root depth considered, land formed 0.5 to 1.0 metres above the groundwater will enable pasture to grow

This is consistent with Department of Water South West Region Guideline for Extractive Industries which is more applicable as the end use will be to agricultural activities and pasture. The groundwater policies for the Metropolitan area relate more to a developed or potentially development end use.

5.0 Climate

The climate of the area is classified as Mediterranean, with dry hot summers and cool wet winters.

Climate data is recorded at Bullsbrook, (Pearce RAAF). Precipitation is 688 mm per annum, of which 89% falls in the months April to October inclusive. At Swan Research Station evaporation exceeds rainfall in all but the four wettest months, and the situation at Bullsbrook can be expected to be similar.

Average maximum temperatures at Bullsbrook reach 33.3 degrees Celsius for the hottest months, January and February, but fall to 17.6 degrees Celsius in July. Average minima for the coldest month August, is 8.2 degrees Celsius.

The climate data for Bullsbrook shows that the predominant summer winds are from the east at 9.00 am and from the south west at 3.00 pm.

6.0 Water Source

The proposed excavation is linked to the re-alignment of the Great Northern Highway and will be used for that purpose. Requirements for water for dust suppression for the works will be limited and will be linked to the supply of water for the construction and dust suppression of the Highway.

Water for construction purposes may be able to be sourced from the existing surface supplies on site as a temporary measure during the construction of the Highway or will be brought to site as required.

Potable water is to be brought to the site as needed.

7.0 Hydrogeology

7.1 Background

There will be no alteration to drainage lines, and neither surface water nor ground water will be affected.

7.2 Surface Water

The location lies within the catchment of Ellen Brook, which lies to the east of the alignment of Brand Highway.

There is no surface drainage on the sand resource, due to the porosity and permeability of the sand from the sand ridges, although water does drain from the land at lower elevation from the ridges to the east of the proposed excavation.

The land surface drops from a higher ridge to 80 metres AHD in the west down to a swale of just above 60 metres AHD before rising to a low ridge at 64 metres AHD in the central east.

The sand resource is a series of sand ridges of Bassendean type sand, which, by the vegetation, suggests yellow sands at depth under the core of the ridges, but which from the limited soil auger holes is leached white silica sand grading to light brown at depth.

The land surface drops from a higher ridge to 80 metres AHD in the west down to a swale of just above 60 metres AHD before rising to a low ridge at 64 metres AHD in the central east.

There are two main ridges, a higher ridge on Lot 2233 to nearly 20 metres above the land to the east and a lower ridge of up to four metres elevation on Lot 2238.

There are intervening low areas between the sand ridges where the water table touches the surface in winter. Some of this has been trained in constructed drains. These are at elevations ranging from 57 – 58 metres AHD in the east to 62 metres in the west.

Drainage in the superficial aquifer is from the Gnangara Mound to the west, flowing east under the low ridges which represent the eastern most extensions of the mound.

When that superficial drainage touches the surface, east of the resource area, water flows commence as seasonal and permanent springs that flow east across pasture and eventually to Ellen Brook.

Examination of the aerial photography of the site shows leakage of the superficial aquifers east of the sand ridges as patches of dark green pasture in summer.

Water emanates from the ground between the two sand resources and drains south from the southern end of Lot 2233 and then east to eventually intersect Ellen Brook. A similar drainage feature drains from the northern portion of Lot 2233 and it also drain east eventually to Ellen Brook.

Both drainage lines appear to flow predominantly in winter, and during summer potentially dry up as the elevation of the groundwater lowers or are intersected by surface dams. Water flows therefore do not always reach Ellen Brook.

There are intervening low areas between the sand ridges where the water table touches the surface in winter. Some of this has been trained in constructed drains. These are at elevations which range around 60 – 61 metres AHD dropping from west to east.

See the figures showing the site elevations, existing contours, proposed future contours, section lines and rehabilitation, and Attachment 2 Water Management Plan.

The site lies within Surface Water Area 34 Swan River System.

See the figures showing the site elevations, existing contours, proposed future contours, section lines and rehabilitation.

7.3 Groundwater

On this site the near surface geology and hydrogeology is relatively simple; the Guildford Formation has low vertical permeability and acts as an aquitard, sitting beneath and interfingering with the overlying Bassendean Sand.

On the subject site the Guildford Formation, with a very thin and variable sheet of sand, occupies the portion east from the resource. The resource area lies on the interfingering zone between the Bassendean Sand and the Guildford Formation and the western edge is deeper Bassendean Sand.

On the other hand the overlying Bassendean Formation is an aquifer that sits near the surface and allows lateral movement of superficial groundwater to flow through it. The Bassendean Formation being the aquifer for the Gnangara Mound.

Groundwater from the Gnangarra Mound to the west, flows east at this location to emerge at the eastern edges of Lot 2233 as two winter or permanent seepages from which water flows east.

The weak and minor ferricrete and coffee rock that sits on the interface between the sand and clay may be causing localised minor confinement of the groundwater.

Elevation of the groundwater has been determined by establishing the winter water table in a wet time during September 2016 and by the drilling of soil auger holes to groundwater. From the available data the groundwater elevations and behaviour are well known.

The groundwater elevation drops from west to east, from 62.0 - 62.5 metres AHD, to 59 metres AHD in the east, touching the surface in winter on the lower wetter areas in the dune swale.

The elevation of the winter water table is some metres below the surface of the sand ridges leading to reduced sol moisture and areas of little summer pasture. The lower swale areas where the water table is closer to the surface maintain pasture into and through summer.

The moist sand allows pasture and plant growth which holds the sand and prevents its deflation by wind in dry times and in the past.

Where there is some upwards hydraulic pressure, from a confining layer, or the groundwater intersects the land surface, there is a permanent or temporary seepage or spring.

The proposed excavation will cut the floor to between 0.5 and 1.0 metres elevation of the winter maximum water table in line with Department of Water *South West Region Guidelines Water Resource Considerations for Extractive Industries.*

See the figures showing the site elevations, existing contours, proposed future contours, section lines and rehabilitation, and Attachment 2 Water Management Plan.

The land owner wants the land to be returned to productive pasture. Currently the sand ridges are too dry to hold water in summer and do not support pasture growth as can be seen on the aerial photographs.

The elevation of the superficial groundwater can be seen to be independent of the land surface because of the intermittent nature of the sand ridges with swales between. The groundwater surface is retained intact with the excavations and the calculations of the recharge show no significant difference with the recharge.

The main recharge that will impact on the flow rates is the use and draw from the Gnangara Mound to the west of the sand excavation away from the excavation and not impacted by it. Those groundwater uses and flows will be considered and maintained by the Department of Water Gnangara Groundwater Areas Allocation Plans (eg *DOW Water resource allocation and planning series Report No 30 November 2009).*

No groundwater will be drawn or will be used from west of the springs or the sand resource area.

The groundwater elevations will therefore not be impacted. See the section lines.

See the figures showing the site elevations, existing contours, proposed future contours, section lines and rehabilitation.

The superficial groundwater flow has high transmissivity vertically.

Department of Water 2010 *Murray Drainage and Water Management Plan* at Pinjarra places the transmissivity as 5 – 15 metres per day or around 9.2 metres per day for similar Bassendean Sand in a similar hydrogeological situation.

The land owner wants the land to be returned to productive pasture. Currently the sand ridges are too dry to hold water in summer and do not support pasture growth as can be seen on the aerial photographs.

Ideally the separation to the water table could be lowered to 0.5 to 1.0 metres and would enable better pasture growth and pasture to be maintained into summer. Lowering the sand ridge will increase the agricultural capability of the land. Capillary action in sand is around 600 mm and root depth of pasture is in the order of 300 – 500 mm depending on the species of grass, so a separation of 0.5 to 1.0 metres is ideal for better pasture growth.

The elevation of the groundwater is shown in the existing and concept final contour plans and sections.

7.4 Wetlands

Wetlands

There are a number of wetlands on site which were first identified in 1996 for the Wetlands of the Swan Coastal Plain Atlas. The wetlands remain on Department of Water Database. The EPBC database was also searched.

Wetlands on or near the proposed excavation are sumplands, meaning that they are seasonally inundated according to the mapping.

The actual ground conditions may not now be applicable due to changes to land use and water regime over the past 20 years. Any on ground changes are listed in the table below.

The Conservation category may also have changed and these changes are listed below.

In reality the wetland areas are small pasture areas where the winter groundwater touches the surface, but drops away in summer. The proposed excavation areas show the boundaries of the excavation as having buffers to the wetlands of around 30 lateral metres with the existing native vegetation remaining in that setback.

Category	Explanation	DOW - General Description
C	Conservation	Wetlands which support high levels of attributes and functions
R	Resource Enhancement	Wetlands which have been partially modified, but still support substantial functions and attributes
M	Multiple Use Wetland	Wetlands with few attributes remaining which still provide important wetland functions

Wetland	ID Number	Category	Area	Comments	Management
Dr 28	39951650783	R	39.4 ha	Low lying pasture with minor scattered shrubs of native vegetation to the north of the sand resources and outside the proposed excavation. Buffer of 100 metres to the eastern excavation.	Excluded from the excavation. Buffers of 50 to 150 metres to the wetland vegetation will be provided. There will be no impact on the vegetation, no drainage changes, no excavations below the water table and no changes to recharge that might impact on the wetlands.
626			Drainage line	A surface drainage line that lies inside native vegetation that grades to wetland vegetation, between the northern ends of the two resource areas. Setback will be > 50 metres from the drainage.	
623			Drainage line	A surface drainage line that lies inside Sr 34. Surrounded by native wetland vegetation. Setback will be > 50 metres from the drainage.	
686			Drainage line	Pasture - devoid of native vegetation. A drain that lies 100 metres north from the eastern resource and drains east to Ellen Brook.	
696			Drainage line	Pasture - devoid of native vegetation. A drain that commences from the end of Sr 34, some 150 metres south east from the eastern resource and drains east to Ellen Brook.	
Sr 34	39993650669	R	16.2 ha	Well vegetated with wetland species. Lies between the two resource areas and is excluded from excavation. Wetland setback will be 50 metres from the wetland species.	

The final land surface will be 0.5 to 1.0 metres above the winter water table.

Buffers of 50 – 150 metres are provided for all wetlands. On the mapping the excavation approaches the vegetation around the wetlands which is *Kunzea glabrescens*. The wetland vegetation is located inside the perimeter of the *Kunzea glabrescens* so that in effect a minimum of 50 metres buffer to the wetland vegetation will be maintained. Where necessary to achieve the minimum of 50 metres the excavation footprint will be reduced accordingly by slight modification as shown on Appendix 1.

There will be no impact on the wetland vegetation, no drainage changes, no excavations below the water table and no changes to recharge that might impact on the wetlands.

For additional information on the management proposed, see Attachment 2 Water Management Plan for information on water movements and other hydrological information.

Groundwater flow is west to east below the proposed floor of the excavations and that flow will be maintained.

There are no Tumulus Spring Communities impacted by this proposal and none within 1.5 kilometres to the south east.

7.5 Final Contours

The floor will be flat to gently sloping at 1 : 5 to 1 : 10 vertical to horizontal to enable a productive agricultural end land use.

The floor of the pit will be lowered to 0.5 to 1.0 metres above the highest water table to enable better soil moisture in summer and better pasture growth for continued agricultural production. The proposal is to stabilise the maximum water table by providing drainage to the dam/lake and then to cut to 0.5 to 1.0 metres above the stabilised elevation. See Figure 4 of the main text.

The separation distances are in line with the Department of Water South West Region Guideline for Extractive Industries which is more applicable as the end use will be to agricultural activities and pasture.

Dropping the separation to the land surface to the 0.5 to 1.0 metres above the highest known water table will result in the elevation being between 58.5 to 59.0 metres AHD in the east rising to 61.5 – 63.0 metres AHD in the west. See the Existing Contour Plan.

Measurements of the water table will be completed using small pits and/or piezometers installed in the floor during excavation.

Concept final batter slopes and a contour plan are attached. See the contour plans and sections.

7.6 Dewatering

De-watering of the pit will not be necessary because the water table will not be intersected because of on going monitoring, by monitoring bores and piezometers in the floor of the pit.

7.7 Recharge

Runoff and interception are functions of rainfall intensity and the infiltration capacity of surface soils, which in turn are determined by soil type, compaction and vegetation cover.

There will be no significant changes to the water balance. Recharge to groundwater should not increase because the site is pasture and will be returned to pasture.

The groundwater issues were considered by the *Environmental Protection Authority* in *Bulletins 512, 788, 821 and 818,* and whilst these do not specifically refer to the extraction of basic raw materials, and are for the Lake Clifton Catchment, they do consider the impact of clearing, planting trees and rural, residential developments. The figure the EPA used for recharge from native vegetation was 10 – 15% rainfall, whereas cleared land had a recharge of 30 – 40 %.

That is the recharge for this small piece of land, Lots 2233 and 2238, will have led to increased recharge on initial clearing. On the other hand the planting of pines on Lot 2233 will have tended to reduce the soil moisture to below that of *Banksia* Woodland. Removing the pines will therefore assist in returning the recharge to the pre- European condition albeit with the influence of climate changes imposed on it.

The land to the west remains as *Banksia* Woodland and will not be cleared. The only changes to the recharge on that land relate to groundwater use, and the planting and replanting of pines or native vegetation which are controlled by Government. The proposed excavation will not change the groundwater flow from the Gnangara Mound or water flows on this site.

DOW 2010, for example, calculates that the gross infiltration to the Superficial Aquifer in the Murray area is estimated to be 440 mm/yr, which is 49% of the annual rainfall based on 900mm annual rainfall. On this site, with an estimated recharge on the pasture land of say 30%, the annual recharge will be in the order of 200 mm.

Recharge from pasture is anticipated currently to be near 30% based on the vegetation and elevation above the water table. Recharge on excavated areas will also be in the order of 30% because of smaller separations to the water table based on the existing sand ridges accepting and retaining moisture from smaller rainfall events which do not reach the water table. (*Environmental Protection Authority Bulletins 512, 788, 821 and 818*). This will result in little change to recharge with excavation.

All rainfall will be retained within the excavated area and on the site because of the highly porous ground, the same as currently occurs on site.

The water table is not anticipated to change and, with the proposed final landform, the flow directions are also not anticipated to be affected.

It must be remembered that the available water is not that of pre-European conditions but rather a result of land clearing and planting to pasture. Recharge under native vegetation, in shallow sandy aquifers such as this, is commonly in the order of 10 – 15% rainfall. Under pasture that rises to 30 – 40%. EPA1995.

That means for an annual rainfall of 688 mm the recharge has increased by over 130 mm per year or 1 300 kL per hectare and is therefore well in excess of the pre-European situation.

As the current and end use are both pasture the current recharge is not anticipated to change significantly apart from small reductions caused by the planting of the tree and shrub belts.

There will be no alteration to drainage lines or groundwater. On closure the surface will continue to be free draining to the water table.

7.8 Salinity

Water quality has been monitored extensively on the Gnangara Mound and is found to be fresh and very good quality water.

7.9 Acid Sulfate Risk

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 forms the basis for much of the assessment procedures in Australia, including those adopted by the Western Australian Planning Commission and the Department of Environment Regulation. The *Acid Sulfate Manual* adopts the procedure of reviewing the published data followed up by field assessment, which has been completed for this site. If a geological risk is determined, then a Preliminary Acid Sulfate Assessment is conducted.

Acid sulfate only becomes a potential risk when a number of circumstances are present.

- There is rock, soil or regolith present that is carrying sulfides.
- Sulfide carrying materials from below the water table are to be exposed to the atmosphere.
- Excavation below the water table is to be carried out exposing the sulfide carrying materials to oxygen in the atmosphere.
- Dewatering of the sulfide carrying materials is proposed, exposing them to oxygen.
- Regolith conditions are already highly acidic, below pH4, under which oxidation can occur through electron exchange without the need for the presence of oxygen.

The site lies outside the mapping contained in WAPC Planning Bulletin 64.

There have been soils auger holes and site examinations which have found no evidence of peat, at risk materials or reducing soils on the resource site with which soil acidity was identified.

No drains or excavation are proposed to be cut below the water table.

In some other low lying parts of the Swan Coastal Plain the iron induration zones can contain organic material which by their reducing nature may hold sulfide sulfur and be acid sulfate generating on exposure to the atmosphere. The iron indurated materials on site are located above the water table which has been artificially raised following land clearing and is not organic enriched and contains no acid sulfate risk from site observations and the testing completed.

The peaty accumulations related to the older spring fed vegetation that occurs east of the resource site may contain sulfides but these will not be impacted either by disturbance, dewatering or changes to the groundwater and soil moisture.

The project has been designed to minimise or mitigate any potential impacts on groundwater elevations.

No soil or water acidity on the resource area has been observed that can be attributed to acid sulfate conditions.

Excavation will not occur below the water table so reduced materials, even if they occurred, will not be exposed to the atmosphere during excavation.

8.0 Protection of Catchments

Department of Water WQPN 15, Water Quality Protection Note "*Extractive Industries near sensitive water resources* 2009, applies to gravel, clays, hard rock, sand and limestone. It generally permits extraction within 3 metres of the highest known water table in sands such as at Gnangara. That separation is to protect the drinking water source supply.

The site lies outside the drinking water supply and lies downstream from the catchment areas.

In the south west, the Department of Water *South West Region Guidelines Water Resource Considerations for Extractive Industries* permits a final land surface of 0.5 metres above the highest winter water table. The south west guideline is more applicable to this site than the guideline WQPN 15 because the end use of the land will be to continued agriculture use.

The excavation of sand from the site complies with the DOW South West guidelines and uses the management actions wherever there is environmental benefit.

The protection of surface and ground water from contamination by hydrocarbons is viewed by WA Limestone as a critically important issue in managing its environmental responsibilities at this site. The company has examined this risk and adopted a range of policies and procedures to mitigate the impact of hydrocarbon spills on the environment.

All precipitation water is to be contained within the pit from where it will soak vertically downwards to the water table.

9.0 Water Quality Management

9.1 Surface Water Protection

All precipitation water is to be contained within the pit from where it will soak vertically downwards to the water table.

As noted above a 30 plus metre wide buffer separates the pit from the winter wet areas or nominated pasture wetlands.

Surface water is protected by the following procedures used for refueling, maintenance and other water protection measures.

9.2 Groundwater Protection

No chemicals are used apart from normal lubricants. Sand excavation is one of the few industries that are permitted to operate in a Priority 1 Public Drinking Water Source Area, indicating the clean nature of the activity. See Department of Water *Land Use Compatibility in Public Drinking Water.*

Groundwater is protected by the depth to the water table, and slow lateral flows through sand to nearby wet pasture.

The most accurate measurement of the water table elevation is the on site measurements through small test pits or piezometers to be installed in the base of the pit during excavation.

On site observations of the water table provide a basis for the pit design. See the Figures relating to the excavation showing contours and sections.

An aim of the project is to improve the land capability. The reason that 0.5 metre final separation is used is that any greater separation will not provide the same capillary action in the soils and will therefore reduce the productivity and capability of the constructed soils.

Soils which are able to access water through capillary action in spring and into summer hold better pasture and provide for improved pasture growth. The 0.5 metre separation between the completed land surface and the base of the pit complies with DOW Guidelines for the South West. However in the interests of being conservative a separation of between 0.5 and 1.0 metres is proposed.

9.3 Waste Rock and Tailings Management

There will be no washing of products. Subgrade materials will be used for subsoil restoration or used for perimeter bunding and landform restoration.

There will be no waste rock or tailings from the sand, but there may be some natural interburden that will be placed in completed sections of the pit.

9.4 Unauthorised Access and Illegal Dumping

The potential for rubbish to be dumped relates to unauthorised access to the site. Access is restricted by perimeter fencing and locked gates as part of the normal rural property. As part of that land use the fences are maintained and upgraded as required.

The site is not near Brand Highway but will continue to be regularly patrolled as part of normal farming operations.

Any illegally dumped material will be promptly removed and taken to an approved landfill or other suitable site, depending on the nature of the material.

Waste generated on site is to be recycled wherever possible and periodically disposed of at an approved landfill site.

9.5 Solid Domestic and Light Industrial Waste

All solid domestic and light industrial waste will be 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 are sealed so that rainfall cannot enter and, as needed, impermeable, therefore preventing the formation of leachates or loss of fluids.

9.6 Wastewater Disposal

A serviced portable toilet system is to be used during operational campaigns.

This complies with *WQPN 15 Extractive Industries near sensitive water resources.*

9.7 Refuelling

Extraction of sand is a clean operation in the nature of the risk to groundwater. No chemicals are used for sand extraction apart from normal lubricants. Sand excavation is one of the few industries that are permitted to operate in a Priority 1 Public Drinking Water Source Area, indicating the clean nature of the activity. See Department of Water *Land Use Compatibility in Public Drinking Water Source Areas.*

WA Limestone have in place safety and pollution management procedures for all their operations. These are summarised below.

All spills are to be cleaned up in accordance with the summarised procedures following.

> *Documents specific to the fuel and maintenance are the DOW – DMP Water Quality Protection Guidelines for Mining and Mineral Processing*
>
> - *Mechanical servicing and workshop facilities*
> - *Above-ground fuel and chemical storage*
> - *WQPN 28 Mechanical servicing and workshop (2006)*
> - *WQPN 15 Extractive Industries near sensitive water resources.*

A list of the management actions for maintenance is provided. The actions will be used where applicable and as the opportunity presents to maintain water quality on this site.

Refuelling - Fuel Management Plan

Refuelling will use dedicated mobile fuel tankers. There will be no onsite fuel storage. This method is undertaken on most mine and construction sites as well as many farming properties.

Over 90% of the hydrocarbons consumed on site are within earthmoving machinery and there are minor quantities used in small stationary engines, which generate power or drive water pumps. The balance of approximately 10% is consumed by road transport vehicles which remove sand from the site.

To minimise the risk of contamination, WA Limestone will not store any bulk fuel on site.

All fuels and lubricants will be delivered to site on a purpose built service truck which dispenses fuel and oils to the earthmoving equipment on demand. Diesel is dispensed to the machines via a "Wiggins" filling system, which is designed to automatically shut off fuel delivery once the machine storage tanks are full. This prevents wastage of a valuable resource and ensures over filling does not occur during this procedure.

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.

The only other risk is from a tank rupture, but tanks are designed to manage this eventuality. Soil contaminated by large spills will be removed from the site to an approved disposal area.

- Refuelling will be carried out in accordance with DOW – DMP Water Quality Protection Guidelines for Mining and Mineral Processing, *Mechanical servicing and workshop facilities* and *Above-ground fuel and chemical storage*.
- Soils and 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.
- The operators of the mobile refuelling facilities (SWP) are trained in re-fuelling duties including the management of any spills.
- Refuelling and lubricating activities are to occur in the base of the pit, and equipment for the containment and cleanup of spills is to be provided. The mobile facilities are equipped with adsorbent mats and products (attapulgite) to be used in the event of spills.
- 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).
- Transport chemicals in accordance with the Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code).
- All on site refuelling is to take place from vehicles compliant with, and in accordance with, the *Dangerous Goods Safety Act 2004* and the relevant Regulations.
- 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. Soil and resource will quickly be placed around the spill to contain it in as small an area as possible. When contained, the contaminated materials will be scooped up and removed to an approved landfill or other approved site.

Spill Management

1. Fuel and maintenance will be carried out in accordance with the DER – DMP Water Quality Protection Guidelines for Mining and Mineral Processing, *Mechanical servicing and workshop facilities* and *Above-ground fuel and chemical storage*.

2. Soils and 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.

3. Refuelling and lubricating activities are to occur on natural elevated land above the perched seasonal water table, and equipment for the containment and cleanup of spills is to be provided.

4. 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).

5. All significant adverse incidents (such as a fuel spill of >5 litres in one dump), are to be recorded, investigated and remediated. A record is to be kept of incidents, and DER, DOW, Local Authority and Department of Water notified within 24 hours of an incident.

6. In the event of a spill or adverse incident, activities will be stopped in that area until the incident is resolved.

7. Any spills will be contained by the excavation. Soil and resource will quickly be placed around the spill to contain it in as small an area as possible. When contained, the contaminated sand will be scooped up and removed to an approved landfill or other approved site.

9.8 Dangerous Goods and Hazardous Substances

There is no transport, storage or handling of hazardous materials involved in sand extraction apart from fuel.

9.9 Servicing and Maintenance

The following actions will be used where applicable and as the opportunity presents to maintain water quality on this site.

- All major servicing of vehicles will be conducted off site. Minor servicing, such as repair of a hydraulic hose, will be conducted in dedicated areas on the natural land surface with protection measures in place.

- Waste oil and other fluids derived from the routine maintenance of mobile machinery will be transported off site and disposed of at an approved landfill site. Grease canisters, fuel filters, oil filters and top-up soils will be stored in appropriate containers in a shed or brought to the site as required.

- Vehicle wash down is not proposed.

- Regular inspections and maintenance of fuel, oil and hydraulic fluids in storages and lines will be carried out for wear or faults.

- Servicing plant and equipment will be in accordance with a maintenance schedule.

- Accidental spill containment and cleanup protocol will be implemented. This will normally take the form of scooping up the contaminated material and removing offsite to an approved waste facility.

- Rubbish generated is to be recycled wherever possible and periodically disposed of at an approved landfill site.

- The site will be maintained in a tidy manner by removing all rubbish regularly offsite.

- All surface water will be held on site in the dam in the base of the pit.

- All significant adverse incidents (such as a fuel spill of >5 litres) in one dump, are to be recorded, investigated and remediated. A record is to be kept of incidents and the Local Authority and Department of Water notified within 24 hours.

- The only other risk is from a tank rupture, but tanks are designed to manage this eventuality. A commitment is made to notify Department of Water and Local Authority of any spill greater than 5 litres in one dump. This is much less than the DOW requirement trigger of 100 litres. Soil contaminated by large spills will be removed from the site to an approved disposal area.

10.0 Monitoring

The two main aspects of monitoring are;

Ongoing monitoring using the existing monitoring bores and installed piezometers on the floor of the excavation to determine the maximum winter water table across the site and ensure that the excavation is maintained 0.5 – 1.0 metres above that level.

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ATTACHMENT 3

Offsite Impacts Plan

Proposed Sand Excavation

Lots 2233 and 2238, Byrne Road, Muchea

WA Limestone

February 2017

Landform Research
Land Systems - Quarries - Environment
ABN 39 841 445 604

OFFSITE IMPACTS MANAGEMENT PLAN

1.0 Visual Management Plan

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.

There are a number of management actions that can be taken in quarries to minimise visual impact and these will be used wherever possible. The general management actions are summarised below together with the visual impact issues that relate to this site. The actions will be used where applicable and as the opportunity presents to minimise visual impact.

The site is set well back from Brand Highway by 2 kilometres.

Buffer distances to the closest dwelling is over 500 metres to the south and south east from the eastern resource. The buffer from the western resource is over 1 kilometre.

The excavation of sand from the site therefore complies with the EPA Buffer Generic Guidelines of 300 – 500 metres.

Excavation will operate from the floor of the pit working west into the face of the pit on the western resource and to the south and perimeter of the eastern resource. Excavation will push towards the perimeters behind the existing faces, with the floor being progressively lowered.

IDEAL OPERATIONAL PROCEDURES	COMMITMENTS ON ACTIVITIES CONDUCTED ON SITE
• Locate exposed features behind natural barriers and landform.	• This is proposed.
• Operate from the floor of the pit below natural ground level.	• This is proposed.
• Avoid breaks in the skyline due to workings and haul roads.	• The excavation areas are below the higher natural ground features.
• Push overburden and interburden into positions where they will not be seen or can form screening barriers.	• Perimeter bunds are proposed from a safety perspective and for visual management on this site.
• Stage workings and progressive rehabilitation to provide visual protection of later activities.	• The staging and direction of excavation towards the western and southern faces will assist visual management from the closest dwelling.
• Adopt good house keeping practices such as orderly storage and removal of disused equipment or waste.	• This is committed to.
• Provide progressive rehabilitation of all completed or disturbed areas.	• Rehabilitation to progressively stabilise the excavated ground with pasture is proposed. • Other vegetation and rehabilitation belts will be established progressively.
• Minimise the amount of ground used at any one time.	• This is proposed. Only ground required for excavation will be prepared for excavation with an additional area for support.
• Install fences and gates, which are compatible with the style of the area.	• The resources lie on agricultural land that is fenced with farm style fencing.
• Minimise offsite impacts of night lighting.	• Night operations are not proposed.
• Paint and maintain visually exposed buildings, plant and equipment with low impact colours.	• Portable storage facilities if required will be located on the floor of the pit in the north of the excavations.
• Locate roads and access to prevent direct views into the site	• The only new roads proposed will be the short access road directly to Byrne Road. • Transport of sand will be along the access road to Byrne Road and then to Brand Highway.

• Ensure transport vehicles do not spill material on public roads and ensure prompt cleanup if it occurs.	• Company practices and drive/operator training will address the need to minimise spill by ensuring the trucks are not overloaded. • Collection of spills is to be carried out when reported. • Drivers are to be instructed to be responsible for their loads.

Light Overspill

It is not proposed that the facility will operate at night. The only lighting that might be required at night will be security lighting. However the operational hours will be determined by Main Roads and their time frame for the supply of construction sand, and that may require night time activities.

Summary

Visual impact is regarded as low and WA Limestone is committed to minimising visual impact and will implement the measures outlined.

2.0 Noise Management Plan

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

The *Environmental Protection (Noise) Regulations 1997*, require that sensitive premises including dwellings in non industrial areas are not subjected to noise levels exceeding 45 dBA for more than 10% of the time, 55 dBA for more than 1% of the time and never exceeding 65 dBA during normal working hours. There are penalties for tonality of 5 dB, modulation 5 dB and 10 dB for impulsiveness, although impulsiveness is not likely to be relevant.

Occupational noise associated with the quarrying processes falls under the *Mines Safety and Inspection Act 1994 and Regulations 1995.* 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. Regular site audits of quarry and mining operations are normally conducted by the Department of Mines and Petroleum.

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.

There are a number of management actions that can be taken in quarries to minimise noise generation or travel and these will be used wherever possible. The general management actions are summarised below together with the potential noise impact issues that relate to this site. The actions will be used where applicable and as the opportunity presents to minimise noise on this site.

The *Environmental Protection (Noise) Regulations 1997*, 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 Sunday 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.

Influencing factors are external noise and nearby land uses such as busy roads, and industrial properties. *Schedule 1 of the Environmental Protection (Noise) Regulations 1997* provides for the premises of excavations to be provided with an industrial influencing factor in the calculation of assigned noise levels, by way of the 100 and 450 metre influencing factor circles.

Under *Schedule 1 of the Noise Regulations* the premises on which the extraction of basic raw materials, such as sand and limestone, is occurring 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*.

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.

Having said that, the closest dwelling is 700 metres south from the eastern resource, behind the face of the sand excavation. With a loader or loaders loading from the face the face will provide noise screening for the excavation. The engines and fans of the loaders, which are the noisiest part of the activity, will be pointing north as the loader will approach the face from the north. Based on other sand operations at 500 metres the extraction of sand will easily comply with the Noise Regulations for daylight hours.

The buffer distances to the closest dwellings are over 500 metres which complies with the EPA Buffer Generic Guidelines for sand excavation without supporting information. The mine planning is also designed to keep the excavation at the lowest end of noise impacts in terms of orientation and activity. Note that the majority of the excavation will have over 500 metres separation.

Excavation adjacent of the face will be well screened by the face itself. Sound travels mostly similar to lines of sight and is mitigated by solid barriers. The walls of the pit and bunds will form barriers that reduce noise transmission.

If activities are required prior to 7.00 am, and the operations do not comply with the night time noise regulations, a number of contingencies are available to mitigate noise towards the dwelling if required;

- Loader orientation from the east, which is required for safety.
- Measurement of sound levels and the provision of a low bund along the western side of the excavation to provide additional screening for the loader.
- Excavation of the pit in stages that regulates the locations where activities can occur prior to 7.00 am.
- The sand excavation is likely to be classified as construction, and exemption from the Noise Regulations may be available to Main Roads.

The excavation operations will incorporate the procedures listed below wherever possible to minimise noise emanation from on site activities.

If a screening plant is used, it will be located 500 metres from the closest dwelling, located on the floor of the pit, behind appropriate perimeter bunding as necessary to minimise noise carry.

Normal Quarry Management

The following table summaries the methods that are normally used in quarries to minimise unacceptable noise generation.

IDEAL NORMAL OPERATIONAL PROCEDURES	COMMITMENTS ON ACTIVITIES CONDUCTED ON SITE
• Comply with the *Environmental Protection (Noise) Regulations 1997.*	• The Regulations will be complied with. • Hours of operation will be determined by the requirements of Main Roads. • These are anticipated to be 6.00 am to 5.00 pm Monday to Saturday excluding public holidays. • It is anticipated that the construction of the Highway will be classified as construction noise and the sand excavation is anticipated to be exempt from the Noise Regulations. • Even so experience, buffers and the location of the only sensitive premises demonstrate that the operations will be capable of compliance and have sufficient flexibility to be brought into compliance

	during pre 7.00 am operations.
• Maintain adequate buffers to sensitive premises.	• The closest dwellings are located 500 metres from the edge of the pit, which means that most operations are further away • Any screening plant if required will be located 500 metres from dwellings. • The proposal complies with the EPA Generic Buffer Guidelines.
• Locate exposed features behind natural barriers and landform.	• The buffer, perimeter bunding and landform provide noise screening and orientation of the excavation will be used.
• Operate from the floor of the pit below natural ground level.	• This is proposed.
• Push overburden and interburden dumps into positions where they can form screening barriers.	• Perimeter bunding is proposed where required along the southern boundary of the eastern resource to provide maximum noise screening, such as along the side of the excavation.
• Design site operations to maximise the separation and protection from sensitive premises.	• The location of the excavation and the methods to be used have been selected to minimise noise generation and carry, by excavation from east to west into the face.
• Maintain all plant in good condition with efficient mufflers and noise shielding.	• The use of modern new equipment that is maintained in good condition is proposed.
• Maintain haul road and hardstand surfaces in good condition (free of potholes, rills and product spillages) and with suitable grades.	• This is committed to. • The only transport will be along a short access road to Byrne Road and then to Brand Highway.
• Implement a site code outlining requirements for operators and drivers.	• Site induction and training for all personnel is proposed.
• Use equipment that will minimise noise generation.	• Quiet mobile plant will be used.
• Shut down equipment when not in use.	• This is used and proposed to save fuel and maintenance costs in addition to noise minimisation.
• Scheduling activities to minimise the likelihood of noise nuisance.	• Hours of operation will be determined by the requirements of Main Roads. • These are anticipated to be 6.00 am to 5.00 pm Monday to Saturday excluding public holidays.
• Fit warning lights, rather than audible sirens or beepers, on mobile equipment wherever possible.	• Lights or low frequency frog beepers are to be used rather than high pitched beepers to restrict noise intrusion.
• Use transport routes that minimise community disruption.	• There is no alternative transport route but the chosen route will be short and restricted. • Truck drivers are to be instructed to be aware of dwellings along the roads and the need to minimise noise and travel at safe speeds.
• Avoid the use of engine braking on product delivery trucks in built up areas.	• Truck drivers are to be instructed to minimise the use of engine braking.
• Minimise and conduct at the least disruptive times, non day to day activities such as vegetation, topsoil or overburden stripping on exposed ridgelines.	• Quarrying and processing operations are to be completed during normal working hours.
• Provide a complaints recording, investigation, action and reporting procedure.	• A complaints recording and investigation procedure is proposed. • See 5.0 Complaints procedure.
• Provide all workers with efficient noise protection equipment.	• All personal noise protection equipment will be provided to staff.

Summary

Landform Research

The risk of noise impact on sensitive premises is low.

The proponent will work to Main Roads requirements and is committed to minimising noise emissions and will implement the measures outlined.

3.0 Dust Management Plan

Excessive dust has the potential to impact on both the workers and the adjoining land.

Dust can originate from a number of operations and may impact on onsite workers, or travel offsite. Potential dust impacts are addressed by reducing the dust generated from the quarrying, processing and transport operations.

The proposed operations are similar to other sand pits.

There are a number of management actions that are used in quarries to minimise dust generation or travel and these will continue to be used wherever possible.

3.1 Environmental Dust

- **Background**

Excessive dust has the potential to impact on both the workers and the adjoining land. However the potential generation of dust must be taken in context.

There are a number of key aspects to dust impacts;

- What is the source of particles?
- What is the potential for the particles to be disturbed?
- What is the nature of the particles and how are they likely to behave?
- What types of impacts are the particles likely to have if they move?
- What management actions can be used to mitigate or reduce dust impacts?

Fine particles are a natural part of our environment and are present in soils, pollens, fragments of vegetation and many other sources. It is when the fine particles are excessively disturbed that there becomes concern for the potential impacts, whether they are nuisance or health risks.

The most common form of disturbance is by human impacts. In this local area agricultural soils and limestone roads have the most potential to expose fine particles to disturbance by machinery and vehicles.

In many situations the fine particles are stablised by vegetation, soil microbial materials and reactions and interactions between particles. Once disturbed however dust can be generated and may continue to be a problem until the fine particles are wetted down or return to a relatively stable condition.

The risk of dust assumes no treatment. With effective treatment of dust by water, which is proposed, the risks of onsite, and consequently offsite, dust are minimised.

Sand stays moist even into summer if capillary action of moisture is available or there is no vegetation to suck the moisture from the soil.

The main dust risk is from vehicle movements on the pit and short haul road, which contributes to occupational dust.

When occupational dust is managed then environmental dust is also minimised. The main risk is the traffic which relates to occupational health and safety that is controlled under the *Mines Safety and Inspection Act 1994*.

The main methods of dust control are awareness of the issues on a day to day and hour to hour basis as activities on site change. The most appropriate dust management procedures are then chosen to minimise occupational dust and environmental dust. Ongoing site awareness will be combined with a commitment to take whatever action is appropriate.

- **Assessment of Dust Risk**

Dust Guidelines

Dust management is an integral part of the extraction of sand. Facilities and procedures are updated as better technology becomes available.

Occupational dust associated with the quarrying processes falls under the *Mines Safety and Inspection Act 1994 and Regulations 1995* overseen by the Department of Mines and Petroleum.

Dust emissions fall under the *Guidance for the Assessment of Environmental Factors, EPA, March 2000*. Assessments of the potential dust risk are normally made using the Land development sites and impacts on air quality, *Department of Environmental Protection and Conservation Guidelines, November 1996.* These are still in place but are incorporated into the *DEC (DER) 2011 Guideline for Managing the Impacts of Dust and Associated Contaminants from Land Development Sites, Contaminated Sites Remediation and other Related Activities.*

The key Environmental Objectives for the operations are;

- Manage the potential for the generation of dust.

- Visually monitor dust levels and take steps to reduce the potential impact of dust on occupational and environmental aspects of the operation and local area.

Onsite Risks

Excessive dust has the potential to impact on both the workers and the adjoining land. From sand extraction the main particles are sand sized particles from the sand. These are normally in excess of 0.5 mm and have a capability of moving by saltation and do not travel far, being easily stopped by vegetation, pasture, small banks or other features. There is no evidence of sand movement or erosion on site.

The only material that can blow further is the fine organic particles in the topsoil during clearing and reinstatement.

Therefore risk is greater during land clearing and reinstatement and vehicle movements in the summer months. The haul road will be watered as necessary to reduce the generation of dust in the drier months.

Through the winter months of May to September inclusive, there will be little dust risk because rainfall exceeds evaporation. The rainfall is sufficient to wet the whole soil profile to depth, with excess water reaching the water table.

In summer, when evaporation exceeds rainfall, soils dry out and the road base on the access roads can be crushed by repeated vehicle movements. However in elevated and dry stockpile areas or trafficked areas where the clay can dry out and be crushed there is potential for dust to be generated. Most of this dust is regarded as nuisance dust.

The potential impacts are assessed for the sensitive premises to the west, under the worst possible scenario.

The prevailing winds in summer are from the south to south west, particularly in the afternoon and in summer the easterly winds in the mornings can be quite strong.

Winter winds are more variable and on average lighter, but have an easterly predominance.

The dwelling is not in line with the afternoon winds but is partially in line with the morning easterlies.

The main methods of dust control are awareness of the issues on a day to day and hour to hour basis as activities on site change. The most appropriate dust management procedures are then chosen to minimise occupational dust and environmental dust. Ongoing site awareness, combined with a commitment to take whatever action is appropriate, is more satisfactory than occasional sampling and monitoring by equipment. Dust management requirements change rapidly during excavation, and sampling at one time is unlikely to reflect the conditions at another time.

On site sampling can also present difficulties in determining where the particles have come from.

A water tanker will be maintained on site during excavation when there is a risk of generating excessive dust. The water will be used to settle dust on the pit floor and to reduce the dust emanating from any crushing operation.

Apart from the initial land clearing and surface reinstatement, all operations will be conducted below natural ground level. Bearing in mind the distances involved and the dust suppression methods in place, dust should not impact on any dwellings.

Tree Belt - Buffers

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. See *Planning Guidelines Separating Agricultural and Residential Land Uses, Department of Natural Resources Queensland 1997(Pages 65 – 111) and Department of Health WA, 2012, Guidelines for Separation of Agricultural and Residential Land Uses* which uses the same criteria *(Pages 112 – 118).*

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

The Guidelines provide for a buffer of 300 metres for open agricultural land, 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.

A minimum of 500 metre buffer distances is available which complies with the Guideline and the Queensland research.

DER Dust Risk Calculation

The category of dust risk is included in *DER 2011 Guideline for Managing the Impacts of Dust and Associated Contaminants from Land Development Sites, Contaminated Sites Remediation and other Related Activities.* This document is not really applicable to mining because it is to be used to assess the mitigation required based on no mitigation.

It must be remembered that this guideline is not really appropriate for quarries. It was developed for subdivision earthworks at a time when dust management was a lower priority.

All quarries have active and comprehensive dust management procedures in place and are required to do so to protect visual amenity and their staff. The Guidance has been used, but factored in is a reasonable amount of dust management. Using the normal dust management there is a negligible risk of dust impacting on sensitive premises to the west of the quarry.

- **Dust Risk Assessment from DEC (DER) 2011**

PART A Number	Item	Score
1	Nuisance potential of the material	Medium – 4 (moving topsoil) Low – 2 for normal sand excavation Reduced in winter
2	Topography and vegetation screening	Moderately to Well screened – 1
3	Area of site activities	Operational trafficked areas are 1 to 5 ha - 3 5 – 10 hectares - 6
4	Type of work being undertaken	Considering the natural moisture content of the sand; partial earthworks – 9
	Summer total without dust measures for 5 – 10 hectares	18
	Summer total with dust measures	20

PART B Number	Item	Score
1	Distance to sensitive premises	500 metres to 1 km - 6
2	Effect of prevailing wind	Not affected by prevailing winds - 1
	Summer total without dust measures	7
	Summer total with dust measures	7

Activity	Calculated Score	Allocated Risk of Dust
Land Clearing and excavation without dust suppression.	126	Classification 1 Negligible Risk for all excavation. The recommended actions are included in the Dust Management Program.
With dust suppression	140	Classification 1 Negligible Risk for all excavation. The recommended actions are included in the Dust Management Program.

3.2 Occupational Dust

Occupational dust associated with the quarrying processes falls under the *Mines Safety and Inspection Act 1994 and Regulations 1995* overseen by the Department of Mines and Petroleum.

WA Limestone will provide induction and protective equipment for all persons on site.

The DMP require personal dust monitoring to ensure dust levels comply with health risk guidelines.

The dust management procedures to be used on site comply with these guidelines.

3.3 Dust Management

3.3.1 Issues and Management

Actions that can be used to prevent or mitigate dust are standard quarry best practice and will be used on this site on an ongoing basis. Some methods are taken from the DER 2011 Appendix 2 and others from quarry best practice.

Methods that are available, and will be selected from, are listed below although some may not be available such as the timing of the excavation which will be dictated by Main Roads. The most effective by far is the use of water management from a water truck, sprinklers, water canon, water sprays and mists or other such mechanism.

DESIGN AND SITE

1. Minimising the amount of ground open.
2. Minimising the amount of ground being subject to traffic.
3. Locating access roads away from sensitive premises.
4. Design of the pit to reduce wind speed and potential dust lift off.
5. Maintaining effective setbacks.
6. Constructing perimeter bunds to reduce wind speed.
7. Providing wind break fencing generally and on top of bunds as required.
8. Maintaining a secure, fenced site, to prevent illegal access.
9. Rehabilitate and stabilise all completed areas as soon as practicable.
10. Clearing and replacing topsoil and overburden during wetter times when possible; April to October.

OPERATIONS

11. Locate active areas away from windy locations.
12. Locate active areas away from sensitive premises.
13. Working on the floor of the pit.
14. Operate some parts of the pit only when conditions are suitable.
15. Locating mobile plant and stockpiles in sheltered areas.
16. Design staging to minimise dust risk.
17. Conduct higher dust risk operations such as topsoil clearing and placement during more favourable conditions.
18. Shut down equipment that is not required.

ACCESS AND HARDSTAND

19. Constructing the access roads from hard materials that resist dust generation.
20. Maintaining a water truck on site for road and other wetting down when deemed necessary by the site manager.
21. Using a sealant such as a polymer, chemical or emulsified oil on the access road to reduce water use.

PROCESSING

22. Applying water sprays and additives to screening cycles.
23. Providing screening, shielding or misting on mobile plant.
24. Use and maintain filters on all suitable plant.
25. Ensure regular appropriate emptying of filter collection devices.
26. Use water mist sprays where appropriate at fall points and other locations where dust may be generated.

STOCKPILES

27. Minimise the number of stockpiles.
28. Maintain stockpiles in sheltered areas.

29. Reduce the elevation of stockpiles.
30. Limit the drop height to stockpiles and loading.
31. Locate finer products inside or screened by stockpiles of coarse materials.
32. Locate stockpiles away from sensitive premises.

TRANSPORT

33. Cover all loads when fine materials are carried.
34. Ensure all trucks are dust free and not carrying pebbles and other materials outside the tray.
35. Choose the best transport routes.
36. Wet down or sweep the cross over and access roads.

HEALTH AND COMMUNITY

37. Maintain air conditioned cabins on all vehicles.
38. Provide a readily auditable trigger of no visible dust to cross the property boundary in line with the current DER Licence and best practice in WA.
39. Provide a comprehensive visual monitoring program.
40. Conduct effective site induction and awareness training for all staff.
41. Training will include observation and mitigation where possible of all dust emissions.
42. Providing a complaints investigation, mitigation and recording procedure.
43. Liaising with the owners/operators of the nearby sensitive premises.
44. Ceasing operations when conditions are not favourable or when visible dust is crossing the boundary.
45. Obtain the latest weather conditions to increase the awareness of dust risk.
46. Cease operations during adverse weather conditions.
47. Operate during wetter months or when the soils are moist.

DUST MANAGEMENT ACTIONS

ACTIVITY	POSSIBLE RISK SEVERITY and FREQUENCY	IDEAL OPERATIONAL PROCEDURES	COMMITMENTS ON ACTIVITIES CONDUCTED ON SITE	RISK AFTER MANAGEMENT
GENERAL				
Legislation	----	• Comply with the provisions of the Mines Safety and Inspection Act 1994 and Regulations 1995.	• The proponent will comply with the Act and Regulations at all their pits.	----
Buffers	----	• Maintain adequate buffers to sensitive premises.	• The closest dwellings are located 500 metres from the edge of the pit. • Any screening plant if required will be located 500 metres from dwellings. • The proposal complies with the EPA Generic Buffer Guidelines and those used by the Department of Health WA.	----
Landform	----	• Locate activities behind natural barriers, landform and vegetation.	• The design of the pit and staging will be used to provide screening. • Clearing and reinstating topsoil and overburden will be confined to the wetter months, April to October where possible.	----
Landform	----	• Work below natural ground level.	• This will be used.	----

		• Push overburden and interburden dumps into positions where they can form screening barriers.	• This will be used if required along the southern edge of the eastern pit.	----
Staging	----	• Design operational procedures and staging, to maximise the separation to sensitive premises.	• The staging is designed to allow the loader to operate behind the active face and perimeter bunding by approaching the pit from the east.	----
MANAGEMENT				
Occupation	----	• Provide air conditioned closed cabins on plant	• These will be used on site for operational mobile plant.	----
Monitoring	----	• Provide monitoring and supervision of the processing and other practices on site.	• A visual monitoring system is proposed. see below "Trigger Conditions".	----
Trigger conditions	----	• Trigger conditions are used to determine when additional dust management is required.	• Most dust generated from excavation, land clearing, processing and transport has a very large visible component. • The trigger for dust management is to be the generation of visual dust. • When excessive dust is noted dust management measures will be implemented to treat the dust or manage the situation. • A water truck will be available when required as deemed by the site manager.	----
Adverse weather	Moderate to high - Can occur on summer mornings	• When 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.	• These adverse conditions are more likely to occur on summer mornings. In winter stronger winds are normally associated with rain and therefore carry a reduced dust risk. • This policy is used to minimise impact on adjoining land holders.	Low
Equipment failure	Low - Uncommon	• In the event of dust management not being able to be achieved through equipment failure operations will cease until full capability is restored.	• This is committed to.	Low
Loading	Low - Occasional; about once per hour	• Work on the floor of the pit. Loading is low impact with a loader and truck.	• Loading is low impact with a loader and truck.	Low
Transport	Moderate - Occasional; about once per hour	• Cover or wet down loads.	• Transport is via road trucks. The sand loads are proposed to be covered. • The internal access roads will be watered or treated as required through the year to reduce dust generation.	Low
Complaints	----	• Provide a complaints recording, investigation, action and reporting procedure.	• This is committed to.	----
EARTHWORKS				
Land Clearing	Low -	• Schedule activities such as vegetation removal or	• Normally the stripping of overburden and topsoil and their subsequent	Low

	Once per year.	topsoil stripping at times when the materials are less likely to blow or during suitable wind conditions.	use in rehabilitation is undertaken in the drier months but when the soils are still moist enough to suppress dust but not wet. • Completed sections of the quarry are to be progressively rehabilitated as soon as practicable.	
Land restoration	Low - Once per year.	• Schedule activities such as ripping, overburden and topsoil spreading on exposed ridgelines at times when the materials are less likely to blow or during suitable wind conditions.	• See Land Clearing above.	Low

3.3.2 Dust Monitoring

The most effective dust monitoring is the generation of visible dust.

The auditable condition is visible dust crossing the boundary of the premises; the lot boundary.

This is the condition used on Department of Environment Regulation Licences and all other quarries such as sand, limestone and hard rock quarries in Western Australia and has worked well in the past.

It is also the method used by the Department of Mines and Petroleum to rapidly assess occupational dust on site.

As invisible dust can be generated with the visible dust, recognising and dealing with visible dust is a very effective instantaneous method of recognising excessive dust.

There are a number of mechanical dust monitors but only two are approved under Australian Standards. The mechanical measurement of dust can be difficult to obtain accurate results and a number of systems provide retrospective measurements only after the dust has been generated, travelled to the monitor and then triggered the monitor by which time the dust may have ceased. Visual triggering would have detected the dust prior to the dust travelling to the monitor and action would be taken much sooner.

Human monitoring can detect potential dust risks prior, and take action prior, to the dust being generated. They also 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.

The quarry manager and leading hand are ultimately responsible for site supervision of dust. They will 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.

The effectiveness of the dust management is shown by no complaints regarding dust normally being received.

When 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.

Visual monitoring is even more effective when complemented by a reporting and complaints process.

4.0 Greenhouse Gas

The development of the Perth Metropolitan Area and highway upgrades has generated the need for sand, and if these cannot be obtained from this strategically located quarry the sand will have to be obtained from another site with consequent likely greenhouse gas and human impact penalties.

Over the years trucks have become more efficient with respect to greenhouse gas emissions, particularly with the use of truck and trailer and road train configurations.

5.0 Complaints procedure

Visual monitoring is more effective when complemented by an extensive reporting and complaints process.

That reporting mechanism is enhanced by liaison with the closest sensitive premises who are in a position to alert the operators as required. Liaison with the closest residents assist residents who feel they have an effective voice, when it is used well.

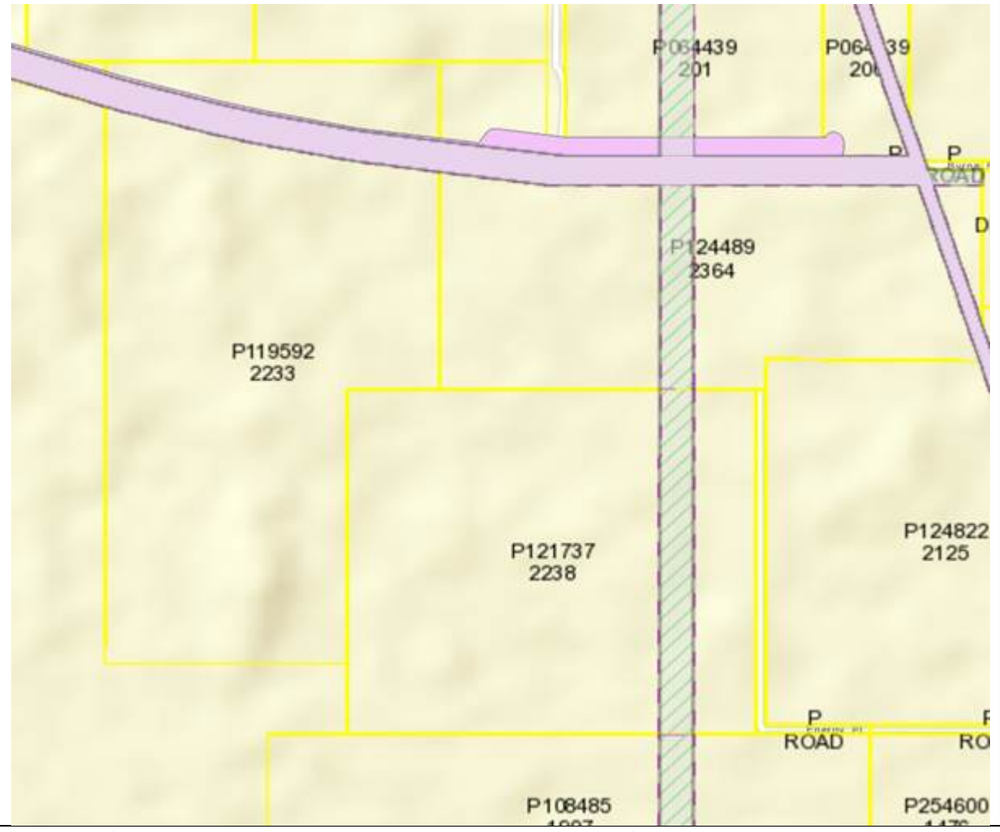
People within the program will be provided with a copy of the Dust Management Plan and phone and email contacts that can be used in the event that visible dust is noticed crossing the site boundary.

An effective complaints mechanism is an essential part of the dust identification and management and is proposed.

A complaints procedure is proposed and will use a normal complaint, investigation, action and reporting system. The complaints record will be available to officers of the Shire of Chittering and generally include.

- The complaint,
- Nature of the complaint, time and date,
- Source of the complaint,
- Investigations of the complaint,
- Results of the investigation,
- If the complaint is valid, any mitigation actions that result,
- Any communication with the complainant.

Agency Submissions			
Submitter	**Comment**	**Proponent Response**	**Shire Officer Response**
Department of Mines and Petroleum (DMP)	Thank you for your letter dated 11 April 2017 regarding the above proposed Extractive Industry Licence. Although Extractive Industry Licences fall outside the *Mining Act 1978*, information on mineral resources, including basic raw materials, is of importance to the Geological Survey of Western Australia (GSWA), a division of the Department of Mines and Petroleum (DMP). The information is used in our MINEDEX database (http://www.dmp.wa.gov.au/Minerals/Mines-andMineral-Deposits-2283.aspx), which is a source of information for our State-wide resource mapping system (http://www.dmp.wa.gov.au/GeoView-WA-Interactive-1467.aspx) The locations and status of basic raw materials extraction sites are also valuable inputs to the Geological Survey's resource assessment and land use planning role. Our aim is for the database to be a comprehensive and up-to-date source of information on all mining-related activities throughout the State. It is a database that is used to inform other government agencies, as well as the general public, of the location of mines and mineral resources. You are encouraged to use it whenever researching information on mineral or petroleum resources, and including basic raw materials. A continuing supply of low-cost basic raw materials is an important part of maintaining the lifestyle and infrastructure that all Western Australians enjoy. I appreciate the opportunity for the Geological Survey of Western Australia to note this proposal.	Noted The sand is required for the construction of the Great Northern Highway realignment and other construction purposes.	Noted.
Department of Aboriginal Affairs (DAA)	Thank you for your letter dated 11 April 2017 seeking comment from the Department of Aboriginal Affairs (DAA) regarding the proposed Extractive Industry – Lot 2233 & 2238 Brand Highway, Muchea (Application). A review of the Register of Places and Objects as well as the DAA Aboriginal Heritage Database concludes that there are currently no know Aboriginal sites or Aboriginal heritage places under the *Aboriginal Heritage Act 1972* (AHA) within the Application area. Therefore based on the information held by DAA no approvals under the AHA are required. DAA also recommends that for any future works that the Developers refer to the State's Aboriginal Heritage Due Diligence Guidelines (Guidelines). The Guidelines can be found on the DAA website at the following link: http://www.daa .wa.gov.au/heritage/land-use/ The Guidelines allow developers to undertake their own risk assessment regarding any proposal's potential to impact Aboriginal heritage.	A search of the DAA database was undertaken as part of due diligence when preparing the application for the proposal. It is noted that there are no recorded sites or heritage places that will be impacted.	Noted. The Shire has also conducted a search of the Shire's Municipal Inventory and State Heritage Register with no recorded heritage items located on the proposed lot.
Main Roads WA	In assessing the application, MRWA determined that the proposed excavation at Lots 2233 and 2238 Brand Highway will be accessed by Bryne Road which is not a MRWA controlled road, however the intersection of Byrne Road and Brand Highway will be the point of access to the MRWA network. MRWA is prepared to support the proposal subject to the following condition being included on the planning approval; • Shire of Chittering and applicant must ensure that proposed vehicles have appropriate RAV access for the road networks as defined in the MRWA HVS RAV mapping tool.	WA Limestone notes the comment. The proposed condition is acceptable to WA Limestone.	It is noted that Brand Highway is capable of carrying proposed vehicles as it forms part of the designate RAV network. Nonetheless, the applicant will be required to ensure the crossover onto Brand Highway is sufficient for its intended purposes.
Department of Lands	Under the Dampier to Bunbury Pipeline Act 1997 (DBPA), the Department of Lands manages the DBNGP corridor on behalf of the DBNGP Land Access Minister. I would like to remind you that you please give the Manager Infrastructure Corridors within the Department of Lands an opportunity to	WA Limestone is aware of the Gas Pipeline easements. The northern easement on Lot 2233 lies 500 metres from the	Noted. Please see below response to DBP and DoL.

	review and provide comment on all Development Applications/Proposal within or in close proximity to the DBNGP corridor. Dampier Bunbury Pipeline (DBP) is conferred Access Rights under DBPA to own and operate high pressure gas within the DBNGP corridor. DBP has advised that there was a Proposed Extractive Industry - RN 757 Brand Highway in circulation for comment. The Infrastructure corridors section within the Department of Lands has not been given the opportunity to provide comment during the consultation period. The proposal is over two Lots, both of which is encumbered by the DBNGP corridor. Also, please advise of the new submission date. 	proposed excavation. The eastern easement on Lot 2238 lies west of the eastern edge of the proposed excavation. The excavation will exclude the pipeline easement. WA Limestone works next to gas pipeline easements in other locations and is aware of the issues, protocols and setbacks and will set back the edge of the excavation to match the required setbacks. In other locations the set back is 25 metres from the edge of the easement with batter slopes of 1 : 4 vertical to horizontal to the edge of the setback as noted in Section 4.2 of the Excavation Management Plan dated January 2017. WA Limestone will accept a Condition on Planning Consent along the lines outlined below. “Excavation is to be limited to the edge of the required set back to the Dampier Bunbury Pipeline (DBP). Excavation adjacent to the Pipeline is to be conducted to the requirements of the Department of Lands and the *Dampier to Bunbury Pipeline Act 1997*”.	
Environmental Protection Authority	Thank you for your letter dated 11 April 2017, seeking comment from the Environmental Protection Authority (EPA) regarding the proposed extractive industry on Lots 2233 & 2238 Byrne Road off the Brand Highway, Muchea. The EPA does not generally provide comment on development applications, as these matters are best dealt with by the relevant responsible authority. I note that clearing of vegetation is proposed and consultation with the Department of Environment Regulation regarding a Native Vegetation Clearing Permit should be undertaken. If you believe that this development will have a significant impact on the environment it can be formally referred to the EPA under section 38 of the *Environmental Protection Act 1986.* Information on what may be considered significant can be found on the EPA’s website at:	Noted WA Limestone is committed to obtaining a Native Vegetation Clearing Permit and has assessed the vegetation against the Clearing Principles that are used for the assessment of Clearing Permits. See Biodiversity Management and Closure Plan, Attachment 1 to the Excavation and Rehabilitation Management Plan dated January 2017. WA Limestone will accept a Condition or Advice Note on Planning Consent requiring a Clearing Permit under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004.*	Noted. The Shire has recommended a condition of approval relating to the need to liaise with DER to gain a Clearing Permit however this can only be achieved after planning approval is granted. Regardless, the applicant has agreed to the requirement.

	http//www.epa.wa.gov.au		
Department of Planning	Thank you for your letter of 11 April 2017, regarding the development proposal for a sand extractive industry at the abovementioned address. Under the Shire of Chittering's Local Planning Scheme No. 6, Lots 2233 and 2238 are zoned 'Agricultural Resource.' And fall within the Water Prone Special Control Area (SCA). Development of an extractive industry may be permitted in this zone at Council's discretion, subject to the proposal being advertised. An objective for the zone is to allow for the extraction of basic raw materials where it is environmentally and socially acceptable. Council would need to be satisfied that the proposal remains consistent with the requirements of Part 4.15 of the Scheme. Vegetation on the proposed western evacuation site is likely to support threatened fauna and is possible also a Threatened Ecological Community under the EPBC Act. Excavation at the western site may not be environmentally acceptable and therefore may not meet the environmental objective for the Agricultural Resource zone. Council could obtain referral advice from the Commonwealth Department of the Environment for the western site. However, Council should consider allowing excavation in the proposed eastern site within existing cleared area and outside the 50m buffers to the adjoining wetlands. The Department of Planning has identified inconsistencies and matters of concern in the supporting report as outlined in **Attachment 1**, and it is recommended that consideration be given to these before the application is determined. • potential impacts on adjoining wetlands; • *potential impact on Banksia Woodland of the Swan Coastal Plain Threatened Ecological Community;* • *potential impact on Carnaby's Black Cockatoo habitat;* • *rehabilitation and revegetation;* • *potential impact on adjoining Unallocated Crown Land (UCL);* • *access; and* • *gas pipeline easements.* If Council resolves to support the proposal, fully or in part, it is recommended that all elements of the proposal that can be measured and quantified should be specifically outlined as planning conditions, to assist Council with ongoing management. **Attachment 2** lists some matters for consideration. The Western Australian Planning Commission's State Planning Policy 2.5 (SPP 2.5) provides guidance on proposals for basic raw materials (BRM). A BRM Fact Sheet was recently released by the WAPC to assist planners with the implementation of SPP 2.5 and is included as Attachment 3. **ATTACHMENT 1** ***Potential impacts on adjoining wetlands*** Lot 2233 contains a Resource Enhancement category wetland and Lot 2238 contains a Multiple Use category wetland. The supporting report states that "most" wetland vegetation will be protected (page 36), implying that there will be a degree of unspecified direct impact. Also, Figure 12 shows excavation areas immediately adjoining each wetland, with no buffer. Extraction should avoid impact on the two wetlands and their 50m minimum buffers as required by the Environmental Protection Authority's *Environmental Guidance for Planning and Development - Guidance Statement No 33 (2008).* It is recommended that the proposal is amended so that there are no impacts on the wetlands	Noted Potential Impact on adjoining wetlands The wetland mapping that was included at Figure 1-9 Biodiversity Management and Closure Plan, Attachment 1 to the Excavation and Rehabilitation Management Plan dated January 2017 may be a little unclear, as yellow was used for the wetland mapping as well as the excavation area. The published wetland mapping is at a broad scale and on the north of the eastern sand resource does not match the boundary of the elevated land. A plan is attached where the wetland boundaries are shown in blue. There is a commitment to restrict excavation to 0.5 to 1.0 metres above the water table, which will exclude wetland vegetation. The boundary of the excavation applied for is selected to provide that separation to the water table. See Attachment 1 End Use and Final Contours page .4, **Wetlands** Buffers to wetlands are normally 50 metres lateral or 1 metre vertical. Figure 12 shows the excavation adjacent to the native vegetation but does not show the non wetland vegetation dominated by *Kunzea glabrescens* that fringes the wetland as discussed on page 21 of Attachment 1 of the Management Plan.	Assessment of the proposal conducted by the Shire against Part 4.15 of LPS6 has revealed that the proposal is consistent with this clause. Details of the assessment can be viewed in the officer's report. The proposal was advertised in accordance with Part 64 of the Regulations (2015). Comment received from DPaW recommends the proposal be referred to the Commonwealth Department of Environment and Energy given the potential Carnaby's Cockatoo habitat within the pine plantation on site. The officer has recommended this as a condition of approval. Noted. Please see below for response to these matters. Noted. Noted. Noted. A condition of approval has been recommended that no excavation is to occur within 50m of any wetland. The applicant has also confirmed that a 50m buffer will separate proposed excavation areas and the wetland.

	or their buffers. ***Potential impact on Banksia Woodland of the Swan Coastal Plain Threatened Ecological Community*** Lot 2233's excavation area is located in an area in which 'Banksia Woodland of the Swan Coastal Plain' is likely to occur. This ecological community has recently been declared as 'Threatened' under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act). The proponent's report states that the area contains no banksias (page 3), yet several key banksia species appear on the list of species observed on the site. The report also states that the vegetated area is low in species diversity and is "so degraded that it is not classified as Banksia woodland" (page 18), although elsewhere parts of the vegetation is described as being in good condition. The condition assessment is questionable, as it appears that the mapping was not undertaken in accordance with accepted Environmental Protection Authority methodology. Regardless, the quality of a community in terms of its number of species or condition are not used for classifying its type.	When the non wetland of the *Kunzea glabrescens* is taken into account there will be a 50 metre set back to wetland vegetation. ***Banksia* Woodland** The vegetation study in Attachment 1 shows that the vegetation is not *Banksia* Woodland. This can be seen in Figures 1 to 2 and (Attachment 1 Figures 1 – 1 to 1 – 3) for the eastern resource and Figures 3 to 4 and (Attachment 1 Figures 1 – 4 to 1 – 7) for the western resource. *Banksia* Woodlands are a Priority 3 Vegetation Community under State Policy and are listed as Threatened under the *EPBC 1999* Legislation. The EPBC referral document for Banksia Woodland requires a remnant to have the following, in Step 1 of their assessment; "*Banksia* Woodlands are described as having; • A distinctive upper sclerophyllous layer of low trees (occasionally large shrubs more than 2 m tall), typically dominated or codominated by one or more of the *Banksia* species. • An emergent tree layer of medium or tall (>10 m) height *Eucalyptus* or *Allocasuarina* species may sometimes be present above the *Banksia* canopy. • An understory that is often highly species-rich with a layer of sclerophyllous shrubs of various heights and a herbaceous ground layer of cord rushes, sedges and perennial and ephemeral forbs, that sometimes includes grasses and groundcover that may vary depending on the density of the shrub layer and disturbance history. "Very degraded or modified patches of an ecological community are not protected under the EPBC Act", but some patches may retain some important natural values that may be crucial for certain species or habitats. Such sites may also be protected through State and local laws or schemes". An assessment of the vegetation to the guidelines under the EPBC Act shows that the vegetation is not *Banksia* Woodland is not assessed as triggering the need to refer the proposal to the	It is noted that Lot 2233 has been cleared some time ago and replanted with Pinaster Pines. The officer acknowledges research has been conducted by landform to ascertain the quality of vegetation. Notwithstanding, some regrowth of Banksia Woodland (now a TEC Species) has occurred. Due to Comment received from both DoP and DPaW recommending the proposal be referred to the Commonwealth Department of Environment and Energy with relation to potential Carnaby's Cockatoo habitat within the pine plantation on site, the Shire has included this as a condition of approval. Noted. It was noted in the applicant's report that some Banksia Woodland within lot 2233 was considered in 'good' condition.

		Commonwealth under the EPBC Act.	
		The EPBC Conservation Advice test for Step 1 is not met.	Noted. This was however debated by both the DoP and DPaW. In the latter submission, DPaW regarded the pine plantation as having potential breeding sites for the carnaby's cockatoo – for this reason the application would require referral.
		In addition Step 2 requires that the remnant be in Good Condition. Degraded and Completely Degraded vegetation does not meet the EPBC Conservation Advice test. *Banksia* Woodland in good or greater vegetation condition must have an area of >2.0 hectares to trigger Step 3.	
		The remnant vegetation does not appear to meet the criteria for referral to the Commonwealth under the EPBC Guidelines. In any case the issue of impacts under State and Commonwealth Legislation will form part of the assessment for the Clearing Permit that can only be applied for after Planning Consent is gained.	Noted. This is not debated.
		As compensation for clearing, 25 metres of buffer to the *Banksia* Woodland adjoining is proposed which will provide much greater number of *Banksia* Plants than currently occur on site	Noted.
	Potential impact on Carnaby's Black Cockatoo habitat Lots 2233 and 2238 are located within 12km of a known Carnaby's Black Cockatoo nesting site, and the proposed removal of good quality habitat such as pines and banksia woodland regrowth within this buffer may adversely affect the breeding of cockatoos in the area. The proponent states that the proposal has been assessed for potential Black Cockatoo habitat, but the method used and the results are not described. The report states that pines provide "limited food", but no evidence is provided to support this assertion. It is also unclear that the loss of the pines would be adequately compensated for by the creation of a 25m wide buffer of banksia woodland (ie 2ha) planted after excavation as it this would not be planted for ten years and it is much smaller the current area under bushland regrowth and pines.	The eastern resource is previously cleared land with a monoculture of *Xanthorrhoea preissiana* (grass tree). The western resource is old pine plantation with little or no *Banksia* which is restricted to isolated seedlings.	Noted. The Shire has recommended a condition of approval stating a Clearing Permit be applied for through DER per DER's advice.
		A Clearing Permit will be required and will be applied for after Planning Consent is obtained. At that time the Clearing Permit will only be issued after a thorough examination of the vegetation by Department of Environment Protection and Department of Parks and Wildlife. M	Noted.
		The vegetation will also be assessed against the Guidelines	Noted.
		Carnaby's Cockatoo	
		Black Cockatoos including Carnaby's was considered under Section 2.2 Fauna in Attachment 1 of the management Plan. There are no Proteaceous food sources on site suitable for Black Cockatoos.	Noted. The advice received from DoP has been reinforced by DPaW. Accordingly, the Shire is obliged to follow through on such advice notwithstanding the applicant's response.
		The pines themselves do provide some food sources. Current Government Policy is to remove the pines to reduce transpiration and the impact on the water tables and retain *Banksia* Woodland habitat for the Black Cockatoos. 5000 hectares of pine plantation are to be retained for cockatoo feeding habitat.	Noted.
		That policy formed an integral part of the management of Cockatoo habitat in the Perth and Peel Green Growth Plan for 3.5 million December 2015. Whilst that plan is restricted to the	Noted

	Rehabilitation and revegetation I t is unclear how rehabilitation of both excavation areas would be undertaken, particularly in relation to staging. The criteria and activities described in WA Limestone's report appear to be generic in nature and not specific to this proposal. The proponent should outline rehabilitation that will occur at this site. Where site-specific measures are provided, their rationale is unclear. For example, why would a tumulus spring habitat be created to offset cleared native vegetation, if there is no spring on the site?	Perth Peel Region, just south of this location the principles and considerations that were taken within that plan provide guidance for the management of this site and proposal. The other issue is the European Wood Borer and the management of any dead pines on this site. The removal of the degraded pines and their replacement with a buffer of *Banksia* Woodland is consistent with Government Policy.	Noted. Regardless, the authors of this policy have recommended referral. In addition, the state's parks and wildlife department have recommended that referral be undertaken.
	It is also unclear how the western excavation area would be successfully revegetated on completion of the operation, as the direction of staging suggests that revegetation will not occur until the resource has been fully extracted in ten years or more. The vegetated area currently comprises about 18ha of native vegetation regrowth and pines, and on completion would comprise pasture grasses and about 2ha of replanted banksia woodland species. There is no proposal to re-contour and spread topsoil until excavation concludes, by which time there would be little or no viable seed contained in topsoil stored from earlier stages. Further clarification on this matter should be sought from the proponent. It is recommended that cleared pines and native vegetation are not burnt to eradicate the risk of European house borers, as proposed on page 27, but are instead chipped to 100mm pieces, an alternative method referred to by the Department of Agriculture which would not impact on air quality.	**Rehabilitation and revegetation** The current vegetation on the western area is old pine plantation that has not grown well with an understorey of scattered native understory plants. The area consists approximately 5.6 hectares of pasture with scattered native plants and 15.5 of degraded pine plantation. At the end of excavation there is proposed to be a return of approximately 4 hectares of quality *Banksia* Woodland as a 25 metre buffer to the natural *Banksia* Woodland to the west and south with the remainder of the land being pasture. The rehabilitation program is extensive and provides clear commitments and prescription on how the revegetation of the site will be undertaken. It is based on standard mining and rehabilitation best practice for the Swan Coastal Plain. As the methods of rehabilitation are similar from site to site the text may at first glance appear generic but is actually a methodology and commitment for progressive rehabilitation of each stage of the excavation and at the end of excavation.	Noted. The Shire is generally satisfied the rehabilitation plan is satisfactory if completed in accordance with staging of excavation. Planting of vegetation buffers along the western and southern boundaries are to be installed as soon as possible following the commencement of the excavation. The officer has recommended this as a condition of approval. The applicant's report states excavation will occur with direct transfer of topsoil. As mentioned above, the Shire is satisfied with the rehabilitation plan providing rehabilitation occurs in accordance with the proposed staging.
	Potential impacts on adjoining Unallocated Crown Land (UCL)	The sand excavation will be undertaken in a similar manner to all other sand pits and rehabilitation using the methods outlined in Attachment 1 will be used. That will be direct transfer of topsoil which will only be stored if direct transfer is not possible (for example page 27 Exposure of the resource, Land clearing Attachment 1 page 41, Land Restoration Attachment 1 page 42). Rehabilitation will be progressive and not wait until the end of excavation. For the western resource the direct transfer of topsoil will be to the buffers and even across the areas where pasture will be applied. The rehabilitation will not be delayed for ten years On page 34 of Attachment 1 the progressive closure of completed stages of the pit is outlined. That is the pits will be progressively closed and rehabilitated. Completion Criteria are provided, combined with commitments, monitoring and auditing, (Progressive Closure of completed Stages of the Pit Attachment 1 page 37). Lists of species suitable for rehabilitation	Noted. This can be placed as a recommended condition of approval.

	It is unclear how sand will be extracted to the western boundary of Lot 2233 with no impact on the adjoining UCL, which comprises banksia woodland. Impacts could be through dust, sand collapse or impact on fauna, including cockatoos. Ultimately there would be a 25m rehabilitated vegetation strip along this boundary, but it is unclear what will happen in the interim.	are provided, Attachment 1 page 44. Detailed methods of rehabilitation are outlined on pages 43 to 46 of Attachment 1 to the Management Plan.	
		Unallocated Crown Land Sand and other extraction is undertaken in many areas adjacent to remnant vegetation as is remnant vegetation widespread along gravel roads and adjacent to active agricultural land. From all locations there is no evidence of impacts on adjoining native vegetation from such activities. The time spent excavating next to the adjoining Unallocated Crown land is small and in each location could be in the order of a few weeks.	The officer has recommended a condition of approval to install the vegetation buffer as soon as possible following the commencement of excavation rather than after (as originally proposed). This will assist in mitigating impact to the UCL.
		Sand excavation is not dusty as demonstrated at the many sand excavation sites. The dust originates from the clearing and reinstatement of topsoil in dry conditions and access road transport and activity which is similar to all unsealed roads, except in this case water treatment will be used to minimise dust; a practise that does not normally occur on rural properties or unsealed roads.	Noted.
		A limited number of studies have been conducted on the observable impacts of dust on adjoining vegetation, but are usually assessing large iron ore mines, mines with metallic or other pollutants. The studies for the Jack Hill Mine for example showed that under very heavy dust loads only two species of *Acacia* were partially impacted. That study lies in an arid environment and resulted in hematite dust.	Noted.
	Access Proposed access routes to the excavation areas from Byrne Road or Energy Place need to be identified and any issues addressed, such as impacts on the western wetland if access is planned to pass through it.	The only dust generated from sand mining is organic matter from topsoil during clearing in dry conditions and limestone or gravel dust from road activities. The other difference is that the rainfall in the South West is throughout the year, constantly removing dust, unlike arid areas.	Noted.
	Gas pipeline easements The Dampier to Bunbury Natural Gas Pipeline crosses Byrne Road and Energy Place, passing north-south through Lots 2364 and 2125, which adjoin Lot 2238 to its north and east. The connected Neerabup Gas Lateral runs east-west through the northern part of Lot 2233. These pipelines should be shown on the relevant figures, together with their 300m referral buffers, and conditions referring to these be needed. The pipeline easement currently shown on figures requires a label.	Extensive observations at many sand quarries on which Landform Research work show no impacts on adjoining vegetation, such as within the Gnangara Plantation. **Access** Access is proposed to be Byrne Road, page 26, page 30. There are no dwellings on Byrne Road outside the current land holding. Byrne Road was chosen to avoid impacts on residents in Chittering Road.	Noted. The officer has recommended a condition of approval stipulating plans are to be submitted to both DBP and the Shire to address the access route from the excavation area.

		Gas Pipeline Easements WA Limestone works next to gas pipeline easements in other locations and is aware of the issues, protocols and setbacks and will set back the edge of the excavation to match the required setbacks. In other locations the set back is 25 metres from the edge of the easement with batter slopes of 1 : 4 vertical to horizontal to the edge of the setback as noted in Section 4.2 of the Excavation Management Plan dated January 2017. WA Limestone will accept a Condition on Planning Consent along the lines outlined below. "Excavation is to be limited to the edge of the required set back to the Dampier Bunbury Pipeline (DBP). Excavation adjacent to the Pipeline is to be conducted to the requirements of the Department of Lands and the *Dampier to Bunbury Pipeline Act 1997*". *See above*	As above. The Shire has recommended a condition of approval to this effect. Noted.
Chittering Landcare	The Ellen Brockman Integrated Catchment Group in collaboration with the Chittering Landcare Group have reviewed the documentation relating to the above proposed extractive industry. The report accompanying this proposal is thorough and important aspects of the proposal have been covered by Landform Research. We wish to make the following comments related to the environmental aspects of the proposal. 1. The excavation should maintain 2 metres of undisturbed profile from the future likely maximum winter water table for the site (Statewide Policy no. 1: Policy and guidelines for construction of silica sand mining in public drinking water source areas (Water and Rivers Commission 1999) now being reviewed by DoW April 2017). This is applicable since the groundwater on the eastern side of the Gnangara mound is used by the people of Muchea as a drinking water source.	**Separation to the water table.** As noted above, and in the documentation, the land is rural land and will be returned to rural land. Examination of any aerial photography shows the sand ridges as unproductive grazing land as a result of the depth to the water table and the lack of water holding capability of the sand ridge and the lack of ability for capillary action. Compare that to the other pasture which is closer to the water table and holds good pasture into the summer. As far as is known the excavation site lies outside the Gnangara Mound with the western resource forming the edge. As far as is known no water from the extraction site or downstream of the site is used as a drinking water source. The DOW South West Guideline for Extractive Industries is attached, even though it is not applied this far north. It has been applied by the Department of Water at Corio Road in Pinjarra to improve land capability following sand excavation. See Management Plan Final Contours page 28 - 29 **Hard stand**	The Shire has recommended a condition of approval to ensure excavation will not pass beyond 2m of the water table, as per Chittering Landcare's comment. 0.5m – 1.0m was determined to be too low and not in consistent with SWP1.

	2. The hardstand to be established for the parking of vehicles, "self-contained maintenance", refueling by mobile tankers, placement of the sea container and portable toilets (not apparently indicated on any of the plans provided) needs to be constructed to a standard that spillages of fuel and other contaminants can be contained and subsequently removed from the site at the end of the life of the excavation. Piezometers need to be installed to the eastern side of the hardstand to monitor the groundwater for contamination and a monitoring program designed to the satisfaction of the Shire of Chittering.	The reason the hard stand is not shown on the plans is because it will move across the site as excavation proceeds. As excavation moves on, the hardstand will be picked up and moved closer to the face and the old hardstand area will be rehabilitated. It is therefore difficult to place the location of the hardstand on a plan. Again the serviced portable toilet and any other facility will also be relocated as the face moves and will not have definite locations on site. The construction of the hard stand will be to a specification that is capable of mitigating potential impacts to the water table. The only vehicles parked on site will be the operator's car and a loader/s. If a screening plant is used then that will be maintained on site near the active face. Refuelling and maintenance vehicles will attend site, complete their task and drive offsite, being on site for only short periods. Piezometers will be installed on the eastern side of the excavation area, two for each resource. WA Limestone will accept a condition for their installation and a monitoring requirement, probably Autumn and late winter, will be adequate and most suitable.	Noted. The officer has recommended that refuelling occur offsite to minimise any spillages. The applicant has stated that minimal vehicles will be on-site, yet in other parts has suggested the excavation activity – inclusive of numbers may significantly increase. Accordingly, while the latter remains an assumption because the applicant has not been clear. Regardless, a simple remedy to negate contamination impacts caused by resting vehicles and refuelling can be to ensure it is undertaken off site.
	3. The revegetation of the 25 metre buffer along the western and southern boundaries should be installed as soon as possible following the commencement of the excavation and fenced to exclude livestock at closure.	**25 metre buffer** It would be possible to excavate along the boundaries first, to enable planting of that buffer early on, but it is not the most efficient way of excavating which is best excavated into the face. The first stage of the western resource could be along the western boundary. This could be conditioned and may require the provision of an updated direction of excavation Figure 12.	Noted. The planting of the vegetation buffer as soon as possible following the commencement of the excavation and fenced to exclude livestock at closure is an optimal outcome. Noted. This will be recommended as condition of approval.
	4. Revegetation (from experience gained on Bassendean Sands) needs to be 10,000 plants per hectare. The 1000 plants per hectare stated in the report is insufficient to create a suitable buffer. Plants planted 1 metre apart in rows that are 1 metre apart. Plantings need to be trees (eg *Corymbia callophylla, E. todtiana, Allocasuarina fraseriana*,} , understorey (including Banksia sp. Hakea sp), groundcover in a ratio of 20:60:20. No irrigation or fertilizer required but as stated in the report, timing of the plantings is crucial. Direct seeding is not very successful in the Bassendean sands and tube stock needs to be used in the revegetation.	**Numbers of plants** 10 000 plants per hectare is very high and could not be sustained as tree species. Tree and tall shrub species (*Banksias*) normally have 250 – 450 plants per hectare when mature. The problem arises in ensuring that there is sufficient soil moisture through summer for that number. Often it is better to plant or seed at a lower density and get less, good healthy plants with others adding from the adjoining vegetation over time. The 10 000 could be sustained as a goal for completion criteria, for the 25 metre bund/buffer, when the use of seeding is added to the topsoil and could be conditioned or dealt with through an updated rehabilitation plan.	Noted. The Shire considers 10,000 plants per hectare to be a better result due to the nature of the sandy soils creating difficult growing conditions. Liaising with Chittering Landcare for the most suitable plant species may avoid issues with soil moisture in summer. Noted. See above.

	5. At closure, the sumpland is to be fenced to exclude livestock. Suitable crossings can be installed to allow access to paddocks to the west. 6. At closure, perennial pastures are to be established to give good ground cover and take up nutrients. These will establish well where the groundwater is at two metres. Publications are available from the Department of Agriculture and Food on how to establish suitable perennial pastures on the Swan Coastal Plain. These pastures should be fertilized with low, slow release phosphorus fertilisers to reduce any leakage of nutrients to the groundwater. The Ellen Brook is the priority catchment for nutrient transport to the Swan River and estuary and all efforts are required to reduce any movement of nutrients from the property into the groundwater or surface water. The disturbance of the sand by the excavation will initiate a release of nutrients over the ten year period (pers. comm Dr Robert Summers) increasing the rate at which the nutrients are transported to the Ellen Brook.	**Sumpland** WA Limestone agrees to fence the edge of the sumpland, between the two resources, adjoining the excavation area. **Pasture End Use** The pasture will be established by the land owner. The principal of perennial pasture is supported and that is contained within the Closure and Rehabilitation Plan in Attachment 1. **Nutrients** Sand such as this has little nutrient holding capability if white, and minor tightly held capability for phosphorus if the sand is yellow. For Ellen Brook the most important nutrient risk is phosphorus and nitrogen. Currently the nutrients on site such as nitrogen and phosphorus will be held in the topsoil, which will be retained on site. There could also be a small amount of nitrogen attached to roots of Fabaceae within the soils although those pants do not contribute a significant amount of the existing vegetation. Any nutrients attached to yellow sand will be removed from site with the sand. Offset against this will be no use of fertiliser during the excavation of the sand and reduced grazing which will assist in reducing the risks of nutrient loss. Considering the nature of the nutrients, the changes to the land uses and the staging it is considered that any risk of increased nutrient loss from the site will be small and potentially offset by the temporary changes to land use. The proposed monitoring bores will be used to detect any changes to water quality.	Noted. Noted. Noted.
Dampier to Bunbury Natural Gas Pipeline	DBP as the owner and operator of the Dampier to Bunbury Natural Gas Pipeline would like to make the applicant aware that inherent risks associated with extraction activity adjacent to or within reasonable distance from high pressure gas transmission pipeline needs to be accounted for. This response is therefore provided with the following comments: • The two existing crossings on Byrne Road and any new crossings will need to be formally assessed as additional protection may be required. This additional protection may entail the placement of concrete protection slabs over the pipelines at the crossing points. • The cost of the investigation and any additional protection measures identified will be at the cost of the applicant. • The applicant is to provide DBP with a Traffic Management Plan displaying the propose route that machinery / trucks will be taking to access the extractive pits from Byrne Road. • The use of Energy Place as a possible alternate access / egress to the extractive pits is	WA Limestone agrees to these conditions and is committed to consulting with DBP, as they do in other locations. WA Limestone works next to gas pipeline easements in other locations and is aware of the issues, protocols and setbacks and will set back the edge of the excavation to match the required setbacks. In other locations the setback is 25 metres from the edge of the easement with batter slopes of 1 : 4 vertical to horizontal to the edge of the setback as noted in Section 4.2 of the Excavation Management Plan dated January 2017. WA Limestone will accept a Condition on Planning Consent along the lines outlined below.	Noted. Recommended conditions of approval relating to DBP's requirements are contained within the officer's report.

	restricted to light vehicles only. DBP's Main Line Value is located on Energy Place and DBP would not support haul road/road truck movement along this road without a full engineering assessment. • The southern boundary of DBNGP corridor within Lot 2233 is to be surveyed and demarcated with substantial fencing. This will be at the cost of the applicant. • The DBNGP pipeline located in lot 2364 is to be positively located via potholing and demarcated with substantial fencing. The location of the fencing will be at the discretion of DBP. The potholing and fencing will be at the cost of the applicant. • The entire DBNGP corridor is to be displayed and referenced on all aerial photographs / plans that accompany the supporting documentation.	"Excavation is to be limited to the edge of the required set back to the Dampier Bunbury Pipeline (DBP). Excavation adjacent to the Pipeline is to be conducted to the requirements of the Department of Lands and the *Dampier to Bunbury Pipeline Act 1997*".	
Department of Lands	The department would like to remind the Shire of Chittering of the requirement to refer all Development Applications within or in close proximity to the DBNGP corridor to the department. Under the *Dampier to Bunbury Pipeline Act 1997* (DBPA), the department manages the DBNGP corridor on behalf of the DBNGP Land Access Minister. The DBNGP corridor traverses through Lot 2233 on DP119592 and Lot 2238 on DP121737. Based on the information provided and in relation to the DBNGP corridor only, the extractive industry referral on Lots 2233 and 2238 Brand Highway, Muchea has associated risks which may materially interfere with the exercise of rights that have been, or might in the future be, conferred under section 34 of the DBPA. These risks must be identified and mitigated to ensure any risks to the high pressure gas pipelines and associated infrastructure within the DBNGP corridor meet Australian Standards AS2885 Pipelines – gas and liquid petroleum. The cost of the assessment and any associated protection measures that need to be implemented prior to the commencement of on-ground works will be at the cost of the proponent. In addition, any works within the DBNGP corridor will be subject of an approval under section 41 of the DBPA. DBNGP (WA) Nominees Pty Limited (DBP), is conferred Access Rights under the DBPA to own and operate high pressure gas pipelines within the DBNGP corridor. The department supports DBP's comments as outlined in their letter dated 23 May 2017 (see attached) which should be considered when providing planning conditions for the proposed development and brings to your attention the following: • Should Energy Place be used as a possible alternate access / egress to the extractive pits, a full engineering assessment must be carried to identify and mitigate any potential risk to the high pressure gas pipelines and associated infrastructure within the DBNGP corridor. • Due to the number of trucks accessing Byrne Road, the existing crossing and / or any other new crossing on Byrne Road must be assessed to identify additional protection measures that may be required to protect the high pressure gas pipelines and associated infrastructure within the DBNGP corridor. In addition, a suitable traffic management plan must be implemented. • The southern boundary of the DBNGP corridor within Lot 2233 is to be surveyed and fenced at the cost of the proponent to restrict heavy vehicles from accessing the DBNGP corridor. • The western boundary of the DBNGP corridor within Lot 2238 is to be fenced to prevent any future encroachment by extraction personnel, equipment, excess materials and spoils during the extraction period. • The full extent of the DBNGP corridor must be clearly depicted and referenced on all plans / map. The department on behalf of the DBNGP Land Access Minister grans in-principle support to the proposed extractive industry subject to the proponent meeting technical conditions provided by DBP	WA Limestone is aware of the gas pipelines and agrees to the conditions required to manage and protect the Dampier to Bunbury Natural Gas Pipeline by and is committed to consulting with DBP, as they do in other locations. WA Limestone works next to gas pipeline easements in other locations and is aware of the issues, protocols and setbacks and will set back the edge of the excavation to match the required setbacks. In other locations the setback is 25 metres from the edge of the easement with batter slopes of 1 : 4 vertical to horizontal to the edge of the setback as noted in Section 4.2 of the Excavation Management Plan dated January 2017. WA Limestone will accept a Condition on Planning Consent along the lines outlined below. "Excavation is to be limited to the edge of the required set back to the Dampier Bunbury Pipeline (DBP). Excavation adjacent to the Pipeline is to be conducted to the requirements of the Department of Lands and the *Dampier to Bunbury Pipeline Act 1997*".	Noted. Noted. Noted. As above, Recommended conditions of approval relating to DBP's requirements are contained within the officer's report. See above response to DBP. See above response to DBP. Noted. See above response to DBP.

	for proposed works within the DBNGP corridor. The department has the following comments to provide – a) The proponent should be advised that prior to the commencement of any on ground development works within the DBNGP corridor, they must seek approval in writing from the DBNGP Land Access Minister. The application will be assessed as at the date of the application and approval, if granted, may be subject to conditions imposed by or on behalf of the DBNGP Land Access Minister. b) Pursuant to section 41 of the DBPA, restrictions will apply to the area of land that is contained in the DBNGP corridor. The proponent must apply for a section 41 approval specifically for (but not limited to): i. Any installation of tracks/road crossing, services and fence crossing or installations of pivots within the DBNGP corridor. ii. Any possible encroachment by future construction personnel, equipment, excess building materials and spoils during construction. A section 41 form and other relevant information can be found on our website: www.lands.wa.gov.au c) Any registration of new interest in the DBNGP corridor is disallowed and considered contrary to the intention of the DBPA. Proponents may apply for access either by section 41 approval; or in cases of pipeline activities, a section 34 Access Right. The proponent should also be advised to contact the **"1100 Dial Before You Dig**:" national referral service before commencement of any works.		Noted. See above response to DBP. Noted.
Department of Environment Regulation	Under section 51C of the *Environmental Protection Act 1986* (EP Act), clearing of native vegetation is an offence unless undertaken under the authority of a clearing permit, or the clearing is subject to an exemption. Exemptions for clearing that is a requirement of a written law, or authorized under certain statutory processes, are contained in Schedule 6 of the EP Act. Exemptions for low impact routine land management practices outside of environmentally sensitive areas (ESAs) are contained in the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004.* ESAs are declared in the *Environmental Protection (Environmentally Sensitive Areas) Notice 2005.* A review of available datasets indicates that the eastern resource area partly overlaps mapped 'resource enhancement' and 'multiple use' (Ellen Brook Floodplain) wetlands; that both of the resource areas contain vegetation; and that neither of the resource areas are mapped as an ESA. There are no exemptions available for the purpose of extractive industry. The information provided makes reference to the requirement for a clearing permit. As at 31 May 2017, no clearing permit applications have been received by the Department of Environment Regulation (DER) in relation to this proposal.	The Department of Environment Regulation will not assess Clearing Permit Applications until Planning Consent is granted, which is why the Application for a Clearing Permit has not been lodged. WA Limestone is aware that a Clearing Permit is required and this is considered in Attachment 1 of the Management Plan. The current mapped boundaries of the wetlands is close to the on ground vegetation but in a couple of places does not match exactly. The mapping of the wetland and setbacks is best determined in conjunction with the Department of Water and Department of Parks and Wildlife and can be applied at the Clearing Permit process.	As the site is not exempt from requiring a clearing permit, a recommended condition of approval by the officer states a Clearing Permit must be obtained to ensure no illegal clearing occurs. Noted. Noted.
Department of Health	The DOH has no objection to the development application provided the operation of the development is in accordance with approved management plans. A register of complaints and subsequent actions to address those complaints should be maintained by the operator. The ongoing operation of this development is to be in accordance with the Office of the Environmental Protection Authority Guidance Statement No 3. *'Separation Distances between Industrial and Sensitive Land Uses 2005.'*	Noted A Complaints register and procedure is proposed and will be implemented. The proposal complies with Office of the Environmental Protection Authority Guidance Statement No 3. *'Separation Distances between Industrial and Sensitive Land Uses 2005.'* Generic buffer guidelines.	Noted, the applicant will be bound by the conditions of approval and the management plans, should approval be issued. Assessment conducted found the proposal complies with *EPA's Guidance Statement no. 3*.

Public Submissions			
Public 1 **OPPOSE**	I am Opposed to this Project, as it may affect the WATER TABLE that we all rely on.	It is unclear where this resident lives and whether they live down gradient of the groundwater flow for example. The proposed excavation will not intersect the water table and is consistent with the Guidelines for extractive industries rural zone in the South West to increase land capability through bringing the land surface closer to the water table. This location is not located in the South West but is within the rural zone and will be returned to rural. With a separation of 0.5 to 1.0 metres the land capability of the rural land will be improved and instead of pasture dying in summer it will be retained and last through, providing good summer grazing. The recharge to the water table, elevations of the water table and through flow of the shallow groundwater will not change.	The applicant will not be digging below the water table. Furthermore, no toxic chemicals are proposed, only basic lubricants. Additionally, the officer has proposed a 2m separation from the water table in lieu of the applicants suggested 0.5 – 1.0m
Public 2 **OPPOSE**	Hi just emailing the shire in regard to submission for sand pits on the email link, we didn't receive any notification we heard through neighbours who live on side streets off Chittering Street, the noise, dust and impact on the environment would be a problem, as the proposal closes Friday 28th doesn't leave time for rate payers to have their say, only on this site could we have our say which doesn't seem fair, could you please make note [**REMOVED FOR PRIVACY**] are opposing the submission.	The proposed excavation is isolated from residences with no traffic travelling past dwellings. Temporary bunds will be used to minimise visual impact and provide noise and dust reductions during excavation. The closest point of the sand extraction will be 500 metres, and only for a short time frame, with all other excavation increasingly further away. That buffer distance is greater than the EPA and other Government Guidelines for buffers to sand excavation of 300 to 500 metres. There will be no transport or traffic along Chittering Street. Transport will be along Byrne Road, directly to Brand Highway approximately 1.7 km from Chittering Road.	The applicant has complied with required separation distances aimed at reducing impacts on nearby residential development from noise and dust. The applicant has also proposed vegetation buffers along southern boundaries closest to Chittering street. Trucks will move along Byrne road and brand highway only.
Public 3 **OPPOSE**	Regarding the above correspondence, my partner and I have discussed it and we are firmly against the application, some of our reasons are: - We moved up here for a lifestyle as have many people, let's keep the "residential areas residential" - The noise will be disruptive - The aesthetic appearance of Chittering St is already ruined, with that business that should have never been allowed to open up there with the huge ugly shed, this will only add to that	The proposed excavation is isolated from residences with no traffic travelling past dwellings. Temporary bunds will be used to minimise visual impact and provide noise and dust reductions during excavation. The closest point of the sand extraction will be 500 metres, and only for a short time frame, with all other excavation increasingly further away. That buffer distance is greater than the EPA and other Government Guidelines for buffers to sand excavation of 300 to 500 metres. See Separation to dwellings on pages 21 and 22 of the	Please see above comments relating to mitigation measures for noise and dust.

	- The extra trucks/machinery that will be in Muchea because of it - There is to be an industrial nodule in Muchea on the Gt Northern, whilst I appreciate that this sand may not be in that area that SHOULD be the only industrial area in Muchea We hope that council will make a stand and squash this application, otherwise there will just be more of the same and our land values will decrease because of it.	Management Plan and the Offsite Impacts Management in Attachment 3 to the Management Plan for Noise, Dust, and Visual Management There will be no transport or traffic along Chittering Street. Transport will be along Byrne Road, directly to Brand Highway approximately 1.7 km from Chittering Road.	Sand extraction is not considered an industrial land use. Each application must be assessed upon its own merits. Land values for the subject property or surrounds are not a consideration available to the Shire.
Public 4 **OPPOSE**	I strongly oppose to the proposal. The holes being dug will fill with water and cause a safety issue for children in the area. Will bring snakes. Noise of machinery. Extra pollution to the arena and our water source. Dust from machinery. We moved here 11 years ago for a peaceful lifestyle not for it to turn into an industrial workplace. Industrial work should be put near the sheep yards not in a township.	Unclear where this resident lives so WA Limestone is unable to comment on the objection, except to say that the proposed operations are designed to minimise disruption to the local community and maximise buffers to dwellings as discussed above in Public 3.	Excavation pits will only be accessible to employees and not the general public. Noted, although the addition of prey fauna is not capable of being substantiated. The applicant has complied with required separation distances aimed at reducing impacts on nearby residential development from noise and dust. Sand extraction is permitted in public drinking water source areas as they are not generally seen to impact on public drinking water. Further to this, no digging is proposed below the water table. Noted. See above comment relating to compliance with separation distances. The property and hence proposed extraction area is not located within the Muchea Townsite. Further to this, sand extraction is not considered an industrial land use.

*Note: Comments are as per original submission received by the Shire. Submission comments have not been edited unless for the purposes of confidentiality where necessary.

Matter's for Council's consideration

1. Use of Management Plans

Management plans should be used to guide matters that cannot be reasonably determined at the time of application. It is recommended that these matters be defined now and be set as conditions of development approval.

2. Approved Plan

If supported, the approval should be subject to a condition that the development occurs in accordance with an approved plan that outlines the standards required by Council. The approved plan should show (but not be limited to):

(a) the location and size of each excavation area;

(b) the location of buildings, equipment and/or other site works that may be incidental but related to the excavation works;

(c) the staging or works;

(d) the size and location of any stockpiles;

(e) an indication of nominal buffer distances from each pit, guided by the *Environmental Protection Guidance Statement 3: Separation Distances Between Industrial and Sensitive Land Uses*;

(f) the location of dwellings and other sensitive land uses adjacent to or on the site;

(g) proposed access to, from and within the site including an indication of the road standard;

(h) major site conditions including environmental attributes (i.e. wetlands and their buffers, vegetated areas) and gas pipeline easement and any buffers; and

(i) other information as required by Council.

It is also recommended that the site be surveyed to assist Council with monitoring and compliance if it is required.

3. Buffers from sensitive land uses

In considering the proposal, it is recommended that Council be guided by *Environmental Protection Guidance Statement 3: Separation Distances between Industrial and Sensitive Land Uses* to ensure that generic buffer distances have been addressed, and that if variation is justified, it is evidence-based.

4. Appropriate dust and noise suppression

This issue can be dealt with in a management plan. However, Council would need to be satisfied in the first instance that the proposal could achieve appropriate dust and noise suppression so as to meet the requirements of Local Planning Scheme No. 6.

5. Cleared vegetation

If vegetation is to be cleared and not stored for rehabilitation purposes, it is recommended that it be chipped (to 100mm size) rather than burnt, to minimise the impact on air quality.

6. Internal and external access

If Council determines that road upgrading is necessary, it is recommended that the requirement is imposed as a condition of development approval, prior to the commencement of site works so as to avoid potential dust impacts. Internal site roads should also be considered in terms of potential dust impacts and the desirability of avoiding wetlands and their buffers.

Consideration should be given to the amount of traffic that may be generated by this proposal and whether existing access to Brand Highway is adequate.

7. Revegetation

Council could consider imposing a condition that replanting is undertaken both throughout and following the period of extraction and that it includes species that will provide food for black cockatoos, on the advice of the local landcare group or the Department of Parks and Wildlife.

8. Other approvals

Council could consider issuing an advice note with any approval that outlines additional approvals that may be required in regard to a Clearing Permit, an Extractive Industry Licence and/or a works approval and Operating Licence from the Department of Environment Regulation.

Schedule of Modifications
Shire of Chittering Town Planning Scheme No.6
Scheme Amendment No.58

Delete the amendment and replace with the following:

1. Amend the Scheme Map by rezoning Lot 8 Buckthorn Drive, Lower Chittering from 'Agricultural Resource' to 'Rural Residential'.

2. Insert a new schedule, 'Schedule 12 - Rural Residential' into the Scheme Text.

3. Insert an entry into Schedule 12 - Rural Residential, as below:

No.	Description of Land	Conditions
1.	Lot 8 Buckthorn Drive, Lower Chittering	1. These conditions are to be read in conjunction with the Scheme requirements for the Rural Residential zone. Where conflicts exist, these conditions prevail. 2. The minimum lot size shall be 2 hectares. 3. The structure plan is to respond to the significant environmental features of the site and is to contain the following: a) the provision of a lot layout that minimises impact on areas of remnant vegetation in excellent and very good condition; b) the identification of building envelopes in locations that minimise the need for clearing of vegetation including for asset protection zones, access, firebreaks and fencing; c) the identification of measures for the protection and retention of existing and potential Black Cockatoo habitat trees and priority flora species; d) lot boundaries that do not dissect areas of remnant vegetation that are in excellent condition. 4. The structure plan is to provide for a road network that connects Buckthorn Drive and Navelina Drive. 5. The structure plan is to be supported by a Bushfire Management Plan prepared to the specifications and satisfaction of the local government and the Department of Fire and Emergency Services. 6. All lots are to be provided with a demonstrated sustainable fit-for-purpose water supply in accordance with Scheme requirements, including the provision of a 120,000L tank.

4. Delete the text under Clause 4.8.1 and replace with the following:

   (a) Subdivision and development shall be generally in accordance with a Structure Plan prepared and approved in accordance with Part 4 of the deemed provisions.
   (b) No further subdivision is permitted unless provided for in an approved Structure Plan and servicing, bushfire management and vegetation protection measures are demonstrated to be consistent with current State planning policy.

LOCAL GOVERNMENT ACT 1995

SHIRE OF CHITTERING

SHIRE OF CHITTERING REPEAL LOCAL LAW 2017

In pursuance of the powers conferred upon it by the *Local Government Act 1995* and under all other powers enabling it, the Council of the Shire of Chittering resolved on <INSERT DATE RESOLVED> to make the following local law.

1.1 Citation

This local law may be cited as the Shire of Chittering Repeal Local Law 2015.

1.2 Commencement

This local law comes into operation 14 days after the date of its publication in the *Government Gazette*.

1.3 Repeal

The following local law is repealed—

(a) By-laws relating to Signs, Hoardings and Bill Posting, published in the *Government Gazette* on 20 August 1993).

_____

Dated:

The Common Seal of the }
Shire of Chittering }
was affixed by authority of a }
resolution of the Council in the }
presence of: }

_____ _____

Cr Gordon Houston Alan Sheridan
Shire President Chief Executive Officer