



1. Application details

1.1. Permit application details

Permit application No.: 973/1

Permit type: Area Permit

1.2. Proponent details

Proponent's name: Dampier Salt Ltd.

1.3. Property details

Property: AML70/245

Local Government Area: Shire Of Carnarvon

Colloquial name:

1.4. Application

Clearing Area (ha)

No. Trees

Method of Clearing

For the purpose of:

77.1

Mechanical Removal

Mineral Production

2. Site Information

2.1. Existing environment and information

2.1.1. Description of the native vegetation under application

Vegetation Description	Clearing Description	Vegetation Condition	Comment
Beard vegetation type 328: Succulent Steepe with Scrub; Waterwood and <i>Acacia sclerosperma</i> over Saltbush and Samphire (Shepherd et al. 2001).	The 77.1 hectares of vegetation proposed to clear is for the up-grade and repair works on levees of the solar salt field and construction of a borewater dam (Dampier Salt Limited, 2005). The proposed works are situated on the terrestrial habitats on the western margin of the southern part of Lake MacLeod. The proposed clearing areas are located in the Warroora land system which is described as flat to gently sloping saline alluvial plains, with minor areas of sand and limestone, supporting tall acacia shrublands and low shrublands of saltbush, bluebush and samphire (GIS database; Payne et al., 1987). A review of the detailed accounts of the Warroora land system in Payne et al. (1987) suggested that the vegetation of the proposed areas to clear are representative of the 'Limestone Outcrop Plains' and 'Saline Plains' sub units (Biota, 2005). Payne et al. (1987) describes the Limestone Outcrop Plains as scattered low shrublands dominated by <i>Maireana polypterygia</i> (bluebush) or <i>Atriplex bunburyana</i> (saltbush) and <i>Acacia xiphophylla</i> .	Very Good: Vegetation structure altered; obvious signs of disturbance (Keighery 1994) Good: Structure significantly altered by multiple disturbance; retains basic structure/ability to regenerate (Keighery 1994)	Biota Environmental Sciences Pty Ltd prepared a report 'Lake MacLeod Solar Salt Project Desktop Flora and Vegetation Assessment; Vegetation Clearing Permit Report' for Dampier Salt Limited (DSL) as a supporting document to DSL's application to clear native vegetation (Biota, 2005). It was prepared largely on information supplied by DSL and also by reference to other published information. No updated field survey work was undertaken in the preparation of the report (Biota, 2005).

However, Biota (2005) stated the *Acacia xiphophylla* species does not appear to be present in the proposed clearing areas. The Saline Plains are described as scattered low shrublands dominated by *Halosarcia* spp. (samphire) and *Atriplex vesicaria* (saltbush). Other low shrubs present include *Maireana tormentosa* and *Threlkeldia diffusa* (Payne et al. 1987). Photographs of the proposed clearing areas provided by Dampier Salt Limited (DSL) (Plates 3.1 - 3.4) all show low, open shrublands, dominated by samphire and saltbush on calcareous clays and heavy saline soils (Biota, 2005).

3. Assessment of application against clearing principles

(a) Native vegetation should not be cleared if it comprises a high level of biological diversity.

Comments

Proposal is not likely to be at variance to this Principle

The Dampier Salt Limited Lake MacLeod solar salt field is located within the Carnarvon 2 (CAR2-Wooramel) Interim Biogeographic Regionalisation for Australia (IBRA) subregion (GIS database). The areas proposed to clear are situated along the western margin of the southern part of Lake MacLeod (GIS database). There are three land systems of the Carnarvon Basin which occur in the vicinity of the proposed clearing areas: Brown, Warroora and MacLeod (Biota, 2005). Only the Warroora LS will be affected by the proposed clearing activities, with 77.1 ha to be cleared (Biota, 2005). The Warroora land system is described as flat to gently sloping saline alluvial plains, with minor areas of sand and limestone, supporting tall acacia shrublands and low shrublands of saltbush, bluebush and samphire (Payne et al., 1987). The 77.1 ha of proposed clearing represents ~3% of the 2,526 ha of this land system occurring locally and <0.1% of the 83,100 ha that occurs in the bioregion (Biota, 2005).

Lake MacLeod is approximately 30 km north of Carnarvon and covers 150,000 hectares of mostly dry salt lake (Dampier Salt Limited et al., 2005). The lake is an environmentally sensitive area (GIS database) that is approximately 120 km long and for most of its length around 10 km wide (widest point 40 km) (DSL et al., 2005). The area is an outstanding example of a major coastal lake that is episodically inundated by fresh water, which includes permanent saline wetlands and inland mangrove swamps that are maintained by subterranean waterways from the Indian Ocean (DEH, 1995). The environments associated with the permanent wetlands are of outstanding conservation value and are highly significant in maintaining regionally and nationally important ecological processes (DEH, 1995). Lake MacLeod is a wetland listed as being of National Significance by the Australian Nature Conservation Agency (ANCA) (Desmond and Chant, 2001). The northern end of the lake has also been proposed for listing as a Wetland of International Significance under the RAMSAR agreement (DSL et al., 2005). This extensive and diverse wetland system supports Australia's largest inland community of mangroves (DEH, 1995) and is rich in aquatic invertebrates and waterbirds (CALM, 2002). It is a major migration stop over and drought refuge area for shorebirds and is one of the most important non-tidal stop over sites in Australia (DEH, 2005). The Carnarvon region is a centre of evolutionary radiation for the lizard genus *Lersita*, which has many locally endemic species (CALM, 2002). The high species diversity displayed by the *Lersita* group is also listed in Desmond and Chant (2001) as a feature of significant biodiversity value at a regional scale.

The areas regarded as having the greatest ecological value are found within the northern ponds which are located within the DSL Lake MacLeod lease however they are some 40 km north of the salt field operation area. The areas proposed to clear are situated on the terrestrial habitats on the western margin of the Lake MacLeod salt field operation area. The proposed clearing for the expansion of four borrow pits and establishment of a new borewater storage dam requires the clearing of 77.1 ha of native vegetation, some of which is already partially disturbed given its proximity to existing, approved materials sourcing pits (Biota, 2005). The areas surrounding Lake MacLeod are covered by a number of pastoral leases (GIS database). The areas proposed to clear are separated and dispersed over a distance of 11 km with the maximum area of 42 ha to be cleared in any one location (Biota, 2005). Based on the small spatial extent of the clearing in relation to the local and regional representation of the vegetation proposed to be cleared, this proposal is unlikely to have significant impact on the existing and surrounding biodiversity values in the area (CALM, 2006). This proposal is not likely to be at variance to this principle.

Methodology Biota (2005).
CALM (2002).

CALM (2006).
DEH (1995).
Desmond and Chant (2001).
DSL et al. (2005).
GIS Database:
-Clearing Regulations- Environmentally Sensitive Areas- DOE 30/05/05.
-IBRA Subregions- EA 18/10/2000.
-Pastoral Leases- DOLA 10/01.
-Pre-European Vegetation- DA 01/01.
Payne et al. (1987).
Shepherd et al. (2001).

(b) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia.

Comments Proposal is not likely to be at variance to this Principle

The Lake MacLeod wetland is a major migration stopover and drought refuge area for shorebirds and is one of the most important non-tidal stop over sites in Australia (DEH, 2004). It is a critical habitat for maintaining the life cycle of a number of migratory bird species (DEH, 1995). Large aggregations of migratory shorebirds have been counted at the proposed Ramsar site (30-40 km north of proposed clearing), mainly on the shallows and mudflats associated with the permanent lagoons (DSL et al., 2005). Surveys have recorded 70 waterbird species at Lake MacLeod of which 25 are listed under Australia's bilateral treaties on migratory species with Japan and China (DSL et al., 2005).

A survey of Lake MacLeod by Jaensch and Vervest (1990) found that waterbird numbers were insignificant in the dry areas of the lake in comparison with the numbers in the permanent wetland. K. Grinter of Dampier Salt had told Jaensch and Vervest (1990) that Stilts nested in large numbers on undisturbed flood protection levees around the saltfield during the 1980 flood. Although a few ducks and one or two shorebirds have been recorded, the saltfields appeared to be insignificant for waterbirds (Jaensch and Vervest, 1990). Database searches, literature reviews (particularly the CALM/WA Museum regional survey of the Carnarvon Basin) and desktop habitat assessments carried out by Biota (2005) indicated that no listed Threatened fauna species were likely to be reliant on the areas proposed for clearing. A review of the land system mapping indicated that the habitat types to be cleared are widespread in the locality and in the wider bioregion (Biota, 2005). The proposed clearing is in five areas with a total of 77.1 ha out of a land system comprising 80,000 ha (Biota, 2005). The areas proposed to clear range from 1.2556 ha to 41.6 ha in size and are separated and dispersed over a distance of 11 km. Given the distance from the permanent wetlands and associated fauna, the availability of similar (and generally better quality) habitat nearby and the size and distribution of the areas to be cleared, the proposed clearing is not likely to represent a significant habitat loss for any associated fauna. Therefore, this proposal is not likely to be at variance to this principle.

Methodology Biota (2005).
DEH (1995).
DEH (2004).
DSL et al. (2005)
GIS Database:
-CALM Threatened Fauna- CALM (30/09/2005).
Jaensch and Vervest (1990).

(c) Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora.

Comments Proposal is not likely to be at variance to this Principle

A search of the CALM Threatened Flora database was carried out for the proposed clearing areas, buffered by a distance of 50 km (Biota, 2005). According to the CALM database records and regional CALM advice it appears unlikely that known Declared Rare Flora (DRF) would occur within the areas proposed to clear (CALM, 2006; GIS database). There were also no known records of DRF from within the wider searched area however 10 Priority listed species were found to occur within the extended 50 km radius. These include: *Ptilotus alexandri* (P2), *Schoenia filifolia* (P1), *Chthonocephalus tomentellus* (P2), *Eremophila glabra* (P2), *Lepidium biplicatum* (P2), *Chthonocephalus spathulatus* (P1), *Abutilon* sp. Quobba (P2), *Abutilon* sp. Hamelin (P2), two records of *Stenanthemum divaricatum* (P3) and nine records of *Acacia ryaniana* (P2) (CALM, 2005). Most priority flora known from this locality occur in dunefield vegetation rather than the saline shrublands found in the areas proposed to clear (CALM, 2005). The P2 species *Chthonocephalus tomentellus* is known in the southern margins of Lake MacLeod in vegetation associated with acacia shrubs on red sand dunes near saline depressions (CALM, 2005) and therefore could occur in the proposal areas. The closest record (*Abutilon* sp. Quobba) was located approximately 4 km to the west of pit 53 and will not be disturbed by this proposal (Biota, 2005). One P2 species endemic to the region, *Sondottia glabrata*, recorded by Keighery et al. (2001) occurs on saline flats and may occur in the area. However, it is also known from several other populations in the same sub-bioregion extending south along the coast and into the Shark Bay area (Biota, 2005).

It is unlikely that the proposed clearing will impact on significant flora based on the CALM database search and previous flora surveys. Given the area proposed to be cleared is small in relation to the local extent of the land

system the likelihood of significant impacts on any restricted flora which have not been previously recorded nearby is low (CALM, 2006). Therefore, this proposal is not likely to be at variance to this principle.

Methodology Biota (2005).
CALM (2006).
GIS Database:
-Declared Rare and Priority Flora List- CALM (1/07/2005).
Keighery et al. (2001).

(d) Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community.

Comments Proposal is not likely to be at variance to this Principle

There are no known Threatened Ecological Communities (TEC's) within the area applied to clear (GIS database). There is only one TEC documented from the CAR2 sub-bioregion which is the "Hypersaline microbial community number 2 (Hamelin stromatolite)" (Desmond and Chant, 2001). This TEC is more than 200 km south of Lake MacLeod (GIS database) and will not be affected by the proposed clearing.

Samphire communities of Lake MacLeod were included in the CAR2 list of 'ecosystems at risk' by Desmond and Chant (2001). The threatening processes of this community include the inflows to the lake due to degradation of surrounding catchments and mining activities (Desmond and Chant, 2001). Samphire communities are however, relatively widespread around Lake MacLeod, therefore it is unlikely that the 77.1 ha proposed to clear will adversely impact on the future status of these communities. DSL's Borrow Pit Rehabilitation Procedure will ensure that once borrow removal or other ground disturbance is finished the area is backfilled and rehabilitated as soon as practicable (DSL, 2005b). Rehabilitation work in an area is determined by the projected land use of the area, or 'end use.' It is DSL's objective that all disturbed land on the Lake MacLeod lease be returned to native vegetation (DSL, 2005b). Provided that the proposed borrow pit areas are progressively rehabilitated in accordance with the Borrow Pit Rehabilitation procedures it is likely that this proposal can be undertaken in an environmentally acceptable manner (CALM, 2006). Therefore, this proposal is not likely to be at variance to this principle.

Methodology Desmond and Chant (2001).
DSL (2005b).
GIS Database:
-Threatened Ecological Communities- CALM (12/04/2005).

(e) Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared.

Comments Proposal is not likely to be at variance to this Principle

The State Government is committed to the National Objectives and Targets for Biodiversity Conservation which includes a target that prevents clearance of ecological communities with an extent below 30% of that present pre-European settlement (Department of Natural Resources and Environment, 2000; EPA, 2000).

The areas proposed to clear are situated within the Carnarvon 2 (CAR2-Wooramel) IBRA subregion which has an area of 3.9% in conservation reserves (IUCN I-IV) (GIS database; Desmond and Chant, 2001). According to Shepherd et al. (2001) approximately 100% of the native vegetation cover remains within this subregion. The vegetation at the application area is a component of Beard Vegetation Association 328 (GIS database) of which there is ~100% of the pre-European extent remaining however has zero percent in conservation reserves (Shepherd et al., 2001). While the benchmark of 15% representation in conservation reserves (JANIS Forests Criteria, 1997) has not been met for Beard vegetation association 328, approximately 100% of the pre-European extent remains and it is therefore of 'least concern' for biodiversity conservation (Department of Natural Resources and Environment, 2002).

	Pre-European Area (ha)	Current extent (ha)	Remaining %*	Conservation Status**	% in Reserves/ CALM managed land
IBRA Bioregion - Carnarvon	8,523,963	8,523,963	100	Least Concern	3.45
Beard vegetation association -328	11,267	11,267	100	Least Concern	0.0

* Shepherd et al. (2001)

** Department of Natural Resources and Environment (2002)

There has been little historical clearing of native vegetation in the project area and the wider locality (DSL, 2005). The only land system in the area where the clearing is proposed (Warroora LS) is extensive, with its extent in the Carnarvon Basin region totalling 83,100 ha (Payne et al., 1987) of which less than 0.1% is proposed to clear. The project area is already partially disturbed due to grazing from the surrounding pastoral lease and proximity to existing materials sourcing pits (Biota, 2005). The proposal is not likely to be at variance to this principle.

Methodology Biota (2005).
Department of Natural Resources and Environment (2002).
Desmond and Chant (2001).
EPA (2000).
GIS Database:
-IBRA Subregions-EA (18/10/2000).
-Pre-European Vegetation- DA 01/01
JANIS Forests Criteria (1997).
Payne et al. (1987).
Shepherd et al. (2001).

(f) Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland.

Comments Proposal is not likely to be at variance to this Principle

The proposed clearing areas are situated on the western margin of the southern part of Lake MacLeod. Lake MacLeod is a large saline basin with a lake bed that lies 3-4 m below sea level (DSL, 2005b). The surface is normally dry; however, major rainfall events can result in the lake being partially or wholly covered by water (DSL, 2005b). DEH (2004) describes the Lake MacLeod area as a major coastal lake that is episodically inundated by freshwater, which includes permanent saline wetlands and inland mangrove swamps that are maintained by subterranean waterways. No part of Lake MacLeod is within a protected area. However, the lake is listed on the Register of the National Estate (DEH, 2004). The areas regarded as having the greatest ecological value are found in the north-west portion of the lake in the area of permanent wetland known as the northern ponds (DSL et al., 2005). Parts of Lake MacLeod have been recognised for its significance to bird populations by inclusion in Australia's Directory of Important Wetlands (DSL et al., 2005). DSL are investigating the designation of part of their lease as a Wetland of International Importance under the Ramsar Convention (DSL, 2003).

The DSL operations at Lake MacLeod have had little impact on the lake or the surrounding environment (DSL, 2004). The natural lake processes, including periodic flooding, have not been disturbed and the surrounding land continues to support pastoral activities (DSL, 2003). DSL has a clearly stated environmental policy which includes commitments to prevent pollution and minimise the impact of its operations on the surrounding environment and neighbouring communities (DSL, 2003). DSL initiated monitoring of the ponds in 1997 and are currently developing a management plan. DSL's Borrow Pit Rehabilitation Procedure will ensure that once borrow removal or other ground disturbance is finished the area is to be backfilled and rehabilitated as soon as practicable (DSL, 2005b). Considering the total area proposed to clear is small in relation to the local extent of uncleared vegetation around Lake MacLeod and is some 30-40 km south of the northern ponds, it is unlikely to affect any wetland communities or hydrological processes of the lake. Therefore, this proposal is not likely to be at variance to this principle.

Methodology DEH (2004).
DSL (2003).
DSL (2004).
DSL (2005b).
DSL et al. (2005).
GIS Database:
-Linear hydrography (hierarchy)- DoE 13/4/2005

(g) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation.

Comments Proposal is not likely to be at variance to this Principle

DSL Borrow Pit Operations (2005a) states that the location of the borrow pits is selected where possible to avoid streams, reserve areas, areas of high erosion, drainage, flood hazards, locations with high landscape amenity or visibility, areas of unique or undisturbed vegetation, areas of aboriginal heritage or areas that are otherwise particularly sensitive from an environmental or social standpoint. Furthermore, adequate distance must be maintained between areas of disturbance and permanent watercourses or their flood plains, to reduce erosion and water pollution potential. Areas of disturbed vegetation should also be preferentially chosen over undisturbed areas (DSL, 2005a). DSL will develop a drainage plan for all borrow pits to restrict the amount of extraneous water entering the site and manage runoff (DSL, 2005a). DSL (2005a) has considered the slopes of the edges of the void must be low enough to keep the surfaces stable and avoid fall injury. Slopes of 3:1 may be effective in reducing the risk of erosion and terracing may help prevent erosion on steeper slopes (DSL, 2005a). Erosion will be confined within the area of the borrow pits, and will be rehabilitated in accordance with DSL rehabilitation procedures once operations are completed in the area (DSL, 2005b). Subject to weather, DSL aims to rehabilitate all areas cleared for the proposed works within five years of operations ceasing in the area (DSL, 2006). This commitment excludes the area for the bore water dam (DSL, 2006).

The application area is situated on the Warroora land system which consists of flat to gently sloping saline

alluvial plains, sluggish drainage tracts, limestone outcrop plains and minor sandy banks (Payne et al., 1987). The vegetation in the Warroora LS has considerable drought durability and the system is not usually susceptible to erosion (Payne et al., 1987). The limestone outcrop plains support scattered low shrublands on dark red or reddish-brown fine sandy loam - sandy clay loam soils that are typically less than 40cm deep. Slopes are generally less than 0.5% (AGWA, 2006). The Department of Agriculture (2006) advise that the proposed clearing is not likely to cause serious soil erosion on this land unit. The saline plains land unit is likely to support halophytic shrubs on red duplex soils. Slopes are generally flat. These soils are not regarded as being prone to soil erosion (AGWA, 2006). Therefore, it is not likely the proposed clearing will cause appreciable land degradation.

Methodology AGWA (2006).
DSL (2005a).
DSL (2005b).
DSL (2006).
GIS Database:
-Evaporation Isoleths- BOM 09/1998.
-Mean Annual Rainfall Surface (1975-2003)- DOE 09/2005.
-Soils, Statewide- DA 11/99.
-Groundwater Salinity, Statewide- 22/02/00.
Payne et al. (1987).

(h) Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area.

Comments Proposal is not likely to be at variance to this Principle

The closest conservation area is the One Tree Point A class Nature Reserve (GIS database), situated approximately 40 km south of the proposed clearing and 3 km north of Carnarvon. The proposed clearing is unlikely to have any affect on the conservation values of this reserve.

Lake MacLeod is a Redbook area which is listed as being of National Significance by the Australian Nature Conservation Agency (ANCA) (Desmond and Chant, 2001). The northern end of the lake has also been proposed for listing as a Wetland of International Significance under the RAMSAR agreement (DSL et al., 2005). However this area, which is regarded as having the greatest ecological value within Lake MacLeod, is located 40 km north of the salt field operation area. Therefore, the northern ponds are unlikely to be impacted upon by the proposed clearing.

The benchmark of 15% representation in conservation reserves (JANIS Forests Criteria, 1997) has not been met for Beard vegetation 328. The 'Reservation Priorities of Ecosystems' for CAR2 sub-bioregion in Desmond and Chant (2001) listed Beard vegetation association 328 as a high priority as currently there is 0% in reserves/CALM managed land (Shepherd et al., 2001). However according to Shepherd et al (2001) there is around 100% of this vegetation type uncleared (11,267 ha) within the CAR2 sub-bioregion. The proposed areas to clear are already partially disturbed by pastoral and mining activities and are therefore unlikely to be of significant conservation value. Therefore, this proposal is not likely to be at variance to this principle.

Methodology Desmond and Chant (2001).
DSL et al. (2005).
GIS Database:
-Pre-European Vegetation- DA 01/01.
-CALM Managed Lands and Water- CALM 1/07/05.
JANIS Forests Criteria (1997).
Shepherd et al. (2001).

(i) Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water.

Comments Proposal is not likely to be at variance to this Principle

The areas proposed to clear are not located in a Public Drinking Water Source Area (PDWSA) or a *RIWI Act 1914* area (GIS database). The average annual rainfall is 330 mm with an annual evaporation rate of 2600 mm (GIS database). Groundwater stored in shallow, unconfined aquifers is subject to the concentrating effect of water use by trees and other deep rooted vegetation (Payne et al., 1980). This, combined with the small proportion of rainfall available to recharge aquifers, results in most groundwater being brackish to saline (Payne et al., 1980). Groundwater salinity levels in the areas proposed to clear range from 3000-7000 mg/L and greater than 35000 mg/L in Lake MacLeod (GIS database). With the exception of intensive rainfall events and above average seasonal rainfall there is likely to be little surface flow during normal seasonal rains and recharge into regional groundwater would be minimal. The quality of groundwater is unlikely to be impacted on and the clearing is not expected to alter water tables or cause changes to pH or increase salinity.

The surface of the southern part of the lake is normally dry although it can be partially or wholly covered by water from summer or winter rains (DSL et al., 2005). The water of Lake MacLeod is hypersaline (DSL et al.,

2005) however seasonal influences of freshwater discharge can create a short-term gradient in pH, salinity, dissolved oxygen and nutrients in surface water (DSL et al., 2005). By the end of the wet season this gradient has been found to all but disappear (DSL et al., 2005). As part of DSL's borrow pit procedures (DSL, 2005a) a drainage plan will be developed for all borrow pits to restrict the amount of extraneous water entering the site and manage runoff. DSL also aims to rehabilitate all areas cleared for the proposed works within five years of operations ceasing in the area (DSL, 2006). Considering all the above and that the five areas proposed to clear are relatively small and dispersed over a distance of 11 km it is not likely the proposal will be at variance to this principle.

Methodology DSL (2005a).
DSL et al. (2005).
DSL (2006).
GIS Database:
-Evaporation Isopleths- BOM 09/98 (Evaporation).
-Groundwater Salinity, Statewide- 22/02/00.
-Public Drinking Water Sources (PDWSAs) - DOE 09/08/05.
-Rainfall, Mean Annual- BOM 30/09/01
-RIWI Act, Areas- WRC 05/04/02.
Payne et al. (1980).

(j) Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.

Comments Proposal is not likely to be at variance to this Principle

The areas proposed to clear are situated within the Gascoyne region, which experiences an arid to semi-arid climate with a highly variable temporal and spatial rainfall distribution (BOM, 2006). Severe droughts are a prominent element of the climate (Burbidge et al., 2000). Lake MacLeod is located within the Northern Australian cyclonic region and therefore flooding events are a natural infrequent occurrence in this landscape (Burbidge et al., 2000). The average annual rainfall is 230 mm with an average annual evaporation rate of 2600 mm (BOM, 2006; GIS database) therefore there is little surface flow during normal seasonal rains. The lake surface is at an elevation of three to four metres below sea level (DSL, 2006). Floods can inundate the lake to an elevation of -1.75 m AHD (Australian Height Datum) at 20 year return intervals (DSL, 2006). Lake MacLeod has high levels of evaporation of about 3000 mm per annum (DSL, 2005). Given that areas proposed to clear are small in relation to the extent of uncleared vegetation in the region it is unlikely to cause or exacerbate the incidence or intensity of flooding. Therefore, this proposal is not likely to be at variance to this principle.

Methodology BOM (2006).
Burbidge et al. (2000).
DSL (2005).
DSL (2006).
GIS Database:
- Evaporation isopleths- BOM (09/1998).
- Mean annual rainfall Surface (1975-2003)- DOE 09/05.
- Topographic contours, Statewide- DOLA 12/09/02.

Planning instrument, Native Title, Previous EPA decision or other matter.

Comments

There is a native title claim over the area under application; WC97/028. This claim has been registered with the National Native Title Tribunal on behalf of the GNULLI claimant group. However, the mining tenement has been granted in accordance with the future act regime of the *Native Title Act 1993* and the nature of the act (i.e. the proposed clearing activity) has been provided for in that process, therefore the granting of a clearing permit is not a future act under the *Native Title Act 1993*.

Dampier Salt Ltd Lake MacLeod AML70/245 has a groundwater licence GWL56934 (002) for industrial purposes, granted in accordance with the *Rights in Water and Irrigation Act 1914*. The licence will not need to be amended to take into account the clearing application (DoE, 2006).

Dampier Salt Ltd Lake MacLeod AML70/245 has a current licence/works approval 7178/8 granted in accordance with the *Environmental Protection Act 1986*. The proposed clearing is not at variance to this licence, and no amendment to the licence will be required (DoE, 2006).

Methodology DoE (2006).
GIS Database:
-Aboriginal Sites of Significance- DIA 04/07/02.
-Native Title Claims- DLI 19/12/04

4. Assessor's recommendations

Purpose	Method	Applied area (ha)/ trees	Decision	Comment / recommendation
Mineral Production	Mechanical Removal	77.1	Grant	The clearing principles have been addressed and the proposed clearing is not likely to be at variance to any of the 10 principles. The assessing officer therefore recommends that the permit be granted.

5. References

- Biota Environmental Sciences Pty Ltd (2005) Lake MacLeod Solar Salt Project Desktop Flora and Vegetation Assessment; Vegetation Clearing Permit Report. Dampier Salt Limited, Western Australia.
- Burbidge, A.H., Harvey, M.S. and McKenzie, N.L. (2000) Biodiversity of the Southern Carnarvon Basin. Records of the Western Australian Museum Supplement No. 61. Western Australia.
- Bureau of Meteorology (2006) Climate of Carnarvon; Climate Averages at Carnarvon Airport. Accessible online at http://www.bom.gov.au/weather/wa/carnarvon/climate_and_history.shtml (accessed 16/03/2006).
- CALM (2002) A biodiversity audit of Western Australia's 53 Biogeographic Subregions in 2002.
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- Dampier Salt Limited (2003). Responsible Care Report 2003. Dampier Salt Limited, Western Australia.
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- Dampier Salt Limited (2005b) Borrow Pit Rehabilitation; DSL Environmental Operational Procedure, FS114. Dampier Salt Limited, Western Australia.
- Dampier Salt Limited (2006) Development of Borrow Pits for Crystalliser Maintenance at the Lake MacLeod Solar Salt Field. Dampier Salt Limited, Western Australia.
- Dampier Salt Limited, CALM, and WWF-Australia (2005) The Proposed Listing of a Wetland of International Importance at Lake MacLeod: Draft Management Plan September 2005. An Initiative of Dampier Salt Limited, The Western Australia Department of Conservation and Land Management and WWF-Australia, Western Australia.
- Department of Environment and Heritage (1995) Lake MacLeod Area, Carnarvon, W.A. Accessible online from <http://www.deh.gov.au/> (accessed 07/03/2006).
- Department of Natural Resources and Environment (2002) Biodiversity Action Planning. Action planning for native biodiversity at multiple scales; catchment bioregional, landscape, local. Department of Natural Resources and Environment, Victoria.
- Desmond, A. and Chant, A. (2001) A Biodiversity Audit of Western Australia's 53 Biogeographical Subregions in 2002; Carnarvon 2 (CAR2 - Wooramel Subregion). CALM, Western Australia.
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6. Glossary

Acronyms:

BoM	Bureau of Meteorology, Australian Government.
CALM	Department of Conservation and Land Management, Western Australia.

DAWA	Department of Agriculture, Western Australia.
DA	Department of Agriculture, Western Australia.
DEH	Department of Environment and Heritage (federal based in Canberra) previously Environment Australia
DEP	Department of Environment Protection (now DoE), Western Australia.
DIA	Department of Indigenous Affairs
DLI	Department of Land Information, Western Australia.
DoE	Department of Environment, Western Australia.
DoIR	Department of Industry and Resources, Western Australia.
DOLA	Department of Land Administration, Western Australia.
EP Act	Environment Protection Act 1986, Western Australia.
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999 (Federal Act)
GIS	Geographical Information System.
IBRA	Interim Biogeographic Regionalisation for Australia.
IUCN	International Union for the Conservation of Nature and Natural Resources – commonly known as the World Conservation Union
RIWI	Rights in Water and Irrigation Act 1914, Western Australia.
s.17	Section 17 of the Environment Protection Act 1986, Western Australia.
TECs	Threatened Ecological Communities.

Definitions:

{Atkins, K (2005). *Declared rare and priority flora list for Western Australia, 22 February 2005. Department of Conservation and Land Management, Como, Western Australia*} :-

- P1** **Priority One - Poorly Known taxa:** taxa which are known from one or a few (generally <5) populations which are under threat, either due to small population size, or being on lands under immediate threat, e.g. road verges, urban areas, farmland, active mineral leases, etc., or the plants are under threat, e.g. from disease, grazing by feral animals, etc. May include taxa with threatened populations on protected lands. Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
- P2** **Priority Two - Poorly Known taxa:** taxa which are known from one or a few (generally <5) populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in urgent need of further survey.
- P3** **Priority Three - Poorly Known taxa:** taxa which are known from several populations, at least some of which are not believed to be under immediate threat (i.e. not currently endangered). Such taxa are under consideration for declaration as 'rare flora', but are in need of further survey.
- P4** **Priority Four – Rare taxa:** taxa which are considered to have been adequately surveyed and which, whilst being rare (in Australia), are not currently threatened by any identifiable factors. These taxa require monitoring every 5–10 years.
- R** **Declared Rare Flora – Extant taxa (= Threatened Flora = Endangered + Vulnerable):** taxa which have been adequately searched for, and are deemed to be in the wild either rare, in danger of extinction, or otherwise in need of special protection, and have been gazetted as such, following approval by the Minister for the Environment, after recommendation by the State's Endangered Flora Consultative Committee.
- X** **Declared Rare Flora - Presumed Extinct taxa:** taxa which have not been collected, or otherwise verified, over the past 50 years despite thorough searching, or of which all known wild populations have been destroyed more recently, and have been gazetted as such, following approval by the Minister for the Environment, after recommendation by the State's Endangered Flora Consultative Committee.

{Wildlife Conservation (Specially Protected Fauna) Notice 2005} [Wildlife Conservation Act 1950] :-

- Schedule 1** **Schedule 1 – Fauna that is rare or likely to become extinct:** being fauna that is rare or likely to become extinct, are declared to be fauna that is need of special protection.
- Schedule 2** **Schedule 2 – Fauna that is presumed to be extinct:** being fauna that is presumed to be extinct, are declared to be fauna that is need of special protection.
- Schedule 3** **Schedule 3 – Birds protected under an international agreement:** being birds that are subject to an agreement between the governments of Australia and Japan relating to the protection of migratory birds and birds in danger of extinction, are declared to be fauna that is need of special protection.
- Schedule 4** **Schedule 4 – Other specially protected fauna:** being fauna that is declared to be fauna that is in need of special protection, otherwise than for the reasons mentioned in Schedules 1, 2 or 3.

{CALM (2005). *Priority Codes for Fauna. Department of Conservation and Land Management, Como, Western Australia*} :-

- P1** **Priority One: Taxa with few, poorly known populations on threatened lands:** Taxa which are known from few specimens or sight records from one or a few localities on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, active mineral leases. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
- P2** **Priority Two: Taxa with few, poorly known populations on conservation lands:** Taxa which are known from few specimens or sight records from one or a few localities on lands not under immediate threat of habitat destruction or degradation, e.g. national parks, conservation parks, nature reserves, State forest, vacant Crown land, water reserves, etc. The taxon needs urgent survey and evaluation of conservation

status before consideration can be given to declaration as threatened fauna.

- P3 Priority Three: Taxa with several, poorly known populations, some on conservation lands:** Taxa which are known from few specimens or sight records from several localities, some of which are on lands not under immediate threat of habitat destruction or degradation. The taxon needs urgent survey and evaluation of conservation status before consideration can be given to declaration as threatened fauna.
- P4 Priority Four: Taxa in need of monitoring:** Taxa which are considered to have been adequately surveyed, or for which sufficient knowledge is available, and which are considered not currently threatened or in need of special protection, but could be if present circumstances change. These taxa are usually represented on conservation lands.
- P5 Priority Five: Taxa in need of monitoring:** Taxa which are not considered threatened but are subject to a specific conservation program, the cessation of which would result in the species becoming threatened within five years.

Categories of threatened species (*Environment Protection and Biodiversity Conservation Act 1999*)

- EX Extinct:** A native species for which there is no reasonable doubt that the last member of the species has died.
- EX(W) Extinct in the wild:** A native species which:
- (a) is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or
 - (b) has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
- CR Critically Endangered:** A native species which is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
- EN Endangered:** A native species which:
- (a) is not critically endangered; and
 - (b) is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
- VU Vulnerable:** A native species which:
- (a) is not critically endangered or endangered; and
 - (b) is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
- CD Conservation Dependent:** A native species which is the focus of a specific conservation program, the cessation of which would result in the species becoming vulnerable, endangered or critically endangered within a period of 5 years.