Lake MacLeod Pty Ltd

Lake MacLeod Closure Plan

Document ID LEI-OPER-PLAN-001

[redacted]

Mineral Lease – ML245SA

Tenements – L09/10, L09/11, L09/17, L09/18

Jetty Lease – LM1379

January 2025

[redacted]

[redacted]

Disclaimer

The mine closure plan (MCP) has been prepared by Leichhardt Industrials Group Pty Ltd, on behalf of Lake MacLeod Pty Ltd (Proponent), specifically for the Lake MacLeod Operations within Mineral Lease ML245SA granted under the *Evaporites (Lake MacLeod) Agreement Act 1967* (Agreement Act), and miscellaneous licences granted under the *Mining Act 1978*.

This mine closure plan is an update to the 2019 and 2010 mine closure plans prepared by Dampier Salt Limited (DSL).

Revision Record

Revisions	Description	Author(s)	Reviewer(s)	Approver	Approval Date
Rev A	Issued for LMC review	[redacted]	[redacted]		
Rev 0	Issued for submission to JTSI	[redacted]	[redacted]		
Rev 1	Revised following DSL review	[redacted]	[redacted]		
Rev 2	Revised in response to DEMIRS comments	[redacted]	[redacted]		
Rev 3	Revised in response to DWER and DPLH comments	[redacted]	[redacted]		
Rev 3.1	Updated with new licenses/permits and response to DWER and DPLH comments	[redacted]	[redacted]		

Issue History

Revisions	Issued To	Date	Transmittal

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1 Project Summary

1.1 Introduction

Lake MacLeod Pty Ltd (LMC) is a wholly owned subsidiary of Leichhardt Industrials Group Pty Ltd (LIG). LMC is an Australian-owned company that has entered into a binding Asset Sale Agreement to acquire the Lake MacLeod Operations (the 'Site'), located in the Gascoyne region of Western Australia, from Dampier Salt Limited (DSL). LIG is also currently completing studies and approvals for the Eramurra Solar Salt Project located near Karratha.

Lake MacLeod is located, approximately 900 kilometres (km) north of Perth as shown in Figure 1-1 and is within Mineral Lease ML245SA granted under the *Evaporites (Lake MacLeod) Agreement Act 1967* (State Agreement), and miscellaneous licences granted under the *Mining Act 1978*.

The Lake MacLeod salt operation is located in the southern portion of Lake MacLeod off Blowholes Road, approximately 40 km north of the town of Carnarvon. Lake MacLeod itself occupies an area of 225,000 hectares and is approximately 110 km long and 40 km wide. Lake MacLeod is a predominantly dry salt lake, with permanent water bodies located at the Northern Ponds (Cygnet and Ibis Ponds). The Lake MacLeod Operation was first developed in 1965, primarily as a potash production facility.

The Lake MacLeod Operation has three separate facilities as shown in Figure 1-1

1. a salt operation, including brine collection ditches;
2. a gypsum operation; and
3. a port and ship loading facility .

The salt operation is located in the southern end of Lake MacLeod, and sources lake brine that flows down-gradient from the northern part of the lake for use in the salt operation.

The gypsum operations are located within Lake MacLeod, approximately 18 km north of the salt operations.

The ship loading facility is located at Cape Cuvier, approximately 16 km west of the gypsum operations as shown in Figure 1-1.

The approved production capacity of the Lake MacLeod Operation, as stated in the Department of Water and Environmental Regulation (DWER) Licence L7178/1997/11, is 6.1 million tonnes per annum (Mtpa) of both salt and gypsum combined, which is shipped from Cape Cuvier.

DSL (a subsidiary of Rio Tinto) is currently in the process of divesting the Lake MacLeod operation to LMC. It is expected that this MCP will be enlivened following successful transfer of ownership to LMC; however many existing legal and obligatory documents still retain the DSL name and have been referred to in this MCP as such.

Throughout this MCP, LMC is deemed to be the future owner, operator, and manager of the Lake MacLeod site. LMC will continue to operate the three areas with the same general approach and methodology as DSL.

1.2 Purpose

This MCP has been produced as an update to the 2019 MCP, to reflect LMC Site ownership, and to demonstrate LMC's closure planning understanding and commitment to closure related activities.

This MCP is a conceptual site-level closure plan for the Lake MacLeod Operation, providing a knowledge base and closure strategy applicable to the operation as a whole, based on the information available at the time of publication.

The life of mine is considered as an ongoing resource due to the lack of a traditional mining ore body or similar. Therefore, a life of mine (LOM) or closure year has not been stated. Additionally, completion criteria are not yet fully developed. Draft criteria have been presented in this MCP, however they will be reviewed and revised once the site confirms a LOM and closure planning progresses.

There are a variety of reasons why a site may enter into closure and this MCP provides the necessary preliminary information towards rehabilitation and closure of the Lake MacLeod Site.

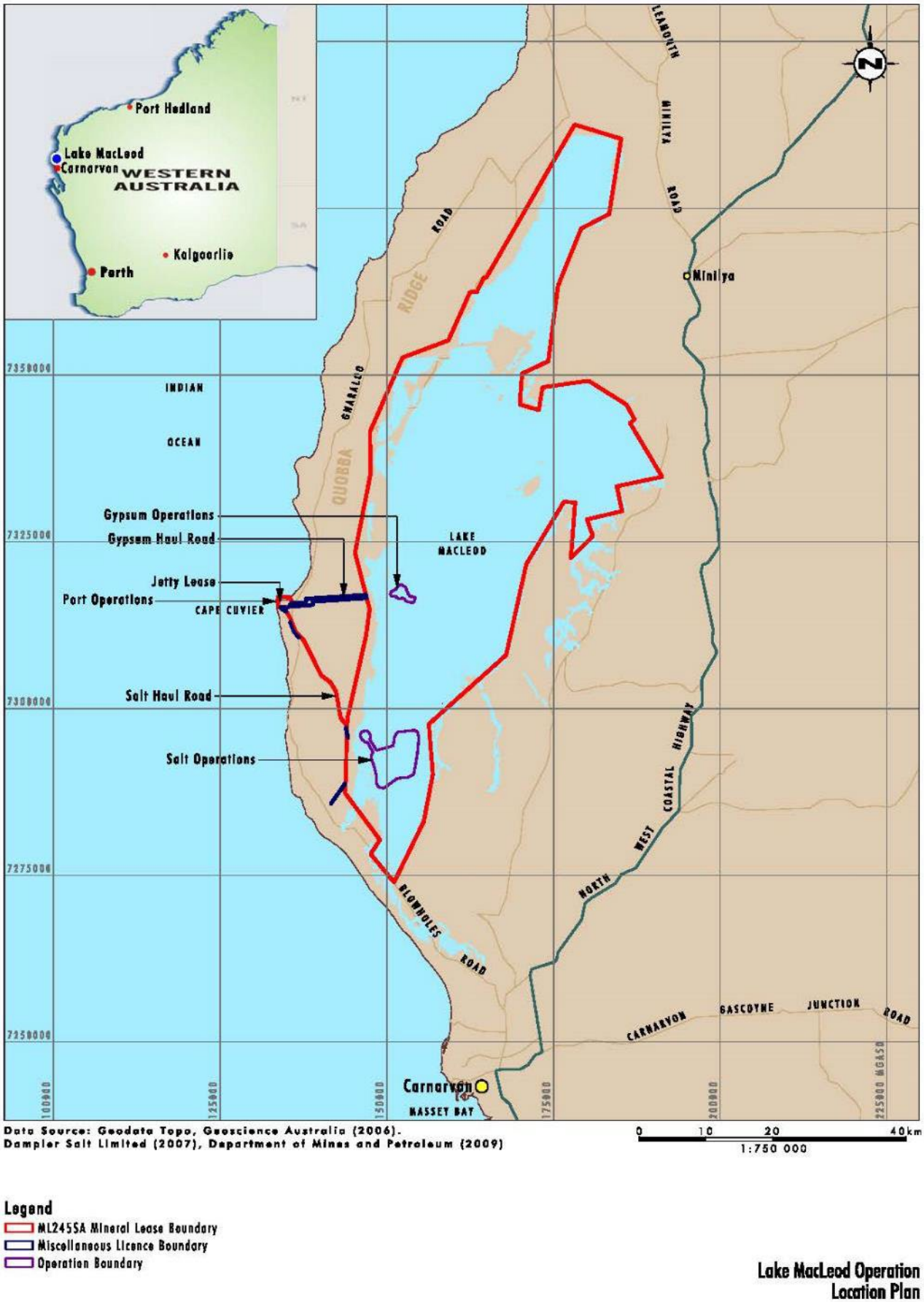


Figure 1-1: Lake MacLeod Operation Location Plan (Umwelt, 2019)

1.3 MCP Structure

The MCP is structured as follows:

1. Project summary

The Project is introduced. Site history, land tenure and Site domains are also described.

2. Identification of closure obligations and commitments

The legal framework that guides closure planning for the Site is established and legally binding closure conditions are presented.

3. Stakeholder engagement

Stakeholders are identified and engagement outcomes are presented. The strategy for ongoing stakeholder engagement is also presented.

4. Baseline and closure data and analysis

Environmental, social and technical information for the Site is presented to provide context for the completion criteria and to support the development of closure plans.

5. Post-mining land use(s)

The closure vision and post-mining land use (PMLU) for the Site are presented.

6. Closure risk assessment

The results of the mine closure risk assessment are presented, and management options are described.

7. Closure outcomes and completion criteria

Closure outcomes and associated completion criteria are presented.

8. Closure implementation

Closure activities are described for decommissioning and demolition of infrastructure, contamination management, landform reshaping, and rehabilitation of disturbed areas.

9. Closure monitoring and maintenance

This section details the post-closure monitoring and maintenance strategy.

10. Financial provisioning for closure

A summary of the closure cost framework and methodology is provided, including cost assumptions and limitations.

11. Management of information and data

Data management and storage requirements are discussed.

12. Reviewed mine closure plans

The MCP updates that have been made since the previous MCP revisions are described, along with responses to Department of Energy Mines, Industry Regulation and Safety (DEMIRS) feedback.

13. Appendices

Supporting information relevant to the MCP is presented, including the MCP Checklist (Appendix A).

1.4 Site Overview

1.4.1 Lake MacLeod Operation Infrastructure

The Lake MacLeod Operation is comprised of three separate facilities: the salt operation, including brine collection ditches; the gypsum operation; and the port and ship-loading facility at Cape Cuvier (Figure 1-1). A summary of the infrastructure present in each area is provided below.

The Lake MacLeod Salt Operation is located in the south of Lake MacLeod as shown on Figure 1-1. The layout of the Lake MacLeod Salt Operation is shown in Figure 1-2. Infrastructure located in the Salt Operation area includes:

- Salt operation administration area – administration building, parking areas, training centre, workshops, laboratory, warehouse, fuel farm, reverse osmosis plant, power transmission station and associated services (Figure 1-3).
- Salt wash plant – includes the wash plant, wet salt dump bridge, radial stacker and wet salt stockpile(Figure 1-3).
- Salt production area – this includes the brine recovery trenches (BRT), brine and bitterns channels , Pump Stations 3, 4, 5, and 7, lime storage and plant, potassium permanganate storage and dosing plant, north-east sump, crystalliser ponds, bitterns storage area, lake fuel farm, production crib room, underground power lines, weather station, bore 6 and the lake bore dam (Figure 1-2).
- 30,000 flood levee – approximately 30 km in length and extends from Pump Station 3 along the north, east and south sides of the salt production area and to the western lake shore (Figure 1-2).
- Salt roads – salt haul road extending from the Salt Operation to Cape Cuvier, the salt access road from Blowholes Road, and access roads to borrow pits, etc. (Figure 1-1).
- Borrow pits and quarries – used for sourcing gravel, rock and soil, predominantly for the Salt Operation (Figure 1-2).
- Airfield (located on miscellaneous lease L09/17) (Figure 1-2).
- Decommissioned potash production facility – this includes an old building that is lined with asbestos sheeting, old concrete tanks that have been subject

to significant corrosion, a bore and a water storage dam that is still in use (Figure 1-4).

- Decommissioned salt production ponds located approximately 10 km south of the current salt production area (Figure 1-5).

The Lake MacLeod Gypsum Operation is located approximately 18 km north of the salt operation. The gypsum production area includes the following infrastructure:

- Gypsum dredge area – this includes the dredged areas and associated electrical lines (not in use), (Figure 1-6). Note: the dredge has previously been removed offsite.

- Gypsum mine area – this comprises the areas subject to gypsum mining, the gypsum heap leach stockpiles and associated access roads (Figure 1-6).

- Gypsum infrastructure – this includes the groundwater bores, portable reverse osmosis plant, water storage ponds, crib room, generators, fuel farm, truck wash, and associated infrastructure (Figure 1-6).

- Gypsum roads – the gypsum haul road extending from the Gypsum Operation to Cape Cuvier (under miscellaneous licence L09/00011), and access roads from the edge of the lake to the gypsum mining areas as well as from the salt operations to the gypsum operations as shown in the initial location map (Figure 1-1).

The Lake MacLeod ship-loading facilities are located at Cape Cuvier (Figure 1-1). Infrastructure associated with Cape Cuvier is more clearly shown in Figure 1-7 and includes:

- Ship-loading facilities – this includes the jetty, licenced mooring buoys (for tugs), warping buoys for ship-berthing, and the ship-loader.

- Salt facilities at Cape Cuvier – consists of the collector conveyor, stacker conveyor, dry salt stockpile and dump bridge.

- Gypsum facilities at Cape Cuvier – this includes stacker conveyors 3 and 4, the dry gypsum stockpile and gypsum dump bridge.

- Supporting infrastructure including access roads, heavy machinery and equipment washdown facility, crib room, switch room, lighting towers, riggers huts, old tunnel remains, radio tower and fuel installation and rill hopper.

The remaining areas in lease ML245SA are not used for any operational purpose and have no disturbance requiring closure.

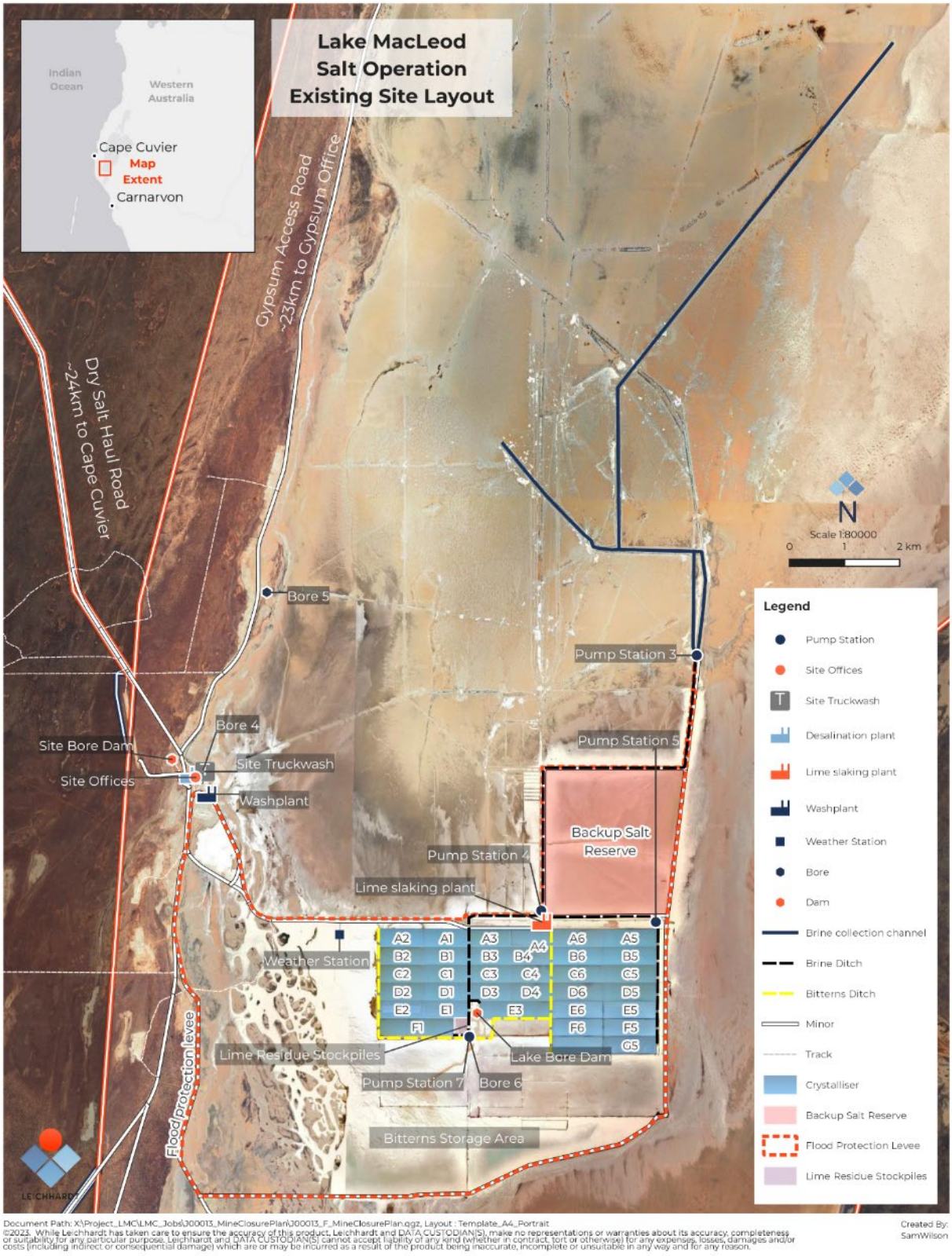


Figure 1-2: Lake MacLeod Salt Operation Existing Site Layout

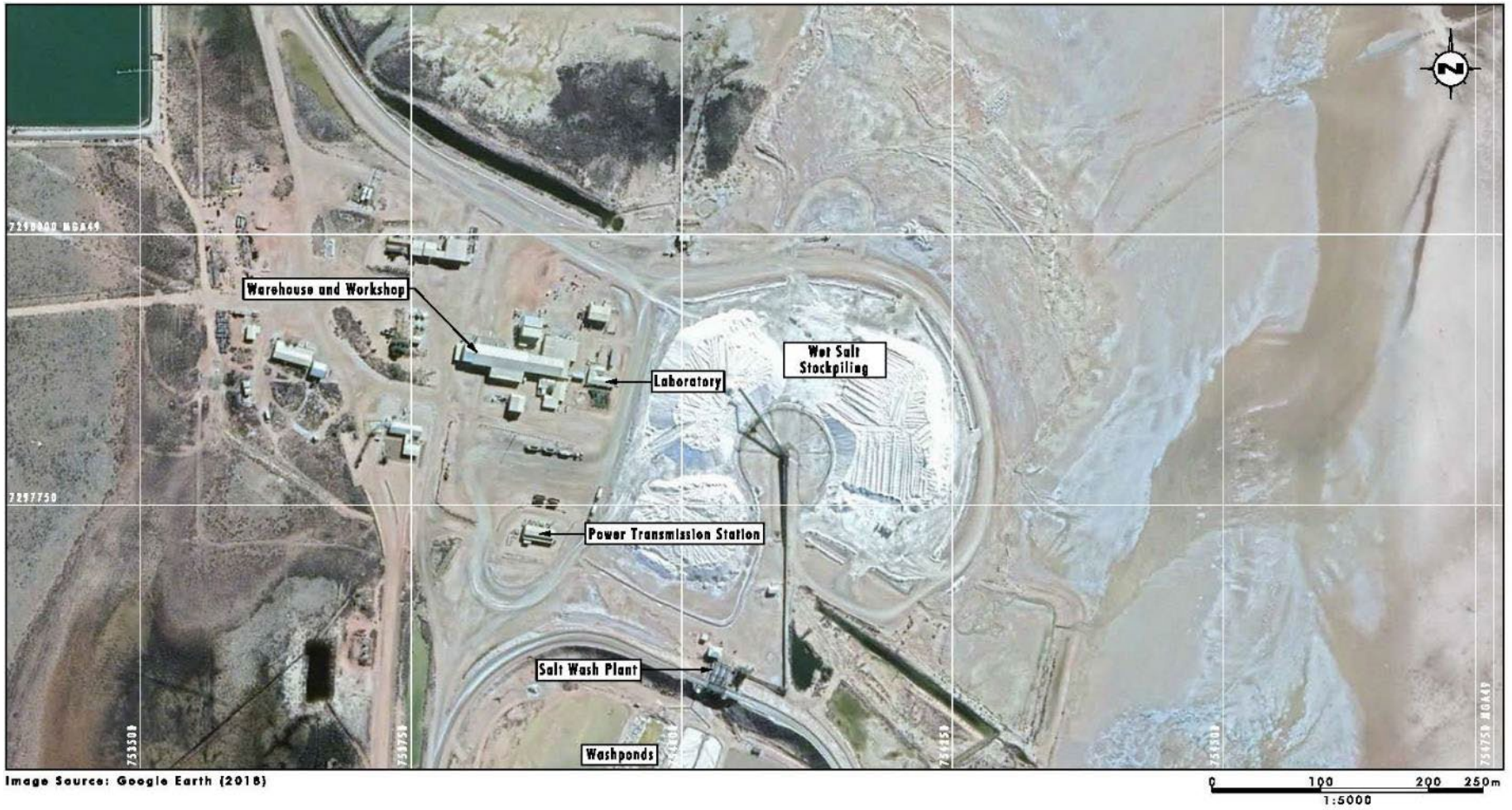


Figure 1-3: Lake MacLeod Salt Operation – Administration, Salt Wash Plant and Stockpile Area (Umwelt, 2019)

Figure 1-4: Decommissioned Potash Production Facility (Umwelt, 2019)

Figure 1-5: Decommissioned Salt Process Ponds (and external Beta-carotene Facility) (Umwelt, 2019)

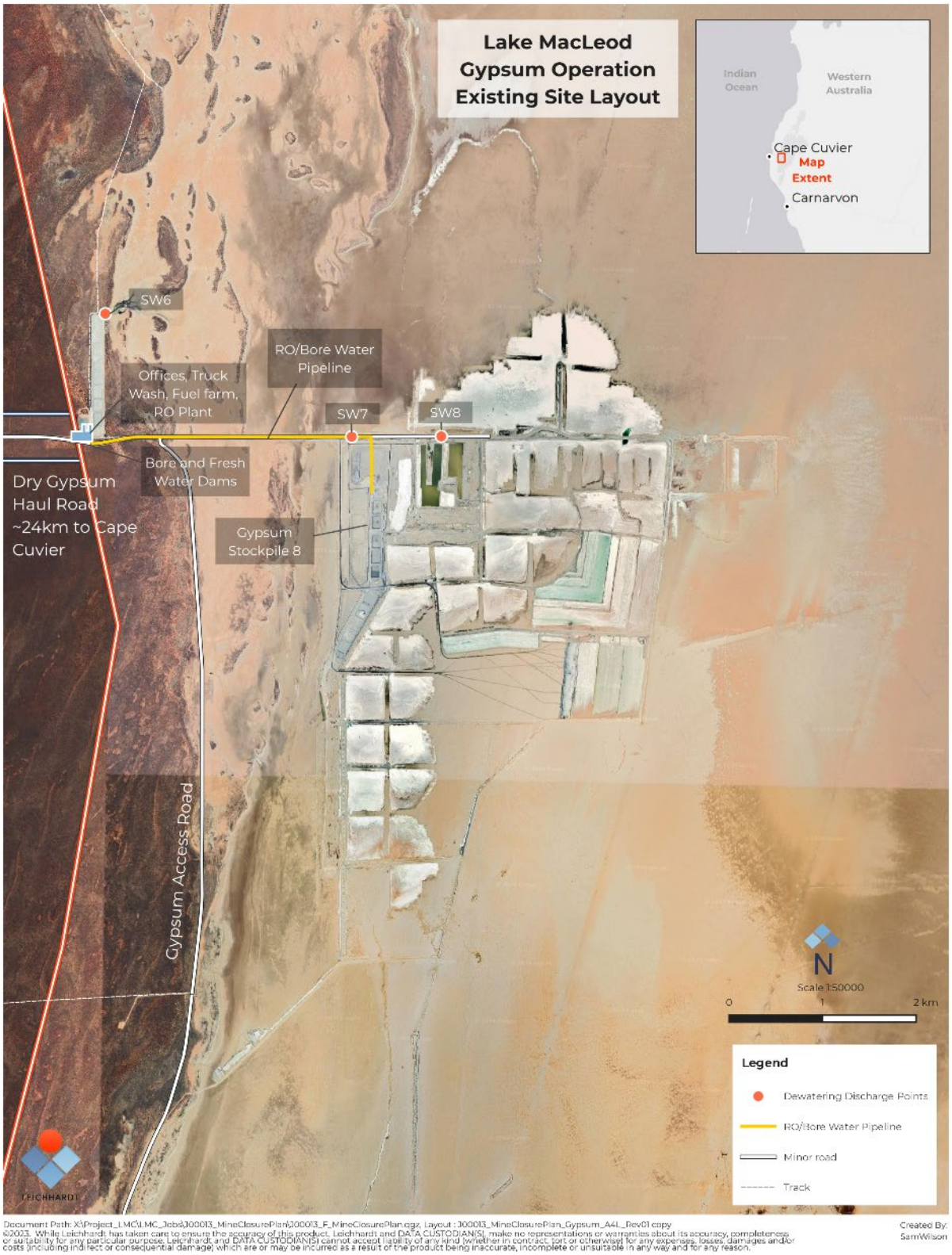


Figure 1-6: Lake MacLeod Gypsum Operation Existing Site Layout

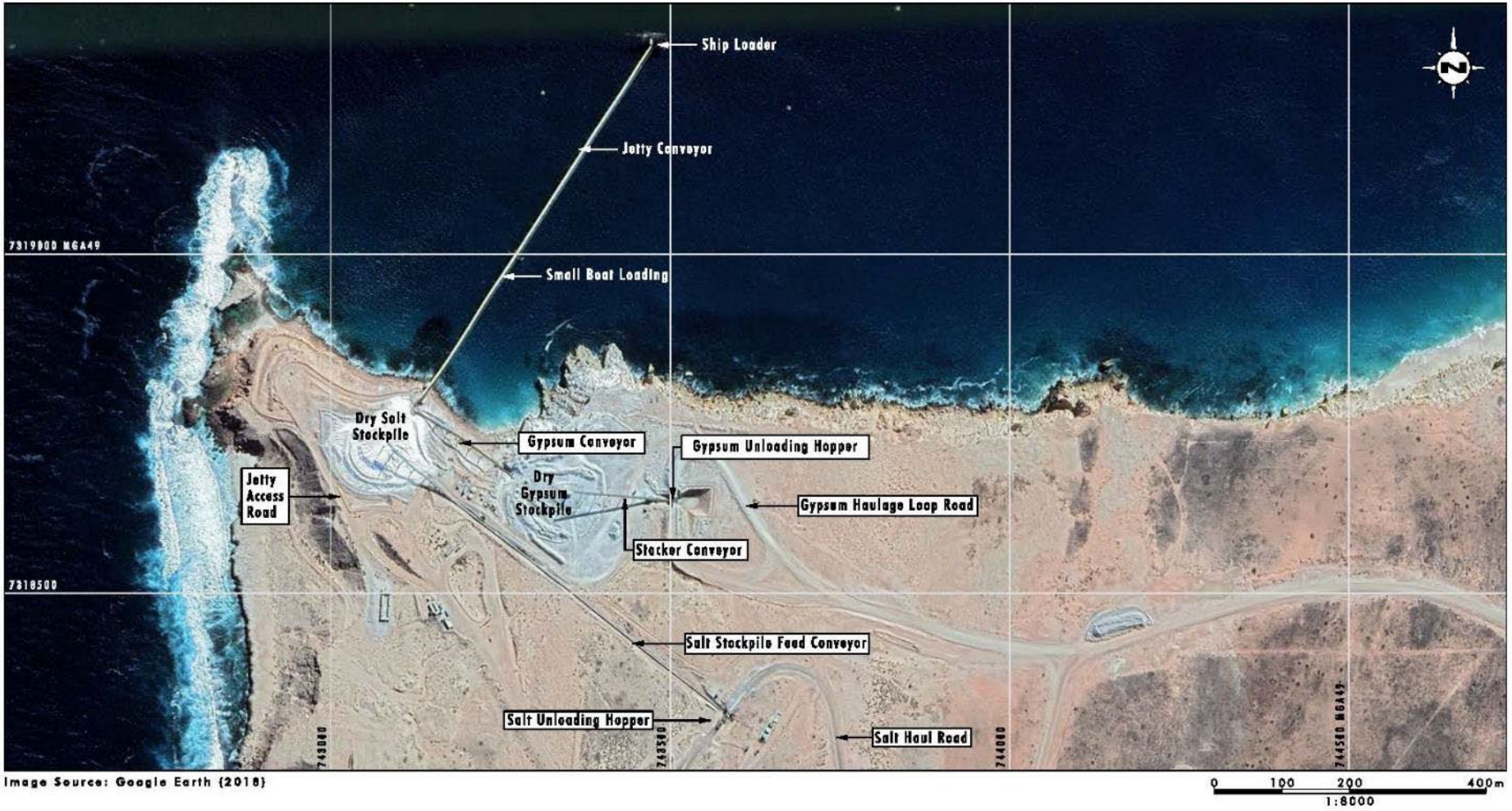


Figure 1-7: Cape Cuvier Operations Existing Site Layout (Umwelt, 2019)

1.4.2 Salt Production Process

Lake MacLeod has approvals to produce up to 6.1 Mtpa of salt and gypsum from brine extracted from the underlying Texada Halite aquifer and from the solid gypsum deposit on the surface of the lake. Brine within the aquifer has a salinity approximately ten times more concentrated than seawater. This eliminates the need for concentration ponds at Lake MacLeod.

Seawater seeps through an underground karst system into the Northern Ponds, and is then concentrated by evaporation before entering the underlying aquifer as brine. Further details about the Lake MacLeod hydrogeological processes are provided in Section 4.1.7.5.

The brine is collected in brine recovery trenches that penetrate through the surface Ibis Gypsite geological layer and access the underlying Texada Halite aquifer (refer to Figure 1-2). Due to the upward pressure of brine within the Texada Halite aquifer, brine flows out of the aquifer into the trenches. Pump Station Three (PSN3) then pumps the brine further south through the brine recovery trenches at a rate of approximately 3400 m^3/hr. Bore water is added at Pump Station 3 to prevent salt crystallisation on the pump.

Brine pumped from PSN3 flows along the brine channels and passes through Pump Station Four (PSN4), where lime and potassium permanganate are added. Lime is used to adjust the pH and for removing soluble magnesium and iron salts as precipitated hydroxides (Kaumann, 1960). Potassium permanganate is a strong oxidant that removes iron and hydrogen sulphide from the brine. The precipitates formed during brine dosing, and any excess reagents (lime and potassium permanganate), collect in the base of the channels between PSN4 and the crystallisers. Precipitate from the brine channels – known as lime residue – is periodically excavated and stored in stockpiles near the channels (locations shown in Figure 1-2).

Treated brine flows from PSN4 into the crystallisers and is concentrated by evaporation, with both solar and wind energy contributing significantly to the evaporation potential. Brine is maintained at a depth of approximately 300 mm in the crystallisers. Sodium chloride crystalises out of solution from the brine. When the specific gravity of the brine reaches approximately 1.25, it is classed as bitterns solution and is pumped to the bitterns storage area (Figure 1-2, and further discussed in Section 1.4.4).

Approximately 240 mm of salt is grown in the crystallisers in an average year. Salt production typically commences in September and continues until approximately May of the following year. There is generally no abstraction of brine between June and August due to increased fresh water inflow from winter rainfall and reduced winter evaporation (Logiden Pty Ltd, 1994). The salt grown in the crystallisers is harvested throughout the year and is washed and stored in the wet salt stockpile prior to transport by road to the dry salt stockpile at Cape Cuvier for export. Salt is loaded onto ships at Cape Cuvier using a conveyor system and ship-loader.

1.4.3 Gypsum Production Process

Gypsum production at Lake MacLeod commenced in 1996. During operations, gypsum was dredged from deposits located on the surface of the lake bed and then stockpiled. The stockpiled gypsum was washed with bore water and potable water (attained from a reverse osmosis water plant) to remove any salt. The wet gypsum was then drained and transported by road to a dry gypsum stockpile located at Cape Cuvier. The final dry gypsum product was loaded onto ships using the same conveyor system as that used for salt.

Gypsum production has operated intermittently since it was commissioned in 1996. The dredging method has been replaced with an excavation and heap leaching mining process and gypsum is excavated from the surface of the lake bed, stockpiled and subject to heap leaching using bore water to remove salt residue. The leached gypsum is then transported to the dry gypsum stockpile at Cape Cuvier for shipping.

1.4.4 Bitterns Storage Area

1.4.4.1 Bitterns Storage

Bitterns solution produced at Lake MacLeod is pumped to the bitterns storage area where bitterns salt precipitates out of solution, and water evaporates. Bitterns are the last component of marine salt to precipitate, after carbonate, gypsum and halite, and are enriched in magnesium, potassium and sulphate. The bitterns storage area has an area of approximately 845 hectares and is underlain by the Upper Ibis Gypsite aquifer (Groundwater Resource Management, 2014)

Groundwater monitoring in the vicinity of the Bitterns Storage Area has identified a complex interaction between the stored bitterns and surrounding groundwater system. When the lake is dry monitoring indicates relatively high quality (brackish) groundwater immediately down-gradient of the Bitterns Storage Area. This indicates that there is little lateral seepage from the Bitterns Storage Area to the groundwater environment when Lake MacLeod is dry (Groundwater Resource Management, 2014).

After flood events when water levels in the Bitterns Storage Area are elevated groundwater conditions along the northern, eastern and southern sides of the Bitterns Storage Area change from brackish to hypersaline. This indicates seepage of bitterns does occur periodically, most likely in response to high water heads in the Bitterns Storage Area (Groundwater Resource Management, 2014).

The Bitterns Storage Area is a temporary storage area for bitterns at Lake MacLeod. The site is not currently licensed to discharge bitterns solution from the Lake MacLeod Operation and final bitterns salt disposal options for the operation have not been determined or approved. Options for the disposal of bitterns salt and rehabilitation of the bitterns storage area need to be considered in planning for closure.

1.4.5 General Waste Management

A 3.1 ha landfill facility is located approximately 1.5 km north of the salt operation plant site, adjacent to the salt lake. The facility receives inert waste, and some putrescible waste including used timber. The landfill facility uses a series of deep trenches (approximately 3 m to 4 m deep) to dispose of waste.

The decommissioned tyre dump and landfill are two separate facilities.

All other wastes, including putrescible waste from the offices and crib rooms, are sent off site to the Shire of Carnarvon landfill facility in Carnarvon.

1.5 Key Dates and Milestones

The key dates and milestones for the Site are outlined in Table 1-1. The operation is considered as an ongoing resource and has no defined closure date at this point in time.

Table 1-1: Key Site Dates and Milestones

Date	Description
1965	Texada Mines developed and commenced mining for the production of potash
1975	Commercial potash production ceased, and salt production became the primary focus.
1978	The Lake MacLeod operation was acquired by DSL
1996	The gypsum operation commenced.
2008	The Lake MacLeod operation was maintained at the minimum rate as stated in the State Agreement using existing stockpiles.
2013	Gypsum operations re-commenced
March 2018	Approval was given by DWER to increase the production capacity of the Lake MacLeod operations to 6.1 Mtpa of combined salt and gypsum production.
January 2024	Formal agreement reached for LMC to acquire the Lake MacLeod operation (note this is not yet formally in place until transfer of the State Agreement).

1.6 Land Ownership

The Lake MacLeod Operation is located within Mineral Lease ML245SA, granted under the State Agreement (Figure 1-1), as well as several smaller miscellaneous licences granted under the *Mining Act 1978* for the following locations:

- L09/10 – Cape Cuvier Haul Road

- L09/11 – Gypsum Haul Road
- L09/11 – Airstrip
- L09/18 – Site Access Road.

The land underlying Lake MacLeod salt lake is classified as unallocated Crown Land, which is not subject to any interest, other than Native Title interests under the *Native Title Act 1993* (Cth), and is not reserved or declared under the *Land Administration Act 1997* (WA). The Department of Planning, Lands and Heritage (DPLH) administers unallocated Crown Land in Western Australia.

The tenements are the subject of the Gnulli native title determination: Peck on behalf of the Gnulli Native Title Claim Group v State of Western Australia [2019] FCA 2090. Pursuant to that native tile determination, the Baiyungu People hold native title rights and interests in the land the subject of the Tenements and are represented by the Nganhurra Thanardi Garrbu Aboriginal Corporation.

Lake MacLeod Operation areas located west of the salt lake are situated on the Quobba Pastoral Lease. Locations of Quobba and other pastoral stations near to the Lake MacLeod Operation are discussed in Section 4.1.3.

The DPLH, the Baiyungu People, and the Quobba pastoral lease owner have been identified as key stakeholders. Further discussion of potential stakeholders and future consultation requirements are provided in Section 3.

Table 1-2 lists the leases held by LMC at the Lake MacLeod Operation, including the tenure type, expiry date, purpose and area of the leases. The leases cover approximately 220,000 hectares, which is most of the surface of Lake MacLeod, although only approximately 2,200 hectares are currently occupied by operational infrastructure. The extent of the leases is shown in Figure 1-8.

Table 1-2: Leases held by LMC at Lake MacLeod

Tenure ID	Tenure Type	Date Granted	Expiry Date	Purpose	Area (ha)
ML245SA	Mineral Lease	01/02/1968	31/03/2021	Solar Salt Field	219,124
L09/10	Miscellaneous Lease	14/07/1989	13/07/2019	Road	35
L09/11	Miscellaneous Lease	23/05/1994	22/05/2019	Haul Road for purposes of *Evaporites (Lake MacLeod) Agreement Act 1967*	630
L09/17	Miscellaneous Lease	13/07/2007	12/07/2028	Aerodrome Roads	26
L09/18	Miscellaneous Lease	13/07/2007	12/07/2028	Road	31
LM1379	Jetty Lease	01/04/1979	31/03/2021	Licence issued under the *Jetties Act 1926* to use and maintain the salt and gypsum loading facility	1

Figure 1-8: Lake MacLeod Operation Lease Boundaries

1.7 Closure Domains

Closure domains are disturbance areas that have the same rehabilitation requirements and are likely to have the same PMLUs. The closure domains developed for Lake MacLeod are:

- General infrastructure.
- Salt operations.
- Gypsum operations.
- Cape Cuvier operations.
- Haul roads, access roads, borrow pits.

Figure 1-9 to Figure 1-12 provide the locations of closure domains with descriptions of each provided in Table 1-3.

1.8 Project Contact

The Project contact regarding mine closure is:

[redacted]

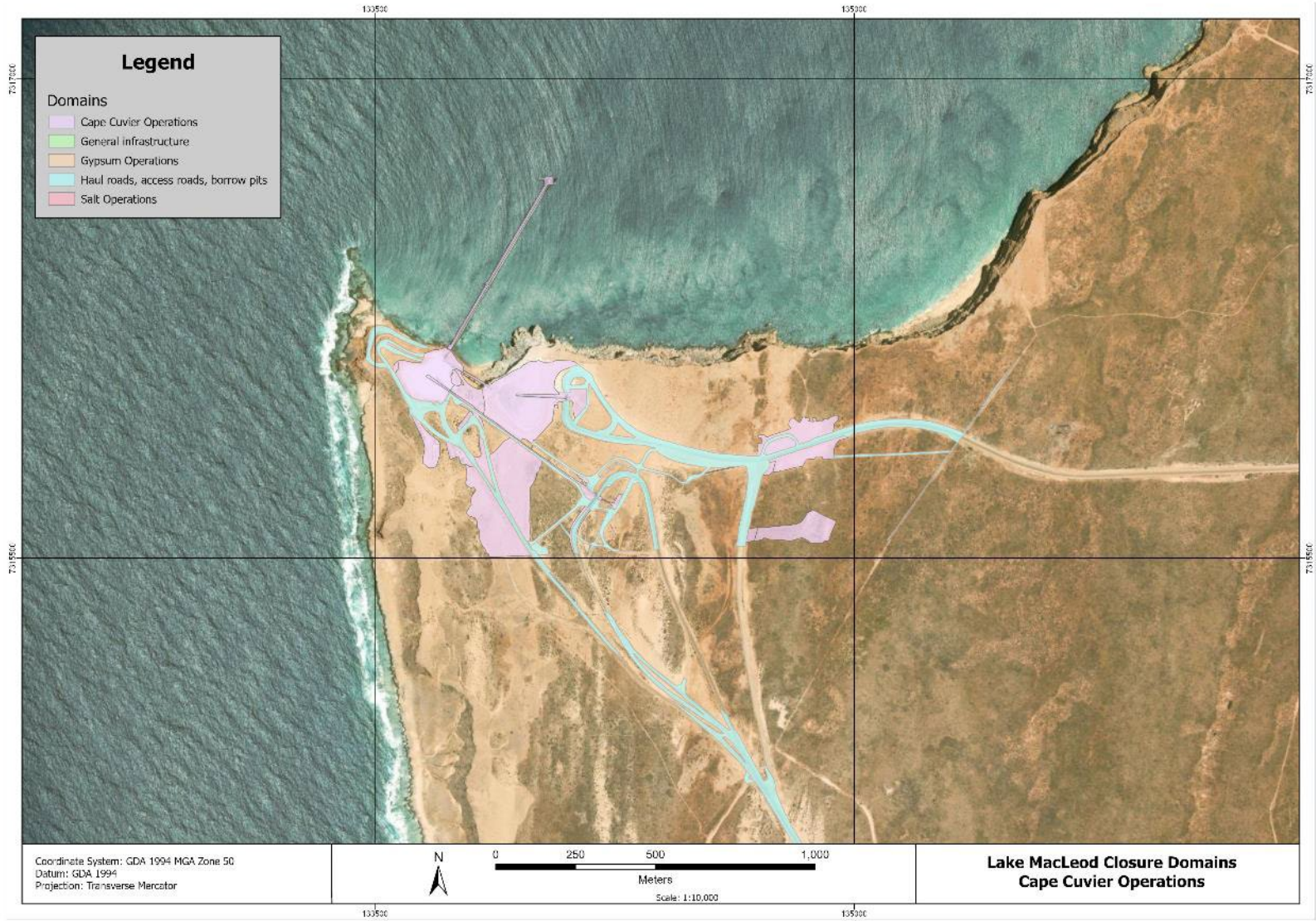


Figure 1-9 Lake MacLeod Closure Domains – Cape Cuvier

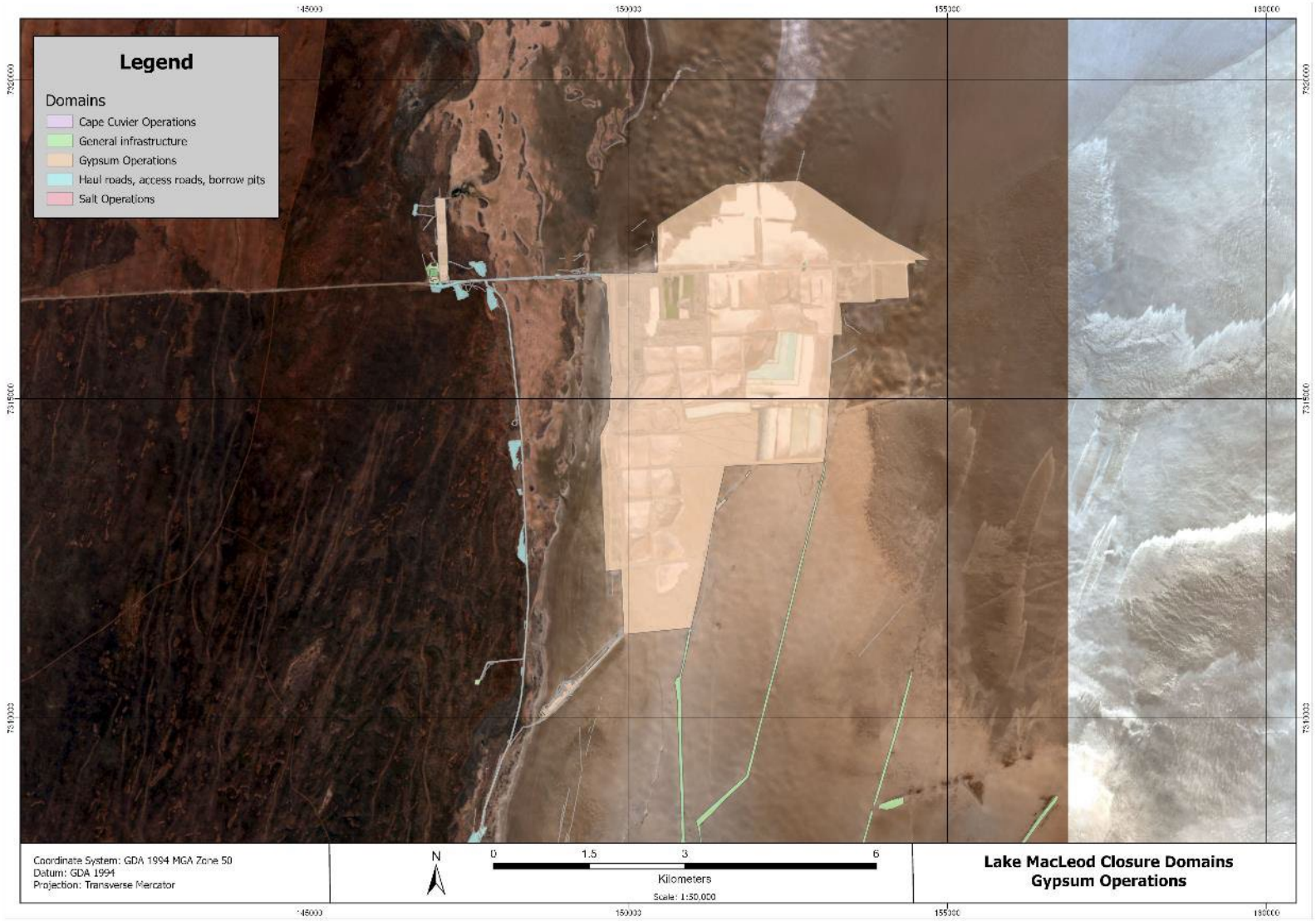


Figure 1-10 Lake MacLeod Closure Domains – Gypsum Operation

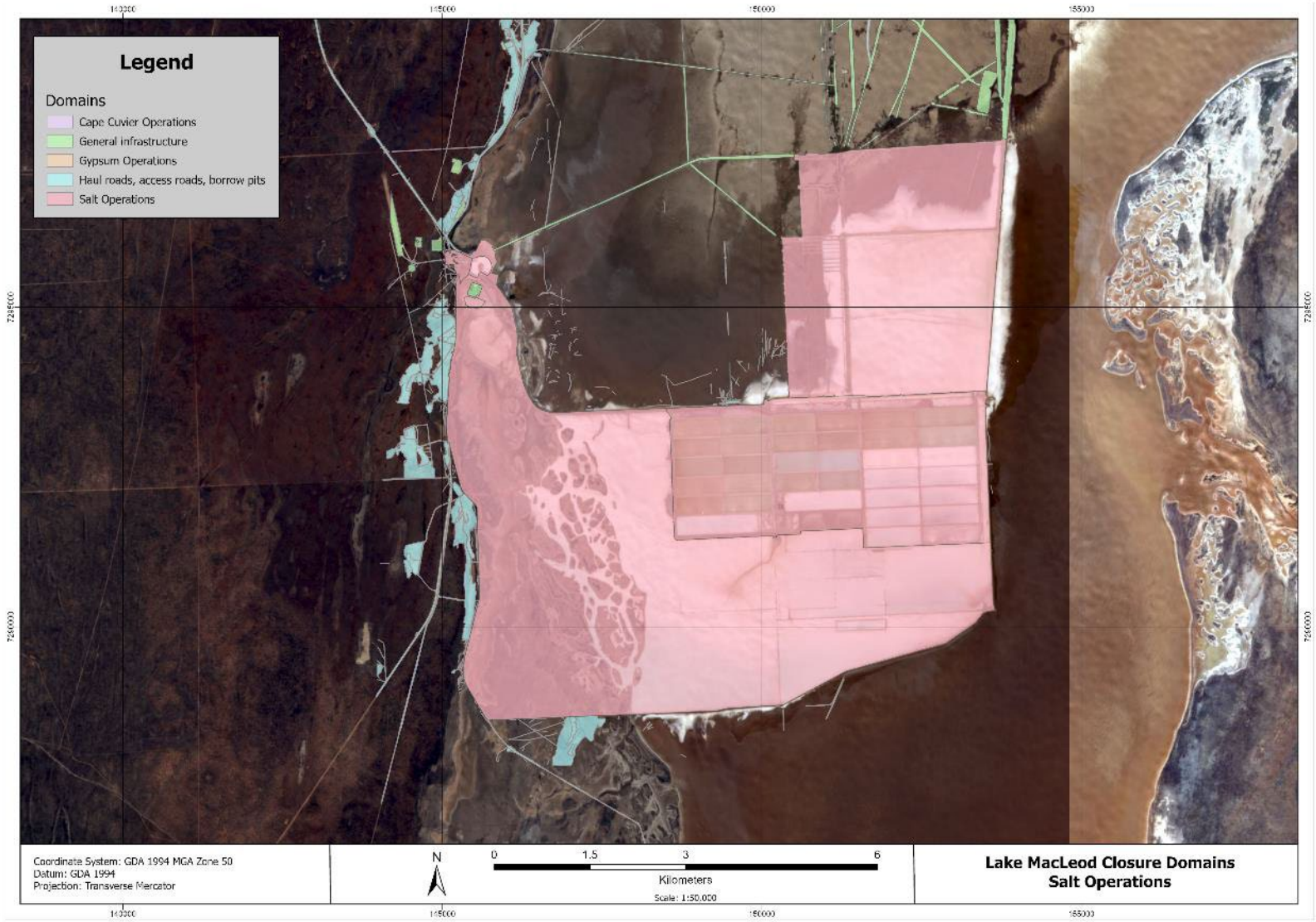


Figure 1-11 Lake MacLeod Closure Domains – Salt Operation

Figure 1-12 Lake MacLeod Closure Domains – Roads and Borrow Areas

Table 1-3: Closure Domains at the Lake MacLeod Operation

Domain	Lease Areas	Description	Estimated Area (ha)
General infrastructure	ML245SA, L09/17	• All buildings at each site including (where relevant) office / crib rooms, workshops, and laboratory. The buildings and infrastructure associated with particular locations may be decommissioned independent of each other in the event that salt, gypsum or Cape Cuvier operations are closed at different times. The majority of the support buildings are located at the administration area, near the salt operations. • General infrastructure includes four fuel farms and three washdown facilities located across the three operational areas, reverse osmosis plants, decommissioned airfield, wet salt stockpile, landfill, laydown areas, and bioremediation farm. • Bores and dams are also included and are associated with the salt and gypsum operations. • Utilities and service infrastructure such as electrical, communications, and pipes. Electrical infrastructure includes overhead and underground power lines, as well as mobile generators (gen-sets).	630
Salt Operations	ML245SA	• Brine and bitterns collection channels, crystalliser ponds, bitterns storage area, flood levee, permanganate dosing, salt production infrastructure area, potassium mineral waste (gypsum waste) and lime waste stockpiles • Infrastructure includes the lime plant, pumping stations, plus the old potash plant.	5,175
Gypsum Operations	ML245SA	• Dredge areas, mining areas, gypsum heap leach areas / stockpiles, and any decommissioned plant (e.g., stacker)	1,980

Domain	Lease Areas	Description	Estimated Area (ha)
Cape Cuvier Operations	ML245SA, LM1379	• Jetty, ship-loading facilities, conveyors, topside infrastructure, and mooring buoys • Terrestrial conveyors and stackers • Dry salt stockpile and gypsum dry stockpile	20
Haul roads, access roads, borrow pits	ML245SA, L09/10, L09/11, L09/18	• Haul and access roads • Borrow pit disturbance.	575

2 Identification of Closure Obligations and Commitments

2.1 Legislation

The Lake MacLeod Operation is managed in accordance with the terms and conditions set forth by the relevant State and Commonwealth Acts and Regulations.

The Lake MacLeod Operation is approved and administered under the State Agreement and associated leases and lease conditions. In addition, four miscellaneous licences have been granted under the *Mining Act 1978*. Tenements that have been granted under the *Mining Act 1978* are required to be managed in accordance with the conditions of the tenement and the requirements of the *Mining Act 1978*.

Section 1.6 summarises the relevant site leases and tenements, with the locations shown in Figure 1-1.

2.1.1 Commonwealth Legislation

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) protects matters of national environmental significance from actions that may have a significant impact on their environmental or heritage values. Any action, including closure activities, that is likely to have a significant impact on any matter of national environmental significance should be referred under the EPBC Act.

There is currently no known EPBC approval in place. This is likely as the Lake Macleod Site was operating when the legislation was introduced in 2000, and either the Site is considered:

- Authorised under the grandfathering exemption section 43A (actions with prior authorisations).
- Not likely to have a significant impact on matters of national environmental significance provided for in the EPBC Act.
- Authorised under the grandfathering exemption section 43B (lawful continuation of use of land).

Further information on matters of national environmental significance relevant to the Lake MacLeod Operation are provided in 4.1.8.

The *Native Title Act 1993* allows Native Title to be claimed over Crown land under certain circumstances. Indigenous owners from the regional area are identified as stakeholders (refer to Section 3 for further information).

2.1.2 *Evaporites (Lake MacLeod) Agreement Act 1967* (WA)

The Lake MacLeod Operation is conducted under the State Agreement, under which Mineral Lease ML245SA was granted. This Act has clauses relating to default on the Agreement, the effect of determination of the Agreement (Table 2-1), and the length and potential extension of the Lake MacLeod Mining Lease (Table 2-2).

Of particular importance to closure planning are Clauses 10(r) and 10(s) of the State Agreement. These clauses are presented in Table 2-1 with an interpretation of what the requirements mean for LMC. These clauses are applicable to operations on the Mineral Lease granted under the State Agreement.

The State Agreement is administered by the Minister for State and Industry Development, or future equivalent. The Minister is supported by the Department of Jobs, Tourism, Science and Innovation (JTSI).

Table 2-1: *Evaporites (Lake MacLeod) Agreement Act 1967* requirements relevant to Closure

Clause	Requirement	Relevance to Closure	Where it is addressed in this Closure Plan
10(r)(i)	**Effect of determination of Agreement** that on the cessation or determination of this Agreement: except as otherwise agreed by the Minister the rights of the Company to in or under this Agreement and the rights of the Company or any assignee of the Company or any mortgagee to in or under any lease license easement or right granted or demised hereunder or pursuant hereto shall thereupon cease and determine but without prejudice to the liability of either of the parties hereto in respect of any antecedent breach or default under this Agreement AND the Company shall without further consideration but otherwise at the request and cost of the State transfer or surrender to the State or the Crown all land the subject of any lease license easement or right granted or demised hereunder or pursuant hereto AND the Company hereby irrevocably constitutes and appoints the Minister or such person as he may from time to time nominate the true and lawful attorney of the company to execute the transfer or surrenders aforesaid;	Upon cessation of the State Agreement, at the request and cost of the State, the lands subject to leases under the Agreement shall be transferred or surrendered to the State, is without prejudice to the liability of either party in respect to any antecedent breach of default under the Agreement, and that the Minister and the Company's lawful attorney will execute the transfer or surrenders.	Section 8
10(s)	that on the cessation or determination of any lease license easement or right granted or demised hereunder or pursuant hereto by the State to the Company or (except as otherwise agreed by the Minister) to an associated company or other assignee of the Company under clause 14 hereof the improvements and things other than locomotives rolling stock plant equipment and removable buildings erected on the relevant land and provided for in connection therewith shall remain or become the absolute property of the State without compensation and freed and discharged from all mortgages and encumbrances and the Company will do and execute such documents and things (including surrenders) as the State may reasonably require to give effect to this provision AND the Company hereby irrevocably constitutes and appoints the Minister or such person as he may from time to time nominate the true and lawful attorney of Company to execute those documents and things (including surrenders) and in the event of the Company prior to such expiration or determination or subsequent thereto deciding to remove its locomotives rolling stock plant equipment and removable buildings or any of them form any land the Company shall not do so without first notifying the State in writing of its decision and thereby granting to the State the right or option exercisable within three (3) months thereafter to purchase at valuation in situ the said locomotives rolling stock plant equipment or removable buildings or any of them and such valuation will be mutually agreed or in default of agreement shall be made by such competent valuer as the parties hereto may appoint or failing agreement as to such appointment then by two competent valuers one to be appointed by each party or by an umpire appointed by such valuers should they fail to agree	At the cessation of a lease granted under the State Agreement, all improvements on the land other than locomotives, rolling stock, plant, equipment and removable buildings become the property of the State. Prior to removal of plant or equipment, DSL[1] must give three months' notice to the State with the option for the State to purchase the items.	**Section 8.1**
Third Schedule, 4(2)	The Company shall during the continuance of this Agreement produce from the mineral lease and ship common salt [defined as the evaporite sodium chloride] at a rate of not less than ... 500 000 tons per annum	If the Company defaults on the requirement to produce and ship a minimum of 500,000 tonnes per annum (tpa) of salt, the Agreement may be subject to determination due to default (clause 10(q)).	**Section 8.6**
22	Notwithstanding anything herein contained the Company may at any time give notice to the State that matters have arisen which make the completion or continuance of the works impracticable or uneconomic and desires to determine this Agreement whereupon this Agreement will then cease and determine, and the State may enforce all or any one or more of its rights remedies or powers set out in paragraphs (r) and (s) of clause 10 hereof.	In the case that the mine is not economically viable anymore, DSL can give notice to the State of the intention to close the mine. In this case clauses 10(r) and (s) will come into effect.	**Section 8.6**

[1] The *Evaporites (Lake MacLeod) Agreement Act 1967* is currently between the State and DSL, therefore DSL is listed as the relevant party. Once necessary approvals are in place, DSL will be replaced with LIG.

Table 2-2: *Evaporites (Lake MacLeod) Agreement Act 1967* Clauses Pertaining to Limit of Mine Approval

Clause	Requirement	Relevance
8 (1)(a)(iv)	As soon as conveniently may be after the commencement date the State shall after application is made by the Company cause the mining areas to be leased to the Company under the provisions of the Mining Act [1904] relating to mineral leases and that Act shall notwithstanding any of the provisions thereof be deemed to be so amended varied and modified as to enable the lease to be granted on the following terms and conditions namely: (iv) subject to the condition that the company shall be entitled (provided the right of re-entry contained in the lease has not been exercised) to the option — (A) to renew the lease for a further term specified by the Company not to exceed twenty-one (21) years and on the expiry thereof; (B) to further renew the lease for further terms specified by the Company each not to exceed twenty-one (21) years on the same terms and conditions as are contained in subparagraphs (ii) (iii) (v) (vi) and (vii) of this paragraph and provided that the aggregate number of years comprised in the original term and all renewal terms shall not exceed sixty-three (63) years;	The Lake MacLeod Mining Lease is restricted to a cumulative 63 years (including renewal terms). The original lease commenced on 1 February 1968 (Appendix B); therefore, the final renewal would expire in 2031.
18(1)	If the Company is desirous of a further continuance of this Agreement (whether in the same or any varied or modified form) and if the parties hereto have not at least fifteen (15) months prior to the expiration of the last term of renewal of the mining lease agreed upon the terms and conditions in respect of a further agreement for the mining and shipment of potash common salt and other evaporites from the mining areas then the State shall at least fourteen (14) months prior to the expiration of the last renewal make the Company such written offer (hereinafter called "the offer") of the terms and conditions of a further agreement as it deems reasonable and unless the Company has — (i) within the month next following the receipt of the offer accepted it (either in the form so offered or as modified or varied by negotiation between the parties hereto) or (ii) within the fourteen days next following the receipt of the offer elected to refer that offer or the part or parts thereof which the Company considers unreasonable to arbitration (as provided in subclause (2) hereof) the State may at the expiration of that month proceed as in manner set out in subclause (3) of this clause.	If DSL would like to continue the Lake MacLeod operation after the 63-year term, the State shall make a reasonable offer of terms and conditions for a further agreement 14 months from expiry unless DSL and the State agree on conditions of new lease 15 months prior to lease expiry or the State offers terms and conditions 14 months before lease expiry.
18(3)	If the Company does not accept the offer or does not elect to refer the offer to arbitration or does not accept the offer as varied or modified by the award on arbitration in accordance with the provisions set out in subclause (1) or (2) of this clause as the case may be then the State may enter into an agreement for the mining and shipment of potash common salt and other evaporites from the mining areas with any other person on terms and conditions more favourable on the whole than the offer made by the State or in the event of the offer having been submitted to arbitration provided the State has first offered to the Company the right of first refusal of such terms and conditions and such offer is not accepted by the Company within a reasonable time.	If DSL does not agree to the terms and conditions or any change to the conditions the State can award the right to mine to another company which agrees to the terms and conditions. An agreement with another person/company would require terms and conditions more favourable than the offer made by the State and that if the offer had been submitted to arbitration the Company would have the right of first refusal of such terms and conditions.
21	This Agreement shall expire on the expiration or sooner determination of the mining lease (including the respective renewals thereof) of the mining areas but without prejudice to the right of action of either party hereto in respect of any breach of the covenants agreements and conditions herein contained	The Lake Macleod State Agreement expires when the lease is terminated.

Clause	Requirement	Relevance
23	Notwithstanding any provision hereof the Minister may at the request of the Company from time to time extend any period or date referred to in this Agreement for such period or to such later date as the Minister thinks fit and the extended period or later date when advised to the Company by notice from the Minister shall be deemed for all purposes hereof substituted for the period or date so extended. Provided that where any such extension of period or date would have the effect either directly or indirectly of extending the term of any lease license temporary reserve or other concession granted under the Mining Act the consent of the Minister shall not operate until the Company has also obtained the like consent of the Minister for Mines.	The Minister may request extensions to any period or date referred to in the Agreement for any additional time or to any date deemed fit. If such an extension would have the effect of extending the term of any lease licence temporary reserve or other item granted under the Mining Act then it is subject to the consent of the Minister for Mines..

2.1.3 Mining Act 1978 (WA)

The *Mining Act 1978* (WA) includes provisions relating to grant of mining tenements, mining operations, and mine closure. The provisions relating to closure in the *Mining Act 1978* (WA) are summarised in Table 2-3. These provisions are relevant to the Mining Act tenements at the Lake MacLeod Operation.

Table 2-3: Provisions in the *Mining Act 1978* (WA) relevant to Closure

Section of the Act	Summary of Relevant Requirements	Where it is addressed in this Closure Plan
95(1)	The holder of a mining tenement may surrender the tenement by lodging a surrender for registration.	Section 8.6
113	When a mining tenement expires or is surrendered or forfeited, the owner of the land may take possession of the land forthwith.	Section 8.6
114(2), (3), (4)	The holder of a mining tenement that expires or is surrendered or forfeited should remove any mining plant (including buildings, plant, machinery, equipment, tools or any other property) within three months of the expiry or surrender of forfeiture, or a longer period as determined by the Minister. Any mining plant that is not removed may be sold and removed by the Minister.	Not applicable – no mining plant or equipment located on Mining Act tenements.
114(6)	The Minister shall determine whether any mining plant is allowed to remain on the land, and if so, for how long and the rent that shall be paid.	
114(7)	If any tailings or other mining product remain untreated on the land that was part of an expired, surrendered or forfeited mining tenement for longer than three months after the expiry or surrender or forfeiture, the tailings or mining product becomes the property of the Crown.	Not applicable – no mining product or tailings is stored in Mining Act tenements at the Operation.
114(8)	No timber or other material used and applied in the construction or support of any shaft, drive, gallery, adit, terrace, race, dam or other mining work shall be removed without the consent in writing of the Minister.	Not applicable – no infrastructure of this type located on Mining Tenement at the Operation.
114B	The expiry, surrender or forfeiture of a mining tenement does not affect the liability of the person who was the holder of the mining tenement to pay any rent, fee, royalty, penalty, or other money payable on or before the date of expiry, surrender or forfeiture; to comply with any obligation imposed on or before that date; or for any act done or default made on or before that date under or in relation to the mining tenement.	Noted

Section of the Act	Summary of Relevant Requirements	Where it is addressed in this Closure Plan
114C	Where a mining tenement expires or is surrendered or forfeited, the former holder of the mining tenement may enter and re-enter the land that was the subject of the mining tenement with such agents, employees, vehicles, machinery and equipment as may be necessary or expedient for the purpose of carrying out remedial work on that land necessary for compliance with an obligation.	Section 8.6

2.1.4 Environmental Protection Act 1986 (WA)

The *Environmental Protection Act 1986* (WA) (the EP Act) includes provisions relating to environmental impact assessment for proposals; pollution and environmental harm offences; clearing of native vegetation; prescribed premises, works approvals and licences; and notices, orders and directions. The gypsum operation was referred under the EP Act in 1993, however the salt operations have not been referred as:

- The Lake Macleod Project is approved and administered under the State Agreement and associated lease and conditions.
- DSL conducts the Lake Macleod Project operations in accordance with relevant permits and licences, including operating licence L7178/1997/11 issued under Part V of the EP Act.
- Operations do not require referral under Part IV of the EP Act.

The main provisions under the EP Act that may be relevant to the closure of the Lake MacLeod Operation are summarised in Table 2-4.

Table 2-4: Provisions in the *Environmental Protection Act 1986* (WA) Relevant to Closure

Section of the Act	Summary of Relevant Requirements
Part IV, Division 1, clause 38	A proposal that is likely to have a significant effect on the environment is required to be referred to the Environmental Protection Authority (EPA) for consideration. A proposal may be referred by any person, including a member of the public or the Minister is there is significant public concern about the likely effect of a proposal. It is considered unlikely that any closure activities would trigger referral to the EPA.
Part V, Division 1 - Pollution and Environmental Harm Offences	It is an offence to cause or allow pollution, or unreasonable emissions, or to cause or allow waste to be placed in such a way that it would be likely to cause pollution. Closure activities, including management of waste, must comply with the requirements of the EP Act.

Section of the Act	Summary of Relevant Requirements
Part V, Division 2 – Clearing of Native Vegetation	A clearing permit is required prior to clearing native vegetation. It is considered unlikely that any native vegetation clearing would be required as part of closure activities.
Part V, Division 3 – Prescribed Premises, Works Approvals and Licences	The Lake MacLeod Operation is a prescribed premise and operates under a Licence to Operate. LMC must comply with the conditions in the Licence to Operate, and any changes to the method of operation, waste discharge equipment, pipeline location, type of materials used of produced or amount or type of fuel used must be undertaken in accordance with a works approval, licence, a requirement in a closure notice or and environmental protection notice. If any changes are proposed to the nature of waste or emissions or it is proposed to increase the emissions above the current licence amount, LMC must apply for an amendment to the licence prior to making the changes.
Part V, Division 4 – Notices, Order and Directions	If any discharge of waste occurs that is not in accordance with the licence to operate or works approval and it is likely to cause pollution or environmental harm, LMC must report to the CEO of the environmental regulator, the details of the discharge as soon as practicable.

A number of regulations also sit under the EP Act. The regulations that may be relevant to closure of the Lake MacLeod Operation are summarised in Table 2-5.

Table 2-5: Regulations under the *Environmental Protection Act 1986* (WA) Relevant to Closure

Regulation Title	Section of the Regulation	Summary of Relevant Requirements
Environmental Protection Regulations 1987	Part 6	LMC may dispose of tyres by burial in accordance with the prescribed standards. LMC should ensure any person who transports used tyres from their site takes them to a licensed storage or disposal place.

Regulation Title	Section of the Regulation	Summary of Relevant Requirements
Environmental Protection (Controlled Waste) Regulations 2004	Regulation 25	The main categories of controlled waste that are likely to apply to LMC include: • bases (alkalis) in solid or liquid form, including lime and potash (C100) • waste (i.e. surplus, discarded, unwanted) non-toxic salts, including sodium chloride and salt slag (category D300) • waste oils, including used oil filters, oil interceptor waste and other oil-water mixtures (categories J100-J180) • industrial wash water, e.g. from a truck wash (categories L100 and L150) • soils contaminated with residue of a controlled waste that exceeds criteria for acceptance in a Class III landfill (category N120) • asbestos (N220) • used tyres (category T140) A waste generator must ensure that their controlled waste is transported by a carrier that is appropriately licensed. The waste generator must ensure that the controlled waste is in a suitable container. The waste generator must describe the type of controlled waste to the carrier before giving it to the carrier. The waste generator must keep the receipt issued by the carrier's driver for at least three years from the day that the waste was loaded onto the carrier's vehicle or tank.
Environmental Protection (Noise) Regulations 1997	All sections	Ensure that noise emissions comply with the prescribed standards in the regulation. The noise emission standards vary depending on the time of day that operations occur, and the type of operations. For example, during closure the mine may be classed as a construction site if no mining activities are taking place. Due to the significant distance to sensitive receptors, it is unlikely that the noise regulations will restrict activities at the Lake MacLeod Operation.
Environmental Protection (Unauthorised Discharges) Regulations 2004	All sections	Ensure prohibited materials (listed in Schedule 1 of the regulation) are not discharged into the environment. Prohibited materials include food waste, mineral oil, hydrocarbons, sewage and sediment.

2.1.5 Contaminated Sites Act 2003 (WA)

LMC will manage the Lake MacLeod Operation in compliance with the requirements of the WA *Contaminated Sites Act 2003* (CS Act). Under this Act, soil and groundwater

contamination issues as a result of the historical use/s of lands currently under lease tenure at the Lake MacLeod Operation will be the liability of LMC.

The CS Act is administered by the DWER. Under the Act, LMC is obliged to report and provide the DWER all investigations, management and remediation plans in relation to soil and ground water contamination issues. The DWER classifies the contamination status of the site in terms of levels of restriction upon land use and/or the necessity for remedial action. Land parcels at the Lake MacLeod Operation have been classified as "contaminated – remediation required". Further information about management of contaminated sites at the Lake MacLeod Operation is provided in **Section 4.3.2**.

2.1.6 Dangerous Goods Safety Act 2004 (WA)

The *Dangerous Goods Safety Act 2004* (WA) and related regulations describe the requirements for safe storage, handling and transport of dangerous goods. This may be relevant at closure for handling and transport of dangerous goods that are located at the Lake MacLeod Operation.

2.1.7 Aboriginal Heritage Act 1972 (WA)

It is an offence under the *Aboriginal Heritage Act 1972* to excavate, destroy, damage, conceal or alter an Aboriginal site unless acting with the consent of the Minister for Aboriginal Affairs under Section 18 of the Act. In order to undertake any development on land where an Aboriginal site is located, an application needs to be submitted for consent from the Minister for Aboriginal Affairs under Section 18 of the Act. An Aboriginal site is as defined in Section 5 of the Act, and includes places that are or were used by Aboriginal people and are of historical, anthropological, archaeological or ethnographic interest. It is the responsibility of LMC to ensure that they do not disturb any Aboriginal sites without obtaining consent under Section 18 of the Act. Information about Aboriginal sites at the Lake MacLeod Operation is provided in Section 4.2.1.1.

2.1.8 Work Health and Safety Act 2020 (WA)

The *Work Health and Safety Act 2020* (WA) establishes a framework to ensure workplace health and safety in Western Australia. It outlines duties for employers, workers, and others to manage risks, prevent harm, and ensure compliance. The Act promotes consultation, accountability, and penalties for breaches to safeguard all stakeholders. This Act is relevant to progressive rehabilitation and closure execution activities.

2.1.9 Rights in Water and Irrigation Act 1914 (WA)

DSL currently holds a licence to take water under the *Rights in Water and Irrigation Act 1914* (WA) (RIWI Act) for abstraction of groundwater. Following transfer of ownership, LMC will continue to comply with the requirements of the licence to take water during closure (see **Section 2.2**). Other requirements of the RIWI Act that may be relevant during closure are that a licence is required to construct, enlarge, alter or deepen any well and to take underground water for purposes other than fire-fighting.

2.2 Licences and Leases

LMC conducts the Lake MacLeod Operation in accordance with the requirements of site-specific leases and licences, which include:

- Mineral Lease ML245SA, granted under the State Agreement, administered by the JTSI. This Mineral Lease is issued under the provisions of the *Mining Act 1978*, with modifications to terms and conditions as specified in the State Agreement. A copy of the title page to the Deed of Covenant transferring the rights from Dampier Salt Limited to Lake MacLeod Pty Ltd which was signed on the 20 November 2024 is provided in Appendix B. There are no changes to the State Agreement with this transfer. There are no conditions relating to closure requirements on the lease, additional to the requirements outlined in Section 2.1.2 above.

- Miscellaneous Licences (L09/10, L09/11, L09/17, L09/18) administered by the DEMIRS. These licences have conditions primarily related to construction and maintenance of roads, and do not have any specific conditions relating to closure planning or management.

- DWER Licence to Operate No. L7178/1997/11 (Category 14 – Solar salt manufacturing, Category 58A – Bulk material loading or unloading (salt), Category 64 – Class II or III putrescible landfill site), granted under the *Environmental Protection Act 1986* (refer to Appendix C). The current DWER Licence to Operate for Lake MacLeod states that the combined production capacity of salt and gypsum is 6.1 Mtpa and includes conditions pertaining to pollution control.

- Groundwater Well Licence No. GWL56934(6), issued under Section 5C of the *Rights in Water and Irrigation Act 1914* and administered by DWER (refer to Appendix D). The licence permits the abstraction of groundwater by the Lake MacLeod Operation and includes five artesian bores, two of which are used for gypsum production and three for salt production.

- Dangerous Goods Licence No. DGS006031 issued in accordance with the *Dangerous Goods Safety Act 2004* and regulations, administered by DEMIRS. The licence permits the storage of diesel (up to a total of 310,000 litres) and 15 kilo litres of flammable liquids of packing group II or III. These storage vessels will need to be decommissioned appropriately.

- Clearing Permits (CPS 4203, CPS 5310, CPS 5979, CPS 8122). Permits to Clear Native Vegetation under the *Environmental Protection Act 1986*, administered by DEMIRS.

- Initial jetty licence issued on 29 May 1972 and deemed to commence on 1 February 1968. Current Jetty Licence 1379 granted on 2 May 2000 for a term of 21 years, commencing on 1 April 2000, subject to the same terms and conditions as the previous jetty licence issued in 1985. The jetty licence was renewed in September 2021 by Dampier Salt Limited. Transfer of the jetty licence from Dampier Salt Limited to Lake MacLeod Pty Ltd was granted and commenced on 2 December 2024 and is provided in Appendix E.

2.3 Project Approval Conditions and Commitments

The DWER Licence to Operate (Licence No. 7178/1997/11) states that the approved premises production capacity is 6.1 Mtpa of combined salt and gypsum production. A licence amendment to increase salt and gypsum production capacity from 3.1 Mtpa and

0.5 Mtpa respectively, was approved by DWER on 20 March 2018 with the issue of Amendment Notice 1 bringing the total approved production capacity to 6.1 Mtpa.

There is no EP Act Ministerial Statement for the operations at Lake MacLeod.

[redacted]

3 Stakeholder Engagement

3.1 Stakeholders

A list of stakeholders that are relevant to the Lake MacLeod Operation has been developed by LMC and this will be regularly reviewed and updated by LMC. The current LMC list of potential stakeholders associated with the closure of the Lake MacLeod Operation (which are also relevant to ongoing operations) are listed below.

- **Indigenous Owners:** Baiyungu peoples, the Nganhurra Thanardi Garrbu Aboriginal Corporation (acting in trust on behalf of the Baiyungu people, the Gnulli native title claimants, the Yinggarda Aboriginal Corporation, and the Yamatji Marlpa Aboriginal Corporation).
- **Federal Representative:** Federal Member for Durack.
- **State Representative:** Member for the North West.
- **Local Government:** Shire of Carnarvon.
- **State Government Departments:** These include the Department of Jobs, Tourism, Science and Innovation (JTSI) as administrators of the State Agreement; DWER (administers the prescribed premises licence, licence to take water, and is the regulator of the CS Act); DEMIRS (administers mining tenements); DPLH (administers unallocated Crown Land and assists the Minister for Aboriginal Affairs with administration of the *Aboriginal Heritage Act 1972*).
- **Port Authorities:** Mid-West Ports Authority, Fremantle Port Authority.
- **Adjacent Pastoralists:** Quobba, Gnaraloo, Minilya, Boologooro and Boolathana stations.
- **Nearby Towns and Local Communities:** People living in Carnarvon and Exmouth and surrounding areas.
- **Non-government organisations:** Pastoralists and Graziers Association, World Wide Fund for Nature.
- **Employees:** Approximately 130 employees are currently based residentially (Carnarvon primarily). The welfare of LMC employees and their families must be considered in the event of closure.
- **Contractors:** consideration for contractors and contract management.
- **Other Major Industries:** The beta-carotene production facility (Beta Nutrition Limited) to the south of the Lake MacLeod Operation.
- **Customers:** salt and gypsum customers.
- **Local Business:** small and medium sized businesses providing goods and services to Lake MacLeod as well as indirect support such as local cafes or tourism enterprises.

3.2 Stakeholder Management

Due to the ongoing mining status of the Lake MacLeod Operation, a formal stakeholder consultation program that specifically addresses closure has not been developed, although engagement on closure will be conducted as appropriate through the operation's Stakeholder Engagement Plan (SEP), which is currently being developed.

Consultation will be undertaken in accordance with the LMC Community Policy; in particular:

'*Engaging early, openly, honestly, and regularly with communities impacted by our operations and considering their views in our decision-making to minimise social impacts*'.

The internal LMC Communication and Consultation Standard also provides guidance to engagement and consultation with contracting partners to improve alignment on HSECQ activities and initiatives. This will be reviewed and integrated as the site progresses towards closure execution.

These documents are reviewed regularly and updated as required and will also form the basis of developing a closure specific stakeholder strategy, when required in the future.

Once a closure timeframe has been identified, the stakeholder management processes will be updated to include consultation and strategies regarding closure as appropriate to the timeframe to closure.

A meeting between LMA, DWER's Industry Regulation division, and DSL was held on 11 November 2024 to discuss the approvals pathway and to address any further queries on the transfer of the operating licence L7178/1997/11 from DSL to LMC. The licence transfer application was then submitted on 20 November 2024 and was formally transferred from Dampier Salt Limited to Lake MacLeod Pty Ltd on 12 December 2024.

Formal stakeholder consultation specific to closure will be undertaken by LMC when a LOM is identified at Lake MacLeod. A closure-specific engagement plan will be developed, and the objective of the engagement will be to:

- Communicate potential closure outcomes or scenarios with relevant stakeholders
- Receive feedback and input on closure-related outcomes
- Maintain communication with stakeholders so they are well informed about the potential effects of closure.
- Ensuring that stakeholder priorities at the time of closure inform the evaluation of potential closure outcomes.

General stakeholder engagement will continue throughout the life of the operation. A SEP is being developed by LMC to guide engagement with community groups and other stakeholders. The SEP will include strategies for engagement with stakeholders on specific matters including closure planning. General stakeholder engagement meetings will continue to be held by LMC and include:

- Periodic meetings with the JTSI, and meetings with other regulators and Government departments as required.
- Meetings with the Mid West Port Authority, Australian Maritime Safety Authority, Australian Customs, the Carnarvon Local Emergency Management Action Committee, and the Shire of Carnarvon as required.
- Meetings with the Shire of Carnarvon, Shire of Exmouth their Chambers of Commerce as well as local business owners and other interested parties.
- Meetings with Indigenous organisations including the Nganhurra Thanardi, Garrbu Aboriginal Corporation, Yinggardi Aboriginal Corporation and Yamatji Marlpa Aboriginal Corporation (YMAC).

Closure planning will be discussed in these regular stakeholder meetings as appropriate.

LMC intends to finalise a Relationship Management Agreement with the Baiyungu people, which had commenced with DSL. The Relationship Management Agreement will set out processes for engagement between LMC and the Baiyungu on various matters related to the Lake MacLeod operations including closure planning.

3.3 Employee Information, Communication and Consultation

A Human Resources Strategy will be developed to address workforce and industrial relations issues associated with closure within an appropriate timeframe if a decision is made to close the operation.

3.4 Planned Closure Engagement

Engagement regarding operational aspects has been previously undertaken by DSL. The current focus for LMC is to introduce a new Lake MacLeod operating company to stakeholders, therefore limiting closure-specific engagement in the short-term.

LMC will continue operational stakeholder engagement and over time, introduce and develop rehabilitation and closure concept awareness as the site progresses towards closure. Proposed closure engagement is outlined in Table 3-1

Stakeholder engagement outcomes will be detailed in future submissions of the Annual Environment Report (AER) and the MCP.

Table 3-1: Planned Closure Engagement

Stakeholder	Planned Engagement Topic	Methods
Indigenous owners	• MCP updates (including post closure land use, closure objectives and completion criteria, identification and management of closure risks, closure implementation strategies, residual assets).	Quarterly meetings to commence five years prior to closure
Adjacent pastoralists	• Post closure land use. • Residual assets. • Access to Site domains.	Yearly meetings to commence five years prior to closure
DEMIRS	• MCP updates (including post closure land use, closure objectives and completion criteria, identification and management of closure risks, and closure implementation strategies. • Residual assets.	MCP updates and AER.
JTSI	• MCP updates. • Residual assets.	Meetings as required to discuss Site changes
DWER	• Remediation and management of contaminated sites • MCP updates. • Residual assets.	Meetings as required to discuss Site changes

Stakeholder	Planned Engagement Topic	Methods
DPLH	• MCP updates. • Aspects involving Aboriginal affairs • Residual assets.	Meetings as required to discuss Site changes
Local government	• Post closure land use. • Residual assets. • Access to Site domains.	Yearly meetings to commence five years prior to closure
Relevant tenement holders	• Post closure land use. • Residual assets. • Access to Site domains.	Yearly meetings to commence five years prior to closure
Local community groups	• Post closure land use. • Residual assets. • Access to Site domains. • Business opportunities	Yearly meetings to commence five years prior to closure.

4 Baseline and Closure Data and Analysis

4.1 Environmental Context

4.1.1 Regional Context

The Lake MacLeod Operation is located within the Western Carnarvon Basin, a large sedimentary basin sloping gently towards the coast and extending from approximately Exmouth in the north to Kalbarri in the south and inland to the Kennedy Range (Payne, Curry, & Spencer, 1987).

Lake MacLeod is a large, flat, inland playa (dry lake bed) and temporary salt lake covering an area of approximately 225,000 hectares. The lake is approximately 120 km in length, approximately 10 to 40 km wide, and with the long axis orientated north-south. Lake MacLeod is located approximately 15 km inland and is separated from the Indian Ocean by a natural land barrier known as the Quobba Ridge or Barrier. The height of the Quobba Ridge ranges from 20 metres to 60 metres above sea level (Logan, The MacLeod Evaporite Basin, Western Australia, 1987).

The lake surface is extremely flat, with a downward slope of approximately 1 metre over 120 km north to south (approximately -3 mAHD to -4 mAHD). The floor of Lake MacLeod is an evaporite deposit consisting of carbonate, overlain by halite, and gypsite. Lake MacLeod supports little vegetation except for the area surrounding the Northern Ponds.

The lake surface is typically dry, except for two permanent ponds in the north of the lake, namely Cygnet and Ibis Ponds, also referred to as the Northern Ponds. The location of the Northern Ponds are shown in (Figure 4-1).

Water in the Northern Ponds is supplied by subterranean links to the ocean. A number of ephemeral rivers and creeks discharge into Lake MacLeod, including Lyndon River, Minilya River, Cardabia Creek and Boolathanna Creek (Figure 4-1).

These rivers and creeks deliver water to Lake MacLeod intermittently as a result of summer cyclonic activity or winter rainfall. After significant rain events, the entire surface of Lake MacLeod becomes inundated with a flood sheet up to 2 metres deep. A flood sheet may develop approximately one year in six, on average (Logan, The Lake/DSL System Interactions and Impacts 1968 to 2013, 2003). More details about surface hydrology are provided in Section 4.1.7.7.

4.1.2 Biogeographic Region

The biogeographic region classification system defines a bioregion based on geology, landforms, climate, vegetation and fauna. The Lake MacLeod Operation is in the Carnarvon Biogeographic Region.

The operation is located in the Wooramel or Carnarvon 2 subregion of Australia (Department of Environment and Water Resources, 2004). This subregion is described as:

> *Composed of quaternary alluvial, Aeolian and marine sediments overlying Cretaceous strata. A mosaic of saline alluvial plains with samphire and saltbush low shrublands, Bowgada low woodland on sandy ridges and plains. Snakewood scrub on clay flats, and tree to shrub steppe over hummock grasslands on and*

between red sand dune fields. Limestone strata with Acacia stuartii or A. bivenosa shrubland outcrop in the north, where extensive tidal flats in sheltered embayment's support mangal...[in] small areas around Lake MacLeod and near Carnarvon (Desmond & Chant, 2001).

4.1.3 Land Use

Lake MacLeod was originally a natural salt lake with associated saltpans incorporating samphire, mangrove and saltmarsh communities (HLA-Envirosciences Pty Limited, 2004). The majority of the lake still retains this form.

The area underlying Mineral Lease 245SA is predominantly comprised of Lake MacLeod salt lake, which is Unallocated Crown Land (formerly known as Vacant Crown Land). Responsibility for Unallocated Crown Land resides with the Western Australian DPLH. The areas surrounding Lake MacLeod are pastoral leases. These pastoral leases are Quobba and Gnaraloo to the west and Minilya, Boologooro and Boolathana to the east and south (Figure 4-1).

LMC's operations west of Lake MacLeod are within the Quobba Pastoral Station.

The land the subject of the Tenements are the subject of the Gnulli native title determination. Pursuant to native tile determination, the Baiyungu People hold native title rights and interests in the land the subject of the Tenements.

At the southern end of Lake MacLeod, Beta Nutrition Limited (BNL) has a facility for growing, harvesting and extracting beta-carotene from the algae *Dunaliella salina*. The facility is operated under a Permit for Non-pastoral Use on Boolathana Station and was granted a lease in 2005, which is just outside the extent of ML245SA. The facility is located approximately 10 km south of the current LMC salt production area and 1 km west of the decommissioned salt production ponds, on the western edge of Lake MacLeod (Figure 1-5).

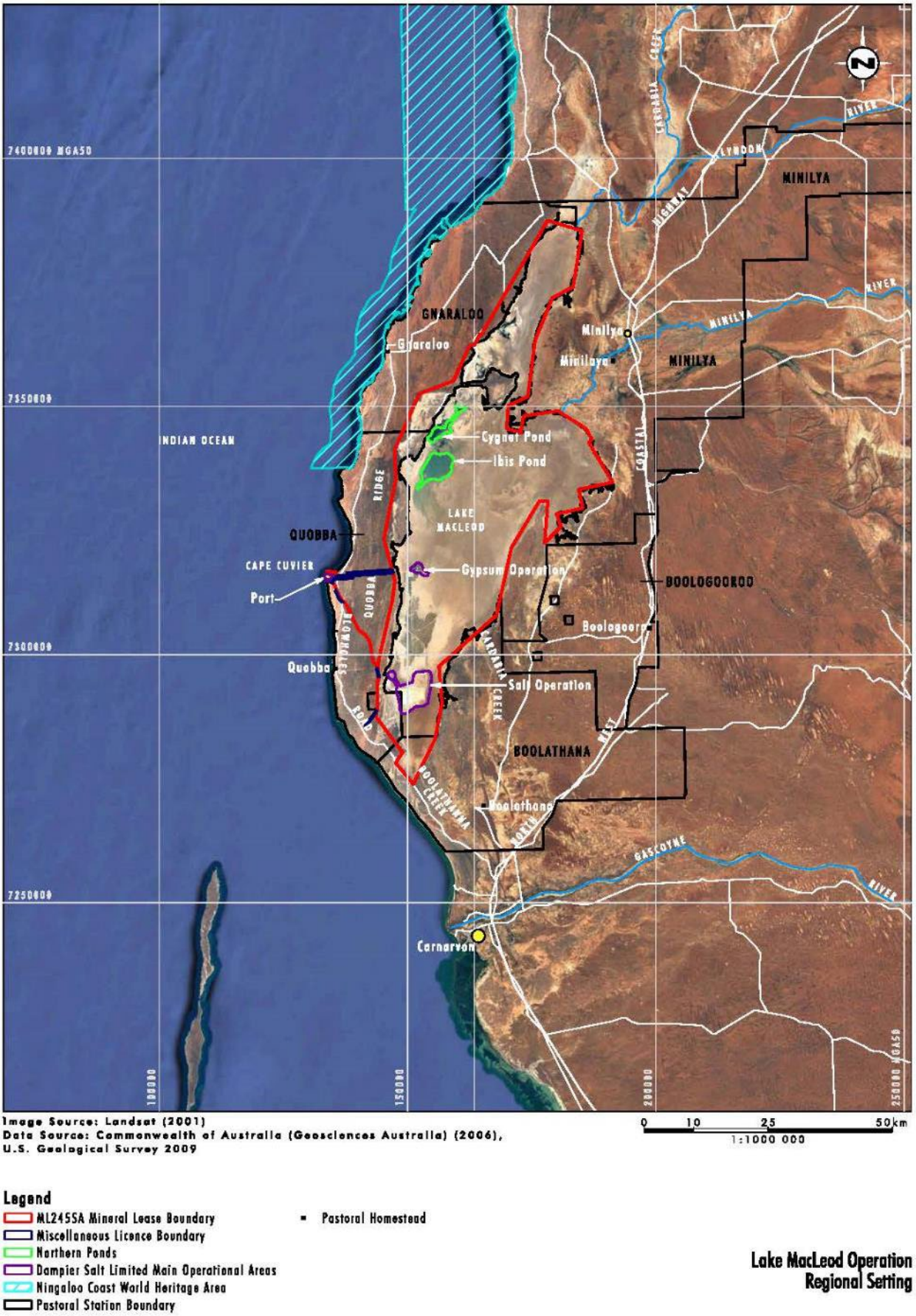


Figure 4-1: Lake MacLeod Operation Regional Setting

4.1.4 Land Systems

Land system mapping is an ecological approach, as it considers the inter-relationships between land characteristics and processes. Land systems are classified according to landform, soil, vegetation and drainage, and are subdivided into land units. Identification of land systems and land units is undertaken by the study of aerial photography, followed by extensive ground-truthing surveys.

LMC's Lake MacLeod Operation is located primarily within the Lake MacLeod salt lake (Figure 4-1).

Lake MacLeod is classified as being within the Lake Land System (Payne, Curry, & Spencer, 1987). The Lake Land System is characterised by extensive lake beds and salt pans supporting little perennial vegetation and having narrow marginal sandy banks which support spinifex hummock grassland (Payne, Curry, & Spencer, 1987). The Lake Land System is prone to flooding and has very low potential for successful pastoral activities (Payne, Curry, & Spencer, 1987). It is noted that the lake bed itself would have negligible potential for pastoral activities given that it is made up of an evaporite deposit.

Other land systems in the vicinity of Lake MacLeod, and a brief description of the land type and vegetation, are provided in Figure 4-2. Land units associated with each land system, including information on soils, landform, vegetation and major flora species associated with each land unit, are listed in Appendix F.

The location of the majority of the Lake MacLeod Operations on the Lake Land System suggests that alternative land uses such as pastoralism (on the salt lake) or industrial developments are unlikely to be successful.

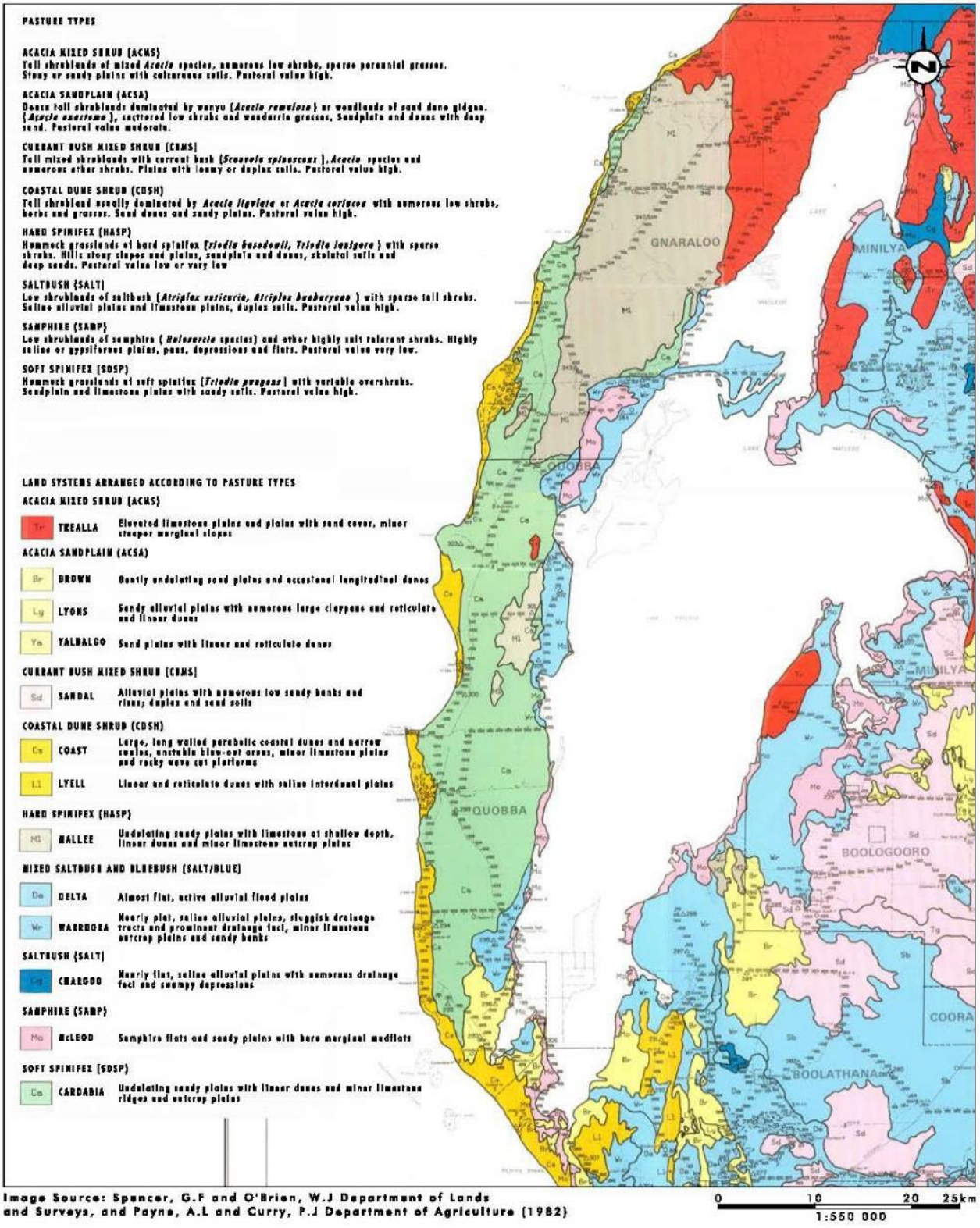
4.1.5 Topography

Lake MacLeod is separated from the Indian Ocean in the west by approximately 15 km of rocky outcrops (mainly Tertiary limestone) and coastal sand dunes extending in a north-south orientation (Logan, 1987). This coastal strip separating the Indian Ocean from Lake MacLeod is referred to as the Quobba Ridge and in places it rises to approximately 60 mAHD (Logan, 1987).

Lake MacLeod is very flat, with a downward gradient of approximately 1 in 100 sloping north to south. The highest areas in Lake MacLeod are the north-western and north-eastern ends, at -2.8 mAHD. The Northern Ponds, located in the north-west of the lake, and Ralph Sink, located in the north-east of the lake (Figure 4-1), are low points at -3.2 mAHD to -4.0 mAHD.

There is a ridge at approximately -3.0 mAHD, called the Swan Promontory that divides these two low areas in the north of the lake. The central area of the lake is very flat, with a slight gradient down to the southern portion of the lake. According to (Logan, 2003), the lowest point in Lake MacLeod occurs in the southernmost extent of the lake at an area known as the Texada Sink.

At this location the ground level is approximately -4.3 mAHD. LMC's salt and gypsum operations are located in the central flat area of Lake MacLeod. The port is located on the far side of Quobba Ridge on the coast at Cape Cuvier.



Lake MacLeod Operation
Regional Land Systems

Figure 4-2: Lake MacLeod Operation Regional Land Systems

4.1.6 Areas of Environmental Significance

The Ningaloo coast to the north is the only areas of significance near the Site. The southern extremity is approximately 25 km north of Cape Cuvier. Further information on the Ningaloo coast and area of significant online search results is provided in Appendix F.

4.1.7 Abiotic Characterisation

4.1.7.1 Climate

Detailed climate information is derived from the Bureau of Meteorology (BoM) Carnarvon Airport meteorological station (station number 006011), located approximately 40 km south of Lake MacLeod (shown in Figure 4-3 and Table 4-1). The Carnarvon Airport meteorological station is located at latitude 24.89°S and longitude 113.67°E, at an elevation of 4 metres. The station commenced operating in 1945 and is currently still in use.

The Lake MacLeod region experiences low summer and winter rainfall and is classified as semi-desert (Payne, Curry, & Spencer, 1987). Carnarvon's climate is significantly influenced by south-easterly winds, in combination with southerly coastal breezes which persist throughout most of the year. The annual average rainfall of 230 mm mainly falls in the winter months from cold fronts from the south. Tropical cloud bands from the north also bring rainfall during summer. The period of lowest rainfall is between September and December. Mean monthly rainfall and potential evaporation for Carnarvon Airport meteorological station are plotted in Figure 4-3.

Early summer is generally dominated by anticyclones and in this period no significant rainfall occurs anywhere in the Carnarvon Basin (Payne, Curry, & Spencer, 1987). In midsummer and autumn, the high temperatures of the northern areas in the Carnarvon Basin are interrupted by thunderstorms and/or the south-eastward passage of tropical cyclones. Rains that result from these events are generally localised (Payne, Curry, & Spencer, 1987). Summers in the coastal and southern areas of the Carnarvon Basin are typically very dry, though the heat is lessened by diurnal sea-breezes (Payne, Curry, & Spencer, 1987).

Winter weather patterns (May to October) in the Carnarvon basin typically comprise calm, fine, anticyclonic weather with cool nights and mild days (Payne, Curry, & Spencer, 1987). These mild weather patterns are sometimes interrupted by the eastward passage of frontal systems bringing rain (Payne, Curry, & Spencer, 1987). In May, rainfall tends to fall further north and inland as a result of the path taken by depressions and their associated fronts from the Indian Ocean (Payne, Curry, & Spencer, 1987). Heavy winter rains tend to fall between the months of May and July due to the interaction between some of the stronger and more northerly fronts and middle-level tropical disturbances approaching from the north-west (Payne, Curry, & Spencer, 1987). Towards the end of winter, depressions travel southwards and rain-bearing fronts become weak at the northern ends of the Carnarvon Basin, bringing little rain to the northern extent (Payne, Curry, & Spencer, 1987).

During spring, stable anticyclonic conditions are generally re-established over the Carnarvon Basin, typically bringing warm and very dry weather during September to early November (Payne, Curry, & Spencer, 1987).

An understanding of the regional climate is important when planning closure activities such as earthworks and revegetation. Earthworks should be planned to coincide with periods of low rainfall and reduced risk of cyclones. If undertaking revegetation, the species should be selected to suit the regional climate, and planting should be undertaken in Depending on species-specific requirements, planting should generally take place in late autumn (April to May) to give the plants a winter season to settle in before the dry hot summer.

4.1.7.2 Climate Change Impacts

Climate projections for the Central-west region, in which Lake MacLeod is located, show a drying trend out to 2100, forecasting reduction of annual rainfall between 1% and 26% and a temperature rise between 1.9°C and 3.3°C, depending on model scenario (Department of Water, 2015). However, the Department of Water (2015) noted that this was in contrast to the observed trend of increased rainfall in interior stations, and that long-term climate records may be more applicable than the climate model in water resource planning.

The *Dampier Salt Ltd Climate Change Report* (Rio Tinto, 2014b) provides a summary of climate change modelling scenarios to 2060. The report is based on CSIRO and BoM climate modelling available at the time. The model predictions applicable to the Lake MacLeod Operation are:

- Tropical cyclones appear to reduce, but inter-decadal variability overshadows the slight changes in the frequency of the total numbers of tropical cyclones for the region. A potential increase in the proportion of high intensity tropical cyclones is anticipated.

- Quasi-biennial and 3–4-year oscillations in the future climate temperature and rainfall records. This effect is likely to be passed on to the air temperatures through associated changes in the strength of the Leeuwin and Ningaloo Currents.

- Significant multi-decadal scale oscillations were observed in the rainfall climates, both historical and future, for many months of the year.

- A warming trend was predicted for the region around Lake MacLeod, although it was predicted to be significantly less than for the inland locations near Tom Price and sightly below that for the Dampier region.

- A sustained drying of the climate was predicted for the Lake MacLeod region for the months from January to August inclusive.

Possible warming and drying of the climate would be conducive to increased salt production, due to more favourable conditions for evaporation. However, higher intensity tropical cyclones would not only be adverse for salt production, but would be more likely to cause damage to the Lake MacLeod Operation.

If the Lake MacLeod Operation experiences significant damage from extreme weather events, it may be a trigger for the operation to enter care and maintenance or closure (see Section 8.6).

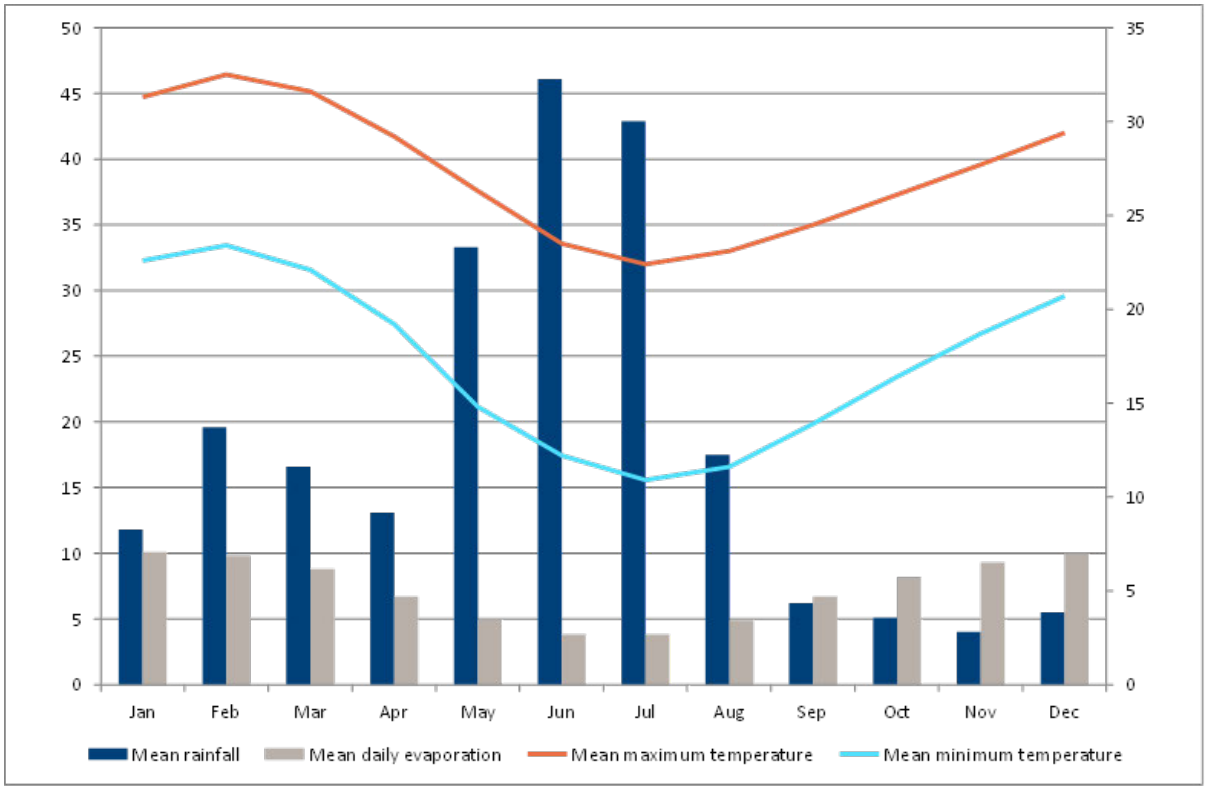


Figure 4-3: Carnarvon Airport Average Climate Data (Umwelt, 2019)

Table 4-1: Climate Statistics from Carnarvon Airport Meteorological Station No. 006011

Statistic Element	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual	Years	No. of Years
Mean maximum temperature (°C)	31.3	32.5	31.6	29.2	26.3	23.5	22.4	23.1	24.5	26.1	27.7	29.4	27.3	1945 to 2018	72
Mean minimum temperature (°C)	264	23.4	22.1	19.2	14.8	12.2	10.9	11.6	13.9	16.4	18.7	20.7	17.2	1945 to 2018	72
Highest temperature (°C)	47.8	46.9	47.8	41.1	37.1	32.2	30.9	33.6	38.8	42.4	43.4	45.4	47.8	1945 to 2018	72
Lowest maximum temperature (°C)	24.2	23.9	22.2	21.1	17.1	14.6	15.3	15.3	17.6	18.9	21.0	22.2	14.6	1945 to 2018	72
Mean rainfall (mm)	11.8	19.6	16.6	13.1	33.3	46.1	42.9	17.5	6.2	5.1	4.0	5.5	223.0	1945 to 2018	73
Highest rainfall (mm)	157.2	148.5	206	88.8	194.7	160.5	215.6	59.2	31.4	52.6	81.4	255.0	556.6	1945 to 2018	74
Lowest rainfall (mm)	0	0	0	0	0	1	0	0.2	0	0	0	0	75.3	1945 to 2018	74
Mean daily evaporation (mm)	10.1	9.8	8.8	6.7	5.0	3.8	3.8	4.9	6.7	8.2	10.0	9.9	7.3	1966 to 2017	50

4.1.7.3 Tides and Waves

The Lake MacLeod Operation areas of production are located approximately 10 to 15 km inland from the coast. Therefore, these areas are not impacted by tides and waves. Only the Cape Cuvier ship loading facility has the potential to be influenced by tides and waves. The port is exposed to moderate to severe wave climates (Baird Australia Pty Ltd, 2017).

Cape Cuvier does not record sea water level. The closest port is Carnarvon, approximately 90 km south of Cape Cuvier. The tides at Carnarvon are classified as mixed diurnal and semi-diurnal. Tidal characteristics for Carnarvon are shown in Table 4-2 in Chart Datum (CD) and Australian Height Datum (AHD). Australian Height Datum is 0.941m above CD (Baird Australia Pty Ltd, 2017).

Table 4-2: Tidal Characteristics of Carnarvon (Baird Australia Pty Ltd, 2017)

Tidal characteristic	Abbreviation	Level, Chart Datum (m)	Level, relative to mean sea level (mAHD)
Highest astronomical tide	HAT	2.0	+1.06
Mean high water springs	MHWS	1.71	+0.77
Mean high water neaps	MHWN	1.08	+0.14
Mean sea level	MSL	1.03	+0.09
Mean low water neaps	MLWN	0.98	+0.04
Mean low water springs	MLWS	0.35	-0.59

The Cape Cuvier ship loading facility is located within the Cyclone Belt and the region may experience as many as eight cyclones per year. The Cyclone Season officially lasts from 1 November to 30 April. The cyclones can be intense with recorded wind speeds greater than 250 km/hr (Baird Australia Pty Ltd, 2017).

A Datawell wave rider buoy has been deployed adjacent to the Cape Cuvier site since April 2011. Extreme value analysis of the approximately five years of short-wave data is presented in Table 4-3.

Table 4-3: Significant wave height criteria based on data obtained between April 2011 and June 2016 (Baird Australia Pty Ltd, 2017)

Parameter	ARI						
	5yr	10yr	20yr	50yr	100yr	200yr	500yr
Wave Height Estimate	4.3m	4.5m	4.7m	5.0m	5.2m	5.4m	5.6m

Any proposed PMLU that involves retention or enhancement of the ship-loading infrastructure or jetty at Cape Cuvier should consider the likely long-term worst case

scenario tide and wave data at Cape Cuvier to ensure that the infrastructure is likely to be resilient at the exposed location.

The Department of Transport published a study in 2010 *Sea Level Change in Western Australia – Application to Coastal Planning*. The study recommended that coastal planning within Western Australia should use the upper bound of the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report (AR4) global average sea level rise projections to estimate future sea level rise. For Western Australia, the projected sea level rise over 100 years between 2010 and 2110 was 0.9 m vertical, and for every year beyond 2110 the rate of sea level rise was assumed to be 0.01 m/year (Department of Transport, 2010). The projected sea level rise should be considered when planning any long-term coastal infrastructure or development, which may be associated with alternative land-use scenarios for Cape Cuvier.

The rocky coastline at Cape Cuvier provides some resilience to coastal landform variability (Demara WA Pty Ltd, 2012). However, high sediment / sand availability between Carnarvon and Point Quobba is subject to high variability in supply and distribution, particularly associated with flooding of the Gascoyne River (Demara WA Pty Ltd, 2012). Overall, Cape Cuvier is considered to have low to moderate susceptibility to landform change due to climate variation and sea level rise (Demara WA Pty Ltd, 2012).

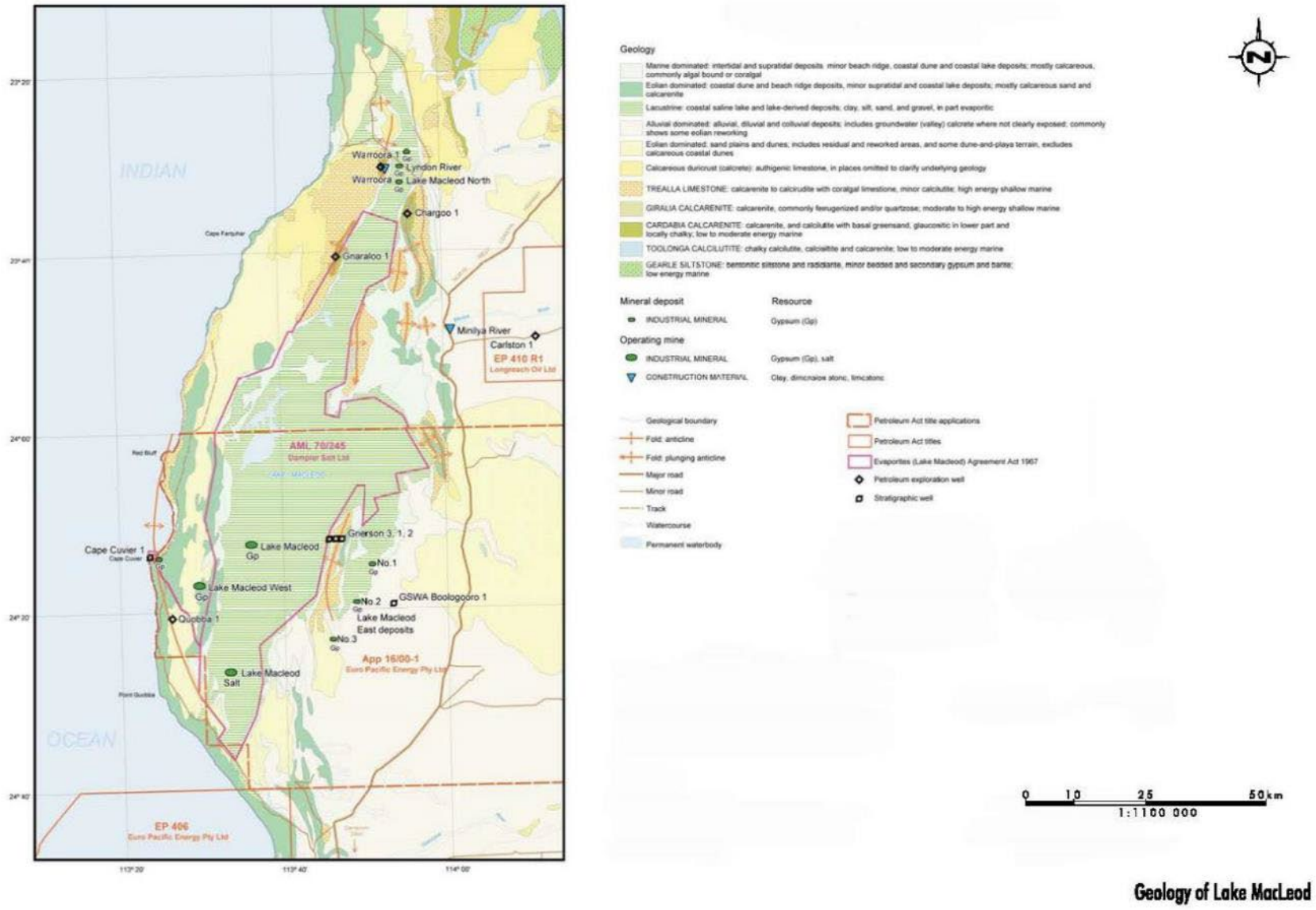
4.1.7.4 Geology and Geomorphology

Lake MacLeod is a large saline playa which was once open to the sea at both ends. A playa is a dry lake bed at the bottom of a desert basin, sometimes temporarily covered with water. Playas have no vegetation and are among the flattest geographical features in the world (Houghton Mifflin Company, 2005).

The lake was created by the formation of a barrier at the northern end through a combination of anticline uplift and increased dune migration, and the more recent blocking of the southern end by beach ridge progradation (i.e. migration seawards). Erosional sea-level terraces warped by tectonism occur around Lake MacLeod. An oblique bar built on shelly limestone, thought to have been originally formed as a tombolo or at the meeting point of two flood-tide systems divides Lake MacLeod into two basins (Hocking, Moors, & Van De Graaff).

The Lake MacLeod basin includes an evaporite sequence at least 12 metres thick, containing salt, gypsum and sylvite (Hocking et al, 1987). Deposits of gypsum in the Lake MacLeod basin are widespread and thick (Hocking, Moors, & Van De Graaff). Figure 4-4 is a broad-scale (1:500,000) map indicating the geology of Lake MacLeod.

The low-lying area running parallel to the coast and extending south from Exmouth Gulf through Lake MacLeod to Shark Bay is known as the Bullara Sunkland (Gascoyne Development Commission, 1997; Hocking, Moors, & Van De Graaff). An extensive longitudinal dunefield lies between Exmouth Gulf and Lake MacLeod. The dunefield comprises younger, unlithified, slightly calcareous dunes which overlie an older field of calcreted, larger dunes (Hocking, Moors, & Van De Graaff).



Source: Roberts, F.I (2004) Lake MacLeod area, Resource potential for land use planning (Scale 1:500 000) Western Australian Geological Survey

Figure 4-4: Geology of Lake MacLeod

4.1.7.5 Hydrogeology

4.1.7.5.1 Aquifer layers

Major hydrogeological and surface water features of Lake MacLeod are shown Figure 4-5.

Further description of these features is provided in Section 4.1.7.7. The underlying geology of Lake MacLeod is referred to as MacLeod Evaporite, which is comprised of Ibis Gypsite, Texada Halite and Cygnet Carbonate (Logan, 2003). The MacLeod Evaporite covers the majority of Lake MacLeod. Cross sections of the MacLeod Evaporite are shown in Figure 4-6.

Ibis Gypsite is the uppermost layer of the MacLeod Evaporite and forms the surface of Lake MacLeod. The gypsite layer has low permeability and varies in thickness from two metres to six metres across the lake. The low permeability Ibis Gypsite acts as an aquiclude above the Texada Halite aquifer, limiting movement of brine from the aquifer to the lake surface. Pressure in the Texada Halite aquifer can drive brine levels up to one metre above the aquifer surface when the Ibis Gypsite layer is ruptured (Logan, 2003).

The Texada Halite aquifer is a rock salt aquifer which underlies the Ibis Gypsite. The aquifer is five to six metres (Logan, 2003) and is contained under pressure between the overlying low permeability Ibis Gypsite and the underlying impermeable Cygnet Carbonate (Figure 4-6). The brine used in production of salt at Lake MacLeod is drawn from the Texada Halite aquifer.

The bottom layer of the MacLeod Evaporite is a low permeability carbonate layer approximately one metre thick, known as Cygnet Carbonate (Figure 4-6) (Logan, 2003). The Cygnet Carbonate provides the bottom hydroseal layer of the MacLeod Evaporite and prevents exchange of groundwater with underlying strata.

Located in the southern extent of the MacLeod Evaporite is the Texada Sill. Cross sections through the Texada Sill are shown on Figure 4-7. South of the Texada Sill is the Texada Sink Figure 4-5.

At the Texada Sink, the underlying geological layers are Boolathanna Formation Pilot Member, calcrete horizon, and Quobba Sands. The Boolathanna Formation Pilot Member is the surface layer, approximately one to two metres thick, and is comprised of calcareous quartz sand interlayered with clay, gypsite and skeletal sand. The calcrete horizon is a 0.05 metre to 0.2-metre-thick layer of laminar calcrete that acts as a low permeability hydroseal. The hydroseal is maintained in the north by overlap with the Cygnet Carbonate. The hydroseal is essentially continuous, although there are some solution holes that provide limited hydraulic connection across the hydroseal (Logan, 1987).

Seawater Seepage Inflow and Recharge of the Texada Halite Aquifer

The primary inflow to Lake MacLeod is seawater seepage, through four currently active seepage faces: Gnaraloo, Cygnet Marsh, Quobba and Bejaling (Logan, 1987). The location of the four active seepage faces and cross-sections through each seepage area are shown on Figure 4-8.

The rate of seepage through the seepage faces is controlled by the permeability of layers along the seepage path. The seepage rates through the Gnaraloo, Quobba and Bejaling seepage faces are generally less than the potential evaporation rate, resulting in no net long-term expression of surface water. During winter, the seepage rate at the Bejaling seepage face is greater than the evaporation rate, resulting in formation of brine sheets and ephemeral ponds at the Texada Sink (Logan, 1987).

In contrast, the Cygnet Marsh seepage face provides net seepage of approximately 270 GL/yr to Lake MacLeod and is the primary source of brine for the Texada Halite aquifer (Logan, 1987). Seepage of seawater through the Cygnet Marsh recharges Cygnet Pond. The seawater is then concentrated to hypersaline levels in Cygnet Pond via evaporation, with average seepage inflow rates of 270 GL/yr reduced to average discharge rates of approximately 210 GL/yr (Logan, 2003). Water flows from Cygnet Pond to Ibis Pond over the Cygnet Sill, which controls the water level in Cygnet Pond.

Ibis Pond has a large surface area, resulting in high evaporation and further concentration of brine from Cygnet Pond. During winter, the Ibis Pond expands towards the south and east due to fresh water inflow from increased rainfall and reduced evaporation. At its furthest extent, Ibis Pond covers the Karst Plain and Wall, shown in Figure 4-5.

The Karst Plain and Wall is an area of high porosity through the surface Ibis Gypsite layer, allowing infiltration of hypersaline water (brine) from Ibis Pond into the Texada Halite aquifer. Approximately 18 GL/yr of brine is discharged from Ibis Pond to the Karst Plain and Wall and recharges the Texada Halite Aquifer (Logan, 2003).

The brine used in production of salt at Lake MacLeod is derived from the Texada Halite Aquifer, which is recharged from seawater seepage concentrated by evaporation from the Cygnet and Ibis Ponds. The Cygnet Sill is located between the Cygnet Pond and the Ibis Pond, and controls water level in the Cygnet Pond. The Cygnet Sill acts as a weir and provides hydraulic separation between the Lake MacLeod Operation and the Cygnet Pond (Groundwater Resource Management, 2014). The Texada Halite Aquifer is recharged from overflow of the Ibis Pond, such that brine for the operations is recharged via passive processes and is not abstracted or pumped from the Northern Ponds.

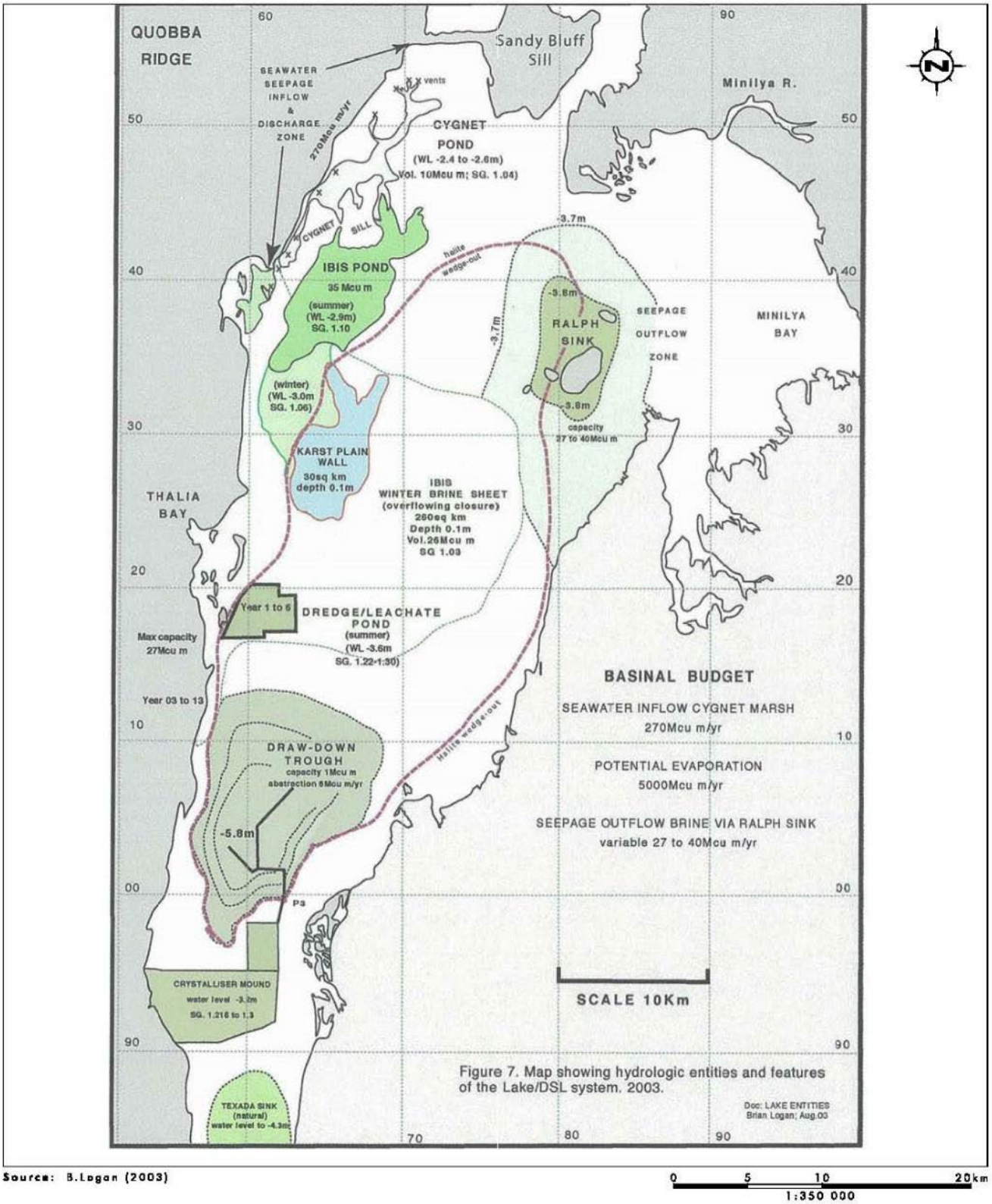


Figure 4-5: Hydrogeological Features of Lake MacLeod

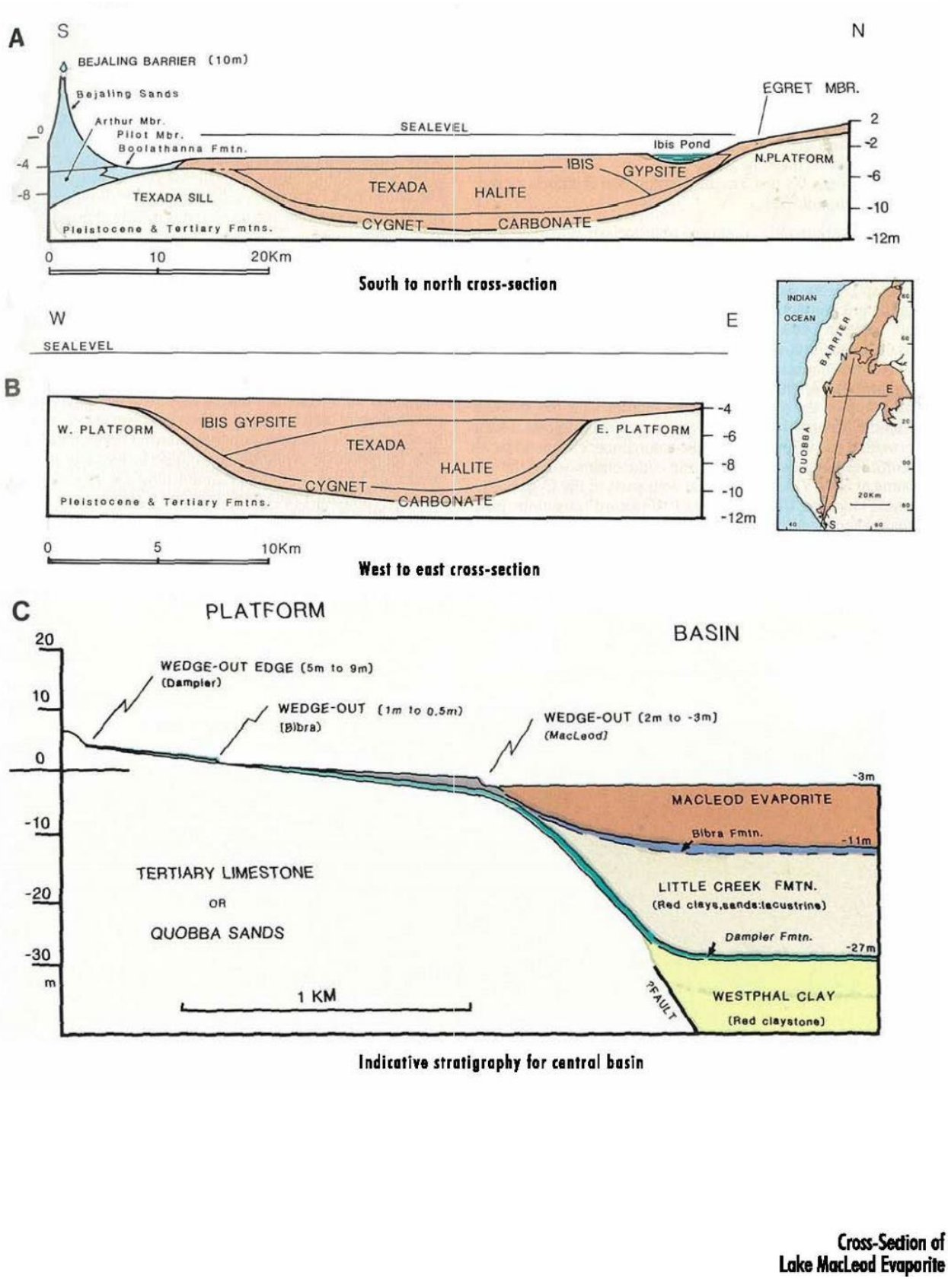
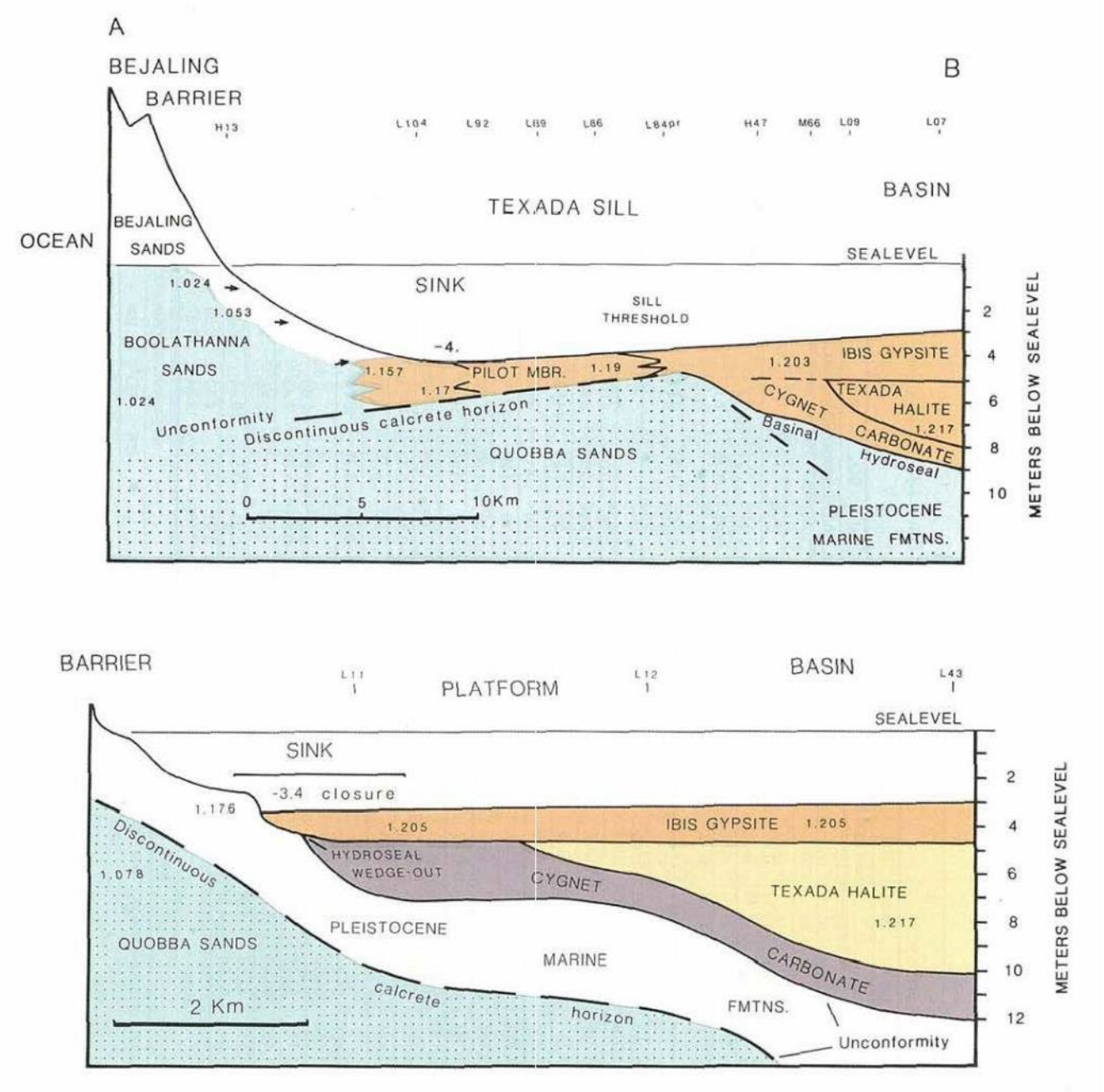
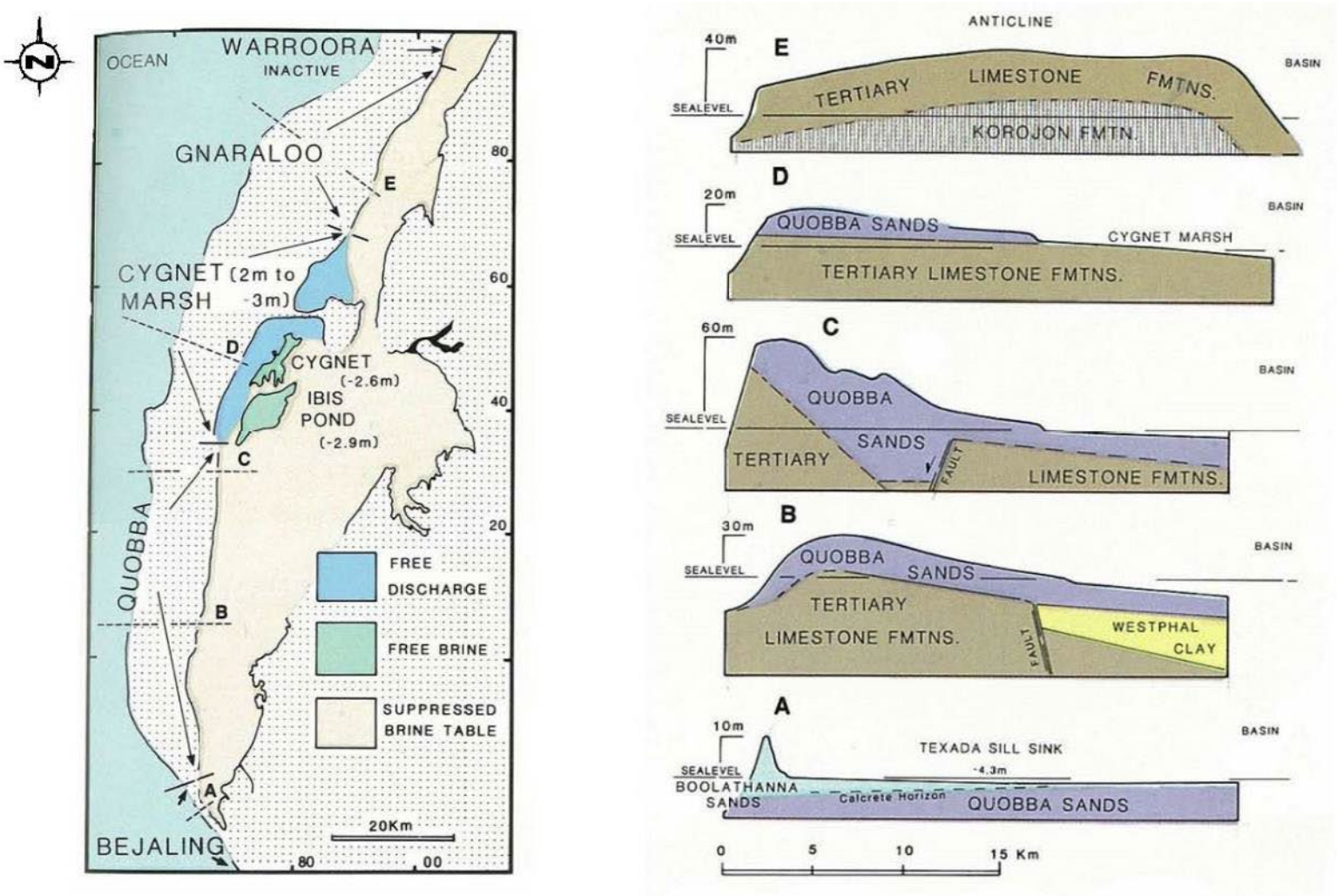


Figure 4-6: Cross-Sections of Lake MacLeod Evaporite



Cross-Section south to north through the Texada Sink Sill

Figure 4-7: Cross-Section South to North through the Texada Sink Sill



Seepage Faces into Lake MacLeod

Figure 4-8: Seepage Faces into Lake MacLeod

4.1.7.6 Groundwater

A shallow and deeper groundwater system are present below Lake MacLeod. The shallow system comprises the Ibis Gypsite and Texada Halite aquifers. These are underlain by the low permeability Cygnet Carbonate, which in the area of the salt field restricts flows to the deeper groundwater system comprising the Quobba Aquifer and Trealla Limestone (Groundwater Resource Management, 2014).

Laterally the very high permeability Texada Halite pinches out against the overlying Ibis Gypsite and Cygnet Carbonate. However, the gypsite does on-lap onto the Quobba Aquifer to the north, east and west; and is contiguous with the Boolathanna Formation to the south, thereby facilitating lateral flows between the shallow and deep systems along these margins (Groundwater Resource Management, 2014).

The deeper groundwater system extends beyond the footprint of the lake and overlies the Krojon and Toolonga Calcarenites, which are considered to be aquitards and provide a base to the deeper system. The Trealla Limestone outcrops along the coast and include karst structures that hydraulically link Cygnet Pond to the Indian Ocean (Groundwater Resource Management, 2014).

Horizontal groundwater flows in the shallow groundwater system are generally to the south and east from the recharge zones near to and south of Cygnet and Ibis Ponds, towards the regional depressions in the lake surface at the Ralph and Texada Sinks. The vertical flow regime is poorly understood (Groundwater Resource Management, 2014).

Groundwater recharge to the near surface lake deposits will be from infiltration from brine sheets flowing south from Ibis Pond and from periodic infiltration of brackish to saline water from flood sheets (Groundwater Resource Management, 2014).

Separate to the aquifers supplying production brine is the aquifer that supplies raw water, which is used for washing the salt and gypsum, and supplies the reverse osmosis plants. This water is sourced from the Birdrong Sandstone Aquifer, which is the most significant aquifer within the Carnarvon Artesian Basin. The aquifer is approximately 50 m thick at Lake MacLeod, at a depth of more than 200 m below the lake surface (Groundwater Resource Management, 2014). The Birdrong Aquifer is artesian, confined below the Muderong Shale low-permeability unit (Groundwater Resource Management, 2014). Water quality is generally brackish.

4.1.7.7 Surface Hydrology

4.1.7.7.1 Surface Water Features in Lake MacLeod

Lake MacLeod, covering 225,000 hectares and with a surface level up to five metres below sea level, represents a major point of internal regional drainage (Gascoyne Development Commission, 1997). The lake is normally dry, except when the Gascoyne, Minilya or Lyndon Rivers are in flood. Two permanent water bodies are present in the north-western area of the lake – the Ibis and Cygnet Ponds. Some of the key surface water bodies and features at Lake MacLeod are shown on Figure 4-5 and include Cygnet Pond, Ibis Pond, the Ralph Sink and the Texada Sink.

Cygnet Pond is a permanent water body in the north of Lake MacLeod with water level at approximately -2.6 m AHD (Logan, 1987) (Figure 4-5).

Cygnet Pond has an average water depth of 0.4 metre and the surface area of the pond is approximately 1200 hectares (Logan, 1987). Cygnet Pond is separated from Ibis Pond by a low permeability sill, which acts as a weir and is thought to isolate Cygnet Pond from Ibis Pond and the downstream brine abstraction that supplies the salt operation (Groundwater Resource Management, 2014).

Ibis Pond is situated south of Cygnet Pond, and has a water level of approximately -2.9 m AHD (Logan, 1987) (Figure 4-5).

The average water depth is 0.8 metre, with the deepest section of the pond in the north near the Cygnet Sill. The surface area of the pond varies considerably from summer to winter. Summer surface area is approximately 3200 hectares, and winter surface area is 26,000 hectares (Logan, 1987).

The ponds are recharged by marine discharge, with the Cygnet Pond receiving the majority of the marine discharge. Water from this pond subsequently overflows into Ibis Pond, which overflows to the south onto the lake surface (Groundwater Resource Management, 2014).

The Ralph Sink is located in the north-east of Lake MacLeod (Figure 4-5).

Ralph Sink is located in a topographic depression, with ground elevation approximately -3.5 mAHD (Logan, 1989). During summer, the brine surface is usually suppressed below the ground level (Logan, 1989). However, in winter there is usually a flood sheet or brine pool at the Ralph Sink (Logan, 1989). The Ralph Sink is the most important location for seepage of brine out of Lake MacLeod (Logan, 1989). Brine may be transported to Ralph Sink by seepage through underlying aquifers; or direct overland flow, particularly under the influence of south-westerly winds (Logan, 2003).

The Texada Sink is located in the south of Lake MacLeod at Texada Sill. Texada Sink is located in a topographic depression in the lowest part of Lake MacLeod with elevation ranging from -3.6 m AHD to -4.3 m AHD (Logan, 1987). During summer, the brine surface at the Texada Sink is reduced to a thin 0.05 metre to 0.1 metre sub-surface layer above the hydroseal. In winter, ephemeral ponds 0.05 metre deep above the lake surface are formed by flow of brine into the sink from the Bejaling seepage face or discharge of floodwater from Boolathanna Creek (Logan, 1987).

The Northern Ponds comprise permanent saline waters (maintained by groundwater seepage), covering around 2.5 % of the lake. In contrast, the southern part of the lake tends to remain dry without the occurrence of substantial flooding.

Cygnet and Ibis Ponds are located approximately 16 km north of the Gypsum Operation and 38 km north of the Salt Operation. Texada Sink is approximately 5 km south of the southern portion of the 30,000 levee that surrounds the Salt Operations. It is unlikely that closure activities would impact on any of these key surface water features.

4.1.7.7.2 Rivers

The major rivers in the vicinity of Lake MacLeod are the Minilya River, Lyndon River and Gascoyne River (Figure 4-1).

The Minilya, Lyndon and Gascoyne Rivers are all ephemeral, with only occasional permanent water holes. The Minilya River and the Lyndon River discharge directly into Lake MacLeod at its northern end. Figure 4-9 shows Lake MacLeod in December 2000, when the Lyndon and Minilya Rivers discharged into Lake MacLeod (US Geological Survey, 2009).

The mouth of the Gascoyne River, featuring a significant delta, lies approximately 15 km south of the southern end of Lake MacLeod (Hocking, Moors, & Van De Graaff). The Gascoyne River is the region's largest river, with a total catchment area of 6.7 million hectares, including tributaries, and flows only occasionally between February and August (Gascoyne Development Commission, 1997). The Gascoyne River discharges to the coast near Carnarvon; however, in large flood events, the Gascoyne River also discharges to Lake MacLeod via Boolathanna Creek and Cardabia Creek (Logan, 2003). Figure 4-10 shows Lake MacLeod in April 2000, with the Gascoyne River flowing and a hydraulic connection via the floodplain of the Gascoyne River to Boolathanna and Cardabia Creeks, which are discharging into Lake MacLeod (US Geological Survey, 2009).

The LMC Salt Operation is located approximately 45 km north of the Gascoyne River. The Lyndon and Minilya Rivers discharge into Lake MacLeod approximately 35 km north of the LMC Gypsum Operation (Figure 4-1).

It is unlikely that closure activities would impact on any of the regional rivers.

4.1.7.7.3 Flooding

In addition to seepage inflow to Lake MacLeod, flood events intermittently add surface water to the lake system via a combination of discharge from the major rivers and 'intra-basinal rainfall' (Logan, 1989). 'Intra-basinal rainfall' was used by Logan (Logan, 1989; Logan, 2003) to refer to the combination of direct rainfall to the lake surface and inflow from the immediate lake catchment. Flows into the lake initially accumulate in the Ralph Sink and the Texada Sink in the north and south of the lake respectively (Figure 4-5).

The sinks accommodate approximately 50 million cubic metres of water in total before the perimeters of the flood sheets begin to extend out over the surface of Lake MacLeod (Logan, 1989).

Figure 4-11, reproduced from Logan (2003), provides a summary of the average depth of flood sheets in Lake MacLeod for the period from 1960 to 2000. According to Logan (2003), virtually every year there is a low volume (<500 million cubic metres) shallow flood sheet of up to 0.3 metres in depth (flood elevation of approximately - 2.9 mAHD) somewhere on the lake bed. This is a result of either intra-basinal rainfall and/or minor river discharge caused by winter rainfall or a cyclonic event in late summer (Logan, 2003). As shown in Figure 4-11, larger floods occur less frequently; there were 14 flood sheets with average depths of between 0.3 metres and 1.5 metres (flood elevation of approximately - 2.9 mAHD to - 1.8 mAHD) between 1960 and 2000. Flood sheets with average depths of between 0.7 metres and 1.5 metres (elevation of approximately - 2.5 mAHD to - 1.8 mAHD) have occurred on five occasions between 1960 and 2000.

According to Logan (2003), the more voluminous floods are the most important in terms of the hydrology and chemistry of the lake, as these events link all of the hydrologic entities of Lake MacLeod, rapidly dissolve salt crystals on the lake bed, and move high

concentration salt loads around the lake from the flood peak until eventual evaporation of the flood waters. Infiltration of flood waters into the halite aquifer may also occur at the Karst Plane and Wall and wherever the Ibis Gypsite layer has been breached. Due to the very large, open area at Lake MacLeod, wind can have a strong influence on flood waters, resulting in mixing of flood waters and build up in certain areas of Lake MacLeod, depending on wind direction. As described in Section 4.1.7.1, the climate of Lake MacLeod is characterised by southerly winds throughout much of the year, which result in flood waters accumulating in the Ralph Sink and the Northern Ponds (Logan, 1989).

The 30,000 Levee protects the Lake MacLeod Salt Operation from ingress of water due to flood events on Lake MacLeod. However, large flood events may temporarily halt the gypsum operations, which are not protected by a flood levee. In addition, if a high rainfall event occurs over on the salt operations, this would also temporarily halt salt production. Salt and gypsum operations would resume after the surface water subsides, unless there was significant damage to infrastructure, which may trigger the operations entering care and maintenance or unexpected closure in the event of severe damage (see Section 8.6 for more information about unexpected closure).

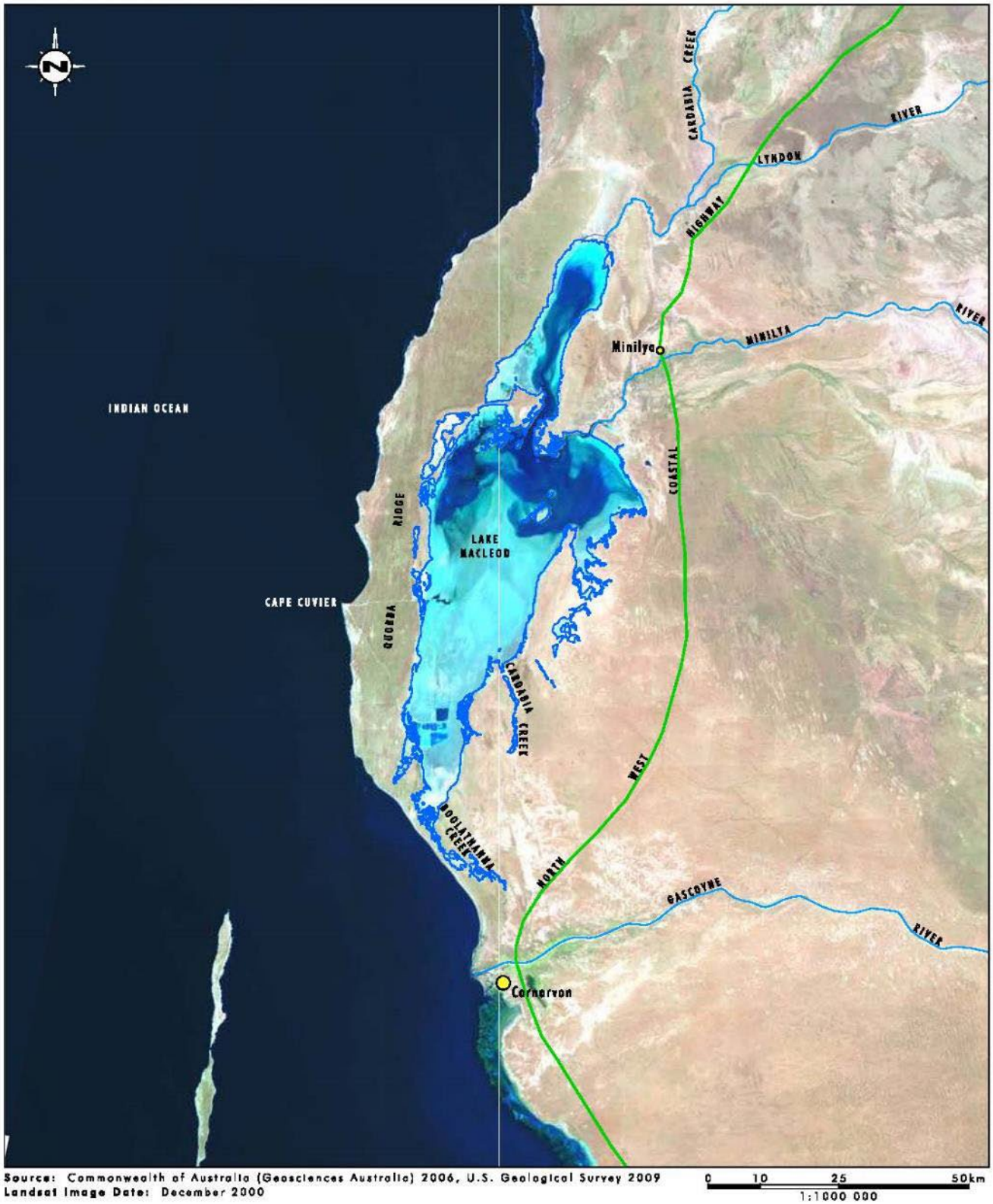


Figure 4-9: Lyndon and Minilya Rivers Discharging to Lake MacLeod in December 2000

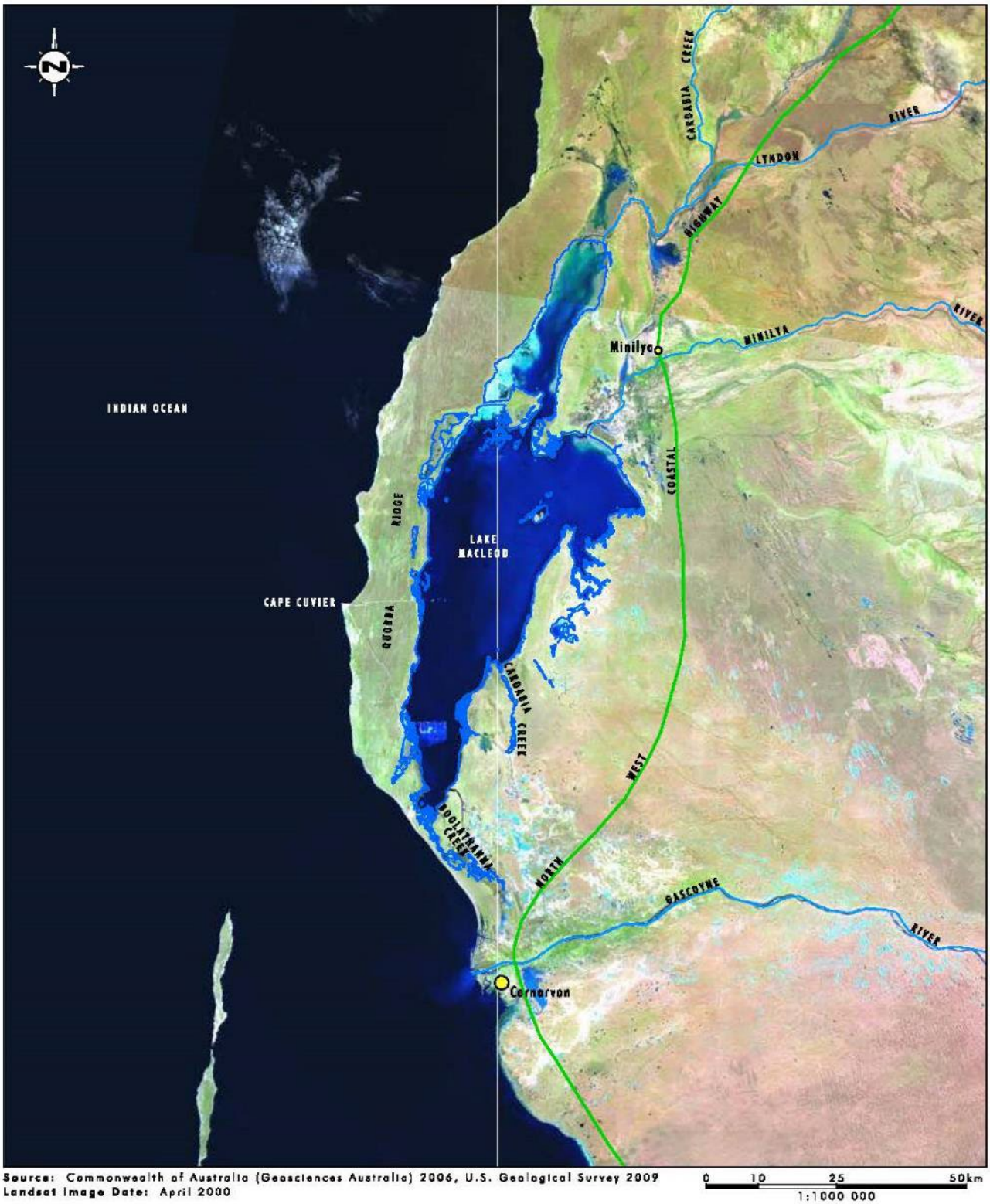


Figure 4-10: Gascoyne River Discharging to Lake MacLeod via Boolathanna and Cardabia Creeks in April 2000

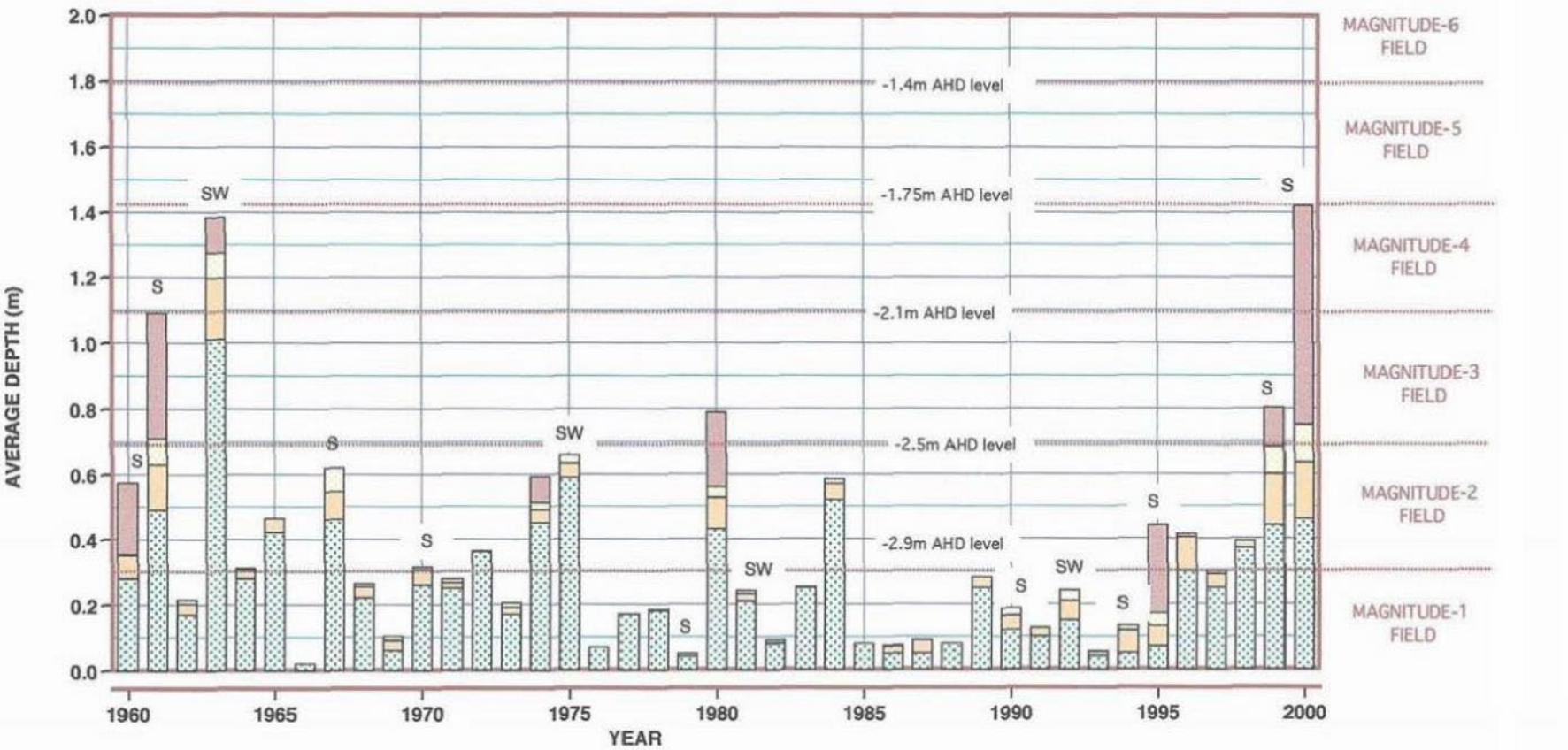


Figure 5. .Average depth of flood sheets, 1960 to 2000, showing level increments provided by sources. S= late summer events; SW = late summer into winter event; others are winter events. Magnitude fields and levels AHD in red. Depths are relative to av. lake bed elevation at -3.2mAHD. Resident marine brines have been discounted; add 0.04m for summerand 0.06m for winter event.

Average depth of flood sheets in Lake MacLeod 1960 to 2000

Figure 4-11: Average Depth of Flood Sheets in Lake MacLeod, 1960 to 2000

4.1.7.8 Soils

Sandy calcareous soils, which are low in organic matter, dominate the coastal area in which Lake MacLeod is located (Gascoyne Development Commission, 1997). The soils within and adjacent to Lake MacLeod are mostly classified as Salt Lake Soil (Soil Group 102) (Schoknecht, 2002). According to Schoknecht (2002), Salt Lake Soil is typically wet to within 80 cm of the surface level for a major part of the year, has variable textures, is often gypseous and/or calcareous and highly saline, with primary areas of salinity occurring on salt lake beds and adjacent flat saline areas. The latter areas are often vegetated with salt-tolerant flora species (halophytes).

Figure 4-12 is a broad-scale map of soils potentially occurring within and around the Lake MacLeod Operation (CSIRO Australia, 2009). LMC operational areas are located on hydrosols, chromosols and rudosols.

Hypersalic hydrosols occur at land areas bordering Lake MacLeod (Schoknecht, 2002). Some borrow pits and quarries at the Lake MacLeod Operation are located on this soil type. High salinity and seasonal waterlogging render this soil unsuitable for most plants, except for specialist flora species such as halophytes in fringing areas (Schoknecht, 2002).

Borrow pits and quarries are also located on land with soils classified as chromosols (Figure 4-12).

According to the Australian Soil Classification, chromosols are soils with a strong texture difference between the upper and lower horizons, with the latter not being either sodic or strongly acidic (Isbell, 1996).

The coastal plain west of the salt and gypsum operations is typified by rudosols (Figure 4-12). The port at Cape Cuvier is located on this soil type. Rudosols are soils with rudimentary development of soil horizons and little colour or texture change with depth. Many rudosols in the Lake MacLeod area are highly saline, rendering them unsuitable for most plant species except for halophytes adapted to highly saline conditions. The data available on rudosols is very limited.

The LMC Operation is primarily located on the salt lake, where there is little natural vegetation. Areas of disturbance that may require revegetation are the locations of borrow pits, quarries and roads, and the port at Cape Cuvier, which are located on hydrosols, chromosols and rudosols. However, no site-specific soil analysis has been undertaken. In planning for closure, LMC should consider undertaking soil mapping to assist in planning appropriate revegetation methods.

4.1.7.9 Acid Sulphate Soils

In Western Australia, acid sulphate soils (ASS) are most commonly found in low-lying wetlands, estuaries, back-swamps, tidal flats and salt marshes (Department of Environment Regulation, 2016). No baseline studies have been conducted regarding the potential for ASS to occur within the Lake MacLeod Operation lease areas.

A broad-scale map of ASS potentially occurring in and around the Lake MacLeod Operation was obtained from the Australian Soil Resource Information System (ASRIS) (CSIRO Australia, 2009) and is presented in Figure 4-13.

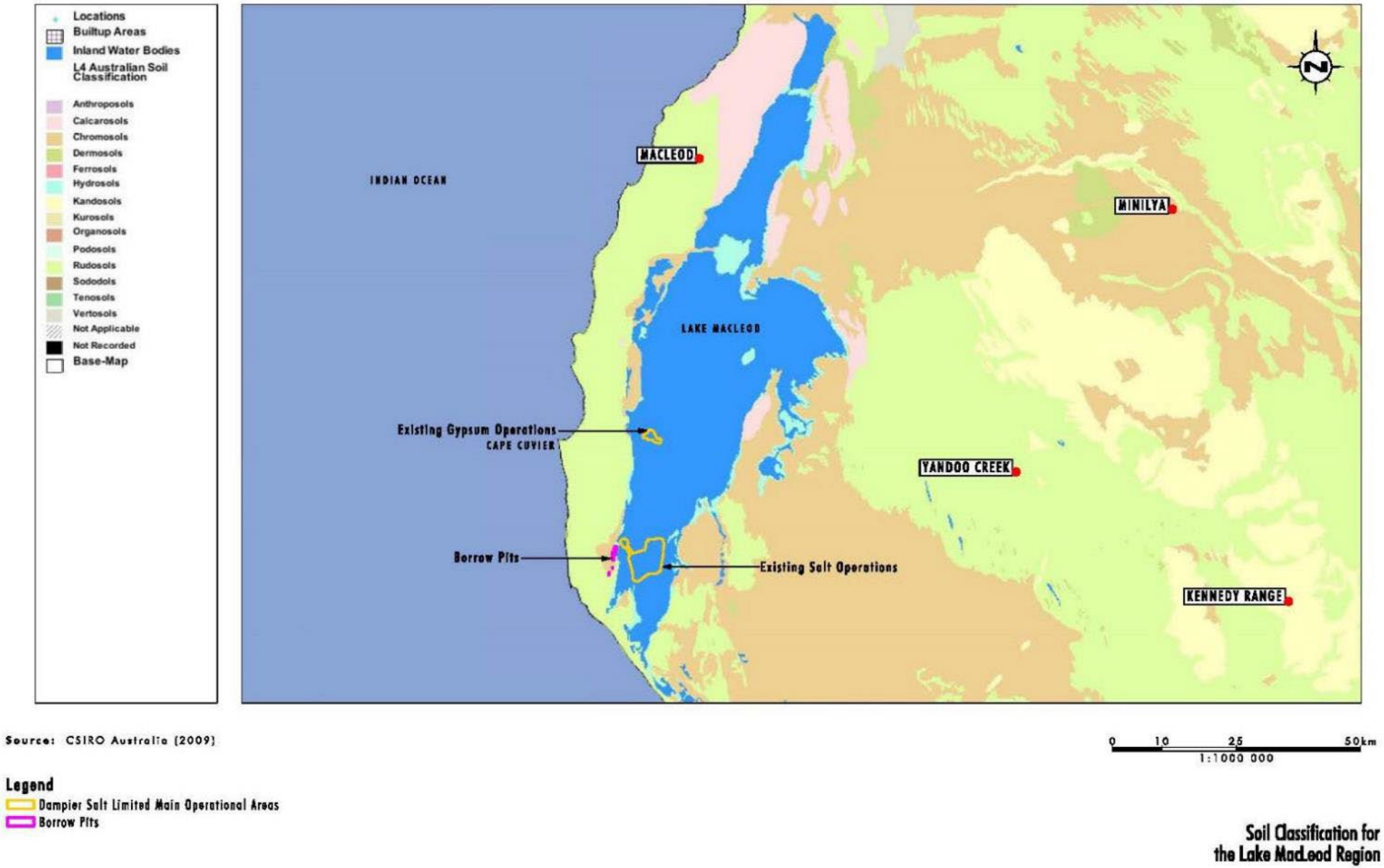


Figure 4-12: Soil Classification for the Lake MacLeod Region

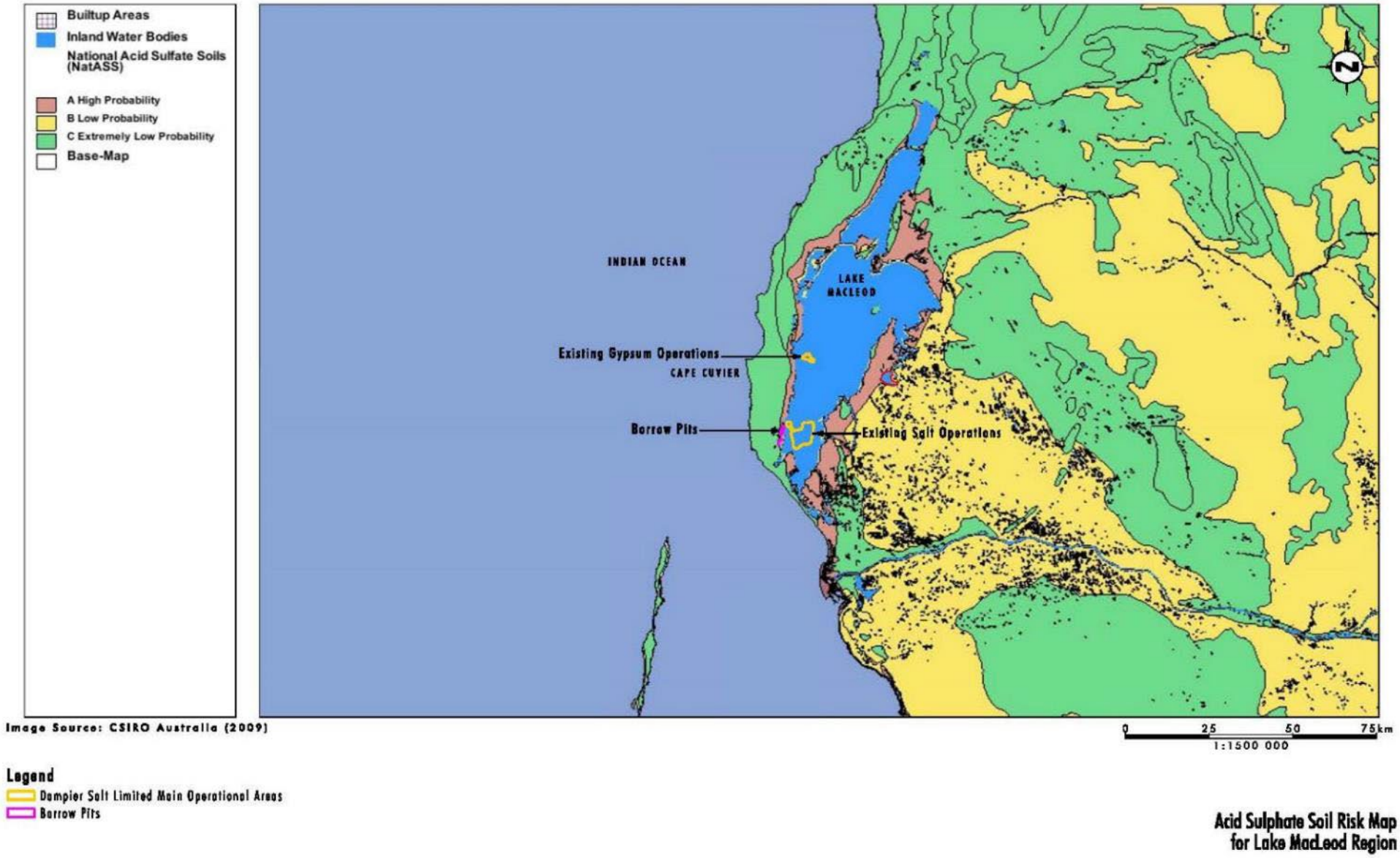


Figure 4-13: Acid Sulphate Soil Risk Map for the Lake MacLeod Region

Based upon the ASRIS acid sulphate soil regional mapping, a significant risk of the presence of acid sulphate soils exists on the fringes of Lake MacLeod at the base of the Quobba Ridge (Figure 4-13).

In planning for closure, an acid sulphate soil management plan should be developed if any excavations or earthworks are planned for the western fringe of Lake MacLeod, which may disturb acid sulphate soils.

4.1.8 Biotic Characterisation

4.1.8.1 Vegetation Communities

4.1.8.1.1 Threatened and Priority Ecological Communities

Database searches were conducted through the Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW); and the Western Australian Department of Biodiversity, Conservation and Attractions (DBCA) for Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs). The requested search area included the Lake MacLeod Operation and lease areas.

The results presented below are protected ecological communities identified within the Lake MacLeod salt lake, or within 50 km of the Lake MacLeod Operation.

No TECs have been recorded within Lake MacLeod or within 50 km of the LMC Operation.

Five PECs have been recorded within the area of interest:

- *Lake MacLeod Invertebrate assemblages*, Priority 4(ii), located in the north of Lake MacLeod, approximately 15 km north of the Gypsum Operations
- *Lyell Land System*, Priority 3(iii), located south of Lake MacLeod, approximately 13 km south and southeast of the Salt Operations
- *Subtropical and Temperate Coastal Saltmarsh*, Priority 3(iii), located south of Lake MacLeod, approximately 43 km south of the Salt Operations
- *Barrabiddy Land System*, Priority 3(iii), located east of Lake MacLeod, approximately 80 km northeast of the Gypsum Operations
- *Marloo Land System*, Priority 3(iii), located north of Lake MacLeod, approximately 100 km north of the Gypsum Operations.

The locations of the PECs are shown on Figure 4-16.

Further details regarding the two PECs within 20 km of the Lake MacLeod Operation are provided below.

The ‘Lake MacLeod invertebrate assemblages’ PEC is described as a:

> Saline aquatic community with strong marine affinities with particularly rich copepod elements, is effectively a well-developed, very rich birrida community with strong marine and terrestrial components with especially rich hypactacoid community. Distinctive but lacks threats (Desmond & Chant, 2001).

The ‘Lyell Land System’ PEC is described as:

> Sandplains with reticulate dunes and saline interdunal plains supporting tall and low acacia shrublands and saltbush. Threats: over grazing, weed invasion (Buffel grass) (Department of Biodiversity, Conservation and Attractions, 2017).

It is not considered likely that there will be any impacts on these ecological communities during operations or closure, however these communities will guide the species seed mixes required in locations where revegetation is necessary.

It is unlikely that there would be any opportunities to enhance habitat or provide additional protection for these ecological communities as part of the PMLU.

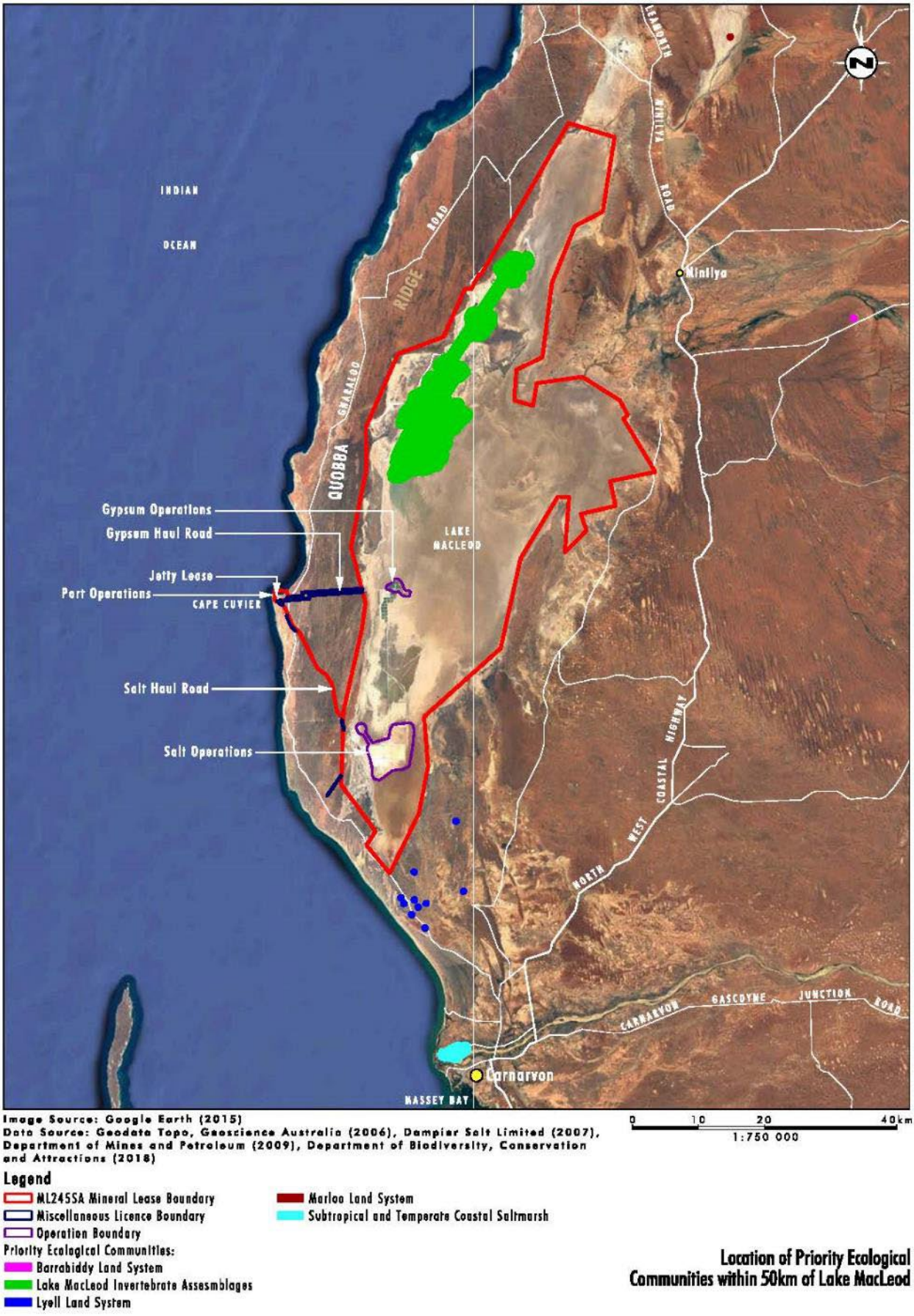


Figure 4-14: Location of Priority Ecological Communities with 50 km of Lake MacLeod

4.1.8.1.2 *Regional Vegetation Communities*

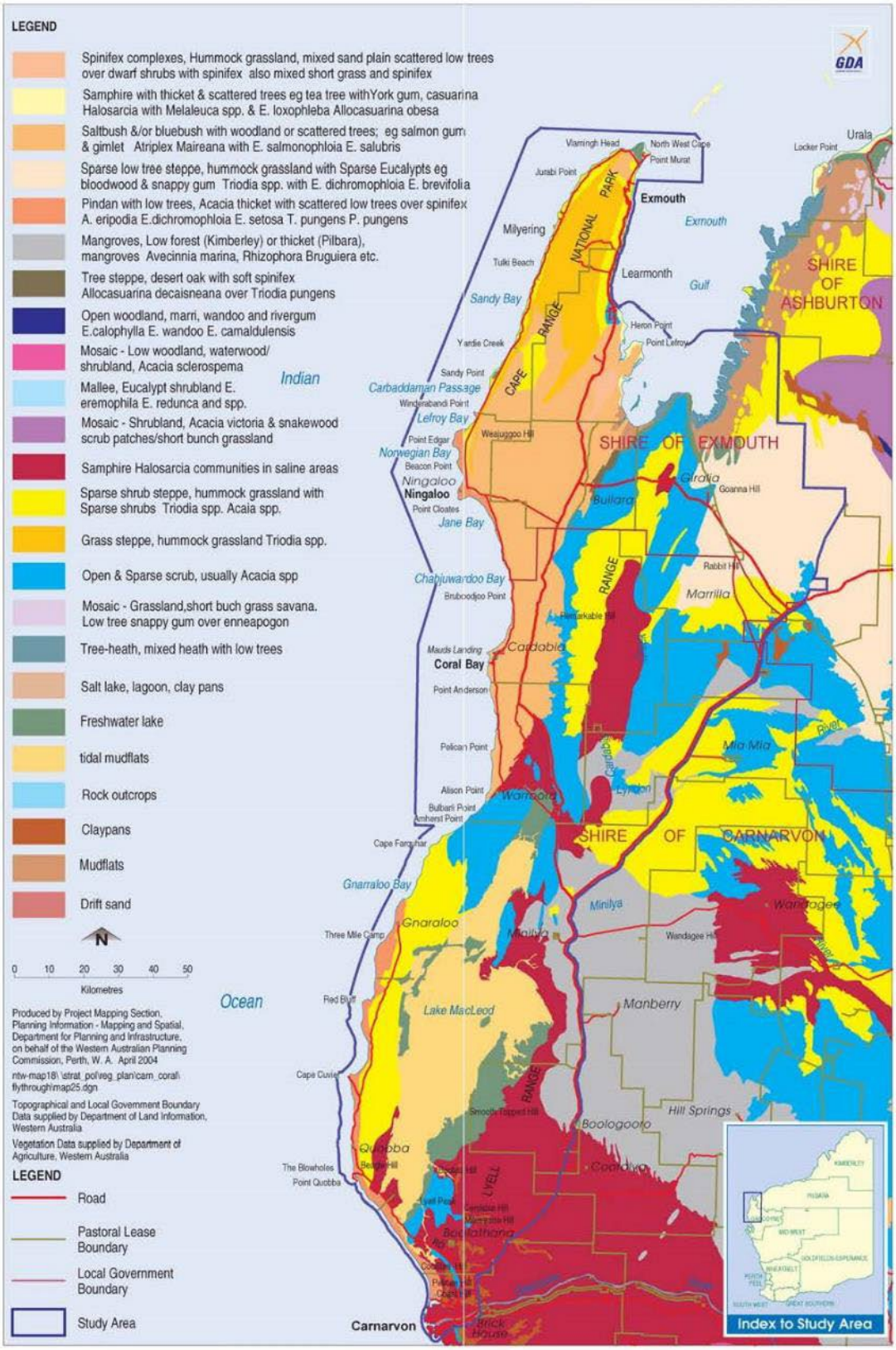
Figure 4-17 illustrates the vegetation associations occurring within and around Lake MacLeod as defined by Beard (1975; Western Australian Planning Commission, 2004). The vegetation associations in which LMC operational areas are located are summarised in Table 4-5.

Table 4-4: Regional Vegetation Associations at the Lake MacLeod Operation (Western Australian Planning Commission, 2004)

LMC Operational Area	Vegetation Association
Salt operations	Tidal mudflat [salt lake]
Gypsum operations	Tidal mudflat [salt lake]
Haul roads and borrow pits	Samphire *Halosarcia* community is saline areas Sparse shrub steppe, hummock grassland with sparse shrubs. *Triodia* and *Acacia* species. Saltbush and/or bluebush with woodland or scattered tree, e.g. salmon gum and gimlet. *Atriplex maireana, Eucalyptus salmonophloia* and *E. salubris.*
Cape Cuvier port	Saltbush and/or bluebush with woodland or scattered tree, e.g. salmon gum and gimlet. *Atriplex maireana, Eucalyptus salmonophloia* and *E. salubris.*

The salt and gypsum operational areas are primarily located on the salt lake, which has no identified vegetation association and is relatively barren.

Rehabilitation methods and objectives shall be developed with consideration of the regional vegetation associations, so that the rehabilitation vegetation community is compatible with the surrounding ecological communities.



Vegetation Associations occuring within and around Lake MacLeod

Image Source: Western Australia Planning Commission (2004b)

Figure 4-15: Vegetation Associations occurring within and around Lake MacLeod

4.1.8.2 Flora

This section provides information collected from site surveys. For database and online search data for the Lake MacLeod Site plus information on the Northern Ponds area, refer to Appendix H.

If any native vegetation clearing is required to be undertaken as part of closure activities, a targeted flora survey should be undertaken prior to vegetation clearing to determine whether any threatened flora species occur within the proposed area of clearing.

Where practicable and relevant to the landform and ecological communities, rehabilitation methods will seek to establish suitable habitat to support threatened flora species that may be likely to occur.

4.1.8.2.1 Flora and Vegetation – Lake MacLeod Operation Surveys

No baseline vegetation, flora or fauna surveys were undertaken at the Lake MacLeod Operation prior to the commencement of operations in 1965.

In a survey conducted on behalf of DSL by (Streamtec Pty Ltd, 1988), the flora surrounding Lake MacLeod was described as spinifex (*Triodia*) grasslands with moderately dense *Acacia*, *Senna*, *Eremophila* and *Banksia* shrublands further away from the lake's edge. It was noted during the same survey that introduced Buffel grass (*Cenchrus ciliaris*) readily invaded disturbed areas, though native species were able to out-compete the weed in undisturbed areas (Streamtec Pty Ltd, 1988).

Table 4-6 summarises the outcomes from site-specific flora surveys that have been undertaken since 1998. Key details relating to the flora and vegetation are described below.

The southern section of Lake MacLeod (Quobba and Boolathanna stations) was surveyed in 2010 to obtain baseline information for flora and vegetation condition (Outback Ecology, 2010). Limestone ridges and calcrete flats in the northwest of the survey area were dominated by scattered *Acacia* species over *Frankenia* and *Atriplex* shrublands. *Tecticornia* species, particularly *T. halocnemoides* and *T. peltata,* formed shrublands on lake margins and extensive areas in the south-west and south of Lake MacLeod (Outback Ecology, 2010).

Vegetation across the southern Lake MacLeod survey area was dominated by *Acacia tetragonophylla*, which occurred in almost every vegetation type except low lying heaths and on mud flats. In many cases it was the dominant species, forming tall thick shrublands extending across large distances. Low lying areas within *A. tetragonophylla* shrublands, particularly in proximity to the lake edge, were dominated by low heathlands of *Atriplex* spp. and *Frankenia*, often with a *Tecticornia* component (Outback Ecology, 2010).

Flora surveys undertaken at Lake MacLeod have recorded three priority species: *Abutilon* sp. Hamelin (P2) (not recorded from DPAW database search), *Lepidium biplicatum* (P3) and *Stackhousia clementii* (P3) (Table 4-6). The locations of the recorded priority flora are shown in Figure 4-18.

In planning for closure, the vegetation communities and flora species recorded in similar landforms to the Lake MacLeod Operation will be reviewed to develop suitable rehabilitation species lists for areas of disturbance outside of the salt lake, such as the borrow pits and the port. No revegetation will be undertaken within the salt lake itself.

4.1.8.2.2 Invasive Flora Species

A search of the DCCEEW database for matters of national environmental significance protected under the EPBC Act included a list of Weeds of National Significance and other introduced plants that are considered to pose a threat to biodiversity. The weeds of national significance that were identified in the EPBC Act Protected Matters Report as likely to occur in the search area were:

- Buffel grass (*Cenchrus ciliaris*).
- Prickly pear (*Cylindropuntia spp.*).
- Mesquite (*Prosopis* spp.).
- Athel pine (*Tamarix aphylla*).

Buffel grass is the only one of these listed species that has been recorded in the Lake MacLeod Operation area, based on the results of flora surveys listed in Table 4-6. Buffel grass should be monitored and managed in rehabilitation areas as required to ensure that the presence or abundance of buffel grass doesn't compromise closure objectives.

Table 4-5: Summary of Results from Site-Specific Flora Surveys

Report	Survey area and purpose	Domain	Landforms	Dominant flora families and genera	Protected flora species
Stage 2: Lake MacLeod Flora and Vegetation Survey (Outback Ecology, 2010)	Southern section of Lake MacLeod ML (Quobba and Boolathanna stations) Developing a baseline for flora and vegetation condition	N/A	Costal dunes and narrow swales Gently undulating sand plains and occasional longitudinal dunes Samphire flats and sandy plains with bare marginal mudflats Saline alluvial plains Sandplains with reticulate dunes and saline interdunal plains	Chenopodiaceae (saltbush) Fabaceae (legume) Asteraceae (daisies)	*Abutilon* sp. Hamelin (P1 at the time of the Study, P2 in 2018)
Lake MacLeod Solar Salt Stage 1 Expansion Project - Native Vegetation Clearing Permit Report (Biota Environmental Sciences, 2010)	Lake MacLeod Stage 1 Expansion areas Vegetation clearing	General Infrastructure	Undulating sandy plains with linear dunes Broad saline plains, with sandy banks and low rises Flat to gently sloping saline alluvial plains	Chenopodiaceae (saltbush) Asteraceae (daisy) Poaceae (grass)	*Lepidium biplicatum* (P2 at the time of the Study, P3 in 2018) *Stackhousia clementii* (P3 at the time of the Study, P3 in 2018)

Report	Survey area and purpose	Domain	Landforms	Dominant flora families and genera	Protected flora species
Native Vegetation Clearing Permit Report (Outback Ecology, 2011d)	Borrow pits Vegetation Clearing	General Infrastructure	Samphire flats and sandy plains with bare marginal mudflats Saline alluvial plains Undulating sandy plains with linear dunes and minor limestone ridges and outcrop plains.	Chenopodiaceae (saltbush) Asteraceae (daisy)	Nil
Cape Cuvier Haul Road Realignment: Level 1 Vegetation and Flora Assessment (Outback Ecology, 2011c)	Triangle truncating the existing haul road T-junction Realignment of haul road	Cape Cuvier Operations	Coastal dunes with narrow swales, limestone plains, wave-cut platforms and beaches, supporting diverse tall and low shrublands	Chenopodiaceae (saltbush) Fabaceae (legume) Poaceae (grass)	Nil
Lake McLeod Pits 50 to 53 - Level 1 Vegetation and Flora Assessment (Outback Ecology, 2012a)	Pits 50-53 Developing a baseline for flora and vegetation condition	General Infrastructure	Flat to gently sloping saline alluvial plains, with minor areas of sand and limestone	Chenopodiaceae (saltbush) Poaceae (grass) Fabaceae (legume)	Nil
Lake MacLeod Native Vegetation Clearing Permit Report (Biota Environmental Sciences, 2018)	Location for proposed communication tower and access tracks Vegetation Clearing	Haul roads, access roads, borrow pits	Coastal Dunes	Chenopodiaceae (saltbush) Fabaceae (legume)	Nil

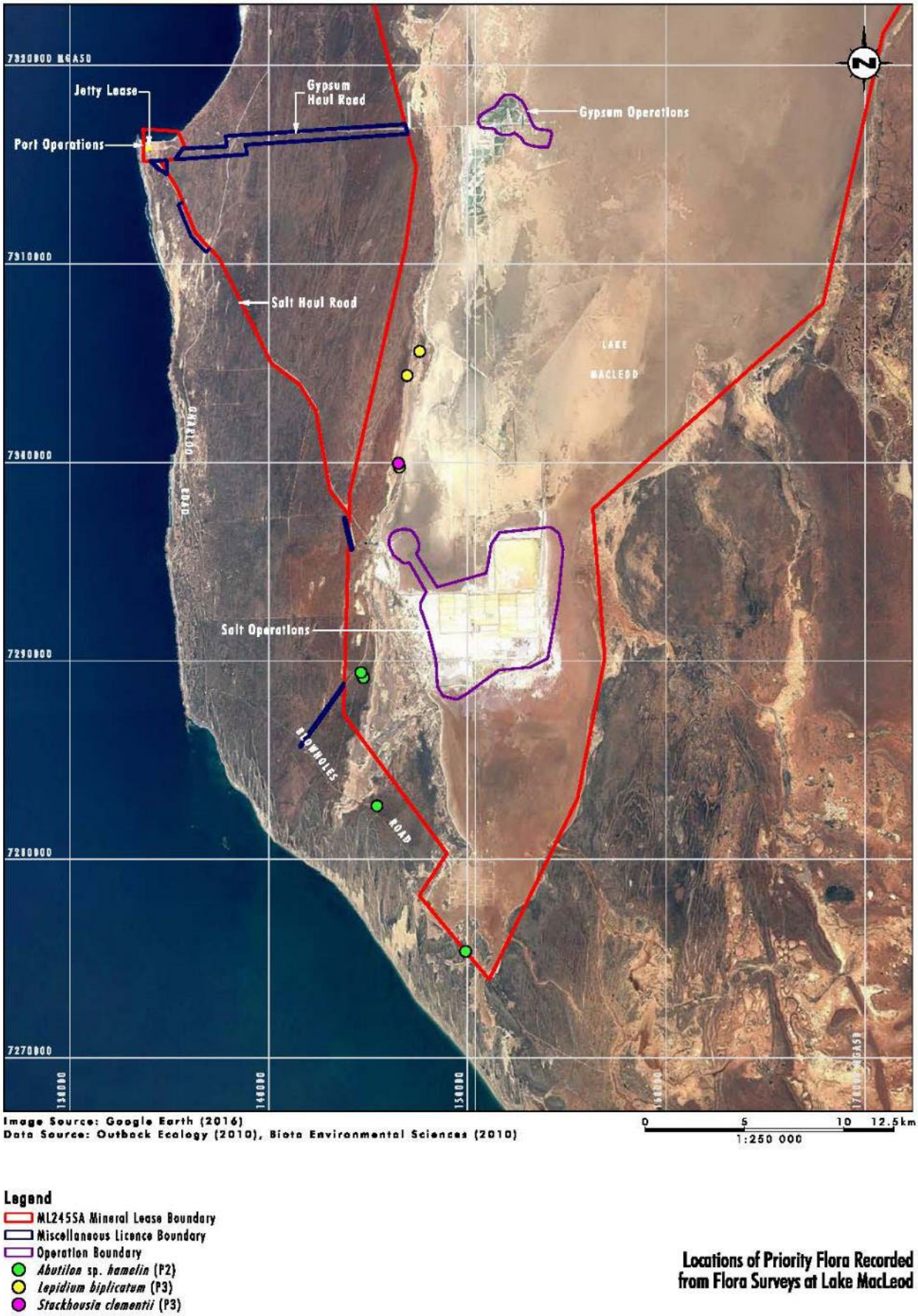


Figure 4-16: Locations of Priority Flora Recorded from Flora Surveys at Lake MacLeod

4.1.8.3 Fauna

This section provides information collected from site surveys. For database and online search data for the Lake MacLeod Site plus information on the Northern Ponds area, refer to Appendix H.

4.1.8.3.1 Fauna – Regional Level

Lake MacLeod has been identified as providing habitat to diverse populations of fish and bird species, and is considered an important resting spot for trans-equatorial waders (Gascoyne Development Commission, 1997; Department of the Environment, Water, Heritage and the Arts', 2009). The main area of ecological significance at Lake MacLeod is the Northern Ponds.

Cygnet Pond in the north of Lake MacLeod (refer to Figure 4-1), is rich in aquatic invertebrates, including amphipods, gastropods, bivalves, copepods, polychaets and forminifera (Logan, 2003). Cygnet Pond contains three species of fish and is an important stopover for migratory waterbirds. More than 70 bird species have been observed at Lake MacLeod (Phillips, Butcher, Hales, & Coote, 2005; Dampier Salt Limited, CALM, WWF-Australia, 2006). The peak period for migratory birds is mid-August to end-October.

In comparison to Cygnet Pond, Ibis Pond has low biodiversity, comprised predominantly of thin cyanobacteria mats and occasional migratory birds and fish (Logan, 2003). Logan (2003) indicated that the lower biodiversity at Ibis Pond was likely due to the large seasonal fluctuations in salinity in Ibis Pond.

The majority of LMC's operations occur on the playa / salt lake, which has a limited diversity of habitat to support native fauna. It is unlikely that native fauna would be dependent on the saline and barren environment of the salt lake.

4.1.8.3.2 Fauna Survey

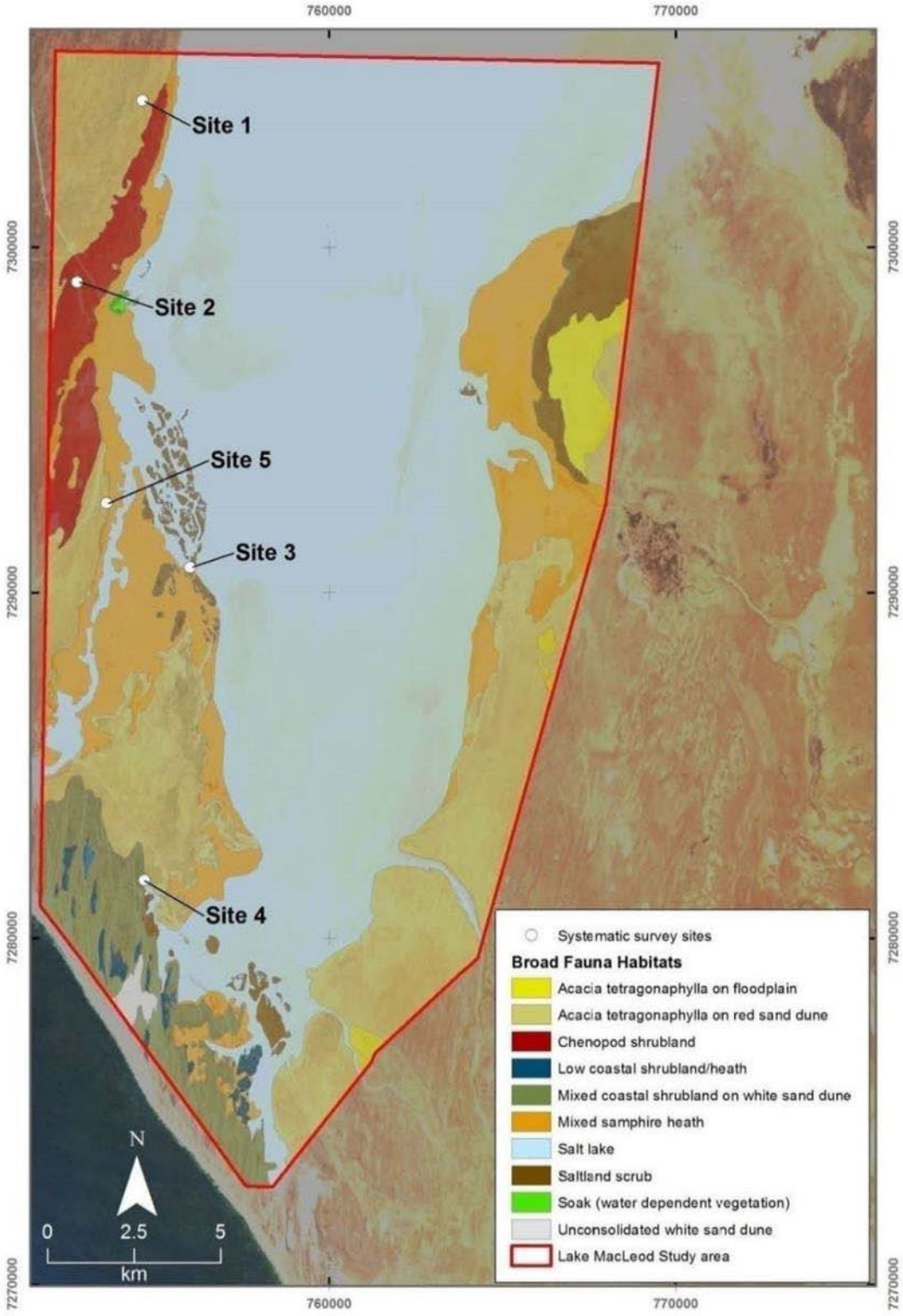
Outback Ecology undertook a terrestrial fauna assessment around the southern perimeter of Lake MacLeod in 2010 (Outback Ecology, 2011e). This work was based on an earlier desktop study of the same area (Outback Ecology, 2009). The fauna survey was carried out in November 2010 and identified a total of 81 vertebrate fauna species, comprising 13 mammals (8 native, 5 introduced), 34 birds and 34 reptile species.

Two conservation significant vertebrate fauna species were recorded within the Study area: the common sandpiper (*Tringa hypoleucos*) and the oriental pratincole (*Glareola maldivarum*). Both of these species are currently listed under the EPBC Act. An additional 54 conservation significant fauna were considered to potentially occur in the area assessed (Outback Ecology, 2011e).

Ten broad fauna habitat types were identified within the Study area (Figure 4-19), with the majority of these being widely represented throughout the Carnarvon bioregion. Significant fauna habitats in the assessment area included soak (water dependent vegetation), stands of inland mangroves and low coastal shrubland/heath. These habitats are considered less common within the landscape and a range of conservation significant fauna may reside within them (Outback Ecology, 2011e).

Terrestrial invertebrate fauna were also recorded from the study site. A total of 185 invertebrate specimens from the targeted groups, comprising 13 mygalomorph spiders, 19 scorpions, 22 slaters and 131 terrestrial snail specimens. Based on current scientific knowledge, four invertebrate species, including two spiders, one scorpion and one isopod have been identified as putative Short-Range Endemic (SRE) species from within the assessment area. Of these species, the spider *Aname* 'MYG214' was considered less likely to be a SRE as it was collected in two different habitats. Likewise, the scorpion and isopod were considered less likely to be SRE as they were found in Chenopod shrubland and *Acacia tetragonaphylla* shrubland on red sand dune, respectively. These habitats are relatively widespread within and adjacent to the study area (Outback Ecology, 2011e).

Where practicable and relevant to the landform and ecological communities, rehabilitation methods will seek to establish suitable habitat to support native fauna species that may be likely to occur.



Fauna Habitat Types Recorded within and around Lake MacLeod

Image Source: Outback Ecology (2011)

Figure 4-17: Fauna habitat types recorded within and around Lake MacLeod

4.1.8.3.3 Migratory Shorebirds

Lake MacLeod is recognised as being internationally, nationally and regionally significant for shorebirds and is a major migration stop-over point and drought refuge area for migratory shorebirds in Western Australia (Ellison & Simmonds, 2003; Clemens, et al., 2008). The lake has been identified as an important feeding ground for non-breeding migratory shorebirds (Centre for Ecosystem Management, 2016).

It should be noted that although Lake MacLeod is recognised as an internationally, nationally and regionally significant location for shorebirds, the main habitat area for shorebirds is at the Northern Ponds and further north (Jaensch & Vervest, 1990).

Migratory shorebirds are protected under the Commonwealth EPBC Act. Migratory shorebirds and their habitat are also protected under several bilateral intergovernmental agreements. These include the Japan – Australia Migratory Bird Agreement (JAMBA), China – Australia Migratory Bird Agreement (CAMBA) and the Republic of Korea – Australia Migratory Bird Agreement (ROKAMBA) and the Bonn Convention. Under these international agreements, Australia is obliged to protect migratory shorebirds and their habitat.

Migratory shorebirds are long-distance travellers commuting annually between their northern hemisphere breeding grounds and their 'over-wintering' grounds in the southern hemisphere. They spend up to seven months in Australia, arriving during August and departing the following March or early April, to fly to their breeding grounds in the northern hemisphere.

Bird watching events took place at Lake MacLeod once or twice every year from 1999 to 2006. These bird watching events focussed on the Northern Ponds, which are the main areas of birdlife at Lake MacLeod, and no bird watching has been undertaken near the LMC salt or gypsum operations.

A study was undertaken by Edith Cowan University in 2015, investigating the shorebird ecology at the three LMC operations. The study found that the maximum invertebrate prey densities at the Northern Ponds were found in the first 5 cm of the sediment, indicating that food was always available for small to medium size shorebirds (Centre for Ecosystem Management, 2015). Amphipods were the primary benthic prey for shorebirds at Lake MacLeod. The resident species at Lake MacLeod are presented in Table 4-7.

Table 4-6: Resident shorebird species Lake MacLeod (after Centre for Ecosystem Management (2015))

Species	Common Name	EPBC status	IUCN Status
Calidris ruficollis	Red-necked Stint		Least Concern
Calidris ferruginea	Curlew Sandpiper	Critically Endangered	Least Concern
Calidris acuminate	Sharp- tailed Sandpiper		Least Concern

Species	Common Name	EPBC status	IUCN Status
Charadrius ruficapillus	Red-capped Plover		Least Concern
Recurvirostra novaehollandiae	Red-necked Avocet		Least Concern
Cladorhynchus leucocephalus	Banded Stilt		Least Concern
Limicola falcinellus	Broad-billed Sandpiper		Least Concern
Calidris canutus	Red Knot		Least Concern
Calidris tenuirostris	Great Knot		Vulnerable

Lake MacLeod also has 15 shorebird species present in numbers that rank in the Top 30 sites for each species in Western Australia (Shorebirds 2020, 2008). Eleven of these shorebirds are migratory, making Lake MacLeod the fourth most important site in Western Australia for migratory shorebirds (Shorebirds 2020, 2008). The shorebird species for which Lake MacLeod is in the Top 30 sites in Western Australia for that species are presented in Table 4-8.

Table 4-7 Shorebird Species for which Lake MacLeod is in the Top 30 Sites for that Species in Western Australia

Status	Family	Species	Common Name
Endemic	Charadriidae	*Charadrius ruficapillus*	red-capped plover
Endemic	Recurvirostridae	*Cladorhynchus leucocephalus,*	banded stilt
Endemic	Recurvirostridae	*Recurvirostra novaehollandiae*	red-necked avocet
Migratory	Charadriidae	*Charadrius leschenaultii*	greater sand plover
Migratory	Charadriidae	*Charadrius veredus*	Oriental plover
Migratory	Charadriidae	*Pluvialis squatarola*	grey plover
Migratory	Scolopacidae	*Actitis hypoleucos*	common sandpiper
Migratory	Scolopacidae	*Calidris acuminata*	sharp-tailed sandpiper
Migratory	Scolopacidae	*Calidris canutus*	red knot
Migratory	Scolopacidae	*Calidris ferruginea*	curlew sandpiper
Migratory	Scolopacidae	*Calidris ruficollis*	red-necked stint

Status	Family	Species	Common Name
Migratory	Scolopacidae	*Calidris tenuirostris*	great knot
Migratory	Scolopacidae	*Limosa lapponica*	bar-tailed godwit
Migratory	Scolopacidae	*Tringa nebularia*	common greenshank
Resident	Recurvirostridae	*Himantopus himantopus*	black-winged stilt

Source: Shorebirds 2020 (2008)

A publication entitled *Shorebirds of Australia* (Geering, Agnew, & Harding, 2007) also recognised that Lake MacLeod has internationally significant numbers of red-necked stint, red knot and curlew sandpiper, all migratory shorebirds.

Jaensch & Vervest (1990) observed a very high number and diversity of birds at the Northern Marshes and Cygnet Pond, with few birds in the hyper-saline Ibis Pond. The high number and diversity of birds was thought to be due to an abundance of food on the large mudflat between Cygnet and Ibis Ponds, and a diversity of feeding habitats and food sources from different salt regimes (Jaensch & Vervest, 1990). Waterbird numbers were observed to be insignificant in the small waterbodies near the Lyndon and Minilya River mouths in comparison with the numbers at the permanent ponds. The broader salt fields were also observed to be insignificant for waterbirds, as the supersaturated brine is generally unsuitable for invertebrates, the main food source for waterbirds (Jaensch & Vervest, 1990).

As discussed in Section 4.1.7.7, Cygnet Pond is separated from the downstream salt operation by a low-permeability sill between Cygnet and Ibis Ponds. Therefore, it is not considered likely that there will be any impacts on the migratory bird habitat at Cygnet Pond due to closure of the Lake MacLeod Operation. It is also unlikely that there would be any opportunities to enhance habitat at the Northern Ponds as part of the PMLU. Nevertheless, alternative land use options will consider any opportunities to provide a net positive biodiversity impact and enhance biodiversity outcomes.

Future bird watching events and fauna surveys should include the vicinity of the LMC operational areas to qualify whether any fauna utilises these areas.

4.1.8.3.4 Fish

The Northern Ponds have few species of fish. The species assemblage is largely unremarkable, except for the broad range of habitats used by few species, their shear abundance and biomass available for fish-eating waterbirds (Centre for Ecosystem Management, 2016). Fish species recorded at Northern Ponds are summarised in Table Table 4-8 below.

Table 4-8 Fish species recorded at Northern Ponds (reproduced from Centre for Ecosystem Management, 2016)

Common Name	Scientific Name	Comment
Flag-tailed (yellowtail) grunters	*Amniataba caudavittata*	Abundant and ubiquitous
Few-Ray Hardyheads	*Craterocephalus pauciradiatus*	Abundant and ubiquitous
Tilapia	*Oreochromis mossambicus*	Ubiquitous
Giant herring	*Elops hawaiensis*	North eastern vents of Cygnet pond only
Sea mullet	*Mugil cephalus*	Reported in the literature; unconfirmed.
Spangled perch	*Leiopotherapon unicolor*	Reported in the literature; unconfirmed.

The invasive *Oreochromis mossambicus* (tilapia) was introduced to the Northern Ponds through flood events in 2000 and 2010-2011. It has now become established and appears to have a wide distribution and high abundance throughout the Northern Ponds. No direct effects of tilapia were observed on native fish (Centre for Ecosystem Management, 2016).

Closure activities are not expected to have any impacts on fish species or abundance at the Northern Ponds.

4.1.8.3.5 Aquatic Invertebrates

During dry spells, the surface sediment in the southern area of Lake MacLeod contains a sparse, patchy aquatic invertebrate egg bank, with low diversity, reflecting the relatively uniform habitat in this part of the lake (Outback Ecology, 2011b). Only two invertebrate taxa were identified during sampling of the dry sediments, including eggs of the Australian endemic brine shrimp *Parartemia laticaudata*, and an ostracod (seed shrimp) species (unidentified). *Parartemia laticaudata* also hatched successfully during rehydration, reaching maturity quickly (Outback Ecology, 2011b).

An assessment of the same area after a substantial flooding event showed that 15 taxa were present in the southern extent of Lake MacLeod, dominated by crustaceans, particularly harpacticoid copepods. Other fauna included calanoid and cyclopoid copepods, ostracods, a rotifer, mysid shrimp and chironomid representatives. There were no clear differences between assemblages across the lake. All of the taxa recorded are widespread, and have been recorded elsewhere in Australia and the world (Outback Ecology, 2011b).

In the Northern Ponds, 34 aquatic invertebrate families were found at six vent sites, with amphipods and gastropods being the dominant families (Centre for Ecosystem Management, 2016).

Aquatic invertebrate assemblages on Lake MacLeod have not been identified as conservation-significant and are likely to be tolerant of wide-ranging salinity and inundation regimes, due to the natural salt lake habitat. Closure activities are not expected to have any impacts on aquatic invertebrate assemblages on Lake MacLeod, including in the Northern Ponds.

4.1.8.3.6 Aquatic Biota

Sampling of the southern extent of Lake MacLeod after a flood event detected thirteen phytoplankton taxa, representing three phyla including Bacillariophyta (diatoms), Cyanophyta (blue green algae) and Chlorophyta (green algae). These taxa are cosmopolitan, salt tolerant genera. Bacillariophyta and Cyanophyta were the dominant groups (with six and five taxa respectively), while Chlorophyta representatives were limited (two taxa). The blue-green alga Oscillatoria was recorded in high numbers from the majority of sites. The diversity of taxa is comparable to that recorded for other salt lakes in Western Australia (Outback Ecology, 2011a).

The periphyton assemblage included twenty-three taxa, with several prominent genera including *Amphora*, *Navicula* and *Nitzschia*. Sites located in close proximity to each other recorded the most similar diatom assemblages, a reflection of habitat availability and colonisation preferences. All of the taxa recorded were common and widespread (Outback Ecology, 2011a).

To assess the aquatic biota at of the Northern Ponds area of Lake MacLeod, eight ponds, that represented the change in spatial scales of the ponds found at Lake MacLeod, were investigated (Centre for Ecosystem Management, 2016).

The ponds were primarily composed of marine taxa, as well as those from deep oceans, freshwater, hypersaline and terrestrial ecosystems. Each of the ponds contained different assemblages of bacteria (benthic and planktonic), and to a lesser degree, ciliates. In total, 171 bacterial operation taxonomic units (OTUs) were detected and 30 ciliates OTUs were detected. Five bacterial OTUs were present in all of the ponds, whereas only a single ciliate OTU was detected in every pond. Each pond assemblage appears to be on its own evolutionary trajectory, with ecological drift likely playing a role in structuring each community (Centre for Ecosystem Management, 2016).

Closure activities are not expected to have any impacts on aquatic biota at the Northern Ponds.

4.1.8.3.7 Stygofauna

Outback Ecology undertook a pilot stygofauna survey of the southern region of Lake MacLeod, comprising the Texada Halite and Quobba Sands aquifers, in September 2010. The stygofauna survey recorded three invertebrate taxa:

- Copepod - *Apocyclops dengizicus*
- Ostracod - *Diacypris* sp.
- Insecta - Chironomidae

The specimens were collected from two bores located south of the salt operations, in the Quobba Sands aquifer. All of these taxa are known from surface waters. In particular, the cyclopoid copepod *Apocyclops dengizicus* is a well-documented cosmopolitan species, occurring in various regions throughout the world. It is likely that high salinities and unsuitable physical habitat associated with the two aquifer systems preclude the presence of stygofauna within the Lake MacLeod study area (Outback Ecology, 2011b).

4.1.8.3.8 Animal Pests

The major animal pests considered likely to occur in the Lake MacLeod area are feral cats, foxes, feral goats and rabbits. Protection of areas of revegetation should be considered in the establishment stages if herbivores are causing damage.

4.2 Social and Communities Context

4.2.1 Cultural Environment

4.2.1.1 Aboriginal Heritage

The traditional owners of the land underlying the Lake MacLeod Operation are Baiyungu People, who are represented by the Nganhurra Thanardi Garrbu Aboriginal Corporation. The Tenements are the subject of the Gnulli native title determination: Peck on behalf of the Gnulli Native Title Claim Group v State of Western Australia [2019] FCA 2090. Pursuant that native tile determination, the Baiyungu People hold native title rights and interests in the land the subject of the Tenements.

[redacted]

Registered Aboriginal Sites (6060 Cape Cuvier and 7138 Quobba Dunes), and a Lodged Site (6061 Lake Macleod) exist within or near the Lake MacLeod operating leases. As closure planning progresses, and prior to closure execution, LMC will review Aboriginal Sites and Heritage Places databases for additional or revised locations and ensure closure works do not adversely impact or disturb these areas. No Section 16 or Section 18 Consents under the Aboriginal Heritage Act 1972 have been granted for Lake MacLeod operations.

4.2.1.2 Historic Heritage

There are no known areas of historic heritage in proximity to the Lake MacLeod Operation.

4.2.2 Regional Socio-Economic Characterisation

Regional socio-economic characterisation provides an overview of the population characteristics and economics of the region. This information can be useful to guide closure planning, so that the proposed PMLU is consistent with the characteristics of the region.

The Strategic Plan 2022-26 released in 2022 by the Gascoyne Development Commission (GDC), provides key information on the region including population, contributions made by each sector of the region's economy, and economic opportunities.

The population of the Gascoyne region is approximately 9,260 (Gascoyne Development Commission, 2022), with 3,536 people living and working within the Gascoyne region, but had a usual residence outside of the region, predominantly elsewhere in Western Australia (Australian Bureau of Statistics, 2018b).

The top five major industries include resources; construction; agriculture, forestry and fishing; transport, postal and warehousing; and tourism and hospitality. Salt is the largest mined commodity.

The Gascoyne Strategic Plan 2022-26 identified that "… the Gascoyne Region is strategically placed to support new mineral, resource and renewable industry projects. Exmouth and Carnarvon already play a key role in the resource sector supply chain, supporting offshore oil and gas in the Carnarvon Basin, high-value salt operations at Useless Loop in the Shire of Shark Bay and Lake MacLeod in the Shire of Carnarvon. Rare earths, gypsum, limestone, and other basic raw materials also present significant opportunity as part of the region's resource base". Additionally, tourism and food production are also seen as opportunity areas for the region (Gascoyne Development Commission, 2022).

4.2.3 Local Socio-Economic Characterisation

The local socio-economic characterisation of Lake MacLeod is based upon the nearby town of Carnarvon, 40 km south of Lake MacLeod. Carnarvon has a population of approximately 5,077 people and is the accommodation location for Lake MacLeod personnel.

When closure planning identifies a LOM, LMC will undertake a baseline community assessment that will inform a transition plan for those community individuals and businesses that may be impacted by cessation of the Lake MacLeod operations.

4.3 Operations Data

4.3.1 Groundwater Monitoring

The salt and gypsum operations rely on deep artesian bores, screened 500 to 600m below ground level, targeting the regionally extensive Birdrong Sandstone aquifer, for their water supplies. Three production bores (4, 5 and 6) are used to supply the salt operation and two production bores (VGH 900 and VGH 901) supply the gypsum operation, 19km to the north. The two borefields, referred collectively as the Lake MacLeod Borefield, are situated in the Gascoyne Groundwater Management Area (DSL, 2023).

Groundwater production from the Lake Macleod Borefield is subject to the terms and conditions of License No. 0056934(4) issued by the DWER on 29 July 2013. An application was submitted on 26 June 2023 to extend the Licence, that was valid until 23 July 2023, and it is currently under review by DWER (DSL, 2023).

Condition 1 of GWL0056934(6) states that the licensee shall comply with the commitments or requirements of the operating strategy as prepared by the licensee and approved by the Department of Water on 29 July 2013, including any modifications to the strategy as approved during the term of the licence. Condition 1 of GWL0056934(6) states that the licensee shall comply with the commitments or requirements of the operating strategy as prepared by the licensee and approved by the Department of Water on 29 July 2013, including any modifications to the strategy as approved during the term of the licence (DSL, 2023).

A report is prepared annually which summarises the groundwater monitoring data that is collected at the Site (DSL, 2023) in the period between January and December. Groundwater abstraction recorded in 2023 was 1,165,049kL from the salt operations and 1,074,701kL from the gypsum operations. Total groundwater abstraction in 2023 was 2,239,750kL. This represents 67% of the licensed allocation of 3,350,000kL per annum and a decrease of 51,694kL when compared to the 2022 period (DSL, 2023).

Groundwater samples were taken once during the 2023 review period as per the DWER licence. Samples were tested for basic parameters (pH, EC, dissolved oxygen), salts, nutrients and metals. During 2023, all parameters were within normal historical ranges (DSL, 2023).

4.3.2 Contaminated Land Investigations

In 2015, parts of the Lake MacLeod Operation were classified under the *Contaminated Sites (CS) Act 2003* as "contaminated – remediation required". The parts of the site that were classified comprise the Cape Cuvier Port, Salt Operations and Gypsum Operations. The reasons for classification refer to a series of investigation reports prepared between 2009 and 2015, including a preliminary site investigation, detailed site investigation, groundwater monitoring events and a site management plan. The reasons for classification state that the investigation reports show that the site has been contaminated, and remediation is required to reduce unacceptable risks to human health or environmental values.

The contaminated sites investigation reports that have been undertaken for the Lake MacLeod Operation are listed below. This section provides a summary of contaminated sites information only; the listed reports should be consulted for more detailed information.

- *Preliminary Site Investigation, Lake MacLeod Operations* (URS, 2009)
- *Lake MacLeod Operations: Detailed Site Investigation* (URS, 2010)
- *Detailed Site Investigation, Lake MacLeod WA* (OTEK, 2012)
- *Lake MacLeod, Western Australia Groundwater Monitoring Event – August 2013 and Soil Investigation* (GHD, 2014)
- *Dampier Solar Salt Operations Lake MacLeod 2014 Groundwater Monitoring Event* (GHD, 2015a)
- *Lake MacLeod Operations Groundwater Monitoring Event 2015* (GHD, 2015b)
- *Lake MacLeod Solar Salt Operation 2016 Groundwater Monitoring Event* (GHD, 2017)
- *Lake MacLeod Operations, Contaminated Site Management Plan 2018* (Ralph Consulting, 2018).

The location of the contaminated sites investigations are shown in Figure 4-18 and Figure 4-19, with a summary of the outcomes presented in Table 4-9.

A conceptual site model developed in 2018 (Ralph Consulting) concluded that the risk to human health and/or the environment is low or not unacceptable which can be attributed to a combination of factors including:

- No foreseeable change to the land use;
- No impact to sensitive receptors;
- Stable to shrinking plumes; and
- Decreasing hydrocarbon concentrations over time.

However, under the CS Act classification, remediation is required as contamination has been identified at site and remediation is required to reduce unacceptable risks to human health, the environment or any environmental value to acceptable levels.

The identified contaminated sites are primarily being managed using basic low-cost remediation technologies including Monitored Natural Attenuation (MNA). The performance of MNA is being reviewed periodically, consistent with national guidance, to confirm the initial assumptions are still valid, and that regulatory support for the strategy continues (Ralph Consulting, 2018). Any areas of contamination will need to be remediated prior to relinquishment of mining tenements.

Figure 4-18: Contaminated Sites Investigation Areas – Lake MacLeod Operation

Figure 4-19: Contaminated Sites Investigation Areas – Salt Operation Detail

Table 4-9: Summary of Contaminated Sites Investigation Work

Area [2]	Year assessed	Land use	Location	Contaminants of Concern	Management Strategy / Requirements
1 & 2	2009	Transformer shed and old power station	ML245SA – Salt Operations	Asbestos in soil Hydrocarbons in soil Metals (arsenic, copper and nickel) in groundwater Hydrocarbons and LNAPL in groundwater	Monitoring of hydrocarbons in groundwater, possible application of nitrate to enhance microbial attenuation. Clean up asbestos fragments.
3, 4 & 5	2009	Condensing and crystallising ponds, wash plant and salt stockpile	ML245SA – Salt Operations	High concentrations of salts in residual brine.	No active management during operations. No identified risk to sensitive receptors. Closure completion criteria to reflect appropriate soil and groundwater quality targets for the identified PMLU.
6	2009	Contaminated salt and soil stockpiled	ML245SA – Salt Operations	Stockpile of salt and soil contaminated with hydrocarbons	Stockpile is treated via bioremediation. When hydrocarbon levels are confirmed to be within acceptable limits, the material is used for road maintenance, levee repairs, backfill of borrow pits and other general fill applications.

[2] Numbers relate to Figure 4-18 and Figure 4-19

Area [2]	Year assessed	Land use	Location	Contaminants of Concern	Management Strategy / Requirements
7	2009	Heavy and light vehicle wash	ML245SA – Salt Operations	Hydrocarbons in soil Metals (arsenic, copper, nickel, zinc) in groundwater	No active management during operations. No identified risk to sensitive receptors. Closure completion criteria to reflect appropriate soil and groundwater quality targets for the identified PMLU.
8	2009	Heavy and light vehicle refuelling area		Hydrocarbons in soil and groundwater	Monitoring of hydrocarbons in groundwater, possible application of nitrate to enhance microbial attenuation.
9	2009	Lube bay		Hydrocarbons in soil and groundwater. Metals (copper, nickel, zinc) in groundwater	Subsequent sampling demonstrated that hydrocarbons in groundwater have attenuated. No identified risk to sensitive receptors or ongoing management required.
10	2009	Warehouse and workshop		Hydrocarbons in soil and groundwater. Metals (copper) in groundwater	Natural attenuation, monitoring of hydrocarbons in groundwater.
11	2009	Water discharge points		Hydrocarbons in surface water and sediment Metals (copper, nickel and zinc) in groundwater	Prior to or during closure activities: further sediment quality investigation, possible treatment of hydrocarbons in sediment.

Area [2]	Year assessed	Land use	Location	Contaminants of Concern	Management Strategy / Requirements
12	2009	Office complex and laboratory	ML245SA – Salt Operations	Not determined	None identified
13	2009	Lake crib room and fuel farm	ML245SA – Salt Operations	Hydrocarbons in soil and groundwater	Natural attenuation, monitoring of hydrocarbons in groundwater.
14	2009	Old potash facility	ML245SA – Old Potash Facility	Asbestos in soil Hydrocarbons in soil Metals (arsenic, copper, nickel, lead, zinc, iron) in groundwater	Clean up asbestos fragments. Asbestos sheeting at the old potash facility will need to be appropriately managed as part of demolition of the facility.
15	2009	Laydown area and blast yard	ML245SA – Salt Operations	Blast residue and metals (chromium and zinc) in soil Metals (copper, zinc, nickel) in groundwater	No active management during operations. No identified risk to sensitive receptors. Closure completion criteria to reflect appropriate soil and groundwater quality targets for the identified PMLU. Possible additional soil sampling and cleanup as part of closure and remediation activities.

Area [2]	Year assessed	Land use	Location	Contaminants of Concern	Management Strategy / Requirements
16	2009	Pumping station 3	ML245SA – Salt Operations	Iron sulphide in brine channel Metals (copper, nickel, lead, zinc, iron) in groundwater	No active management during operations. No identified risk to sensitive receptors. Closure completion criteria to reflect appropriate soil and groundwater quality targets for the identified PMLU. Possible additional sampling and cleanup as part of closure and remediation activities.
17	2009	Tyre dump	ML245SA – Salt Operations	Tyres and other potential waste disposal	No active management during operations. No identified risk to sensitive receptors. Closure completion criteria to reflect appropriate soil and groundwater quality targets for the identified PMLU.
18	2009	Rubbish tip		Inert and putrescible waste Metals (copper, nickel, zinc, lead) in groundwater	
19	2009	Heavy vehicle refuelling area	ML245SA – Gypsum Operations	Hydrocarbons in soil Metals (copper, nickel, zinc, lead) in groundwater	No active management during operations. No identified risk to sensitive receptors. Closure completion criteria to reflect appropriate soil and groundwater quality targets for the identified PMLU.
20 & 21	2009	Heavy vehicle wash and diesel generators		Not determined	None identified

Area [2]	Year assessed	Land use	Location	Contaminants of Concern	Management Strategy / Requirements
22 & 23	2009	Salt and gypsum stockpiling area, overland conveyor and ship loader	Cape Cuvier Port	Not determined	None identified
24	2009	Cape Cuvier Port fuel farm and pipeline	Cape Cuvier Port	None identified	No active management during operations. No identified risk to sensitive receptors. Closure completion criteria to reflect appropriate soil and groundwater quality targets for the identified PMLU. Assessment of groundwater quality prior to or during decommissioning. However, previous attempts to install groundwater monitoring wells were unsuccessful due to drilling refusal.
-	2022	Heavy and light vehicle refuelling farm and the workshop areas	ML245SA – Salt Operations	Per- and polyfluoroalkyl substances (PFAS) and perfluorooctane sulfonate (PFOS)	Low levels considered implausible that the PFAS impacts would pose a risk to human health, therefore no management strategy identified.

The most recent contaminated sites assessment was completed in 2022 (ERM, 2024). The assessment generally aligned with the Site Management Plan (SMP) developed by Ralph Consulting in 2018.

The assessment identified groundwater hydrocarbon impacts at the heavy and light vehicle refuelling farm and the workshop areas which were consistent with previous assessments in 2018 and 2020. The risk to the receptors was considered to be low and the plume stability assessment indicated that the plume was stable with evidence of natural attenuation (ERM, 2024).

Concentrations of PFAS were identified in shallow soils, sediment and surface water at the heavy and light vehicle refuelling farm and the workshop areas, and results were consistent with previous assessments. Concentrations of PFOS in groundwater exceed the adopted human health assessment criteria, however it was considered implausible that the PFAS impacts would pose a risk to human health as the water is unlikely to be used for non-potable or recreation uses (ERM, 2024).

4.4 Closure Investigations

4.4.1 Levee Breaching Analysis

It is proposed to breach the flood levees and internal levees as part of closure activities to facilitate degradation of the salt and gypsum ponds, ditches and salt crystallisers, and promote return to a salt lake playa landform.

Breaching of levees and dissolution of solids salt stocks at the Salt Operation may lead to release of high salinity water, which could compromise aquatic ecology of the salt lake and impact on aquatic biota, if it is not managed appropriately. A study of the aquatic ecology of Lake MacLeod was undertaken by Outback Ecology in 2011. The study and a subsequent memo identified that the majority of aquatic biota in salt lakes require lower-salinity water (<50,000 mg/L total dissolved solids) during flood events to hatch and mature (Outback Ecology, 2011a), (Outback Ecology, 2012b). This includes salt-sensitive biota and the juvenile stages of more salt-tolerant biota.

A closure water and solute balance was modelled by Groundwater Resource Management (2014) to determine the salinity of water that would result from dissolution of salt stocks at the Salt Operation at 2-year Average Recurrence Interval (ARI) flood events, and at 10 year ARI flood events. The water and solute model used the flood sheet volumes calculated by Groundwater Resource Management that are summarised in Table 4-10, and the volume of salts in the solid pavements at the Salt Operations that are calculated in Table 4-11.

Table 4-10 Lake MacLeod Flood Sheet Volume Estimates (Groundwater Resource Management, 2014)

Annual Exceedance Probability (AEP)	Annual Recurrence Interval	Combined Flow Volume Scaled to Lake MacLeod Catchment (GL)	Direct Precipitation on MacLeod Surface (GL)	Total Flood Sheet Volume (GL)
50%	2 years	46.7	133.4	180.1
10%	10 years	360.2	261.1	621.3
5%	20 years	541.3	327.1	868.4
2%	50 years	825.3	421.2	1,246.5
1%	100 years	1,052.6	498.4	1,551.0
0.1%	1,000 years	2,106.6	546.0	2,652.6

Table 4-11: Dry Weight Concentrations in Solid Stocks Estimates (Groundwater Resource Management, 2014)

Analyte	Unit	Bitterns Storage Area	Northeast Sump	Crystalliser[1]
Ca	mg/	16	260	44,250
Mg	mg/kg	2,360	4,530	5,604
Na	mg/kg	370,000	290,000	250,000
K	mg/kg	1,800	2,900	3,695
Cl	mg/kg	47,000	430,000	343,000
SO_4	mg/kg	4,490	7,440	115,430
Br	mg/kg	135	279	243
Cu	mg/kg	<0.05	<0.05	1
Se	mg/kg	<0.5	<0.5	<0.5
Zn	mg/kg	<0.5	<0.5	3
TDS	mg/kg	425,801	735,409	762,226
Area	Ha	2,000	1,850	6,200

Analyte	Unit	Bitterns Storage Area	Northeast Sump	Crystalliser[1]
Thickness	m	0.1	0.1	0.1
Volume	m^3	2,000,000	1,850,000	6,200,000
Mass of solids [3]	Tonne	3,700,000	3,422,500	11,470,000
Mass of salts	Tonne	1,575,464	2,516,937	8,742,732

Notes:
[1] The concentrations for the crystallisers are the mean of the concentrations for the crystalliser pavement and harvest pan.
[2] TDS is sum of all ions.
[3] Based on solid stocks pavement density 1,850 kg/m^3

Groundwater Resource Management (2014) calculated that for a 2 year ARI flood event, salinity of the flood water would be increased by 71,000 mg/L TDS due to dissolution of the solid stocks, and for a 10 year ARI flood event, salinity of the flood water would be increased by 21,000 mg/L. It was concluded that even for a 10 year ARI flood event (salinity increase of 21,000 mg/L), the increase in the lake water salinity may adversely impact on ecology of the aquatic biota in the salt lake (Groundwater Resource Management, 2014). Therefore, dissolution of the salt stocks and release of higher salinity into the salt lake would need to be managed to minimise adverse impacts to salt lake ecology. This may involve staged breaching of levees over several flood events to moderate the volume of salts released per flood event.

The following recommendations were made regarding management of saline water resulting from dissolution of solid salt stocks (Groundwater Resource Management, 2014):

- Saline water from levee breaching that is higher than 50,000 mg/L total dissolved solids (TDS) would be acceptable to flow onto the salt lake during dry conditions, where the salts would precipitate onto the lake surface. The extent of salt accumulation would need to be managed to ensure that during the first stages of a lake flood event, the flood water salinity was less than 50,000 mg/L TDS.

- Saline water higher than 50,000 mg/L TDS would also be acceptable to flow onto the salt lake during the latter stage of lake flood conditions, when the flood water salinity was already higher than 100,000 mg/L TDS.

- Saline water higher than 50,000 mg/L TDS should not be permitted to flow onto the salt lake during the initial stages of flood events, when the flood water salinity is less than 50,000 mg/L. This will permit salt-sensitive aquatic biota to hatch and develop.

- Low salinity water may be able to flow onto the salt lake during all conditions.

- Monitoring of the water and sediments should be undertaken to verify the above management actions are achieving the management objective to ensure flood water salinity is less than 50,000 mg/L in the initial stages of a natural flood event.

The modelling undertaken by Groundwater Resource Management (2014) assumed that all solid stocks would be dissolved completely during one flood event, which is a "worst case scenario" in terms of the resulting increase to salt lake water salinity. Therefore, it is

considered that levee breaching and dissolution of solid stocks can be managed by staging of levee breaching and partial dissolution of solid stocks per flood event to minimise adverse impacts on salt lake ecology.

The likely timeframe for complete dissolution of solid stocks would depend on the frequency and magnitude of flood events at Lake MacLeod following the decision to close the operations.

4.4.2 Mineral Waste Investigation

GHD undertook an assessment of waste materials at the wash plant pond sediment, lime residue storage and bitterns solution in 2008 (GHD, 2008). The assessment included *in situ* field testing and laboratory analysis for a range of constituents including environmental, mineralogical and geotechnical parameters.

The management approach for elevated minerals and/or metals within mineral waste is considered in Section 8 and with appropriate dissolution of bitterns and managed natural attenuation, the management of mineral waste is not expected to constitute a contamination risk; pending on-going favourable monitoring results.

4.4.2.1 Wash plant ponds sediment

The sediment from the four wash plant ponds and the stockpile were assessed in 2008 (GHD, 2008), and the sediment from the four ponds was chemically similar. The sediments were strongly alkaline consisting of clastic gypsum, brucite, calcite and quartz. With the exception of zinc, concentrations of most metals were low (GHD, 2008).

The metals present within the sediments were not considered to present a significant hazard to the environment. The metals are not present in large quantities, and the alkalinity of the sediment and stockpile reduces the mobility of the metals. The levels of zinc present within the leachate are within an order of magnitude of those observed within the samples taken from Lake MacLeod and were considered unlikely to pose a significant environmental hazard (GHD, 2008).

4.4.2.1 Lime residue storage

Two areas, the lime ditch residue and the lime residue stockpile were sampled within the lime residue storage area (GHD, 2008).

The lime ditch residue was found to be predominantly composed of gypsum with minor components of calcite and hydrocalumite. The leachate tested contained no metals above detection limits. The dominate ionic species were chloride, calcium, sodium and sulphate. The material is extremely alkaline, but otherwise poses no significant environmental or health hazards (GHD, 2008).

The lime residue stockpile was also extremely alkaline. Minerology differed between stockpile samples, some areas dominated by gypsum and brucite and others dominated by halite. Concentrations of zine and manganese were detected in the lime residue stockpile leachate. The dominant ionic species in the leachate samples were sodium, chloride, sulphate and calcium (GHD, 2008).

The major health and environmental risk associated with the lime residue stockpile is from the high pH. Properly contained, this material is unlikely to present a significant risk to the environment (GHD, 2008).

4.4.2.2 Bitterns solution

The composition of bitterns solution, seawater, Lake MacLeod water, and Texada Halite aquifer brine is compared in Table 4-12 (GHD 2008).

Table 4-12: Concentrations of total dissolved solids and main constituents of salinity in seawater, Halite aquifer brine in 1994, Lake MacLeod and Bitterns water in 2008

Constituent	Units	Seawater (Anthoni, 2006)	Halite aquifer brine 1994 (Logiden Pty Ltd, 1994)	Lake MacLeod 2008 (GHD, 2008)	Bitterns 2008 (GHD, 2008)
Total Dissolved Solids (TDS)	mg/L	35,000	270,000	47,067	357,333
Sodium (Na)	mg/L	10,752	88,200	14,367	79,600
Magnesium (Mg)	mg/L	1,295	8,100	1,420	23,900
Calcium (Ca)	mg/L	416	400	1,577	347
Potassium (K)	mg/L	390	2,400	550	8,327
Chloride (Cl)	mg/L	19,345	156,800	26,000	224,667
Sulphate (SO4)	mg/L	2,701	11,200	5,300	34,733

In summary, the brine found in the Texada Halite aquifer was approximately seven times more concentrated than seawater, with relative reduction in magnesium, potassium and sulphate, and relative enrichment of calcium. The bitterns solution was approximately ten times more concentrated than seawater and approximately 1.3 times more concentrated than the Texada Halite aquifer brine. The relative proportions of the major ions were different in the bitterns than in the Texada Halite aquifer brine, with relative reductions in sodium and calcium (both 0.9 times Halite aquifer); and relative enrichment in magnesium (3 times Halite aquifer), potassium (4 times Halite aquifer) and sulphate (3 times Halite aquifer). The chloride concentration in the bitterns solution increased in proportion with the concentration of total dissolved solids (1.3 times Halite aquifer) (GHD, 2008).

The bitterns contain levels of arsenic, chromium, copper, nickel and vanadium exceeding the adopted guideline levels[3]. Some samples also exceeded lead, zinc and manganese guidelines (GHD, 2008). It should be noted that Lake MacLeod surface water also exceeded the adopted guidelines for arsenic, chromium, cobalt, copper, manganese, nickel, vanadium and zinc. Typically, the observed concentration levels of metals were lower than that observed in the bitterns samples (GHD, 2008).

4.4.2.3 Bitterns Long-Term Management

GHD recommended the following actions, and, where relevant, these are included in the knowledge gaps in **Section 1.1** (GHD, 2008):

- Develop a staged release of bitterns to the natural lake system.
- Consider options for final disposal of bitterns salts if staged release will not meet desired closure outcomes.
- Review options and methods for rehabilitation of the lake surface within the bitterns storage area.

In considering options for final disposal of bitterns salt from the Lake MacLeod Operation, it is noted that opportunities may exist for the recovery of metals, trace metals and minerals from the bitterns salt. Several studies have highlighted potential for the extraction of valuable materials from bitterns. It is recommended that the potential to recover metals, trace metals and minerals from the bitterns be investigated as a part of bitterns salt disposal options identification and evaluation for the Lake MacLeod Operation.

Further to potential bitterns reuse, the current closure implementation activities will be reviewed to ensure they remain effective and appropriate. Further studies may be required to better understand the potential contamination risk and management requirements of a bitterns reuse operation risk at closure.

[3] Guidelines used in GHD (2008): DEC (2003) Assessment Levels for Soil, Sediment and Water; ANZECC and ARMCANZ (2000) Guidelines for Fresh and Marine Water Quality 99% and 95% trigger values, and 'Other Guideline Levels'.

4.5 Implications for Closure

In consideration of the collection of baseline and operational data and the closure investigations, the following have been considered during the development of closure plans:

- Baseline vegetation information will be used to inform seed lists and revegetation plans for disturbed areas not on the lake playa.
- Due to the age of operations, and the absence of topsoil stockpiling practices, it is unlikely that sufficient topsoil will be available for revegetation activities.
- Breaching of levees and dissolution of solids salt stocks at the Salt Operation may lead to release of high salinity water, which could compromise aquatic ecology of the salt lake and impact on aquatic biota, if it is not managed appropriately.
- The ionic composition of the bitterns solution is not comparable to natural lake quality and requires careful management on closure.
- Closure plans for the Salt Operations will require careful management of surface water release so that saline water higher than 50,000 mg/L TDS will not be permitted to flow onto the salt lake during the initial stages of flood events, when the flood water salinity is less than 50,000 mg/L.
- The jetty transition arrangements are not clear, and although the State Agreement refers to handover of infrastructure back to the State, this arrangement needs to be further reviewed and tested.
- When the Site transitions to closure, the environmental approvals in place at the time need to enable closure activities. Currently, closure activities should be allowable activities, however, if the jetty is to be removed, this may trigger additional approval requirements.

5 Post-mining Land Use

5.1 Closure Planning

A closure vision provides LMC and stakeholders with an understanding of LMC's intention towards the closure of the Lake MacLeod Operation. The closure vision for the Site is:

To leave a safe and sustainable post-mining land use through consultation with stakeholders, that meets the requirements of LMC and relevant stakeholders.

The closure vision will continue to be reviewed and refined during subsequent updates of this closure plan to ensure it is aligned with the most current information, legal and other requirements as well as taking into account the current expectations of key stakeholders.

The Lake MacLeod closure vision aligns with the DEMIRS objective for rehabilitation and closure such that mining activities are rehabilitated and closed in a manner to make them physically safe to humans and animals, geo-technically stable, geo-chemically non-polluting/non-contaminating, and capable of sustaining an agreed post-mining land use without unacceptable liability to the State (DEMIRS, 2020).

The proposed final landform should aim to return the salt and gypsum operations to a landform hydrologically compatible with the surrounding salt lake, and the port to a landform that is compatible and in alignment with the surrounding coastal landscape, unless specifically agreed otherwise with stakeholders. All disturbed areas (except the lake bed) will be rehabilitated with native vegetation.

In addition, selection of the PMLU will consider the generic closure objective of the DEMIRS, as stated in the *Statutory Guidelines for Mine Closure Plans* (Department of Mines and Petroleum and Environmental Protection Authority, 2015):

"...objective for rehabilitation and closure is that mining activities are rehabilitated and closed in a manner to make them physically safe to humans and animals, geo-technically stable, geo-chemically non-polluting/non-contaminating, and capable of sustaining an agreed post-mining land use without unacceptable liability to the State."

As the site knowledge of contaminants and waste material improves (through ongoing monitoring), LMC will determine the most appropriate remediation activities required to manage the site into (and beyond) closure execution. LMC expect that the majority of the site would be classed (under the CS Act) as Not Contaminated, Decontaminated, or Remediated for Restricted Use. The preference will be to achieve Decontaminated status for areas contaminated during operations.

5.2 Closure Options and Proposed Post-Mining Land Use

5.2.1 Beneficial Land Use

A beneficial use for Lake MacLeod may include industrial, ecotourism (economic benefits), alternate community use (local community benefits) or establishment of habitat for protected species (environmental benefits).

Several "net positive impact" (NPI) studies were undertaken by DSL including:

- *Net Positive Impact Review Report: Dampier Salt Limited* (International Union for Conservation of Nature (IUCN), 2012).

- *Net Positive Impact Assessment for Dampier Salt Ltd* (The Biodiversity Consultancy Ltd, 2012).

These documents identified that the primary biodiversity values at Lake MacLeod are associated with the natural Northern Ponds system; while the Northern Ponds are located within the operational lease, they are not part of the constructed operational facilities (International Union for Conservation of Nature (IUCN), 2012).

As discussed in Section 4.1.7, the Lake MacLeod Operation is hydraulically separated from the Northern Ponds. Therefore, if the Lake MacLeod Operation is closed, it is likely to have a neutral impact on biodiversity values.

Where a beneficial land use cannot be provided or achieved (e.g. environmental harm and/or costs outweigh the benefits, or it is not practicable), the objective is to establish a post-mining landform that will be safe, stable and non-polluting with minimal maintenance and management requirements. Alternative land use options are outlined in Section 5.2.2.

5.2.2 Identification of Alternative Post-mining Land Use Options

Potential PMLU options were identified during a DSL options identification session in 2018. LMC will regularly review and refined to the appropriate level of detail as more knowledge is gathered and as the operation approaches closure:

- Salt lake disturbance areas: return to natural salt lake via levee breaching and natural degradation (base case scenario)

- Jetty: retain and hand over to alternate user/the State as stated in the State Agreement. This could support export of mineral resources (e.g. from new mine developments), construction materials (e.g. sand, gypsum as produced by third parties)

- Infrastructure: pastoral use of bores and dams, possibly reverse osmosis plant(s)

- Ecotourism land uses: Northern Ponds, Cape Cuvier – recreational or commercial fishing, bird watching, whale watching, cruise ship, Indigenous trekking (walking heritage trail)

- Aquaculture land uses: lake disturbance areas – carotene (southern end of lake), brine shrimp (gypsum area or further north for brine shrimp due to salinity profile)

- Recreational land uses: salt lake – off-road racing, land speed records, paragliding, sky diving, camel riding, hunting, novelty dry lake racing

- Agricultural land uses: pastoral lease areas – goat farm/cheese production

- Alternative mining (or re-mining) land uses: salt lake – potash, bitterns, magnesium brine (dust suppression for regional unsealed roads).

As the Site is considered as an ongoing resource, LMC has not formally commenced evaluating alternative closure land use options in detail. If a decision to close the Lake MacLeod Operation is made, LMC will further develop alternate PMLU options to an appropriate level of detail.

As closure planning progresses, this MCP will be updated with more refined closure option(s) following investigations and consultation with relevant government and community stakeholders.

Based on the current knowledge base and closure strategy, it is possible that there may be several PMLUs across the site; however, for the purposes of this MCP, and with current knowledge, it is most likely that the Site's PMLU will target a pre-mining topography and land use.

5.2.3 Pre-Mining Topography And Land Use

Targeting the pre-mining topography and land use for all disturbance areas is based on the following:

- The original landform is expected to be safe, stable, non-polluting and capable of supporting the post-mining land use in the long term, which aligns with the closure objectives of DEMIRS.
- The original landform would be expected to have minimal long-term residual liability or maintenance requirements, which aligns with the closure objectives of DEMIRS.

Targeting the pre-mining topography and land use is the base case PMLU in the event of closure of the Lake MacLeod Operation. Requirements to achieve these PMLUs include:

- Targeting pre-mining vegetation communities such as coastal dune communities and coastal sandplain vegetation in the terrestrial areas
- Targeting pre-mining salt lake / playa environments for disturbance within the salt lake footprint including samphire or saltmarsh communities on the border of the lake

The PMLU for the ship-loader and jetty facilities at Cape Cuvier is currently planned to remain as industrial uses and be divested back to the State (or alternate third-party user). If the facility is decommissioned, the infrastructure disturbance area would target the pre-infrastructure marine area environment.

Table 5-1 summarises the proposed final landform for each domain at LMC's Lake MacLeod Operation.

Table 5-1 Current Post-Mining Land Uses per Domain

Domain	Post-Mining Land Use
General infrastructure	• A return to pre-mining topography and vegetation communities (e.g., coastal dunes) that support a native functioning ecosystem

Domain	Post-Mining Land Use
Salt Operations	• A return to pre-mining environment (e.g., salt lake / playa with samphire or saltmarsh communities on lake edge) that support a native functioning ecosystem
Gypsum Operations	• A return to pre-mining environment (e.g., salt lake / playa with samphire or saltmarsh communities on lake edge) that support a native functioning ecosystem
Cape Cuvier Operations	• A return to pre-mining topography and vegetation communities (e.g., coastal dunes) that support a native functioning ecosystem
Cape Cuvier Operations	• Jetty and associated marine infrastructure to remain and ownership transferred to the State
Haul roads, access roads, borrow pits	• A return to pre-mining topography and vegetation communities (e.g., coastal dunes) that support a native functioning ecosystem

6 Closure Risk Assessment

A risk assessment workshop was undertaken during June 2024. The purpose of the risk assessment was to assess mine closure related risks for the Site. The risk assessment workshop was attended by Mine Earth, RED OHMS Group and LMC representatives. The method adopted aligned with the Australian and New Zealand Risk Management Standard (ISO 31000:2018), and the risk matrices used were sourced from the International Council on Mining and Metals (ICMM) planning for integrated mine closure toolkit (ICMM, 2019).

The ICMM, in its mine closure best practice guidance, states that the main closure risks for consideration fall into the broad categories of health and safety, legal and regulatory, environmental, social, financial and reputational risks. While the description of consequence levels is broad, consideration of all environmental factors can be undertaken using these risk matrices.

The objectives of the risk assessment were to:

- Identify and rank inherent risks. Inherent risk is described as a risk event prior to implementing risk controls.
- Identify risk controls for those inherent risks that could compromise the achievement of closure objectives.
- Assess residual risk after risk controls have been implemented.

The Site closure risk assessment is provided in Appendix I. Risk events were ordered by domain and from highest to lowest residual risk rating. The outcomes of the risk assessment were used to inform the development of closure activities for relevant domains (Section 8).

The risk categories in order of lowest risk to highest risk were: 'Low' – 'Medium' – 'Significant' – 'High'. There were no risk events with a 'High' residual risk ranking, however the following residual risk event was assessed as 'Significant':

- Stakeholder unwilling to accept jetty transfer.

The control options identified to mitigate against this significant risk event included ongoing maintenance to promote successful transfer (to State or other third party); and undertaking ongoing stakeholder engagement.

It should be noted that knowledge gaps still remain and as the closure knowledge base increases for Lake McLeod, the risks should be reviewed and reassessed with clear links to outcomes and specific risk pathways.

7 Closure Outcomes and Completion Criteria

Closure performance will be measured against agreed closure outcomes and criteria and will be reported to relevant stakeholders as evidence to support tenement relinquishment.

The aspects, outcomes, criteria and standards required to measure closure performance relate to each other as follows:

- Aspects are the themes that need to be considered for closure.
- Outcomes describe the intent of the mine closure program in relation to each aspect.
- Criteria describe specific elements that can be measured or certified to have occurred and that are critical to achieving the objective. Each objective may have more than one criterion.
- Standards may be either an agreed value that is measurable and is regarded as the minimum that must be achieved, or a certification that closure works comply with an agreed design.

LMC aims to meet all closure outcomes and criteria and finalise monitoring twenty years after the completion of closure works. A final monitoring report will be developed at the end of the closure monitoring period, in conjunction with inspections by the DEMIRS, to document the achievement of closure outcomes.

Closure outcomes, criteria and standards for Lake MacLeod are site-specific and have been developed based on licence requirements (such as groundwater and EP Act Part V licences), as well as for aspects that were identified in the closure risk assessment as having a residual risk of medium or above, including:

- Legal compliance
- Safety
- Heritage
- Infrastructure
- Vegetation
- Surface water
- Groundwater
- Fauna
- Geotechnical stability
- Contaminated sites.

As the Lake MacLeod Operation is considered as an ongoing resource, closure outcomes and criteria are conceptual only (Table 7-1). Final closure outcomes and completion criteria will be developed in consultation with relevant stakeholders, within an appropriate timeframe if a decision is made to close the operation.

Closure outcomes and criteria will be refined and updated over time as monitoring data is collected and if operational monitoring programs identify additional impacts. The Site's completion criteria have also been developed in consideration of the "Framework for developing mine-site completion criteria in Western Australia" developed by WABSI (Young, et al., 2019).

A number of the standards presented in the following sections relate to a "Close Out Report", which will be developed to demonstrate that closure works have been implemented in accordance with the detailed MCP, specifically in relation to deconstruction, earthworks, revegetation or miscellaneous closure tasks.

Table 7-1 Conceptual closure outcomes and completion criteria

Aspect/outcome	Applicable domain	Completion criteria	Standard	Reporting
Legal compliance				
All relevant legal and compliance requirements have been met.	All domains	Relevant legal compliance requirements have been met and regulator acceptance of closure outcomes achieved.	Close out report identifies that all relevant legal requirements have been met.	Close out report.
Safety				
Closed areas will be designed to deter public access.	All domains	All roads not retained under a stakeholder agreement have been rehabilitated.	Close out report identifies that all roads not retained have been rehabilitated.	Close out report.
Heritage				
Impact on traditional owner values and heritage sites do not occur during closure works.	All domains	Heritage sites are not disturbed during closure works.	Close out report identifies that heritage sites were not impacted by closure works.	Close out report.
Infrastructure				
Infrastructure will be removed or left in situ where agreed.	All domains	All below ground infrastructure within 1 m of the ground surface will be removed.	Close out report demonstrates that all below ground infrastructure has been removed.	Close out report.
		All above ground infrastructure, not retained under a stakeholder agreement will be removed.	Close out report demonstrates that all above ground infrastructure not retained, has been removed.	Close out report.

Aspect/outcome	Applicable domain	Completion criteria	Standard	Reporting
Vegetation				
Self-sustaining native vegetation will be established on disturbed areas.	• General infrastructure • Cape Cuvier operations • Haul roads, access roads, borrow pits	Native perennial plant cover in rehabilitated areas has reached the agreed standard.	Plant cover standards to be developed.	Rehabilitation monitoring reports
		Native perennial species richness in rehabilitated areas has reached the agreed standard.	Species richness standards to be developed.	Rehabilitation monitoring reports
		Representative native taxa from nearby vegetation communities will be included in the rehabilitation seed mix.	Close out reports demonstrate native taxa from nearby vegetation communities have been included in the seed mix.	Rehabilitation monitoring reports.
		Weed cover in rehabilitated areas will be less than the agreed standard.	Weed cover standards to be developed.	Rehabilitation monitoring reports.
Surface water				
Impacts to surface water quality in the salt lake will be minimised.	• Salt Operations • Gypsum Operations	Water quality leaving the site meets an agreed standard.	Surface water parameters to be developed.	Surface water monitoring reports.
		All stockpiles will be removed.	Close out report demonstrates that all stockpiles have been removed.	Close out report
	All domains	Contaminated sites will be managed as per the CS Act.	Close out report demonstrates that all contaminated sites have been managed as per the CS Act.	Close out report

Aspect/outcome	Applicable domain	Completion criteria	Standard	Reporting
			Surface water parameters to be developed (and to include total recoverable hydrocarbons, total suspended solids, relevant major/minor ions, electrical conductivity, and pH).	
		Surface water and groundwater interactions	Interactions between surface and groundwater shall be measured with the purpose of informing any required maintenance of natural system interactions	Monitoring and Close out report
Groundwater				
Impacts to groundwater systems will be minimised.	All domains	Any contaminated sites will be managed as per the CS Act. Water quality leaving the site meets and agreed standard.	Close out report demonstrates that all contaminated sites have been managed as per the CS Act. Ground water parameters to be developed (and to include total recoverable hydrocarbons, total suspended solids, relevant major/minor ions, electrical conductivity, pH, and static pressure).	Close out report
Fauna				

Aspect/outcome	Applicable domain	Completion criteria	Standard	Reporting
Native fauna will be encouraged to inhabit rehabilitated areas.	All domains	Vegetation completion criteria have been met	Agreed standards have been met.	Close out report
	• Salt Operations • Gypsum Operations	Ponds and bunds on the lake bed have been reprofiled. Water quality leaving the site meets and agreed standard.	Close out report demonstrates that the ponds have been reprofiled. Water parameters to be developed.	Close out report
Geotechnical stability				
Constructed landforms will be geotechnically stable.	Cape Cuvier	Geotechnical assessment confirms that disturbed areas to be rehabilitated at Cape Cuvier have a similar geotechnical stability as surrounding natural areas.	Geotechnical sign off	Geotechnical report.
Contaminates sites				
Contaminated sites will be managed.	All domains	Any contaminated sites will be managed to achieve the post-mining acceptable end-point classifications as per the CS Act.	Close out report demonstrates that all contaminated sites have achieved the classifications as per the CS Act required to achieve the preferred PMLU.	Close out report

8 Closure Implementation

Closure implementation involves the following activities, depending on the domain:

- Decommissioning and demolition of infrastructure.
- Identification and remediation of contamination.
- Landform reshaping.
- Ground preparation, revegetation and rehabilitation of disturbed areas.

The activities are described in the following sections based on a PMLU that targets the environment and topography that existed pre-mining. The PMLU and corresponding activities will be reviewed and revised with each MCP update.

8.1 Infrastructure Decommissioning

Decommissioning comprises the removal of all unwanted infrastructure and services, and may include:

- Decommissioning and demolition, deconstruction and removal (or burial in landfill accordance with lease and licence conditions) of all structures not being transferred to a new owner.
- Management of hazardous materials including contaminated land identified following demolition.
- Disposal of waste.

Closure activities for each facility have been outlined in Table 8-1.

All infrastructure will be decommissioned and demolished unless a new owner is identified (this may include the State), and a legal agreement is documented. It should be noted that clause 10(s) of the State Agreement requires that LMC is required to give three months' prior notice to the State if LMC intends to remove any plant or equipment (to allow the State an option to purchase the items).

Table 8-1 Measures required for Decommissioning LMC's Lake MacLeod Operation

Domain	Item	Closure Measures
General infrastructure	Salt Operation Administration area	Remove the administration area and associated infrastructure including all workshops, offices, crib rooms, reverse osmosis facilities. This will involve dismantling of infrastructure and disposal off-site, the removal of concrete footings to at least 1 m below ground level and the sale of any salvageable items. Decommission and remediate fuel storage, fuel farms, and transfer infrastructure and remove concrete footings to at least 1 m below ground level. Test for hydrocarbon contamination and dispose of any waste hydrocarbons using a licensed Controlled Waste Contractor to remove from site.
General infrastructure	Water infrastructure	Decommission and remove reverse osmosis plants. Cap bores (when no longer required for water use or monitoring) Decommission of site dams. Remove the internal plastic liners and reshape walls.
General infrastructure	Electrical infrastructure	Decommission or retain power facilities (power station, power lines, power poles), as agreed with stakeholders. If decommissioned, explore opportunities to sell metal for scrap or recycle materials.
Salt Operations	Salt wash plant	Dismantle and remove all production buildings and mechanical structures at the current wash plant site.
Salt Operations	Salt production area	Dismantle pump stations and remove all pumps and infrastructure and either sell or scrap. Dismantle and remove the lime and potassium permanganate plant.
Salt Operations	Potash production facility	Demolition and remediation of areas by specialist contractor for asbestos removal. Dismantle and remove the remaining infrastructure. Cement slabs will also require removal to at least a depth of 1 m.
Gypsum Operations	Gypsum dredge area	Dismantle pumps, diesel engines, switchgear, control gear and associated facilities and transport off site. Undertake soil and groundwater remediation where required. Remove the stacker and dispose of – explore whether this can be sold as scrap or recycled.

Domain	Item	Closure Measures
Gypsum Operations	Gypsum heap leach area	It is assumed the gypsum stockpile will be reduced to zero. The gypsum hardstand below the stockpile will be ripped. Remove all piping. Remove the internal plastic liners from the ponds and reshape the bunded areas. All cement areas will be broken up and buried in borrow pits or removed from site.
Cape Cuvier Operations	Ship loading facilities and general infrastructure at Cape Cuvier	Remove supporting infrastructure, including riggers huts, lighting towers, crib room, old tunnel remains and the radio tower and recycle scrap where possible. Dismantle and remove stackers and conveyors for both the salt and gypsum loading operations. *The jetty is assumed to be handed back to the State, however if the handover/ divestment option for the ship loading facility and jetty is not viable, the jetty and ship loading facility will be decommissioned. The jetty would then be deconstructed, and waste material transferred to suitable waste facility or salvaged and recycled.*
Cape Cuvier Operations	Cape Cuvier dry salt and gypsum stockpiles	Demolish the dry salt dump bridge and the gypsum dump bridge steel structure. Explore whether the materials can be sold for scrap or recycled. Otherwise, bury on site at borrow pits.

8.2 Soil and Groundwater Remediation

Monitoring and management of contaminated land is undertaken during operations, and is intended to operational remediation activities (and reduce those required at closure); however, there may be locations where this is not possible.

Areas that will potentially have contamination remaining at closure include:

- High salt concentration in soils or on natural ground surface.
- High alkalinity from gypsum operational and stockpile areas.
- Asbestos at old potash facility.
- Hydrocarbons at fuel storage areas and vehicle washdown areas across the site.

At closure, these areas will be tested and remediation appropriate to the findings will be undertaken in accordance with the CS Act. The preference will be to achieve Decontaminated (or Remediated for Restricted Use) classification for areas contaminated during operations that will enable achievement of the preferred PMLU.

Techniques to ameliorate contaminated soils, particularly hydrocarbons, may include land farming and mixing hydrocarbons with green waste to achieve bio-remediation. Deep ripping and aerating, then application of fresh water may assist the remediation of heavily salted ground.

8.3 Landform Reshaping

Landform reshaping is the process of undertaking earthworks to reshape disturbed ground to meet the requirements of the proposed PMLU. It will occur following the decommissioning, demolition, and remediation activities as required.

Making the site safe and stable, while enabling the areas to be sustainable in the long-term are the priority for landform reshaping.

Landforms requiring reshaping have been grouped into two categories and are discussed in the following sections:

1. Salt lake / playa footprint
2. All other surfaces.

8.3.1 Salt lake / playa footprint

Previously identified alternate closure options were also reviewed including partial breaching of the 30,000 Levee or allowing all constructed surfaces to naturally attenuate over time to a ‘new natural’ topography.

The current option to rehabilitate the salt lake / playa disturbance areas is outlined in Table 8-2 and is based upon a managed dissolution and release of bittern and pond water.

Further investigation and refinement is required to confirm the most appropriate approach. This has been identified as a gap and is listed in the Knowledge Gaps (Section 12.1).

Table 8-2 Salt lake / playa disturbance area closure activities

Domain	Aspect	Closure Measures
Salt Operations	Salt operation and bitterns areas	• Remove individual internal bunds and levees to create several large mixing pond areas within the salt disturbance footprint (retain 30,000 Levee and other significant bunds/levees) • Install (or adapt existing) pipes and pumps to enable water balance management within bunded areas • Manage staged mixing of bitterns into the larger mixing ponds to dilute bitterns water using bore water or following rainfall events • When water in the ponds reaches an agreed standard, staged releases would occur into the Lake MacLeod catchment • Gradual dissolution of the hard salt crusts through application of fresh bore water to initiate dissolution of the hard salt crusts • Follow removal of all bitterns area and mixing pond waters, the following should be undertaken on the lake surface once it has been identified as geotechnically stable to sufficiently support machinery: o Remove all water management infrastructure (such as pipes and pumps) o Remove and reshape all levees (including 30,000 Levee), embankments, constructed raises and drainages o Deep rip thick salt crusts • Allow natural attenuation of the surface to occur.
Gypsum Operations	Gypsum lake area	• Remove all water from ponds • Remove all infrastructure except access roads required for monitoring • Remove and reshape all levees, embankments, constructed raises and stockpile pads • Rip thick salt crusts • Backfill drains and depressed pond areas where practicable • Allow natural attenuation of the surface to occur
Salt Operations	Collection drains	• Backfill drains and depressed pond areas (if and where practicable) • Allow natural attenuation of the surface to occur

8.3.2 All Other Surfaces

The proposed method to manage all disturbance areas outside the salt lake / playa footprint is provided in Table 8-3. These closure activities require further investigation and refinement as the site progresses towards closure.

All general disturbance areas will require the following activities (where relevant):

- Reshape all disturbed areas to align with proposed PMLU.

The specific closure activities for various disturbance areas are provided in Table 8-3.

Table 8-3 General disturbance area closure activities

Domain	Item	Closure Measures
General infrastructure	Wet salt stockpile	Deplete the wet salt stockpile. The hard salt pavement may then be removed by either: • using a scraper and the materials moved into the settling pond; or • dissolving the hard salt pavement beneath it with fresh water, with the waste water disposed of in the bitterns storage area.
General infrastructure	Airfield	• Rip and reshape in preparation for rehabilitation (Section 8.4).
General infrastructure	Other site infrastructure areas	• Rip and reshape in preparation for rehabilitation (Section 9.4). to achieve a final landform compatible with the PMLU.
General infrastructure	Fuel farms and vehicle washdown facilities	• Rip and reshape in preparation for rehabilitation (Section 9.4). to achieve a final landform compatible with the PMLU.
Cape Cuvier Operations	Cape Cuvier dry salt stockpile	• Deplete the dry salt stockpile. • Scrape and/or rip the hard pan and dispose on site. • Alternatively, dissolve the hard salt pan using fresh seawater. The waste would then be diluted with sea water and disposed in the ocean (with regulatory approval). • Rip and reshape in preparation for rehabilitation (Section 9.4). to achieve a final landform compatible with the PMLU.
Cape Cuvier Operations	Cape Cuvier gypsum stockpile	• Deplete the dry salt stockpile. • Rip and reshape in preparation for rehabilitation (Section 9.4). to achieve a final landform compatible with the PMLU.

Domain	Item	Closure Measures
Haul roads, access roads, borrow pits	Borrow pits and quarries	• Quarries may be used as a containment area for inert fill taken from dismantling and demolition activities elsewhere. • Reshape to achieve a landform compatible with the PMLU. • Overburden would be spread over the borrow pit floor and topsoil would be spread over the overburden.
Haul roads, access roads, borrow pits	Haul and access roads	• Rip and reshape in preparation for rehabilitation (Section 9.4). to achieve a final landform compatible with the PMLU.

8.4 Rehabilitation

Rehabilitation activities include:

- Ground preparation including replacement of subsoil, topsoil and soil improvements
- Seed sourcing and management
- Application of seeds for revegetation. It is assumed that seedlings would not be used in revegetation activities at this site, however this may change if rehabilitation monitoring results identify poor revegetation outcomes using seeding alone.
- Maintenance (including irrigation if/as required).

Table 8-3 identifies the following areas that will require ground preparation and seeding:

- Airfield
- General site infrastructure areas
- Fuel farms and vehicle washdown facilities
- Cape Cuvier dry salt stockpile
- Cape Cuvier gypsum stockpile
- Haul and access roads.

Rehabilitation activities will be planned, managed and recorded to enable continual rehabilitation improvement. This process will be regularly reviewed.

The proposed post-mining landform and vegetation types and areas are shown in Figure 8-1.

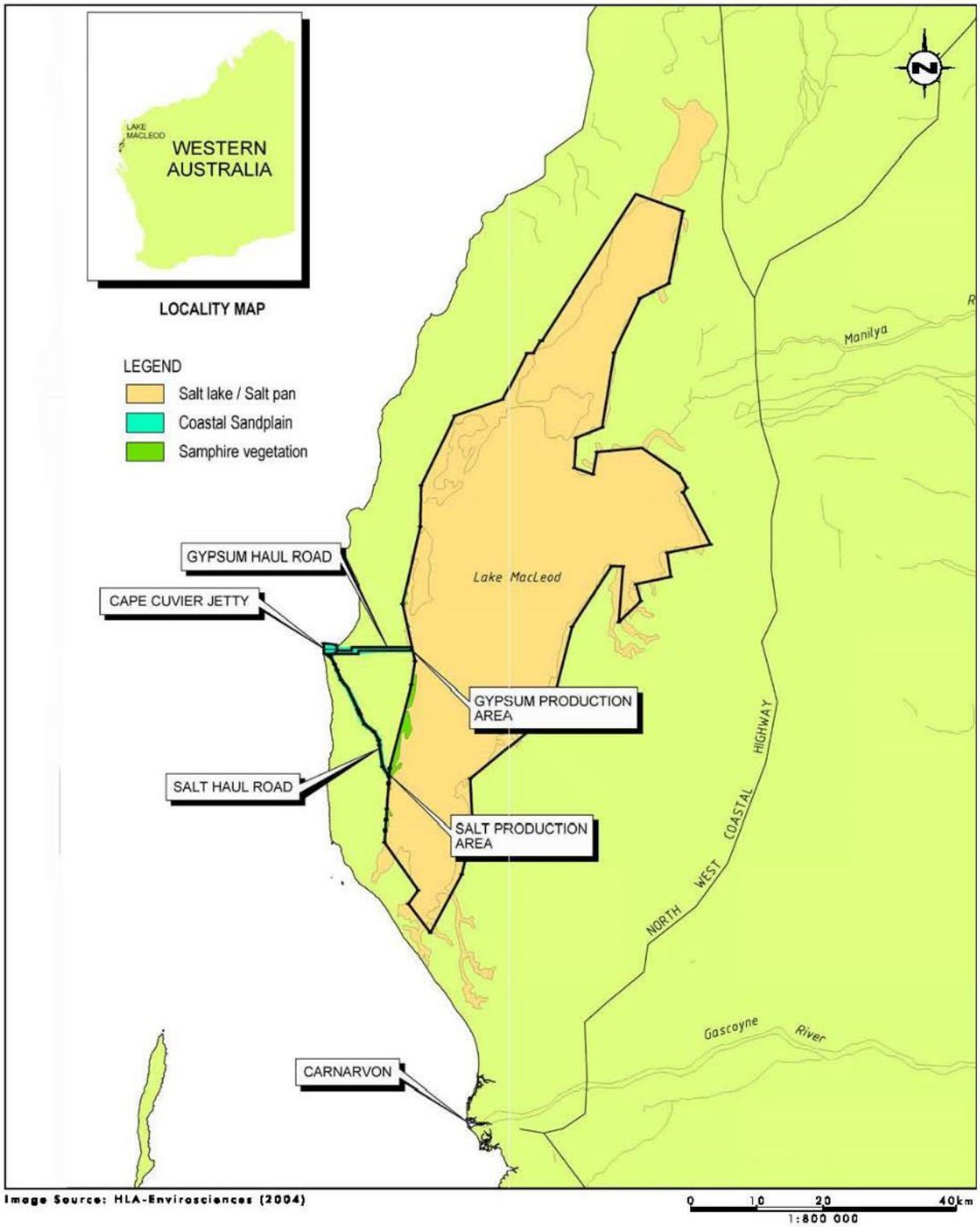


Figure 8-1: Indicative Final Landform and Types of Revegetation at the Lake MacLeod Operation

8.4.1 Topsoil and Growth Media

There are currently no known topsoil stockpiles at site. Therefore, the source of topsoil should be investigated. Further to this, if topsoil material is not identified or available, use of potential subsoil material plus ameliorants or amendments may be required where growth media is required. Investigation into topsoil and subsoil availability has been included in the knowledge gaps (Section 1.1).

If topsoil becomes available through closure activity works, its use would be limited to areas of similar topsoil and vegetation type.

8.4.2 Species Mix

A seed mix will be developed that prioritises seed from species that are endemic to the site, or naturally located in adjacent areas. The list will be regularly reviewed and refined following monitoring and may also be influenced on market availability and seed quality and viability.

8.4.3 Weed and Pest Management

Weed hygiene will be undertaken during all closure activities including machinery movements and topsoil/subsoil use.

Non-native or naturalised flora will be removed from rehabilitation activity areas. Monitoring will be undertaken as outlined in Section 9.

8.5 Implementation Issues and Management

8.5.1 Security

Restrictions to site access would continue during closure execution, and would continue for as long as needed for safety and environmental reasons. Decisions on the post closure access to site would be made after negotiations with key stakeholders in an appropriate timeframe prior to closure. A site security plan would be developed and implemented during closure activities.

8.5.2 Dust Management

Areas that require dust suppression are generally unsealed thoroughfares that receive a high volume of traffic and are prone to erosion. Currently, at the Lake MacLeod Operation dust suppression generally follows the haul fleet and is also required at the Cape Cuvier Operations. Brine is used to control dust in preference to fresh water during operations. As most areas are likely to require rehabilitation at closure, fresh water may be used for dust suppression instead of brine. Dust suppression would occur during closure implementation as required.

In the short term, directly following rehabilitation earthworks, dust may be an issue at the site during windy conditions. As vegetation becomes established, it is likely that airborne dust events will become less frequent. Dust management would therefore continue as required throughout the closure process.

8.6 Unplanned or Unexpected Closure

In the event that LMC decides to suspend operations or put the site into care and maintenance, LMC will:

- Notify the relevant Environmental Officer at the DEMIRS of its intentions.
- Notify the district inspector of mines as required under the *Mines Safety Inspection Act 1994*.
- Undertake a risk assessment and an audit of the Site.
- Commit to making the site safe.
- Continue to undertake monitoring.
- Prepare a Care and Maintenance Plan and submit this to the DEMIRS within three months of notification.
- Establish an inspection/monitoring schedule.
- Update the Emergency Response Plan.

If the Site is to be permanently closed following unplanned or unexpected closure, the activities will be reviewed and revised to facilitate complete closure with the goal to achieve the identified PMLU.

9 Closure Monitoring and Maintenance

Once the closure program of works has been implemented for each domain as described in Section 8, closure performance will be measured against agreed closure outcomes and completion criteria. Post closure performance will be reported to relevant stakeholders as evidence to support tenement relinquishment. The post closure monitoring and post closure maintenance plan for each closure aspect is presented in Table 9-1. Monitoring will continue until relevant completion criteria have been achieved.

Monitoring will be undertaken by specialist consultants and be in line with relevant standards and guidelines.

Post closure, monitoring data will be compiled and reported in the Site's AER. In addition, every three years the MCP will be updated and LMC's progress to meeting completion criteria will be described.

Development of the closure monitoring program will utilise existing monitoring data as a baseline, where appropriate.

Table 9-1 Conceptual Closure Monitoring and Maintenance Plan

Outcome	Criteria	Methods	Frequency	Trigger values and corrective actions
Legal compliance				
All relevant legal and compliance requirements have been met.	Relevant legal compliance requirements have been met and regulator acceptance of closure outcomes achieved.	The Close Out Report identifies that all relevant legal requirements have been met.	Once-off, year 1 post closure	A review of legal and compliance requirements will be undertaken.
Safety				
Closed areas will be designed to deter public access.	All roads not retained under a stakeholder agreement will be rehabilitated.	The development of a close out report to confirm that all roads not retained have been rehabilitated.	Once-off, year 1 post closure	Additional roads will be progressively rehabilitated if they are no longer required. Rehabilitated roads will be reworked if necessary.
Heritage				
Impact on traditional owner values and heritage sites do not occur during closure works.	Heritage sites will be avoided during closure works.	The development of a close out report to confirm that heritage sites were not impacted by closure works.	Once-off, year 1 post closure	Remedial works will be undertaken if required.
Infrastructure				
Infrastructure will be removed or left	All below ground infrastructure within	The development of a close out report to demonstrate that all below ground infrastructure within 1 m of	Once-off, year 1 post closure	Below ground infrastructure within 1 m of the ground

Outcome	Criteria	Methods	Frequency	Trigger values and corrective actions
in situ where agreed.	1 m of the ground surface will be removed.	the ground surface has been removed.		surface will be removed if necessary.
	All above ground infrastructure, not retained under a stakeholder agreement will be removed.	The development of a close out report to demonstrate that all above ground infrastructure not retained under a stakeholder agreement has been removed.	Once-off, year 1 post closure	Above ground infrastructure not retained under a stakeholder agreement will be removed if necessary.
Vegetation				
Self-sustaining native vegetation will be established on disturbed areas.	Native perennial plant cover in rehabilitated areas has reached the agreed standard. Native perennial species richness in rehabilitated areas has reached the agreed standard. Representative native taxa from nearby vegetation communities will be included in the rehabilitation seed mix. Weed cover in rehabilitated areas will be less than the agreed standard.	Vegetation monitoring in rehabilitated areas will be undertaken for 10 years to assess: • Vegetation % cover • Species richness • Species/life form composition • Weed cover • Assessment of number of juvenile seedlings • Identification of species producing seed Natural analogue sites will also be monitored to confirm climatic factors and other influences on vegetation health. Vegetation parameters will be assessed using standard methods and a combination of plots and transects. Annual closed site inspections will focus on poor drainage,	Vegetation and weed monitoring will be undertaken in years 1, 2,3, 5, 7, 9 post-closure.	If areas of rehabilitation do not meet calculated standards or are not on an increasing trajectory after 5 years the following mitigation will be considered: • Soil testing • Reseeding • Remedial works • Weed management Weed management will include: • Seed and weed inspections to be undertaken prior to any machinery entering the Site area.

Outcome	Criteria	Methods	Frequency	Trigger values and corrective actions
		damage from fauna and climate to determine any negative influences on rehabilitation. The development of a close out report to demonstrate that representative native taxa from nearby vegetation communities has been included in the seed mix and that all vegetation completion criteria have been met.		• Opportunistic removal of small or new weed occurrences should be undertaken by hand and any fruiting material should be destroyed. • The occurrence of weeds will be noted during rehabilitation monitoring. • If weeds are identified, targeted annual weed spraying will continue for at least the first three years following closure works.
Surface water				
Impacts to surface water quality in the salt lake will be minimised.	Discharge water quality meets and agreed standard	Surface water parameters of ponded water will be tested prior to release to the lake bed. Parameters to be tested include pH, salinity, anions and cations and metals. All samples will be sent to a NATA accredited laboratory for assessment.	Event based, prior to release to the lake bed.	Water will not be released to the lake bed unless it meets the agreed standards.

Outcome	Criteria	Methods	Frequency	Trigger values and corrective actions
	All stockpiles will be removed.	Close Out Report demonstrates that all stockpiles have been removed. .	Once-off, year 1 post closure	Remedial works to remove stockpiles will be undertaken.
	Contaminated sites will be managed as per the CS Act.	The development of a close out report to demonstrate that all contaminated sites have been managed as per the CS Act.	Once-off, year 1 post closure	Continue to remediate sites as per the CS Act.
Groundwater				
Impacts to groundwater systems will be minimised.	Any contaminated sites will be managed as per the CS Act.	The development of a close out report to demonstrate that all contaminated sites have been managed as per the CS Act.	Once-off, year 1 post closure	Continue to remediate sites as per the CS Act.
Geotechnical stability				
Constructed landforms will be geotechnically stable.	Geotechnical assessment confirms that disturbed areas at Cape Cuvier have a similar geotechnical stability as surrounding natural areas.	The development of a close out report to demonstrate that the geotechnical stability at disturbed sites at Cape Curvier is appropriate.	Once-off, year 1 post closure	Remedial works will be undertaken.
Contaminated sites				
Contaminated sites will be managed.	Any contaminated sites will be managed to achieve the post-mining acceptable end-point classifications as per the CS Act.	The development of a close out report to demonstrate that all contaminated sites have achieved the classifications as per the CS Act required to achieve the preferred PMLU.	Once-off, year 1 post closure	Continue to remediate sites to achieve the post-mining acceptable end-point classifications as per the CS Act..

10 Financial Provisioning for Closure

The closure cost estimate (CCE) was updated in 2024 to include current rates and review assumptions and calculations, and to align the costed tasks with those presented within this MCP.

The Class IV CCE provision estimate was prepared in a Microsoft Excel workbook. Separate worksheets were established to divide the Site into different domains. Within each of these worksheets, specific disturbance areas were broken into a series of line items which reflected the closure tasks that would be required to meet the closure plan as specified in Section 8. The CCE includes demolition and removal of relevant infrastructure, rehabilitation earthworks, application of rehabilitation resources including soil, and rehabilitation treatments, including ripping and seed application.

The costing worksheets were established as a bill of quantities. Each line item consisted of a quantity and a unit rate. The relevant quantity for each line item was determined from existing and planned disturbance GIS data sourced from the landform closure designs, aerial photography and input from LMC personnel.

The CCE was developed by applying a schedule of rates to relevant groups of closure tasks, in accordance with the scope of closure works outlined in Section 8. The CCE accounts for the following costs:

- Deconstruction (LMC owned assets):
    - Preparing assets for deconstruction.
    - Deconstructing above ground assets.
    - Packing assets for offsite transport.
    - Transporting equipment offsite.
    - Removal of scrap.
- Earthworks:
    - Breaking up concrete slabs and footings.
    - Removing concrete slabs and footings as required.
    - Remediation of impacted soils.
    - Re-profiling landforms.
    - Spreading topsoils and subsoils.
    - Shaping and contouring for surface water management.
    - Ripping and scarifying compacted surfaces.
- Revegetation:

    - Seeding.
- Management costs for the closure program of works.
- Contractor mobilisation and demobilisation costs.
- Post closure costs including maintenance, monitoring, reporting and management.
- Contingency.

The CCE assumes that the Jetty infrastructure at Cape Cuvier will be handed over to the state as per the State Agreement.

The CCE will be progressively updated to ensure that cost settings reflect the most recent level of understanding. LMC maintains thorough documentation of the CCE, and has made adequate provision within company accounts for the full cost of mine closure.

11 Management of Information and Data

LMC will prepare the following environmental and compliance reports for the Lake MacLeod Operation:

- AER to DWER.
- Annual Audit Compliance Report (AACR) to DWER.
- AER to DEMIRS.
- Native Vegetation Clearing Permit Reports to DEMIRS.
- National Greenhouse and Energy Report to the Clean Energy Regulator.
- National Pollutant Inventory to DWER.
- Reptile Removalist Licence Report to Department of Biodiversity, Conservation and Attractions.
- Environment Indicators Survey and Energy, Water and Environment Survey to Australian Bureau of Statistics.
- Annual Groundwater licence report to DWER.

Progress of closure at the Lake MacLeod Operation will be communicated through the reports listed above, and other reporting mechanisms as appropriate. The relevant reports include a summary of areas rehabilitated and analysis of monitoring results. Further closure-related information will be reported if and when closure activities commence.

LMC will maintain internal electronic systems for recording and retaining data related to closure.

12 Reviewed Mine Closure Plans

The previous MCP was submitted in 2019. This MCP has been updated to align with the DEMIRS guidelines and in response to feedback received on the 2019 MCP. Several other changes have been made to this MCP and these are summarised in Table 12-1.

Responses to comments received on the 2019 MCP have been described in Table 12-2.

Multi Agency responses to comments received on the 2024 MCP, this MCP submitted to support the transition from Dampier Salt Limited to Lake MacLeod Pty Ltd have been described in Table 12-3.

Table 12-1 MCP updates

MCP Section	Update
Section 1 - Introduction	Changes to the ownership structure of the Site have been described.
Section 2 – Identification of Closure Obligations and Commitments	Legal obligations for the Site have been reviewed and this section has been refined and only includes legal obligations relevant to closure.
Section 3 – Stakeholder Engagement	Key and internal stakeholders have been identified and recent stakeholder engagement has been presented. A plan for ongoing stakeholder engagement has been developed.
Section 4 – Closure Data and Analysis	Data collected during the operational phase of the Site has been included and all relevant closure investigations have been described. A section detailing the implications for closure has been included in this version of the MCP.
Section 5 – Post-mining Land Use	The PMLU was reviewed and updated where appropriate. Irrelevant data was removed from this section.
Section 6 – Closure Risk Assessment	A new closure risk register was developed for the Site and is presented in this section of the MCP.
Section 7 – Closure Outcomes and Completion Criteria	A review of the previous closure outcomes and criteria was undertaken, and a new conceptual framework was developed.
Section 8 – Closure Implementation	Closure plans were reviewed and updated where required.
Section 9 – Closure Monitoring and Maintenance	This section has been updated in accordance with the refined completion criteria framework.
Section 10 – Financial Provisioning for Closure	This section has been updated to reflect the most recent CCE update.
Section 11 – Management of Information and Data	This section remains largely unchanged.

MCP Section	Update
Section 12 – Reviewed Mine Closure Plans	This was a new section developed for this version on the MCP to align with the DEMIRS guidelines. Knowledge gaps and indicative timing have been included (previously in Section 8). A response to the most recent DEMIRS feedback has been included

Table 12-2 Responses to DEMIRS comments

MCP Section	Comment	Response
2024 MCP submission		
All	**General** Some of the references to the table numbers are incorrect, please review the document.	Noted – table and figure references updated where necessary.
Section 12	**Responses to previous MCP Reg ID 86217 Knowledge Gaps** The response to the last item and half of the preceding item are missing. This should be updated.	The original text for this comment has not been located following multiple requests to relevant stakeholders. Consequently, no text in the MCP has been changed.
Section 5.2	Post Mining Land Use (PMLU) – there has been no substantial update to the MCP in terms of identifying the PMLU. The PMLU must be specific, a return to pre mining vegetation is not a PMLU. The PMLU could be improved by linking to a land use, for example. "a return to pre mining vegetation and topography to support a native functioning ecosystem".	Table 5-1 has been amended to better articulate the PMLU. For example, a revised PMLU is now: 'A return to pre-mining topography and vegetation communities that support a native functioning ecosystem'

MCP Section	Comment	Response
Section 3.4	Stakeholders – Table 3-1 should be more specific, for example the use of "state agencies" rather than specifying each relevant agency.	Table 3-1 has been amended to include relevant agencies, and associated planned engagement topic/s and method of engagement.
Section 6	Not addressed in the previous response - As there are a lot of knowledge gaps around closure at this site, the risk assessment is not well informed and lacks links to outcomes and specific risk pathways. This should be revised in future iterations of the MCP.	Noted and additional reference to future MCP requirements included in Section 6.
Section 6	The risk assessment in the MCP should be a consideration of the environmental factors, the consequences do not need to include financial etc.	Table 13-7 Risk Consequence Ratings. Table 13-7 has been amended to only include the following Consequence types: 'Safety', 'Environment', 'Legal and regulatory', and 'Social / community'. It is important to note that the risk assessment results remain unchanged.
Section 6	The consequence should not be changed between inherent and residual risk, unless the risk can be eliminated or substituted. The risk assessment should be reviewed and updated.	Referring to Risk #7 – Excessive dust. The cause has been clarified to be 'Stockpiles and gypsum material not removed appropriately covered.' The Control Option is to remove the stockpile, therefore risk is eliminated. No change to inherent or residual risk rankings.
Section 7	**Table 7-1 – Conceptual closure outcomes and criteria** Criteria – Table 7-1 – conceptual criteria are acceptable for this revision of the MCP, but need refinement based on further studies into veg and landscape and defined PMLU.	Noted; this aligns with existing text in Section 7: Closure outcomes and criteria will be refined and updated over time as monitoring data is collected and if operational monitoring programs identify additional impacts. The Site's completion criteria have also been developed in consideration of the

MCP Section	Comment	Response
		"Framework for developing mine-site completion criteria in Western Australia" developed by WABSI (Young, et al., 2019).
2019 MCP submission		
General comment on MCP	Rio Tinto have classed their Lake MacLeod Operations as having an "Indefinite Life". With this premise, Rio Tinto proposes leaving the development of some areas of the MCP to "within 5 years of closure". Whilst mining salt does not share the same constraint of resource depletion that other commodities might, mines can close for a range of reasons making mine closure planning necessary to ensure sufficient plans can be successfully implemented and adequate resourcing is in place should closure be required.	Noted, this has been reviewed and updated where appropriate.
Post-mining land use / Completion Criteria	The post-mining land use(s) (PMLU) needs to continue to be developed with the stated options further investigated and defined. DMIRS recommends that the PMLU(s), closure objectives and completion criteria be defined through consultation with stakeholders during operations and not left to being defined 5 years from closure. DMIRS recommends DSL become familiar with "A framework for developing Completion Criteria". This document highlights the importance of identifying PMLU which then influences the development of completion criteria. Leaving this to 5 years from closure rules out opportunities to progressively develop and refine completion criteria during operations.	Noted, a new framework for closure outcomes and completion criteria for the Site have been developed (Section 0). A plan to collect additional data to support the completion criteria standards has also been included (see Table 12-3).
Section 4.5 – Knowledge Gaps – Table 4.23 – Knowledge Base Gaps	Knowledge gaps – DMIRS recommends that in future iterations of the MCP to include an extra column in this table, to track the required tasks and timing around closing out the knowledge gaps.	Noted and included in Table 12-3.

MCP Section	Comment	Response
Section 5.0 – Stakeholder Engagement	While the MCP provides a list of stakeholders, these are mostly relevant to operational matters. DSL need to formulate a list of key stakeholders relevant to closure, that will be actively involved in the development of a post-mining land use and completion criteria. Early engagement with stakeholders will enable DSL to better understand and manage stakeholder expectations around closure.	Noted, the stakeholder list has been reviewed and only those associated with closure have been included. A plan for ongoing stakeholder engagement has been developed (Table 3-1).
Section 5.2 – Stakeholder Management Process	DMIRS recommends that a specific closure consultation program be developed and enacted upon by DSL.	A plan for ongoing stakeholder engagement has been developed (Table 3-1).
Section 6.1 – Closure Vision	This section should be replaced with a defined post-mining land use. The "base case final land use" provided in Section 6.3.4 appears to be an adequate basis for post-mining land use determination.	Proposed post-mining land uses have been presented in Table 5-1.
Table 6.5 – Preliminary Closure Objectives and Targets	The use of the term "where practicable" needs to be reviewed. The MCP planning process should determine what is practicable and required and factor those determinations into the objectives and targets.	All closure objectives and outcomes have been updated and reviewed.
Table 6.5 – Preliminary Closure Objectives and Targets – Cost efficiency	This section states that a cost-benefit analysis will be used to help determine the final landform and land-use. DMIRS notes that minimum closure obligations are required to be met, regardless of any cost-benefit analysis undertaken.	Noted, this comment has been removed from the MCP.
Section 8.4 - Rehabilitation	This section gives a generic definition of rehabilitation and what it entails. It is recommended that DSL include	Noted, this section has been updated to describe the process of applying topsoil and seed and contour ripping where required (Sections 8.3 and 8.4).

Table 12-3 2024 MCP Agency Comments

Agency Comments	Lake MacLeod Pty Ltd Response
Department of Water and Environmental Regulation	

Industry Regulation – Part V Division 3 Environmental Protection Act 1986
 	
The Department of Water and Environmental Regulation's (DWER) Industry Regulation (IR) Division has responsibility under Part V, Division 3, of the *Environmental Protection Act 1986* (EP Act) for administering works approvals and licensing or registration of prescribed premises.
 	
DWER has completed a review of the MCP and provides the following comments:
 	
• DWER notes the current operating licence (**L7178/1997/11**) under the EP Act for the Lake MacLeod Operations has an approved production capacity of 6.1 million tonnes per annum of both salt and gypsum combined.
• The following Schedule 1 categories under the *Environmental Protection Regulations 1997* are under the current operating licence:
  ○ Category 14: Solar salt manufacturing;
  ○ Category 58A: Bulk material loading or unloading; and
  ○ Category 64: Class II or III putrescible landfill site.
• DWER notes that LMC deemed to be the future owner, operator and manager will continue to operate the three areas with the same general approach and methodology as DSL.
	Noted

Agency Comments	Lake MacLeod Pty Ltd Response
• The table of contents does not list all the appendices, where the approvals (State Agreement and licences) are missing.	Table of contents updated
It should also be noted that a recent meeting was held on 11 November 2024 between IR, DSL, and LIG to discuss the approvals pathway and address any further queries on the transfer of the operating licence **L7178/1997/11** from DSL to LMC.	MCP updated to include IR, DSL, and LIG meeting and licence transfer application (Section 3.2).
On 20 November 2024, LIG formally applied to transfer **L7178/1997/11.** The application is currently under validation by Industry Regulation.	
Licence transfer DWER staff met with Dampier Salt staff to discuss the regulatory requirements for the transfer of groundwater and EP Act Part V licences to the new owners. The licence transfer applications must be received within 30 days of settlement.	Noted
Completion criteria Surface water and Groundwater completion criteria need to be developed for the next iteration of the MCP.	Noted
The MCP should also reference any relevant obligations from the regulatory instruments (groundwater and EP Act Part V licences).	MCP updated to include reference to regulatory instruments in Section 7.

Agency Comments	Lake MacLeod Pty Ltd Response
Knowledge gaps Supports the filling of the water related knowledge gaps and that this information should be provided for the next iteration of the MCP. • Water quality standards for discharge • Interactions between surface and groundwater and key lake features after closure	Noted and Table 7.1 updated.

Agency Comments	Lake MacLeod Pty Ltd Response
Department of Planning, Lands and Heritage	
Aboriginal Heritage DPLH note that at section 3.1 the draft MCP identifies the Department of Aboriginal Affairs (DAA) as a State Government Department stakeholder. LMC is advised that the DAA is no longer in existence, and the Minister for Aboriginal Affairs is currently assisted by DPLH in the administration of the AHA. The draft MCP identifies the Aboriginal Heritage Act 1972 (AHA) as relevant legislation for compliance with at section 2.1.7, and states at section 4.2.1.1 that Registered Aboriginal Sites Cape Cuvier (ID 6060) and Quobba Dunes (ID 7138) are within or near to the Lake MacLeod operating leases. A review of the Register of Places and Objects, as well as the DPLH Aboriginal Heritage Database, concludes that the subject area, being the Mineral Lease, Mining Tenements and Jetty Lease described above, intersects with the actual boundary of Registered Site Cape Cuvier (ID 6060). The subject area also intersects with the actual boundary of Lodged Aboriginal heritage Place Lake MacLeod (ID 6061). Therefore, based on the current information held by DPLH, if any ground disturbing works related to the proposal will occur within the boundaries	MCP updated (see Section 3.1). MCP updated (see Section 4.2.1)

Agency Comments	Lake MacLeod Pty Ltd Response
of Registered Site Cape Cuvier (ID 6060) and Lodged Place Lake MacLeod (ID 6061), approval under the AHA will be required.	
LMC states that as closure planning progresses, and prior to closure execution, it will review Aboriginal Sites and Heritage Places databases for additional or revised locations and ensure closure works do not adversely impact or disturb these areas. The subject area in its entirety does not appear to have been comprehensively surveyed, so it is unknown what other Aboriginal cultural heritage may be in the area. LMC will need to be aware of its obligations under the AHA.	Noted
DPLH also advises LMC regularly checks the publicly accessible DPLH Aboriginal Cultural Heritage Inquiry System (ACHIS) should new Aboriginal cultural heritage be reported within the subject area: **https://espatial.dplh.wa.gov.au/ACHIS/index.html?viewer=ACHIS**	Noted
DPLH note that the Yinggarda, Baiyungu and Thalanyji People (Gnulli Native Title Claim Group) hold native title rights and interests in the subject area, represented in the subject area by the Nganhurra Thanardi Garrbu Aboriginal Corporation and the Yinggarda Aboriginal Corporation.	Noted
DPLH note the Memorandum of Understanding with the Gnulli Native Title Claim Group, Heritage Agreement with Yamatji Marlpa Aboriginal Corporation on behalf of the Gnulli People and draft Relationship Management Agreement with Nganhurra Thanardi Garrbu Aboriginal Corporation.	Noted
DPLH encourages ongoing consultation to allow for best practice management of Aboriginal heritage extant in the vicinity of the project.	Noted

Agency Comments	Lake MacLeod Pty Ltd Response
Section 2.1.5 – *Contaminated Sites Act 2003* (WA): • It is positive that the MCP notes the Contaminated Sites Act 2003 (CS Act) within the Identification of Closure Obligations and Commitments section. • DPLH welcomes the strong statement from Lake MacLeod Pty Ltd (LMC) regarding acceptance of liability for contamination issues at the Lake MacLeod operation. • This section should reference the Work Health and Safety Act 2020.	New Section 2.1.8 Work Health and Safety Act 2020 added.
Section 3 – Stakeholder Engagement: • Section 3.1 should outline the role of the Department of Water and Environmental Regulation (DWER) as regulator of the CS Act (and not just administrator of licences). • Section 3.1 lists the Department of Aboriginal Affairs as a stakeholder. No such Department exists – this should be revised. • Table 3.1 should detail remediation and management of contaminated sites more specifically, rather than being assumed to be generally incorporated into the identification and management of closure risks within planned engagement topics with Government departments.	Section 3.1 updated. Section 3.1 updated. Table 3.1 updated.
Sections 4.1.7.10 and 4.3.2 – Contaminated Land Investigations: • Information regarding Contaminated Land Investigations is repeated (almost identical in content) between sections 4.1.7.10	Noted

Agency Comments	Lake MacLeod Pty Ltd Response
and 4.3.2, with the Table in Section 4.3.2 (Table 4.10) being more comprehensive and outlining all areas included within the notice of classification under the CS Act.	
• LMC may want to consider including this information in only one section of the MCP to avoid confusion (around whether they contain different information). It is recommended that Table 4.10 (which outlines all known areas of contamination) be used.	Section 4.1.7.10 removed, Figs 4-14 and 4-15 moved to Section 4.3.2.
• Both sections suggest that the conceptual site model (Ralph Consulting 2018) concluded that the "risk to human health and/or the environment is low or not unacceptable". This does not align with the classification under the CS Act (attached), which specifically identifies that "as the site has been shown to be contaminated, and remediation is required to reduce unacceptable risks to human health, the environment or any environmental value to acceptable levels, the site is classified as "Contaminated – Remediation Required".	Section 4.3.2 updated.
• It is also inconsistent with the identification of management strategies / requirements outlined in Table 4.10, which outlines multiple areas (including those with asbestos and hydrocarbon contamination) with active management or remediation requirements.	Noted
• Additionally, Ralph Consulting's conclusion was based on there being no foreseeable change to the land use, which would not be the case if any mining tenements were relinquished. Therefore, this conclusion is irrelevant within the MCP.	Section 4.3.2 updated
• It is noted that section 4.3.2.1 identifies PFAS and PFOS as groundwater contaminants, but they are not included within the Contaminants of Concern listed in Table 4.10. It is recommended that PFAS and PFOS are included in Table 4.10.	PFAS and PFOS added to Table 4.9

Agency Comments	Lake MacLeod Pty Ltd Response
Section 4.4.2 – Mineral Waste Investigation: • As there are elevated minerals and/or metals identified within the wash plant ponds, lime residue storage and (in particular) bitterns solution, it is recommended that the MCP include comment on whether these constitute a contamination risk.	Section 4.4.2 updated with: • The management approach for elevated minerals and/or metals within mineral waste is considered in Section 8 and with appropriate dissolution of bitterns and managed natural attenuation, the management of mineral waste is not expected to constitute a contamination risk; pending on-going favourable monitoring results.

Sections 5,7 and 8 – Post-Mining Land Use, Closure Outcomes and Implementation:
 	
• The MCP should include stronger commitments to driving towards appropriate reclassifications, rather than broadly stating that the sites will be managed as per the CS Act.
• It is recommended that LMC include statements in the appropriate sections regarding the remediation of contamination (and meeting the criteria for post-mining land use that will be chosen).
• In particular, DPLH would like to see a statement of intent and a commitment from the mining company that it will drive and fund investigations and remediation until the final post-remediation classification is one of the following:
  ○ Contaminated – Restricted Use;
  ○ Remediated for Restricted Use;
  ○ Decontaminated; or
  ○ Not Contaminated – Unrestricted Use (unlikely after mining).
• Note that DPLH does not generally accept land returned to the State that is classified as "Possibly Contaminated – Investigation Required", "Contaminated – Remediation Required" or "Awaiting
	Section 5.1 updated to include:
	As the site knowledge of contaminants and waste material improves (through on-going monitoring), LMC will determine the most appropriate remediation activities required to manage the site into (and beyond) closure execution. LMC expect that the majority of the site would be classed (under the CS Act) as Non Contaminated, Decontaminated, or Remediated for Restricted Use. The preference will be to achieve Decontaminated status for areas contaminated during operations.

Agency Comments	Lake MacLeod Pty Ltd Response
Classification". Any DWER classification applied at end classification needs to be compatible with the end land use.	
Section 8.2 – Soil and Groundwater Remediation: • This section needs to be updated in accordance with the recommendations provided for sections 5, 7 and 8 above. Remediation needs to be at an acceptable level to meet endpoint classifications commensurate with the proposed post-mining land use.	Section 8.2 updated to include: The preference will be to achieve Decontaminated (or Remediated for Restricted Use) status for areas contaminated during operations that will enable achievement of the preferred PMLU.
Section 9.1 – Conceptual Closure Monitoring and Maintenance Plan: • Regarding the Contaminated Sites section of the table, it is recommended that reference to post-mining acceptable end-point classifications under the CS Act are included to align with the recommendations noted above for sections 5, 7 and 8. These comments should also go beyond stating that "any contaminated sites will be managed as per the CS Act". With respect to the "Infrastructure" section in Table 9.1, please note that the Department expects that all infrastructure is removed following decommissioning/closure of the mine.	Table 9.1 Contaminated sites Criteria and Methods sections updated to: Any contaminated sites will be managed to achieve the post-mining acceptable end-point classifications as per the CS Act. The development of a close out report to demonstrate that all contaminated sites have been managed and achieved the classifications as per the CS Act required to achieve the preferred PMLU. Noted.

12.1 Knowledge Gaps

This section provides a summary of the gaps identified in the MCP and will be filled prior to closure. Table 12-4 provides a summary of knowledge gaps identified and includes the potential implications for closure planning.

Priority has been assigned based on the complexity and risk associated with the knowledge gap. The progress towards filling the knowledge gaps has also been described.

Table 12-4 Knowledge Base Gaps

Knowledge Gap	Closure Planning Implications	Priority	Progress
Bitterns storage area closure	Options for long term bitterns dilution and management should be identified and assessed. There is an opportunity to investigate the possible use of material in the bitterns storage area as a future mining resource. Undertake further investigation to determine the most appropriate method for remediation of the bitterns storage area.	High	Yet to commence.
Degradation processes associated with flood levees and berms	The method of levee breaching and removal and disposal/reuse of levee and berm material needs to be determined for post-closure land use options. The feasibility and timeframe of natural degradation of the embankment areas needs to be examined. It is recommended that modelling be undertaken to assess the feasibility of the proposed PMLU and to ensure confidence that the proposed strategies will be effective in reinstating a natural ecosystem similar to that prior to mining. The model should, at a minimum, incorporate topographical and levee breaching studies as well as the impact of cyclones and floods.	Medium	Yet to commence.
Water quality standards for discharge.	Water quality standards are to be developed to inform the strategy of release of water from the salt ponds to the playa.	Medium	Yet to commence.
Species lists for areas of disturbance outside the salt lake	Review outcomes of site-specific flora surveys, including species composition, and demarcation of vegetation communities, to determine appropriate species list for rehabilitation. Site-specific rehabilitation techniques need to be established prior to final closure to ensure successful and cost-effective rehabilitation outcomes.	Medium	Yet to commence.

Knowledge Gap	Closure Planning Implications	Priority	Progress
Interactions between surface and groundwater and key lake features after closure	There is insufficient information to understand the potential interactions between surface water, groundwater and key lake features at closure. Trenches, bores, wells and dredge ponds that penetrate the overlying gypsite layer and intercept the halite aquifer underlying Lake MacLeod may continue to influence hydrogeology and surface water flow in Lake MacLeod if they are not sealed at closure. Further investigation of the hydraulic linkages at Lake MacLeod should be undertaken to determine whether leaving the trenches, bores, wells and gypsum dredge ponds unsealed will have a detrimental impact on the water quality or hydrology of the underlying aquifer, the nearby beta-carotene facility, and the conservation-significant areas such as the Northern Ponds.	Medium	Yet to commence
Evaluation of PMLU options	A cost-benefit analysis of the viability of divestment of ship loading infrastructure and the jetty at Cape Cuvier versus the cost and environmental impact of dismantling and collapsing the jetty to the sea floor should be undertaken. Cost-benefit analysis of the reuse or divestment of infrastructure across the site should be undertaken.	Medium	Yet to commence
Timeframes for achievement of completion criteria	The likely timeframe for complete dissolution of salt pavements and achievement of final landforms by natural degradation processes would depend on the frequency and magnitude of flood events, and is unknown.	Medium	Yet to commence.
Jetty transfer opportunities and legal pathway	Opportunities for jetty divestment should be investigated including the process and framework the facility would be divested – or transferred to the State	Medium	Yet to commence.

Knowledge Gap	Closure Planning Implications	Priority	Progress
Uncertainty regarding costs	The closure cost estimate ranked the following items as having high uncertainty: • Human resources management costs (such as redundancy payments) at closure • Excavation of salt and gypsum stockpile bases • Demolition of structures, including asbestos contained in the Old Potash Facility • Post-closure environmental monitoring Costs for these items should be reviewed in the event that further information becomes available or if it is likely that the Lake MacLeod Operation will close.	Medium	Underway, the CCE for the Site has been updated.
Vegetation standards for completion criteria.	Plant cover, species richness and weed cover data to be collected at natural analogue areas and previously rehabilitated borrow pits to inform relevant completion criteria.	Low	Yet to commence.
Jetty removal options	If divestment or transfer back to the State are not considered viable options, the process, cost, legal requirements, and approvals pathway to remove the jetty should be investigated.	Low	Yet to commence.
Soil characteristics	No detailed knowledge of the physical and chemical characteristics of the soils at the Lake MacLeod Operation. Also no knowledge of the spatial extent of different soil types. Undertake site-specific soil assessment for areas requiring revegetation. This will help determine appropriate revegetation methods.	Low	Yet to commence.
Growth media	If topsoil is not available following soil characteristic investigations, trials will be considered to determine success of subsoil +/- ameliorants for use as growth media	Low	Yet to commence.

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Appendices

APPENDIX A MINE CLOSURE CHECKLIST

Refer to Table 13-1 for the Mine Closure Checklist plus cross-references to document locations.

Table 13-1 Mine Closure Checklist

Q No	Mine Closure Plan (MCP) checklist	Y/N/NA	Page No.	Comments	Changes from previous version (Y/N)	Page No.	Summary
1	Has the Checklist been endorsed by a senior representative within the tenement holder/operating company? (See bottom of checklist.)	Y					
Public Availability							
2	Are you aware that from 2015 all MCPs will be made publicly available?	Y					
3	Is there any information in this MCP that should not be publicly available?	N					
4	If "Yes" to Q3, has confidential information been submitted in a separate document/section?						
Cover Page, Table of Contents							
5	Does the MCP cover page include: • Project Title • Company Name • Contact Details (including telephone numbers and email addresses) • Document ID and version number • Date of submission (needs to match the date of this checklist)	Y			Y		*Company details have been updated*
Scope and Purpose							
6	State why the MCP is submitted (e.g. as part of a Mining Proposal, a reviewed MCP or to fulfil other legal requirements)	Y	10		Y		*To support the transfer of the Project.*
Project Overview							
7	Does the project summary include:	Y	13 to 27		Y		*Minor changes to Project summary.*

Q No	Mine Closure Plan (MCP) checklist	Y/N/NA	Page No.	Comments	Changes from previous version (Y/N)	Page No.	Summary
	• Land ownership details (include any land management agency responsible for the land / reserve and the purpose for which the land / reserve [including surrounding land] is being managed) • Location of the project; • Comprehensive site plan(s); • Background information on the history and status of the project.						
Legal Obligations and Commitments							
8	Does the MCP include a consolidated summary or register of closure obligations and commitments?	Y	34 to 45		Y		*Updated to include additional closure obligations*
Stakeholder Engagement							
9	Have all stakeholders involved in closure been identified?	Y	46		Y		*Stakeholder details have been updated.*
10	Does the MCP include a summary or Register of historic stakeholder engagement with details on who has been consulted and the outcomes?	Y	46		Y		
11	Does the MCP include a stakeholder consultation strategy to be implemented in the future?	Y	48 to 50		Y		
Post-mining land use(s) and Closure Objectives							
12	Does the MCP include agreed post-mining land use(s), closure objectives and conceptual landform design diagram?	Y	117 to 120		Y		
13	Does the MCP identify all potential (or pre-existing) environmental legacies, which may restrict the post mining land use (including contaminated sites)?	Y	Appendix I		Y		*Risk assessment was updated.*
14	Has any soil or groundwater contamination that occurred, or is suspected to have occurred, during the operation of the mine, been reported to DER as required under the Contaminated Sites Act 2003?	Y	101		Y		*Information has been updated*

Q No	Mine Closure Plan (MCP) checklist	Y/N/NA	Page No.	Comments	Changes from previous version (Y/N)	Page No.	Summary
Development of Completion Criteria							
15	Does the MCP include an appropriate set of specific completion criteria and closure performance indicators?	Y	124	Table 7-1	Y		*Completion criteria for the project have been updated and refined.*
Collection and Analysis of Closure Data							
16	Does the MCP include baseline data (including pre-mining studies and environmental data)?	Y	51 to 100		Y		*Baseline information was updated.*
17	Has materials characterisation been carried out consistent with applicable standards and guidelines (e.g. GARD Guide)?	NA			Y		
18	Does the MCP identify applicable closure learnings from benchmarking against other comparable mine sites?	Y	116		Y		*Updated to include most recent monitoring data*
19	Does the MCP identify all key issues impacting mine closure objectives and outcomes (including potential contamination impacts)?	Y	Appendix I		Y		*Mine closure risk assessment has been updated.*
20	Does the MCP include information relevant to mine closure for each domain or feature?	Y	128 to 130	Table 8-1	Y		*Closure investigations have been updated.*
Identification and Management of Closure Issues							
21	Does the MCP include a gap analysis/risk assessment to determine if further information is required in relation to closure of each domain or feature?	Y	163 to 156	Table 12-3	Y		*Mine closure risk assessment has been updated.*
22	Does the MCP include the process, methodology, and has the rationale been provided to justify identification and management of the issues?	Y	Appendix I		Y		
Closure Implementation							
23	Does the MCP include a summary of closure implementation strategies and activities for the proposed operations or for the whole site?	Y	128 to 134		N		*Closure implementation for the whole site is included*

Q No	Mine Closure Plan (MCP) checklist	Y/N/NA	Page No.	Comments	Changes from previous version (Y/N)	Page No.	Summary
24	Does the MCP include a closure work program for each domain or feature?	Y	128 to 130	Table 8-1	Y		
25	Does the MCP contain site layout plans to clearly show each type of disturbance as defined in Schedule 1 of the MRF Regulations?	Y	15		Y		*Site layout updated*
26	Does the MCP contain a schedule of research and trial activities?	Y	162		Y		*Knowledge gaps have been updated.*
27	Does the MCP contain a schedule of progressive rehabilitation activities?	N/A	-		N		*N/A*
28	Does the MCP include details of how unexpected closure and care and maintenance will be handled?	Y	138		N		*Unexpected closure and care and maintenance has been updated*
29	Does the MCP contain a schedule of decommissioning activities?	Y	128		N		*Decommissioning activities have been updated*
30	Does the MCP contain a schedule of closure performance monitoring and maintenance activities?	Y	139		Y		*Monitoring and maintenance schedule has been updated*
Closure Monitoring and Maintenance							
31	Does the MCP contain a framework, including methodology, quality control and remedial strategy for closure performance monitoring including post-closure monitoring and maintenance?	Y	139		Y		*Monitoring and maintenance program has been updated*
Financial Provisioning for Closure							
32	Does the MCP include costing methodology, assumptions and financial provision to resource closure implementation and monitoring?	Y	144		Y		*CCE was updated*
33	Does the MCP include a process for regular review of the financial provision?	Y	144		Y		*CCE updated every three years*

Q No	Mine Closure Plan (MCP) checklist	Y/N/NA	Page No.	Comments	Changes from previous version (Y/N)	Page No.	Summary
Management of Information and Data							
34	Does the MCP contain a description of management strategies including systems and processes for the retention of mine records?	Y	146		Y		*Management strategies have been updated*

Corporate Endorsement:

I hereby certify that to the best of my knowledge, the information within this Mine Closure Plan and checklist is true and correct and addresses all the requirements of the Guidelines for the Preparation of a Mine Closure Plan approved by the Director General of the DEMIRS.

Name: Signed:

Position: Date:

(NB: The corporate endorsement must be given by tenement holder(s) or a senior representative authorised by the tenement holder(s), such as a Registered Manager or Company Director)

APPENDIX B MINERAL LEASE 245SA AGREEMENT

2024

THE HONOURABLE ROGER COOK
PREMIER OF THE STATE OF WESTERN AUSTRALIA
MINISTER FOR STATE AND INDUSTRY DEVELOPMENT, JOBS AND TRADE

DAMPIER SALT LIMITED
ACN 008 706 590

LAKE MACLEOD PTY LTD
ACN 670 992 060

LEICHHARDT INDUSTRIALS GROUP PTY LTD
ACN 656 192 602

EVAPORITES (LAKE MACLEOD) AGREEMENT 1967

DEED OF COVENANT

Title page, signed by both parties on 20 November 2024

APPENDIX C PRESCRIBED PREMISES LICENCE L7178/1997/11

Government of Western Australia
Department of Water and Environmental Regulation

Licence

Licence number	L7178/1997/11
Licence holder	Lake Macleod Pty Ltd
ACN	670 992 060
Registered business address	Suite A7, 435 Roberts Road Subiaco WA 6008
DWER file number	DER2014/001046-2
Duration	04/10/2015 to 03/10/2025
Date of transfer	12/12/2024
Premises details	Lake Macleod Solar Salt Project Blowholes Road CARNARVON WA 6701 Part of Mining Tenements: AML 70/245, L09/10, L09/11, L09/17 and L09/18 As defined by the coordinates in Schedule 1.

Prescribed premises category description (Schedule 1, *Environmental Protection Regulations 1987*)	Category production or design capacity	Assessed premises production or design capacity
Category 14: Solar salt manufacturing: premises on which salt is produced by solar evaporation.	Not applicable	6,100,000 tonnes per annual period
Category 58A: Bulk material loading or unloading: premises on which salt is loaded onto or unloaded from vessels by an open materials loading system.	100 tonnes or more per day	84,000 tonnes per day
Category 64: Class II or III putrescible landfill site: premises on which waste (as determined by reference to the waste type set out in the document entitled "Landfill Waste Classification and Waste Definitions 1996" published by the Chief Executive Officer and as amended from time to time) is accepted for burial.	20 tonnes or more per year	60 tonnes per annual period

This licence is granted to the licence holder, subject to the attached conditions, on 12 December 2024, by:

Jarrod Abrahams

Digitally signed by Jarrod Abrahams
Date: 2024.12.12 14:23:38 +08'00'

MANAGER, RESOURCE INDUSTRIES
an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA)

Licence history

Issued	Instrument number	Summary of changes
4 October 2010	L7178/1997/10	Licence reissue
1 October 2015	L7178/1997/11	Licence reissue: • to change the format of the licence and the addition of discharge points to land and surface water; • increase in solar salt production from 2.9Mtpa to 3.1Mtpa; and • the reinstatement of Category 80 for gypsum production.
20 March 2018	L7178/1997/11	Amendment Notice 1: • to increase gypsum production capacity and reclassify gypsum production as a Category 14 and Category 58A; • amendment to monitoring program for discharges to Lake Macleod; and • addition of Acid Sulfate Soil investigation and management conditions.
15 November 2018	L7178/1997/11	Amendment Notice 2: • to allow for the addition of emission point SW11 for the dewatering of Lake MacLeod; • to allow for the relocation of discharge points as gypsum mining expands within the proposed mining area; • addition of trigger criteria for management actions, associated with discharges to Lake Macleod; and • amendment to Acid Sulfate Soil monitoring and management conditions.
3 April 2020	L7178/1997/11	• Removal of conditions relating to ASS field testing. • Amalgamation of the licence with amendment notices 1 and 2.
12 December 2024	L7178/1997/11	• Licence transferred from Dampier Salt Limited to Lake Macleod Pty Ltd.

Severance

It is the intent of these licence conditions that they shall operate so that, if a condition or a part of a condition is beyond the power of this licence to impose, or is otherwise *ultra vires* or invalid, that condition or part of a condition shall be severed and the remainder of these conditions shall nevertheless be valid to the extent that they are within the power of this licence to impose and are not otherwise *ultra vires* or invalid.

Licence conditions

1 General

1.1 Interpretation

1.1.1 In the licence, definitions from the EP Act apply unless the contrary intention appears.

1.1.2 In this licence, the terms in Table 1 have the meanings defined.

Definitions

Table 1: Definitions

Term	Definition
ACN	Australian Company Number
AACR	Annual Audit Compliance Report means a report in a format approved by the CEO as presented by the licence holder or as specified by the CEO from time to time and published on the department's website.
AER	Annual Environmental Report
annual period	means the inclusive period from 1 January until 31 December in the same year.
approved form	the AACR Form template approved by the CEO for use and available via DWER's external website.
AS/NZS 5667.1	means the Australian Standard AS/NZS 5667.1 *Water Quality – Sampling – Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples.*
AS/NZS 5667.4	means the Australian Standard AS/NZS 5667.4 *Water Quality – Sampling – Guidance on sampling from lakes, natural and manmade.*
AS/NZS 5667.6	means the Australian Standard AS/NZS 5667.9 *Water Quality – Sampling – Guidance on sampling of rivers and streams.*
AS/NZS 5667.9	means the Australian Standard AS/NZS 5667.6 *Water Quality – Sampling – Guidance on sampling of marine waters.*
AS/NZS 5667.10	means the Australian Standard AS/NZS 5667.10 *Water Quality – Sampling – Guidance on sampling of waste waters.*

Term	Definition
Category/Categories	categories of Prescribed Premises as set out in Schedule 1 of the EP Regulations.
CEO	means Chief Executive Officer of the Department of Water and Environmental Regulation. "submit to / notify the CEO" (or similar), means either: Director General Department administering the *Environmental Protection Act 1986* Locked Bag 10 Joondalup DC WA 6919 or: info@dwer.wa.gov.au
clean fill	has the meaning defined in Landfill Definitions.
Delegated Officer	an officer delegated under section 20 of the EP Act.
department	the department established under section 35 of the *Public Sector Management Act 1994* and designated as responsible for the administration of Part V Division 3 of the EP Act.
DWER	Department of Water and Environmental Regulation
EP Act	*Environmental Protection Act 1986* (WA)
EP Regulations	*Environmental Protection Regulations 1987* (WA)
Gypsum Operations Dust Management Plan	means Gypsum Operations Dust Management Plan JA- MPL-1462, Rio Tinto, Dampier Salt Limited, Version 3.0, Last reviewed 30 September 2015.
ha	hectare
Inert waste type 1	has the meaning defined in Landfill Definitions.
Inert waste type 2	has the meaning defined in Landfill Definitions.
km	kilometres
Landfill Definitions	means the document titled "Landfill Waste Classification and Waste Definitions 1996" published by the Chief Executive Officer of the Department of Water and Environmental Regulation as amended from time to time.
licence	means this licence numbered L7178/1997/11 and issued under the EP Act.

Term	Definition
licence holder	Dampier Salt Limited
m	metres
mg/L	milligrams per litre
mg/L $CaCO_3$	milligram per litre as calcium carbonate
Minister	the Minister responsible for the EP Act and associated regulations.
mm	millimetres
µS/cm	microsiemens per centimetre
m^3	cubic metres
m^3/min	cubic metres per minute
monthly period	means a one-month period commencing from day 1 of a month until day 1-1 of the immediately following month. *e.g. "means a one-month period commencing from the seventh day of a month until the sixth day of the immediately following month."*
Mtpa	million tonnes per annum
NATA	means the National Association of Testing Authorities, Australia.
NATA accredited	means in relation to the analysis of a sample that the laboratory is NATA accredited for the specified analysis at the time of the analysis.
putrescible	has the meaning defined in Landfill Definitions.
premises	means the area defined in the premises map in Schedule 1 and listed as the premises details on page 1 of the licence.
prescribed premises	has the same meaning given to that term under the EP Act.
Schedule 1	means Schedule 1 of this licence unless otherwise stated.
Schedule 2	means Schedule 2 of this licence unless otherwise stated.

1.1.3 Any reference to an Australian or other standard in the licence means the relevant parts of the standard in force from time to time during the term of this licence.

1.1.4 Any reference to a guideline or code of practice in the licence means the version of that guideline or code of practice in force from time to time, and shall include any amendments or replacements to that guideline or code of practice made during the term of this licence.

1.1.5 Nothing in the licence shall be taken to authorise any emission that is not mentioned in the licence, where the emission amounts to:

(a) pollution;

(b) unreasonable emission;

(c) discharge of waste in circumstances likely to cause pollution; or,

(d) being contrary to any written law.

1.2 General conditions

1.2.1 The licence holder shall operate and maintain all pollution control and monitoring equipment to the manufacturer's specification or any relevant and effective internal management system.

1.2.2 The licence holder shall immediately recover, or remove and dispose of spills of environmentally hazardous materials outside an engineered containment system.

1.2.3 The licence holder shall:

(a) implement all practical measures to prevent stormwater run-off becoming contaminated by the activities on the premises; and

(b) treat contaminated or potentially contaminated stormwater as necessary prior to being discharged from the premises[1]

Note[1]: *The Environmental Protection (Unauthorised Discharges) Regulations 2004* make it an offence to discharge certain materials into the environment.

1.3 Premises operation

1.3.1 The licence holder shall ensure that where wastes produced on the premises is not taken offsite for lawful use or disposal, they are managed in accordance with the process requirements in Table 1.3.1.

Table 1.3.1: Waste processing

Waste type	Process(es)	Process limits[1, 2]
• Inert waste type 1 • Inert waste type 2 • Clean fill • Putrescible wastes	Handling, associated storage and disposal of waste by landfilling	<u>All waste types</u> • No more than 60 tonnes per year of all waste types cumulatively shall be disposed of by landfilling; • Disposal of waste by landfilling shall only take place within the landfill area shown on the Map of landfill area (Figure 2 in Schedule 1). • Waste shall be placed in a defined trench or within an area enclosed by earthen bunds, and • The tipping area is to be no greater than 2m in height above ground level. <u>Special waste type 2 (tyres)</u> • Tyres are to be covered at regular intervals such that no more than 1,000 tyres are left exposed at any one time; and • Batches of tyres should be separated from each other by at least 100mm of soil with each batch consisting of not more than 1,000 whole tyres or 40m³ of tyre pieces.

Note [1]: Requirements for landfilling tyres are set out in Part 6 of the *Environmental Protection Regulations 1987* (EP Regulations).

Note [2]: Additional requirements for the acceptance and landfilling of controlled waste (including asbestos and tyres) are set out in the *Environmental Protection (Controlled Waste) Regulations 2004*.

1.3.2 The licence holder shall ensure that cover is applied and maintained on landfilled wastes in accordance with Table 1.3.2 and that sufficient stockpiles of cover are maintained on site at all times.

Table 1.3.2: Cover requirements[1]

Waste type	Material	Depth	Timescales
• Clean fill • Inert waste type 1 • Inert waste type 2 • Putrescible wastes	Inert waste type 1 or soil	-	As soon as practicable after deposit and prior to compaction.
Inert waste type 2 (tyres)		1,000mm	

Note: Additional requirements for the covering of tyres are set out in Part 6 of the EP Regulations.

1.3.3 The licence holder shall take all reasonable and practical measures to ensure that no windblown waste escapes from the premises and that wind-blown waste is collected on at least a monthly basis and returned to the tipping area.

1.3.4 The licence holder shall ensure that there are no fires at the landfill facility.

1.3.5 The licence holder shall ensure that bitterns is only discharged into containment ponds with the relevant infrastructure requirements specified in Table 1.3.5.

Table 1.3.5: Containment infrastructure

Containment cell or dam number(s)	Material	Infrastructure requirements
Bitterns holding ponds as shown on map of containment infrastructure location (Figure 4 in Schedule 1).	Bitterns	Bitterns holding area • Engineered earthen levee designed to protect the salt field from flooding of the Lake. • Levee is selectively rock armoured on outer wall to minimise erosion during flood events.

1.3.6 The licence holder shall ensure that:

(a) hydrocarbon contaminated soil remediation occurs in landform cells;

(b) leachate from the landform cells and stormwater run-off that has come into contact with the soil shall be directed to a collection sump; and

(c) the collection sump is capable of storing (as a minimum) run-off from a 1 in 10 year rainfall event.

1.3.7 The licence holder must:

(a) reduce the drop height of gypsum at the ship loader to as low as reasonably practicable; and

(b) transfer gypsum to Stockpile 2 using a stacker equipped with a chute; for the purpose of reducing the exposure of gypsum to wind.

2 Emissions

2.1 General conditions

2.1.1 The licence holder shall record and investigate the exceedance of any descriptive or numerical limit specified in any part of section 2 of this licence.

2.2 Point source emissions to surface water

2.2.1 The licence holder shall ensure that where waste is emitted to surface water from the emission points in Table 2.2.1 as identified on the maps of emission points in Schedule 1, it is done so in accordance with the conditions of this licence.

Table 2.2.1: Emission points to surface water

Emission point reference	Emission point reference on Map of emission points	Description	Source including abatement
SW1	Discharge point 1 (wet salt stockpile discharge)	Outlet pipe into Lake MacLeod from wet salt stockpile.	Wet salt stockpile discharge of excess water to Lake MacLeod.
SW2	Discharge point 2 (wet salt stockpile discharge)		
SW3	Discharge point 3 (wash plant brine overflow)	Overflow pipe into Lake MacLeod from Wash Plant.	Salt wash brine from Wash Plant overflow point.
SW4	Discharge point 4 (Truckwaste, lube bay & reverse osmosis plant Discharge Point)	Unlined pond on Lake MacLeod from which truck wash bay, Lube bay and Reverse Osmosis plant (at salt operations) discharge into.	Wastewater from truck wash bay via a triple interceptor.
SW5	SW5	Outlet pipe into ocean from truck wash bay at Cape Cuvier.	Wastewater from truck wash bay via a triple interceptor.
SW6	SW6	Outlet pipe into Lake MacLeod from Gypsum Stockpile 1.	Wastewater from heap leach pad for Gypsum Stockpile 1.
SW7	SW7	Outlet pipe into Lake MacLeod from Gypsum Stockpile 8 drainage system.	Wastewater from heap leach pad for Gypsum Stockpile 8.

Emission point reference	Emission point reference on Map of emission points	Description	Source including abatement
SW8	SW8	Outlet pipe into Lake MacLeod from in-situ drainage systems.	Wastewater from in-situ heap leach areas located within Lake MacLeod.
SW11	SW11		
Mine Block 18	SW9 & SW10		
Mine Block 19	SW15		
Mine Block 20	SW14		
Mine Block 21	SW13		
Mine Block 22	SW11 & SW12		
Mine Block 23	SW16 & SW17		

2.2.2 The licence holder must:

(a) not cause or allow point source emissions to surface water greater than the limits listed in Table 2.2.2; and

(b) perform the management actions specified in Table 2.2.2 where Trigger Criteria is exceeded.

Table 2.2.2: Point source emission limits and management trigger criteria to surface water

Emission point reference	Parameter	Limit (including units)	Trigger criteria	Averaging period	Management actions
SW4 SW5	Total recoverable hydrocarbons	15 mg/L	N/A	Spot sample	N/A

Emission point reference	Parameter	Limit (including units)	Trigger criteria	Averaging period	Management actions
SW6 SW7 SW8 SW9 SW10 SW11 SW12 SW13 SW14 SW15 SW16 SW17	pH[1] Titratable acidity[1]	N/A	pH <6; and Titratable acidity >100 mg/L $CaCO_3$	Monthly	The licence holder must: • aerate leachate to precipitate dissolved iron and directed to a series of settlement basins/trenches; and/or • undertake neutralisation treatment (liming); and/or • relocate the disturbance area to another location.

Note [1]: In-field non-NATA accredited analysis permitted.

2.2.3 The licence holder must only discharge leachate from mine blocks, depicted in Schedule 1, from a maximum of two emission points at any one time.

2.3 Emissions to land

2.3.1 The licence holder shall ensure that where waste is emitted to land from the emission points in Table 2.3.1 and identified on the maps of emission points in Schedule 1 it is done so in accordance with the conditions of this licence.

Table 2.3.1: Emissions to land

Emission point reference	Emission point reference and location on Map of emission points	Description	Source including abatement
L1	Discharge point 6 (Biomax Irrigation Area)	Biomax treated wastewater irrigation area.	Treated wastewater from Biomax sealed aerobic treatment unit.
L2	Discharge point 7 (Lab Neutralisation Pit)	Seepage from unlined neutralisation pit.	Wastewater discharged from laboratory to pit to be chemically treated.
L3	Gypsum Discharge point 3	Outlet pipe into infiltration sump from gypsum fuel facility and truckwash.	Wastewater from gypsum fuel facility and truckwash triple interceptor.

2.3.2 The licence holder shall not cause or allow point source emissions to land greater than the limits listed in Table 2.3.2.

Table 2.3.2: Point source emission limits to land

Emission point reference	Parameter	Limit (including units)	Averaging period
L3	Total recoverable hydrocarbons	15mg/L	Spot sample

2.4 Fugitive emissions

2.4.1 The licence holder shall ensure fugitive emissions are managed in accordance with the documents, or parts of documents, specified in Table 2.4.1.

Table 2.4.1: Management plans

Management plan reference	Parts	Date of document
Gypsum Operations Dust Management Plan	All	30 September 2015

3 Monitoring

3.1 General monitoring

3.1.1 The licence holder shall ensure that:

(a) all water samples are collected and preserved in accordance with AS/NZS 5667.1;

(b) all wastewater sampling is conducted in accordance with AS/NZS 5667.10;

(c) all surface water sampling is conducted in accordance with AS/NZS 5667.4, AS/NZS 5667.6 or AS/NZS 5667.9 as relevant; and

(d) all laboratory samples are submitted to and tested by a laboratory with current NATA accreditation for the parameters being measured.

3.1.2 The licence holder shall ensure that:

(a) monthly monitoring is undertaken at least 15 days apart; and (b) quarterly monitoring is undertaken at least 45 days apart.

3.2 Monitoring of point source emissions to surface water

3.2.1 The licence holder shall undertake the monitoring in Table 3.2.1 according to the specifications in that table.

Table 3.2.1: Monitoring of point source emissions to surface water

Emission point reference	Parameter	Units	Frequency
SW4	Total recoverable hydrocarbons	mg/L	Quarterly
SW5			
SW6 SW7 SW8 SW9 SW10 SW11 SW12 SW13 SW14 SW15 SW16 SW17	Chloride, sulfate, sodium, magnesium, potassium, calcium, total suspended solids, arsenic, beryllium, boron, cadmium, chromium, copper, fluoride, lead, mercury, nickel, total nitrogen, total phosphorus, selenium, bicarbonate	mg/L	Quarterly
	Electrical conductivity[1]	µS/cm	Quarterly
	pH[1]	-	Monthly
	Titratable acidity[1]	mg/L	Monthly

Note [1]: In-field non-NATA accredited analysis permitted.

3.3 Monitoring of emissions to land

3.3.1 The licence holder shall undertake the monitoring in Table 3.3.1 according to the specifications in that table.

Table 3.3.1: Monitoring of emissions to land

Emission point reference	Parameter	Units	Frequency
L3	Total recoverable hydrocarbons	mg/L	Quarterly

4 Information

4.1 Records

4.1.1 All information and records required by the licence holder shall:

(a) be legible;

(b) if amended, be amended in such a way that the original and subsequent amendments remain legible or are capable of retrieval;

(c) except for records listed in 4.1.1(d) be retained for at least six years from the date the records were made or until the expiry of the licence or any subsequent licence; and

(d) for those following records, be retained until the expiry of the licence and any subsequent licence:

I. off-site environmental effects; or,

II. matters which affect the condition of the land or waters.

4.1.2 The licence holder shall ensure that:

(a) any person left in charge of the premises is aware of the conditions of the licence and has access at all times to the licence or copies thereof; and

(b) any person who performs tasks on the premises is informed of all of the conditions of the licence that relate to the tasks which that person is performing.

4.1.3 The licence holder shall complete an Annual Audit Compliance Report (AACR) indicating the extent to which the licence holder has complied with the conditions of the licence, and any previous licence issued under Part V of the EP Act for the premises for the previous annual period.

4.1.4 The licence holder shall implement a complaints management system that as a minimum, records the number and details of complaints received concerning the environmental impact of the activities undertaken at the premises and any action taken in response to the complaint.

4.2 Reporting

4.2.1 The licence holder shall submit to the CEO an Annual Environmental Report (AER) within 120 calendar days after the end of the annual period. The report shall contain the information listed in Table 4.2.1 in the format or form specified in that table.

Table 4.2.1: Annual Environmental Report

Condition or table (if relevant)	Parameter	Format or form
-	Summary of any failure or malfunction of any pollution control equipment and any environmental incidents that have occurred during the annual period and any action taken	None specified
Table 3.2.1	Discharge to water monitoring results	
Table 3.3.1	Discharge to land monitoring results	
4.1.3	Compliance	Annual Audit Compliance Report (AACR)[1]
4.1.4	Complaints summary	None specified

Note [1]: The AACR Form template approved by the CEO for use and available via DWER's external website.

4.2.2 The licence holder shall ensure that the Annual Environmental Report also contains:

(a) an assessment of the information contained within the report against previous monitoring results and licence limits; and

(b) a list of any original relevant monitoring reports submitted to the licence holder from third parties for the annual period and make these reports available on request.

4.3 Notification

4.3.1 The licence holder shall ensure that the parameters listed in Table 4.3.1 are notified to the CEO in accordance with the notification requirements of the table.

Table 4.3.1: Notification requirements

Condition or table (if relevant)	Parameter	Notification requirement[1]	Format or form[2]
2.1.1	Breach of any limit specified in the licence	Part A: As soon as practicable but no later than 5pm of the next usual working day Part B: As soon as practicable	N1

Note [1]: Notification requirements in the licence shall not negate the requirement to comply with s72 of the EP Act.
Note [2]: Forms are in Schedule 2

Schedule 1: Maps

Premises map

The boundary of the prescribed premises is shown in the map below (Figure 1).

Figure 1: Map of the boundary of the prescribed premises

Premises boundary

The premises boundary is defined by the coordinates in Table 2.

Table 2: Premises boundary coordinates

Easting	Northing
AML70/245	
790286.9	7388044.7
797253.5	7385445.0
795055.9	7374346.4
790666.2	7372296.7
786836.2	7363847.2
785037.2	7352768.2
780996.1	7351047.3
780616.2	7346437.1
783416.2	7345627.2
784076.1	7348907.3
790986.1	7349527.3
796636.2	7345647.4
797796.3	7343327.4
797106.3	7342832.4
801616.2	7334497.4
794726.3	7333497.5
795386.3	7329687.6
790086.5	7328647.6
790836.6	7326177.7
787436.8	7323067.8
788326.5	7321397.5
786636.5	7321497.4
780587.3	7322347.5
777178.7	7309058.5
765072.6	7299228.3
765444.5	7291700.4
757210.6	7282351.0
752082.0	7289643.1
752194.3	7291304.6
752216.3	7291610.6
752218.2	7291637.7
752306.4	7292871.8
752322.4	7293096.3
752437.4	7294613.6
752438.7	7294632.5
752705.8	7298371.4
752725.2	7298643.0
752784.2	7299467.9
751756.5	7301061.8
751285.3	7304325.0
751168.3	7305105.6
750463.3	7306364.0
749048.6	7307497.9
748349.8	7308991.5
748215.5	7309324.7
747999.3	7309750.5
746538.6	7312895.4
745980.4	7313474.8
745472.8	7314168.8
744859.6	7315670.0
744495.0	7316539.7
743943.3	7317531.9
743280.9	7318146.9

Easting	Northing
763817.1	7284802.4
759032.2	7275884.7
755702.1	7280331.2
742892.9	7319756.2
744684.6	7319528.0
744940.1	7318893.6
744985.2	7318781.6
744880.3	7318647.0
744490.4	7318146.8
743680.5	7318146.9
743398.4	7318146.9
744007.1	7317581.9
744567.1	7316574.6
744933.7	7315700.2
745543.1	7314208.1
746041.7	7313526.5
746605.5	7312941.3
748070.5	7309786.9
748288.4	7309357.8
748423.2	7309023.5
749113.2	7307548.7
750525.6	7306416.7
751245.4	7305132.0
751364.6	7304335.8
751833.1	7301090.5
752793.7	7299600.8
752876.1	7300755.6
752883.7	7300862.2
756140.0	7313444.1

Easting	Northing
743013.8	7318146.9
742881.2	7318147.0
742880.1	7318951.6
774556.3	7363747.6
775786.4	7365867.5
776086.4	7365837.5
790286.9	7388044.7
L09/10	
744066.1	7318146.9
744053.7	7317431.9
744023.4	7317411.0
743892.4	7317524.3
743656.8	7317682.9
743562.9	7317772.7
743189.9	7318146.9
743680.5	7318146.9
744066.1	7318146.9
L09/11	
756245.5	7319147.0
756354.1	7318647.0
748136.1	7318646.9
748136.2	7318146.9
744490.4	7318146.8
744880.3	7318647.0
747136.1	7318646.7
747136.1	7319146.9
756245.5	7319147.0
L09/18	
752208.4	7291269.5

Easting	Northing
756739.0	7316884.2
754837.0	7325634.0
757565.5	7337345.4
757634.9	7343595.1
763015.3	7354427.5
770035.9	7356697.5
773636.3	7363757.6

Easting	Northing
752197.7	7291120.2
750774.3	7289188.3
749865.9	7288026.6
749819.8	7288097.5
750710.7	7289236.7
752208.4	7291269.5

Landfill area map

The landfill area is shown in the map below (Figure 2).

Figure 2: Map of landfill area

Cape Cuvier infrastructure map

The Cape Cuvier infrastructure is shown in the map below (Figure 3).

Figure 3: Map of Cape Cuvier Infrastructure

Map of containment infrastructure locations

The map of the containment infrastructure areas as defined in Table 1.3.5 are shown in the map below (Figure 4).

Figure 4: Map of containment infrastructure location

Emission points maps

The locations of the emission points defined in Tables 2.2.1, 2.2.2, 2.3.1 and 2.3.2 are shown in the maps below (Figure 5,Figure 6, Figure 3, Figure 7 and Figure 8).

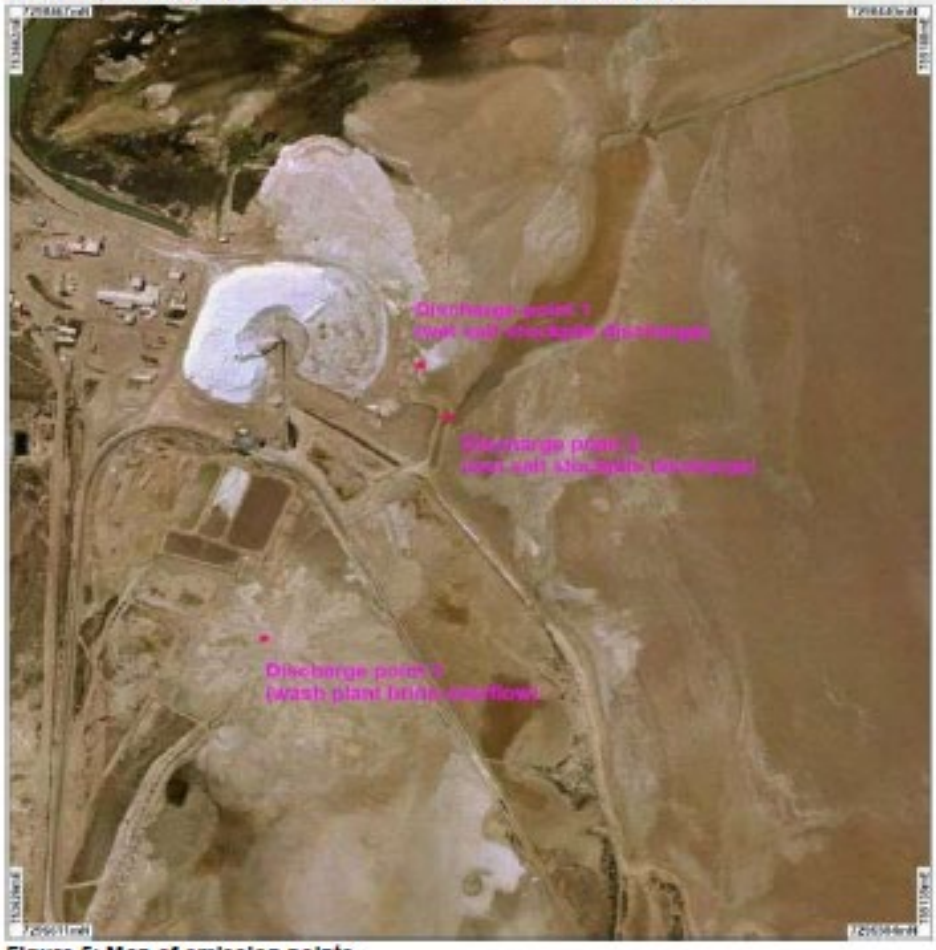

Figure 5: Map of emission points

Figure 6: Map of emission points

Figure 7: Map of emission points

Legend

- Surface Water Emission points (MGA coordinates)
- Future Gypsum Mine block areas (MB18 – MB23)

Figure 8: Map of emission points

Schedule 2: Reporting & notification forms

Government of **Western Australia**
Department of **Water and Environmental Regulation**

Licence: Licence holder:

Form: N1 Date of breach:

Notification of detection of the breach of a limit.

These pages outline the information that the operator must provide.

Units of measurement used in information supplied under Part A and B requirements shall be appropriate to the circumstances of the emission. Where appropriate, a comparison should be made of actual emissions and authorised emission limits.

Part A

Licence number	
Name of operator	
Location of premises	
Time and date of the detection	

Notification requirements for the breach of a limit	
Emission point reference/source	
Parameter(s)	
Limit	
Measured value	
Date and time of monitoring	
Measures taken, or intended to be taken, to stop the emission	

Part B

Any more accurate information on the matters for notification under Part A.	
Measures taken, or intended to be taken, to prevent a recurrence of the incident.	
Measures taken, or intended to be taken, to rectify, limit or prevent any pollution of the environment which has been or may be caused by the emission.	
The dates of any previous N1 notifications for the premises in the preceding 24 months.	

Name	
Post	
Signature on behalf of licence holder	
Date	

APPENDIX D LICENCE TO TAKE WATER GWL56934(6)

File No:
DWERVT17216

Government of **Western Australia**
Department of **Water and Environmental Regulation**

Instrument No. GWL56934(6)

LICENCE TO TAKE WATER

Granted by the Minister under section 5C of the Rights in Water and Irrigation Act 1914

Licensee(s)	Lake MacLeod Pty Ltd		
Description of Water Resource	Gascoyne Carnarvon - Birdrong.	**Annual Water Entitlement**	3,350,000kL
Location of Water Source	ML245SA		

Authorised Activities	**Taking of water for**	**Location of Activity**
	Mineral ore processing and other mining purposes	ML245SA
Duration of Licence	From 17 December 2024 to 11 June 2034	

This Licence is subject to the following terms, conditions and restrictions:

1. The annual water year for water taken under this licence is defined as 1 January to 31 December.
2. The licensee shall comply with the commitments of the operating strategy Non-saline water operating strategy management plan, as prepared by Leichhardt Industrials Pty Ltd and approved by the Department of Water and Environmental Regulation on 20/12/2024 including any modifications to the commitments as approved during the term of the licence.
3. The licensee shall submit a Groundwater Monitoring Review report to the Department of Water and Environmental Regulation every 3 Years on 28 February. The first report is due 28/02/2027.
4. All monitoring and reporting shall be carried out in accordance with Operational Policy 5.12 'Hydrogeological reporting associated with a groundwater well licence'.
5. The licensee must ensure the installed meter(s) accuracy is maintained to within plus or minus 5% of the volume metered, in field conditions.
6. The licensee must notify the Department of Water in writing of any water meter malfunction within seven days of the malfunction being noticed.
7. The licensee must obtain authorisation from the Department of Water before removing, replacing or interfering with any meter required under this licence.
8. The well must be adequately capped to prevent surface entry of contaminants. Flowing wells must be equipped with a valve to control the flow.
9. Any flowing well shall be fitted with a tapping (including a bayonet fitting) in the wellhead construction to enable the measurement of the aquifer's hydraulic pressure (potentiometric head pressure).
10. The wellhead shall be fitted with an appropriate device and/or removable plate directly above the borehole to provide vertical access for logging purposes.
11. Any well that is to be permanently decommissioned shall, within 30 days of being identified as not fit for purpose or no longer required, be sealed and filled to control flow, prevent the surface entry of contaminants and prevent the vertical movement of water in the well, including water in the annular space surrounding the casing, using methods described in 'Minimum construction requirements for water bores in Australia, Fourth Edition, 2020'
12. The licensee shall measure the static head pressure of the well(s) every month and report the results to the Department of Water and Environmental Regulation, every 3 Years commencing 28/02/2027.
13. The licensee must measure and record the electrical conductivity of the water in millisiemens per centimetre (mS/cm), measured at 25 degrees Celsius, from each production well every month.
14. The licensee shall have a major components analysis carried out on water samples from each well every 12 Months.

This Licence is granted subject to the Rights in Water and Irrigation Regulations 2000.

LICENCE TO TAKE WATER

Granted by the Minister under section 5C of the Rights in Water and Irrigation Act 1914

End of terms, conditions and restrictions

This Licence is granted subject to the Rights in Water and Irrigation Regulations 2000.

APPENDIX E JETTY LICENCE

Government of **Western Australia**
Department of **Transport**

MARITIME

19 December 2024

Our ref: LM1379
Enquiries: 13 11 56, option 5, option 2
E-mail: Maritime.Licensing@transport.wa.gov.au

Lake Macleod Pty Ltd
SE7A 435 ROBERTS RD
SUBIACO WA 6008

Dear Scott,

Thank you for your recent application which has been approved, pursuant to the Jetties Act 1926. Please find a copy of your licence for your records.

As a licensee you are bound by the terms and conditions to which you signed and agreed to through submission of the license application form. The terms and conditions provide obligations for all licence types and can be located on the Department of Transport website at www.transport.wa.gov.au/imarine.

The licence also requires you to comply with all written laws, including local laws, by-laws and planning schemes that relate to the structure. You should make independent inquiries to your local shire about the relevant written laws that apply if unsure as to what they are.

Please contact the Maritime Licensing Team should you wish to discuss the contents of this letter.

Yours sincerely

Shaun Butcher
A/Team Leader Licensing

Department of Transport

JETTY LICENCE

JETTY NUMBER: LM1379

19 December 2024

LICENSEE/s

Lake Macleod Pty Ltd
SE7A 435 ROBERTS RD
SUBIACO WA 6008

LICENCE TYPE

LICENCE CATEGORY	***Private Commercial***
LICENCE CLASSIFICATION	***New***
JETTY ADDRESS	***CAPE CUVIER, SHIRE OF CARNARVON***
LICENCE COMMENCEMENT DATE	***2/12/2024***

The Chief Executive Officer of the Department('CEO') GRANTS to the Licensee/s a jetty licence whose details are set out above. This licence is granted on the conditions already agreed by the Licensee/s when applying and paying for this jetty licence. The conditions are additionally set out and available at www.transport.wa.gov.au/imarine/jetty-licences.asp.

On behalf of the Chief Executive Officer

Shaun Butcher
A/Team Leader Licensing

Brown Land System

The majority of the area covered by the Brown land system (within the survey area) is located around the southern quarter of Lake MacLeod. The system is dominated by flat to gently undulating sandy plains of yellowish red to dark red sands with longitudinal dunes. These sandy plains support tall shrublands (2 – 3 m) of *Acacia* spp. Other land units present are longitudinal dunes, swales, and alluvial plains – the latter being the only area susceptible to water erosion when degraded. Condition was assessed as mostly good (54%) to fair (38%).

Cardabia Land System

This land system lies along the length of the coastline parallel to Lake MacLeod and spans the area between the coast and the southern half of the Lake's western edge. Most of the system (75%) comprises undulating sandy plains, which supports hummock grassland with scattered tall shrubs (2 – 3 m) of *Acacia* spp. And *Exocarpus aphyllus*, and mixed low shrubs (< 1.5 m). Hummock grasslands on sandy plains are a combination of hard spinifex (mostly *Triodia basedowii*) and soft spinifex (mostly *Triodia pungens*), but comprise soft spinifex only on the three other land units present (1. longitudinal dunes, 2. stony rises, and 4. Calcrete plains). Grassland associations on the land units 1, 2 and 4 include scattered low shrub on calcrete plans and longitudinal dunes, very scattered low *Ficus platypoda* trees on stony rises, and close tall shrublands of *Acacia ramulosa*. The system was largely assessed as being in good condition (87%), however longitudinal dunes are highly susceptible to wind erosion when lacking vegetation cover and there is the potential to improve sites with appropriate management, particularly regarding the use of fire.

Chargoo Land System

This land system comprises low-lying alluvial and flood plains, largely found around the top north, northeastern shore of Lake MacLeod. Soil profiles include from brown to greyish-brown clays at alluvial plains, dark reddish-grey or reddish-brown clays at Gilgai plains, heavy brown clays at drainage depressions, and reddish-brown duplex, loamy sand at flood plains. A large proportion (55%) of the system is alluvial plain, which supports low saltbush shrubland dominated by Atriplex spp., *Chenopodium auricomum* and perennial grasses (*Sporobolus mitchellii, Eragrostis setifolia, Eriachne benthamii, Cenchrus ciliaris*). Land units 3, 5 and 6 (Gilgai plains, drainage depressions, drainage floors) are characterised by tussock grassland, dominated by *Sporobolus mitchellii* (3 and 5), or *Eriachne benthamii* (6). Flood plains support scattered low woodlands dominated by *Acacia cuspidifolia*. The system is periodically flooded and susceptible to water and wind erosion in the absence of perennial vegetation cover. The system was assessed as being in good (44%) or fair (43%) condition.

Coast Land System

This system largely comprises large long-walled dunes and interdunal corridors with sandy floors (i.e. sandy swales) on the coast. Vegetation cover on the both the dunes and in the sandy swales varies from very scattered to close, and is characterised by low shrubland, which on the dunes is dominated by *Acacia coriacea*. The sandy swale supports a variety of chenopod species including *Atriplex bunburyana*, which is a key feature of the low shrub layer. The system is stable when vegetated but highly susceptible to wind erosion, particularly when denuded or disturbed. The system was assessed as being in a largely good (72%) condition.

Lake Land System

The majority of the Lake MacLeod Operation is located on the Lake land system which is characterised by unvegetated broad pans, lakebeds and playas composed of clay, silt, sand and gravel deposits. The major pans and lakebeds unit, of which this system is largely comprised, exhibits occasional patches of tall Melaleuca spp. shrub and *Eragrostis australasica* grass. The sandy banks that fringe the lakebed support irregular clumps of tall *Melaleuca leiocarpa*, and soft spinifex hummock grasslands of *Triodia pungens* and *Eragrostis eriopoda*. A minor proportion of the system comprises patchy shrubland dominated by *Melaleuca* spp. (inflow zones) or *Melaleuca* spp. and *Eucalyptus coolabah* (claypans). The system was assessed as being in a largely good (78%) condition.

McLeod Land System

This land system comprises the sandy banks, saline plains, mudflats and slopes that surround Lake MacLeod. The mudflats are largely lacking in vegetation and are subject to seasonal flooding. The remaining vegetated area is broadly composed of low shrubland dominated by *Maireana polypterygia, Atriplex vesicaria* and/or *Halosarcia* spp. (typically *Halosarcia halocnemoides*). The land system was assessed as almost entirely in good (99%) condition.

Trealla Land System

This land system is located to the east and west of the upper third of Lake MacLeod. The system comprises flat to gently sloping plains over limestone, interspersed by drainage depressions, stony outcrops and elevated limestone plains, and changing to drainage slopes and lower footslopes as the system approaches the lakeshore. Tall mixed shrublands dominated by Acacia spp. are present across the majority system, except for some drainage depressions which support low Eucalyptus coolabah woodlands, and the lower footslopes which are dominated by low *Maireana polypterygia* shrub. *Acacia sclerosperma* is the dominant tall shrub on the flat plains over limestone, whereas *A. victorae*, *A. xiphophylla* dominate on limestone plains and dissected drainage slopes, respectively. The lower stratum of the tall mixed shrubland supports a high diversity of low shrubs and perennial grasses; *Ptilotus obovatus* being the most common low shrub. The system was assessed as being in good (66%) or fair (29%) condition.

Warroora Land System

This land system is discontinuously located along the eastern and western shores of Lake MacLeod, the largest area being on the south-eastern side of the lake. The system is characterised by flat to gently sloping plains, with major depositional areas of calcareous alluvium and colluvium, and minor areas of sandy banks and limestone outcrops. The system is a diverse assemblage of the following units 1. limestone outcrop plains, 2. low sandy banks, 3. alluvial plains, 4. saline plains and 5. ephemeral swaps and drainage depressions. Units 1, 3 and 4 support low shrublands dominated by saltbush (*Maireana polypterygia*; units 1 and 3), samphire (Atriplex vesicaria with Halosarcia spp.; unit 4), and/or bluebush vegetation communities (Atriplex vesicaria; unit 3, with *Acacia xiphophylla*; unit 1). Tall shrubland grows on units 2 and 5, where *Acacia tetragonophylla*, *A. sclerosperma* and *Atriplex paludosa* dominate on sandy banks and *Melaleuca uncinata* or *Acacia tetragonophylla* dominate ephemeral swaps and drainage depressions. The system was assessed as being in a largely good (89%) condition.

Table 13-2 Lake MacLeod Land System Units

Land	Land Units System	Mean % of Land System occupied by Land Unit	Site Area	Closure Domains Potentially Located on Land System
Lake	Major pans and lakebeds Sandy banks and sheets Inflow zones Claypans	80 10 5 5	Most operations	• Salt Operations • Gypsum Operations
Cardabia	Longitudinal dunes Sandy plains Stony rises Calcrete plains	10 75 5 10	Roads to port	• Haul roads, access roads, borrow pits
Coast	Parabolic dunes Sandy swales Beach fore-dunes Blow-out dunes Restricted limestone plains Beaches and wave cut platforms	50 40 5 3 2 <1	Cape Cuvier port	• Cape Cuvier Operations

Land	Land Units System	Mean % of Land System occupied by Land Unit	Site Area	Closure Domains Potentially Located on Land System
Warroora	Limestone outcrop plains Sandy banks Alluvial plains Saline plains Ephemeral swamps and drainage depressions	15 15 40 20 10	Some roads	• Haul roads, access roads, borrow pits
Brown	Longitudinal dunes Sandy Plains Swales Alluvial plains	5 90 4 2	Some roads	• Haul roads, access roads, borrow pits
MacLeod	Sandy banks Saline plains Dissected slopes Mudflats	20 40 10 30	Some roads	• Haul roads, access roads, borrow pits
Trealla	Limestone plains Flat plains over limestone Dissected slopes Drainage depressions Lower foots lopes	10 75 10 2 3	No direct impacts (lake shore)	• N/A

Land	Land Units System	Mean % of Land System occupied by Land Unit	Site Area	Closure Domains Potentially Located on Land System
Chargoo	Sandy banks	<1	No direct impacts (lake shore)	• N/A
	Alluvial plains	55		
	Gilgai plains	15		
	Flood plains	15		
	Drainage depressions	10		
	Drainage floors	5		

APPENDIX G AREAS OF ENVIRONMENTAL SIGNIFICANCE

International Conservation Registers

The Ramsar Convention is an international treaty for the conservation and utilisation of wetlands of international importance. Lake MacLeod has also been deemed by the State Wetlands Coordinating Committee to have merit for further consideration of listing under the Ramsar Convention. Lake MacLeod meets four Ramsar Criteria for listing as a Wetland of International Importance (Jaensch & Watkins, 1999), however Lake MacLeod has not been Ramsar listed to date.

As Lake MacLeod has been recognised to have conservation significance, the PMLU and landform at closure should be consistent with the conservation values of the site. The primary area of conservation significance is the Northern Ponds.

Commonwealth Conservation Registers

A web-based search was undertaken of the DCCEEW database in August 2018, providing a report of matters of national environmental significance protected under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The search was conducted based on a polygon encompassing the entirety of the LMC lease areas and a 20 km buffer as shown in Figure 1-1. The search revealed several 'Areas of National Significance' in the Lake MacLeod area. A synopsis of the areas of significant identified in the search results is presented in Table 13-3.

Table 13-3: Synopsis of Protected Matters Report for the Lake MacLeod Area including a 20 km buffer zone from the Department of the Environment, Database (2018)

Areas of National Significance	Number	Comment#
Matters of National Environmental Significance		
World Heritage Properties	1	The Ningaloo Coast
National Heritage Places	1	The Ningaloo Coast
Commonwealth Marine Areas	1	EEZ and Territorial Sea
Other Matters Protected by the EPBC Act		
Commonwealth Heritage Places	1	Ningaloo Marine Area - Commonwealth Waters
Australian Marine Parks	3	Gascoyne (Habitat Protection Zone (IUCN IV)), Gascoyne (Multiple Use Zone (IUCN VI)), Ningaloo (Recreational Use Zone (IUCN IV))

The full EPBC Act Protected Matters Report is included in Appendix H. Any action, including closure activities, that is likely to have a significant impact on any matter of national environmental significance should be referred under the EPBC Act.

Lake MacLeod is an area of conservation significance due to its provision of habitat for a variety of flora and fauna, particularly migratory shorebird species (refer to **Section 4.1.8.3** for further details).

The Ningaloo Coast is listed as World Heritage Property as well as National Heritage Property. The Ningaloo Coast World Heritage Area is characterised by the aesthetically striking contrast between the lush ocean and the arid terrestrial environment. The dominant marine feature is the Ningaloo Reef, which supports an large population of whale sharks, a high diversity of marine habitats and tropical and temperate fauna and flora, including coral reefs (Department of the Environment and Energy, 2011). The main terrestrial feature is the extensive karst system and network of underground caves and water courses of the Cape Range (Department of the Environment and Energy, 2011).

The Ningaloo Coast World Heritage Area is recognised for meeting the following criteria (Department of the Environment and Energy, 2011):

- Contains superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance – including mostly intact landscapes and seascapes, providing a stark contrast to each other.

- Contains the most important and significant habitats for in situ conservation of biological diversity – including the largest known aggregation of whale sharks in the world, important aggregations of other fish and marine species, and taxonomically diverse and rare subterranean species within the terrestrial karstic system.

The boundary of the Ningaloo Coast World Heritage Area extends along the coast from Exmouth as far south as the northern portion of Quobba Station (Figure 4-1).

Cape Cuvier is the closest part of the Lake MacLeod Operations to the World Heritage Area; the World Heritage Area is approximately 20 km north of Cape Cuvier. It is not likely that closure activities or the PMLU at Cape Cuvier or any other part of the Lake MacLeod Operations would impact on the Ningaloo Coast World Heritage Area.

Lake MacLeod is identified as a nationally important wetland in the Directory of Important Wetlands in Australia (wetland reference number WA009) (Environment Australia, 2001). Lake MacLeod is described as an outstanding example of a major coastal lake that is inundated by fresh water on regular intervals including permanent saline wetlands and inland mangrove swamps that are maintained by subterranean waterways and a unique assemblage of wetland types in Australia.

Lake MacLeod was chosen as a nationally important wetland due to meeting the following criteria:

- It is a good example of a wetland type occurring within a biogeographic region in Australia.
- It is a wetland which plays an important ecological or hydrological role in the natural functioning of a major wetland system/complex.
- It is a wetland which is important as the habitat for animal taxa at a vulnerable stage in their life cycles, or provides a refuge when adverse conditions such as drought prevail.
- The wetland supports 1% or more of the national populations of any native plant or animal taxa.
- The wetland is of outstanding historical or cultural significance.

Further information about the significance of Lake MacLeod as an Important Wetland is provided in **Section 4.1.8.3**.

State Conservation Registers

In 1975, the Conservation Through Reserves Committee made recommendations to the Environmental Protection Authority (EPA) on locations that should be protected in reserves (Department of Industry and Resources, 2005). These areas are referred to as the Red Book Recommendations. Lake MacLeod was listed as a Red Book Recommendation (number 9.4) (Department of Mines and Petroleum, 2009b). In 1990, the state government directed that all EPA Red Book Recommendations were to be implemented as nature reserves or national parks (Department of Industry and Resources, 2005). Some of the EPA Red Book Recommendations have not yet been implemented; these are primarily in the Pilbara and Murchison region, and include the recommended Lake MacLeod site (Department of Industry and Resources, 2005).

APPENDIX H THREATENED SPECIES, COMMUNITY AND EPBC ACT PROTECTED MATTERS REPORTS

Commonwealth Threatened Flora Databases

A web-based search was undertaken of the DCCEEW database in August 2018, providing an *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Report. The only protected plant species that was identified in the Protected Matters Report was *Pityrodia augustensis* (Mt Augustus foxglove). This species typically grows amongst rocks on slopes or in drainage lines (Paczkowska, 1996). It is unlikely that this species would occur at the Lake MacLeod Operation.

State Threatened Flora Databases

A search of the DBCA Threatened Flora Database was requested on 17 August 2018. The requested search area included LMC's entire Lake MacLeod Operation and lease areas. Results were obtained from the Department's Threatened (Declared Rare) and Priority Flora database, the Western Australian Herbarium Specimen database and the Department's Threatened and Priority Flora List.

Twenty six threatened and priority flora species have been recorded within the search area. Known threatened and priority flora species within these search boundaries comprise:

- Four Priority One species (species which are known from one or a few (generally <5) locations which are potentially at risk);
- Seven Priority Two species (species which are known from one or a few (generally <5) locations, some of which are on lands managed primarily for nature conservation);
- Fourteen Priority Three species (species which are known from several locations, and from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat); and
- One Priority Four species (Rare, Near Threatened and other species in need of monitoring).

Threatened flora database search results are summarised in Table 13-4 below.

Table 13-4: Threatened Flora Identified in State Threatened Flora Database Search

Priority	Family	Species/Taxon
1	Asteraceae	Schoenia filifolia subsp. arenicola*
1	Chenopodiaceae	Atriplex spinulosa*
1	Fabaceae	Swainsona ecallosa*

Priority	Family	Species/Taxon
1	Malvaceae	Abutilon sp. Pritzelianum (S. van Leeuwen 5095)+*
2	Amaranthaceae	Ptilotus alexandri*
2	Amaryllidaceae	Crinum flaccidum+*
2	Asteraceae	Chthonocephalus tomentellus*
2	Elatinaceae	Bergia auriculata+*
2	Malvaceae	Abutilon sp. Quobba (H. Demarz 3858)*
2	Mimosaceae	Acacia ryaniana+*
2	Polygonaceae	Rumex crystallinus*
3	Asclepiadaceae	Gymnanthera cunninghamii
3	Asteraceae	Chthonocephalus spathulatus+*
3	Brassicaceae	Lepidium biplicatum
3	Celastraceae	Stackhousia clementii+*
3	Chenopodiaceae	Dysphania congestiflora*
3	Meliaceae	Owenia acidula
3	Meliaceae	Owenia acidula+
3	Mimosaceae	Acacia atopa*
3	Mimosaceae	Acacia startii+*
3	Montiaceae	Calandrinia rubrisabulosa*
3	Phyllanthaceae	Phyllanthus fuernrohrii
3	Poaceae	Sporobolus blakei*
3	Rhamnaceae	Stenanthemum divaricatum*
3	Solanaceae	Nicotiana heterantha
4	Scrophulariaceae	Eremophila youngii subsp. Lepidota*

+ TPFL, *WA Herbarium

Flora and Vegetation – Northern Ponds

The Northern Ponds – Cygnet and Ibis Ponds – are the only areas of significant vegetation within Lake MacLeod. Although these areas are more than 15 km north of the Lake MacLeod Operation, it is valuable to have an understanding of the ecology of this system. The Northern Ponds have high ecological value and are located within the same catchment and flood sheet area as the salt and gypsum operations.

The vegetation at Cygnet Pond resembles communities typically found at intertidal flats in hyper-saline environments. The taxonomic diversity is very low. The flora at Cygnet Pond is comprised of *Avicennia* mangroves, stunted halophytes, *Ruppia* (estuarine seagrass) and green algae (Logan, 2003). Cygnet Pond supports Australia's largest inland community of mangroves (also referred to as mangals) and Lake MacLeod as a whole supports the largest area of inland mangroves in the world (Ellison & Simmonds, 2003; Logan, 2003). Only one mangrove species grows at Lake MacLeod and this is *Avicennia marina* (Ellison & Simmonds, 2003). According to (Semenuik, 1993), the stunted communities of *Avicennia marina* at Lake MacLeod represent the only mangrove species to extend that far south on the Western Australian coast.

In comparison to Cygnet Pond, Ibis Pond has low biodiversity, comprised predominantly of thin cyanobacteria mats (Logan, 2003).

As discussed in **Section 4.1.7.7**, Cygnet Pond is separated from the downstream salt operation by a low-permeability sill between Cygnet and Ibis Ponds. Therefore, it is not considered likely that there will be any impacts on the flora at Cygnet Pond due to closure of the Lake MacLeod Operation. It is also unlikely that there would be any opportunities to enhance habitat at the Northern Ponds as part of the PMLU. Nevertheless, alternative land use options will consider any opportunities to provide a net positive biodiversity impact and enhance biodiversity outcomes.

Commonwealth Threatened Fauna Databases

A web-based search was undertaken of the DCCEEW database in August 2018, providing an EPBC Act Protected Matters Report. The search included Lake MacLeod and a 20 km buffer around all sides. Table 13-5 is a synopsis of the relevant protected fauna that were identified from the search (note: some species are listed in multiple categories).

Table 13-5: Synopsis of Protected Matters Report for the Lake MacLeod Area including a 20 km buffer zone from the Department of the Environment, Database (2018)

Matters	Number	Comment[#]
Matters of National Environmental Significance		
Listed Threatened Species	32	16 bird species (4 CE, 4 E, 8 V), 6 mammals (2 E, 4 V), 6 reptiles (1 CE, 2 E, 3V), 4 sharks (4 V)
Listed Migratory Species	62	11 migratory marine birds (1 E, 4 V), 20 migratory marine species (4 E, 9 V), 3 migratory terrestrial species, 28 migratory wetland species (3 CE, 2 E, 1V)
Other Matters Protected by the EPBC Act		
Listed Marine Species	90	52 birds (3 CE, 3 E, 6V), 23 fish, 1 mammal, 14 reptiles (1 CE, 2 E, 3 V)
Whales and other Cetaceans	14	14 mammals (2 E, 3 V)

[#] CE – Critically Endangered, E – Endangered, V – Vulnerable

It is unlikely that any of these listed fauna would use the salt lake for habitat. However, for areas of disturbance west of Lake MacLeod in vegetated areas, it may be relevant to consider the potential impacts on terrestrial protected species. Marine protected species may be relevant when considering the potential impacts from activities at Cape Cuvier.

State Threatened Fauna Databases

A search of the DBCA Threatened Fauna Database was requested on 17 August 2018. The requested search area included the Lake MacLeod Operations and lease holdings. A number of protected fauna species have been recorded within the search area, these comprised:

- 5 Endangered species (species that are considered to be facing a very high risk of extinction in the wild);
- 14 Vulnerable species and 2 Vulnerable at a subspecies level (species that are considered to be facing a high risk of extinction in the wild);
- 2 Other specially protected species (fauna otherwise in need of special protection to ensure their conservation);
- 1 Conservation Dependent species (fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened);
- 2 Priority One species (species that are known from one or a few locations (generally five or less) which are potentially at risk.);
- 2 Priority Three species (species that are known from several locations and do not appear to be under imminent threat, or species from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat);
- 2 Priority Four species (taxa in need of monitoring); and
- 38 additional species protected under an international agreement .

The protected fauna species identified from the database search are listed in Table 13-6, with the exception of species protected under an international agreement, which are listed in the EPBC Act Protected Matters Search in Appendix H.

Table 13-6: Threatened Fauna results from DBCA database search

Family	Species/Taxon	Common name	Conservation Code
Ardeidae	*Botaurus poiciloptilus*	Australasian bittern	Endangered
Charadriidae	*Charadrius mongolus*	Lesser sand plover	Endangered
Cheloniidae	*Caretta caretta*	Loggerhead turtle	Endangered
Procellariidae	*Puffinus huttoni*	Hutton's shearwater	Endangered
Rostratulidae	*Rostratula australis*	Australian painted snipe	Endangered

Family	Species/Taxon	Common name	Conservation Code
Charadriidae	*Charadrius leschenaultii leschenaultii*	Greater sand plover (Mongolian)	Vulnerable
Cheloniidae	*Chelonia mydas*	Green turtle	Vulnerable
Cheloniidae	*Eretmochelys imbricata*	Hawksbill turtle	Vulnerable
Dasyuridae	*Dasyurus geoffroii*	Chuditch, western quoll	Vulnerable
Diomedeidae	*Thalassarche cauta*	Shy albatross	Vulnerable
Diomedeidae	*Thalassarche chlororhynchos*	Atlantic yellow-nosed albatross	Vulnerable
Falconidae	*Falco hypoleucos*	Grey falcon	Vulnerable
Laridae	*Sternula nereis nereis*	Fairy tern	Vulnerable
Macropodidae	*Lagostrophus fasciatus fasciatus*	Banded hare-wallaby, mernine	Vulnerable
Megapodiidae	*Leipoa ocellata*	Malleefowl	Vulnerable
Procellariidae	*Ardenna carneipes*	Flesh-footed shearwater, fleshy-footed shearwater	Vulnerable
Scincidae	*Egernia stokesii badia*	Western spiny-tailed skink	Vulnerable
Scolopacidae	*Numenius madagascariensis*	Eastern curlew	Vulnerable
Scolopacidae	*Calidris ferruginea*	Curlew sandpiper	Vulnerable
Scolopacidae	*Calidris tenuirostris*	Great knot	Vulnerable
Scolopacidae	*Limosa lapponica menzbieri*	Bar-tailed godwit (northern Siberian)	Vulnerable
Scolopacidae	*Limosa lapponica*	Bar-tailed godwit	Vulnerable at subsp. level
Dugongidae	*Dugong dugon*	Dugong	Other specially protected

Family	Species/Taxon	Common name	Conservation Code
Falconidae	*Falco peregrinus*	Peregrine falcon	Other specially protected
Balaenopteridae	*Megaptera novaeangliae*	Humpback whale	Conservation Dependent
Branchipodidae	*Parartemia contracta*	A brine shrimp (Wheatbelt)	Priority 1
Scincidae	*Lerista haroldi*	Gnaraloo mulch slider	Priority 1
Thamnocephalidae	*Branchinella denticulata*	A fairy shrimp (Carnavon to Kalgoorlie)	Priority 3
Thamnocephalidae	*Branchinella wellardi*	A fairy shrimp (Carnarvon and Murchison)	Priority 3
Phaethontidae	*Phaethon rubricauda*	Red-tailed tropicbird	Priority 4
Accipitridae	*Elanus scriptus*	Letter-winged kite	Priority 4

Source: Department of Biodiversity Conservation and Attractions 2018b

Australian Government

Department of Climate Change, Energy, the Environment and Water

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 14-Jun-2024

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the Administrative Guidelines on Significance.

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	37
Listed Migratory Species:	47

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at https://www.dcceew.gov.au/parks-heritage/heritage

A permit may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	67
Whales and Other Cetaceans:	12
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	1
EPBC Act Referrals:	1
Key Ecological Features (Marine):	None
Biologically Important Areas:	3
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Species [Resource Information]

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text
BIRD		
Aphelocephala leucopsis Southern Whiteface [529]	Vulnerable	Species or species habitat likely to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Endangered	Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat may occur within area
Phaethon rubricauda westralis Red-tailed Tropicbird (Indian Ocean), Indian Ocean Red-tailed Tropicbird [91824]	Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Tringa nebularia		
Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area
FISH		
Thunnus maccoyii		
Southern Bluefin Tuna [69402]	Conservation Dependent	Species or species habitat likely to occur within area
MAMMAL		
Balaenoptera musculus		
Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
REPTILE		
Aipysurus apraefrontalis		
Short-nosed Sea Snake, Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Aipysurus foliosquama		
Leaf-scaled Sea Snake, Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat likely to occur within area
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas		
Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Egernia stokesii badia		
Western Spiny-tailed Skink, Baudin Island Spiny-tailed Skink [64483]	Endangered	Species or species habitat may occur within area
Eretmochelys imbricata		
Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Natator depressus		
Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
SHARK		
Carcharias taurus (west coast population)		
Grey Nurse Shark (west coast population) [68752]	Vulnerable	Species or species habitat likely to occur within area
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Pristis pristis		
Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area
Pristis zijsron		
Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus		
Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sphyrna lewini		
Scalloped Hammerhead [85267]	Conservation Dependent	Species or species habitat likely to occur within area

Listed Migratory Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Migratory Marine Birds		
Anous stolidus		
Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes		
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area

Scientific Name	Threatened Category	Presence Text
Fregata ariel		
Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Hydroprogne caspia		
Caspian Tern [808]		Foraging, feeding or related behaviour known to occur within area
Macronectes giganteus		
Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Phaethon lepturus		
White-tailed Tropicbird [1014]		Species or species habitat may occur within area
Sternula albifrons		
Little Tern [82849]		Species or species habitat may occur within area
Thalassarche carteri		
Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta		
Shy Albatross [89224]	Endangered	Species or species habitat may occur within area
Thalassarche impavida		
Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi		
White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area
Migratory Marine Species		
Balaenoptera edeni		
Bryde's Whale [35]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Carcharhinus longimanus Oceanic Whitetip Shark [84108]		Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Dugong dugon Dugong [28]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Eubalaena australis as Balaena glacialis australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Lamna nasus Porbeagle, Mackerel Shark [83288]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area
Mobula alfredi as Manta alfredi Reef Manta Ray, Coastal Manta Ray [90033]		Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Mobula birostris as Manta birostris Giant Manta Ray [90034]		Species or species habitat likely to occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area
Pristis pristis Freshwater Sawfish, Largetooth Sawfish, River Sawfish, Leichhardt's Sawfish, Northern Sawfish [60756]	Vulnerable	Species or species habitat may occur within area
Pristis zijsron Green Sawfish, Dindagubba, Narrowsnout Sawfish [68442]	Vulnerable	Species or species habitat known to occur within area
Rhincodon typus Whale Shark [66680]	Vulnerable	Species or species habitat may occur within area
Sousa sahulensis as Sousa chinensis Australian Humpback Dolphin [87942]		Species or species habitat may occur within area
Migratory Terrestrial Species		
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area

Scientific Name	Threatened Category	Presence Text
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat likely to occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Listed Marine Species		[Resource Information]
Scientific Name	Threatened Category	Presence Text
Bird		
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area
Ardenna carneipes as Puffinus carneipes Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Species or species habitat likely to occur within area
Bubulcus ibis as Ardea ibis Cattle Egret [66521]		Species or species habitat may occur within area overfly marine area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat known to occur within area
Calidris canutus Red Knot, Knot [855]	Vulnerable	Species or species habitat likely to occur within area overfly marine area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area overfly marine area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat known to occur within area overfly marine area

Scientific Name	Threatened Category	Presence Text
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat known to occur within area overfly marine area
Charadrius leschenaultii Greater Sand Plover, Large Sand Plover [877]	Vulnerable	Species or species habitat likely to occur within area
Charadrius veredus Oriental Plover, Oriental Dotterel [882]		Species or species habitat may occur within area overfly marine area
Fregata ariel Lesser Frigatebird, Least Frigatebird [1012]		Species or species habitat likely to occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Hirundo rustica Barn Swallow [662]		Species or species habitat may occur within area overfly marine area
Hydroprogne caspia as Sterna caspia Caspian Tern [808]		Foraging, feeding or related behaviour known to occur within area
Larus pacificus Pacific Gull [811]		Foraging, feeding or related behaviour known to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat may occur within area
Macronectes giganteus Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Phaethon lepturus White-tailed Tropicbird [1014]		Species or species habitat may occur within area
Phaethon lepturus fulvus Christmas Island White-tailed Tropicbird, Golden Bosunbird [26021]	Endangered	Species or species habitat may occur within area
Rostratula australis as Rostratula benghalensis (sensu lato) Australian Painted Snipe [77037]	Endangered	Species or species habitat likely to occur within area overfly marine area
Sternula albifrons as Sterna albifrons Little Tern [82849]		Species or species habitat may occur within area
Thalassarche carteri Indian Yellow-nosed Albatross [64464]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta Shy Albatross [89224]	Endangered	Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Thalassarche impavida Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Species or species habitat may occur within area
Tringa nebularia Common Greenshank, Greenshank [832]	Endangered	Species or species habitat likely to occur within area overfly marine area
Fish		
Campichthys galei Gale's Pipefish [66191]		Species or species habitat may occur within area
Choeroichthys suillus Pig-snouted Pipefish [66198]		Species or species habitat may occur within area
Festucalex scalaris Ladder Pipefish [66216]		Species or species habitat may occur within area
Filicampus tigris Tiger Pipefish [66217]		Species or species habitat may occur within area
Halicampus brocki Brock's Pipefish [66219]		Species or species habitat may occur within area
Haliichthys taeniophorus Ribboned Pipehorse, Ribboned Seadragon [66226]		Species or species habitat may occur within area
Hippocampus angustus Western Spiny Seahorse, Narrow-bellied Seahorse [66234]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Hippocampus histrix Spiny Seahorse, Thorny Seahorse [66236]		Species or species habitat may occur within area
Hippocampus planifrons Flat-face Seahorse [66238]		Species or species habitat may occur within area
Hippocampus trimaculatus Three-spot Seahorse, Low-crowned Seahorse, Flat-faced Seahorse [66720]		Species or species habitat may occur within area
Lissocampus fatiloquus Prophet's Pipefish [66250]		Species or species habitat may occur within area
Nannocampus subosseus Bonyhead Pipefish, Bony-headed Pipefish [66264]		Species or species habitat may occur within area
Solegnathus lettiensis Gunther's Pipehorse, Indonesian Pipefish [66273]		Species or species habitat may occur within area
Solenostomus cyanopterus Robust Ghostpipefish, Blue-finned Ghost Pipefish, [66183]		Species or species habitat may occur within area
Stigmatopora argus Spotted Pipefish, Gulf Pipefish, Peacock Pipefish [66276]		Species or species habitat may occur within area
Syngnathoides biaculeatus Double-end Pipehorse, Double-ended Pipehorse, Alligator Pipefish [66279]		Species or species habitat may occur within area
Trachyrhamphus bicoarctatus Bentstick Pipefish, Bend Stick Pipefish, Short-tailed Pipefish [66280]		Species or species habitat may occur within area
Mammal		
Dugong dugon Dugong [28]		Species or species habitat may occur within area
Reptile		

Scientific Name	Threatened Category	Presence Text
Aipysurus apraefrontalis Short-nosed Sea Snake, Short-nosed Seasnake [1115]	Critically Endangered	Species or species habitat likely to occur within area
Aipysurus foliosquama Leaf-scaled Sea Snake, Leaf-scaled Seasnake [1118]	Critically Endangered	Species or species habitat likely to occur within area
Aipysurus laevis Olive Sea Snake, Olive-brown Sea Snake [1120]		Species or species habitat may occur within area
Aipysurus pooleorum Shark Bay Sea Snake [66061]		Species or species habitat may occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
Chelonia mydas Green Turtle [1765]	Vulnerable	Breeding known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Breeding likely to occur within area
Emydocephalus annulatus Eastern Turtle-headed Sea Snake [1125]		Species or species habitat may occur within area
Ephalophis greyae as Ephalophis greyi Mangrove Sea Snake [93738]		Species or species habitat may occur within area
Eretmochelys imbricata Hawksbill Turtle [1766]	Vulnerable	Species or species habitat known to occur within area
Hydrophis elegans Elegant Sea Snake, Bar-bellied Sea Snake [1104]		Species or species habitat may occur within area
Hydrophis kingii as Disteira kingii Spectacled Sea Snake [93511]		Species or species habitat may occur within area

Scientific Name	Threatened Category	Presence Text
Hydrophis major as Disteira major Olive-headed Sea Snake [93512]		Species or species habitat may occur within area
Hydrophis platura as Pelamis platurus Yellow-bellied Sea Snake [93746]		Species or species habitat may occur within area
Natator depressus Flatback Turtle [59257]	Vulnerable	Breeding known to occur within area

Whales and Other Cetaceans		[Resource Information]
Current Scientific Name	Status	Type of Presence
Mammal		
Balaenoptera acutorostrata Minke Whale [33]		Species or species habitat may occur within area
Balaenoptera edeni Bryde's Whale [35]		Species or species habitat may occur within area
Balaenoptera musculus Blue Whale [36]	Endangered	Species or species habitat likely to occur within area
Delphinus delphis Common Dolphin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis Southern Right Whale [40]	Endangered	Species or species habitat likely to occur within area
Grampus griseus Risso's Dolphin, Grampus [64]		Species or species habitat may occur within area
Megaptera novaeangliae Humpback Whale [38]		Species or species habitat known to occur within area
Orcinus orca Killer Whale, Orca [46]		Species or species habitat may occur within area

Current Scientific Name	Status	Type of Presence
Sousa sahulensis Australian Humpback Dolphin [87942]		Species or species habitat may occur within area
Stenella attenuata Spotted Dolphin, Pantropical Spotted Dolphin [51]		Species or species habitat may occur within area
Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]		Species or species habitat likely to occur within area
Tursiops truncatus s. str. Bottlenose Dolphin [68417]		Species or species habitat may occur within area

Extra Information

Nationally Important Wetlands	[Resource Information]
Wetland Name	State
Lake MacLeod	WA

EPBC Act Referrals			[Resource Information]
Title of referral	Reference	Referral Outcome	Assessment Status
Not controlled action			
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed

Biologically Important Areas		[Resource Information]
Scientific Name	Behaviour	Presence
Seabirds		
Sternula nereis Fairy Tern [82949]	Breeding	Known to occur
Whales		
Balaenoptera musculus brevicauda Pygmy Blue Whale [81317]	Distribution	Known to occur
Megaptera novaeangliae Humpback Whale [38]	Migration (north and south)	Known to occur

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Please feel free to provide feedback via the Contact us page.

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APPENDIX I CLOSURE RISK MATRIX AND RISK REGISTER

Table 13-7 Risk Consequence Ratings

Consequence					
Consequence type	**Insignificant (1)**	**Minor (2)**	**Moderate (3)**	**High (4)**	**Major (5)**
Safety	First-aid case	Medical treatment case	Lost-time injury	Permanent disability or single fatality	Numerous permanent disabilities or multiple fatalities
Environment	Lasting days or less; affecting small area (m); receiving environment altered with no sensitive habitats and no biodiversity value (e.g. urban/ industrial areas)	Lasting weeks; affecting limited area (hundreds of m); receiving environment altered with little natural habitat and low biodiversity value	Lasting months; affecting extended area (km); receiving environment comprising largely natural habitat and moderate biodiversity value	Lasting years; affecting area on sub-basin scale; receiving environment classified as having sensitive natural habitat with high biodiversity value	Permanent impact; affecting area on a whole basin or regional scale; receiving environment classified as highly sensitive natural habitat with very high biodiversity value
Legal and regulatory	Technical noncompliance. No warning received; no regulatory reporting required	Breach of regulatory requirements; report/ involvement of authority. Attracts administrative fine	Minor breach of the law; report/ investigation by authority. Attracts compensation/ penalties/ enforcement action	Breach of the law. May attract criminal prosecution, penalties/ enforcement action; individual licence temporarily revoked	Significant breach of the law. Individual or company lawsuits; permit to operate substantially modified or withdrawn
Social / community	Minor disturbance of culture/social structures	Some impacts on local population, mostly repairable. Single stakeholder	Ongoing social issues. Isolated complaints from community	Significant social impacts. Organised community protests threatening	Major widespread social impacts. Community reaction affecting business

Consequence					
Consequence type	**Insignificant (1)**	**Minor (2)**	**Moderate (3)**	**High (4)**	**Major (5)**
		complaint in reporting period	members/ stakeholders	continuity of operations	continuity. Licence to operate in jeopardy

Table 13-8 Risk Likelihood Scale

Likelihood Scale	
Scale	**Likelihood**
Improbable (1)	<3% Likelihood of occurring is less than 3%. It would require a substantial change in circumstances to create an environment for this to occur, and even then, this is a rare occurrence.
Unlikely (2)	3-10% Likelihood of occurring more than or equal to 3% and less than 10%. There are no specific circumstances to suggest this could happen.
Possible (3)	10–30% Likelihood of occurring more than or equal to 10% and less than 30%. There is a possibility of this risk occurring as it has occurred before (albeit infrequently) in the mining and metals industry / area.
Likely (4)	30-90% Likelihood of occurring more than or equal to 30% and less than 90%. This consequence is not uncommon in the mining and metals industry/area.
Almost Certain (5)	>90% Greater than 90% likelihood of occurring. Has happened/will probably happen during the mine life and there is no reason to suspect it won't happen.

Table 13-9 Risk Matrix

Likelihood	Consequence				
	Insignificant	Minor	Moderate	High	Major
Improbable (1)	Low (1)	Low (3)	Medium (6)	Medium (10)	Significant (15)
Unlikely (2)	Low (2)	Low (5)	Medium (9)	Significant (14)	Significant (19)
Possible (3)	Low (4)	Medium (8)	Significant (13)	Significant (18)	High (22)
Likely (4)	Medium (7)	Medium (12)	Significant (17)	High (21)	High (24)
Almost Certain (5)	Medium (11)	Significant (16)	Significant (20)	High (23)	High (25)

Table 13-10 Mine closure risk assessment

#	Event	Causes	Consequences	Consequence	Likelihood	Inherent Risk	Control Options	Consequence	Likelihood	Residual risk
1	Salt load exceeds lakes' natural assimilative capacity	Poor material management. Seepage into groundwater. Incorrect bitterns disposal. Breaching of the 30,000 Levee. Thick salt crusts. Atypical salt composition. Large quantity of salt movement (flush).	Poor quality run-off and seepage. Impacts to receiving environment. Impacts to lake biota. The requirement for ongoing remedial works. Impacts to Lake MacLeod biodiversity.	Moderate (3)	Unlikely (2)	Medium (9)	Staged breaching of the Levee to control salinity inputs to Lake MacLeod. Investigate scarification of salt crust to improve salt dissolution.	Moderate (3)	Improbable (1)	Medium (6)
2	Delay in tenement relinquishment.	Completion criteria are not achievable, not aligned to PMLU, or are not endorsed by the regulators. Completion criteria and monitoring program are not aligned to outcome requirements. Poor closure and rehabilitation planning and implementation. JTSI is unwilling to accept residual liabilities as current State Agreement assumes site and asset transfer back to the State.	Delay in mining tenement relinquishment. Ongoing closure management, monitoring, and maintenance costs. Uncertainty about long term management of residual liabilities for the community, the State, and LMC.	Moderate (3)	Likely (4)	Significant (17)	Develop acceptable and achievable closure criteria in consultation with relevant stakeholders. Continue to develop applicable closure and rehabilitation plans. Implement works in accordance with approved closure designs. Continue to engage relevant stakeholders to develop a plan to relinquish mining tenure in a coordinated manner and to establish a plan for the long term management of residual liabilities. Monitor closure performance and present performance data to relevant stakeholders. Ongoing research Infinite resource	Moderate (3)	Unlikely (2)	Medium (9)
3	Stakeholder unwilling to accept jetty transfer	The State/JTSI is unwilling to accept the Jetty in the condition offered (although current Agreement does not consider condition of infrastructure). Degraded or damaged state of jetty. Outdated, purpose-built jetty that may not suit all needs/uses. Competition (another jetty constructed). Change in stakeholder expectations (e.g. marine vs	Reduced potential divestment opportunities. Financial impacts to improve for transfer of ownership. Alternative removal option/s required.	Major (5)	Possible (3)	High (22)	Ongoing maintenance to promote successful transfer (to State or other third party). Ongoing stakeholder engagement.	Major (5)	Improbable (1)	Significant (15)

#	Event	Causes	Consequences	Consequence	Likelihood	Inherent Risk	Control Options	Consequence	Likelihood	Residual risk
		terrestrial waste removal). Updated State Agreement requirements.								
4	Uncontrolled drainage.	Poorly constructed and designed drainage controls. Poor materials selection and placement. Extreme rainfall events exceed the design capacity of drainage controls. Mineral waste and gypsum stockpiles that remain at site.	Unacceptable levels of erosion. Increased sediment load to surface water. Loss of growth media and seed. Unsafe conditions. Increased salt loads to the lake. Aesthetics	Moderate (3)	Unlikely (2)	Medium (9)	Design and construct adequate long-term controls to manage surface water drainage. Implement an appropriate rehabilitation plan (ground preparation, growth media, seeding, etc.). Rundown stockpiles and remove (or deep rip) bases. Construct mineral waste stockpile erosion structures.	Moderate (3)	Improbable (1)	Medium (6)
5	Release of airborne fibrous materials	Release of asbestos as potash facility degrades and is demolished. Removal / rehabilitation of other facilities (e.g. old power station) Unknown locations may exist.	Impacts to receiving environment. Requirement for ongoing remedial works. Detrimental human health conditions. Higher than expected cost for disposal.	Moderate (3)	Possible (3)	Significant (13)	Specialist to remove asbestos material. Potash facility to be deconstructed/demolished by experienced contractor. Ongoing contaminated site investigations and remediation. Ground disturbance procedures / permits / controls Security in place (fencing). Compliance with WHS Guidelines (working with asbestos/fibrous material).	Moderate (3)	Improbable (1)	Medium (6)
6	Unauthorised access to site	Unintentional access to operational areas (tourists). Intentional access to operational areas (recreation).	Human injury or fatality.	High (4)	Possible (3)	Significant (18)	Rehabilitate access roads where they are no longer required. Breach bunds Reprofile collection ditch batters; maintain fauna escape netting Reinstate pastoral fencing around Lake. Investigate potential fill source and requirements (material balance).	High (4)	Improbable (1)	Medium (10)
7	Excessive dust	Stockpiles and gypsum material not appropriately covered. Windy conditions. Poor revegetation.	Impacts to receiving environment. Requirement for ongoing remedial works.	Minor (2)	Possible (3)	Medium (8)	Implement an appropriate rehabilitation plan (surface treatments, seed selection, collection, storage and management). Remove all material stockpiles and bases.	Insignificant (1)	Unlikely (2)	Low (2)

#	Event	Causes	Consequences	Consequence	Likelihood	Inherent Risk	Control Options	Consequence	Likelihood	Residual risk
8	Contamination resulting from hazardous materials storage and handling.	Inadequate transport, handling and hazardous materials. Asbestos material present. Hazardous materials left on site. Contaminated sites not treated/remediated. Inappropriate storage remaining on site. Degradation of storage facilities.	Negative impacts to groundwater. Detrimental effects to the receiving environment.	Moderate (3)	Possible (3)	Significant (13)	Removal of all hazardous materials prior to closure. Treat / remediate contaminated sites. Manage as per the relevant management plan.	Moderate (3)	Unlikely (2)	Medium (9)
9	Assets left intact after closure deteriorate and become a liability (all assets except jetty).	Residual assets are not transferred to new owner. The post closure liability for residual assets is not agreed with new owners. Stakeholder expectations for residual assets are not defined. Residual assets are not fit for purpose and are not functional at transfer. Stakeholders do not accept assets.	Company reputation adversely affected. Assets become a liability. Human injury.	Moderate (3)	Possible (3)	Significant (13)	Only those assets that have an agreed owner and viable future use, will be left intact after closure. Responsibility for residual assets will be transferred to the new owner. Where required, ensure that residual assets are fit for purpose and left in good working order.	Moderate (3)	Unlikely (2)	Medium (9)
10	Stakeholder expectations are not met .	Inadequate stakeholder consultation. Changing stakeholder expectations. Inaccurate impact predictions. Breach of State/Traditional Owner (TO)/other agreements. Proposed PMLU not accepted by stakeholders. Unexpected restrictions in land access.	Company reputation adversely affected. Missed opportunities to improve closure outcomes. Increased closure implementation and post-closure management costs. Extended timeframe to relinquishment of mining tenure.	Moderate (3)	Possible (3)	Significant (13)	Effectively and demonstrably engage relevant stakeholders in the closure planning process. Continue to validate impact predictions. Formalising agreements, post-mining land uses (PMLUs), etc.	Moderate (3)	Unlikely (2)	Medium (9)
11	Early/Premature closure	Unforeseen climate event. Economic or regulatory factors.	Inadequate provision for closure. Stakeholder expectations not	Minor (2)	Unlikely (2)	Low (5)	Continue to review and update the cost provision. Ability to operate flexibly and react to market conditions. Ongoing closure planning and	Minor (2)	Improbable (1)	Low (3)

#	Event	Causes	Consequences	Consequence	Likelihood	Inherent Risk	Control Options	Consequence	Likelihood	Residual risk
			met. Inadequate closure planning.				climate predictions including with regular reviews. Maintaining appropriate insurance.			
12	Heritage sites damaged by closure works	Heritage sites are not clearly identified/demarcated. Closure contractors have not been provided heritage locations. Accidental damage during closure activities.	Company reputation adversely affected. Increased closure implementation and post-closure management costs. Extended timeframe to relinquishment of mining tenure. Legal non-compliance.	High (4)	Unlikely (2)	Significant (14)	Heritage areas marked and fenced. Contractors aware of sites. Ground disturbance processes in place. Regularly review and update the Cultural Heritage Management Plan. Regular engagement with TOs.	High (4)	Improbable (1)	Medium (10)
13	Poor revegetation outcomes.	Lack of suitable growth medium. Poor seed supply, quality, and management. Extreme/poor climatic events. Excessive weed occurrence. Grazing pressures. Excessive erosion of rehabilitated surfaces. Poor drainage. Saline waste materials in/near revegetation area.	Requirement for ongoing remedial works. Weeds become dominant. Excessive dust generation. Erosion causes loss of growth media, seeds, etc. Limited fauna recolonisation. Rehabilitated areas do not achieve a self-sustaining native vegetation outcome. Inability to meet closure criteria.	Minor (2)	Likely (4)	Medium (12)	Implement an appropriate rehabilitation plan (ground preparation, surface treatments, seed selection, collection, storage and management). Undertake post closure monitoring and maintenance as required. Implement ongoing weed control and management. Feral animal control.	Minor (2)	Possible (3)	Medium (8)
14	Geotechnical instability due to operational and closure activities	Unstable cliff structure at Cape Cuvier. Excessive erosion. Closure activities damage landforms.	Geotechnical instability. Cost and time to address ongoing remedial works.	Moderate (3)	Unlikely (2)	Medium (9)	Stockpiles will be removed. Infrastructure to be removed by an experienced contractor. Reprofiling and/or stabilisation of landform at closure. Removing public access.	Moderate (3)	Improbable (1)	Medium (6)