DWER Licence L7178/1997/11 Licence Amendment Supporting Document

Lake MacLeod Solar Salt Project

Document ID 2505 – L7178/1997/11

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[redacted]

Revision Record

Revisions	Description	Author(s)	Reviewer(s)	Approver	Approval Date
0.1	First Draft	TM	RF, GM & JB	RF	22/05/2025
0.2	Second Draft	TM	RF	RF	27/05/2025
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Issue History

Revisions	Issued To	Date	Transmittal
1.0	DWER	28/05/2025	Email

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1 Project Background

Lake MacLeod Pty Ltd (**Lake MacLeod**) acquired the Lake MacLeod Solar Salt Operation from Dampier Salt Limited (**DSL**) on 02 December 2024. Salt production commenced at Lake Macleod in the 1960's with continuous operation to the present under a number of project owners. Lake MacLeod now operates the Lake MacLeod salt fields to produce halite salt (sodium chloride) from hyper saline groundwater using solar evaporation. This groundwater is fed by the Indian Ocean by means of seepage and upwelling vents due to Lake MacLeod being lower than sea level. The Lake MacLeod operation is located on the northwest coast of Western Australia 50 km North of Carnarvon, approximately 900 km north of Perth. The regional location of the operation can be seen in Figure 1.

The saturated brine contained in Lake MacLeod is approximately 10 times saltier than normal seawater, eliminating the need for a series of concentration ponds normally required at other salt mines to evaporate water to reach "salting" point (sodium chloride saturation).

A collection ditch has been cut into the halite layer to recover brine from Lake MacLeod. The brine is pumped from the collection ditch through a transport channel to a common collection point. Once deposited in the crystallising ponds the brine is further evaporated and salt is deposited on top of a pavement, a hardened floor of salt. Deposition is stopped by draining the remaining brine when about three quarters of the sodium chloride has been deposited and before other salts come out of solution in significant quantities. The residual brine is called bitterns and contains high concentrations of potassium, magnesium, and other salts. Bitterns are discharged from the crystallisers into a holding pond on the lake's surface where the water is evaporated. The resulting solid bitterns represent a significant resource which may also be harvested.

The harvested salt is then washed at the salt wash plant to remove impurities off the salt. Once washed the salt is stockpiled and allowed to drain. Once the salt has finished draining, it is hauled by road trains, 24 km to a dry stockpile at Cape Cuvier for shipment. Reclaim for ship loading is by dozers which push the salt into a hopper, which then feeds to a conveyor system under the stockpile. The conveyor system transports the salt to the ship loader which feeds the salt onto the vessel at the wharf.

Gypsum mining is carried out on the premises by excavation of raw gypsum from the lake surface. This is achieved through using an excavator and truck mining method. Following excavation, heap leaching of the gypsum stockpiles occurs with

sprinklers using bore and fresh water, the latter produced from bore water using the reverse osmosis plant (**RO**) at the gypsum facility, on two gypsum leach pads. This washes sodium chloride (**salt**) minerals from the gypsum stockpiles to the required chloride levels. The gypsum is then transported to Cape Cuvier where it is stockpiled and shipped.

Lake MacLeod currently holds a Department of Water and Environmental Regulation (**DWER**) Part V EP Act Licence L7178/1997/11 (**the Licence**), which was last amended on 14 March 2025. Table 1 below contains an overview of the current licence. This document has been prepared to provide relevant information to support a new licence amendment application.

Table 1: Prescribed premises overview

Licence number:	L7178/1997/11		
Premises:	Lake MacLeod Solar Salt Operation		
Prescribed premise details:	**Category number**	**Category description**	**Assessed production/design capacity**
	14	Solar salt manufacturing	6,100,000 tonnes per annual period
	58A	Bulk material loading or unloading (salt)	84,000 tonnes per day
	64	Class II or III putrescible landfill site	60 tonnes per annual period
Issue date:	1 October 2015		
Commencement date:	4 October 2015		
Last amendment date:	14 March 2025		
Expiry date:	3 October 2035		

2 Licence Amendment Objective

The operation has historically produced up to 3 Mt/a of salt, more recently that annual production has been around 1.5 Mt/a. Lake MacLeod intends to increase the current production of salt from 1.5 Mt/a to 3 Mt/a with a target of achieving this by 2027. The main constraint to accomplish this is the crystalliser pond area and corresponding brine delivery. To achieve the increase in production, expansion of the existing salt crystalliser ponds by approximately 300 hectares (ha) will be

required. The annual brine flows through the project will nominally double, and pump station upgrades or additions are required.

As part of the crystalliser expansion work, Lake MacLeod is also seeking to relocate the existing northern flood levee further to the north. This will protect the newly constructed crystalliser cells from flood events as well as future proofing any further expansions of the crystalliser field that may be required in the years to come. Note it is only the flood levee that will be relocated further to the north and not the bitterns holding pond, there will be no changes to the bittern holding pond as part of this licence amendment.

Some other minor changes are requested as part of this licence amendment application as listed below. Additional detail on these requested changes are included in section 4.

- Improvements to the oily water separators conditioned within the licence;
- Inclusion of an oily water separator not previously captured on the licence;
- Amend the monitoring requirements associated with the acid sulfate soils at the gypsum mining operations; and
- Update of figures and spatial data associated with the licence.

Lake MacLeod is not seeking to include any new categories on the Licence or change the current assessed production/design capacity.

This Supporting Document to the Licence Amendment Application Form provides the attachments required by DWER *Application form: Works Approval / Licence / Renewal / Amendment / Registration v 16, August 2022* (**application form**; DWER, 2022).

Lake MacLeod has reviewed the application form and determined that the following attachments are required to support this application (provided in this document):

- Attachment 2 (Premises map);
- Attachment 3B (Proposed activities);
- Attachment 3C (Map of area proposed to be cleared)
- Attachment 5 (Other approvals);
- Attachment 6A (Emissions and discharges); and
- Attachment 7 (Siting and location).

Lake MacLeod determined that the following attachments are not required as they remain unchanged from the Licence or are not relevant to this application:

- Attachment 1A to 1C (Applicant details);
- Attachments 3A, 3C and 3D (environmental commissioning, clearing and additional information);

- Attachment 4 (Marine surveys);
- Attachment 6B (Waste acceptance);
- Attachment 8 (Additional information);
- Attachment 9 (Category- specific checklist(s));
- Attachment 10 (Proposed fee calculation – the fee calculation for the amendment is simple and does not require supporting documentation); and
- Attachment 11 (Request for exemption from publication).

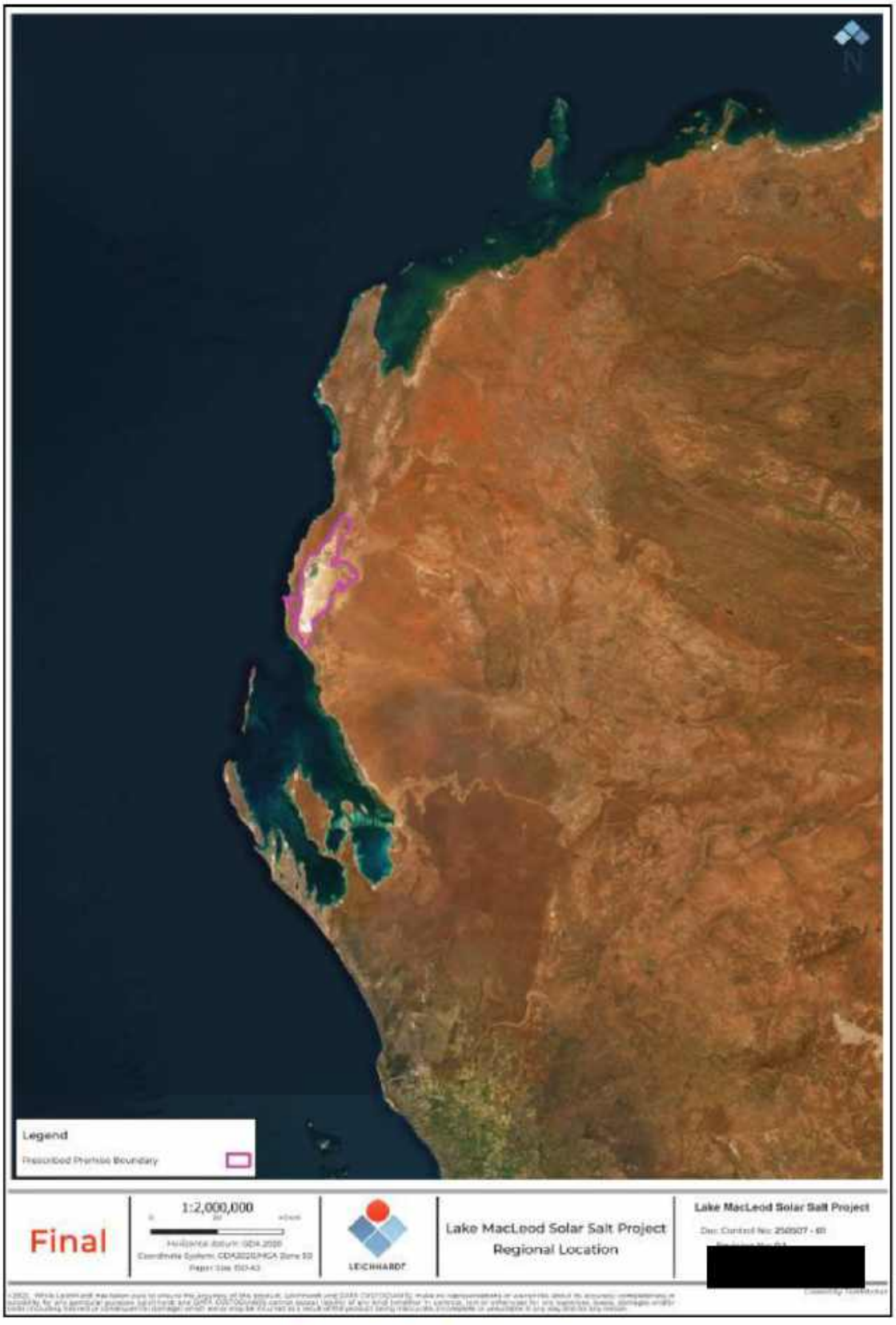

Figure 1 - Regional Location

3 Attachment 2 - Premises Maps

There are no changes to the premises location or prescribed premise boundary as part of this application. The unchanged premises boundary is shown in Figure 2 premises boundary coordinates are provided in Table 2.

Table 2: Premises boundary coordinates (GDA2020)

Latitude °S	Longitude °E
AML70/245	
790286.9	7388044.7
797255.5	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	7331397.5
786636.5	7331497.4
780587.3	7322347.5

Latitude °S	Longitude °E
777178.7	7309058.5
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
765072.6	7299228.3
765444.5	7291700.4

Latitude °S	Longitude °E
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
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748423.2	7309023.5
749113.2	7307548.7
750525.6	7306416.7
751245.4	7305132.0
751364.6	7304335.8
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752793.7	7299600.8
743943.3	7317531.9
743280.9	7318146.9

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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
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744880.3	7318647.0
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747136.1	7319146.9
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752883.7	7300862.2

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757565.5	7337345.4
757634.9	7343595.1
763015.3	7354427.5
770035.9	7356697.5
773636.3	7363757.6
756245.5	7319147.0
L09/18	
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752197.7	7291120.2
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752208.4	7291269.5

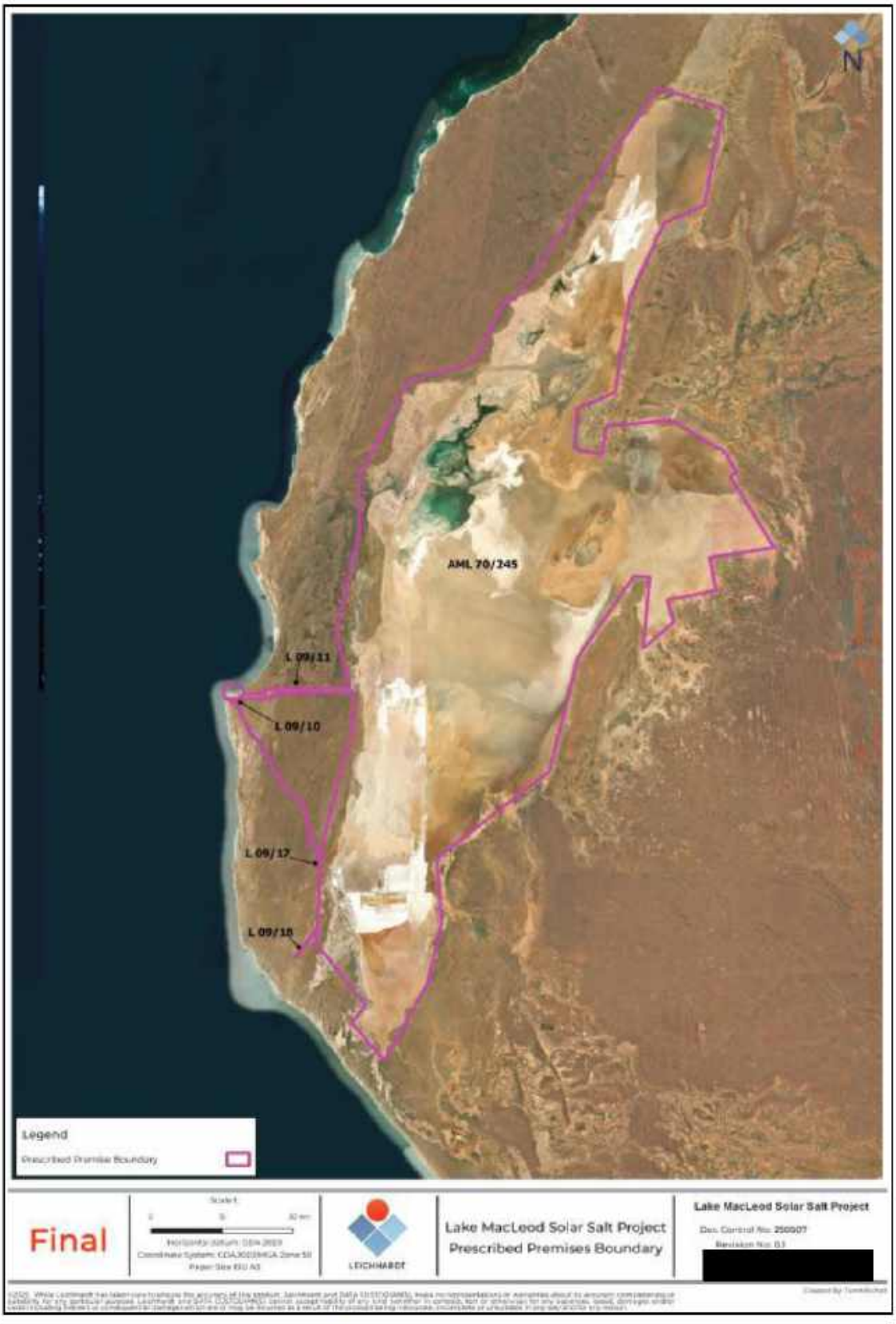

Figure 2 - Premises boundary (from L7178/1997/11)

4 Attachment 3B - Proposed Activities

4.1 New Crystalliser Ponds

The crystalliser area currently has 34 crystallisers of nominally 20 to 25 ha each. Figure 3 displays the current crystalliser configuration.

The new crystallisers will be around 50 ha of wet area each, about twice the size of the existing. The new crystallisers will be constructed and operated as a single series (batch process) crystalliser similar to the few larger existing crystallisers such as F3/ F1 and E3. The bunds would be in the order of 1.2m high, allowing for a salt floor and up to 600 mm of product salt.

Approximately 525,000 m^3 of material will be sourced from borrow areas along the Western shore of the lake to construct the required levees. It is anticipated that all levee material can be sourced from these defined borrow areas and waste gypsum material. Lake MacLeod currently has an approved borrow pit under Native Vegetation Clearing Permit (NVCP) 5310/3 that will provide the majority of material required. Investigations are currently being conducted to determine potential additional borrow pit areas. If these are required, a new NVCP application will be submitted later in the year.

GHD has been commissioned to design the new crystalliser cells and flood levee. This design work is ongoing but has been progressed to 15% design. GHD have prepared a report on the 15% design and this information has been used to assess any environmental risks associated with these works. Section 4.1 through to Section 4.10 of this supporting document will reference the GHD design report, and the GHD report is provided as Appendix 1 of this report.

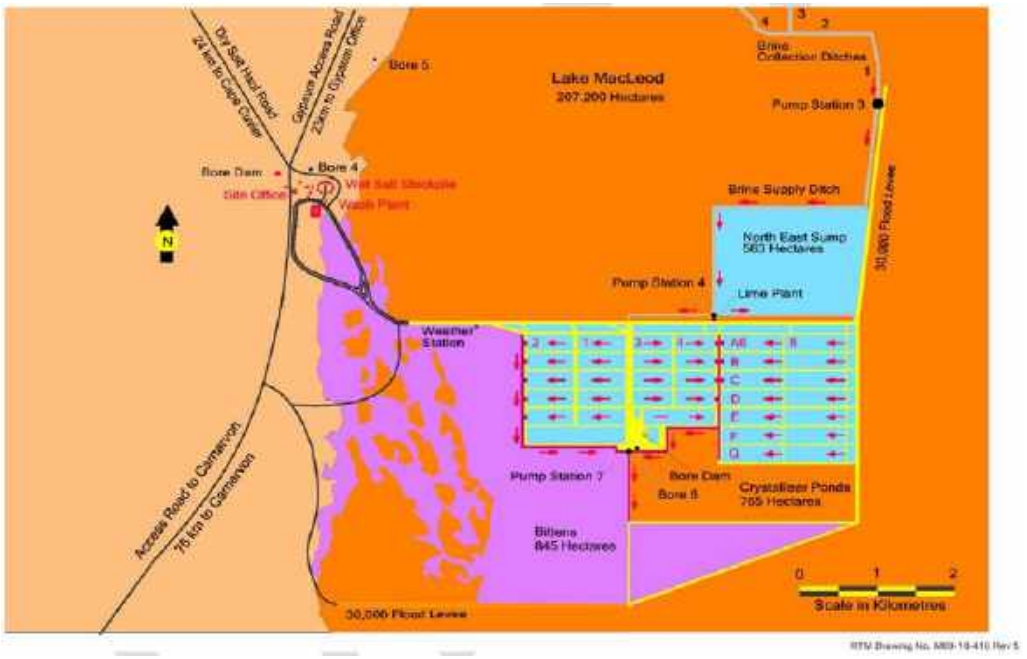

Figure 3: Current Crystalliser Configuration

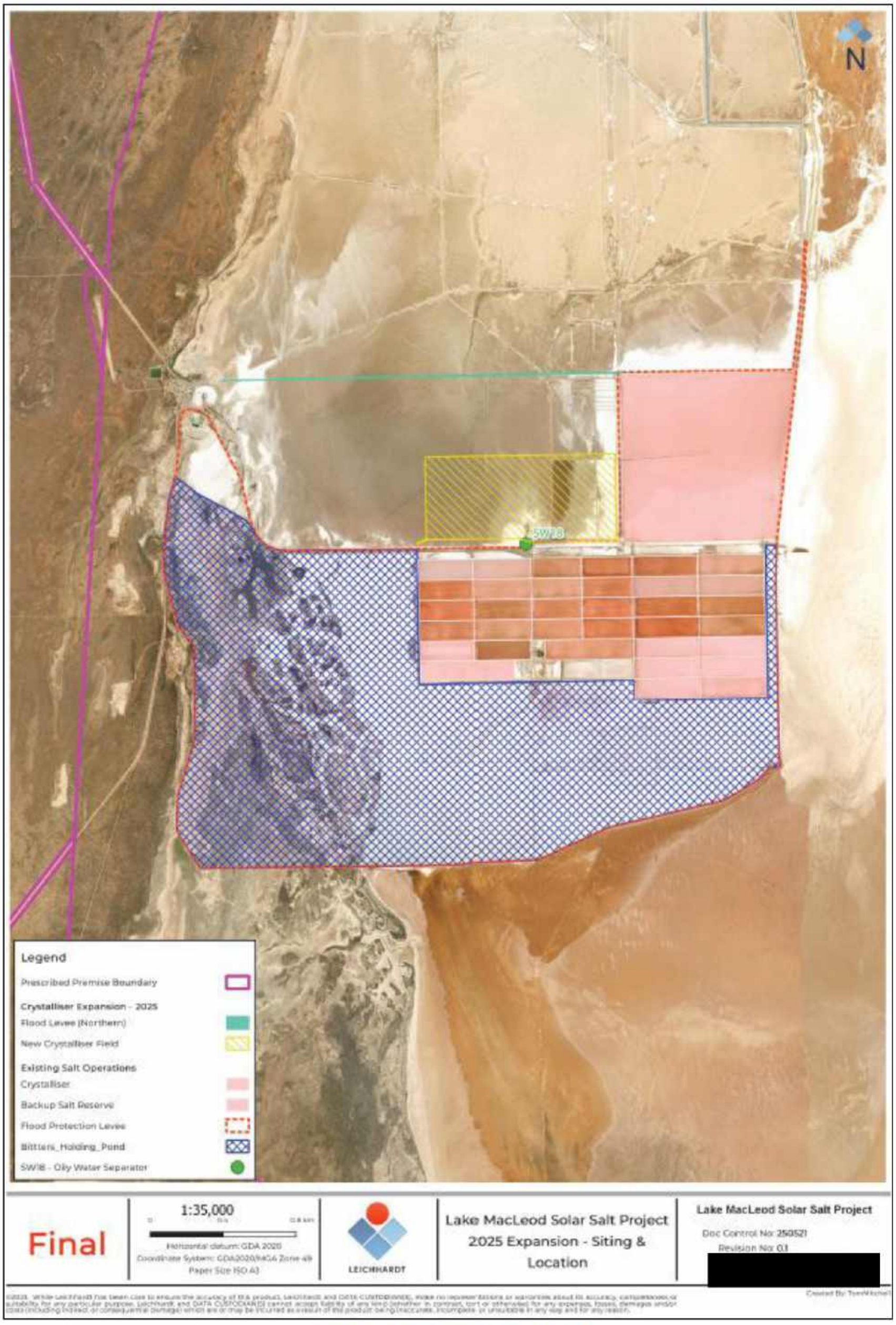

Figure 4 - Key Infrastructure Location

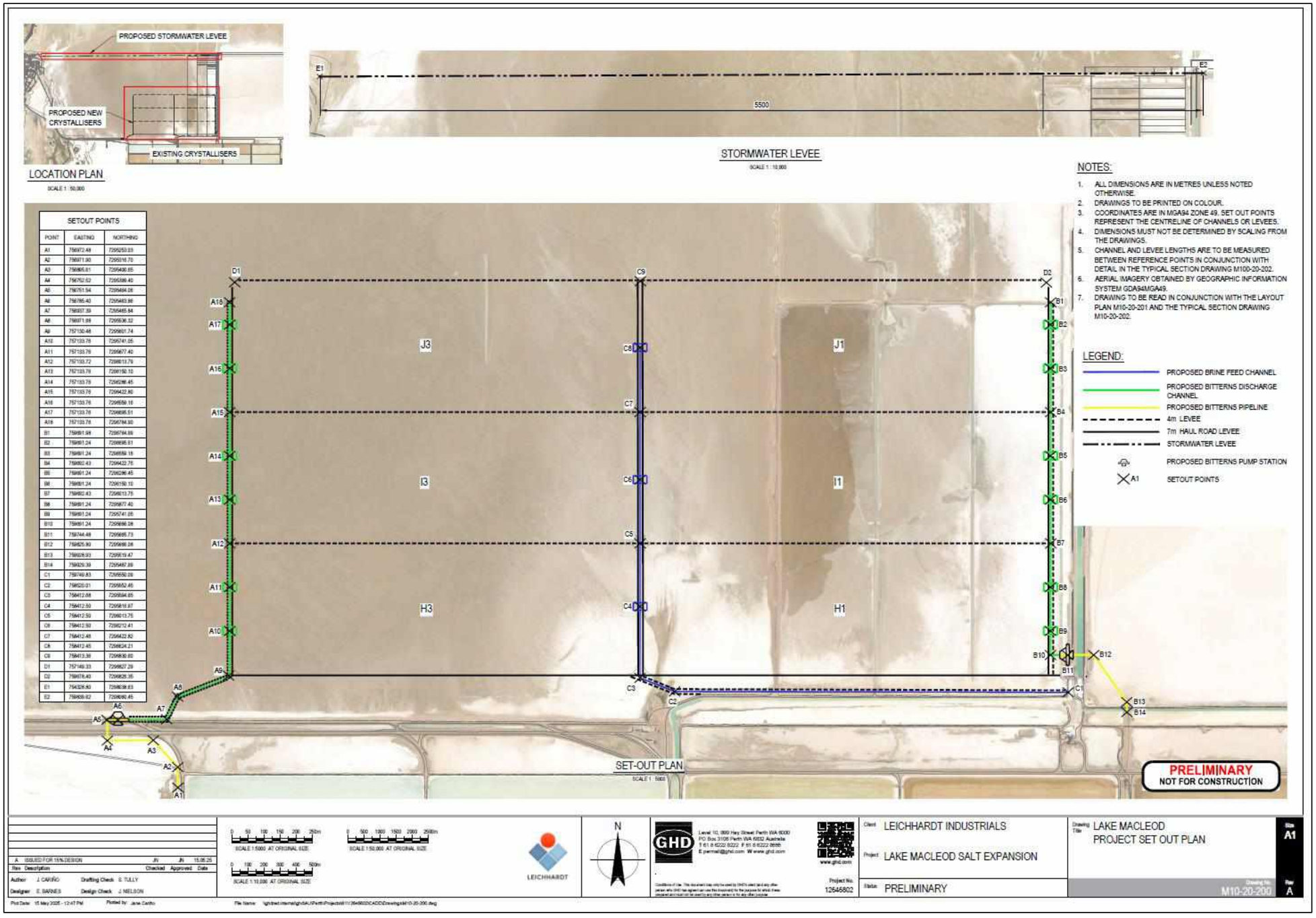

Figure 5 - Proposed Crystalliser and Flood Levee Layout

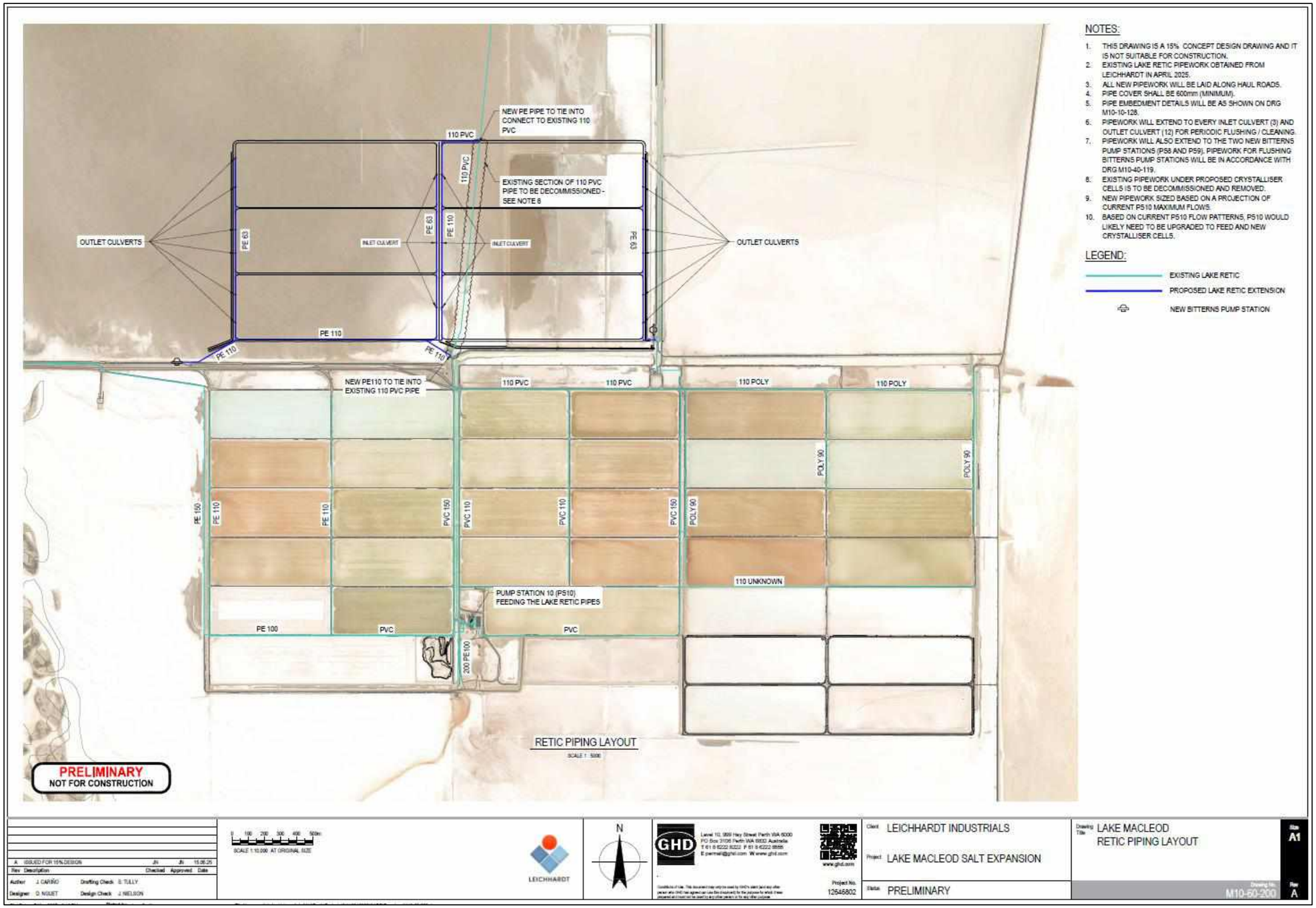

Figure 6 - Reticulation and Piping Layout

4.2 Earth Works

The following are the key criteria relating to the general civil earthworks design of the new crystalliser field and flood levees:

- Total of 6 cells, length of 1250 m by width of 400 m to achieve a total of 300 ha of new crystallisers (Figure 5).
- Pavement level is to be 300 mm above existing ground level (comprised of grown product, not earthworks).
- Internal levee height – set by the required freeboard above the 1.2 m diameter culverts. This will result in a levee height from pavement level on the internal cell side of 1.725 m and on the channel side, 2.325 m.
- Levees are proposed to be constructed from gravel from nearby borrow pits and or waste gypsum material.
- Levees on the outside of the new crystalliser system are proposed to be 4 m top width levees, as they will not be required for access for harvest vehicles to the cell pavements.

4.3 7m Wide Haul Road Levees

The following are key criteria relating to the design of the 7 m haul road levees:

- Levee internal top widths are to be 7 m, not inclusive of additional width for windrows.
- Embankment batter slopes for the 7 m haul roads are to be 1:1.5. In order to accommodate this and the required culvert cover, the levee base footprint width will be approximately 13m.
- Levees to consist of gravel from nearby borrow pit and or waste gypsum material and a waterproof membrane to a depth of 2000 mm from the top of levee.
- Earthen windrows are proposed for 7 m haul road levees only, with an additional height above the road level of 0.5 m and horizontal footprint of 1.5 m.
- Internal road slope - Saw tooth road design (longitudinal slope of 0.8% in a saw-tooth pattern creating high and low points along the road), with a 2% crossfall away from crystallisers and towards drainage outlets.
- V-drains are proposed to daylight into windrow openings at all low points along the haul roads as per existing design. This will be nominally every 150 m along the haul roads.

4.4 4m Wide Levees

The following are key criteria relating to the design of the 4 m levees:

- 4 m levees are intended to be fit as light vehicle roads only.
- Levee top widths are to be 4 m.
- Top level for all 4 m levees road levees will be -1.375 m AHD, consistent with the proposed haul road levees.
- Embankment batter slopes for the 4 m levees are to be 1:1.5. This results in a base footprint width of approximately 10 m.

- Levee to consist of gravel from nearby borrow pit and or waste gypsum material and a waterproof membrane to a depth of 2000 mm from the top of levee.
- The following locations are not requiring harvest vehicle access and therefore are suitable for 4 m light vehicle levees:
    - The northern side of the new proposed crystalliser.
    - The external levees adjacent to bitterns channels.
    - The new levee on the northern bank of the proposed brine transfer channel which ties into the existing access road at the upstream extent of works. This, in combination with the existing access road on the southern side of the new channel are proposed to ensure sufficient channel capacity for the transfer channel to feed the new crystalliser system up to required peak flows.
    - Conservatively, additional levees adjacent to the south-western bitterns channel to Pump Station 9 (PS 9) have been included.

4.5 Flood Levee (Northern)

The Flood Levee to the north of the salt operations is proposed to be relocated further north so that it protects the new crystalliser field. This will also provide additional protected area for any potential future expansions of the crystalliser field. Figure 4 includes the location of the existing flood protection levee and the proposed location of the new levee.

It is important to avoid confusion between the flood protection levee and the bitterns holding pond. A significant portion of the flood protection levee is utilised as both a flood protection levee and the containment wall for the bitterns holding pond. However, to the north, as can be seen in Figure 4 they diverge. The new flood levee to the north will have no impact on the bitterns holding pond and there will be no change to the bitterns holding pond or current discharge locations into the bitterns holding pond.

The following are key criteria relating to the design of the Flood Levee:

- Height – varies as set by the 2% Annual Exceedance Probability (AEP) event stormwater flood level of -1.1 m AHD.
    - Final width is still being determined. Base footprint will vary with levee height as a result of varying existing ground levels.
    - Batter slopes - 1:2.5 on the inside and 1:3 on the outside (lake side.
    - It is noted that the existing access road levee, where the new proposed stormwater levee will tie into is not currently at the required flood protection height for the 2% AEP event with freeboard. Therefore, a ramp down to the existing access road level (~1.4m AHD) will be required.
    - Levee to consist of gravel from nearby borrow pit and or waste gypsum material and a waterproof membrane to a depth of 2000 mm from the top of levee.

4.6 Channels

The following are key criteria relating to the design of the channels:

- All channels will have 1:1.5 side slopes with base widths of 3.2 m.
- Internal brine and bitterns channels will have no gradient, as per existing and previous design drawings.
- Internal brine and bittern channels will have an invert level of -3.7 m AHD – set by the relative level of the pavement to the existing ground level. Therefore, the relative level difference of channel invert to culvert invert level is to be maintained as per existing.

4.6.1 New Brine Feed Channel

- The new proposed parallel brine transfer channel will have a longitudinal gradient of ~0.09% from where it ties in with the existing brine feed channel to where it becomes the proposed internal brine feed channel. This fall is a result of the elevation difference between the existing brine channel tie in location (at approximately -2.55m AHD) to the a forementioned design level (-3.7 m AHD). This will result in the new crystalliser system to be gravity fed from the existing outtake channel for Pump Station 4 (PS 4).
- Offset distance between new brine transfer channel to the existing access road (south side of the channel).
- 2-5 m offset from toe of the embankment to the grading of the channel.
- Design is based on surveyed spot levels provided for the PS4 outtake ditch. It is assumed that the existing PS4 outtake channel and existing parallel brine transfer channel will be maintained to prevent flow blockages or preferential flow.
- Assumed maximum demand brine flow rate to the new system (including brine transfer channel) is 0.606 m^3 /s (2,180 m^3 /hr).

4.6.2 New Bitterns Channels

- The bitterns channels will be designed so that the tailwater levels do not impede discharge from draining culverts. Two crystallisers are assumed to be able to drain freely at a time, but only to separate bitterns channels. The intention is for the bitterns pump to always ensure that the water level in the channel is no higher than the invert level of the draining culvert (with an allowance of 15% of water depth height for freeboard).
- A minimum 20% freeboard is to be allowed for within the channels at maximum anticipated flows – this was assessed through hydraulic modelling.
- It is assumed that downstream channels have sufficient capacity to receive the additional bitterns discharge from the new crystalliser.

4.7 Hydraulic Modelling

4.7.1 Approach and Assumptions

A simplified representation of the new crystallisers approportionate to a 15% design, was created using the software DRAINS (version 2023.11.8726.15750 – 64 bit). The intention for this modelling was to assess the design in relation to the capacity of the proposed channels against the design flow rates provided Lake MacLeod. The following key models were created for this assessment:

Model 1: Proposed brine feed channel capacity– assuming a single crystalliser is to be filled at a constant maximum potential flow rate.

Model 2: Proposed bitterns channel capacity assessment – assuming the bitterns pump on level will always ensure that the water level in the channel is no higher than the invert level of the draining culvert (with a 15% allowance of water depth height for freeboard).

Model 3: Existing channel capacity assessment between PS3 and PS4 – assuming a constant peak flow from PS3.

4.7.2 Hydraulic Modelling Results

Model 1 – Brine feed channel capacity assessment

Modelling results indicated that the channel will provide sufficient capacity and freeboard within the channel for the peak incoming flow of 0.606 m^3 /s.

It was noted that the modelling results indicate that the freeboard available within the culverts at this peak maximum flow rate is anticipated to be ~11% of the available flow area.

Model 2 – Bitterns channel capacity assessment

Modelling results indicate that a constant pump out rate at the assumed 0.389 m^3 / s (1,400 m^3 / hr) will likely be sufficient to drain one crystalliser cell in approximately 3.5 - 4 days. This result should be considered indicative only as the purpose of this assessment was to confirm that the bitterns' channels as designed would have sufficient capacity. Considering a direct pump out rate of 0.389 m^3 /s and the assumed total static starting volume of fluid within one crystalliser, a maximum theoretical drain down time could be considered ~3 - 4.5 days depending on assumed starting volumes (a conservative assumption of 300 mm to drain would be an estimate of 4.5 days). It is key to note the modelling assumes a constant pump out rate at the peak allowable rate for the intended bitterns pump design, which does not reflect reality. In addition, draining flow rates directly from the crystallisers, through culverts to the channel reduce over time as the total volume in the crystalliser reduces.

Model 3 Existing channel capacity assessment between PS3 and PS4

Lake MacLeod has reviewed the findings from the GHD 15% design report and believes the existing pumps will have the required capacity.

4.8 Lake Reticulation

Due to salt build-up, the following proposed infrastructure will be periodically washed/flushed with borewater from site, following a similar process as the current operations:

- Sluice gates on each of the 18 inlet/outlet culverts
- Bitterns pump stations (PS8 and PS9) discharge pipework.

Borewater is currently pumped from Site Bore Dam (located near Bore 4) to Lake Bore Dam (located near Bore 6 to the south of the existing crystalliser ponds). Lake Bore Dam then conveys borewater via a freshwater pipe network. The outlet

manifold of these pumps is split into two reticulation systems. One side of the outlet manifold supplies the Lime Plant with borewater for various processes (Lime Plant Reticulation) and the other outlet supplies ~150 existing culverts and pump stations PS3, PS4, PS5 and PS7 (Lake Reticulation). It is understood that the existing lake reticulation system comprises mostly DN90/110 PVC/PE PN12.5 pipework.

GHD's Water Balance Report (April, 2025) indicated that the flows in the Lake Reticulation system supplying the ~150 culverts and pump stations are currently variable but have a peak of ~25 m^3 /hr (7l/s) (i.e. system capacity).

The proposed salt expansion will have an additional 18 culverts and two pump stations, thus increasing the flow and head requirements of PS10. For concept design, to determine the additional flows required by the proposed system, it was assumed that the borewater flow would increase on a pro-rata basis, resulting in an additional flow of 3.34 m^3/hr (~1 L/s).

PS10 would therefore need to cater for an increased flow rate from 25 m^3 / hr to 28.34 m^3 / hr and require an additional head of approximately 0.8 m to lift the borewater to the new pond area. This additional flow rate would not require an increase to Lake MacLeod's existing annual abstraction limit under GWL56934 (6) of 3,350,000 kL. An additional bore may be required to be installed to replace existing bores, if this is required an application for a licence under section 26D of the *Rights in Water and Irrigation Act 1914 (Water Agencies (Powers) Act 1984).*

4.9 Mechanical

4.9.1 Proposed Pump Upgrades

Lake MacLeod has reviewed the findings from the GHD 15% design report regarding proposed pumping upgrades and is currently considering if these will be required.

4.9.2 New Pump Stations

To service the new crystalliser cells, two new bitterns pump stations will be added, with one duty pump in each of the new bitterns channels. Pump Station 8 (PS 8) will transfer bitterns from the new Bitterns Channel East to the existing Bitterns Channel East and Pump Station 9 (PS 9) will transfer bitterns from the new Bitterns Channel West to the existing Bitterns Channel West.

The new bitterns pump stations PS8 and PS9 will have a combined duty to match PS7, or 1440 m^3 /h each. This applies at any time two cells drain simultaneously into the bitterns system across the whole site.

The two new bitterns pump stations (PS8 and PS9) have been based on the existing PS7, designed in 2009 by Dampier Salt Ltd. The new stations will consist of one duty pump each, within a concrete sump constructed at the end of each new bitterns channel. The sumps shall be sufficiently deep to have a low set point aligning with the bitterns channel invert level. This will allow the channel to be fully drained to minimise salt build-up and thus maintenance.

4.10 Process and Reagents

There will be no change to the current reagents that are used (milk of lime (MOL) and potassium permanganate) which are currently added to the brine from the existing dosing plant near PS 4. There will also be no change to the dosing rates of these reagents.

4.11 Oily Water Separator Upgrades

As an opportunity for improvement, and to ensure that the increase in truck movements associated with the increase in production is accounted for, the oily water separator locations on the licence will be upgraded.

These upgrades will occur at the three locations detailed below.

- Truck waste, lube bay and reverse osmosis plant Discharge Point at the salt operations (SW4 – Emission to Water);
- Wastewater from the truck wash bay triple interceptor at Cape Cuvier (SW5 – Emission to Land); and
- Waste water from the fuel facility and truck wash triple interceptor at the gypsum operations (L3 – Emission to Land).

The works will involve improvements to the concrete at the facilities to reduce the likelihood of cracking and increase the longevity of the concrete.

Ultraspin oily water separation systems will also be added to each of the existing facilities. These units are considered industry best practice for separating hydrocarbons from water and will significantly improve the functionality of the existing triple interceptors.

Lake MacLeod does not consider the improvement works at the oily water separator locations will cause any additional environmental risks and once installed will ensure discharges from these locations continue to stay within the limits already conditioned within the licence.

Additionally, Lake MacLeod requests all references to triple interceptors within the licence are amended to “Oily Water Separation System”. This will ensure there are no references to specific components of the system but the system as a whole.

4.12 Additional Oily Water Separator

Lake MacLeod has identified that there is an Oily Water Separation System currently being used and discharging into the lakebed that is not captured on the licence. Lake MacLeod requests this is included in the licence with the same monitoring and trigger conditions as SW4 and SW5. This Oily Water Separation System discharge point would be labelled SW18, and its location can be seen in Figure 7. The current infrastructure at the site including concreate wash pad and triple interceptor are displayed in Figure 8 and Figure 9 respectively. The facility is not used frequently and does not process a high volume of water and is primarily used for desalting pumps and washing windscreens.

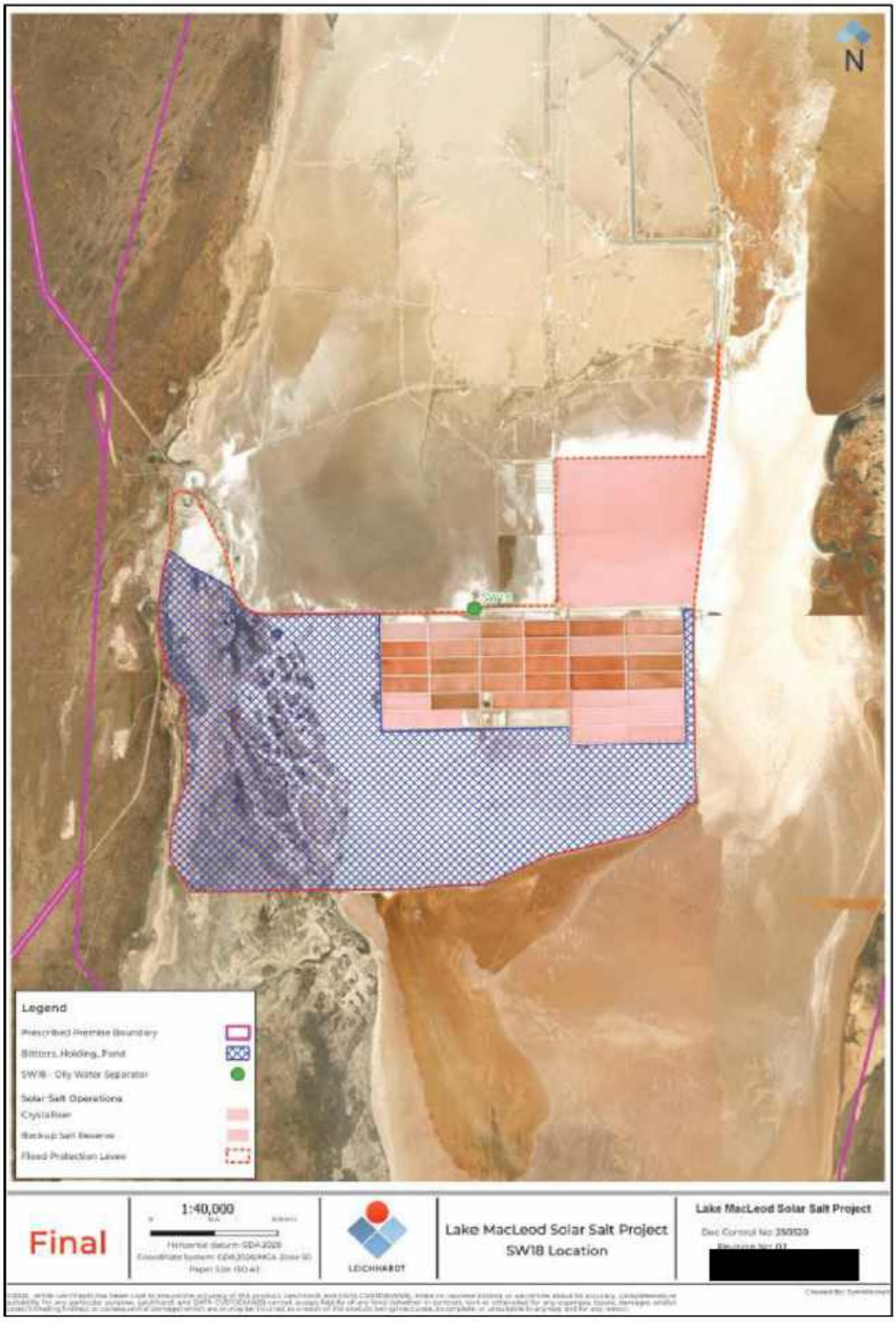

Figure 7 - SW18 Location

Figure 8 - SW18 Wash Pad

Figure 9 - SW18 Triple Interceptor

4.13 Reduced Monitoring Requirement for Acid Sulfate Soils

Lake MacLeod requests to have the monitoring requirements in Table 9 of the licence regarding the assessed risk of acid sulfate soil generation at the gypsum mining operations to be re-assessed. These conditions were placed on the licence as part of Amendment Notice 2 issued on 15 November 2018 following a soil and surface water monitoring program and report which concluded that the overall risk of acid sulfate soil was low. Please see below for the decision justification from DWER at the time.

DWER Decision Comments – Amendment Notice 2

The disturbance of ASS should be avoided wherever possible. Based on recent monitoring data, the Delegated Officer has determined that the relocation and operation of leachate discharge points presents an acceptable level of risk, subject to additional monitoring and management actions conditioned. The Delegated Officer has also made this determination based on the maximum of two discharge points operated per Mine Block at any time to ensure that there are no increases in discharge rates.

In accordance with s.4A of the EP Act, the Delegated Officer has given consideration to the principles; the precautionary principle and the principle of conservation of biological diversity and ecological integrity. Lake MacLeod is vulnerable to acidification and there remains uncertainty around the impacts of key gypsum extraction activities in undisturbed areas of the lake.

Conditions have been applied through this Amendment Notice to require the Licence Holder to manage surface water discharges in accordance with National ASS Guidance (2018). Management may include either:

- *avoiding extraction at areas of high ASS risk; and/or*
- *aerating surface water discharges to precipitate dissolved iron and directed to a series of settlement basins/ trenches; and/or*
- *undertake a neutralisation treatment (liming) at the area of extraction.*

The Licence Holder will continue to be required to monitor emission points in accordance with the conditions set in the Existing Licence. The Delegated Officer has determined that additional monitoring and active management will reduce the risk of generating ASS and direct discharges of acidic water onto Lake MacLeod.

Lake MacLeod Justification for Re-Assessing

Over the six years of monitoring that has been conducted since these conditions were imposed there has been no pH values recorded below 6 at either of the routine discharge points of SW6 and SW8 as can be seen in Figure 10 and Figure 11.

The pH values have been consistently stable in a near neutral pH range between 7 and 9. As can be seen in Figure 11, where Total Titration Acidity (TTA) ($CaCO_3$) values have exceeded the 100 mg / L trigger at SW8 there is no corresponding

reduction in pH. It is Lake MacLeods view that the TTA triggers are not applicable to Lake MacLeod and that pH itself should be the key parameter to be monitored.

As such Lake MacLeod requests the changes below to be made to Table 9.

- Remove titratable acidity as a parameter that needs to be monitored and leave pH as the key parameter; and
- Reduce the frequency of monitoring for pH from monthly to quarterly to align with the frequency of the other parameters.

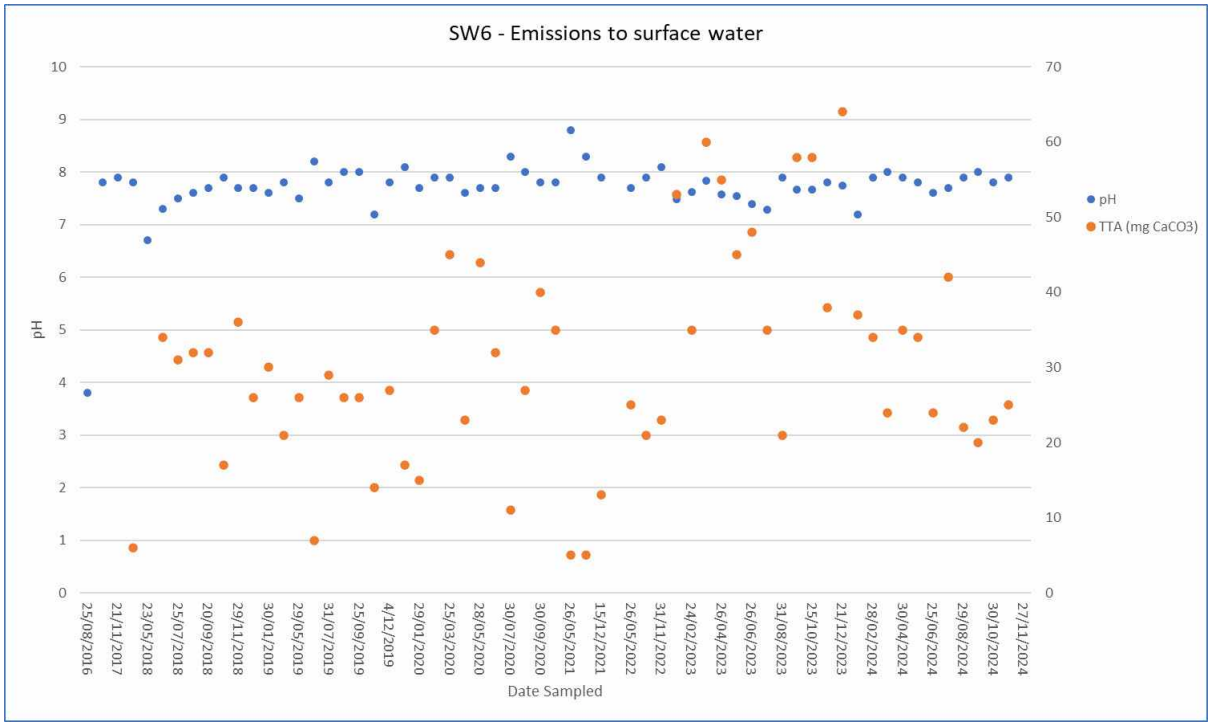

Figure 10 - SW6 Emissions to Surface Water Historical Data

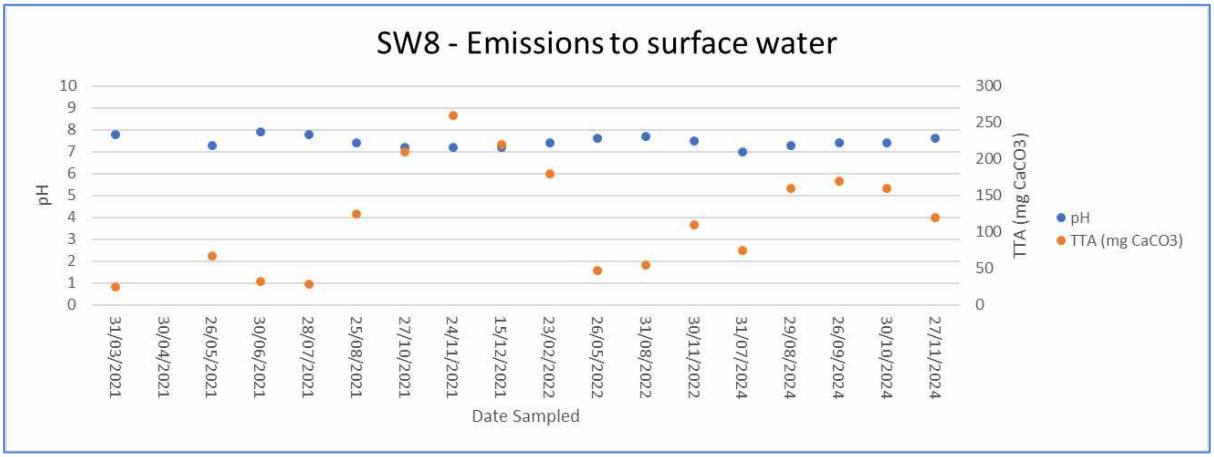

Figure 11 - SW8 Emissions to Surface Water Historical Data

5 Attachment 3C – Map of Area to be Cleared

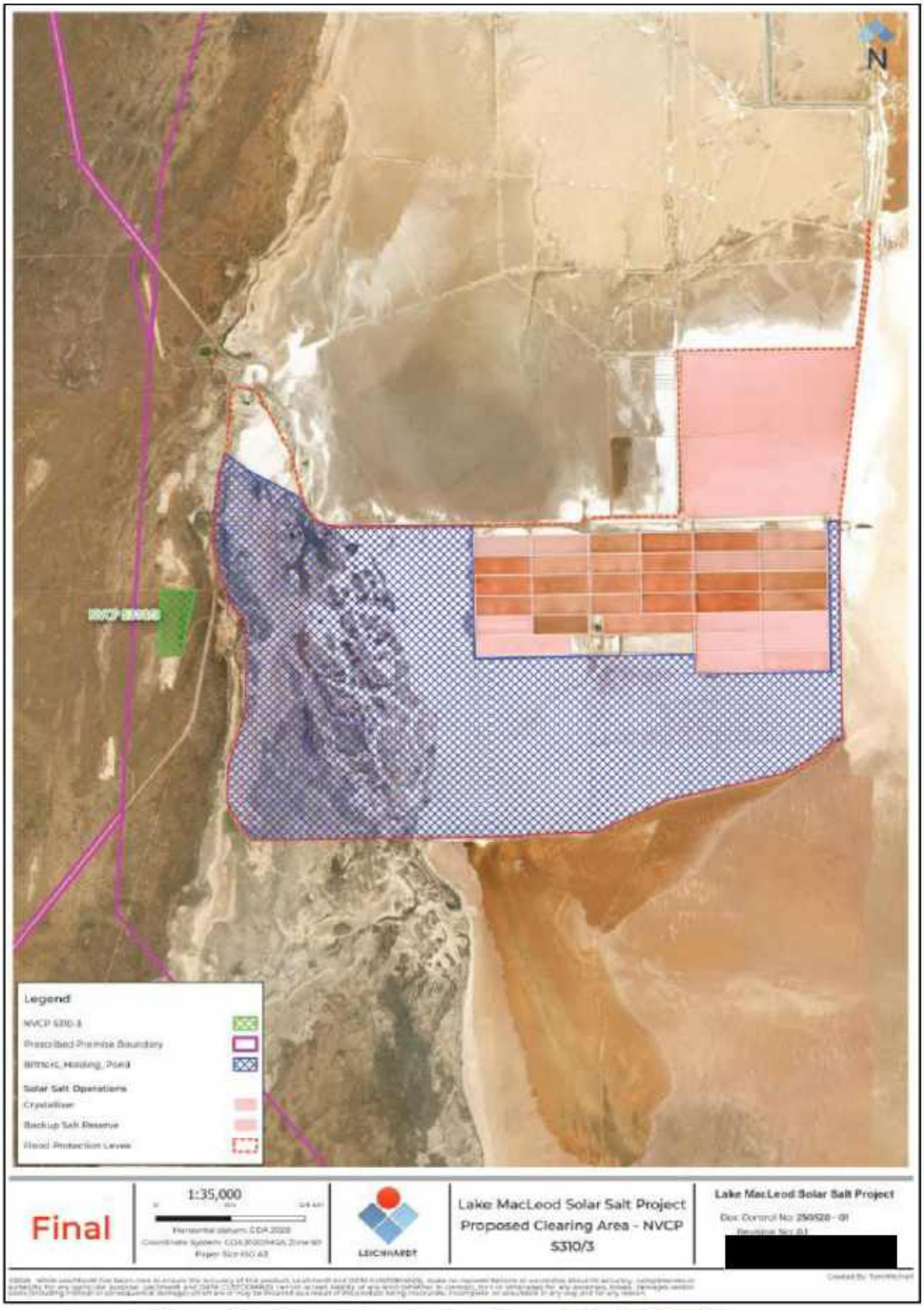

Figure 12 - Map of Area to be Cleared (NVCP 5310/3)

6 Attachment 5 - Other Approvals and Consultation

6.1 Native Vegetation Clearing

This expansion work will require the clearing of native vegetation as an indirect impact. The crystalliser field and flood levee will be constructed within the lakebed which is void of vegetation. However, to construct the cells of the crystallisers and the flood levee, borrow material from borrow pits located outside of the lakebed will be required. Lake MacLeod currently holds NVCP 5310/3 (Figure 12) which is approved for borrow material and anticipates that this borrow pit will provide sufficient material for the construction of the crystallisers and the flood levee. Lake MacLeod is also in the process of identifying additional suitable borrow pit locations as a contingency. A new NVCP application will be submitted for these new areas later in the year once the supporting biodiversity studies have been completed.

6.2 Prescribed Premises

Lake MacLeod currently holds DWER Part V EP Act Licence L7178/1997/11, which was last amended on 14 March 2025 (refer Table 1 at the beginning of this document for an overview of the current licence). Lake MacLeod does not have any other active works approvals or licences. Nor are there any other Part 5 submissions being assessed by DWER at this time.

6.3 Evaporites (Lake MacLeod) Agreement Act 1997

Lake MacLeod operates the Lake MacLeod Solar Salt project under the *Evaporites (Lake MacLeod) Agreement Act 1967*. This is a State Agreement Act passed by the Parliament of Western Australia to facilitate and regulate the development of evaporite mineral resources (primarily salt and gypsum) at Lake MacLeod.

The Department of Jobs, Tourism, Science and Innovation (JTSI) regulates the implementation of the Act. JTSI have been engaged and consulted on these planned expansion activities. JTSI have also requested to be kept informed as the project proceeds.

6.4 Other Approvals

6.4.1 Rights in Water and Irrigation Act 1914

Lake MacLeod holds a Licence to Take Water (GWL 56934(6)) under the *Rights in Water and Irrigation Act 1914*. This licence has an annual abstraction limit of 3,350,000 kL. The planned expansion works will not require an amendment to that licence or an increase to the abstraction limit.

An additional bore may be installed to replace an existing bore, if this is required an application for a licence under section 26D of the *Rights in Water and Irrigation Act 1914*.

6.4.2 Aboriginal Heritage Act 1972 (WA)

Lake MacLeod is situated on the traditional lands of the Baiyungu people. Native Title is recognised under the three Gnulli claims for the Yinggarda, Baiyungu and Thalanyji people (WCD2019/016) and includes Lake MacLeod as well as Carnarvon Township.

DSL entered into the Gnulli Heritage Agreement in 2011 with Yamatji Maarlpa Aboriginal Corporation (YMAC) on behalf of the Gnulli People. The Gnulli Heritage Agreement provides a process for the conduct of heritage surveys. Lake MacLeod will continue to follow the processes set out in the Gnulli Heritage Agreement until such time that a revised heritage process through the Relationship Management Agreement (RMA) with the Baiyungu People is finalised and an agreed transition is in place. Engagement on the new RMA will be conducted with Nganhurra Thanardi Garrbu Aboriginal Corporation (NTGAC) as they are the Prescribed Body Corporate that hold the native title rights and interests of the Baiyungu and Yinggarda People on trust.

There are two known cultural heritage sites on the Lake MacLeod lease area and one potential site. None of the planned expansion activities will be located on or near to the known heritage sites.

Three heritage assessments have been undertaken over portions of the leases in the past. Lake MacLeod is currently engaging with the Baiyungu People to ensure that any required detailed heritage assessments take place before any activities with the potential to impact cultural heritage proceed.

6.4.3 Contaminated Sites Act 2003 (WA)

A number of contaminated sites areas of concern (AEC) exist at the operation resulting from historical and current operations.

The key source potential at these sties relates to the presence of hydrocarbons, fuel storage, refuelling of vehicles and vehicle maintenance. Known large diesel spillages are limited to one location (Area 8), with 20,000 L of diesel estimated to have leaked from the refuelling facility in November 1998. A number of smaller diesel spillages have occurred across the site.

Lake MacLeod has a Contaminated Site Management Plan (SMP) which is actively implemented and includes monitoring requirements for each of the known sites. The next monitoring program associated with this plan will be conducted later in 2025.

6.5 Stakeholder Engagement

The Lake MacLeod operation is an integral part of the Carnarvon community and Lake MacLeod seeks to maintain constructive, open and transparent relations with all key stakeholders. Engagement with these stakeholders to discuss the planned expansion activities has commenced and is ongoing. Lake MacLeod seeks to ensure all key stakeholders are kept informed at every stage of the expansion activities. Table 3 details the completed and planned engagements.

Table 3: Stakeholder Engagement Register

Stakeholder	Date/s	Consultation Type	Relevant issues/ topics raised	Proponent response/ outcome
Government Stakeholders				
JTSI	05/02/2025	Scoping Meeting (in Person)	Meeting in person with Lake MacLeod management team and JTSI representatives. Discussed the planned expansion activities for 2025.	JTSI were supportive of the proposed works and indicated that they would like to be kept informed as the works progressed.
DEMIRS	14/03/2025	Scoping Meeting (via Teams)	Scoping meeting with DEMIRS to discuss current NVCP status and proposed new NVCPs if required to provide borrow material for construction of the expansion activities.	DEMIRs provided general guidance on the current status of Lake MacLeod's NVCPs and how to proceed with applying for new ones if required.
DWER	17/03/2025	Scoping Meeting (via Teams)	Scoping meeting to discuss Lake MacLeod's expansion plans and additional amendments to the licence.	Feedback from DWER was that all of the proposed changes could be assessed under a licence amendment application.
JTSI	02/04/2025	Scoping Meeting (in Person)	Additional meeting held with JTSI and Lake MacLeod management to provide further updates on the planned expansion activities.	JTSI indicated that they are supportive of the works and would like to be provided a copy of the Licence Amendment Application once submitted to DWER.
Landholders and other Residents				
NTGAC	March – May of 2025	Phone Calls with NTGAC Chair	A number of phone and in person conversations between the Lake MacLeod CEO and the chair of NTGAC have been conducted to provide context on the proposed expansion activities and additional required heritage surveys.	Feedback from the NTGAC chair was for more information to be presented at the next NTGAC board meeting which is scheduled for early June 2025.
YMAC	01/05/2025	Heritage Survey Request	A Heritage Survey Request was sent to YMAC/NTGAC for their consideration that detailed disturbances to borrow pit areas required for the expansion.	Lake MacLeod is awaiting final feedback regarding when the surveys will be completed.

Stakeholder	Date/s	Consultation Type	Relevant issues/ topics raised	Proponent response/ outcome
Quobba Station	12/05/2025	Phone Call	Discuss the proposed expansion activities and the approvals process with the owner of Quobba station.	Owner of Quobba station indicated they are supportive of the expansion plans.
NTGAC	**YTBD**	Meeting (in Person)	The Lake MacLeod management team will present the proposed expansion activities to the NTGAC board in early June 2025; the date is yet to be confirmed	Future meeting, no feedback yet.

7 Attachment 6A - Emissions and Discharges

Lake MacLeod is not seeking to include any new categories on the Licence or change the assessed production/design capacity. It is Lake MacLeod's opinion that all the emissions and discharges associated with this licence amendment have already been assessed as part of the current version of the licence.

The evidence supporting this assertion is that there is no increase to the current assessed production/design capacity and there will be no new emissions or discharge locations associated with the new crystallisers or flood levees. The new crystallisers and flood levee are located in and around the current operations. They have been strategically located to ensure their footprint is as much as possible on areas that have previously been disturbed.

The only new emission that has not previously been assessed is the inclusion of the Oily Water Separator at SW18. Lake MacLeod is requesting to have this included on the licence and conditioned in accordance with the existing licence requirements.

8 Attachment 7 - Siting and Location

This section will discuss the decision making behind choosing the location of the new crystalliser field and the northern flood levee (Figure 13).

8.1 Crystalliser Field - Siting and Location

GHD was engaged to complete a high-level options assessment in February 2025 to assist with determining the best location of the new crystalliser field. While engineering considerations were a critical component of this assessment the mitigation hierarchy for environmental impacts was also a key component of the decision-making process. Some of the early most preferred designs from an engineering perspective were located to the southwest of the existing fields within the bitterns holding pond, however due to their direct impact on the native vegetation in the area these were discounted.

The final location, as can be seen in Figure 13, was chosen with the following mitigation hierarchy considerations in mind.

- Located within the lakebed and does not impact on any native vegetation;
- Approximately 30% of the area has previously been utilised as crystalliser fields; and
- The area is directly adjacent to the existing crystalliser fields such that existing infrastructure can be utilised as much as possible and bitterns discharge is easily integrated into the existing discharge system.

8.2 Flood Levee (Northern)

The new location of the northern flood levee has been chosen based on the reasoning below.

- Located within the lakebed and does not impact on any native vegetation;
- Utilises area of historical flood levees which reduces the amount of borrow material required; and

- Will not significantly alter the surface water hydrology of that area of the lake. As can be seen in Figure 13, the existing flood levee already contains the surface water of the lake within that immediate area.

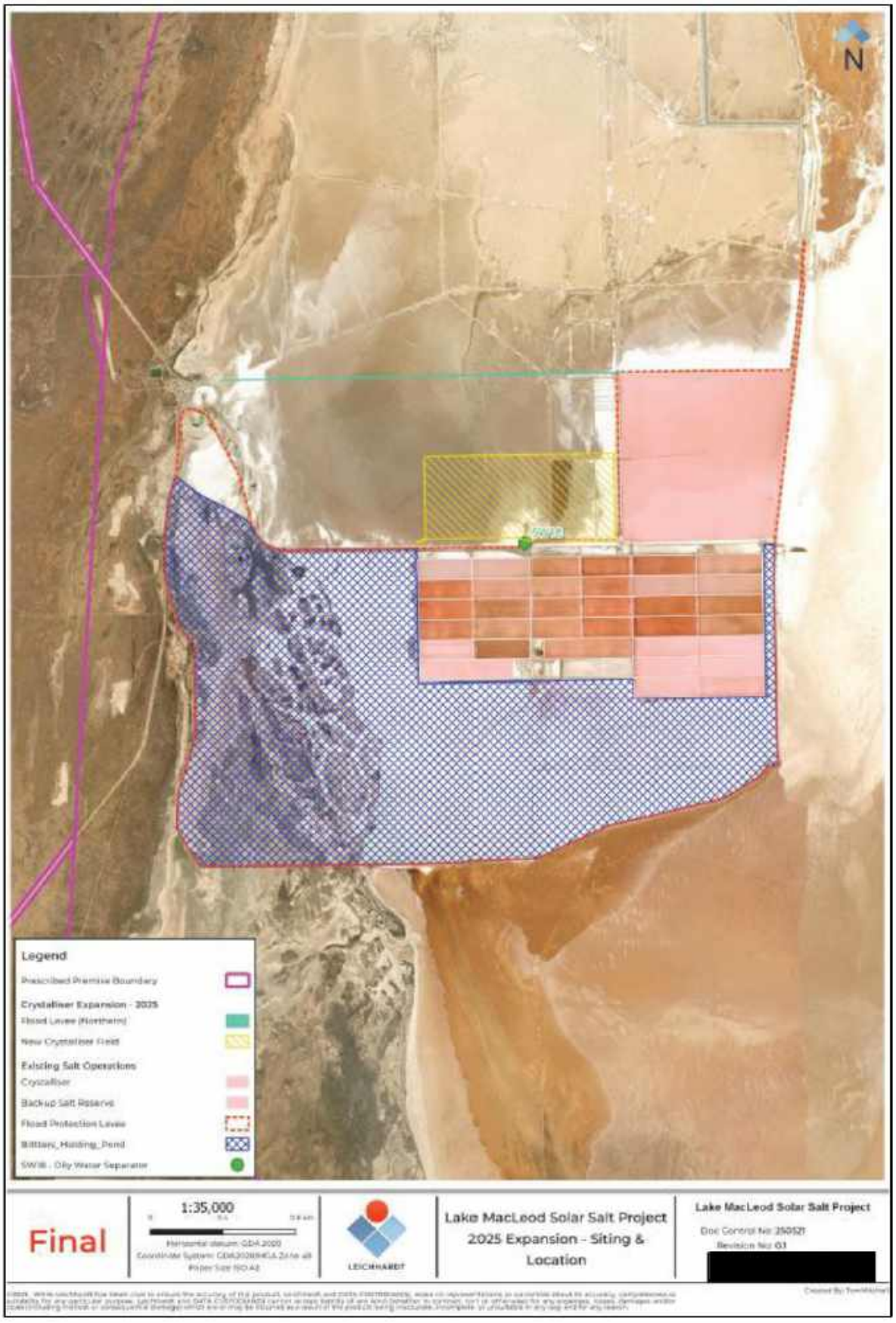

Figure 13 - Siting and Location

9 Glossary

Term	Meaning
Application form	DWER *Application form: Works Approval / Licence / Renewal / Amendment / Registration v 16, August 2022*
DEMIRS	Department of Energy, Mining, Industry Regulation and Safety
DWER	Department of Water and Environmental Regulation
EP Act	*Environmental Protection Act 1986* (WA)
EP Regulations	Environmental Protection Regulations 1987
EPA	Environmental Protection Authority (WA)
JTSI	Department of Jobs, Tourism, Science and Innovation
Licence	Licence L7178/1997/11
Mtpa	Million Tonnes Per Annum
NTGAC	Nganhurra Thanardi Garrbu Aboriginal Corporation
NVCP	Native Vegetation Clearing Permit
YMAC	Yamatji Maarlpa Aboriginal Corporation

10 References

Barnes, E. Farivar, F. Orlando, D. Haulkhory, G. and Nader, G. (2025) *Lake MacLeod Salt Expansion 15% Design Report*.

GHD (April 2025) Lake Macleod Salt Expansion Project – Water Balance

GHD (February 2025) GHD's options assessment for preferred location of new crystalliser ponds, entitled '12646802- Lake Macleod High Level Options Assessment'

11 Appendices

Appendix 1 – Lake MacLeod Salt Expansion – 15% Design Report