Water Balance and Leachate Management Plan

Tamala Park Waste Management Facility

Prepared for Mindarie Regional Council

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[redacted]	Waste Discipline Manager (West Coast)	TW23015-08 - MRC Tamala Park Water Balance LMP_3.0
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1 Introduction

Talis Consultants Pty Ltd (Talis) was commissioned by the Mindarie Regional Council (Council) to update the leachate water balance model for the Tamala Park Waste Management Facility (the Site) as part of the detailed design of the Southern Piggyback Cell (SPC). This assessment builds on Talis' previous Leachate Management Plan (LMP) developed in 2022, after the submission of the Closure and Post-Closure Management Plan (the Closure Plan), Talis, June 2021. It also follows the leachate management strategy presented in the Environmental Protection Notice – Item 1 Leachate Management Plan, Talis, January 2025, hereinafter referred to as the EPN LMP for clarity. At the time of writing Council received initial feedback on the LMS is awaiting a response from the Department of Water and Environmental Regulation (DWER) on the EPN LMS.

This Water Balance and Leachate Management Plan (WBLMP) incorporates the most up to date leachate generation data and most recent landfill design considerations, including the new SPC and the recent capping of the Stage 2 West area (December 2024), to estimate the current, worst-case-scenario, inflows and outflows, followed by the various stages of progressive closure, essential for effective leachate management.

1.1 Background

Council operates the Site located on Lot 9043 (Plan 424903), 30km north of Perth. The Site is a Category 64 Class III putrescible landfill that operates under Site Licence L9395/2023/1 (DWER Licence).

Talis was commissioned to undertake the details design of the proposed SPC, which will be the final cell developed at the landfill. Development of the SPC is necessary to ensure the Site can meet its closure obligations. Talis has previously completed several critical projects for the Site, including the Closure and Post-Closure Management Plan (CPCMP), the Capping Stability Risk Assessment, and the Surface Water Management Strategy.

As part of the SPC detailed design, a comprehensive updated leachate water balance is required for the entire Site, integrating this latest addition. This WBLMP outlines the proposed leachate management strategy across all landfill areas, including the necessary strategies for managing leachate generation and maintain compliance throughout the Site's operational and post-closure phases.

1.2 Landfill Closure and Post-Closure Management Plan

The Site landfill has been split into several sections, and as portions of the landfill reach the final fill profile, the cells are progressively permanently capped and rehabilitated. The eastern portion of the landfill, 'Stage 1', is not lined with a geosynthetic lining system and therefore was not considered for this assessment. The remaining portion of the landfill, 'Stage 2' and 'Piggyback' is lined with a geosynthetic lining system and has been progressively capped where possible. The capping status for landfill section is provided in Table 1-1.

Table 1-1: Closure Status of Site Landfill

Landfill Section	Closure Status	Leachate Extraction Capability
Stage 1, South Phase	Capped and restored	None
Stage 1, North Phase	Capped and restored	None

Landfill Section	Closure Status	Leachate Extraction Capability
Stage 2, Phase 1	Capped and restored	Four (4) extraction points on the northern edge. Two (2) operational, one under repair and one inoperable.
Stage 2, Phase 2 (West)	Capped December 2024	One (1) extraction point on the western edge
Stage 2, Phase 2 & 3 (Central)	To be capped December 2026	One (1) extraction point on the southern edge
Stage 2, Phase 2 & 3 (East)	To be capped December 2028	One (1) extraction points on the southern edge
Northern Piggyback (North)	Capped and restored	None. Gravity system connected to the base of Stage 2.
Northern Piggyback (South)	To be capped December 2028	
SPC	To be constructed late 2025 / early 2026	Two (2) extraction points initially with a potential tertiary extraction point as a contingency.

In the CPCMP, Talis developed the conceptual design for the final capping system of the landfill, which will be installed progressively to encapsulate the upper surface of the landfill, reduce infiltration and the generation of leachate, and ultimately minimise environmental impacts. It is anticipated that there will be at least two additional capping events required to fully close the landfill, and it was estimated that the Site landfill has a remaining operational lifespan of 4 years.

To achieve the final capping profile, it is acknowledged that the current temporary leachate pond system, referred to as 'the mats' need to be decommissioned and replaced with a new leachate pond system constructed in the quarry area located to the south of the landfill and to the north of the screening embankment. The progressive capping works will help to reduce leachate production over time; however, the new leachate ponds must be designed for "worst-case" scenario to ensure there is enough capacity to manage leachate generation until full landfill closure and rehabilitation has occurred. Therefore, the new leachate management system will also consider the existing leachate volumes that are currently being stored within the landfill.

1.3 Purpose

This WBLMP summarises the application of a better practice leachate management system for the Site's landfill operations that provides operational flexibility. A key aspect of this document is to provide engineering information regarding assumptions, calculations and models implemented as part of the design works. The plan also outlines the leachate management requirements as well as necessary infrastructure and justification of implemented better practice design principles. The WBLMP contains the following elements:

- Site Information;
- Local Climate Data;
- Landfill Leachate Management Strategy;
    - Key Infrastructure;

    - Leachate Generation Modelling;
    - Water Balance Assessment;
- Operational Management and Monitoring Strategy; and
- Approvals Path Mapping.

The WBLMP should be read in conjunction with the EPN LMP which provides additional commentary on the odour management aspects of the proposed future leachate management activities. As such, discussion of odour management will not be repeated in this WMLMP.

2 Site Information

The following sections provide details regarding the Site layout, its key relevant environmental attributes, and the historical leachate extraction rates at the Site.

2.1 Site Layout

The current Site layout can be seen in Drawing W-100 provided (Appendix A). Access to the Site is via Marmion Avenue at the centre of the western boundary. There is a weighbridge, administration buildings and offices, a community waste drop off and reuse shop, and a waste transfer station in the western portion of the Site. The extents of the existing landfill encompass the central areas of the Site with active landfill operations being undertaken across Stage 2, Phase 2 and Phase 3. The corresponding landfill leachate management infrastructure is currently located in the southern portion of Stage 2, Phase 1 which has yet to be capped. The area directly south of the landfill accommodates workshops, vehicle washdown and wash water treatment. Further south, there is a landfill gas power plant comprising six gas engines, a large limestone quarry / borrow pit area. Therefore, this area has been earmarked for the new Leachate Management Area (LMA) for the Site.

2.2 Environmental Attributes

2.2.1 Topography

The Site's surface elevation slopes from approximately 50m Australian Height Datum (AHD) in the northern and southwestern portions of the Site to approximately 10mAHD at the eastern boundary.

The general topography of the proposed LMA and layout of the Site is shown on Drawing W-100 (Appendix A).

The LMA provides a generally flat area for the new pond system with some constraints around its southern perimeter due to the Site's large screening embankment. The surrounding topography ranges from 50mAHD, at the top of the embankment, to 43mAHD, consistently sloping from the southwest to the northeast across the LMA. Immediately to the northeast corner the land slopes away steeply to the northeast, while the southwest corner abuts the steep internal slope of the screening embankment sloping from southwest to the northeast.

2.2.2 Geology

The geology of the Site consists predominantly of sand of the Quindalup Dune system overlying low grade sand and limestone of the Tamala Limestone formation. Geoscience Australia (1:2.5 million scale) classifies surface geology across the Site as being "Dunes, sand plan with dunes, coastal dunes".

2.2.3 Groundwater

An unconfined aquifer system is present within the sand and limestone of the superficial formations that underlie the Site. An extensive network of groundwater monitoring bores are located up-gradient, down-gradient and to the north of the Site. According to the 2024 Groundwater Monitoring Report (SLR, October 2024), "historical data shows a general decline in groundwater elevations between 2000 and 2005, after which a steady general increase in groundwater elevations is recorded across all monitoring wells. Slightly higher groundwater elevations have been historically reported east (hydraulically up-gradient) of the site whilst the lowest groundwater elevations have been reported west of the landfill (hydraulically down-gradient)". Rapid groundwater recharge does not appear to occur soon after heavy rainfall is recorded, but rather as a result of year-long infiltration and percolation down towards the groundwater table, indicating a period of lag. Major peaks were recorded in 2005, 2008, 2012, 2013, 2017, 2018, 2019 and 2022, and major drops in groundwater elevations were recorded in 2007, 2010, 2013, 2014, 2016, 2018, 2019, 2020 and 2024 which, as expected, tend to correlate to years with high and low rainfall.

Groundwater elevations during the February 2024 groundwater monitoring event (GME) were recorded to be approximately 0.5m lower than the July 2024 GME and previous GME's (May 2020 to July 2023). SLR indicate that this is due to the period from October to February 2024 being the driest since 2018.

The groundwater monitoring network is set up to target the superficial unconfined aquifer at three depths: shallow (approx. 30 m depth); intermediate (approx. 37-46 m depth); and deep targeting near the base of the aquifer (up to 86 m depth).

2.3 Leachate Extraction Rates

Table 2-1 summaries the historical leachate extraction data for the Site from 2018 to 2024.

Table 2-1: Summary of Leachate Extraction Rates (m^3)

Year	Stage 2 Phase 1		Stage 2 Phase 2		Stage 2 Phase 3		Total	
	Annual	Daily	Annual	Daily	Annual	Daily	Annual	Daily
2018	964	2.6	879	2.5	4,446	12.2	6,289	17
2019	2,806	7.1	6,451	17.7	9,528	26.1	18,785	51
2020	6,668	18.3	5,648	15.5	8,349	22.9	20,665	57
2021	15,551	42.6	5,034	13.8	13,060	35.8	33,645	92
2022	11,911	33	19,392	53	28,419	78	59,722	164
2023	6,269	17	5,565	15	17,557	48	29,391	80
2024	4,788	13	939	3	2,594	7	8,321	23
Average	6,994	19	6,273	17	11,993	33	25,260	69

The leachate extraction records for the Site over the last seven years illustrate an increase in leachate extraction since 2018, accelerating in 2021, peaking in 2022, and subsequently halving in 2023 following the cessation of leachate irrigation and evaporation in the mats in early 2023. The small amount of leachate being extracted in the second half of 2023 and the whole of 2024 was associated with recirculation/reinjection.

It is important to also note that even though Stage 2, Phase 1 was partially capped in 2011, a reasonable amount of leachate continues to be extracted, suggesting that this stage is likely to be hydraulically linked to the uncapped phases of Stage 2. Therefore, Stage 2, Phase 1 must be considered during the updated leachate water balance model, which will be undertaken to support the Works Approval application for the Southern Piggyback Cell which will be submitted to the DWER in early 2025.

3 Local Climate Data

The local and regional climate data sources utilised in designing the leachate management system at the Site include the following:

- Rainfall;
- Temperature;
- Pan Evaporation;
- Relative Humidity;
- Solar Exposure; and
- Wind Speed.

Historic weather data is typically sourced from the Bureau of Meteorology (BOM) website. The Bureau of Meteorology's (BOM) closest weather station with long-term data is Perth Metro (Station 009225), located approximately 30km south of the Site. The prevailing wind speed and direction, temperature, solar exposure, and humidity data has been sourced from this weather station and is further discussed in the sections below.

However, there is limited quality controlled BOM rainfall data available for the Site. Therefore, the rainfall and pan evaporation data were sourced from SILO. SILO is a database of Australian climate data from 1889 to the present that is hosted by the Queensland Department of Environment and Science (DES). It provides daily meteorological datasets for a range of climate variables in ready-to-use formats suitable for biophysical modelling, research, and climate applications. The datasets are constructed from observational data obtained from BOM, using mathematical interpolation techniques to infill gaps in time series and construct spatial grids. The spatial grid selected (Latitude: -31.70, Longitude: 115.75) is for Tamala Park and encompasses most of the Site.

A 50-year data period was selected to gain a large range of rainfall scenarios whilst maintaining the quality of the data, as the SILO model indicates there are significant limitations on data pre-1957.

3.1 Temperature

The highest mean temperature is 31.7°C, occurring in February, whilst the lowest mean temperature is 8.1°C occurring in July. Table 3-1 shows the average maximum and minimum temperatures at the Perth Metro weather station (Station number: 009225) for years 1994 to 2024.

Table 3-1: Maximum and Minimum Temperatures from Perth Metro Station (1994-2024)

Aspect	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean Max. Temp. (°C)	31.4	31.7	29.7	26	22.4	19.5	18.5	19.2	20.6	23.5	26.8	29.5	**24.9**
Mean Min Temp. (°C)	18.1	18.4	16.9	13.8	10.5	8.7	8.1	8.5	9.7	11.7	14.4	16.5	**12.9**

3.2 Rainfall

Being in a temperate zone, rainfall is seasonal with higher rainfall generally in the months of May to September. Table 3-2 presents a summary of rainfall records, from 1974 to 2024.

Table 3-2: Rainfall Overview in Millimetres for the Site (1974-2024)

Average	13.7	14.7	17.7	35.5	95.6	128	148	117	68.5	38.7	23.5	8.4	**709.4**
50th Percentile	86.2	11.5	51.7	56.9	64.5	67.9	145	115	54.7	51.2	8.7	2.8	**716.2**
90th Percentile	0.5	36.8	31.7	28.3	149	121	255	80.5	33.7	107	11.2	2.8	**857.1**
Highest	0.0	23.1	1.7	37.9	127	266	192	80.4	76.5	35.3	59.8	44.3	**943.2**

The mean annual rainfall for the Site is calculated as 709 millimetres (mm) with the highest recorded annual rainfall at 943mm, which occurred in 1991.

3.2.1 Short Duration Design Rainfall

Rainfall Intensity Frequency Duration (IFD) data for the Site was obtained using the BOM Computerised Design IFD Rainfall System (CDIRS) and the Australian Rainfall and Runoff 2016 database (ARR2016). CDIRS produces a complete set of IFD curves and associated weather data based on user-defined coordinates (http://www.bom.gov.au/water/designRainfalls/revised-ifd/?year=2016).

Table 3-3 summarises the Annual Exceedance Probability (AEP) of storms with 1 to 72-hour (hr) durations. AEPs are required to estimate precipitation rates for a range of events.

Table 3-3: Summary of Annual Exceedance Probabilities for Tamala Park, WA (ARR2016)

Storm Duration	1 in 10	1 in 20	1 in 50	1 in 100
	10%	5%	2%	1%
	Rainfall Depth (mm)			
1 hour	29.6	34.3	41	46.6
2 hour	37.8	44	53.3	61.2
3 hour	43.5	51	62.2	71.9
6 hour	55.1	65.2	80.4	93.9
12 hour	68.7	81.3	101	118
24 hour	83.2	97.1	119	137
48 hour	98.2	112	133	150
72 hour	108	121	141	157

3.3 Pan Evaporation

The approximate average daily pan evaporation rates for the Site are based on the calculated monthly rates from SILO. Table 3-4 outlines the average pan evaporation data, from 1974 to 2024.

Table 3-4: Pan Evaporation Average Data for the Site in Millimetres (1974-2024)

Average	256	209	174	102	65.8	48.0	50.8	61.8	83.6	129	177	233	**1,590**
90th Percentile	265	204	165	108	71.8	56.4	55.8	61.4	92.5	163	161	266	**1,669**
50th Percentile	227	192	196	101	63.6	42.5	42.6	67.2	77.1	104	187	217	**1,516**
Highest	217	179	136	88.7	53.8	41.9	52.2	57.4	80.6	104	170	221	**1,402**

The average pan evaporation ranges monthly from 48.0mm to 256mm. The total annual pan evaporation for the Site is calculated as 1,590mm. This is a significant potential evaporation rate that is almost double the wettest rainfall year experienced at Site.

3.4 Other Key Climate Data

The other key climate data considered for leachate modelling works are solar radiation, relative humidity, wind speed and wind direction.

Solar radiation is the measure of radiant energy emitting from the sun and falling on a horizontal surface. It can range from 9.6 megajoules per square metre (MJ/m^2) to 28.6 MJ/m^2 monthly average observed from Tamala Park Station #009264. Annual average solar radiation is in the order of 19.1 MJ/m^2.

Relative humidity is an indicator of the likelihood of rainfall and a key factor in determining the rate of evaporation. Table 3-5 provides a summary of the relative humidity observed at Perth Metro Station #009225 from 1994 to 2024.

Table 3-5: Relative Humidity (RH) Data (%) Perth Metro (1994-2024)

Average 9am RH (%)	51	53	57	64	72	78	80	75	67	58	52	50	**63**
Average 3pm RH (%)	39	38	40	46	50	56	57	54	53	47	44	41	**47**
Average Monthly Humidity	45	46	49	55	61	67	69	65	60	53	48	46	**55**

The wind direction generally ranges from east-north-easterly in the morning (9am), changing direction to west-south-westerly in the afternoon (3pm). Winds at the Site are typically moderate in the morning and the afternoon. The wind rose for morning and afternoon winds can be seen in Figure 3-1.

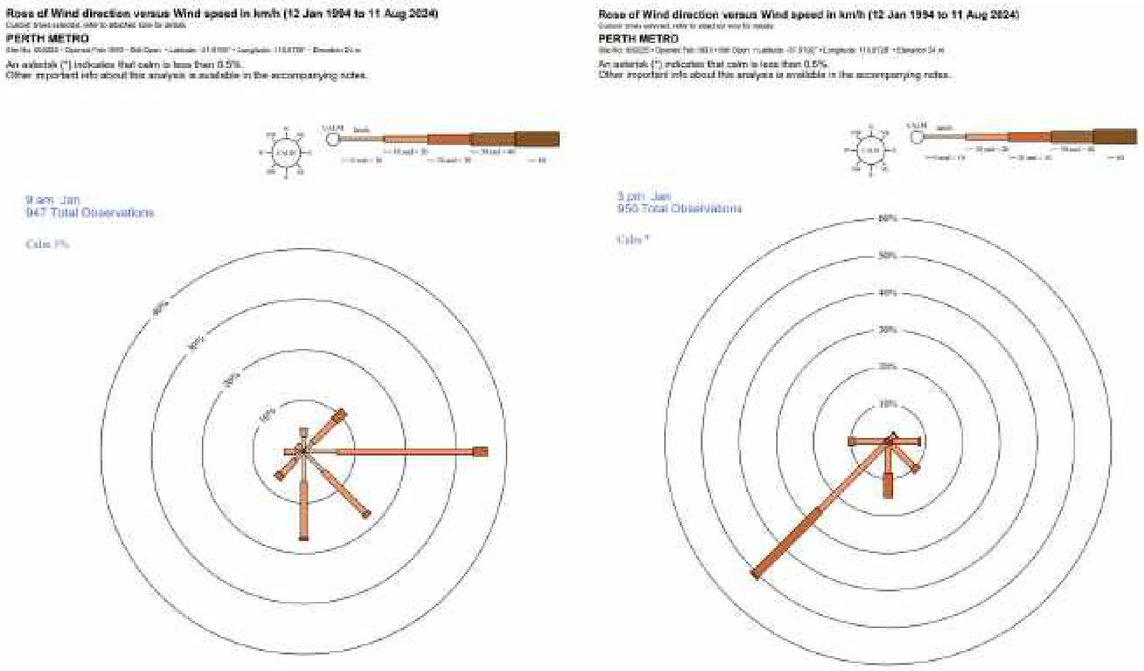

Figure 3-1: 9am (left) and 3pm (right) Wind Rose for Perth Metro Station

4 Landfill Leachate Management Strategy

Leachate may be generated through waste decomposition in the landfill, liquids within the waste deposited, surface water inflow and the percolation of rainfall through waste. The following sections discuss the key infrastructure that will manage the leachate generated at the Site, and how it was designed through modelling the estimated volume of leachate that will be produced.

4.1 Key Infrastructure

4.1.1 Leachate Collection and Extraction System

The basal lining system at the Site consists of three distinct designs. These systems have been implemented in different sections of the landfill. The specific locations and configurations of each system are described in the following sub-sections, with detailed areas shown in Drawing W-401 (Appendix A).

Leachate is extracted from the landfill using submersible pumps installed in inclined sidewall risers connected to the sumps. The locations of the extraction points are indicated on Drawing W-400 (Appendix A).

4.1.1.1 *Basal Lining System #1*

Basal Lining System #1 has been installed across most of Stage 2 Phase 1, excluding the eastern portion of this phase. In addition, it is implemented in the entirety of Stage 2 Phase 2 and Stage 2 Phase 3. The composition of Basal Lining System #1, from bottom to top, is as follows:

- 100mm General fill;
- Geosynthetic Clay Liner (GCL);
- 2.0mm Linear Low-Density Polyethylene (LLDPE) Geomembrane;
- Cushion geotextile; and
- 300mm Leachate drainage aggregate.

4.1.1.2 *Basal Lining System #2*

Basal Lining System #2 has been implemented in the eastern portion of Stage 2 Phase 1. It is also utilised in the entirety of Stage 1 North, providing effective containment for these areas. The composition of Basal Lining System #2, from bottom to top, is as follows:

- 100mm General Fill;
- 2.0mm LLDPE geomembrane;
- Cushion geotextile; and
- 300mm Leachate drainage aggregate.

4.1.1.3 *Basal Lining System #3*

Basal Lining System #3 has been specifically designed for the SPC section of the landfill. The composition of Basal Lining System #3, from bottom to top, is as follows:

- 250mm Compacted Subgrade;
- GCL;
- 2.0mm LLDPE Geomembrane;
- Cushion geotextile; and
- 300mm Leachate Drainage Aggregate.

4.1.2 Proposed Leachate Evaporation Ponds

As discussed in Section 1, the existing ponds system will need to be relocated when the Stage 2 central area is capped. The new pond system must be sized to accommodate the requirements of the future landfill operations and allow for the Site to process the significant leachate head that has built up in the active landfill cells. The large, cleared area south of the Site's landfill has been earmarked for the construction of this leachate pond system in the dedicated LMA. The location and design of the pond system is discussed in Section 4.3.

To prevent leachate stored in the evaporation ponds from percolating into the groundwater system, the new ponds will be lined as follows:

- 2mm High-Density Polyethylene (HDPE) Geomembrane;
- GCL; and
- 500mm Compacted Subgrade Layer; and
- Compacted in-situ Formation Layer.

This composite geosynthetic lining system is in general accordance with the Victorian Environment Protection Agency (Vic EPA), Best Practice Environmental Management 'Siting, Design, Operation and Rehabilitation of Landfills', 2015 (BPEM Guidelines), which is the nominated best practice landfill guidelines adopted by Council for waste management infrastructure design and operation at the Site.

A GCL layer has been nominated due to the Site's geology, discussed in Section 2.2.2, lacking low-permeability soils. In-lieu of these soils, the GCL will provide secondary protection in case the integrity of the primary HDPE geomembrane becomes impacted.

MRC intends to apply to DWER to construct the leachate evaporation ponds as soon as the EPN LMP has been accepted by the DWER, noting that the LMA will need to be commissioned before waste is disposed in the SPC.

4.1.3 Leachate Irrigation

As described in the EPN LMP, the surface of the Stage 2, Phase 2 and 3 areas of the landfill will be irrigated with leachate from a water cart to further increase losses through evaporation and encourage storage of leachate within the upper layers of the cover soils and underlying waste mass.

Irrigating leachate onto the waste mass and active cells has several advantages including:

- Utilising the maximum available surface area within the containments system for evaporation;
- Leachate storage within the temporary cover soils and underlying waste;
- Reduction in use of clean water for dust suppression which constitutes a positive input into the Site's water balance;
- Increased landfill gas generation rate;

- Increased waste settlement, leading to more efficient use of landfill void space; and
- Accelerated waste degradation and stabilisation.

Therefore, it is anticipated that the Site will continue to maintain the irrigation program following the construction of the new leachate pond system in the LMA. However, this should be at a reduced rate to minimise the excessive accumulation of leachate on the landfill's uncapped surface.

4.1.4 Capping System

As described in the CPCMP, the landfill capping system consists of two distinct systems. Drawing W-402 (Appendix A) illustrates the areas covered by each capping system.

The northern section of the landfill features a capped area, which includes the northern part of the Northern Piggyback and most of Stage 2, Phase 1. The existing capping system (Capping System #1) for this area is composed, from bottom to top, as follows:

- 300mm granular regulating layer;
- Separation geotextile;
- 2.0mm thick double textured LLDPE geomembrane layer;
- 300mm Aggregate;
- Minimum 1,000mm restoration layer locally thickened in places to accommodate deeper rooted species; andF
- Vegetation layer incorporating tube stock to reduce erosion and advance revegetation.

The remainder of the landfill will be capped in stages, with a new capping system. This will occur in two distinct phases, first, the central area of Stage 2; and finally, the eastern section, which encompasses the remaining part of the Northern Piggyback and the SPC. The new capping system (Capping System #2) is composed, from bottom to top, as follows:

- 200mm Regulating layer;
- Sub-cap Gas collection layer (geocomposite);
- 1.5mm thick double textured Linear LLDPE Geomembrane Layer;
- Sub-surface drainage layer (geocomposite);
- 1,200mm of Restoration Layer, comprising:
    - 1,000mm thick layer of site-won subsoils; and
    - 200mm thick layer of topsoil/growing medium comprising a 50:50 blend of shredded green waste mulch and limestone;
- Vegetation Layer incorporating hydromulch / seeding to reduce erosion and advance revegetation.

4.2 Leachate Generation Modelling

To ensure the leachate pond system has the appropriate capacity, the potential volume of leachate that will be generated by future landfilling activities must be modelled. The modelling for the Site aims to determine the 'worst case' scenario for leachate generation, which is later used as an input for the Water Balance Assessment. Leachate generated from each cell is dependent on the presence of the capping system, the capping design, the surface area of the cell, and rainfall into the cell during a set period. Other contributing factors to leachate generation include evaporation from the cell surface, solar radiation, relative humidity, and the presence of any vegetation on the uncapped waste profile.

Therefore, the proposed leachate modelling has been designed to manage the following 'worst case', peak leachate generation scenario:

- Two 90th percentile rainfall year followed by three years of 50th percentile rainfall; and
- The landfill reaching its final stages of development.

This scenario represents a very conservative approach that attempts to model the peak leachate generation rate at the Site when the largest area of the landfill containing waste remains uncapped and the capped areas continue to produce leachate. Further details on the generation modelling are discussed in the following sections.

4.2.1 Data Inputs

The potential generation of leachate volumes from the Site landfill was modelled using the Hydrologic Evaluation of Landfill Performance (HELP 3.95D) software program. The HELP program is a quasi-two-dimensional hydrologic model of water movement across, into, through and out of landfills. It requires weather, soil and design data and uses solution techniques that account for the effects of surface storage, runoff, infiltration, evaporation, vegetative growth (where vegetated), soil moisture storage, and seepage through soil, geomembrane or composite liners.

The details and justification of the data selection for the HELP model are discussed in the following sections.

4.2.1.1 *Landfill Cell Design*

Two significant factors in determining leachate generation rates are the overall landfill surface area and the combination of layers, including the capping system, waste mass, and basal lining system. The landfill surface area acts as the catchment for rainfall infiltration, which is maximised when the landfill remains uncapped. The design and configuration of these layers, along with their specific installation areas, influence the infiltration rates and must be carefully considered during the assessment.

The conditions within each zone vary depending on the stage of the project, as areas transition between capped and uncapped states over time.

The landfill surface areas and associate profiles that are proposed for the Site are outlined in Table 4-1 and shown in Drawing W-403 (Appendix A).

Table 4-1: Landfill Cell Design Parameters

Landfill Aspect	Surface Area (m^2)	Location	Design
Zone 1	40,000	Stage 2 Phase 1	• Basal lining: Basal Lining System #1 • Capping system: Capping System #1 – Capped
Zone 2	144,000 (West 35,500 Central 95,000 East 13,500)	Stage 2 Phase 2 and 3	• Basal lining: Basal Lining System #1 • Capping system: Capping System #2 – Uncapped / Capped

Zone 3	28,000	Corresponds to the new cell, the SPC	• Basal lining: Basal Lining System #3 • Capping system: Capping System #2 – Uncapped / Capped • During the assessment period, the first year this zone will be under construction
Zone 4	9,250	Southern part of the Northern Piggyback	• Basal lining: Basal Lining System #2 • Capping system: Capping System #2 – Uncapped / Capped
Zone 5	3,250	Northern part of the Northern Piggyback	• Basal lining: Basal Lining System #2 • Capping system: Capping System #1 - Capped

4.2.1.2 *Landfill Capping Scenarios*

Over the five-year evaluation period for the water balance, the landfill will experience various scenarios. The landfill will be capped in three progressive stages, with periods where significant areas remain uncapped, impacting leachate generation and water management and the SPC will commence operations.

This assessment period captures the worst-case scenario for the Site, characterized by the largest uncapped surface area. The specific phases, along with their dates and descriptions, are summarized in Table 4-2.

Table 4-2: Landfill Capping Scenarios

Scenario	Start Date	End Date	Description
Scenario 1	Jan 2025	Dec 2025	Current scenario, with Stage 1 Phase 1 capped and the western section of Stage 2 Phase 2 capped. SPC not operational.
Scenario 2	Jan 2026	Dec 2028	The SPC becomes operational, and the capping of the central section of Stage 2 is implemented.
Scenario 3	Jan 2029	Dec 2029	Final capping of the landfill, covering the eastern section of Stage 2, the SPC, and the remaining portion of the Northern Piggyback.

4.2.1.3 *Evapotranspiration*

Evapotranspiration was calculated in the HELP model based on the transfer and balance of energy in the environment which included relative humidity and average daily wind speed data. Soil evaporative zone depth, maximum leaf area index and growing season data were also included in the model.

The evaporative zone depth was defined as 50 centimetres (cm) for capped areas and 30cm for uncapped. In reality, the evaporative zone depth would vary due to changes in compaction rates, exposure to the weather, type of waste and initial moisture content. The operational evaporative zone depth was elected conservatively as to determine the upper limit of leachate which would require management.

The HELP model applies a maximum leaf area index to define the ratio of the leaf area of actively transpiring vegetation. The operational phase of the landfill was modelled with zero (0) representing bare ground leaf area index in the uncapped area and 1 for the capped area.

In the HELP model user guidelines, the growing season is defined as when the normal mean daily temperature rises above 10°C. As shown in Section 3.1, the average daily temperature near the Site does not drop below 10°C, and thus the growing season was designated for the whole year.

4.2.1.4 *Curve Number*

HELP modelling requires a user-defined Curve Number (CN) which is an empirical parameter for predicting runoff, the HELP user guide provides a table for typical runoff curves based on the stand of grass and soil texture. The lowest runoff curve number accepted in the HELP model, 0.1, was assigned to represent little to no runoff occurring during storm events.

4.2.1.5 *Layer Design*

The different soil layers used in the HELP model for each of the capped and uncapped zones are detailed in Appendix B.

The placement quality of the HDPE in the uncapped landfill cells will not affect leachate generation rates; however, this variable has been assumed as 'Good' for the purpose of the modelling. A 'Good' HDPE placement quality assumes good field installation with well-prepared, smooth soil surface and geomembrane wrinkle control to ensure good contact between the geomembrane and the adjacent soil that limits drainage rate. It is assumed that there is no subsurface inflow for any of the layers.

4.2.2 Leachate Generation

To understand the future leachate generation volumes from Zones 1 to 5 under varying rainfall scenarios, the HELP model was run for 5 consecutive years, as follows:

- Years 1-2: 90th percentile 'wet' rainfall years
- Years 3-5: 50th percentile 'average' rainfall years

This ensures that the Site's leachate management infrastructure is capable of managing leachate generated under consecutive wet years without overtopping, with leachate levels returning to lower levels once wet conditions abate. Although the exact installation date of the evaporation ponds is not determined, the model assumes initial conditions beginning in 2025 to reflect a conservative worst-case scenario, as the central section of Zone 2 remains uncapped, making it the largest uncapped area at the Site.

Table 4-3 summarises the predicted monthly leachate generation volumes, calculated over the 5-year period for Zones 1 to 5. The complete results and inputs of the HELP modelling are available in Appendix B.

Table 4-3: Yearly Leachate Generation (m^3)

Year	Zone 1	Zone 2 - West	Zone 2 - Central	Zone 2 - East	Zone 3	Zone 4	Zone 5	Total
1	2,781	694	26,969	3,832	0	2,626	230	37,132
2	2,666	663	1,775	3,832	7,949	2,626	220	19,732
3	1,922	525	1,404	1,944	4,031	1,332	158	11,315
4	1,922	522	1,397	2.063	4,278	1,413	159	11,754
5	1,922	522	1,396	198	327	62	159	4,586

Green: The zone is capped;

Blue: The zone remains uncapped;
Orange: The zone is under construction or not yet operational.

During the 90th percentile wet year with the central and east areas of Zone 2 uncapped, as well as Zone 4 uncapped, the Site is predicted to generate approximately 37,132m³ of leachate per annum.

With the capping of the central area of Zone 2 (Central Stage 2 Phase 2) and the inclusion of Zone 3 (SPC), leachate generation decreases to 19,732m³ in the second consecutive wet year. In subsequent years, under 50th percentile average rainfall conditions, leachate generation is projected to decline further to approximately 11,315m³ per annum. Once the landfill is fully capped, the evaporation ponds are estimated to maintain an annual surplus evaporation capacity of approximately 7,000m³, which will contribute to the long-term reduction of leachate volumes.

This progression highlights the importance of progressive capping and site design in reducing leachate generation volumes over time. As more areas of the landfill are capped, and waste is added to active zones, the effective uncapped surface area decreases. This results in lower rainfall infiltration and increased waste absorptive capacity, making leachate generation levels more manageable in the longer term.

4.3 Water Balance Assessment

A Water Balance Assessment was utilised to determine the appropriate size of the proposed leachate evaporation ponds and to assess their subsequent performance. Using a Microsoft Excel algorithm, the assessment presented a simplified input and output system based on the following:

- Inputs:
  - Monthly rainfall
  - Additional leachate generated from rainfall
- Outputs:
  - Evaporation

4.3.1 System Inputs

The leachate generation volumes presented in Table 4-3 were utilised as part of the Water Balance Assessment for the ponds as well as the monthly rainfall for 50th and 90th percentile rainfall years. As detailed in Section 3, the 90th percentile rainfall scenario equates to an annual rainfall of 857mm and the 50th percentile rainfall scenario was calculated as 716mm.

The system does not explicitly model the leachate currently stored in the landfill. However, this volume will be progressively managed during the operational phase by taking advantage of dry months to reduce pond levels and ensuring that the system enters wet months with as much capacity as possible. The operation of the leachate pond system is described in detail in Section 5.

4.3.2 System Outputs

To quantify the amount of leachate evaporated each year, the following parameters were assumed:

- The freeboard was set at 500mm to determine the operational volume of each pond;
- The actual evaporation rate was assumed to be 70% of the potential pan evaporation rate;
- No rainfall within an evaporation pond's catchment area was lost to run-off; and
- For the purpose of the calculations, the evaporation area was set at a 700mm freeboard for each evaporation pond.

No evaporation maximisation methods, such as leachate aeration, drip irrigation, spray atomisers, have been assumed as part of the Water Balance Assessment, to ensure the model was developed with a further element of conservatism.

The model allows for additional leachate to be processed; however, the exact volume that can be treated will depend on rainfall patterns, evaporation rates, and available pond capacity during dry months.

Details on the system outputs are provided in Appendix C.

4.3.3 Assessment Results

The Water Balance Assessment determined that two leachate evaporation ponds are required to effectively manage leachate volumes at the Site. The assessment results informed the design, which consists of a dual-pond system within the LMA. Pond 1 is designed as a deeper storage pond from which leachate will be transferred to the shallower Pond 2 for evaporation. All Drawings for the proposed leachate evaporation pond system have been provided in Appendix A.

During a 50th percentile rainfall year, the proposed pond system is expected to achieve a balanced water outcome, with leachate generation matched by evaporation capacity. Once the landfill is fully capped and leachate generation is reduced significantly, this additional capacity will increase to 7,000m^3 per year, further aiding in the reduction of the leachate volume currently stored within the landfill cells. The results of the modelling are provided in Appendix C.

Typical construction details for the leachate evaporation pond system can be seen in Drawing C-310 (Appendix A). The design characteristics of the evaporation ponds are provided in Table 4-4.

Table 4-4: Leachate Evaporation Pond Design Characteristics

Pond	Catchment Area (m^2)	Evaporation Area* (m^2)	Operational Volume° (m^3)	Total Volume (m^3)
Pond 1	21,837	18,844	31,413	41,239
Pond 2	16,803	15,834	18,355	26,582
Total Capacity	**38,640**	**34,678**	**49,796**	**67,821**

**Maximum Evaporation Area is considered to be at 700mm freeboard from pond crest.*
° Operational Volume is considered to be at 500mm freeboard from pond crest.

4.3.3.1 *Storm Event Check*

The BPEM Guidelines state that a leachate pond must maintain a freeboard sufficient to accommodate rainfall from a 24-hour, 1-in-20-year storm event without overflowing. This requirement has been addressed as a storm event check within the Water Balance Assessment. The storm event was incorporated into the Water Balance Assessment to verify whether the cumulative residual volume in each pond has sufficient capacity to accommodate the storm event, in addition to normal rainfall and leachate inputs for any given month, while remaining below the freeboard level.

The Annual Exceedance Probability (AEP) for a 24-hour, 1-in-20-year storm event was calculated as 97.1mm, as indicated in Table 3-3. The Water Balance Assessment confirmed that the proposed pond system has adequate capacity to manage this storm event while also handling normal system inputs during an average rainfall year.

The results of the Water Balance Assessment with the storm event check are provided in Appendix C.

5 Operational Management and Monitoring Strategy

The leachate management and monitoring strategy for the Site is structured around three key pillars, operational management, the reduction of the leachate surplus, and ongoing monitoring to ensure environmental compliance.

5.1 Operational Leachate Management

Operational leachate management will focus on irrigation, evaporation, and maintaining optimal pond levels to ensure system efficiency and minimise risks. Specific measures include:

- Leachate irrigation: Leachate may be irrigated onto the waste mass as explained in Section 4.1.3;
- Automated monitoring: Leachate pond levels will be controlled via the Site's Supervisory Control and Data Acquisition (SCADA) system, allowing for real-time monitoring and optimisation of pond operations; and
- Evaporation: Future methods, such as aeration, spray atomisers, and drip irrigation, are recommended to maximise evaporation rates and enhance treatment capacity during dry months.

5.2 Monitoring and Maintenance

Continuous monitoring and maintenance will be essential to ensure the system's effectiveness and compliance with regulatory requirements. Key actions include:

- Regular inspections and maintenance: The leachate collection and extraction system will be routinely inspected, maintained, and repaired as necessary;
- Leachate level and quality monitoring: Periodic monitoring will assess leachate levels and quality to ensure compliance with assessment criteria described in Section 6.1.4.2 Odour Monitoring Strategy in the EPN LMP;
- Accurate flow measurement: Flow metres will be installed at key points, including leachate extraction points , pond inlets and outlets including water cart filling pipework for irrigation volumes . This will enable:
  - Validation of the water balance model;
  - Reconciliation of leachate input and output volumes; and
  - Continuous optimisation of operations.

5.3 Management of Existing Leachate Surplus

According to the SLMP, the Site currently holds an estimated 417,000m³ of leachate surplus within the landfill. While this volume has not been directly included in the water balance model, it will be progressively managed through the following strategies:

- Dry season treatment: During dry months, leachate will be actively processed, leveraging available evaporation pond capacity and maximising evaporation rates. This approach ensures that pond levels are reduced as much as possible before entering wet months;

- Post-closure reduction: Once the landfill is fully capped, leachate generation will significantly decrease, enabling the Site to focus on the aggressive reduction of the remaining leachate surplus during the post-closure phase;
- Capacity optimisation: The evaporation pond system is designed to manage not only operational leachate generation but also contribute to the gradual treatment of the leachate surplus over time.

Following the complete capping of the Site, leachate generation will significantly decrease due to reduced rainfall infiltration. Once the landfill is fully capped, the evaporation ponds are estimated to have an annual surplus evaporation capacity of approximately 7,000m³ on a 50th percentile year.

This surplus represents the volume of leachate that can be treated annually beyond what is generated during the post-closure phase.

5.4 Recommendations

The water balance assessment confirms that the proposed leachate ponds will have sufficient capacity to manage leachate generation at the Site over the next five years, effectively until closure, even under a scenario of two consecutive 90th percentile wet years followed by three 50th percentile average rainfall years.

Additional monitoring of leachate flows within the leachate management infrastructure will be essential to calibrate the leachate generation model to ensure the assumptions are valid and the estimates are correct. This information will also be critical in determining any improvement that can be made to optimise the system. This includes tracking inputs into the pond system and outputs to irrigation, conducting volumetric checks of stored and evaporated leachate, measuring changes in leachate levels in Stage 2, and improving flow measurement accuracy. Water levels within the pond should also be monitored once constructed, along with the efficiency of any new infrastructure that has been installed to artificially increase evaporation rates.

Since there is currently not sufficient data to include irrigation effects in the water balance modelling, continuous data collection will be required to refine model inputs and validate predictions over time. The model should be updated once site-specific information is available, allowing for ongoing calibration and improved forecasting of leachate generation and treatment.

The rate at which the LMA can process the leachate accumulated within the landfill has been estimated on a worst-case-scenario basis. As mentioned in Section 5.1, several techniques should be considered. Implementing a combination of these techniques could optimise evaporation rates and reduce the overall leachate volume that requires long-term management. The selection of the most appropriate methods should be based on site-specific conditions, climate data, odour impact, and operational feasibility.

6 Approvals Path Mapping

The Site already operates under licence L9395/2023/1. Therefore, a works approval and licence amendment are required for the construction and operation of the proposed leachate management system.

6.1 Works Approval (Part V of EP Act)

The DWER is responsible for the regulation of Prescribed Premises under Part V of the *Environmental Protection Act 1986*. Certain industrial premises with significant potential to cause emissions and discharges to air, land or water are classified as 'Prescribed Premises' and triggers regulation under the *Environmental Protection Act 1986*. Those activities that are considered to be Prescribed Premises, and their associated production or design thresholds, are listed in Schedule 1 of the *Environmental Protection Regulations 1987*.

As the proposed facility is classified as a Prescribed Premises, a Works Approval will be required for the construction of the leachate management system and a Licence amendment is required for its operation. The Works Approval and Licence are issued by the DWER with legally binding conditions that are intended to prevent or minimise the potential for pollution. As part of the Works Approval assessment process, the DWER will assess whether the designed engineering controls proposed are appropriate and that any potential impacts during the construction works are minimised to the appropriate standards. If these requirements are met, the DWER will issue a Works Approval in approximately 90 working days however this can vary depending on the complexity of the project and the DWER resources available to complete the assessment.

The EPN LMS, may play a role in expediting the approval process for the evaporation ponds. At a minimum, the approvals path will need to account for any additional requirements that may arise from the EPN process.

Under section 102 of the EP Act 1986, anyone can lodge an appeal with the Minister within 21 days of the Applicant being notified on the decision. The grounds for appeal must relate to either of the following:

- Refusal to grant or transfer a licence or works approval;
- Conditions applied to a licence or works approval; or
- Amendment, revocation or suspension of a licence or works approval.

The timeframe for the appeal to be assessed by the Appeals Convenor and for the Minister to make a determination on the appeal varies depending on the appeal.

6.2 Licence Amendment

Talis anticipates that it will take approximately 2-3 months for the DWER to process a completed Licence amendment application. It should be noted that an amended Licence cannot be granted until the Works Approvals compliance report (i.e., Critical Containment Infrastructure Report) has been approved by the DWER, verifying that the infrastructure has been constructed accordingly.

APPENDIX A
Drawings

W-100: Existing Site Layout and Topography

W-400: Site Layout

W-401: Site Layout – Basal Lining

W-402: Site Layout – Capping System

W-403: Site Layout - Zones

C-111: Proposed Leachate Management System

C-111: Leachate Pond System Layout

C-210: Leachate Pond 1 Cross-sections

C-210: Leachate Pond 2 Cross-sections

C-310: Leachate Pond System Typical Details

LEGEND:

- PREMISES BOUNDARY
- STAGE AND PHASE BOUNDARIES
- CAPPING BOUNDARIES
- PIGGYBACK CELLS
- PROPOSED LEACHATE MANAGEMENT AREA
- PROPOSED INFILTRATION BASIN
- LEACHATE EXTRACTION WELLS
- PROPOSED SECURITY FENCE
- PROPOSED SWALE

FOR CONSTRUCTION

100m 0m 100m 200m

1:5000 @ A3

SURVEY DATE: 01 JULY 2025
VERTICAL DATUM: AUSTRALIAN HEIGHT DATUM
HORIZONTAL DATUM: MGA 94 ZONE 50

talis consultants

Client: MINDARIE REGIONAL COUNCIL

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No.	Date	Drawn	Chk.	Amendment / Issue	App.
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B	[illegible]	YJ	AB	ISSUED FOR TENDER	
A	[illegible]	YJ	AB	PRELIMINARY ISSUE	

Project: TAMALA PARK LEACHATE MANAGEMENT AREA

Title: SITE LAYOUT

Scale: AS SHOWN @ A3	Date: 28.08.2025	
Drawn: YJ	Checked: AB	Approved: CS
Job No: TW23015	Dwg. No: W-110	Rev: 0

FOR CONSTRUCTION

SURVEY DATE: 01 JULY 2025
VERTICAL DATUM: AUSTRALIAN HEIGHT DATUM
HORIZONTAL DATUM: MGA 94 ZONE 50

100m 0m 100m 200m

1:5000 @ A3

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Client: MINDARIE REGIONAL COUNCIL

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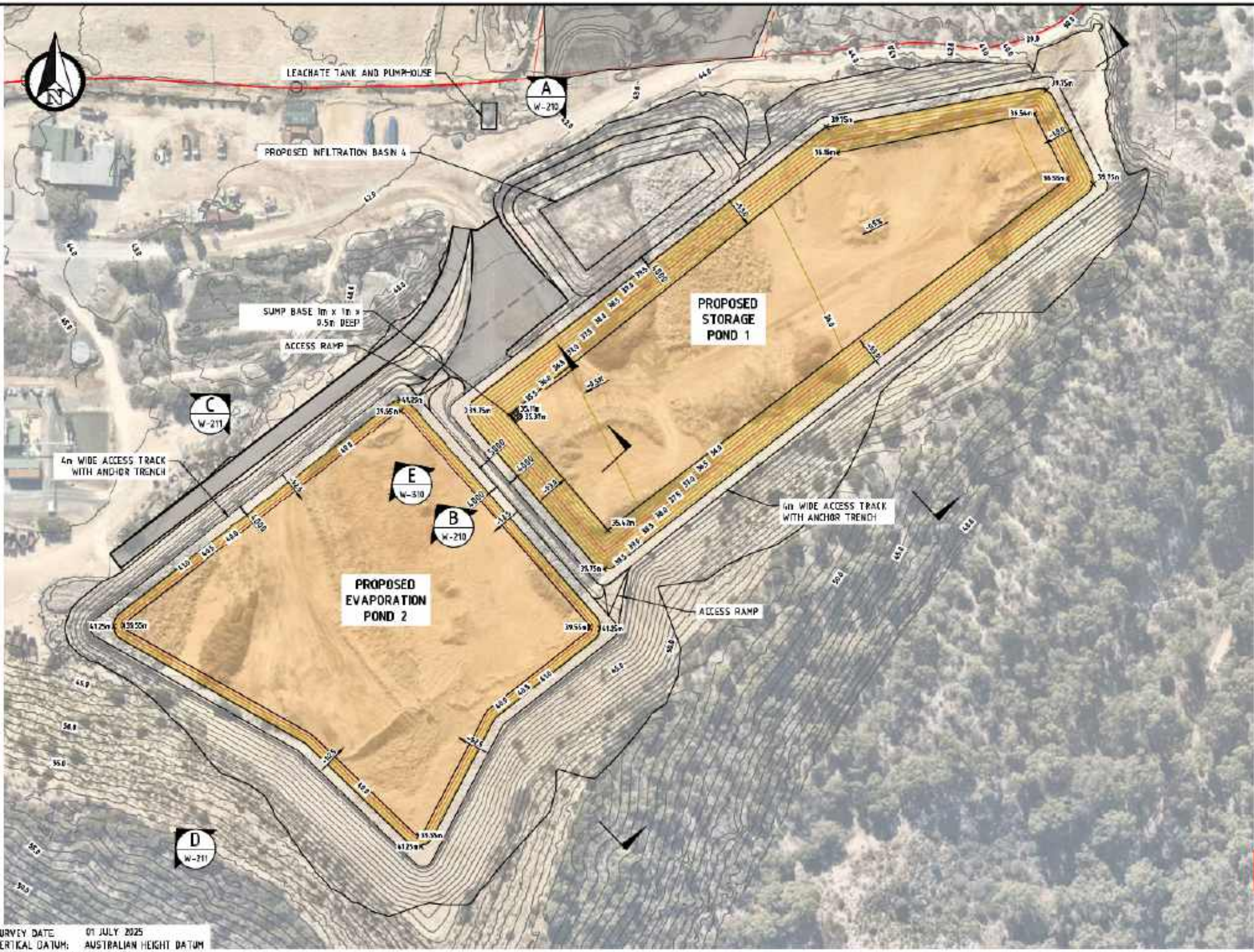
0	28.08.2025	YJ	AB	ISSUED FOR CONSTRUCTION	CS
B	[illegible]	YJ	AB	ISSUED FOR TENDER	
A	[illegible]	YJ	AB	PRELIMINARY ISSUE	

Project: TAMALA PARK LEACHATE MANAGEMENT AREA

Title: EXISTING TOPOGRAPHY

Scale: AS SHOWN @ A3		Date: 28.08.2025
Drawn: YJ	Checked: AB	Approved: CS
Job No: TW23015	Drg. No: W-111	Rev: 0
Filename: TW23015 - LMA_SET.DWG		



LEGEND:

PROPOSED LEACHATE POND

FOR CONSTRUCTION

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1:1500 @ A3

SURVEY DATE: 01 JULY 2025
VERTICAL DATUM: AUSTRALIAN HEIGHT DATUM
HORIZONTAL DATUM: MGA 94 ZONE 50

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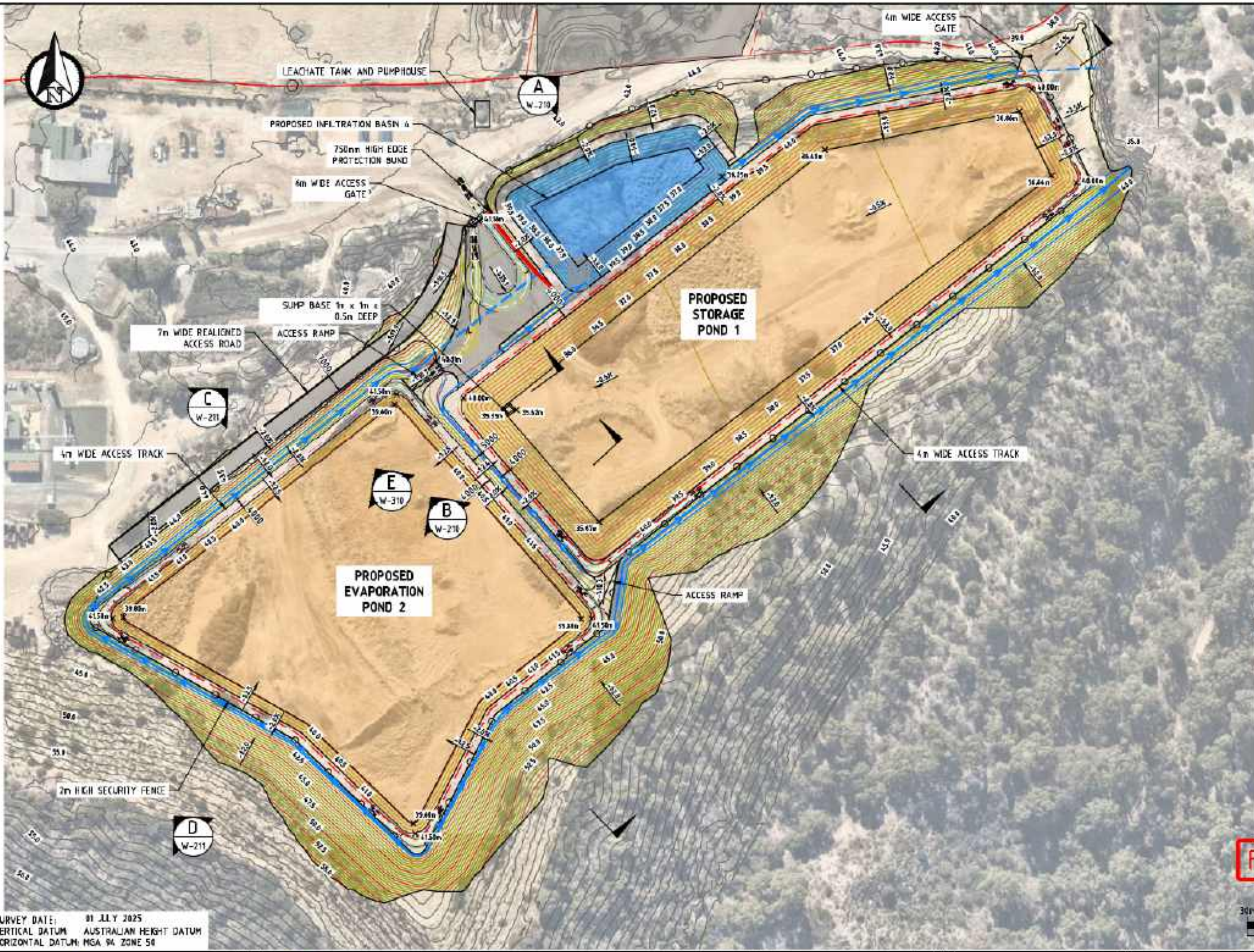
B	[illegible]	YJ	AB	ISSUED FOR TENDER	
A	[illegible]	YJ	AB	PRELIMINARY ISSUE	

Project: TAMALA PARK LEACHATE MANAGEMENT AREA

Title: FORMATION LEVELS

Scale: AS SHOWN @ A3	Date: 28.08.2025	
Drawn: YJ	Checked: AB	Approved: CS
Job No: TW23015	Drg. No: W-112	Rev: 0
Filename: TW23015 - LMA_511.DWG		



LEGEND:

- PROPOSED LEACHATE MANAGEMENT AREA
- PROPOSED INFILTRATION BASIN
- PROPOSED SECURITY FENCE
- PROPOSED SWALE
- PROPOSED ACCESS GATE
- PROPOSED TRENCH LINE

FOR CONSTRUCTION

30m 0m 30m 60m

1:1500 @ A3

SURVEY DATE: 01 JULY 2025
VERTICAL DATUM: AUSTRALIAN HEIGHT DATUM
HORIZONTAL DATUM: MGA 94 ZONE 50

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B	[illegible]	YJ	AB	ISSUED FOR REVIEW	
A	[illegible]	YJ	AB	PRELIMINARY ISSUE	

Project: TAMALA PARK LEACHATE MANAGEMENT AREA

Title: ENGINEERED FILL LEVELS

Scale: AS SHOWN @ A3 | Date: 28.08.2025
Drawn: YJ | Checked: AB | Approved: CS
Job No: TW23015 | Drg. No: W-113 | Rev: 0
Filename: TW23015 - LMA_SET.DWG

SURVEY DATE: 01 JULY 2025
VERTICAL DATUM: AUSTRALIAN HEIGHT DATUM
HORIZONTAL DATUM: MGA 94 ZONE 50

LEGEND:

- PROPOSED LEACHATE MANAGEMENT AREA
- PROPOSED INFILTRATION BASIN
- PROPOSED GEOCOMPOSITE PRESSURE RELIEF DRAIN
- PROPOSED SECURITY FENCE
- PROPOSED SWALE
- PROPOSED EGRESS CARGO NET
- PROPOSED ACCESS GATE
- LEACHATE MAIN BY OTHERS
- LIFE BUOY

NOTES:
LEACHATE POND 01 EVAPORATION AREA OF 18,956 m^2
LEACHATE POND 01 STORAGE OPERATIONAL VOLUME OF 54,035 m^3 WITH 0.5m FREEBOARD

LEACHATE POND 02 EVAPORATION AREA OF 15,887 m^2
LEACHATE POND 02 STORAGE OPERATIONAL VOLUME OF 18,280 m^3 WITH 0.5m FREEBOARD

FOR CONSTRUCTION

30m 0m 30m 60m
1:1500 @ A3

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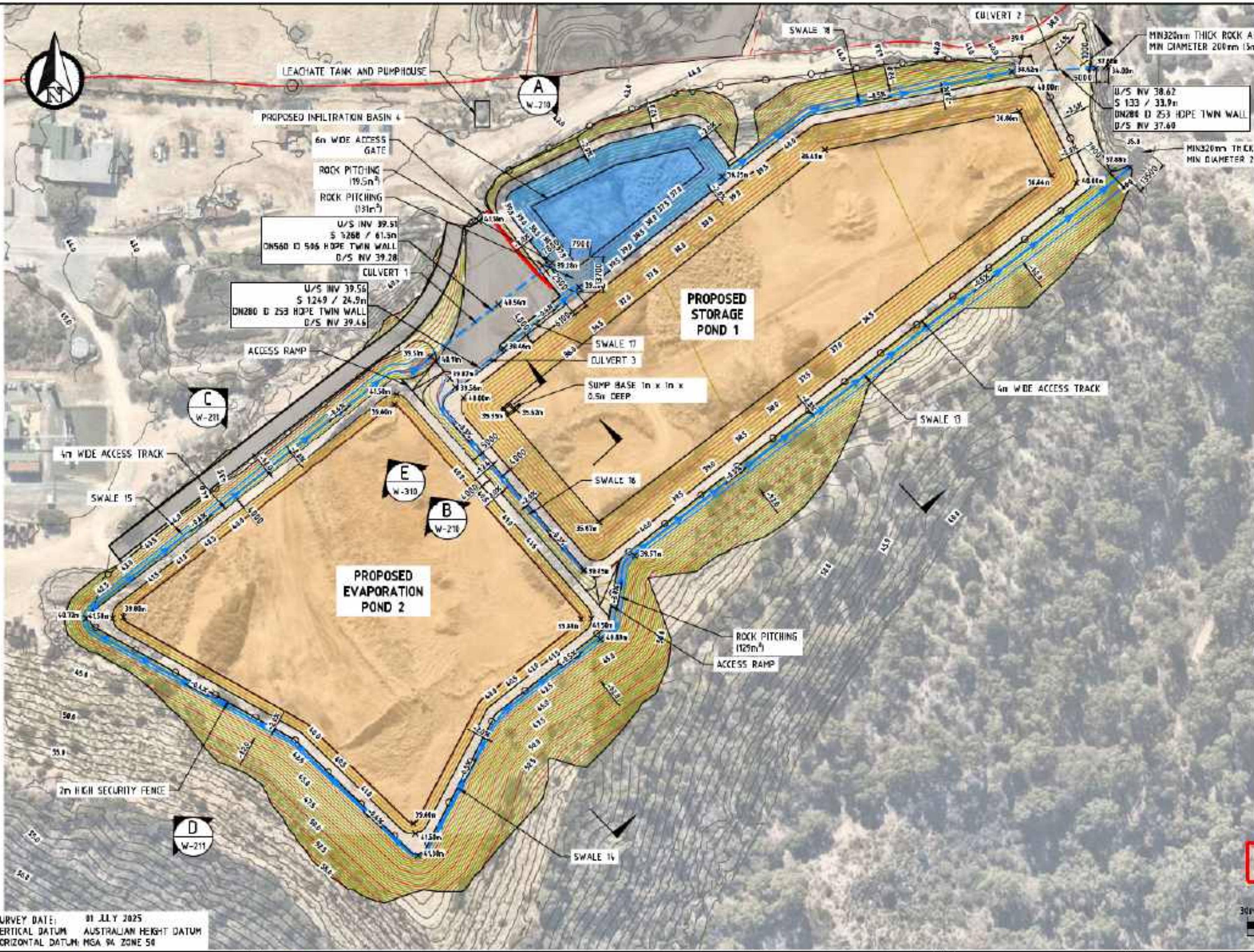
B	25.07.2025	YJ	AB	ISSUED FOR TENDER	
A	16.07.2025	YJ	AB	PRELIMINARY ISSUE	

Project: TAMALA PARK LEACHATE MANAGEMENT AREA

Title: LEACHATE AND GAS MANAGEMENT LAYOUT

Scale: AS SHOWN @ A3 | Date: 28.08.2025
Drawn: YJ | Checked: AB | Approved: CS
Job No.: TW23015 | Dwg. No: W-114 | Rev: 0
Filename: TW23015 - LMA_SET.DWG



LEGEND:

- PROPOSED LEACHATE MANAGEMENT AREA
- PROPOSED INFILTRATION BASIN
- PROPOSED ROCK PITCHING
- PROPOSED SECURITY FENCE
- PROPOSED SWALE
- PROPOSED ACCESS GATE
- PROPOSED CULVERTS

FOR CONSTRUCTION

30m 0m 30m 60m

1:1500 @ A3

SURVEY DATE: 01 JULY 2025
VERTICAL DATUM: AUSTRALIAN HEIGHT DATUM
HORIZONTAL DATUM: MGA 94 ZONE 50

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B	[illegible]	YJ	AB	ISSUED FOR TENDER	
A	[illegible]	YJ	AB	PRELIMINARY ISSUE	

Project: TAMALA PARK LEACHATE MANAGEMENT AREA

Title: SURFACE WATER MANAGEMENT LAYOUT

Scale: AS SHOWN @ A3	Date: 28.08.2025	
Drawn: YJ	Checked: AB	Approved: CS
Job No: TW23015	Drg. No: W-115	Rev: 0
Filename: TW23015 - LHA_SET.DWG		

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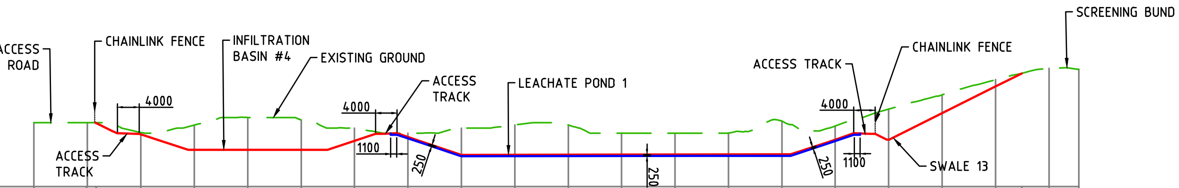

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FORMATION LEVELS									39.052	35.741	35.751	35.761	35.771	35.781 / 35.784	35.791	35.800	38.580						
EXISTING LEVELS	42.000	42.000	42.000	40.162	41.559	43.002	42.537	40.988	40.000	41.001	41.579	41.586	40.000	40.000	40.049	42.318	41.400	44.584	47.217	50.077	51.286	52.227	52.000
DEPTH			0.000	-0.352	-4.639	-6.082	-5.617	-2.383	-0.685	-5.009	-5.577	-5.575	-3.979	-3.969	-4.008	-6.267	-2.557	-5.746	-3.436	-1.295	-0.036		
CHAINAGE	0.000	10.000	11.496	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	120.000	130.000	140.000	150.000	160.000	170.000	180.000	184.936	190.000	195.592

A SECTION
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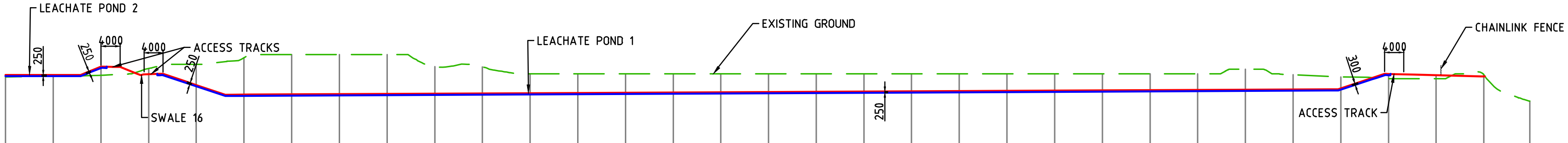

DESIGN LEVELS	39.800	41.500	39.940	37.680	35.668	35.717	35.766	35.815	35.864	35.914	35.963	36.012	36.061	36.110	36.159	36.208	36.257	36.306	36.355	36.404	36.454	36.503	36.552	36.601	36.650	36.699	36.748	36.984	39.984	39.722	39.500	39.500	
FORMATION LEVELS				37.417	35.418	35.467	35.516	35.565	35.614	35.664	35.713	35.762	35.811	35.860	35.909	35.958	36.007	36.056	36.105	36.154	36.204	36.253	36.302	36.351	36.400	36.449 / 35.672	36.498	36.721	39.734				
EXISTING LEVELS	39.520	39.715	41.125	42.000	43.370	44.000	43.999	44.000	41.507	41.446	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000	40.000	41.000	39.814	39.367	39.001	39.000	39.832	39.500	34.296
DEPTH	0.280	1.785	-1.185	-4.320	-7.702	-8.282	-8.233	-8.184	-5.643	-5.533	-4.037	-3.988	-3.939	-3.890	-3.841	-3.792	-3.743	-3.694	-3.645	-3.596	-3.546	-3.497	-3.448	-3.399	-3.350	-4.301	-3.066	-2.383	0.983	0.722	-0.332	0.000	
CHAINAGE	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	120.000	130.000	140.000	150.000	160.000	170.000	180.000	190.000	200.000	210.000	220.000	230.000	240.000	250.000	260.000	270.000	280.000	290.000	300.000	310.000	310.230	319.638

B SECTION
W-112
SCALE: 1:1000

FOR CONSTRUCTION

1:1000 @ A3 VERT
1:1000 @ A3 HORIZ
20m 0m 20m 40m

SURVEY DATE: 01 JULY 2025
VERTICAL DATUM: AUSTRALIAN HEIGHT DATUM
HORIZONTAL DATUM: MGA 94 ZONE 50

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Client: MINDARIE REGIONAL COUNCIL

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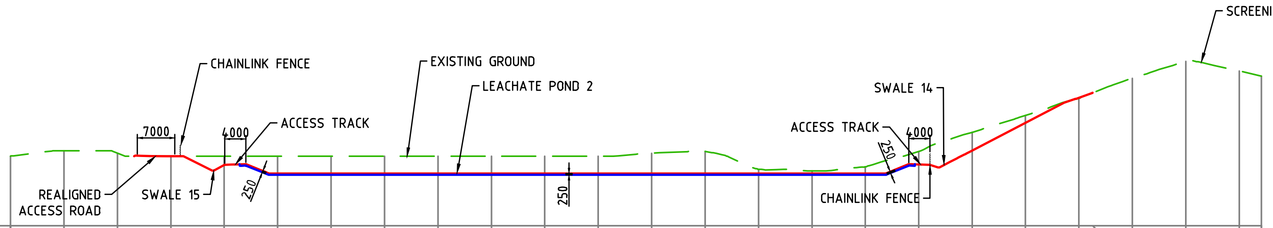
No.	Date	Drwn.	Chk.	Amendment / Issue	App.
0	28.08.2025	YJ	AB	ISSUED FOR CONSTRUCTION	CS
B	25.07.2025	YJ	AB	ISSUED FOR TENDER	
A	18.07.2025	YJ	AB	PRELIMINARY ISSUE	

Project: TAMALA PARK LEACHATE MANAGEMENT AREA

Title: LEACHATE STORAGE POND 1 SECTIONS

Scale: AS SHOWN @ A3 Date: 28.08.2025
Drawn: YJ Checked: AB Approved: CS
Job No: TW23015 Drg. No: W-210 Rev: 0
Filename: TW23015 - LMA_SET.DWG

Printed by Yuiha Jeong on 01.07.2025 12:56 PM

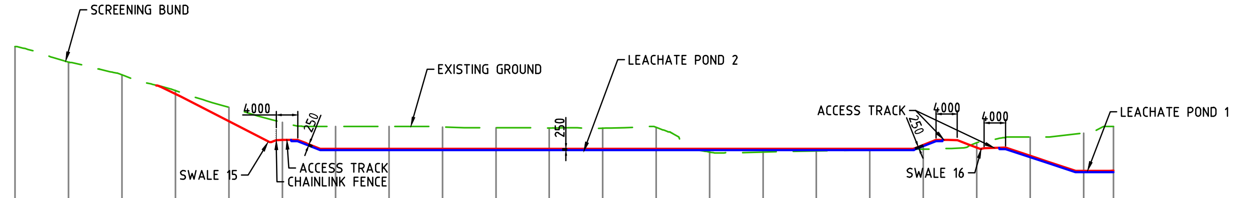


VERT EXAG 1:1
Datum 30.000

	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	120.000	130.000
DESIGN LEVELS				43.015	41.383	39.800	39.800	39.800	39.800	39.800	39.800	39.800	39.800	39.800
FORMATION LEVELS						39.550	39.550	39.550	39.550	39.550	39.550	39.550	39.550	39.550
EXISTING LEVELS	43.000	43.999	43.573	43.000	43.000	43.000	42.999	42.997	42.993	42.990	42.994	42.998	43.571	43.911
DEPTH				0.014	-1.617	-3.200	-3.199	-3.197	-3.193	-3.190	-3.194	-3.198	-3.771	-4.111
CHAINAGE	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	120.000	130.000

	140.000	150.000	160.000	170.000	180.000	190.000	200.000	202.537	210.000	220.000	230.000	234.132
DESIGN LEVELS	39.800	39.800	39.800	41.462	44.065	49.277	53.940	54.892				
FORMATION LEVELS	39.550	39.550	39.550 39.550									
EXISTING LEVELS	40.559	40.247	41.032	43.881	47.491	50.655	53.855	54.838	57.598	60.737	58.942	58.000
DEPTH	-0.759	-0.447	-1.232	-2.419	-3.425	-1.378	0.085	0.054				
CHAINAGE	140.000	150.000	160.000	170.000	180.000	190.000	200.000	202.537	210.000	220.000	230.000	234.132

C W-112 SECTION
SCALE: 1:1000



VERT EXAG 1:1
Datum 30.000

	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000
DESIGN LEVELS				50.083	44.987	41.443	39.800	39.800	39.800	39.800	39.800
FORMATION LEVELS							39.550 39.550	39.550	39.550	39.550	39.550
EXISTING LEVELS	59.000	56.044	53.683	50.736	47.588	44.749	44.000	44.000	43.881	43.732	43.723
DEPTH				-0.653	-2.600	-3.306	-4.200	-4.200	-4.081	-3.932	-3.923
CHAINAGE	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000

	110.000	120.000	130.000	140.000	150.000	160.000	170.000	180.000	190.000	200.000	205.604
DESIGN LEVELS	39.800	39.800	39.800	39.800	39.800	39.800	40.543	40.037	38.479	35.656	35.682
FORMATION LEVELS	39.550	39.550	39.550	39.550	39.550	39.550	40.274				
EXISTING LEVELS	43.669	43.830	39.171	39.183	39.374	39.565	39.737	40.944	42.001	42.758	44.000
DEPTH	-3.869	-4.030	0.629	0.617	0.426	0.235	0.806	-0.907	-3.522	-7.103	-8.318
CHAINAGE	110.000	120.000	130.000	140.000	150.000	160.000	170.000	180.000	190.000	200.000	205.604

D W-112 SECTION
SCALE: 1:1000

FOR CONSTRUCTION

1:1000 @ A3 VERT
1:1000 @ A3 HORIZ
20m 0m 20m 40m

SURVEY DATE: 01 JULY 2025
VERTICAL DATUM: AUSTRALIAN HEIGHT DATUM
HORIZONTAL DATUM: MGA 94 ZONE 50

FILENAME: \\SERVER\TALIS\SECTIONS\WASTE\PROJECTS\TW2021\TW21026 - TAMALA PARK MRC CLOSURE PLAN\DRAWINGS\TW23015 - LMA_SET.DWG

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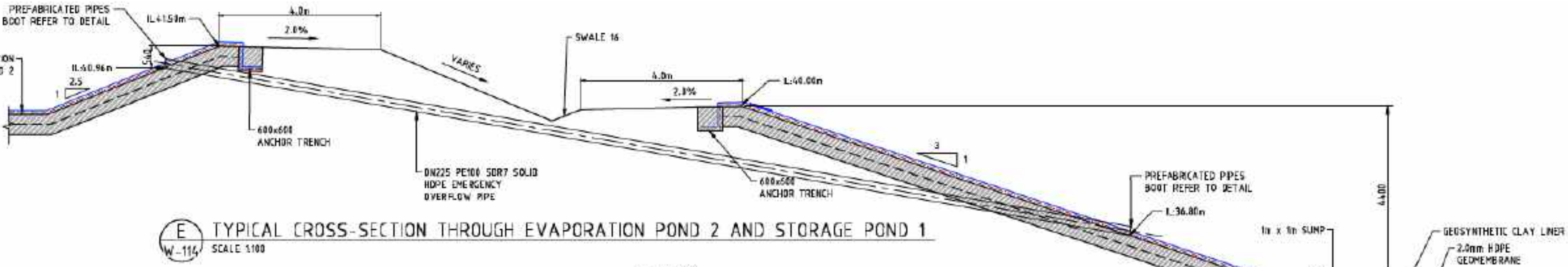
0	28.08.2025	YJ	AB	ISSUED FOR CONSTRUCTION	CS
B	25.07.2025	YJ	AB	ISSUED FOR TENDER	
A	18.07.2025	YJ	AB	PRELIMINARY ISSUE	

Project: TAMALA PARK LEACHATE MANAGEMENT AREA

Title: LEACHATE EVAPORATION POND 2 SECTIONS

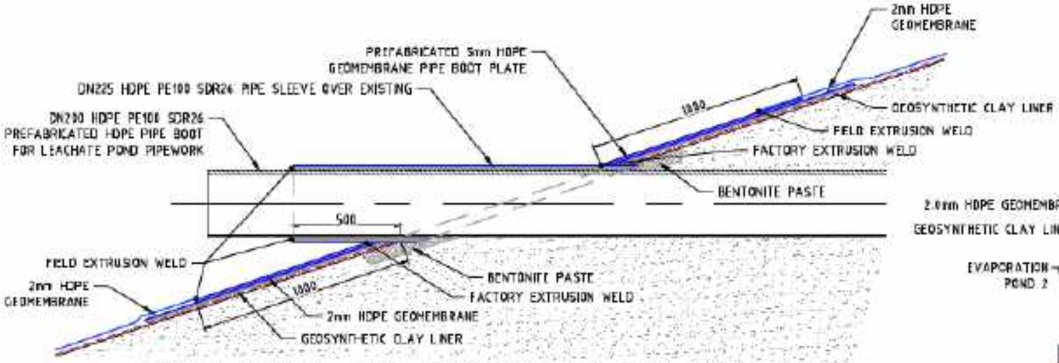
Scale: AS SHOWN @ A3	Date: 28.08.2025	
Drawn: YJ	Checked: AB	Approved: CS
Job No: TW23015	Drg. No: W-211	Rev: 0
Filename: TW23015 - LMA_SET.DWG		



E
W-114

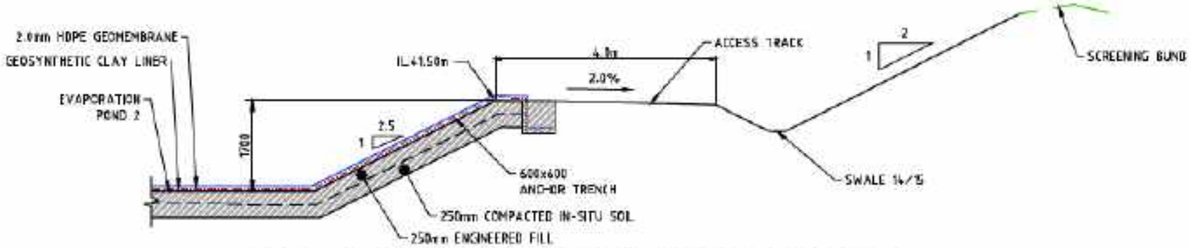
TYPICAL CROSS-SECTION THROUGH EVAPORATION POND 2 AND STORAGE POND 1

SCALE 1:100



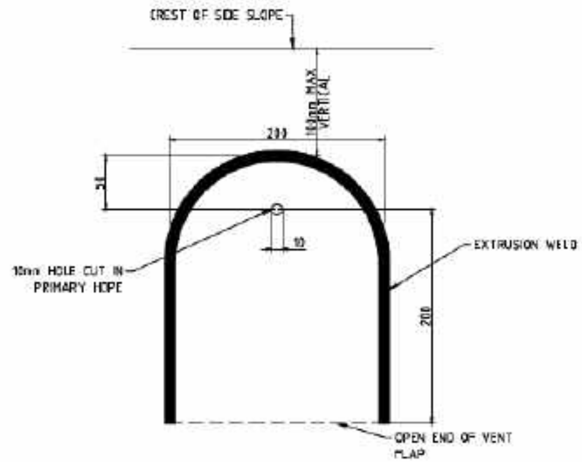
TYPICAL DETAIL - PREFABRICATED HDPE PIPE BOOT

SCALE: 1:20



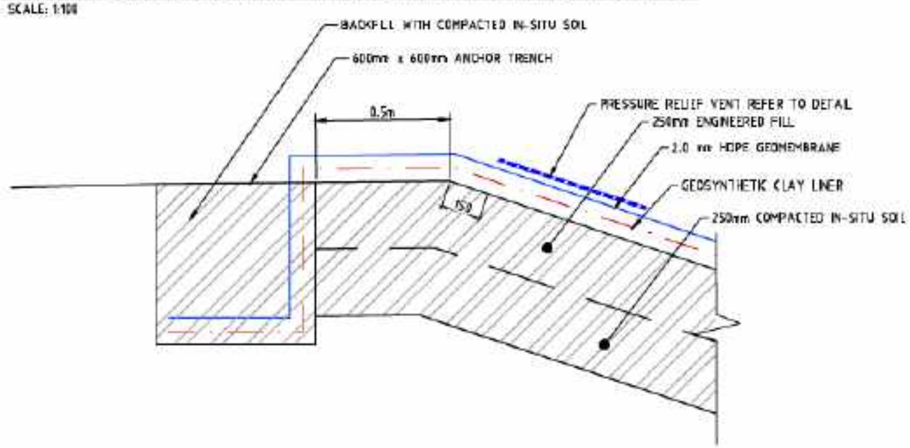
TYPICAL CROSS-SECTION THROUGH EVAPORATION POND 2

SCALE: 1:100



PRESSURE RELIEF VENT AND RAIN FLAP DETAIL

SCALE: 1:5



TRENCH AND LINING DETAIL

SCALE: 1:20

LEGEND:

HDPE GEOMEMBRANE

GEOSYNTHETIC CLAY LINER

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No.	Date	Drwn.	Chk.	Amendment / Issue	App.
0	[illegible]	YJ	AB	ISSUED FOR CONSTRUCTION	CS
B	[illegible]	YJ	AB	ISSUED FOR TENDER	
A	[illegible]	YJ	AB	PRELIMINARY ISSUE	

Project: TAMALA PARK LEACHATE MANAGEMENT AREA

Title: TYPICAL DETAILS

Scale: AS SHOWN @ A3	Date: 28.08.2025	
Drawn: YJ	Checked: AB	Approved: CS
Job No.: TW23015	Drg. No.: W-310	Rev.: 0

Filename: TW23015 - LMA_SET.DWG