REPORT

Erskine Park Landfill

Final Capping and Rehabilitation

Landfill Closure Plan

Submitted to:

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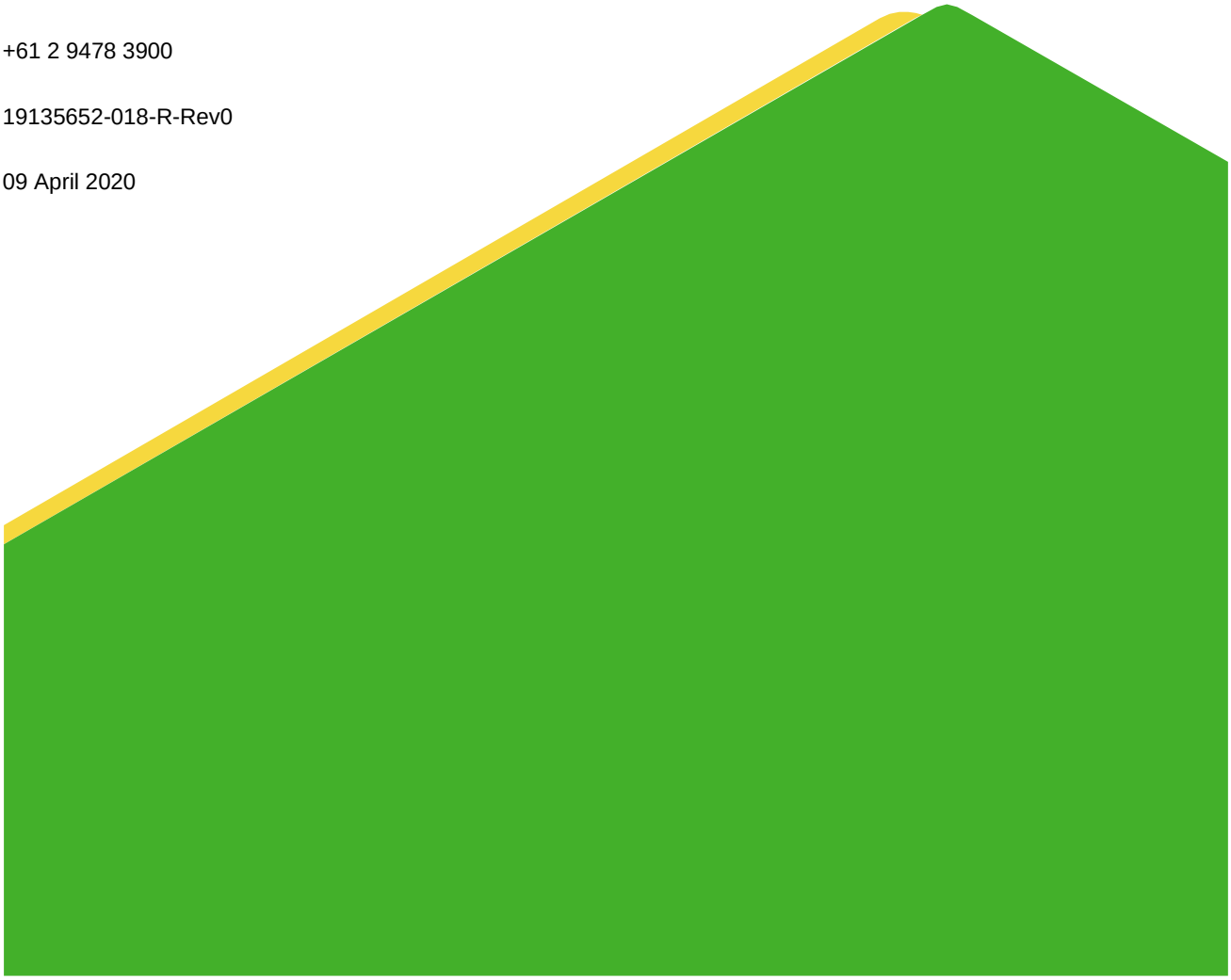

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Consulting Earth Scientists, 2007: Landfill Closure Plan 2007, Erskine Park Landfill. Report ID CES000102-EGD-157-01-D.	Landfill Closure Plan	Unknown
SLR , 2017: *Erskine Park Final Capping and Rehabilitation Landfill Closure Plan, 610.16277 Landfill Closure Plan R2*	Revised Landfill Closure Plan	2017
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ABBREVIATIONS

AS	Australian Standards
AHD	Australian Height Datum
BOD	Biological Oxygen Demand
BT	Benchmark Technique
CES	Consulting Earth Scientists
CQA	Construction Quality Assurance
EBT	Effluent Balancing Tank
EPA	Environment Protection Authority
EPL	Environment Protection Licence
FML	Flexible Membrane Liner
IBT	Inflow Balancing Tank
LEL	Lower Explosive Limit
LEMP	Landfill Environmental Management Plan
LEP	Local Environmental Plan
LTP	Leachate Treatment Plant
mAHD	metres Australian Height Datum
NSW	New South Wales
OMC	Optimum Moisture Content
POEO	Protection of the Environment Operations Act 1997
PCA	Pollution Control Approval
SEPP	State Environment Planning Policy
SLR	SLR Consulting Australia Pty Ltd
SMDD	Standard Maximum Dry Density
SMS	SCADA Management System
QA	Quality Assurance

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1.0 INTRODUCTION

1.1 General

This document presents an update to the Erskine Park Landfill Final Capping and Rehabilitation Closure Plan prepared by SLR dated 23 June 2017 reference 610.16277 Landfill Closure Plan R2.

The Erskine Park Landfill Final Capping and Rehabilitation Closure Plan prepared by SLR dated 23 June 2017 was approved by NSW EPA in 2017.

The updates have been generally limited to the following.

Table 1: Updates to the Closure Plan

Aspect	Description
Final Landform	**The final landform was approved by NSW EPA in 2017.** **Final Landform has been updated to reflect the MSW Wall Application**
Surface Water	**Surface Water updated to reflect the MSE Wall Application and final profile**

Enviroguard Waste Management Ltd (Enviroguard) own and operate the Erskine Park Landfill, 4 Quarry Road, Erskine Park, New South Wales.

The site is located on the former CSR quarry that mined breccia from the Erskine Park diatreme.

Landfilling operations at the site are subject to conditions of Environment Protection Licence (EPL) 4865 issued under the Protection of the Environment Operations (POEO) Act and administered by the NSW Environment Protection Authority (EPA).

Pursuant to Section 76 of the POEO Act and Section 10 of the EPA *Environmental Guidelines: Solid Waste Landfills, Second edition 2016* (Guidelines), a Closure Plan is to be submitted to the EPA on behalf of the owner and 'last licensee', Enviroguard.

Section 10 of the Guidelines states that the Closure Plan is to be submitted for approval no later than 12 months before the completion of the landfill's waste receipt operations and that the Closure Plan should include a post-closure monitoring and maintenance programme intended to ensure the long-term integrity of the landfill.

Post-closure monitoring and maintenance should address the assessment of multiple environmental receptors including emissions to water, the atmosphere, the protection of land use and local amenity. The proposed monitoring and maintenance programme shall be continued until the landfill does not pose a threat to public health & safety and the environment.

1.2 Requirements of the Closure Plan

The requirements of this Closure Plan, as outlined within the Guidelines must address the following issues:

- A description of the proposed closure and rehabilitation works, including a description of the final capping layer for the site and the rehabilitation strategy;
- Specifying the steps taken, or to be taken in closing and stabilising the premises including a proposed timeframe for doing so;

- Ensure that all leachate collection, gas collection, stormwater sediment controls, monitoring and reporting practices are maintained to a standard equivalent to that employed during the operational life of the landfill;
- Ensure that neighbouring residents are advised of contact persons to discuss any problems, such as odour emissions etc. Records of complaints should be kept in the same manner as required during the operational phase of the landfill; and
- Ensure that waste materials are not received for disposal at the facility after operation cease. Waste materials that are intended for use in the remediation should be documented and reported in the same was as for an operating facility.

The monitoring and maintenance obligations outlined in this Closure Plan may only be reduced or modified with the approval of the EPA. Changes or reductions in the scope of post-closure obligations may be possible as the landfill and associated waste mass stabilises with time after closure.

The licensee or occupier (Enviroguard) may seek to complete all obligations and retrieve the financial assurance when it can be demonstrated that the landfill is “stable and non-polluting”, in accordance with the Guidelines. This approach is to be implemented by submitting a certified statement of completion for consideration by the EPA to the effect that the site rehabilitation work has been completed and further environmental management of the premises is not required. Generally this statement will be expected to show that:

- Gas concentrations in all perimeter gas wells have fallen to less than 1% methane (v/v) and less than 1.5% carbon dioxide for a period of 24 months;
- Analysis of the leachate composition indicates low levels of contamination posing no hazard to the environment, and surface water and groundwater monitoring indicates no water pollution (with respect to relevant published water quality guidelines).
- The landfill capping system has been assessed over some years and is considered to be stable with acceptable surface-water drainage;
- The level of suspended solids in rainwater running off the final capping should be less than 50 mg/L;
- The methane concentration at the surface of the final capping should not exceed 500 ppm at any point;
- The closed landfill no longer poses and adverse amenity risk. It does not generate offensive or excessive odour, dust, noise, litter and debris, present a fire risk, or attract scavengers and vermin; and
- Documentation to demonstrate that all functions in this Closure Plan have been completed with accompanying written confirmation of procedures.

Upon approval of the certified statement of completion by the EPA, the “last licensee” can cease post-closure maintenance and monitoring of the site, and any requirements for financial assurance will lapse.

This Closure Plan has been prepared in a manner that is generally consistent with the approach for landfill closure outlined in the Guidelines. The strategy for site closure and post-closure care involves the following elements:

- A final landform design has been developed. The landform incorporates the effects of consolidation of the waste following closure and has been designed to be sympathetic with the surrounding contours;
- On-going implementation of leachate management and landfill gas control and monitoring systems at the site following closure and capping;

- The site will be capped with a seal-bearing layer, sealing layer or clay cap, infiltration drainage layer and revegetation layer comprised of growing medium to ensure that the final surface provides a barrier to the migration of stormwater into the waste, controls emissions to surface water and atmosphere, promotes sound land management and conservation, prevents hazards and protects amenity;
- Conceptual plans are included for primary and secondary re-vegetation. Initially, the site will be re-vegetated with native grass species;
- Implementation of a maintenance programme; and
- Staging of inspections, monitoring and maintenance programmes to assess the effectiveness of the post-closure strategy.

2.0 FACILITY DETAILS

2.1 Site Location

The landfill is located approximately 39 km west north-west of central Sydney, and some 2 km south west of Erskine Park in the Penrith City Council LGA (see **Figure 1**). Erskine Park Road forms the northern boundary of the site, whilst Quarry Road and commercial warehousing forms the western boundary. The southern and eastern boundaries are dominated by recent commercial warehouse developments, open scrub land and clay stockpiles (south).

2.2 Site Description

Landfill operations have been ongoing within the void created by the former CSR mining operations. Volcanic breccia was extracted from the original elevated landform at RL 87m Australian Height Datum (AHD) to RL -40 m AHD at the base of the void prior to filling. The rim of the landfill is at approximately 55m AHD.

The void was mined with terraced sides for access and stability. Prior to commencement of quarrying activities, overburden was removed and stockpiled around the quarry rim.

Imported clay and soils stockpiles are present on site, specifically those stockpiles on the south-east boundary of the site. These stockpiles are to be utilised for the capping and rehabilitation of the site. Stockpiles are currently stabilised with grass and in some cases mature trees.

Waste placement has been ongoing within the base of the void by progressive waste lifts.

2.3 Environment Protection Licence

EPL 4865 was issued to Enviroguard Pty Ltd to permit the disposal of wastes to land as provided in EPL 4865 Administrative Condition A1.

2.4 Site Access

The site is accessed through Quarry Road, which adjoins Mamre Road to the west of the site. An internal bitumen sealed road provides access from Quarry Road to the site offices, weighbridge, gatehouse, and a workshop/maintenance area.Table 2: Accepted Wastes (as EPL 4865)

Waste	Description	Activity
General Solid Waste (non-putrescible)	As defined in Schedule 1 of the POEO Act, as in force from time to time	Waste Disposal (application to land)
Asbestos Waste	As defined in Schedule 1 of the POEO Act, as in force from time to time	Waste Disposal (application to land)
Waste Tyres	As defined in Schedule 1 of the POEO Act, as in force from time to time	Waste Disposal (application to land)
General Solid Waste (non-putrescible)	Immobilised waste which is assessed as General Solid Waste (non-putrescible) and are subject to general or specific immobilisation approvals	Waste Disposal (application to land)

Waste	Description	Activity
Waste	Any waste received on site that is below licensing thresholds in Schedule 1 of the POEO Act, as in force from time to time	-

2.5 Zoning and Lot

Zoning of the site is administered under *State Environmental Planning Policy (Western Sydney Employment Area) 2008*. The site is predominantly zoned E2 Environmental Conservation, with a small section on the north-west corner zoned IN1 General Industrial.

The site is identified as Lot 4 in Deposited Plan (DP) 1094504 and comprises approximately 21.94 Ha. The site is occupied by the existing Erskine Park Landfill within the Penrith Local Government Area.

2.6 Site Services

Site offices, gatehouse, weighbridge and a workshop/maintenance area are currently located at the site. Refer **Figure 2**. These facilities are connected to permanent water supply, sewer, electricity and telephone services.

2.7 Geology

Erskine Park Landfill lies in the centre of the Cumberland Plain, a low lying, undulating shale landscape composed of the Triassic Wianamatta Group. These rocks were deposited on a broad, low lying coastal plain between 190 and 225 million years ago (Herbert, 1980). The Cumberland Plain was punctured by a series of volcanic vents or diatremes during the Tertiary period (65 and 190 million years ago). Breccia extracted from the diatreme by the CSR operation was formed by the transformation of country rock (shale) that slumped into the vent under conditions of extreme heat and pressure.

The Wianamatta Group of rocks belonging to the Bringelly Shale Formation dominate the surrounding geology to the site, and in fact cover vast areas of the Cumberland Plain. The Bringelly Shale grades upwards from a lagoonal coastal marsh sequence at the base to increasingly terrestrial, alluvial plain sediments towards the top of the formation. The Bringelly Shale Formation is underlain by the Triassic Hawkesbury Sandstone Formation. The Bringelly Shale has a maximum thickness of 257m near Campbelltown and is approximately 60m thick at Eastern Creek.

2.8 Hydrogeology

The Bringelly Shale has a very low permeability, with results typically exceeding the Landfill Guidelines leachate barrier recompacted clay or modified soil liner in-situ coefficient of permeability requirement of less than $1x10^{-9}$m/s. It is due to the low permeable nature of the Bringelly Shale that a large proportion of Sydney's landfills are sited within this geological unit.

Rates of groundwater movement are likely to be low as a result of low relief, low altitude (approximately 50 mAHD) and low permeability of the Wianamatta Shale and volcanic breccia in which the landfill is constructed (Herbert, 1980).

Groundwater associated with the Wianamatta Shale is characterised by high salinity (Wooley, 1980; Krumins et al., 1998) and high ammonia concentrations (>10 mg L-1, Old, 1942). Naturally occurring high levels of these parameters reflect the deposition of organic-rich sediment in low energy coastal environments and may

be incorrectly attributed to leachate contamination. Perched groundwater is often evident within the interspersed sandstone horizons and laminite within the Bringelly Shale.

2.9 Topography and Surface Water Hydrology

Ongoing landfilling operations will be undertaken to produce the final landform as shown in **Figure 4**. Final landform consists of a final landform at 92 mAHD (settling to 87 mAHD) designed to a single peak ridge. Following the creation of the final landform, the landfill will be closed, capped and rehabilitated.

Prior to capping and rehabilitation, any incidental rainfall within the boundary of the landfill will infiltrate the waste mass and contribute to leachate generation.

Surface water drainage from the final landform shall be intercepted by grass lined open swales constructed upon the rehabilitated soil surface. Swales will divert stormwater run-off at an approximate 1:25 gradient to the perimeter surface water drains at the toe of the site. The toe drain that intercepts the swales on the landfill mound shall direct the surface water run-off around the landfill to the south-east, west and north-west where it is discharged to two existing sedimentation dams (see **Figure 6**).

The two dams are located in the following areas:

- NW pond (this serves as the primary dam situated offsite approximately 350m north-east of the current weighbridge)
- SE pond (existing pond also called the “Horse Shoe” pond) situated approximately 700m south-east of the weighbridge)

The landfill is located in the catchment of South Creek which flows into the Hawkesbury River at Windsor.

2.10 Climate

The nearest automated weather station (AWS) operated by the Bureau of Meteorology from which climate data can be obtained is Orchard Hills Treatment Works, Site Number 067084. A summary of the rainfall and temperature data obtained from the Bureau of Meteorology for AWS 067084 is provided below in **Table 3**.

The site also maintains its own weather station as a condition of EPL 4865.

Table 3: Summary of Climate Data from AWS 067084

Weather Station	Value	Years
Operating Years	Commenced 1970	
Rainfall		
Mean annual rainfall (mm)	839.7	1970 – 2015
Temperature		
Mean maximum temperature (°C)	23.3	1970 – 1989
Mean minimum temperature (°C)	11.6	1970 – 1989

3.0 SITE OPERATION

3.1 Waste Placement and Compaction

All waste landfilled is understood to have generally been placed in layers and compacted using typical landfilling equipment, including landfill compactors and dozers. There were no formal specifications with regards to waste and cover material compaction requirements at the landfill. SLR noted that a waste compaction goal of 850 kg/m^3 (excluding cover material) was the EPA expectation for landfills receiving over 50,000 tonnes of waste per annum. The landfill is currently achieving over 1.3t/m^3 and expected to achieve 1.8t/m^3 moving forward.

3.2 Waste Covering

3.2.1 Interim Cover

It is understood exposed waste surfaces were generally covered with a layer of clean fill or similar material. The material used for covering of waste is assumed to be quite variable, as a number of different material sources have been used by the various landfill operators in order to attain the required amount of suitable cover material.

3.2.2 Final Cover Layers

The Guidelines require the following outcomes to be achieved by the final cover/cap layer:

- Reduce rainwater infiltration into the waste, thereby minimising the generation of leachate. Infiltration from the base of the final cap should be less than 5% of the annual rainfall;
- Stabilise the surface of the completed part of the landfill;
- Reduce suspended sediment and contaminated runoff;
- Minimise the escape of untreated landfill gas;
- Minimise odour emissions, dust, litter, the presence of scavengers and vermin, and the risk of fire; and
- Prepare the site of its future use.

During a meeting between Enviroguard and EPA on 1 June 2016, is was agreed that Section 9.1 of the Guidelines did not apply to the site, because the site is not:

- Classified as a restricted solid waste landfill; or
- A general solid waste (putrescible) landfill receiving more than 20,000 tonnes of waste per year.

As such, it was agreed that Section 9.3 *Justification of alternative capping* of the Guidelines would apply to the design for the final cap for the site. The alternative capping and rehabilitation profile for the site is presented within **Figures 5** and **6** and generally comprises:

- A minimum 300mm-thick seal bearing layer, comprising of materials presently in situ in the landfill mound;
- A minimum 500mm-thick sealing layer, comprising clay from on-site sources;
- A minimum 900mm-thick revegetation infiltration layer, comprising Virgin Excavated Natural Material (VENM) and/or Excavated Natural Material (ENM);
- A minimum 100mm-thick revegetation topsoil layer.

A gas drainage layer is excluded due to the provision of a landfill gas collection and treatment system (refer to Section 3.5).

3.3 Existing Landform and Vegetation

The site comprises a single, large landfill cell. As the site is currently active, final landform profiles have not yet been achieved.

The Guidelines state that the final settlement of the seal-bearing surface should leave a gradient of greater than 5% to defined drainage points.

No part of the landfill currently has had final capping layers applied to it or have been formally revegetated. Rather, the landfilled waste has been covered with daily and intermediate cover layers comprised of variable soils and revegetated naturally within various areas of the landfill. Vegetation on the site is quite uneven with substantial areas of sparse vegetation.

Some re-profiling works will be required before the final capping layer is installed to promote effective drainage of stormwater run-off from within the landfill footprint. Establishment of a firm and unyielding subgrade below the final capping layer will reduce long-term maintenance costs associated with differential settlement and should minimise ongoing leachate generation by minimising infiltration.

The current surface water management run-off control measures include provision of a perimeter surface water drain at the base of the landfill. Additional surface water management run-off control measures have been proposed to effectively manage surface water run-off from the proposed final capped landform via a series of swales which shall connect to the current perimeter drains, which in turn convey stormwater to the two existing sedimentation dams.

Placement of rehabilitation soils should be undertaken from the base upwards and graded to reduce incising of water channels through the rehabilitation profile. Localised slumping of soils should be remediated to minimise exposure of the underlying seal-bearing surface

3.4 Leachate Management

Leachate is extracted from leachate riser LP003 at a rate of approximately 60 m^3/day.

Enviroguard has constructed a leachate treatment plant (LTP) close to the landfill infrastructure and sewer outlet (see **Figure 3**).

The LTP is designed to reduce leachate levels, and allow the levels to be managed and monitored, to thus reducing the potential for leachate migration off-site. The treated leachate is discharged from the LTP to the sewer system in accordance with a Sydney Water Trade Waste Agreement 35835.

Enviroguard monitor the performance of the LTP via a supervisory control and data acquisition (SCADA) system. The quality of the outflow will be continuously monitored via SCADA. The flow rate at the outlet will be measured by a calibrated mag flow meter. Monitoring and reporting of the effluent is undertaken in accordance with the Sydney Water Trade Waste Agreement.

Enviroguard has installed a Sequencing Batch Reactor (SBR) using a biological nitrification process to treat leachate at the site for operational flexibility, simplicity and economy. The SBR process is similar to traditional activated sludge treatment, with the exception that an SBR is operated in recurring batch cycles rather than in continuous flow-through mode. SBR technology has been widely used for domestic and industrial wastewater treatment processes and has proven to be more cost-effective than continuous activated sludge processes in small volume applications.

The management of leachate onsite works by the leachate being pumped from the existing leachate riser within the landfill to an Inflow Balancing Tank (IBT); this is to provide more uniform leachate and to provide flow equalisation for the proposed batch process. In the first stage of the cycle, leachate will be pumped from the IBT to the SBR. During the second stage, the SBR will be aerated to promote biological oxidation of ammonia and biological oxygen demand (BOD). Aeration is accomplished using blowers and a fine pore membrane diffused air system. Caustic soda is dosed into the system to control pH. During the third stage of the cycle, the blowers are turned off and the biomass will be allowed to settle quiescently. During this stage, sludge will be drawn off, if necessary, from the SBR to the Effluent Balancing Tank (EBT). Drawing off of the sludge from the SBR will provide control of the sludge inventory. In the fourth stage of the SBR cycle, the treated water from the SBR will be decanted to the EBT, the decanter will be operated to avoid scouring of the settled sludge blanket. The EBT is gently mixed and the effluent discharged to sewer.

Landfill Gas Management

Management measures for landfill gas at the site include compaction and covering of the landfilled waste (daily and intermediate cover layers) which reduces rainfall infiltration and landfill gas generation. Furthermore, placement of intermediate cover limits discharge of landfill gas to the atmosphere.

The site was granted development consent in December 2010 (DA 10/0429) for a landfill gas management system at the Site.

In 2014 development consent was granted (DA13/0655) for the installation of a 4.7km gas pipeline between the site and the Austral brick manufacturing plant at Horsley Park. The pipeline recovers all landfill gas from the Erskine Park landfill and is utilised to fire kilns used for brick manufacturing. It should be noted that this development consent was not issued for the site but to the Austral Brick site at Horsley Park.

The landfill gas collection system understood to be generally installed at the site is shown in **Figure 8.**

The site's landfill gas management system is detailed further, as follows;

Landfill Gas Extraction Wells

A vertical cylindrical hole is excavated into the refuse from the surface, using an auger type drilling rig. A partially slotted uPVC or HDPE pipe is placed in the hole, extending up the hole to just below surface level, and the void around the pipe is filled with uniformly sized gravel.

Near the surface of the landfill, the hole around the pipe is sealed with bentonite and soil to minimise air entering the well. Above the seal, a manhole structure is installed to protect the head of the well, including control valves and sampling points.

Each well is placed under vacuum from a central point and landfill gas is extracted. The vacuum extends beyond the immediate structure of the well and landfill gas can be collected from within the waste material.

Header System

The vertical extraction wells and other collection points will be connected by a header system to a central point, where a blower will draw the gas out of the landfill under a vacuum. The header system generally consists of welded HDPE pipes and fittings of varying types and sizes.

In areas where the header system passes below the final cover system and is located in waste materials, bentonite and soil seals will be provided to minimise landfill gas escape or air entry along the header bedding and backfill. Valves will be provided to control the LFG extraction rate at different parts of the site.

Condensate, which forms when landfill gas cools as it leaves the landfill through the header system, will be controlled by in-line condensate traps located at various low points within the collection system. Outside the

limits of waste placement, condensate re-injection to the landfill or disposal into the leachate management system will be used.

Collection Piping to Austral Brick

Landfill gas collected from the landfill mound is diverted through the manifolds and condensate traps via a solid HDPE collection ring main pipe along the southern boundary of the site to the Austral Brick facility where it is used as a partial fossil fuel substitute in the production of bricks and tiles etc.

Flare Station

Enviroguard has the ability to flare landfill gas on site through an existing high temperature flare, should the supply to Austral Brick be interrupted. In this case, the collected landfill gas would be conveyed to an enclosed flare located inside a fenced compound and treated by burning. The open flare(s) is designed and operated in accordance with USEPA regulations,40 CFR Section 60.18. A typical enclosed flare includes an electrical control system and safety devices. The safety devices include:

- Continuous flame sensor with automatic shutdown following flame failure;
- Automatic, timed, start-up and restart sequence;
- Flame arrestor;
- Automatic and manually controlled, fail-safe, rapid closing valve; and
- auto-dialler or other emergency call-out system.

The USEPA has found that this type of enclosed flare can achieve over 99.5% destruction efficiency of non-methane organic compounds (NMOCs).

The flare has a stack height of approximately 8 metres maximum above ground level.

3.5 Environmental Monitoring

Enviroguard have a formal monitoring program employed at the site for groundwater, leachate and landfill gas in accordance with the requirements of EPL 4865. The environmental monitoring program specified in EPL 4865 includes the following parameters.

- Leachate quality;
- Surface water and groundwater quantity;
- Noise;
- Dust; and
- Surface and sub-surface landfill gas emissions.

Environmental monitoring points are shown on **Figure 3**.

4.0 LANDFILL CLOSURE AND REHABILITATION

4.1 Objectives and Strategy

The objectives of site closure and rehabilitation are to ensure that:

- The final landform remains stable and is suitable for the post-closure land use;
- The site has a minimal impact on the surrounding environment; and
- Appropriate measures are implemented to detect and manage impacts on the surrounding environment and minimise degradation of the management infrastructure.

The strategy for the site closure and rehabilitation commences with the cessation of waste-disposal activities followed by development of the engineered capping subgrade, construction of final capping layers and documentation of the closure works. This Closure Plan has been produced to ensure that the closure of the landfill is conducted in an ordered, effective and environmentally responsible manner.

Site related considerations including dust generation, noise impacts, rehabilitation procedures, erosion and sediment control are considered in this plan. The Closure Plan requirements consist of two distinct activities:

1) Landfill closure and rehabilitation; and

2) Post-closure monitoring, inspections and maintenance or remediation (where necessary).

Requirements for each activity are outlined in **Table 3** below.

Table 4: Closure and Rehabilitation Strategy

Main Activities	Strategy Components
Landfill Closure and Rehabilitation Works	■ Waste emplacement to the approved final landform contours and cover with intermediate cover layer; ■ Engineered capping works; ■ Leachate collection and treatment; ■ Surface water and erosion controls during and post-rehabilitation; ■ Landfill gas control to minimise odour emissions and gas migration; ■ Amenity and risk control; ■ Revegetation to stabilise rehabilitation soils and enhance visual amenity; and ■ Noise control.
Post-Closure Monitoring	■ Pollution Monitoring; ■ Maintenance Program; ■ Recording and Reporting Procedure; and

Main Activities	Strategy Components
	■ Site Remediation Action Plans.

4.2 General Proposal and Staging

4.2.1 Proposed Final Landform

The final landform is designed in level and form to be comparable to the original pre-quarry landform, having a crown elevation of RL 87 mAHD. The design features a single ridgeline at RL 92 m AHD settling to RL 87 mAHD. Furthermore, the final landform design generally recreates the original hill slope gradient of up to 1(H):4(V).

It is understood that settlement of the landfilled waste is still occurring at Erskine Park. The final landform is also designed to meet the following requirements:

- Is achievable, practical and will blend in to the surrounding landforms;
- Will effectively shed stormwater run-off (and minimise rainfall infiltration into the landfilled waste), allowing for future stabilisation and settlement of the landfilled waste;
- Can be readily capped with minimal specialist engineering works;
- Is amenable to the ultimate likely future land use; and
- Is amenable to post-closure monitoring and maintenance.

Following settlement, the maximum depth of waste in the landfill will be approximately 125m.

Permanent access roads shall be constructed as the final lifts of waste are placed within the landfill area. The access roads shall be used to support the surface water management system, as well as provide access to maintain the final capping layers, environmental control and monitoring systems.

Upon completion of the waste placement, the area shall be capped with engineered clay and rehabilitated in accordance with this Closure Plan, relevant sections of the Guidelines and applicable conditions of EPL 4865.

Fill materials used for closure and rehabilitation works are proposed to be clay from on-site sources, imported VENM and ENM as well as topsoil. All materials used are subject to acceptance criteria as presented in the Technical Specification.

The stormwater management infrastructure, including the construction of additional rehabilitation swales will be upgraded to provide sufficient controls at least until vegetation becomes established, as outlined within **Section 4.4**.

The profile of the site will be graded to promote surface water run-off.

4.2.2 Current Infrastructure Area

The current surfaced area to the west of the landfill mound incorporates the site offices, weighbridges, workshops, and waste transfer station.

4.2.3 Site Closure

The landfill is expected to be operational until 2024 subject to approval of proposed MSE Wall and consumption of gained airspace.

4.3 Capping Works

4.3.1 Design

The final capping over the landfilled waste is designed to:

- Prevent exposure of the landfilled waste, minimise the potential for leachate seepage (surfacing), and minimise the potential for contamination of surface water run-off;
- Reduce rainfall infiltration into the landfilled waste and associated leachate generation, reducing the potential impact of landfill leachate on local groundwater and surface water quality; and
- Minimise uncontrolled emissions of landfill gas to the atmosphere.

The final capping will comprise the following layers, starting from the surface down;

a) Revegetation layer consisting of:

- A minimum 100mm-thick topsoil cover layer, preferably sourced on-site or from an adjacent site covered with primary or secondary vegetation;
- A minimum 900mm-thick infiltration drainage layer comprising Virgin Excavated Natural Material (VENM) and/or Excavated Natural Material (ENM), each with a maximum permeability of 1 x 10^{-5} m/s;

b) A minimum 500mm-thick sealing layer comprised of compacted clay exhibiting a permeability of less than 1 x 10^{-9} m/s; and

c) A minimum 300mm thick seal bearing layer comprised of intermediate cover. It is understood the seal bearing layer is already in place over the majority of the landfill mound at the time of preparation of this LCP.

The extent and construction cross sections through the capping design are shown on **Figures 5** to **6**. As noted in **Section 3.2.2**, provision of a gas drainage layer has been excluded due to the provision of a landfill gas management system.

4.3.2 Construction Quality Assurance Protocols

Prior to commencement of the capping and rehabilitation works, a Construction Quality Assurance (CQA) Plan, including methods of capping materials placement and design drawings shall be submitted to the EPA for approval.

Placement of the clay sealing layer shall be undertaken under the supervision of an independent CQA Consultant. A CQA report documenting that the closure works were undertaken in accordance with the EPA-approved CQA Plan shall be submitted to the EPA for approval.

4.3.3 Placement Procedure

The capping system will be progressively constructed in accordance with EPL 4865 and the EPA-approved closure design drawings, specification and CQA Plan (SLR, 2017). The capping components shall be undertaken in discrete sections typically starting at the perimeter of the landfill and working towards the centre of the site for final operational considerations. Placement towards the centre of the site is also considered best practice to minimise instability of placing and spreading soils down slope. Post-rehabilitation swales and other erosion control measures will be established progressively during construction.

The following procedure will be adopted:

1) Final waste placement and profiling.

2) Final site survey to confirm required post-settlement levels.

3) Trimming/finishing of the seal-bearing layer.

4) Placement and compaction of the minimum 500mm-thick compacted clay sealing layer. Placement shall be under continuous CQA supervision and in accordance with the EPA-approved CQA Plan. Moisture conditioning may be necessary to ensure the optimum moisture content is maintained for compaction and throughout the period in which the clay cap is exposed to the elements. Clay shall be placed in layers not exceeding 200 mm thickness and compacted along slope contours using a sheep's-foot roller or other approved compaction equipment to the CQA Plan requirements which will typically be 98% SMDD as determined by AS1289.5.11. Each compacted layer shall be moisture conditions and scoured along slope contours to ensure adequate adhesion of successive layers and erosion resistance during construction.

5) Construction of the revegetation infiltration drainage layer comprised of a minimum 900mm-thick infiltration drainage layer comprising VENM and/or ENM each exhibiting a maximum permeability of $1x10^{-5}$ m/s placed over the compacted clay sealing layer.

6) Construction of the revegetation topsoil layer comprised of a minimum 100mm-thick topsoil layer comprising ideally of sandy loam.

7) The completed topsoil surface is to be ploughed along contour to a depth of 50mm to ensure erosion resistance during revegetation, aid moisture retention and aeration of soil. Ploughing or scouring should not penetrate beneath 100mm into the sub-soil layer;

8) Establishment of erosion and sediment controls including construction of the swales to transfer run-off water from the landform to the perimeter collection ditches.

9) The final placed surface shall be re-vegetated.

Access roads shall be designed and constructed within the final rehabilitated landform to provide adequate access for environmental monitoring, maintenance and firefighting. Following seeding and planting, a series of jute strips, or other material strips, may be installed on the final landform in accordance with Landcom (2004) guidelines to provide further erosion control.

4.4 Erosion Measures and Surface Water Controls

The final capped landform will have side slopes of approximately 1(V):5(H) which provide long straight runs along which run-off may accommodate significant speeds. Steeper slopes will be prone to erosion and particular attention should be paid to earthworks on the north-western face of the cap where grades may potentially steepen. The need for swales that cut across the face can be avoided if continuous grass cover is established and maintained. SLR (2017) recommends utilising bush regeneration techniques and investing in a minimum 6 month vegetation establishment period to ensure greater success of vegetation cover.

During vegetation establishment or following dry spells, reduced grass cover may result in the concentration of run-off into preferential flow paths leading to rill erosion and loss of topsoil. Regular irrigation should be considered, ideally during the first 3 months of vegetation establishment. Supply of stormwater for irrigation is discussed below.

Layers of mulch (minimum 100mm-thick) or pinned open weave jute mesh should be integrated to bare soil during prolonged exposure and plant establishment. Pinned open weave jute mesh shall be applied to all areas shown on the design drawings.

Additional localised cut off swales across the face of the post closure landfill may be required to divert run-off at a reduced grade of 1(V):25(H) to reduce the potential loss of topsoil and deposition of sediment in stormwater drainage assets around the base of the mound. This should be considered if planned maintenance does not allow for a 6 month vegetation establishment period.

The final land surface will form two mild valleys that drain the north and south faces from the top saddle. Addition of structural mesh grids within these mild valleys is considered appropriate due to increased erosion risk from concentrated stormwater flows.

Reno mattresses or placed rock chutes may be required where flows are concentrated within swales 1(V):5(H). This excludes areas where run-off is distributed across regions of continuous vegetation. Stepped rock chutes will not be required due to 1:5 being the maximum grade.

Swale dimensions around the ring road accept a 1 in 100 year, one-day-duration storm event. These swales have been reviewed and will accommodate the proposed final landform layout design. Culverts sized by Brown 2007 will convey flows beneath the ring road to the NW and SE sedimentation dams.

The NW and SE sedimentation dams are adequate for sedimentation and detention for the final design. Run-off volumes collected in the SE and NW dams will most likely be insufficient to support the irrigation or watering of the entire site but will support staged vegetation establishment of up to one quarter of the site at a time.

The permanent volume of stored water within the NW and SE dams is approximately 5,400m^3 which will provide sufficient irrigation for between one quarter and a half of the entire site between rain events. This supply will need to be supplemented with an alternative water source to keep up irrigation to the entire site during dry spells.

The current existing and proposed measures include:

- Swales constructed upon the rehabilitated landform designed at a 1(H):25(V) fall to connect to the perimeter drainage ditches;
- A ring of perimeter drainage in the form of drains positioned at the toe of the landfill to collect the surface water run-off from the swales and sides of the rehabilitated landform;
- Use of the south-eastern dam to retain surface water run-off from the south-eastern end of the completed landfill;
- Use of the offsite dam to the north-west of the site to collect surface water run-off from the northern end and south-western corner of the finished landfill;
- A channel on the northern end of this NW Dam to transfer overflow into the South Creek system;
- Perimeter drains in the south-western corner, graded to the south-east and extending directly into the existing south-eastern basin;
- Pipe culverts and drainage lines to transfer flow from the remaining perimeter drains into the north-western dam;
- Regrading of existing overburden where necessary and establishing a vegetation cover of grass to prevent soil erosion;
- Placement of jute strips, or other material strips, at regular intervals over the cover crops along the finished hill slope to prevent destabilisation of the finished form before the vegetation cover has become

established, and preventing coarse sediment from accumulating further down in the sedimentation dams; and

- Progressive planting of bands of trees confined to the lower slopes of the rehabilitated landform. Trees will be planted generally on the lower slopes to ensure that the integrity of the proposed clay capping layer can be maintained.

4.5 Revegetation Plan

Revegetation will provide protection against erosion and allow effective monitoring and maintenance of the capping layer. The revegetation must not present a risk to the integrity of the landfill capping layer. The grass/plant seed mix is to be determined as part of the landfill closure detailed design works. Where required, the thickness and characteristics of the revegetation layer would be changed to suit changes to the onsite vegetation, and to ensure the long term integrity of the landfill capping layer.

It is proposed that the site is revegetated with a combination of primary and secondary vegetation. Primary vegetation will be used to stabilise exposed areas and the landfill surface following the installation of the cap. Secondary vegetation involves the reintroduction of selected natural species to enhance the natural aesthetics and ecological value of the site.

Revegetation of the site will be divided into four distinct zones that will require different management approaches. These zones are:

- Zone 1 – The rim of the quarry - planting on the rim will consist of woodland vegetation to connect with the adjacent corridors (primary and secondary vegetation);
- It is noted that in Zone 1, along the alignment of the wall, Cumberland Woodland Mix would not be planted on the MSE wall structure or wall facing, however would be retained south of the wall.
- Zone 2 – The 17ha capped area of the landfill - the landscape plan for this zone will include a mixture of native shrubs and grasses only. All plants in this zone will have a maximum root depth less than 1m (primary and secondary vegetation) due to the location of the sealing layer;
- Zone 3 – This zone consists of two 1ha areas on the peak of the landfill capping. It is anticipated that these areas will be used for passive recreation and will therefore be landscaped by lawn and native gardens. All plants in this zone will have a maximum root depth less than 1m (primary vegetation) again due to the location of the sealing; and
- Zone 4 – These are the wet areas associated with the sedimentation dams. The landscaping in this area will consist of native wetland species (secondary vegetation).

4.5.1 Primary Vegetation

The primary vegetation for the rehabilitated site will involve seeding, with a combination of annual and perennial grasses compatible to the area, applied within an erosion resistant and moisture retaining mulch. It is recommended that the seed be dispersed by hand broadcasting or alternatively by hydro-seeding with a blend of seed, fertiliser and paper or wood pulp with mulch laid on top.

Irrigation of the topsoil shall be conducted to ensure acceptable soil moisture is maintained during dry spells and to assist initial germination of seeds and subsequent rapid growth. Stormwater retained in the sedimentation dams may be used for this purpose.

Quality assurance procedures will be followed to ensure that all organic material used in site rehabilitation is fit for the purpose intended, is installed effectively and is free of noxious weeds. Suppliers of seed and mulch will be required to provide a certificate of quality and each load of material will be inspected.

Recommendations of specialists in the field, including the Department of Agriculture, will be sought with regard to choice of seed, application and maintenance

4.5.2 Secondary Vegetation

Secondary vegetation will comprise selected trees and shrubs that will be planted on the rehabilitated landfill. Tree and shrub species will be selected with shallow root spread such that they do not extend below 1m and potentially interfere with the integrity of the clay capping. It is envisaged that the secondary vegetation placed on the landfill will be dominated by small shrubs and native grasses.

4.6 Closure Schedule

The timing of the proposed closure works will need to be carefully considered. In order to allow establishment of revegetation grasses, the works may be undertaken over a number of separate stages taking into account the seasonal variations and proposed gas extraction infrastructure installations.

The proposed works will typically be as follows;

1) Progressive grading of side slopes to required landform.
2) Progressive filling and grading of the site to required landform.
3) Progressive capping of side slopes and top of landform.
4) Rehabilitate and revegetate side slopes and top of landform.
5) Install lower slope storm water swales connecting into existing perimeter ditches.
6) Install/extend landfill gas and leachate extraction pipework/infrastructure to side slopes and to top of landform.
7) Extend storm water swales to top of rehabilitated landform.
8) Construct site access tracks and final fencing.

5.0 POST CLOSURE PLAN

An aftercare period of the site following final closure may typically last for more than 30 years as the waste stabilises and the risk of pollution of groundwater and emissions to atmosphere decreases. During this time regular inspections and maintenance will need to be maintained.

A post-closure plan provides a framework for monitoring the effectiveness of any remedial measures implemented during the closure and post-closure periods.

5.1 Site Inspection and Monitoring

Ongoing inspection, maintenance and environmental monitoring are to be carried out during the closure works and also during the post-closure period. Initially, the programme and schedule of monitoring will be in accordance with the EPL 4865. In the longer term, the programme of monitoring would expect to be reduced as monitoring results demonstrate the stabilisation of the waste mass.

5.1.1 Inspection of Final Landform

Site inspections and reporting will need to be undertaken to assess the ongoing condition of the site, since rehabilitated sites can consolidate and be prone to erosion. Such inspections of the site, including surrounding boundaries will need to check for the following;

- Excessive and differential settlement allowing surface water ponding;
- Erosion, cracking or deterioration of the capping or soils layers;
- Leachate seeps and outbreaks;
- Evidence of landfill gas escape / odours and landfill fires;
- Vandalism, including damage to leachate / gas extraction infrastructure and monitoring probes;
- Illegally dumped waste;
- Condition of surface water management system; and
- Vegetation coverage and condition.

5.1.2 Soil and Vegetation Inspections

Quarterly inspections of all rehabilitated areas and irrigation systems, including swales, perimeter ditches and dams will be conducted. Six monthly detailed inspections of plant growth and an assessment of fertiliser and ongoing irrigation requirements for all areas of the site will also be required.

Bi-annual inspections to assess the condition of the primary vegetation grasses will be undertaken for the first three years after establishment of the capped and rehabilitated section.

Failed areas (e.g. dead or unhealthy primary vegetation) will be assessed and reinstated appropriately. Remedial works shall be undertaken in areas requiring topsoil replacement, re-seeding, weed control, fertiliser application etc. in order to maintain a dense, even grass coverage over the final rehabilitated cap.

All primary vegetated grassed areas will be cut at suitable intervals (to suit weather conditions and growth rates). Continual maintenance of roads on the final landform will also be required in order to allow for safe access for monitoring, site maintenance and in case of a fire.

Assessment and subsequent re-planting of shrubs and trees will occur in areas of significant die-off or erosion damage. Replaced saplings are to be supported where necessary and protected from predation, damage from grass cutting etc. Determination of any weed control will also be decided during the site inspection.

5.1.3 Leachate Management

The management of leachate will continue at the landfill well into post-closure of the site until the waste has stabilised. Management will include collection, treatment and disposal.

Enviroguard shall continue to implement a pump and treat program for the leachate generated in the landfill to reduce leachate levels. The method of extraction shall involve the removal of leachate from the riser, and treatment within the LTP prior to discharge into the local Sydney Water sewer network.

The leachate collection and treatment system will require ongoing maintenance to ensure all aspects of the system, such as pumps etc. are working adequately.

The pump and treat operation should also continue post-closure until such a time that the leachate level does not require pumping.

Any leachate outbreaks reported by a site inspection should be investigated to determine the nature of the breach, and should be rectified as soon as possible.

The generation of leachate within the site is expected to diminish over time, especially after final capping of the site, falling to a relatively constant level. Some infiltration thorough the final capping layer is to be expected and allowed for within the proposed capping design.

5.1.4 Landfill Gas Mitigation System

The management of landfill gas will continue at the landfill well into the post-closure period until such time that the production of methane has been demonstrated to consistently fall within acceptable levels.

The active gas control system (including the export to Austral Bricks) currently in place shall remain operational as necessary during periods when high volumes and concentrations of landfill gas are detected at the site.

The gas extraction infrastructure will need to be regularly inspected, maintained, monitored and adjustments made as necessary to ensure a consistent volume and quality of gas and to maintain emission levels as necessary to comply with EPL 4865 and the Guidelines.

The volume and quality of landfill gas is expected to diminish as the emplaced waste degrades over time.

5.1.5 Surface Water Management

Surface water management measures installed at the site during closure will be maintained at the site during the post-closure period such that the landfill does not impact the surrounding surface water drainage. Maintenance works will be required to maintain the efficiency of the drainage swales, perimeter ditches and sedimentation dams.

The potential impacts on surface water will decrease as the site is progressively capped and rehabilitated and vegetation becomes established.

5.1.6 Site Security and Signage

Security fencing will be maintained and repaired if necessary during the post-closure period as it will continue to provide security against unauthorised entry and vandalism. Access gates are to be inspected and maintained in an operational condition. Gates and site access points are to remain locked to prevent unwanted intrusion.

Clear signage will be maintained at the site to prohibit unauthorised access to the site, identify emergency contact numbers, relevant contact person and contact telephone numbers.

5.2 Maintenance Program

Site inspections and maintenance will be conducted by trained personnel who are deemed competent in accordance with conditions of EPL 4865 and the Guidelines. Should any damage, vandalism or degradation to capping layers or environmental control infrastructure which would significantly affect their performance be observed on site, EPA shall be notified and remediation shall be undertaken in a timely manner.

The proposed maintenance and inspection schedule for the site post closure is presented in **Table 5** below. Should significant inclement weather occur or after a natural disaster, site inspections of all environmental control systems shall occur as soon as safe access to the site can be confirmed.

Table 5: Maintenance Program

Component	Frequency
Environmental Monitoring Systems	During Monitoring
Rehabilitated Landform	Quarterly
Erosion and Stormwater Controls	Quarterly and after major storms (>1 year ARI)
Leachate Controls	Quarterly
Fencing	Quarterly
Vegetation	See Section 5.2.1
Litter Control	Quarterly
Vandalism	Quarterly

Taken from CES Landfill Closure Plan, 2007

5.2.1 Maintenance of Planting

All planting will be maintained, fertilised and watered as necessary. Water from the on-site dams may be used to provide irrigation during dry spells. Irrigation is especially important immediately after planting to allow an adequate level of root growth.

5.3 Pollution Monitoring and Reporting

5.3.1 Pollution Monitoring

A summary of the pollution monitoring programme during the post-closure period is provided in **Table 6** below. Monitoring to the requirements of **Table 6** will continue until such time that the EPA approves the site's certified statement of completion.

The monitoring program will be reviewed during the post-closure period to account for changes in conditions within the rehabilitated landfill.

Monitoring and reporting is to be conducted by personnel suitably trained and competent by qualification or experience in conducting such testing. Laboratory analysis is to be conducted by a NATA accredited laboratory with appropriate levels of field and laboratory quality control.

5.2 Maintenance Program

Site inspections and maintenance will be conducted by trained personnel who are deemed competent in accordance with conditions of EPL 4865 and the Guidelines. Should any damage, vandalism or degradation to capping layers or environmental control infrastructure which would significantly affect their performance be observed on site, EPA shall be notified and remediation shall be undertaken in a timely manner.

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Monitoring and reporting is to be conducted by personnel suitably trained and competent by qualification or experience in conducting such testing. Laboratory analysis is to be conducted by a NATA accredited laboratory with appropriate levels of field and laboratory quality control.

Table 6: Summary of Pollution Monitoring

Medium	Parameter	Location	Frequency		
			During rehabilitation and closure	**First Two years after closure**	**Third and subsequent years after closure**
Water Pollution	Surface water quality	South-eastern sedimentation dam	Quarterly	Quarterly	Annual
	Surface water quality	North west sedimentation dam	Quarterly	Quarterly	Annual
	Surface water quality	South creek	Quarterly	Quarterly	Annual
	Leachate quality	Leachate riser	Monthly	Monthly	Six monthly
	Groundwater quality	As per landfill licence	As per landfill licence	As per landfill licence	As per landfill licence
Air Pollution	Landfill gas – surface and subsurface methane gas concentration	As per landfill licence	As per landfill licence	As per landfill licence	As per landfill licence
	Dust deposition rates	As per landfill licence	Monthly	Not required	Not required
Weather	Daily rainfall	Monitoring location as per licence	Daily	Daily	Not required

5.4 Pollution Reporting Procedures

Enviroguard or the licensee will appoint a responsible staff member as the Site Coordinator to manage all environmental monitoring, site inspections, preparation and submission of reports to the EPA, during the post-closure period in accordance with EPL 4865 and the Guidelines.

5.5 Emergency Response Protocol

A detailed protocol will need to be drafted which can be initiated during an emergency. Triggers for an emergency response may be as follows;

- Landfill gas migration from site;
- Leachate egress from the site;

- Exceedance of allowable water quality targets;
- Instability / failure of landfill cap or rehabilitation soils; and
- Fire.

6.0 SITE REMEDIATION PLANS

6.1 Landfill Gas Emission Remediation Plan

The site has a landfill gas extraction system installed to manage the migration of landfill gas from the boundary of the site. This infrastructure includes a series of landfill extraction wells drilled within the landfill waste mass, connected to well heads and collection manifolds. Landfill gas is currently diverted to either off-site to the nearby Austral Brick facility or to the on-site high temperature flare.

However, should landfill gas odours be detected over the rehabilitated landform during inspections or by members of the public, an assessment of the level, nature and extent of potential gas emissions will be undertaken (e.g., gas survey). The EPA will be notified as required by EPL 4865 if monitoring indicates the presence of methane levels in excess of 1% (v/v) in the surface, subsurface or within buildings.

A remediation plan in accordance with the Guidelines will be developed and submitted to the EPA and further monitoring undertaken within 14 days from the initial detection to assess the hazards presented by the emissions. A remediation plan may involve collection and flaring as required to reduce detectable concentrations of methane.

6.2 Water Contamination Remediation Plan

A water contamination remedial plan will be required should any water-quality monitoring results indicate that contamination has occurred. Upon detection, the affected location will be re-sampled as soon as possible after initial detection. If the contamination is confirmed by the re-sampling event, the EPA will be notified in writing within 14 days.

A water contamination remediation plan will need be prepared within 28 days of the initial written notification to the EPA. The plan will identify the specific contaminants of potential concern, the extent of pollution of the surrounding environment and the mitigation measures to be put in place in accordance with the Guidelines. This plan will be submitted to the EPA for approval prior to implementation.

6.3 Certified Statement of Completion

Monitoring of the rehabilitated site will continue until the EPA has approved the certified statement of completion. Upon confirmation of EPA approval, monitoring and maintenance at the site will cease and any financial assurance requirements will lapse.

In accordance with the Guidelines, a certified statement of completion will be submitted to the EPA at the appropriate time to demonstrate that:

- Gas concentration levels in all perimeter gas wells have fallen to less than 1% methane (volume/volume) and less than 1.5% carbon dioxide (volume/volume) above the established natural background for a period of 24 months.
- Analysis of the leachate composition indicates low levels of contamination posing no hazard to the environment, and surface water and groundwater monitoring indicates no water pollution. These matters should be addressed in accordance with the relevant published water quality guidelines.
- The landfill final capping has been assessed over some years and found to be in good condition and stable, with acceptable stormwater drainage and with no evidence of erosion, cracking, dead vegetation, ponding, differential settlement or slope instability.
- The level of suspended solids in rainwater running off the final capping should be less than 50 milligrams/litre.

- The methane concentration at the surface of the final capping should not exceed 500 parts per million at any point.
- The closed landfill no longer poses an adverse amenity risk. It does not generate offensive or excessive odour, dust, noise, litter and debris, present a fire risk, or attract scavengers and vermin.
- All other requirements of the Closure Plan and Surrender Notice have been completed and/or satisfied.

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Signature Page

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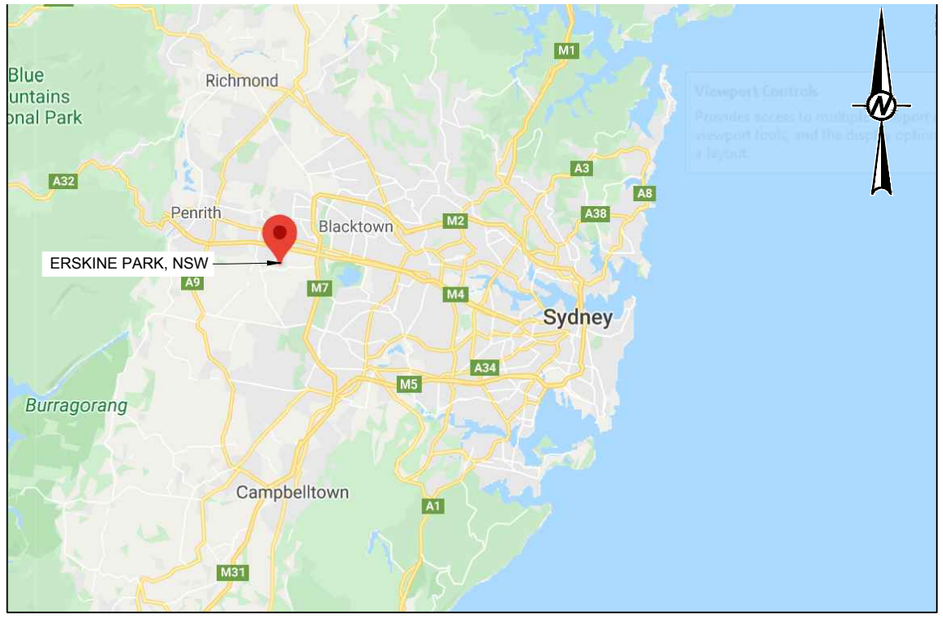
https://golderassociates.sharepoint.com/sites/120150/project files/6 deliverables/19135652-018-r-post closure rehab plan/19135652-018-r-rev0.docx

APPENDIX A

Figures

REGION



SITE LOCATION

NOTE(S)
NOT TO SCALE

NOT FOR
CONSTRUCTION

CLIENT
ENVIROGUARD PTY LTD

CONSULTANT
GOLDER

YYYY-MM-DD	2020-04-08
DESIGNED	JM
PREPARED	BK/SF
REVIEWED	JM
APPROVED	JM

PROJECT
ERSKINE PARK LANDFILL

TITLE
SITE LOCALITY PLAN

PROJECT NO.	CONTROL	REV.	FIGURE
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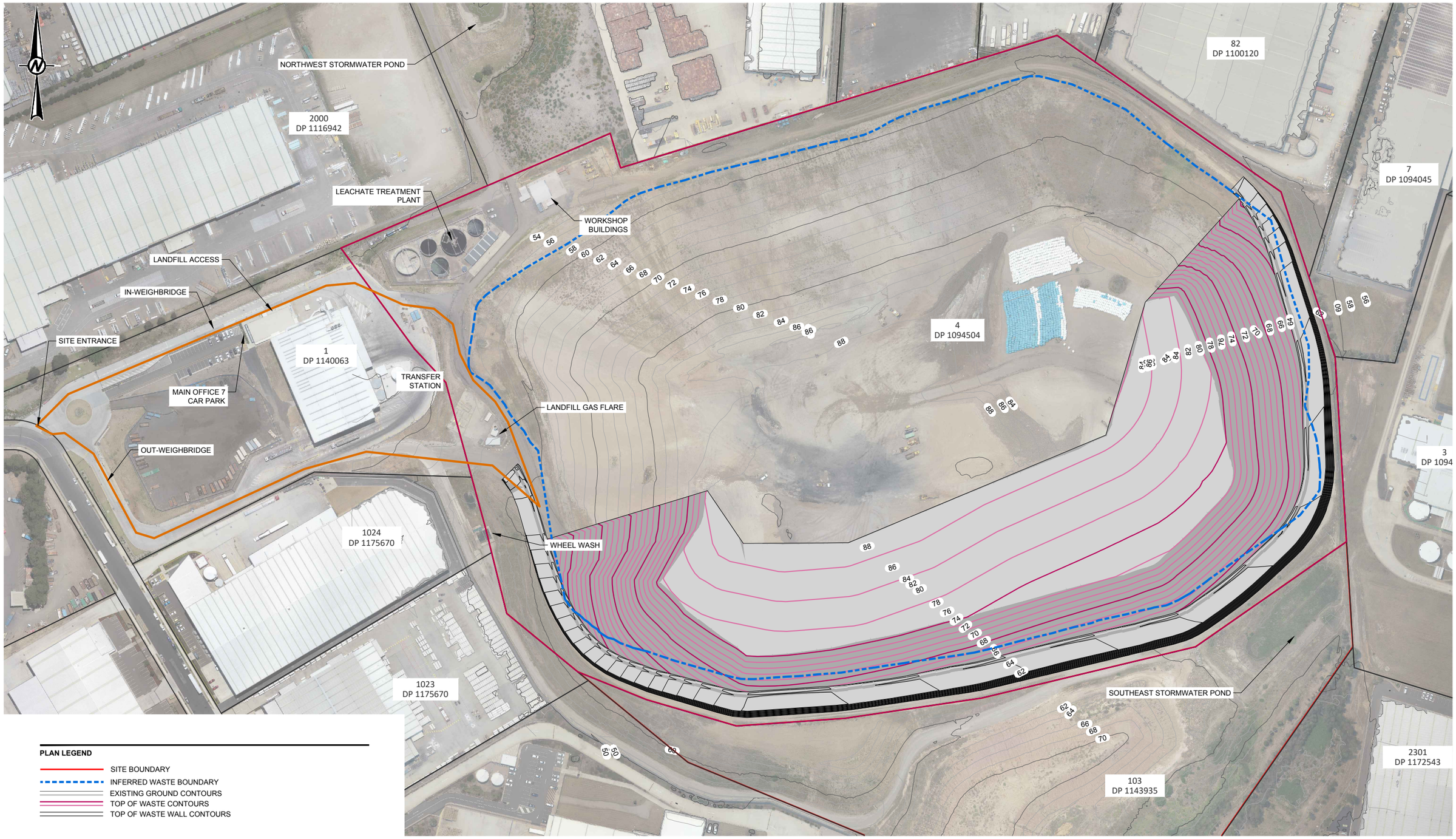

PLAN LEGEND

- SITE BOUNDARY
- INFERRED WASTE BOUNDARY
- EXISTING GROUND CONTOURS
- TOP OF WASTE CONTOURS
- TOP OF WASTE WALL CONTOURS

0 50 100
1:2,500 METRES

NOT FOR
CONSTRUCTION

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
0	2020-04-08	NOT FOR CONSTRUCTION	JM	BK/SF	JM	JM

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PROJECT
ERSKINE PARK LANDFILL

TITLE
SITE LAYOUT PLAN

PROJECT NO.	CONTROL	REV.	of	FIGURE
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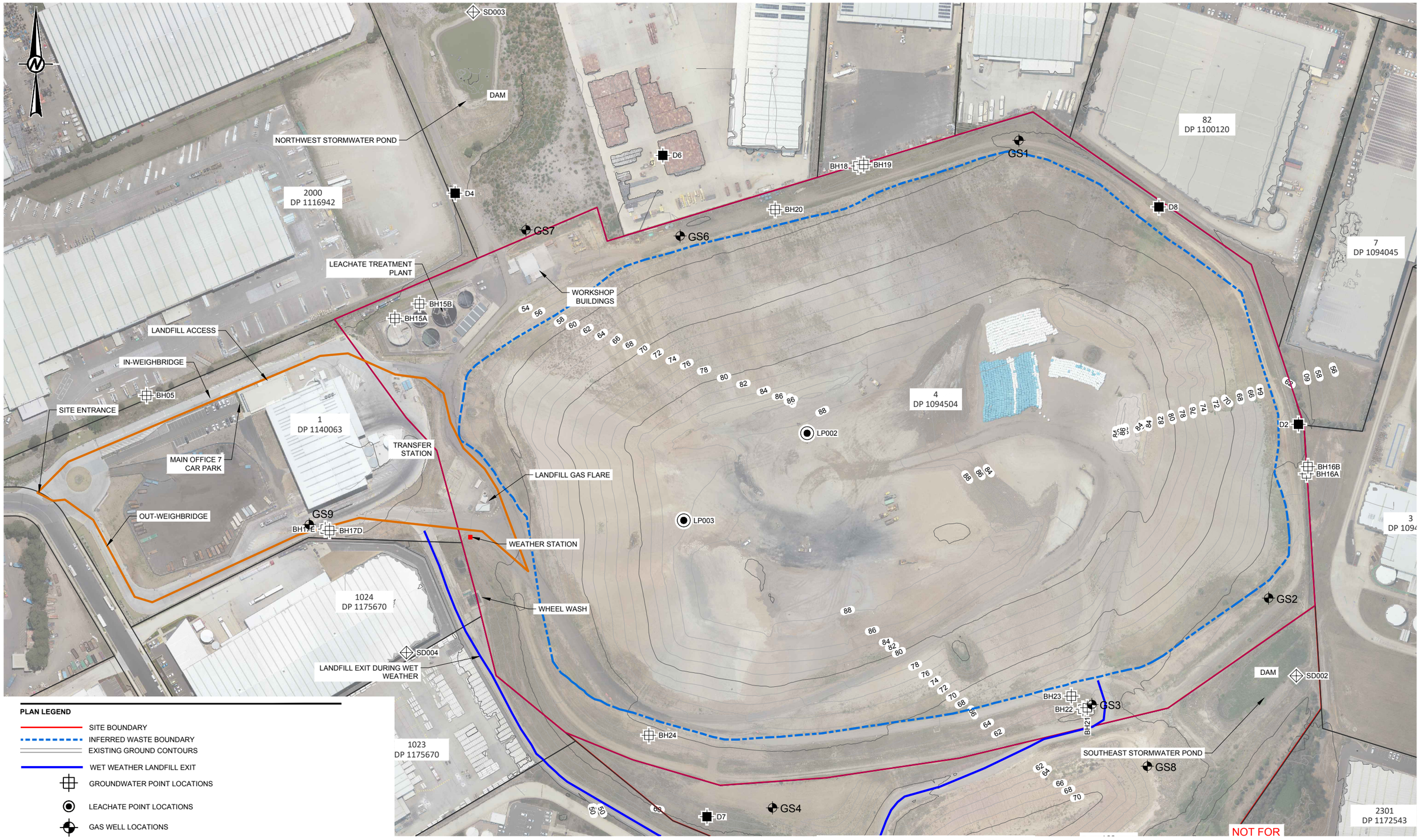

PLAN LEGEND

- SITE BOUNDARY
- INFERRED WASTE BOUNDARY
- EXISTING GROUND CONTOURS
- WET WEATHER LANDFILL EXIT
- GROUNDWATER POINT LOCATIONS
- LEACHATE POINT LOCATIONS
- GAS WELL LOCATIONS
- SURFACE WATER POINT LOCATIONS
- DUST GUAGE POINT LOCATIONS

0 50 100
1:2,500 METRES

NOT FOR
CONSTRUCTION

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
0	2020-04-08	NOT FOR CONSTRUCTION	JM	BK/SF	JM	JM

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PROJECT
ERSKINE PARK LANDFILL

TITLE
ENVIRONMENTAL MONITORING PLAN

PROJECT NO.	CONTROL	REV.	of	FIGURE
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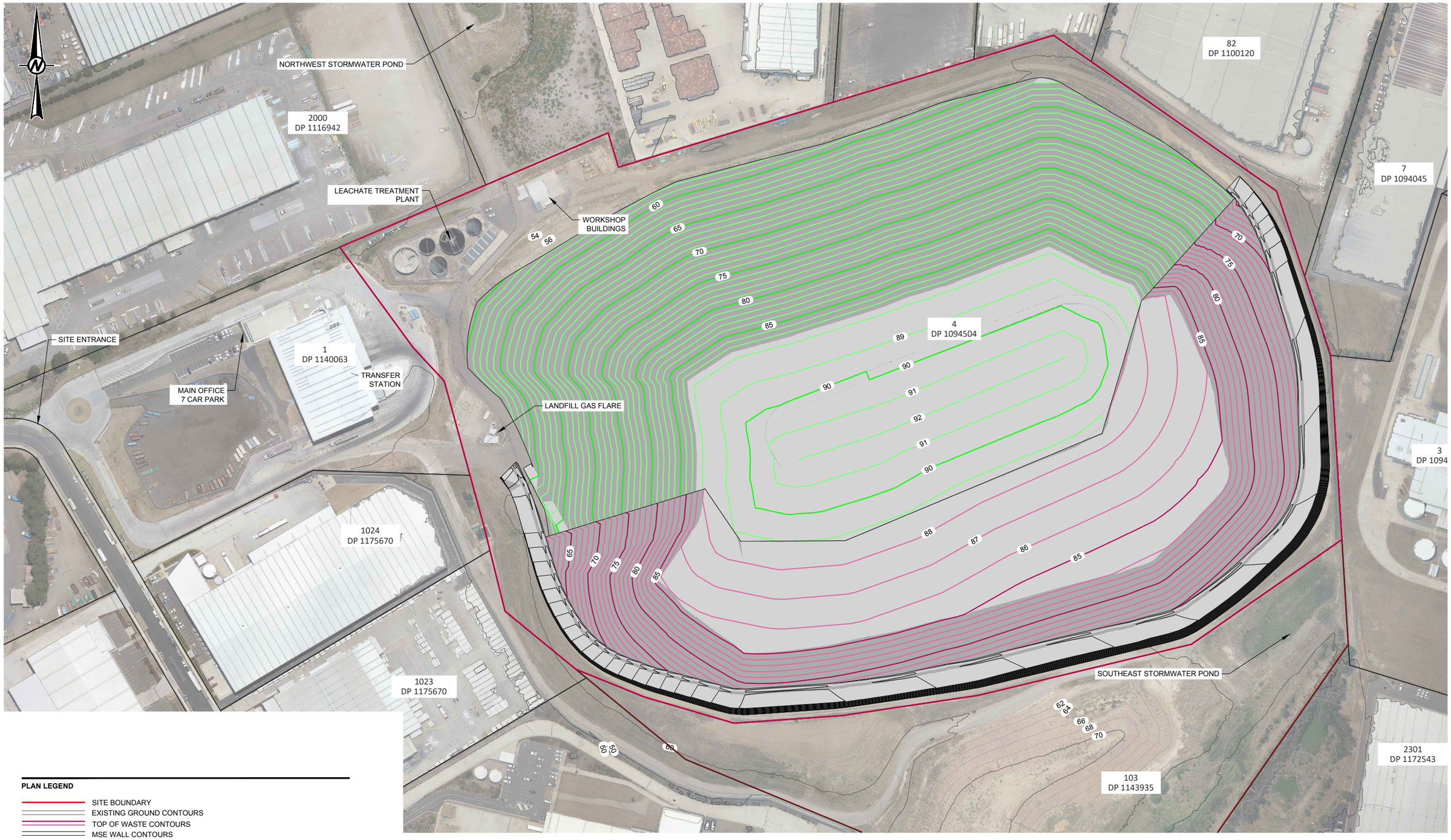


PLAN LEGEND

- SITE BOUNDARY
- EXISTING GROUND CONTOURS
- TOP OF WASTE CONTOURS
- MSE WALL CONTOURS
- GHD TOP OF WASTE CONTOURS

0 50 100
1:2,500 METRES

NOT FOR
CONSTRUCTION

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
0	2020-04-08	NOT FOR CONSTRUCTION	JM	BK/SF	JM	JM

CLIENT
ENVIROGUARD PTY LTD

CONSULTANT
GOLDER
BRISBANE OFFICE
147 CORONATION DRIVE
MILTON, QLD 4064
AUSTRALIA
[+61] (7) 3721 5400
www.golder.com

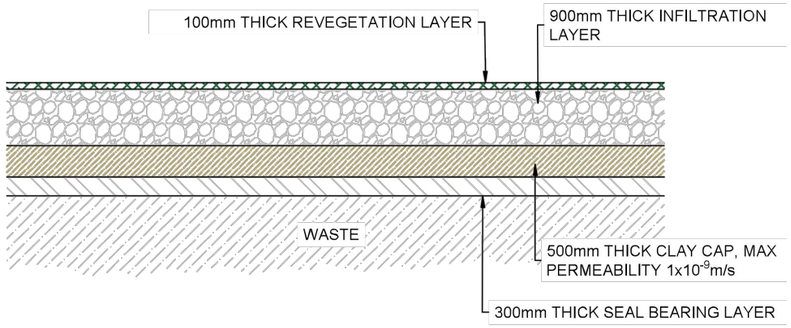
PROJECT
ERSKINE PARK LANDFILL

TITLE
EXTENT OF CAPPING WORKS

PROJECT NO.	CONTROL	REV.	of	FIGURE
19135652	018	0		F004

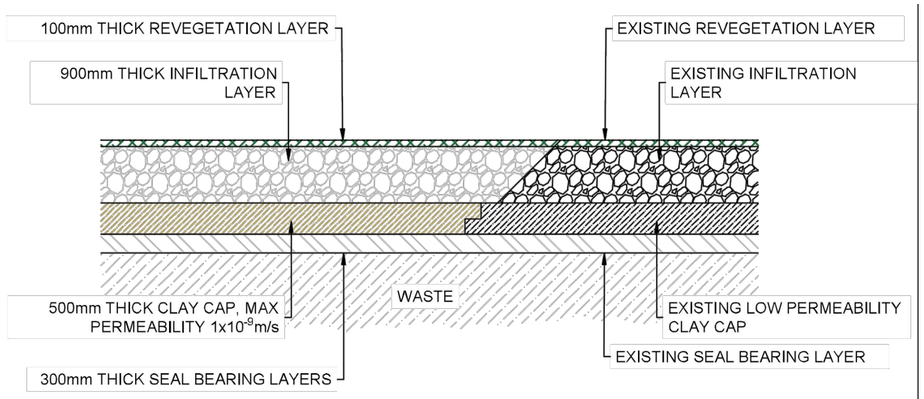
IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM ISO A3
25 mm
0

Path: R:\CLEANAWAY\ERSKINE_PARK\09_PROJECTS\19135652_ErskinePark_MWSA_Wall\018\02_PRODUCTION\DWG\ | File Name: 19135652-018-F-004.dwg | Last Edited By: bkanther Date: 2020-04-08 Time:8:08:12 PM | Printed By: SaDavies Date: 2020-04-09 Time:10:48:41 AM



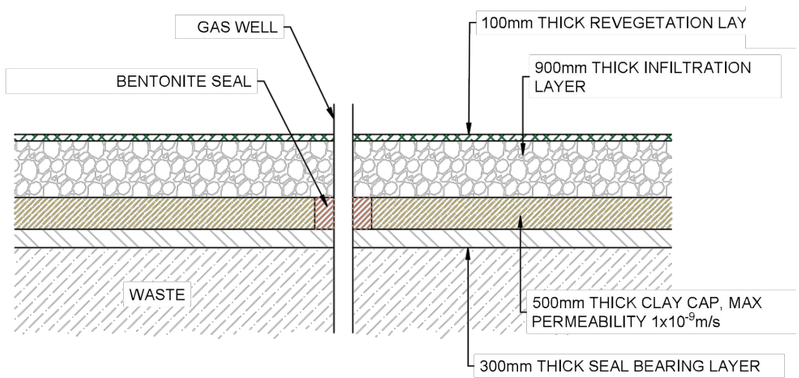
CAPPING DETAIL

SCALE 1:100



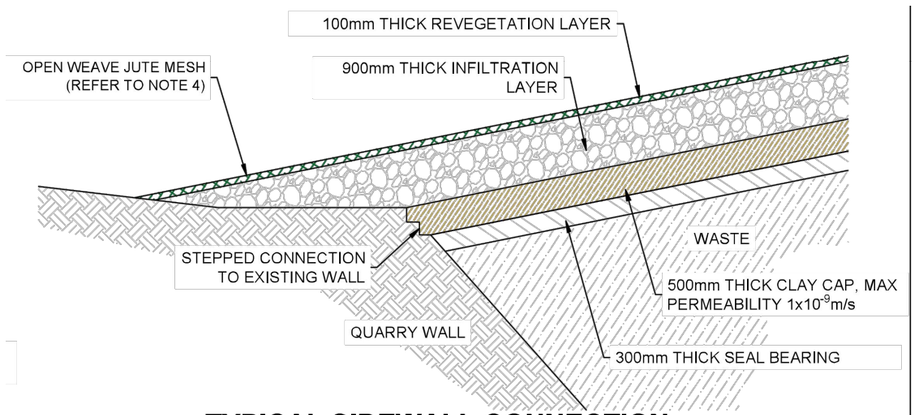
SECTION THROUGH TIE-IN WITH ANY PREVIOUS CAPPING PHASE

SCALE 1:100



SEALING DETAIL AROUND PENETRATIONS THROUGH CLAY CAP

SCALE 1:100



TYPICAL SIDEWALL CONNECTION

SCALE 1:100

REFERENCE(S)

ERSKINE PARK LANDFILL FINAL CAPPING AND REHABILITATION, LANDFILL CLOSURE PLAN PREPARED BY SLR CONSULTING AUSTRALIA PTY LTD, DATED 23 JUNE 2017.

NOT FOR

CONSTRUCTION

0 2.5 5

1:100 METRES

CLIENT
ENVIROGUARD PTY LTD

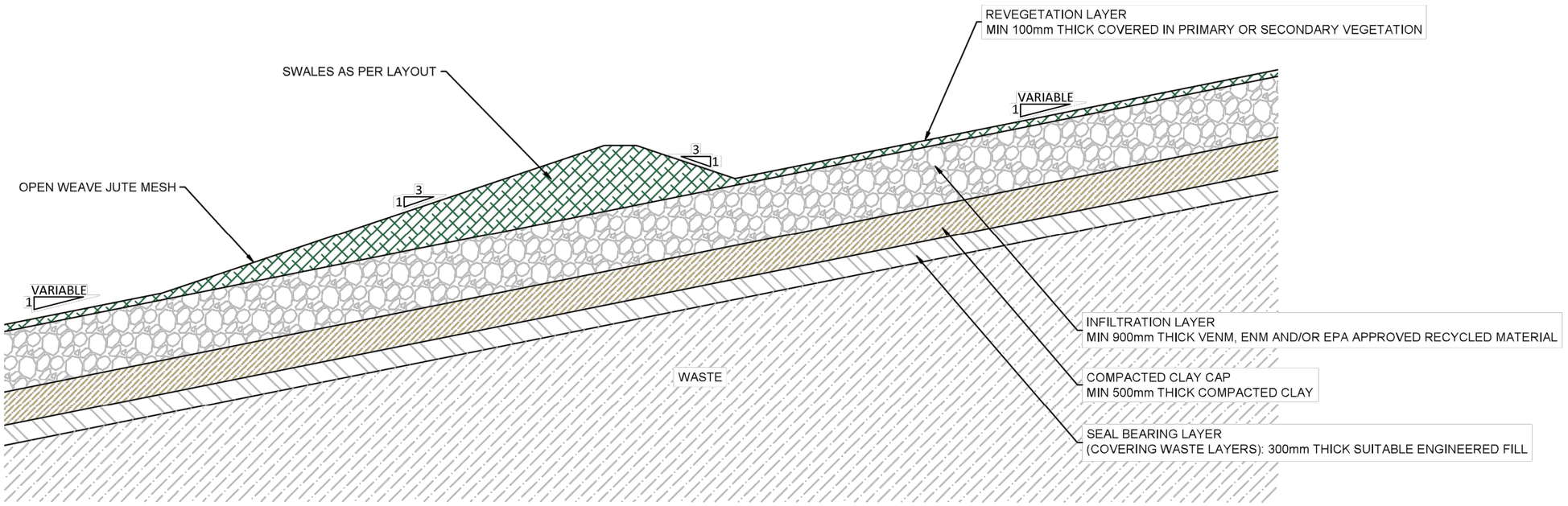
PROJECT
ERSKINE PARK LANDFILL

CONSULTANT
GOLDER

YYYY-MM-DD	2020-04-08
DESIGNED	JM
PREPARED	BK/SF
REVIEWED	JM
APPROVED	JM

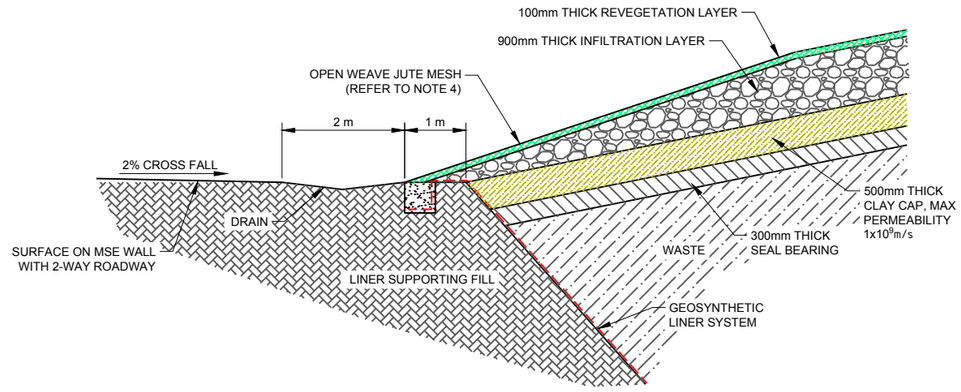
TITLE
CAPPING DETAILS SHEET 1 OF 2

PROJECT NO.	CONTROL	REV.	FIGURE
19135652	018	0	F005



TYPICAL SECTION THROUGH PROPOSED LANDFILL CAPPING

SCALE 1:75



TYPICAL MSE WALL CONNECTION

SCALE 1:100 m

0 2.5 5

1:100 METRES

REFERENCE(S)

ERSKINE PARK LANDFILL FINAL CAPPING AND REHABILITATION, LANDFILL CLOSURE PLAN PREPARED BY SLR CONSULTING AUSTRALIA PTY LTD, DATED 23 JUNE 2017.

NOT FOR

CONSTRUCTION

0 1.25 2.5

1:75 METRES

CLIENT
ENVIROGUARD PTY LTD

PROJECT
ERSKINE PARK LANDFILL

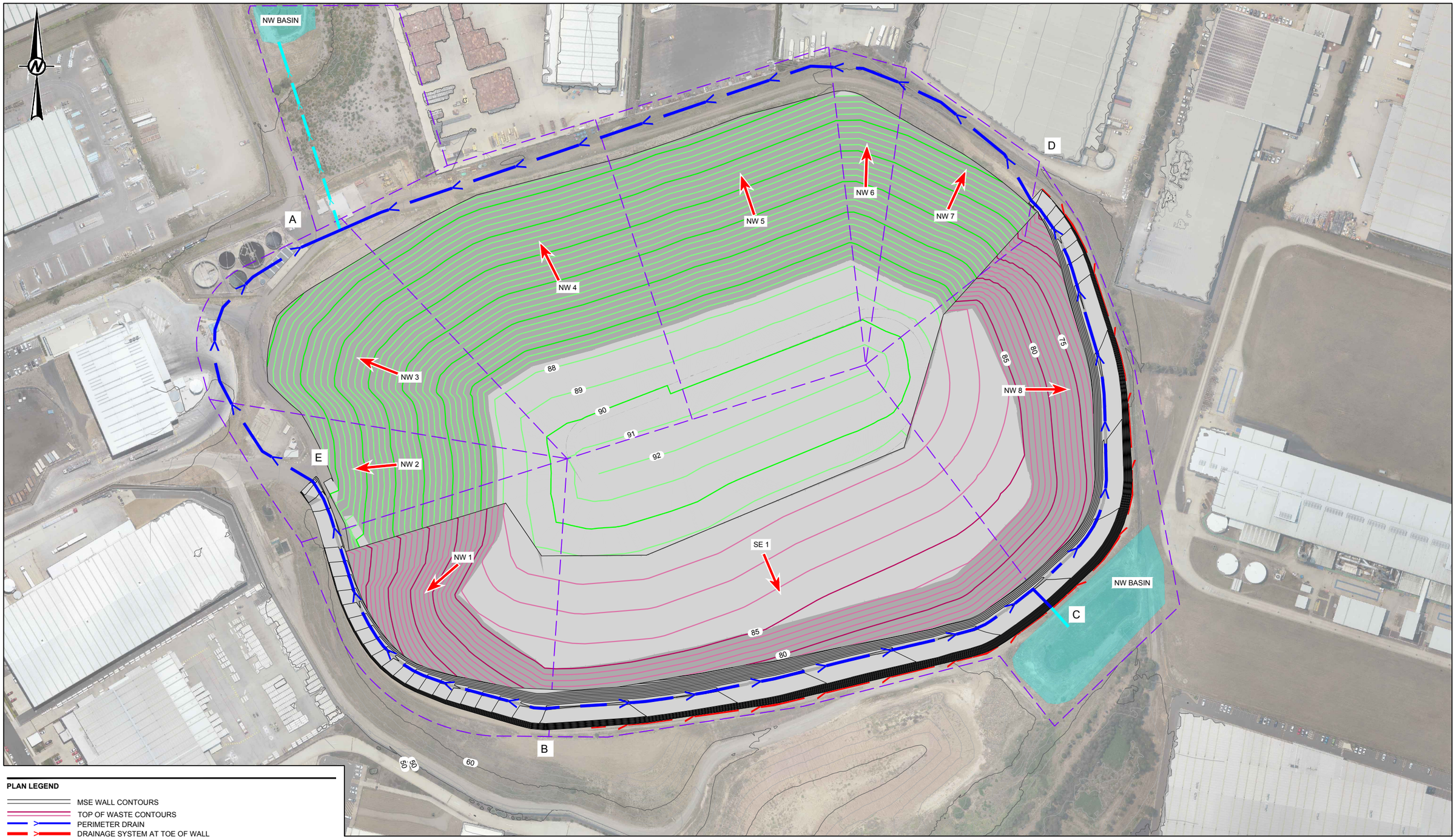
CONSULTANT

GOLDER

YYYY-MM-DD	2020-04-08
DESIGNED	JM
PREPARED	BK/SF
REVIEWED	JM
APPROVED	JM

TITLE
CAPPING DETAILS SHEET 2 OF 2

PROJECT NO.	CONTROL	REV.	FIGURE
19135652	018	0	F006



PLAN LEGEND

- MSE WALL CONTOURS
- TOP OF WASTE CONTOURS
- PERIMETER DRAIN
- DRAINAGE SYSTEM AT TOE OF WALL
- CATCHMENTS BOUNDARY
- CULVERT
- DIRECTION OF FLOW

0 50 100
1:2,500 METRES

NOT FOR
CONSTRUCTION

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
0	2020-04-08	NOT FOR CONSTRUCTION	JM	BK/SF	JM	JM

CLIENT
ENVIROGUARD PTY LTD

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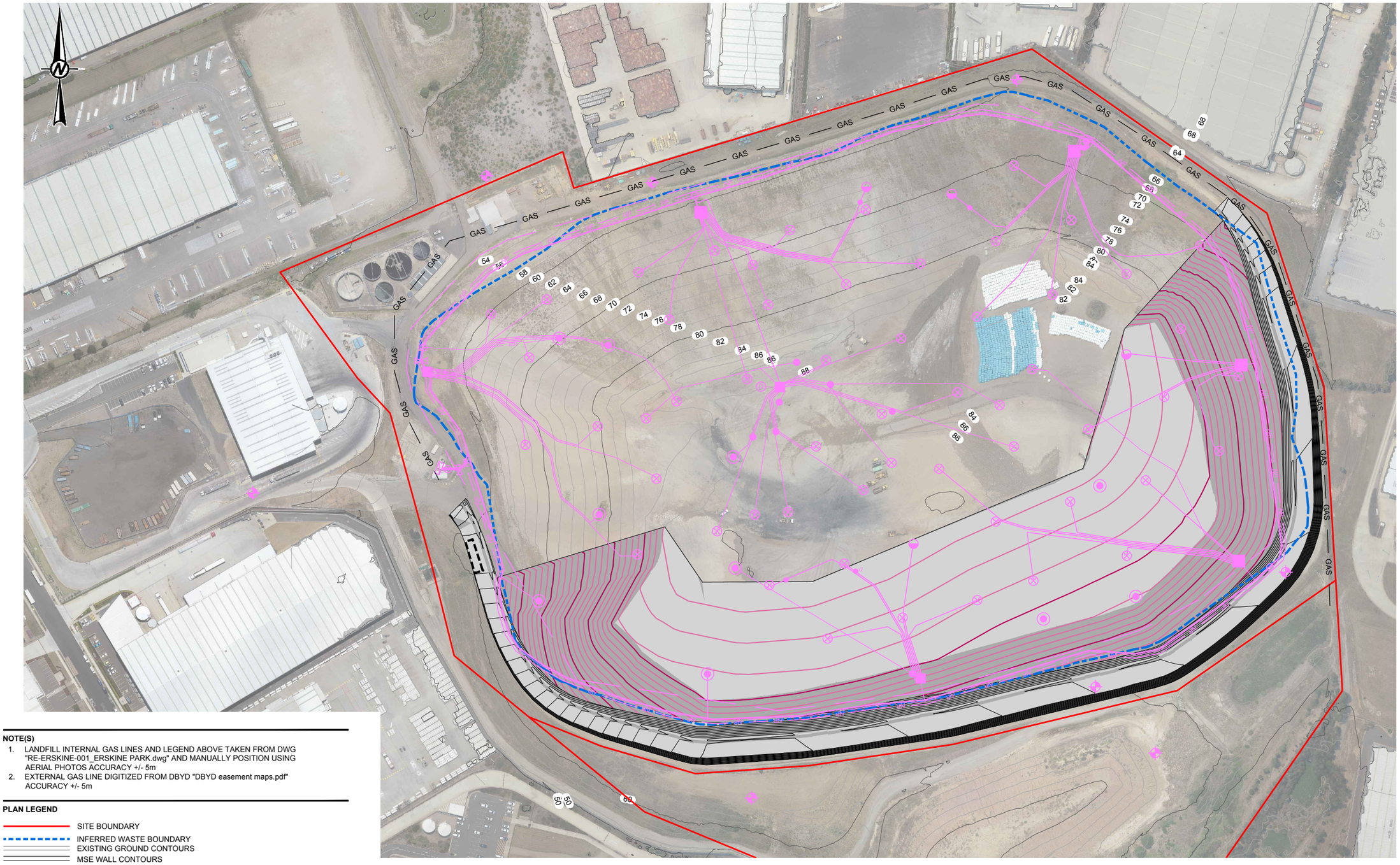
PROJECT
ERSKINE PARK LANDFILL

TITLE
SURFACE WATER MANAGEMENT PLAN

PROJECT NO.	CONTROL	REV.	of	FIGURE
19135652	018	0		F007

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3
25 mm
0



NOTE(S)

1. LANDFILL INTERNAL GAS LINES AND LEGEND ABOVE TAKEN FROM DWG "RE-ERSKINE-001_ERSKINE PARK.dwg" AND MANUALLY POSITION USING AERIAL PHOTOS ACCURACY +/- 5m
2. EXTERNAL GAS LINE DIGITIZED FROM DBYD "DBYD easement maps.pdf" ACCURACY +/- 5m

PLAN LEGEND

- SITE BOUNDARY
- INFERRED WASTE BOUNDARY
- EXISTING GROUND CONTOURS
- MSE WALL CONTOURS
- TOP OF WASTE CONTOURS
- GAS — FUTURE GAS LINE

0 50 100
1:2,500 METRES

NOT FOR
CONSTRUCTION

REV.	YYYY-MM-DD	DESCRIPTION	DESIGNED	PREPARED	REVIEWED	APPROVED
0	2020-04-08	NOT FOR CONSTRUCTION	JM	BK/SF	JM	JM

CLIENT
ENVIROGUARD PTY LTD

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PROJECT
ERSKINE PARK LANDFILL

TITLE
LANDFILL GAS PLAN

PROJECT NO.	CONTROL	REV.	of	FIGURE
19135652	018	0		F008

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ISO A3
0 25 mm

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APPENDIX B

Important Information

The document ("Report") to which this page is attached and which this page forms a part of, has been issued by Golder Associates Pty Ltd ("Golder") subject to the important limitations and other qualifications set out below.

This Report constitutes or is part of services ("Services") provided by Golder to its client ("Client") under and subject to a contract between Golder and its Client ("Contract"). The contents of this page are not intended to and do not alter Golder's obligations (including any limits on those obligations) to its Client under the Contract.

This Report is provided for use solely by Golder's Client and persons acting on the Client's behalf, such as its professional advisers. Golder is responsible only to its Client for this Report. Golder has no responsibility to any other person who relies or makes decisions based upon this Report or who makes any other use of this Report. Golder accepts no responsibility for any loss or damage suffered by any person other than its Client as a result of any reliance upon any part of this Report, decisions made based upon this Report or any other use of it.

This Report has been prepared in the context of the circumstances and purposes referred to in, or derived from, the Contract and Golder accepts no responsibility for use of the Report, in whole or in part, in any other context or circumstance or for any other purpose.

The scope of Golder's Services and the period of time they relate to are determined by the Contract and are subject to restrictions and limitations set out in the Contract. If a service or other work is not expressly referred to in this Report, do not assume that it has been provided or performed. If a matter is not addressed in this Report, do not assume that any determination has been made by Golder in regards to it.

At any location relevant to the Services conditions may exist which were not detected by Golder, in particular due to the specific scope of the investigation Golder has been engaged to undertake. Conditions can only be verified at the exact location of any tests undertaken. Variations in conditions may occur between tested locations and there may be conditions which have not been revealed by the investigation and which have not therefore been taken into account in this Report.

Golder accepts no responsibility for and makes no representation as to the accuracy or completeness of the information provided to it by or on behalf of the Client or sourced from any third party. Golder has assumed that such information is correct unless otherwise stated and no responsibility is accepted by Golder for incomplete or inaccurate data supplied by its Client or any other person for whom Golder is not responsible. Golder has not taken account of matters that may have existed when the Report was prepared but which were only later disclosed to Golder.

Having regard to the matters referred to in the previous paragraphs on this page in particular, carrying out the Services has allowed Golder to form no more than an opinion as to the actual conditions at any relevant location. That opinion is necessarily constrained by the extent of the information collected by Golder or otherwise made available to Golder. Further, the passage of time may affect the accuracy, applicability or usefulness of the opinions, assessments or other information in this Report. This Report is based upon the information and other circumstances that existed and were known to Golder when the Services were performed and this Report was prepared. Golder has not considered the effect of any possible future developments including physical changes to any relevant location or changes to any laws or regulations relevant to such location.

Where permitted by the Contract, Golder may have retained subconsultants affiliated with Golder to provide some or all of the Services. However, it is Golder which remains solely responsible for the Services and there is no legal recourse against any of Golder's affiliated companies or the employees, officers or directors of any of them.

By date, or revision, the Report supersedes any prior report or other document issued by Golder dealing with any matter that is addressed in the Report.

Any uncertainty as to the extent to which this Report can be used or relied upon in any respect should be referred to Golder for clarification

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