BHP

Leinster Town Landfill

BHP Billiton Nickel West Pty Ltd

Works Approval Application Supporting Documentation

For the expansion of the Leinster Landfill

26 November 2019

BHP

Document tracking

Item	Detail
Proposal name	Nickel West Leinster Landfill Works Approval Application Supporting Documentation
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Status/version number	Revision 1
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1. Background information

BHP Billiton Nickel West Pty Ltd (BHP Nickel West) operates a landfill 3km east of the Leinster town site, Western Australia. The Leinster landfill accepts the town's putrescible waste (approximately 2,500 tonnes per year). The landfill is situated on the Crown Reserve 46801.

BHP Nickel West holds Registration R1625/2004/1 under Regulation 5A of the *Environmental Protection Regulations 1987* (WA) for a Category 89 putrescible landfill site with a design capacity of more than 20 but less than 5,000 tonnes per year. The landfill operates in accordance with the *Environmental Protection (Rural Landfill) Regulations 2002* (WA) (Rural Landfill Regulations).

Leinster landfill was originally constructed by AMC (Agnew Mining Company Pty Ltd) in the 1970s to support the development of the Leinster town site. In 2002, WMC (WMC Resources Ltd) constructed additional cells for the landfill under Works Approval 3486. In June 2005, BHP assumed control of the Nickel West Asset from its acquisition of WMC and currently utilises the landfill to dispose waste from members of the public, municipal waste and to support BHP Nickel West operations. Given that the landfill is reaching capacity, BHP Nickel West intends to increase the size of the landfill to allow for above ground waste filling.

The landfill presently consists of cells A-C (Closed Cells), D, E and F, with a total footprint of approximately 8.9 ha. The area Cell G (approximately 1.6 ha) has been designated for future waste storage but to date has not been developed (excavated or built up). As such, Cell G does not form part of this application, if this cell is to be developed in the future, a separate works approval application will be submitted. Cells A to E have been filled up to the ground level and capped with soil. Cell F is currently under operation and being filled to ground level. BHP Nickel West proposes to construct perimeter bunds around Cells D, E, F to allow above-ground filling. For this purpose, an application for a works approval is required. This document outlines all the supporting materials for the application of the works approval.

The landfill will be operated in accordance with a Landfill Operation Plan (Appendix A). Once the design volume of each cell lift is reached, the cell will then be capped and rehabilitated as per the Landfill Post Closure and Rehabilitation Plan (Appendix B).

This document supports an application for a works approval application for the new landfill design and its associated infrastructure under Part V of the *Environmental Protection Act 1986* (EP Act). This document is structured to align with the *Department of Water and Environmental Regulation's (DWER) Application Form: Works Approval/Licence/ Renewal/ Amendment/ Registration* (February 2019, v 11) (Application Form).

Table 1.1 provides an overview of the Application Form and the relevant sections of this document that addresses each of the information requirements.

Table 1.1: Location of information relevant to the Application Form

Section in Application Form	Section in this document
Part 1. Application type	Refer to Application Form
Part 2. Applicant details	Refer to Application Form
Part 3. Premises details	Section 2
Part 4. Proposed activities	Section 3
Part 5. Index of Biodiversity Surveys for Assessments (IBSA)	Refer to Application Form

Part 6. Other DWER approvals	Section 4
Part 7. Other approvals and consultation	Refer to Application Form
Part 8. Fit and competent operator	Refer to Application Form
Part 9. Emissions, discharges, and waste	Section 5
Part 10. Siting and location	Refer to Application Form
Part 11. Submission of any other relevant information	Refer to Application Form
Part 12. Proposed fee calculation	Section 8
Part 13. Commercially sensitive or confidential information	Refer to Application Form
Part 14. Submission of application	Refer to Application Form
Part 15. Declaration and signature	Refer to Application Form
Attachments	
Attachment 1A: Proof of Occupier Status	Not required
Attachment 1B: ASIC company extract	Not required
Attachment 1C: Authorisation to act as representative	Not required
Attachment 2: Premises maps	Section 2
Attachment 3A: Proposed activities	Section 3
Attachment 3B: Map of area proposed to be cleared	Not required
Attachment 3C: Additional information for clearing assessment	Not required
Attachment 4: Biodiversity surveys	Not required
Attachment 5: Other approvals and consultation documentation	Not required
Attachment 6A: Emissions and discharges	Section 5
Attachment 6B: Waste acceptance	Section 6
Attachment 7: Siting and location	Not required
Attachment 8: Additional information submitted	Not required
Attachment 9: Fee calculation	Section 8
Attachment 10: Request for exemption from publication	Not required

2. Attachment 2: Premises maps

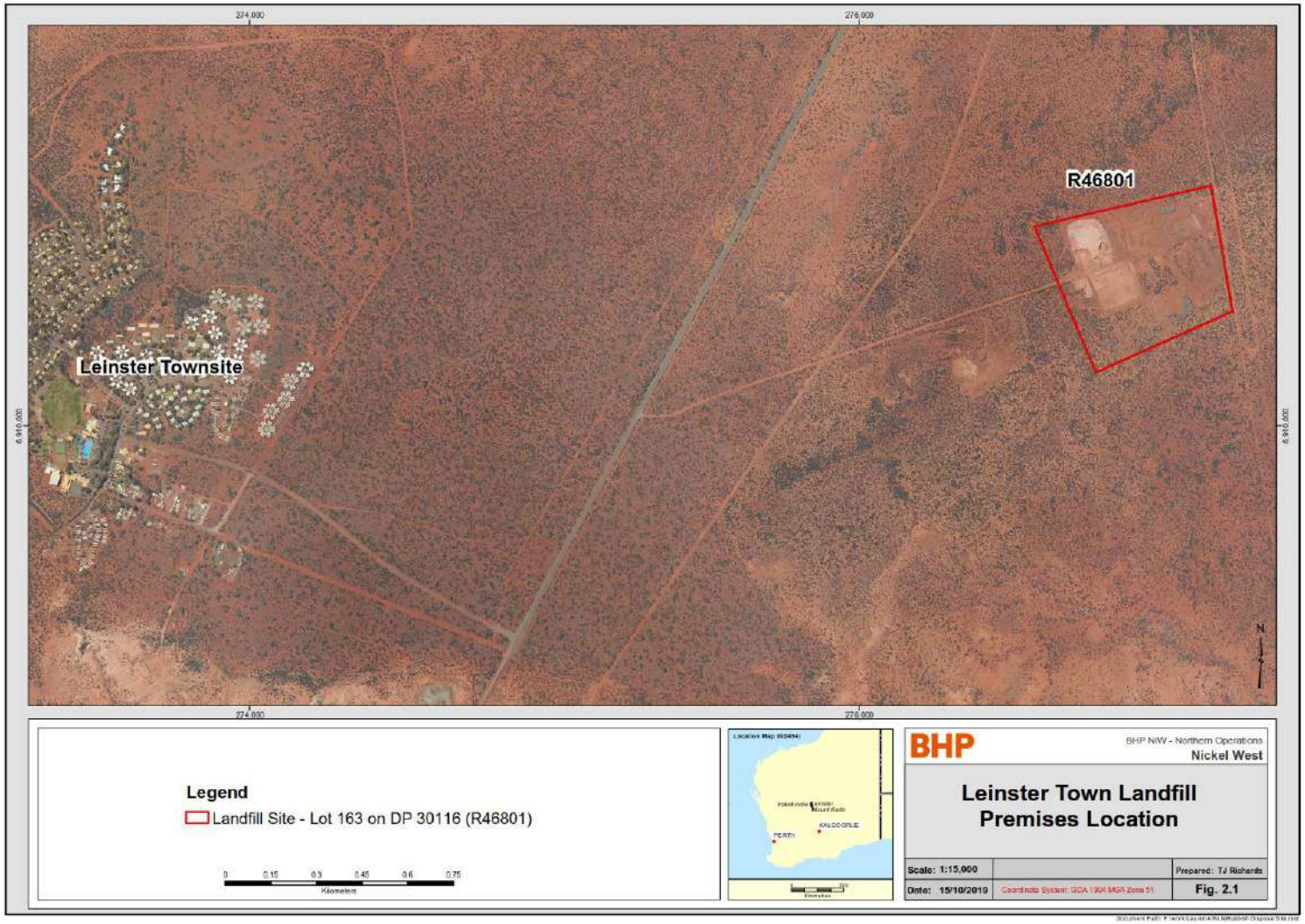

Figure 2.1: Premises Map

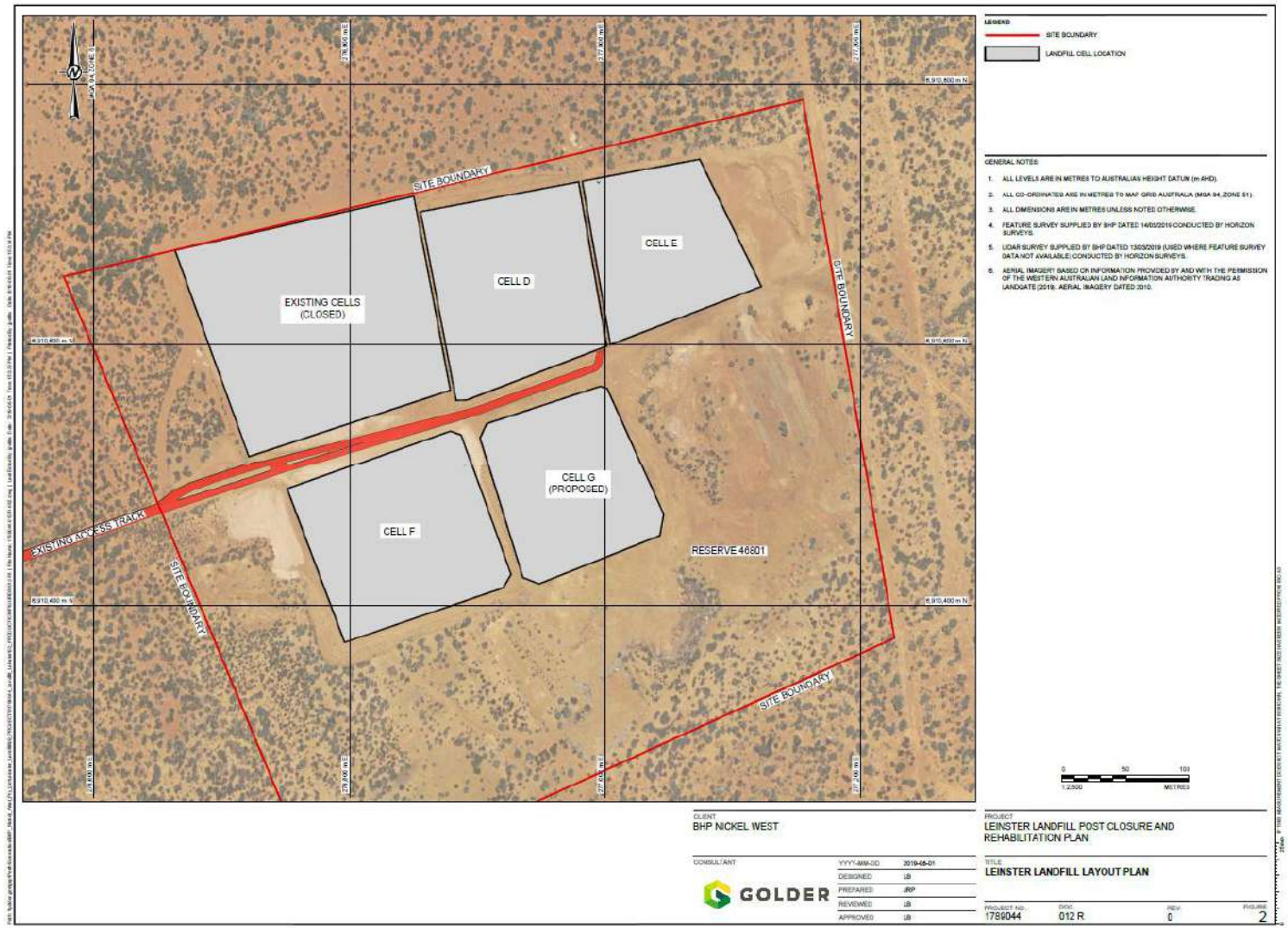

Figure 2.2: Landfill cells arrangement

3. Attachment 3A: Proposed activities

3.1 Landfill construction and operation

3.1.1 Scope, size and scale

BHP Nickel West proposes to build perimeter bunds and associated infrastructure across landfill cells D, E, F (approximately 5.4 ha) to allow for above ground filling of waste. As discussed in section 1, Cell G has been designated for future waste storage but to date has not been developed (excavated or built up). As such, Cell G does not form part of this application, if this cell is to be developed in the future, a separate works approval application will be submitted.

The project would include removal of the existing fence around the cells, placement of the perimeter bund walls, construction of drains around the landfill and installation of permanent perimeter fencing and vehicle access gates around the cells. Construction of works would occur upon approval of this application.

Approximately 2,500 tonnes of waste per annum would be deposited into the landfill from Leinster town site, the public and commercial operators. Only Class I and Class II waste (as defined under the *Landfill Waste Classification and Waste Definitions 1996*) and green waste will be accepted as follows:

- Class I waste – inert waste, construction and demolition waste and bulk waste
- Class II waste – putrescible waste and commercial solid waste
- Green waste – mulched or crushed greenwaste

Landfill construction designs are shown in Figures 3.1 to 3.6.

3.1.2 Key infrastructure and equipment

Table 3.1 describes the key infrastructure and changes associated with the project.

Table 3.1: Key infrastructure requirements

Infrastructure	Design/Construction requirements	Site plan reference
Landfill	Perimeter bund walls for Cell D, E and F: · Construct using general fill material (Gravelly, sandy, silty or clayey materials, free of organic matter/debris/waste, particle size ranging from 100mm to 200mm) · External bund batter slope – 1:2.5 (V:H) · Internal bund batter slope – 1:2.0 (V:H) · Ramps average grade – 1:10 (V:H) · 3 m width on top face of bund wall.	Figure 3.3 – 3.4
Drainage system	· Minimum depth of 0.8 m, slope of 1.5V:1H and total width of 2.4 m	Figure 3.5
Monitoring bores	· TLFMB1, TLFMB5, TLFMB6 located surrounding the landfill	Figure 3.7

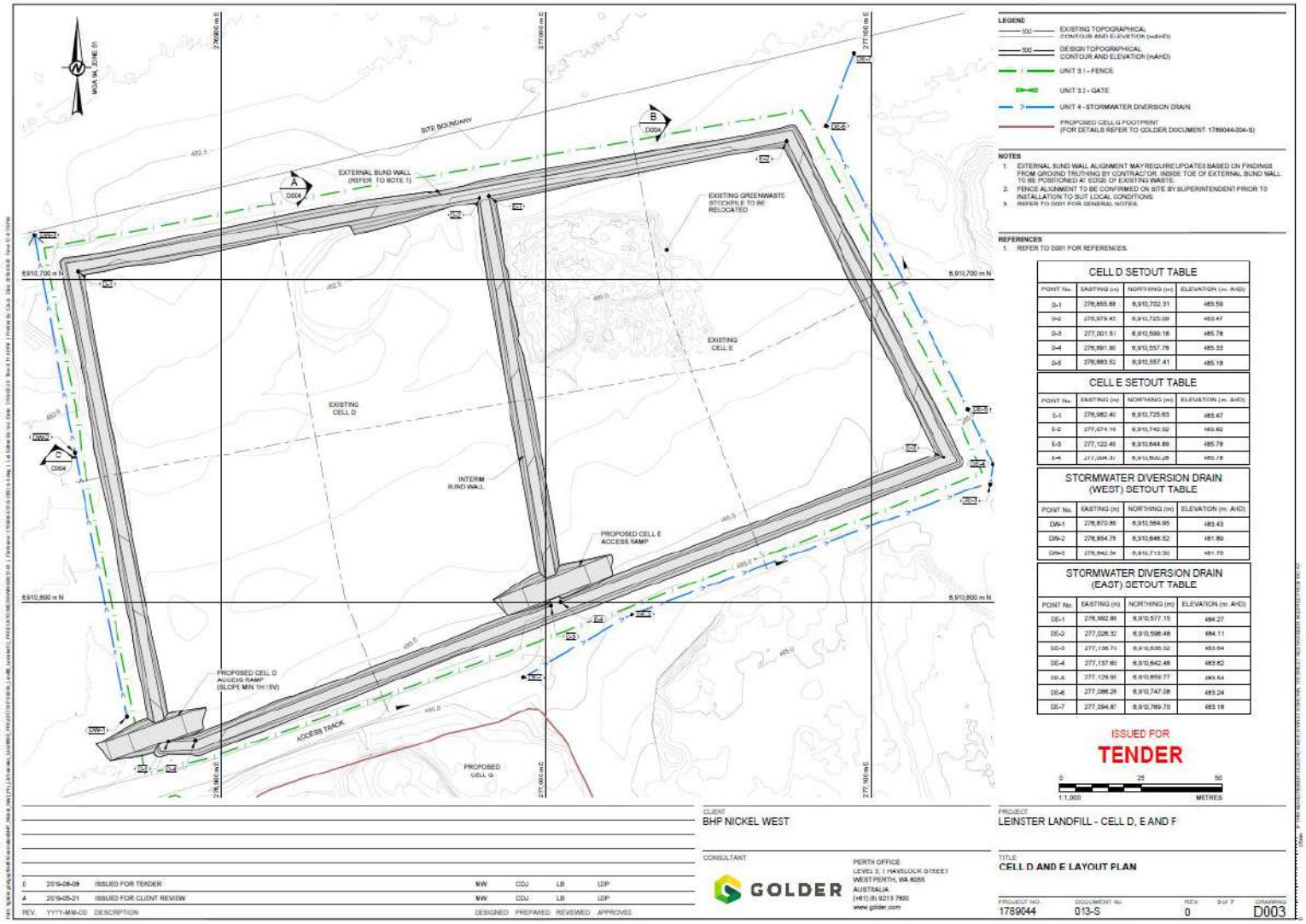

Figure 3.1: Cell D and E design

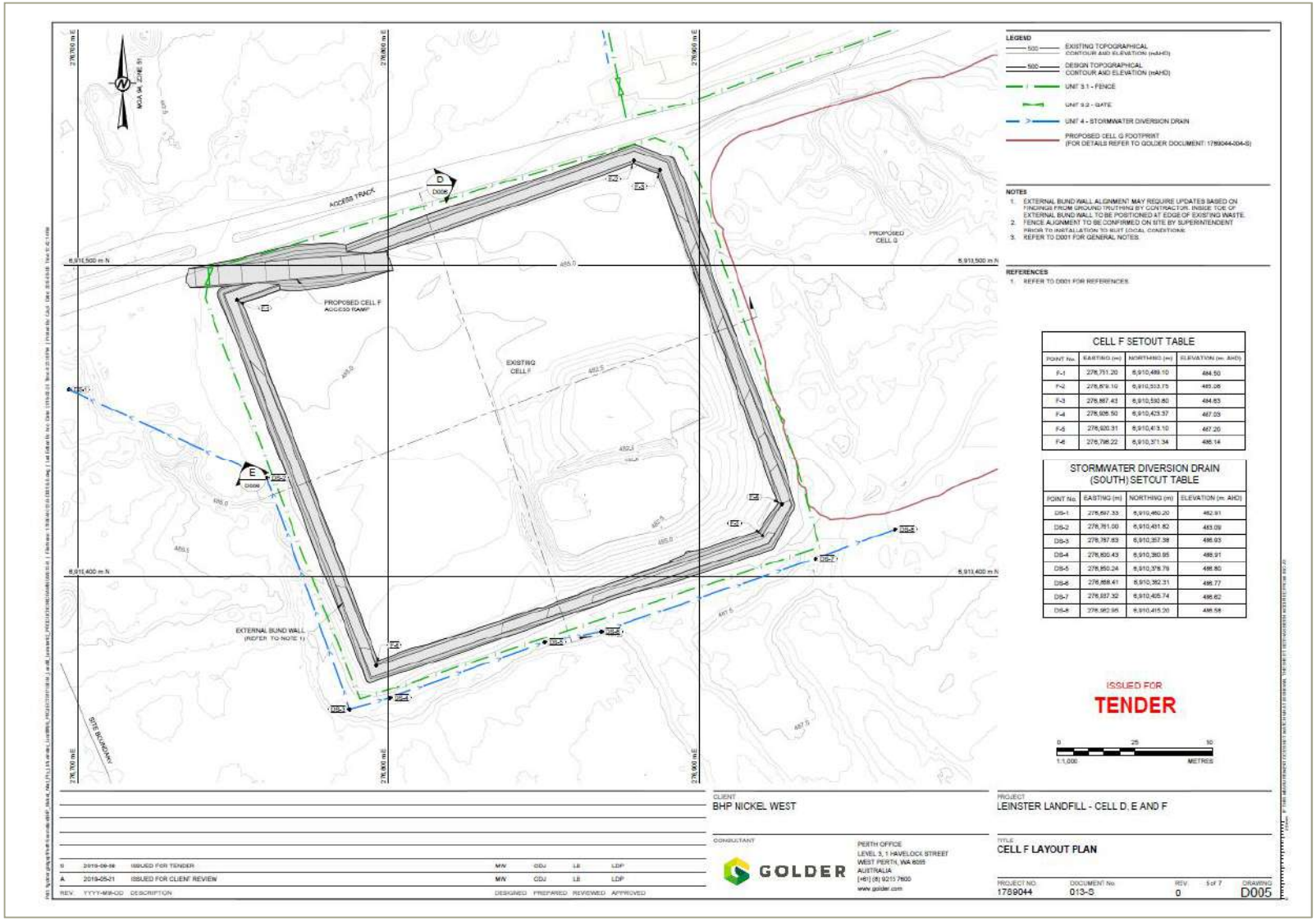

Figure 3.2: Cell F design

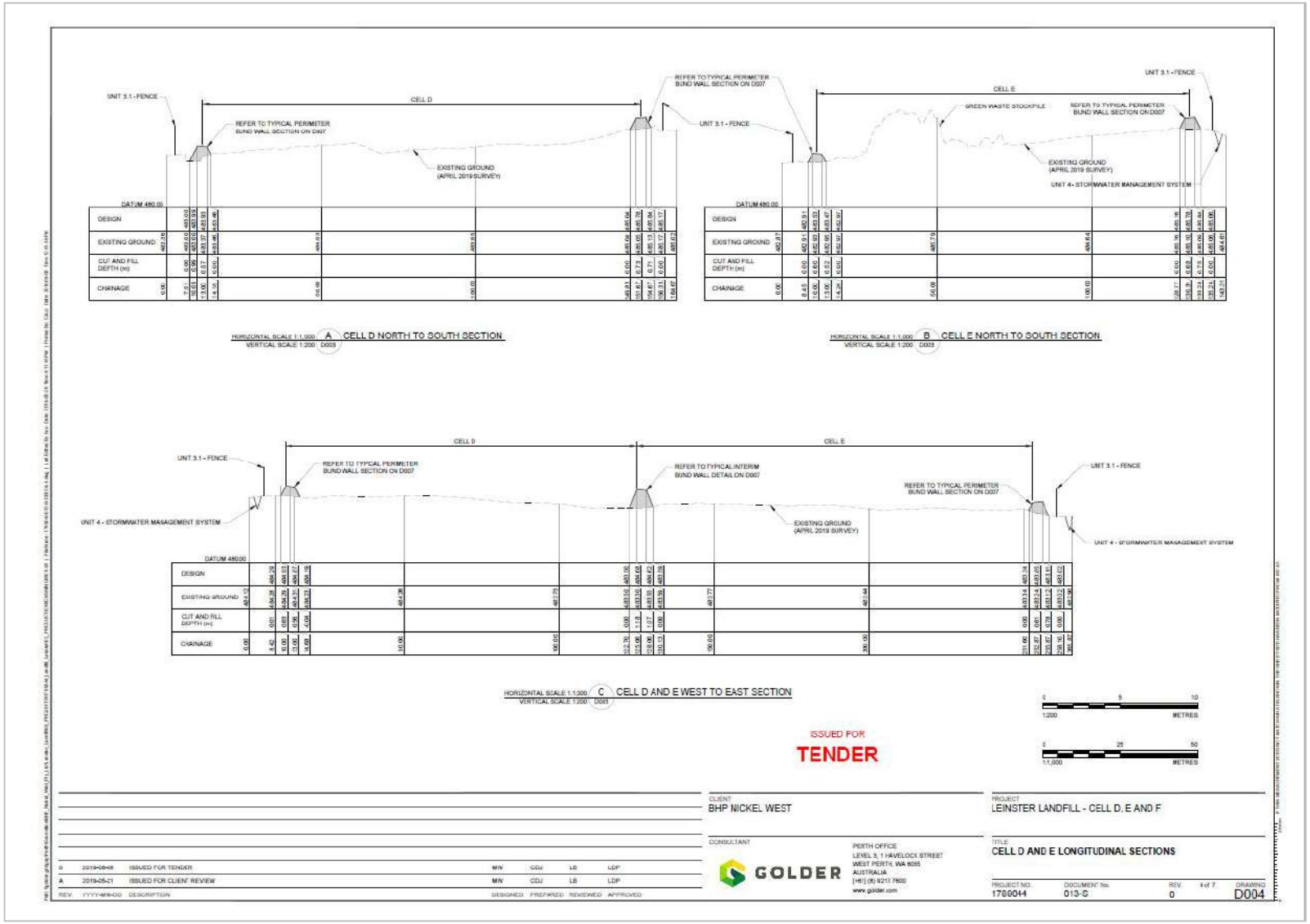

Figure 3.3: Cell D and E cross sectional design

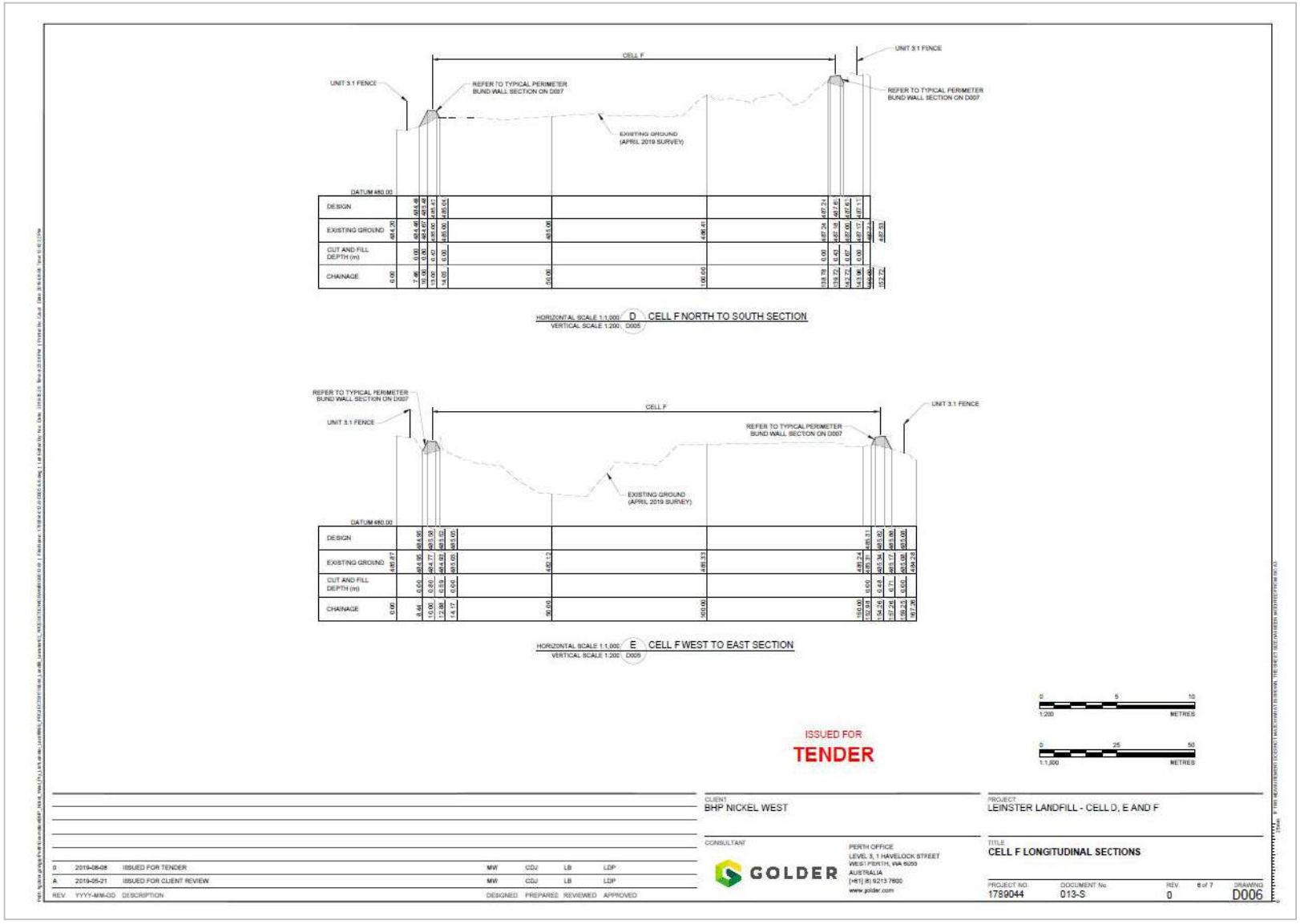

Figure 3.4: Cell F cross sectional design

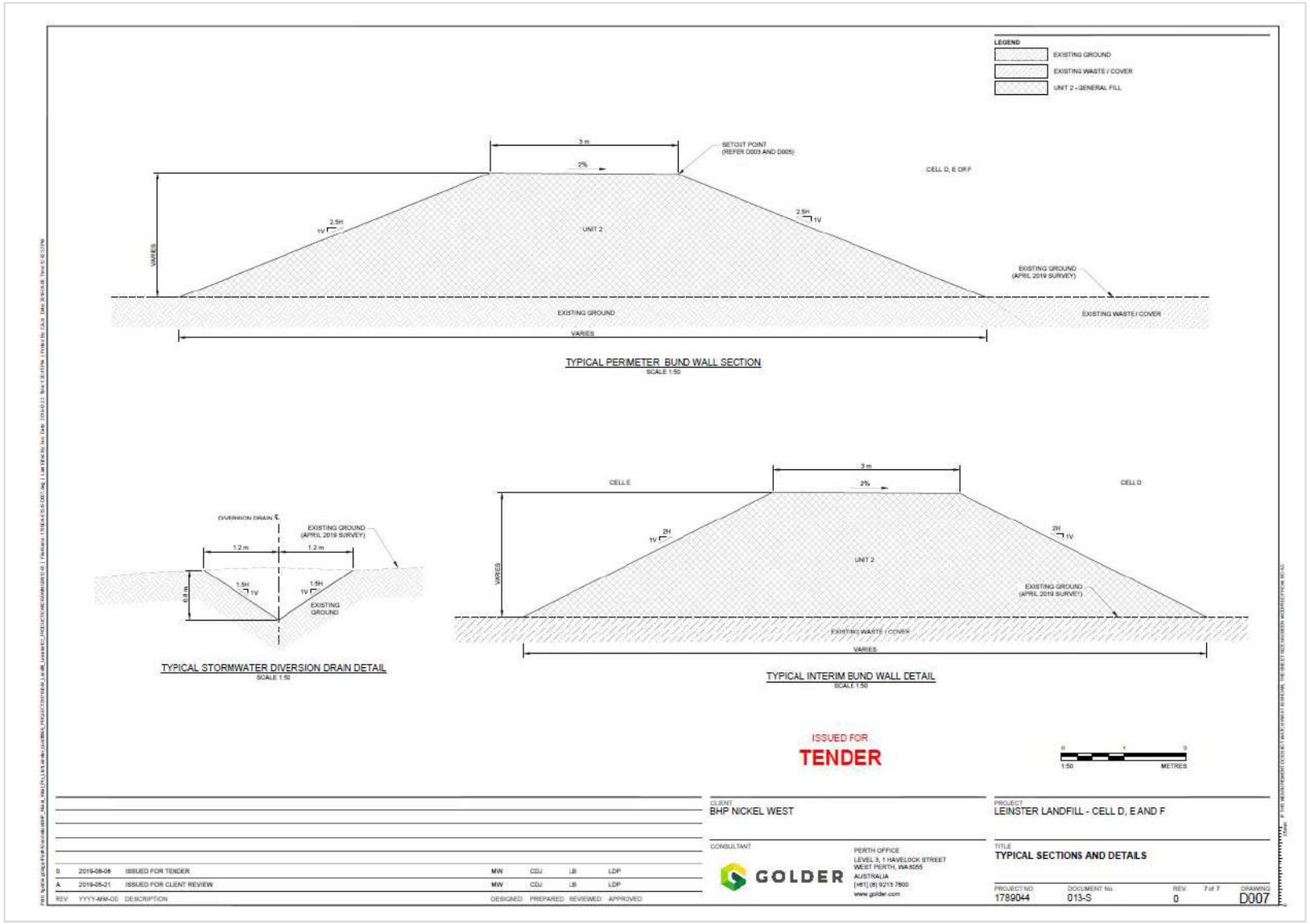

Figure 3.5: Perimeter bund and drainage system dimensions

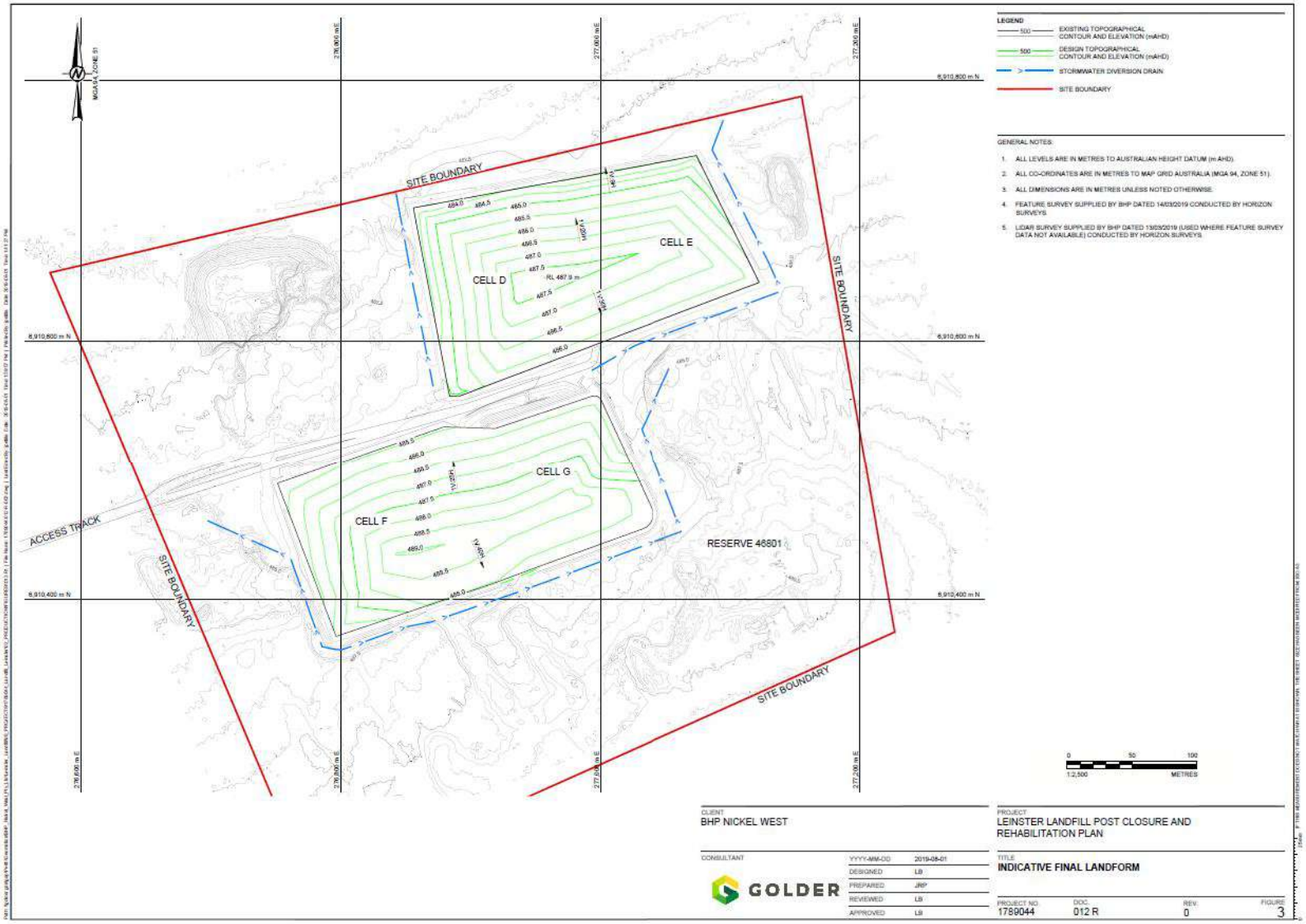

Figure 3.6: Indicative final landform at closure

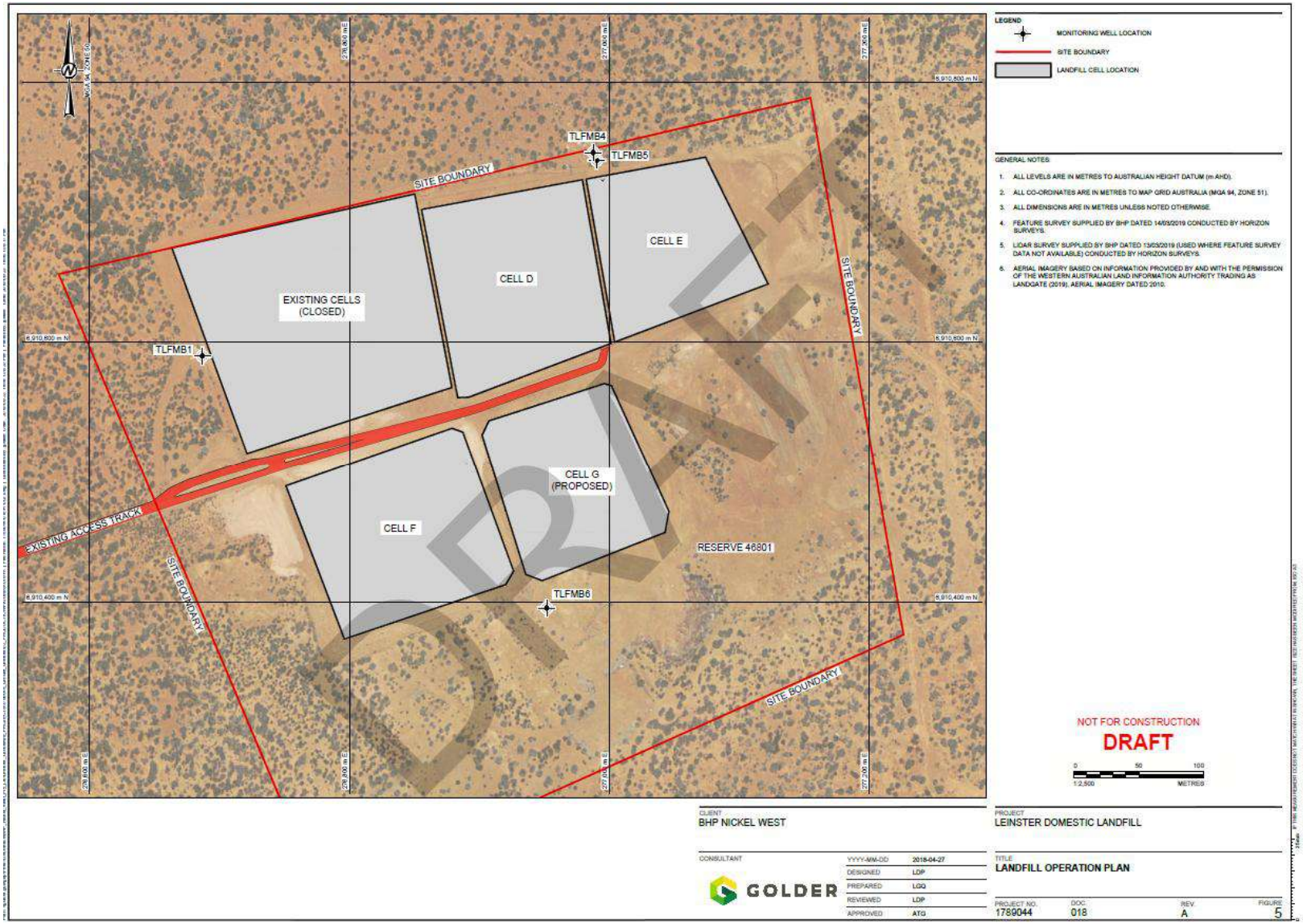

Figure 3.7: Groundwater monitoring bores location

3.1.3 Description of processes

Subject to receiving all necessary approvals, the capacity of the landfill would be increased to allow more waste to be disposed into Cells D, E and F. The landfill will continue to receive waste from the municipal sources and members of the public (no Leinster mine site waste will be received into the landfill). Waste will be disposed to 1m below the final landform levels. Drainage systems will be in place to divert all stormwater away from the landfill. The landfill will be fenced and gated to prevent unauthorised accesses and to restrict fauna access.

The landfill would be operated as per the Landfill Operations Plan (Appendix A) accepting Class I and II types of waste and green waste.

3.1.4 Emission/discharge points

Emissions would occur during construction works with minimal fugitive dust emissions due to machinery and vehicle movements. During the operation of the landfill, potential emissions could include seepage of leachate, contaminated surface water or wind blown rubbish.

3.1.5 Waste storage/disposal locations

All waste is currently being disposed in Cell F. Upon approval of the proposed works, waste will be disposed above ground level into Cells D, E and F.

3.1.6 Construction, commissioning and operations activities

Construction

The following construction works will be undertaken to upgrade the landfill (Golder 2019a):

- Removal of all current fencing around Cells D, E and F.
- An existing green waste stockpile present within Cell E will be relocated and mulched (where possible) to a size of 100 mm prior to placement back in an operational cell.
- Removal of any vegetation above the construction footprint
- No clearing of native vegetation is required to upgrade the landfill cells. All remnant stumps and roots greater than 100 mm in diameter will be removed to a depth of 600 mm below the natural level or final finished surface; all other vegetation and boulders will be removed to a depth of 100 mm below the natural ground surface.
- The bunds will be constructed from general fill material available close to the landfill. The general fill material will conform to the properties as described in the Technical Specification Report (Golder 2019a) and the general fill will be moisture-conditioned, placed, levelled and compacted. Field compaction tests may occur.
- Each cell will be delineated by a 0.5m high, 3m wide engineered bund.
- Construction of a stormwater management system will include an unlined V-drain system constructed around the perimeter of the cells. The dimensions of the drains are specified in Figure 3.5.
- Installation of permanent perimeter fencing and vehicle access gates around the cells.
- All fencing will comprise of galvanised steel chain link security fence and gates with a rail-less/barbed top in accordance with Australian Standard AS 1725.1. The fence would be of a height of 1.8m and would include gates of 6.0m wide for vehicle access.
- All finished constructed surfaces will be shaped to the final lines, levels and grades as specified in Figures 3.3 - 3.5. The surfaces will be smooth and free of abrupt grade changes, rutting and sharp protrusions.
- On completion of works, the site will be cleaned up of all materials and debris. Any damage made will be restored to a neat and tidy condition and all work areas would be smoothed and graded as closely as possible to the natural appearance of the landscape. Where destruction, scarring, damage or defacing has occurred as a result of the operations, repairing, planting or reseeding measures will be undertaken.

Commissioning

Throughout the construction stage of the landfill and prior to commissioning, quality assurance and control assessments would be undertaken. A summary of the QA/QC assessments are provided below:

- Fencing and gates would be installed as per the AS1725.1;
- Unsuitable materials such as vegetation from grubbing, waste, organic soils, soft grounds, soil containing debris or materials not suitable for general fill would be removed;
- A preconstruction quality assurance would be undertaken before commencement of works comprising of a visual inspection of the General Fill.
- Workplace inspections and survey as-builts will occur to ensure construction compliance

Operations

The following activities will occur during operations as per the Landfill Operations Plan (Golder 2019b; Appendix A):

- The landfill will accept class I and class II types of waste from the public, municipal sources, authorised carriers and NiW.
- Adequate amount of fill material will be maintained on site for use as cover.
- Active tipping face restricted to 20 m length and 2 m in height
- Prior to waste placement, cover material will be ripped or removed to allow vertical migration of leachate prior to filling the next level waste. This will prevent horizontal movement of leachate
- Waste shall be placed in horizontal layer no greater than 0.5 m thickness to ensure adequate compaction and when placed against the perimeter bund, at least 1 m below the top of the perimeter bund
- To ensure compaction each lift is to be compacted using a minimum of five passes
- Waste shall be covered as per the below:
    - Putrescible waste – cover by the end of the day
    - Waste easily windblown – cover as soon as practical on the day of disposal
    - Other waste – cover within week
- Cover material to be sandy or gravelly material and should not be clay or low permeable material
- Any windblown waste will be collected and placed into the landfill on a regular basis. Prior to storms or high wind events, preventative measures will be implemented.
- Regular landfill inspections would be carried out to inspect fencing and repairs undertaken as required.
- Waste placement and compaction undertaken as per the Landfill Operations Plan (1789044-018-R-Rev0).
- Any stormwater runoff coming into contact with waste is considered contaminated stormwater and will be contained within the cell and not disposed to the perimeter drainage system.
- Internal bunds would be constructed within the cells to isolate and contain contaminated and uncontaminated stormwater. The bunds will be high enough to ensure no overtopping of stored stormwater and if possible the floor graded away from the internal bunds wall.
- Groundwater monitoring will be undertaken with the three monitoring wells (Figure 3.7) (TLFMB1, TLFMB5, TLFMB6) on a six monthly basis. TLFMB4 is an existing shallow bore, which is not currently suitable for monitoring. This bore will be decommissioned with the establishment of monitoring at TFLMB5.

- Groundwater sampling would be undertaken in accordance with Schedule B2: Site Characterisation of National Environmental Protection (Assessment of Site Contamination) Measure (NEPM) (NEPM, 2014) or BHP standards.
- A Groundwater monitoring report will be generated as part of the Annual Operations Report summarising the water quality, operations and maintenance of the cells, volume/category of waste disposed, materials balance, volume estimate of waste removed from site and summary of incidents.

Closure of the landfill will be undertaken as per the Landfill Post-Closure and Rehabilitation Plan (Golder 2019c; Appendix B) and will include a post-settlement height of the landfill of approximately 2.5m above surrounding ground level.

4. Attachment 5: Other approvals and consultation documentation

4.1 DWER Approvals

A Native Vegetation Clearing Permit is not required. All activity will occur on previously disturbed or rehabilitated areas.

4.2 Environmental Protection Act 1986

4.2.1 Part IV referral and assessment

The Proposal has not been referred to the EPA pursuant to Part IV of the *Environmental Protection Act 1986* (WA).

4.2.2 Part V assessment

No native vegetation clearing is associated with this application.

4.2.3 Existing Part V approvals

The landfill is registered under Registration R1625/2004/1 for a Category 89 putrescible landfill site with a design capacity of more than 20 but less than 5,000 tonnes per year. The *Environmental Protection (Rural Landfill) Regulations 2002* (WA) apply to the operation of the landfill.

4.3 Environment Protection and Biodiversity Conservation Act 1999

The works do not impact any Matters of National Environmental Significance; therefore, referral to the Department of the Environment and Energy (DEE) is not required.

4.4 Mining Act 1978

The landfill is on Crown Reserve 46801 for the purpose of rubbish disposal site (lot 163 on deposited plan 30116). The primary interest holder of the land is the Shire of Leonora, the shire has provided consent for this application to be lodged.

No approvals under the *Mining Act 1978* (WA) are required.

4.5 Stakeholder consultation

As the primary interest holder of the land, the Shire of Leonora, was consulted and provided consent for the submission of this application. Refer Appendix C for the letter of consent.

5. Attachment 6A: Emissions and discharges

5.1 Sources

The main emission sources from the proposed activities are contaminated stormwater, windblown rubbish, dust emissions from construction works and seepage of leachate.

5.1.1 Dust Emissions – Construction works

The expansion of the landfill involves earthworks activities. However, minimal fugitive dust emissions are expected to occur given that dust suppression activities will be undertaken.

No significant flora and fauna have been identified in the area and all disturbed areas fall under previously disturbed areas.

5.1.2 Leachate

Waste leachate or spills are the main sources of emissions during the operational time of the landfill. Minimal seepage through the landfill is expected to occur even in high rainfall events given that disposal would be above the previous cells and the base would be of low permeability material.

The 11-mile borefield is around 2-5 km north-northwest of the site and is considered as the main receptor of impacts to ground water quality from the landfill. However, the borefield is either up or cross gradient of the flow at the site and therefore not anticipated as a potential receptor.

Standard water levels of the groundwater range between 11-13 mbgl which is an adequate depth separation between the landfill and the water table. The site geology comprises of alluvium (up to 5 m thick) underlain by saprolite clay (thickness of 20-35 m).

5.1.3 Contaminated surface water

No permanent natural water bodies are present within the landfill site. A small ephemeral creek is present around 300 m northwest of the landfill.

To reduce the risk of stormwater interference with the landfill, a stormwater management system compromising of an unlined V-drain channel will be constructed around the perimeter of the cells to divert all stormwater in case of a rainfall event. The stormwater management system will be constructed as per the design specification described in Section 3.1.2.

Given that proper diversion channels and bunding will divert and prevent stormwater infiltration within the landfill, the risk of surface water contamination will be greatly reduced.

6. Attachment 6B: Waste acceptance

The landfill receives waste from members of the public, municipal waste and BHP Nickel West operations as described in Table 6.1.

Table 6.1: Waste acceptance table

Source	Waste type	Quantity	Storage infrastructure	Monitoring	Location (on Premises map)
Public, municipal, Nickel West Operations, licensed carriers	Clean Fill Uncontaminated fill Neutralised acid sulfate soil Putrescible Wastes Class I waste – inert waste, construction and demolition waste and bulk waste Class II waste – putrescible waste and commercial solid waste Green waste – mulched or crushed greenwaste	2,500 tonnes per year	Cells D, E, F	Three monitoring bores and regular inspections	Landfill Site

7. Risk Assessment

In accordance with DWER's Guidance Statement: Risk Assessment (DWER 2017) an assessment has been undertaken for the landfill. Potential sources, pathways and impacts to receptors have been identified in this process.

7.1 Risk Assessment Framework

Table 7.1 (risk analysis matrix), Table 7.2(consequence and likelihood criteria) and Table 7.3 (risk treatment protocol) outline the risk assessment matrix and criteria used by DWER to evaluate the risk of adverse impacts to public health and the environment. The outcomes of the risk assessment are provided below in Table 7.4.

Table 7.1: Risk analysis matrix (DWER 2017)

LIKELIHOOD	CONSEQUENCE				
	Slight	**Minor**	**Moderate**	**Major**	**Severe**
Almost Certain	Moderate	High	High	Extreme	Extreme
Likely	Moderate	Moderate	High	High	Extreme
Possible	Low	Moderate	Moderate	High	Extreme
Unlikely	Low	Moderate	Moderate	Moderate	High
Rare	Low	Low	Moderate	Moderate	High

Table 7.2: DWER consequence and likelihood criteria

Likelihood		**Consequence**		
The following criteria will be used to determine the likelihood of the risk / opportunity occurring.		**The following criteria will be used to determine the consequences of a risk occurring:**		
			Environment	**Public Health* and Amenity (such as air and water quality, noise and odour)**
Almost Certain	The event is expected to occur in most circumstances	Severe	· on-site impacts: catastrophic · off-site impacts local scale: high level or above · off-site impacts wider scale: mid-level or above · mid to long term or permanent impact to an area of high conservation value or special significance^. · Specific Consequence Criteria (for environment) are significantly exceeded.	· loss of life · **adverse health effects:** high level or ongoing medical treatment · Specific Consequence Criteria (for public health) are significantly exceeded. · **local scale impacts:** permanent loss of amenity.
Likely	The event will probably occur in most circumstances	Major	· on-site impacts: high level · off-site impacts local scale: mid-level · off-site impacts wider scale: low level · Short term impact to an area of high conservation value or special significance^.Specific Consequence Criteria (for environment) are exceeded.	· **adverse health effects:** mid-level or frequent medical treatment · Specific Consequence Criteria (for public health) are exceeded. · **local scale impacts**: high level impact to amenity.

Possible	The event could occur at some time	Moderate	· on-site impacts: mid-level · off-site impacts local scale: low level · off-site impacts wider scale: minimal. · Specific Consequence Criteria (for environment) are at risk of not being met.	· **adverse health effects:** low level or occasional medical treatment · Specific Consequence Criteria (for public health) are at risk of not being met. · **local scale impacts:** mid-level impact to amenity.
Unlikely	The event is unlikely to occur	Minor	· on-site impacts: low level · off-site impacts local scale: minimal · off-site impacts wider scale: not detectable. · Specific Consequence Criteria (for environment) likely to be met.	· on-site impacts: mid-level · off-site impacts local scale: low level · off-site impacts wider scale: minimal. · Specific Consequence Criteria (for environment) are at risk of not being met.
Rare	The event may only occur in exceptional circumstances	Slight	· on-site impact: minimal. · Specific Consequence Criteria (for environment) met.	· on-site impacts: low level · **off-site impacts local scale**: minimal.

Table 7.3: Risk treatment protocol

Risk Rating	Acceptability	Treatment
Extreme	Unacceptable	Risk event will not be tolerated. DWER may refuse application.
High	May be acceptable. Subject to multiple regulatory controls	Risk event may be tolerated and may be subject to multiple regulatory controls. This may include both outcome-based and management conditions.
Moderate	Acceptable, generally subject to regulatory controls	Risk event is tolerable and is likely to be subject to some regulatory controls. A preference for outcome-based conditions where practical and appropriate will be applied.
Low	Acceptable, generally not controlled	Risk event is acceptable and will generally not be subject to regulatory controls.

7.2 Risk assessment results

Table 7.4 shows the proposed controls and the residual risk after implementation of controls.

Table 7.4: Risk assessment

Activity	Emission	Receptor	Pathway	Potential impact	Controls	Consequence	Likelihood	Risk
Construction works	Air emissions- dust	Vegetation Fauna	Wind dispersion	Vegetation health Destruction of fauna habitat	· Dust suppression activities will be undertaken as required(water cart) · Vehicle speed restriction will be implemented to reduce dust emissions from road surfaces.	Slight	Possible	Low
Construction works / Operations	Leachate or waste spills	Groundwater	Seepage through soil	Water Quality Decline Soil contamination	· Depth to groundwater (11 mbgl) and no beneficial groundwater users, with closest borefield up/cross gradient of landfill · Correct waste disposal types confirm through inspections · Landfill covered on a daily and weekly basis to minimise oxidation of waste and direct exposure to rainfall events · Waste placement to 0.5 m and then	Minor	Unlikely	Moderate

Activity	Emission	Receptor	Pathway	Potential impact	Controls	Consequence	Likelihood	Risk
					compaction to minimise leachate movement · Cover material ripped or removed prior to waste placement to minimise horizontal leachate movement · Surface water diversion to minimise inflow of rainfall · Landfill Post Closure and Rehabilitation Plan (Gold 2019c, Appendix B) includes design to minimise rainwater inflow · Groundwater monitoring undertaken			
Construction works / Operations	Contaminated water run off	Surface water	Rainfall events	Surface Water Contamination Soil contamination	· Stormwater management system and bunding to divert all incoming stormwater away from the landfill · Internal bunds shall be constructed within the cells to isolate and contain contaminated and uncontaminated stormwater.	Minor	Rare	Low

Activity	Emission	Receptor	Pathway	Potential impact	Controls	Consequence	Likelihood	Risk
					· The bunds shall be high enough to ensure no overtopping of stormwater and if possible, and the floor graded away from the internal bunds wall. · Any stormwater runoff that comes into contact with waste shall be contained within the cell and not disposed to the perimeter drainage system.			
Operations	Windblown waste	Fauna	Windblown waste	Attraction of feral animals	· Landfill will be fenced around the perimeter to prevent windblown waste and fauna access. · Any loose windblown waste within the site on fenced area will be collected and placed in the landfill at the start and end of each operational day; and where possible during the day. · Fencing will be regularly inspected and repaired	Slight	Rare	low

Activity	Emission	Receptor	Pathway	Potential impact	Controls	Consequence	Likelihood	Risk
					· Prior to storms or high wind events, preventative measures shall be implemented to prevent windblown waste.			

8. Attachment 9: Application fee

In accordance with section 12.6 of the Application for Works Approval Form, the application fee has been calculated as $6,699, refer Table 8.

Table 5.1: Fee calculation

Estimated Cost of works $	Fee Units[1]	Works Approval Fee Calculation Fee Unit = $40.60[2]
$ 1,500,000	165	40.60 x 165 = $6,699

1 Schedule 3, *Environmental Protection Regulations 1987 [as shown below]*
2 2018-19 Fee schedule, *https://www.der.wa.gov.au/our-work/licences-and-works-approvals/489-industry-regulation-faqs*

Environmental Protection Regulations 1987
Schedule 3 Works approval fee

Schedule 3 — Works approval fee

[r. 5BA(1)]

[Heading amended: Gazette 12 Jun 2018 p. 1889.]

Cost of works	Fee units
Not more than $10 000	15
More than $10 000 but not more than $50 000	15 plus 5 for every $10 000 above $10 000
More than $50 000 but not more than $500 000	35 plus 10 for every $50 000 above $50 000
More than $500 000 but not more than $5 000 000	125 plus 20 for every $500 000 above $500 000
More than $5 000 000 but not more than $25 000 000	305 plus 100 for every $5 000 000 above $5 000 000
More than $25 000 000 but not more than $100 000 000	705 plus 50 for every $5 000 000 above $25 000 000
More than $100 000 000	1405

9. References

Golder (2019a), Cell D, E and F Perimeter Bund Walls, Leinster Landfill Technical report, prepared for BHP Nickel West.

Golder (2019b), Landfill Operations Plan, Leinster Domestic Landfill, prepared for BHP Nickel West.

Golder (2019c), Landfill Post Closure and Rehabilitation Plan, Leinster Domestic Landfill, prepared for BHP Nickel West.

10. Appendices

Appendix A – Landfill Operation Plan

REPORT

Landfill Operations Plan

Leinster Domestic Landfill

Submitted to:

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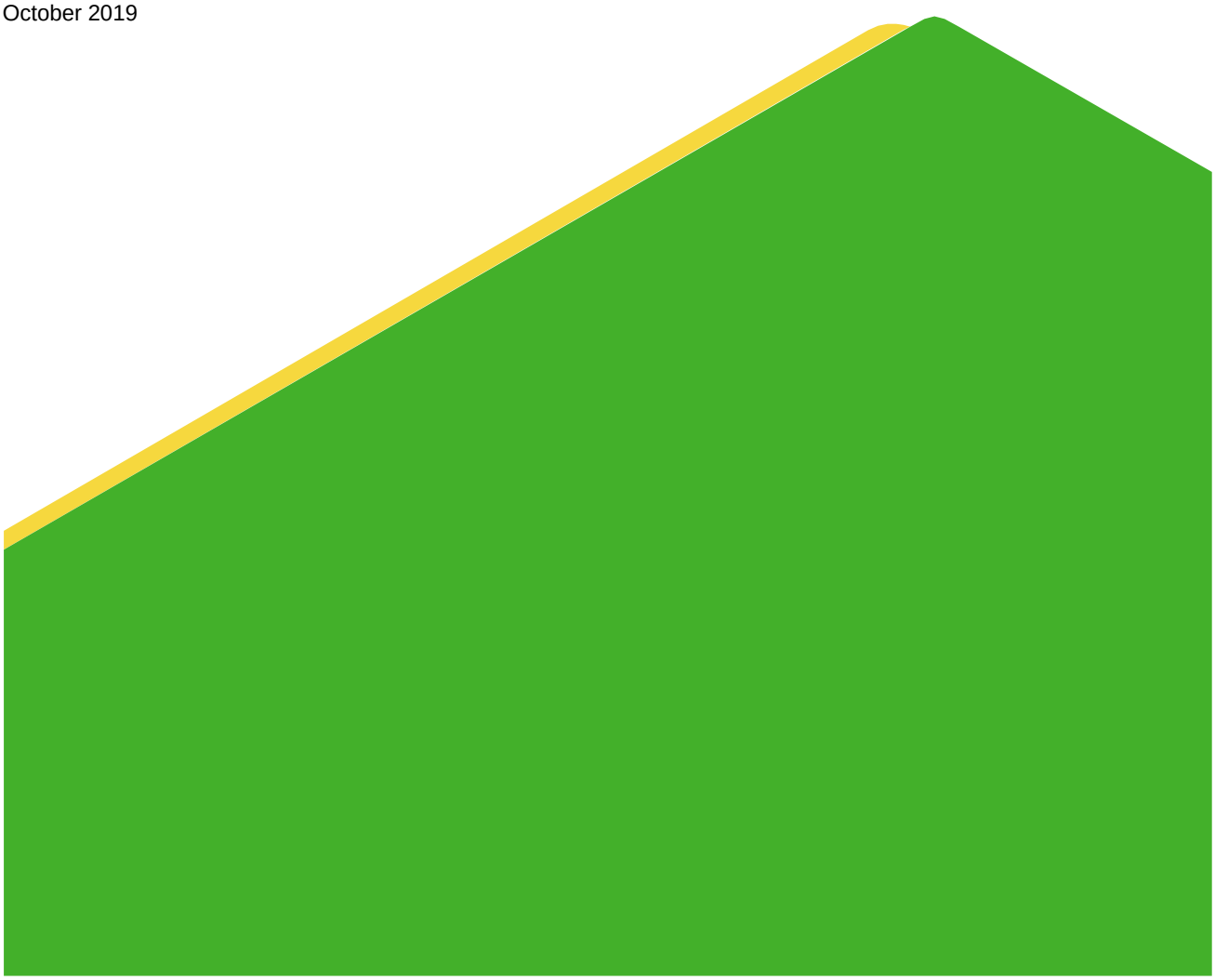
1789044-018-R-Rev0

October 2019



Distribution List

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APPENDICES

1.0 INTRODUCTION

BHP Nickel West Pty Ltd (BHP) are responsible for the operation of the Leinster Domestic Landfill site that is located on Crown Reserve 46801, approximately 3.5 km east of the town of Leinster, Western Australia within the Shire of Leonora.

Leinster Domestic Landfill is a registered site (Registration Number 1625 dated May 2004) under the *Environmental Protection Act 1987* and is classified as a Category 89: Putrescible landfill site. Landfill operations, at this site, do not require a licence under the current regulatory requirements and the site operates in accordance with the *Environmental Protection (Rural Landfill) Regulations 2002.*

1.1 Purpose and Application

The purpose of this Landfill Operations Plan (the plan) is to document the operational requirements for Leinster Domestic Landfill Site (the site).

This plan applies to parties responsible for and involved in the operation and acceptance of waste at the site; namely:

- Owner – BHP
- Landfill operator (Operator) – BHP or BHP's contractor

1.2 Scope

This plan outlines the requirements for the following components of the site operations:

- Waste acceptance
- Waste placement
- Waste compaction
- Covering waste
- Litter control
- Stockpile management
- Drop-off areas
- Stormwater management
- Groundwater management
- Monitoring and reporting.

1.3 Objective

The objectives of this plan are to:

- Clearly document the operating requirements for BHP's landfill operator
- Undertake operations at the site in accordance with the *Environmental Protection (Rural Landfill) Regulations 2002* and other relevant regulatory requirements (Refer Section 1.4)
- Implement waste landfilling practices that will improve waste disposal methods and optimise landfill airspace for both above-ground and below-ground filling

- Undertake operations in accordance with BHP's requirements including the following plans:
  - BHP Leinster Mine Closure Plan 2018 (NLN MCP) (BHP, 2018)
  - Leinster Domestic Landfill, Landfill Post Closure and Rehabilitation Plan (Landfill Closure Plan) (Golder, 2018a)
  - Leinster Domestic Landfill, Landfill Filling Plan (Filling Plan) (Golder, 2018b)

1.4 Regulatory Framework

A range of legislation, regulations, and policies are relevant to landfill operations at the site and are summarised in Table 1. This list is not definitive and may change.

Table 1: Summary of Relevant Legislation, Regulations, and Policies

Document/ Instrument Type	Applicable Documentation/Instruments
Acts and Regulations	Western Australian: ■ *Aboriginal Heritage Act 1972* ■ *Contaminated Sites Act 2003* ■ *Environmental Protection Act 1986* (EP Act) ■ *Environmental Protection Regulations 2004* ■ *Environmental Protection (Rural Landfill) Regulations 2002* ■ *Environmental Protection (Controlled Waste) Regulations 2004* ■ *Environmental Protection (Noise) Regulations 1997* ■ *Environmental Protection (Unauthorised Discharges) Regulations 2004* ■ *Occupational Safety and Health Act, 1984* ■ *Occupational Safety and Health Regulations, 1996* ■ *Rights in Water and Irrigation Act 1914 (RIWI Act)* ■ *Wildlife Conservation Act 1950* ■ *Bush Fires Act 1954* Commonwealth: ■ *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*
Codes of Practice	■ Landfills for disposal of putrescible materials (Department of Water, 2009) ■ Code of Practice for the Management and Control of Asbestos in the Workplace (NOHSC: 2018, 2005) ■ Landfill Waste Classification and Waste Definitions 1996 (as amended 2018) (DWER).
Works Approval	■ Part V Works Approval 3486

1.5 Background

The Leinster Domestic Landfill is a class II putrescible landfill site that accepts approximately 2,500 tonnes per annum from the following sources:

- Kerbside collected municipal solid waste from the Leinster townsite households, commercial premises and accommodation camps.
- Waste dropped off by members of the public.
- Waste dropped off by commercial operators.

Disposal is through hand unloading by the public and commercial operators, and mechanical disposal by commercial operators. Waste generated from Leinster Mine site is not disposed to this landfill site.

This plan includes requirements for above ground filling of waste. Historically the cells have been filled to ground level and covered with soil. This type of operations:

- increases the amount of footprint required for landfilling
- increases infiltration of surface water to the waste as rainfall can pool above the waste mass, and
- may increase leachate generation.

Above-ground filling of waste is required to:

- meet the requirements of the Landfill Closure Plan (Golder, 2018a)
- to promote active runoff of surface water from the cell cap
- minimise infiltration of surface water to the waste and reduce leachate generation, and
- increase the amount of waste disposed to each cell.

2.0 LANDFILL OPERATIONS MANAGEMENT

2.1 Responsibility

Landfilling operations for disposing of waste at the site shall be undertaken by BHP's operations contractor in accordance with the requirements provided in this plan.

2.2 Waste Acceptance

Only Class I and Class II waste (as defined under the Landfill Waste Classification and Waste Definitions 1996 (as amended, 2018) (DWER, 1996)) may be accepted at the landfill site.

The following waste shall be accepted for disposal to the landfill cells:

- Class I waste (including inert waste, construction and demolition waste, and bulk waste)
- Class II waste (including municipal (including putrescible) and commercial solid waste)
- Greenwaste – Mulched/crushed greenwaste

Some waste, as agreed or directed by BHP, shall be diverted from landfill, temporarily stockpiled on site and may require processing including:

- Clean fill – stockpiled for use as cover material on site
- Greenwaste – stockpiled for mulching or crushing and disposal to landfill or diverted from landfill and used as mulch
- White goods – stockpiled for sale
- Others as required by BHP.

2.3 Waste Inspection

- All incoming loads shall be inspected prior to landfilling or relocation to landfill diversion stockpile, and rejected if the waste does not meet the acceptance criteria (refer Section 2.2)
- Rejected waste shall be removed by the customer (if possible) or contained/isolated and managed appropriately
- A Waste Rejection Report (provided in Appendix A) shall be completed. The report shall include date, description of waste, customer details, reasons why waste was rejected, and action taken.
- Waste not acceptable includes:
  - Asbestos
  - Tyres
  - Liquid waste and septage
  - Contaminated soil
  - Hazardous and chemical waste
  - Clinical, medical and quarantine waste
  - Sealed drums and IBCs
  - Flares/explosives

  - Waste classified as class III, IV or V according to Landfill Waste Classification and Waste Definitions 1996 (as amended 2018) (DWER, 1996)
  - High pressure containers including gas and fire bottles (acceptable if valves removed by customer prior to disposal)
- Others as required by BHP.

2.4 Waste Drop-off Areas

Following waste drop-off areas shall be provided and clearly sign posted:

- Public Drop-off Area – Area for the public and hand unloaders shall be clearly signposted and located away from the active face to minimise the risk of equipment/people interaction.
- Vehicle Disposal Area – Waste vehicle (mechanical) unloading area which is separated from the public drop off area. Area may be at the active face but shall minimise the risk of landfilling equipment/vehicle interaction.
- Clean fill – Drop-off area adjacent to the stockpile
- Greenwaste – Drop-off area adjacent to the stockpile
- Whitegoods – Drop-off area adjacent to stockpile
- Others as required by BHP.

Requirements for layout and location of drop-off area are as follows:

- All areas (except greenwaste and metal stockpiles) shall be located so they are visible to the operator from the active face.
- All drop-off areas to provide for one-way traffic (if possible); and clear entry and exit routes suitable for the user's vehicles.

2.5 Waste Placement

- Active face is restricted to a maximum linear length of 20 m and 2 m in height.
- **Waste to be disposed on waste and not over cover material.**
- Prior to placing waste, cover material to be ripped or stripped back and the waste exposed (Figure 1). This will enable leachate to migrate vertically down to the base of the landfill. If the cover is not ripped, then leachate may travel horizontally and discharging through the sides of the cap (Figure 2).

Figure 1: Remove Cover Prior to Placement of Next Waste Lift

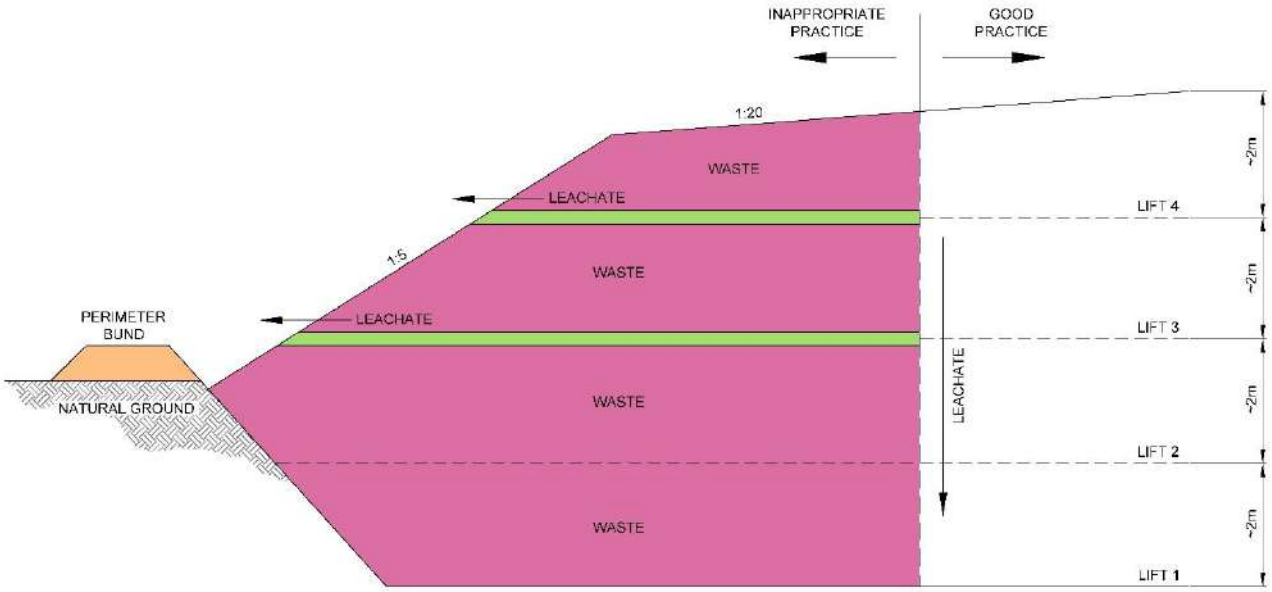


Figure 2: Inappropriate Waste Placement and Leachate Migration Outside the Cell

- Place and spread waste in horizontal layers of not more than 0.5 m in thickness (Figure 3). This waste depth is one of the most important factors for getting good waste compaction.

Figure 3: Waste Placement and Compaction

- The internal batters formed by waste placement are no steeper than 1 vertical (V) to 3 horizontal (H)
- Final top of waste to be filled to:
  - Design levels and grades provided in the Landfill Filling Plan (Golder, 2019) (1V:5H around the perimeter of the cell and 1V:20H in the centre).
  - Waste must be placed below the top of the perimeter bunds so leachate cannot discharge through the sides of the cap. When placing waste against the perimeter bund, the top of waste must be at least 1 m below the top of the perimeter bund (Figure 4).
- Maintain fill guide pegs visible from filling location to assist the operator with achieving the design waste slopes (1V:5H or 1V:20H) in accordance with the Landfill Filling Plan.

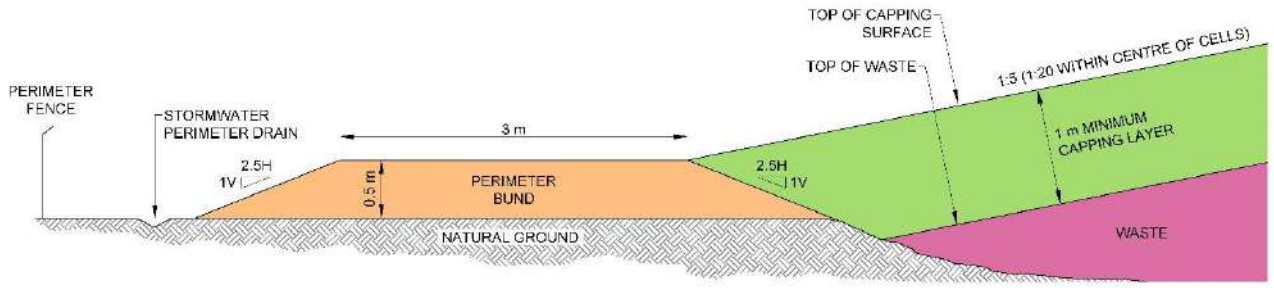


Figure 4: Final Waste Placement

2.6 Waste Compaction

- Waste compaction shall be undertaken to optimise landfill space, improve the stability of the waste mass in the landfill, control litter and vermin, reduce risk of fires, and reduce post-closure settlement and cap maintenance.
- Compact entire length of each waste lift with at least five passes of the waste compaction equipment weighing 20 tonnes or greater.
- As required in Section 2.5, compact layers of no more than 0.5 m in thickness.
- Crush bulky waste prior to landfilling.

2.7 Covering Waste

Daily waste cover shall be provided to waste to mitigate environmental and health impacts including odours, litter, fires, spread of disease (through animals, birds, flies etc), limit water infiltration and leachate generation. Requirements are as follows:

- Putrescible waste – cover by the end of the day.
- Waste easily windblown – cover as soon as practical on the day of disposed.
- Other waste – cover within the week.
- Place a minimum 150 mm of cover over the waste and ensure no waste left exposed
- Prior to filling the next layer of waste above the cover material, the cover is to be ripped or stripped back to ensure leachate is able to migrate vertically through the waste to the base of the landfill and leachate does not “pop out” the side of landfill (Figure 2).
- Cover material to be sandy or gravelly material and should not be clay or low permeable material. Material to contain minimal boulders sized material (i.e. rocks >100 mm).
- Alternative cover may be used subject to BHP approval.

2.8 Intermediate Cover

Intermediate cover shall be provided over waste surfaces as required for trafficability or that are exposed for more than 90 days to reduce the infiltration of water and divert runoff away from the waste. Requirements are as follows:

- Place and wheel compact a minimum of 500 mm cover material over following:
  - Trafficable areas

  - Surfaces that are exposed for more than 90 days, and
  - After reaching the final top of waste design surface.
- Intermediate cover material should be stable low permeable material with low risk of erosion. Material can contain more clay than the daily cover material.
- Grade cover at minimum of 2% and direct clean runoff away from the active face (if there is no contact with waste).
- If possible, direct clean uncontained runoff out of the cell and into the surrounding stormwater drains.
- Maintain intermediate cover.
- Where required, prior to filling the next layer of waste above the intermediate cover material, the cover is to be ripped or stripped back to ensure leachate is able to migrater vertically through the waste to the base of the landfill and leachate does not pop out the side of landfill.

2.9 Cover Material Stockpile Management

- Material excavated during cell construction works shall be stockpiled on site (by BHP) for use as cover material.
- Cover material to be sourced from material stockpile (provided by BHP) on the site.
- Stockpile sufficient material adjacent to the active face for at least two days cover.
- Select suitable material from the stockpile for daily and intermediate cover.
- Ensure that at least six months' cover material is stockpiled on site and advise BHP prior to depleting the stockpile reserves.

2.10 Litter Control

- Litter control shall be implemented, and loose litter within and surrounding the site (at least 500 m around site perimeter); and along the access road shall be kept to a minimum.
- Loose windblown litter within the site, on the fence and surrounds shall be collected and placed in the landfill at the start and end of each operational day; and where possible during the day.
- Minimise the size of active face and ensure sufficient cover material is placed to reduce litter on the site.
- Prior to storms or high wind events, preventative measures shall be implemented; and the waste covered, and loose litter collected and landfilled.
- Site perimeter and active cell shall be fenced (>1.8 m fence) and maintained by BHP.
- Site operator to regularly inspect (at least weekly) fence and repair as required.
- Additional litter control measures (such as litter screens, more frequent covering of waste) shall be implemented if above litter control measure are insufficient to keep litter to a minimum.

2.11 Stormwater Management

- Any stormwater runoff that comes into contact with waste is considered contaminated stormwater and shall be contained within the cell and not disposed to the perimeter drainage system.
- Only uncontaminated stormwater (runoff that has not been in contact with waste) may drain to the perimeter drainage system.

- Within the cells, final capping or interim waste cover may be used to drain stormwater runoff away from exposed waste or the active face to the surround perimeter drainage system .
- Internal bunds shall be constructed within the cells to isolate and contain contaminated and uncontaminated stormwater. The bunds shall be high enough to ensure no overtopping of stored stormwater and if possible, and the floor graded away from the internal bunds wall.

2.12 Housekeeping

- Ensure drop-off areas are contained within dedicated areas, and generally tidy and free of loose litter.
- Ensure correct waste is placed within the different drop-off areas, and move waste incorrectly placed as soon as possible to reduce further uncontrolled waste disposal.

2.13 Fire Management

- Burning of waste is not permitted unless approved by the Department of Waste and Environmental Regulation (DWER).
- Landfill fires shall be put out immediately and any burning or smouldering waste shall be covered with at least 0.5m of fine material. Operator shall confirm the smothering fire was effectively put out and undertake further action, as required, to ensure the fire is put out.
- No landfill fire shall be left unattended until confirmation it has been put out.
- Contact emergency services if the fire cannot be put out by smothering.
- Advise BHP of any fires on the same day of occurrence.

2.14 Reporting

Following reports to be prepared and submitted to BHP:

- Monthly Operations Report including:
  - Weekly operations and maintenance report (summary of work undertaken, operator name and machinery, hour worked, maintenance undertaken or required, estimate of the volume of material used for cover).
  - Volume/tonnage estimate, and category of waste accepted to the site. Reported categories shall include:
    - Class I waste (including inert waste, construction and demolition waste, and bulk waste)
    - Class II waste (including municipal and commercial solid waste)
    - Greenwaste
    - Clean fill
    - Whitegoods
    - Rejected waste
- Volume/tonnage estimate, and category of waste removed from site (i.e. recycled or disposal to alternative waste facility).

- Incident Reports including:
  - Waste rejection report
  - Complaints
  - Fire
- Other reports as required by BHP.

3.0 GROUNDWATER MONITORING AND REPORTING

3.1 Responsibility

Groundwater monitoring and preparation of an annual operations report will be undertaken by BHP in accordance with this plan.

3.2 Groundwater Monitoring

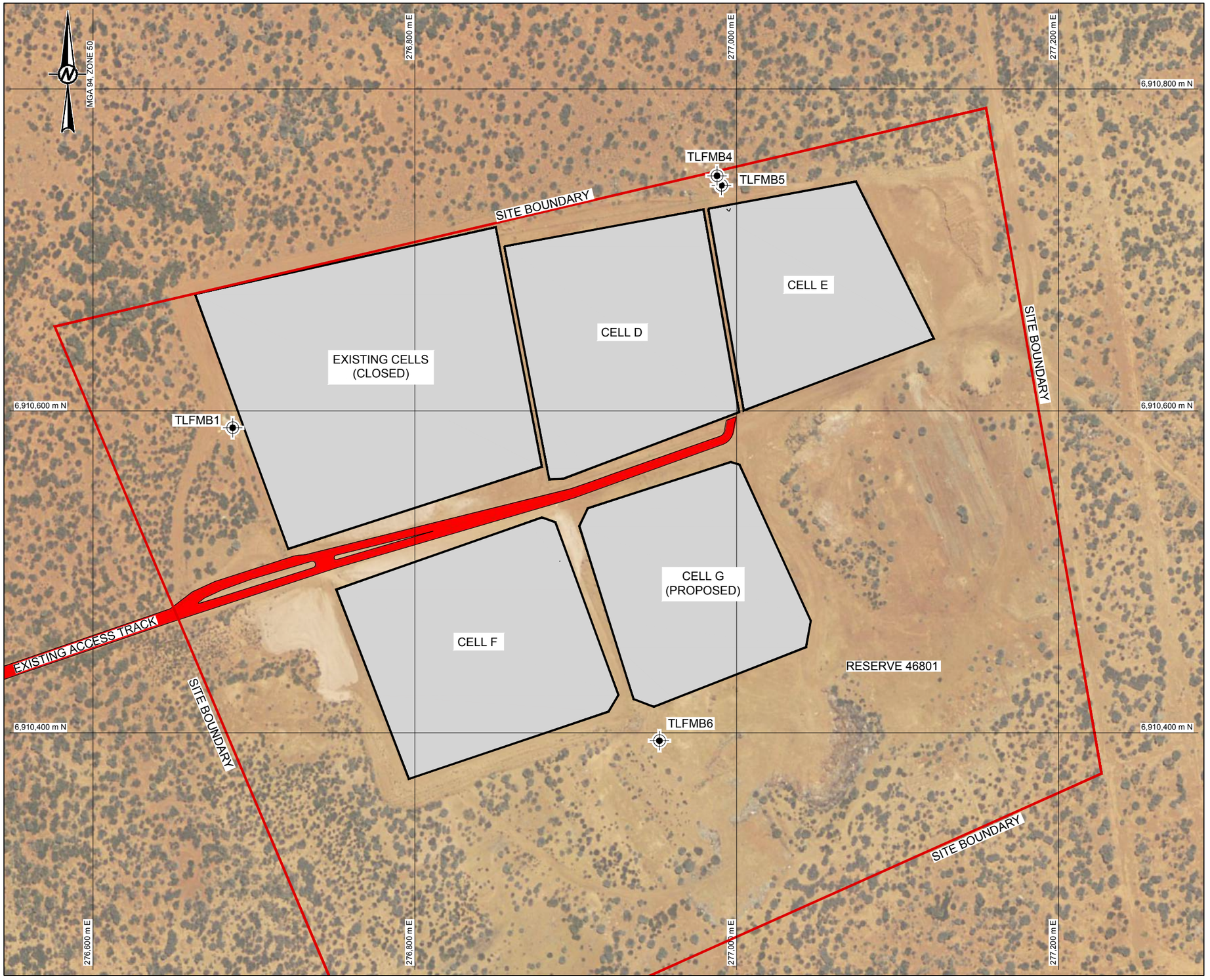
Groundwater sampling shall be undertaken in accordance with:

- Schedule B2: Site Characterisation of National Environmental Protection (Assessment of Site Contamination) Measure (NEPM) (NEPM, 2014) or BHP standards.

Sampling will be undertaken at the monitoring locations shown in Figure 5 and the location monitored in accordance with the requirements provided in Table 2.

Table 2: Leinster Domestic Landfill – Groundwater Monitoring Plan

Monitoring Locations	Parameter	Frequency
Three monitoring wells located south, east and north of landfill site as follows: ■ TLFMB1 ■ TLFMB5 ■ TLFMB6	■ pH ■ Electric conductivity ■ Standing Water Level ■ Chemical oxygen demand ■ Biological oxygen demand ■ Total Nitrogen ■ Ammonia ■ Nitrate – N ■ Total kjeldahl nitrogen ■ Reactive phosphorus ■ Total phosphorus ■ Chloride ■ Total recoverable hydrocarbons ■ Total chromium ■ Cadmium ■ Cobalt ■ Copper ■ Mercury ■ Molybdenum ■ Nickel ■ Lead ■ Zinc	Six-monthly during operations



LEGEND

- MONITORING WELL LOCATION
- SITE BOUNDARY
- LANDFILL CELL LOCATION

GENERAL NOTES:

1. ALL LEVELS ARE IN METRES TO AUSTRALIAN HEIGHT DATUM (m AHD).
2. ALL CO-ORDINATES ARE IN METRES TO MAP GRID AUSTRALIA (MGA 94, ZONE 51).
3. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
4. FEATURE SURVEY SUPPLIED BY BHP DATED 14/03/2019 CONDUCTED BY HORIZON SURVEYS.
5. LIDAR SURVEY SUPPLIED BY BHP DATED 13/03/2019 (USED WHERE FEATURE SURVEY DATA NOT AVAILABLE) CONDUCTED BY HORIZON SURVEYS.
6. AERIAL IMAGERY BASED ON INFORMATION PROVIDED BY AND WITH THE PERMISSION OF THE WESTERN AUSTRALIAN LAND INFORMATION AUTHORITY TRADING AS LANDGATE (2019). AERIAL IMAGERY DATED 2010.

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1:2,500 METRES

CLIENT
BHP NICKEL WEST

PROJECT
LEINSTER DOMESTIC LANDFILL

CONSULTANT
GOLDER

YYYY-MM-DD	2018-04-27
DESIGNED	LDP
PREPARED	LGQ
REVIEWED	LDP
APPROVED	ATG

TITLE
LANDFILL OPERATION PLAN

PROJECT NO.	DOC.	REV.	FIGURE
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3.3 Reporting

Following reports to be prepared by BHP:

- Groundwater monitoring report.
- Annual Operations Report that summarises and is prepared based on the operator's Monthly Operations Report. Report to include:
  - Summary of infrastructure and cells developed during the year.
  - Operations and maintenance undertaken during the year.
  - Annual volumetric survey of airspace consumed
  - Material balance (annual usage and estimate required for following year)
  - Volume/tonnage estimate for following categories of waste accepted to the site. Reported categories shall include:
    - Class I waste (including inert waste, construction and demolition waste, and bulk waste)
    - Class II waste (including municipal and commercial solid waste)
    - Greenwaste
    - Clean fill
    - Whitegoods
    - Rejected waste
  - Volume/tonnage estimate of waste removed from site
  - Summary of incidents.

4.0 ROLES AND RESPONSIBILITIES

The project roles and responsibilities are summarised in Table 3.

Table 3: Roles and Responsibilities during Construction

Proponent	Roles and Responsibilities
BHP	■ Responsible for development and maintaining site infrastructure ■ Development of landfill cells ■ Overall management of site operations ■ Supply of cover material to stockpile/s ■ Groundwater monitoring ■ Sale and removal of waste stockpiles ■ Managing the mulching greenwaste ■ Preparation of annual operating report ■ Preparation of groundwater monitoring report
Landfill Operator	■ Implementation of landfill operation in accordance with the Landfill Operations Plan including: ▪ Waste acceptance, placement and compaction ▪ Covering waste ▪ Litter control ▪ Fire management ▪ Stockpile management ▪ Stormwater management ■ Compliance with regulatory requirements ■ Regular liaison with BHP regarding operations and anticipated issues ■ Preparation of monthly and incident reports

5.0 REFERENCES

BHP, 2018. Leinster Mine Closure Plan. 2018. BHP Nickel West.

DWER, 1996. Landfill Waste Classification and Waste Definitions 1996 (As amended 2018). Department of Water and Environmental Regulation.

Golder, 2019a. Leinster Domestic Landfill – Landfill Operations Plan. Golder, Report 1789044-018-R-Rev0, 2019. Golder

Golder, 2019b. Leinster Domestic Landfill – Landfill Filling Plan. Golder, Report 1789044-017-R-Rev0, 2019. Golder

Signature Page

Golder Associates Pty Ltd

[redacted]

Lia Barnett
Principal Civil Engineer

LB/SNH/hn

A.B.N. 64 006 107 857

https://golderassociates.sharepoint.com/sites/26560g/documents/06 deliverables/018-r-landfill operations plan/1789044-018-r-rev0.docx

APPENDIX A

Waste Rejection Report

Location	LEINSTER DOMESTIC LANDFILL

Customer Details			
Name:		Tel:	
Company:		Email:	
Delivery/Load Details			
Waste Description:			
Time of arrival:		Quantity:	
Reason for Rejection:			

This delivery has been rejected for the above reasons by:

Name:	Title:
Signature:	Date:

golder.com

Appendix B – Landfill Post Closure and Rehabilitation Plan

REPORT

Landfill Post Closure and Rehabilitation Plan

Leinster Domestic Landfill

Submitted to:

BHP Nickel West Pty Ltd

PO Box 22
LEINSTER WA 6437

Submitted by:

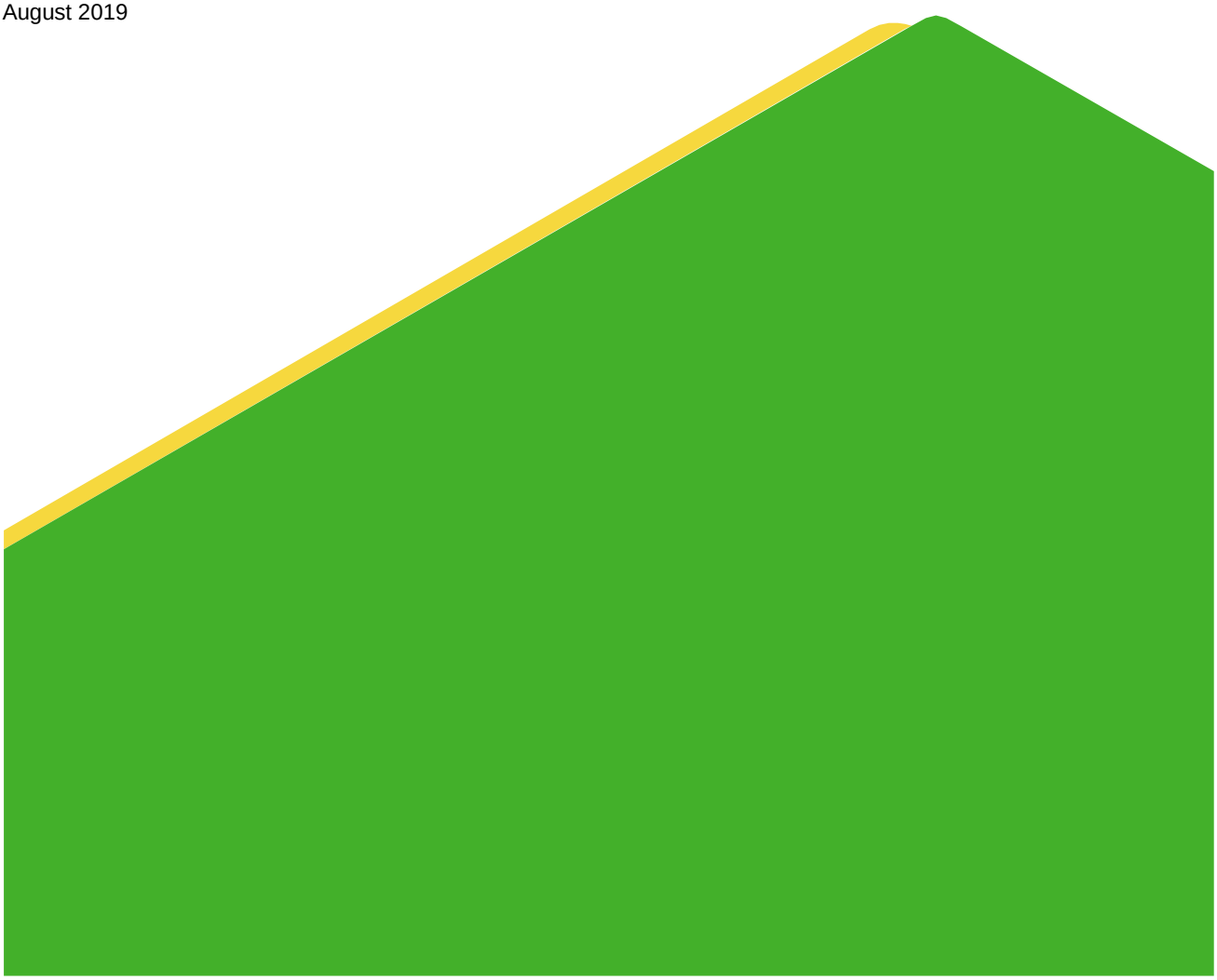
Golder Associates Pty Ltd

Level 3, 1 Havelock Street, West Perth, Western Australia 6005, Australia

+61 8 9213 7600

1789044-012-R-Rev0

August 2019



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FIGURES*

1.0 INTRODUCTION

BHP Nickel West Pty Ltd (BHP) currently owns and operates Leinster Landfill Site (the site) located on Crown Reserve 46801, approximately 3.5 km east of the town of Leinster, Western Australia within the Shire of Leonora as shown in Figure 1.

Leinster Landfill is a registered site (Registration Number 1625 dated May 2004) under the *Environmental Protection Act 1987* and classified as a Category 89: Putrescible landfill site.

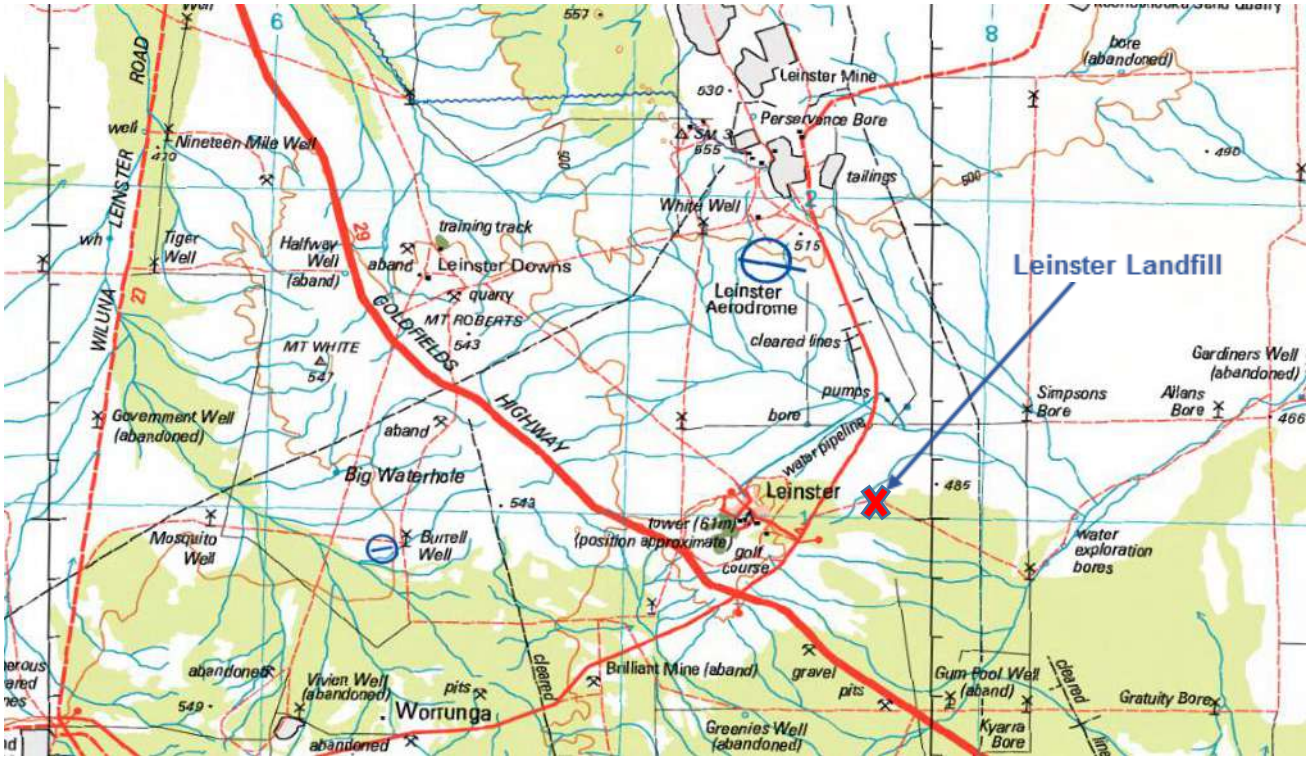


Figure 1: Location of Leinster Landfill (modified from Geoscience Australia, 2008)

1.1 Purpose

The purpose of this Landfill Post Closure and Rehabilitation Plan ('Closure Plan') is to define the objectives and commitments of BHP in relation to the closure of Leinster Landfill in accordance with:

- Regulatory requirements for the site as presented in Section 2.0, specifically regulations detailed in the *Environmental Projection (Rural Landfill) Regulations 2002*
- BHP's Leinster Mine Closure Plan 2018 (NLN MCP) (BHP Nickel West, 2018).

BHP are the current Site Owners and committed to the closure and rehabilitation of the Leinster Domestic Landfill Site.

1.2 Scope

The scope of this closure plan covers (but is not limited to) the following key items:

- Closure obligations and commitments
- Closure objectives and future land use
- Final landform profile

- Landform closure implementation
- Post-closure monitoring and maintenance requirements.

This closure plan is for Cells A-G as shown on Figure 2.

1.3 Overview of Site and Operations

The Leinster Landfill has been operating since the 1970s and accepts approximately 2,500 tonnes per year of the following Class II waste:

- Kerbside collected municipal solid waste from Leinster Town
- Waste dropped off by members of the public and commercial operators

The site is accessed via an unsealed road that branches off the Leinster Nickel Operations mine access road, approximately 850 m north of the intersection with Agnew Road.

The site operations in accordance with the following operation plan:

- Leinster Domestic Landfill – Landfill Operations Plan (Golder, 2019a)

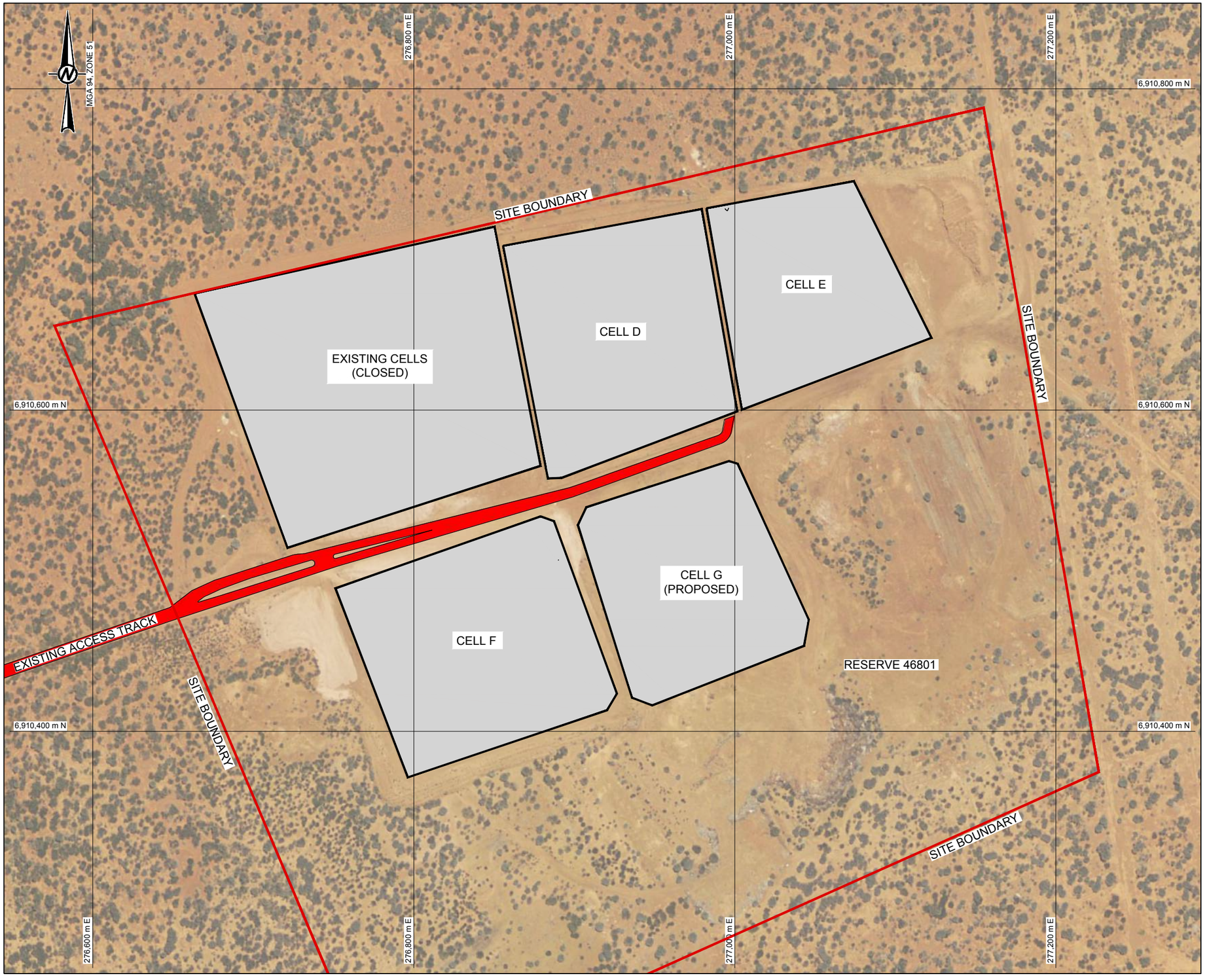
The site previously operated in accordance with the following operation plans:

- Leinster Nickel Operation – Leinster Domestic Landfill – Landfill Management Plan (SMEC, 2006a)
- Leinster Nickel Operation – Leinster Domestic Landfill – Scope of Works (SMEC, 2006b)

The landfill operations do not require a licence under the regulatory requirements and operates in accordance with the *Environmental Protection (Rural Landfill) Regulations 2002.*

As shown in Figure 2, four cells (Cells A-C, D, E, and F) have been developed at Leinster Landfill with Cell G proposed for future development. Cells A-C, D, and E are located north of the access road while Cell F and G are located on the southern side.

Historically the cells have been filled to ground level and covered with soil. Above ground filling of waste to the final landform design levels is planned in the future. Cell F is currently being filled to ground level. BHP propose to construct perimeter bunds and progressively fill Cells D, E, F, and G to the final landform design levels.



LEGEND

- SITE BOUNDARY
- LANDFILL CELL LOCATION

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1:2,500 METRES

CLIENT
BHP NICKEL WEST

CONSULTANT
GOLDER

YYYY-MM-DD	2019-08-01
DESIGNED	LB
PREPARED	JRP
REVIEWED	LB
APPROVED	LB

PROJECT
LEINSTER LANDFILL POST CLOSURE AND REHABILITATION PLAN

TITLE
LEINSTER LANDFILL LAYOUT PLAN

PROJECT NO.	DOC.	REV.	FIGURE
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2.0 REGULATORY CLOSURE OBLIGATIONS AND COMMITMENTS

The West Australian environment is protected by a range of legislation that includes Acts and subordinate legislation (regulations and policies). Legislation relevant to rural landfill activities in WA include:

- *Works Approval 3486 – Leinster Township Landfill issued by the Department of Environmental Protection in 2001*
- *Environmental Protection Act 1986* Part V licence: Category 89: Putrescible Landfill Sites (Registration Number 1625).
- *Environmental Protection (Rural Landfill) Regulations 2002*
- *Environmental Protection Regulations 2004 (WA)*
- *Environmental Protection (Controlled Waste) Regulations 2004*
- *Contaminated Sites Act 2003.*
- *Occupational Safety and Health Act, 1984 (WA)*
- *Occupational Safety and Health Regulations, 1996 (WA)*
- *Environmental Protection (Unauthorised Discharges) Regulations 2004 (WA)*
- *Rights in Water and Irrigation Act 1914 (WA) (RIWI Act).*

The site owner shall ensure that all relevant, environmental legal obligations are met post closure of the site. Table 1 provides a list of Acts, regulations, codes of practice, and approvals relevant to the closure of the site. It is the responsibility of the site owner to ensure they are familiar with the requirements of the legislation, codes of practice and approvals relevant to this closure plan and keep up to date with legislative requirements.

Table 1: Relevant Regulatory Obligations

Legislation/ Guideline	Clause #	Clause
Works Approval 3486	*A1*	*The Works Approval Holder shall supress dust from construction areas and transport activities, to ensure that no visible dust crosses the boundary of the premises.*
	W1(a)	*The Works Approval Holder shall maintain an undisturbed separation distance at least three metres between the base of the waste disposal cell and the highest level of groundwater.*
	W1(b)	*The Works Approval Holder shall maintain a minimum distance of at least 100 metres between the waste disposal site and any superficial water body.*
	W3	*The Works Approval holder shall install one monitoring bore down hydraulic gradient of the landfill site and one monitoring bore up hydraulic gradient of the landfill site, designated (MB1, MB2) at a location described in the documentation to support the application to construct the works.*
	W4(a)	*The Works Approval holder shall, prior to the submission of the compliance document as required by Condition G3, take and have analysed representative groundwater samples from the following monitoring sites:* *Bores MB1, MB2: pH, conductivity, total dissolved solids nitrate-nitrogen, ammonia-nitrogen, total nitrogen, total phosphorus and standing water level.*

Legislation/ Guideline	Clause #	Clause
Environmental Protection (Rural Landfill) Regulations 2002	*17.1*	*The occupier of the landfill site must prepare and submit to the Chief Executive Officer for approval a post-closure rehabilitation plan, in accordance with subregulation (2), for the site within 18 months of the site being registered under regulation 5B of the Environmental Protection Regulations 1987.*
	17.2	*A post-closure rehabilitation plan is to set out a plan for the rehabilitation of the site after it has ceased to be a landfill site and is to specify:* *a) Options for the use of the site after it has ceased to be a landfill site, and is to specify the preferred option.* *b) A conceptual design of the infrastructure needed for the preferred option for the use of the site after it has ceased to be a landfill site* *c) The estimated final contours of the site, after allowing for settlement, and specifying to what extent settlement has been allowed for* *d) The capping materials proposed to be used on the site* *e) A proposed system of drainage for the site* *f) Measures proposed for the protection of the environment and the monitoring of the site* *g) The estimated period for which the site will require protection and monitoring.*

2.1 Guidelines

Other guidelines that have been considered during the development of this closure plan include the *Guidelines for Preparing Mine Closure Plans* (DMP/EPA 2015) and this landfill closure plan has been prepared in broad consideration of these guidelines. It should be noted that these guidelines provide general guidance regarding processes and approaches, rather than defining specific criteria and parameters for application within the closure design.

3.0 FUTURE LAND USE

The proposed future land use for the site post-closure is in alignment with the NLN MCP. This landfill is grouped with the Domain: Town and Airport Infrastructure (NLN MCP) and the proposed land use for this Domain is self-sustaining native vegetation (to support local biodiversity and improve post-mining aesthetics).

4.0 CLOSURE OBJECTIVES

The overarching objective for the Closure Plan is to deliver safe, stable and non-polluting outcomes and agreed post-mining land use/s that comply with legal and other obligations and achieve mining tenement relinquishment and a walk-away solution for BHP.

Closure objectives shall be in accordance with legislative requirements (reference Section 2.0) and the objectives (extract shown below) provided in the Table 5.4: Closure Objectives of the NLN MCP.

*"**Safe***

- *Materials harmful to human health will be encapsulated or remediated*
- *Final landforms and land use/s will not pose unacceptable risks to people or fauna*
- *Infrastructure will be removed unless agreed to by regulators and post-relinquishment land owners/managers.*

Stable

- *Final landforms will be geotechnically stable*
- *Erosion stability will be achieved by controlling surface run-off and low stability materials*

Non-Polluting

- *Seepage will not harm sensitive groundwater receptors*
- *Surface water run-off will not harm the surrounding environment*
- *Materials harmful to the environment will be encapsulated or remediated*

Agreed Land Use

- *The post-mining land use/s will be agreed with key stakeholders*
- *The final landforms will not adversely impact surrounding pastoral land use*
- *Revegetated areas will support self-sustaining vegetation dominated by native species*
- *Revegetation of rehabilitation areas and other initiatives will seek to maintain local diversity."*

5.0 LANDFORM CLOSURE IMPLEMENTATION

5.1 Staged Closure

Each landfill cell or parts of the cell will be progressively closed and an interim cap placed as soon as practical after the waste reaches the final top of waste height as defined by the final landform. BHP will progressively fill the cells in accordance with the fill plan (Golder, 2019b) that has been prepared to enable BHP to progressively fill to the planned top of waste profile within each cell. In summary progressive closure activities proposed include:

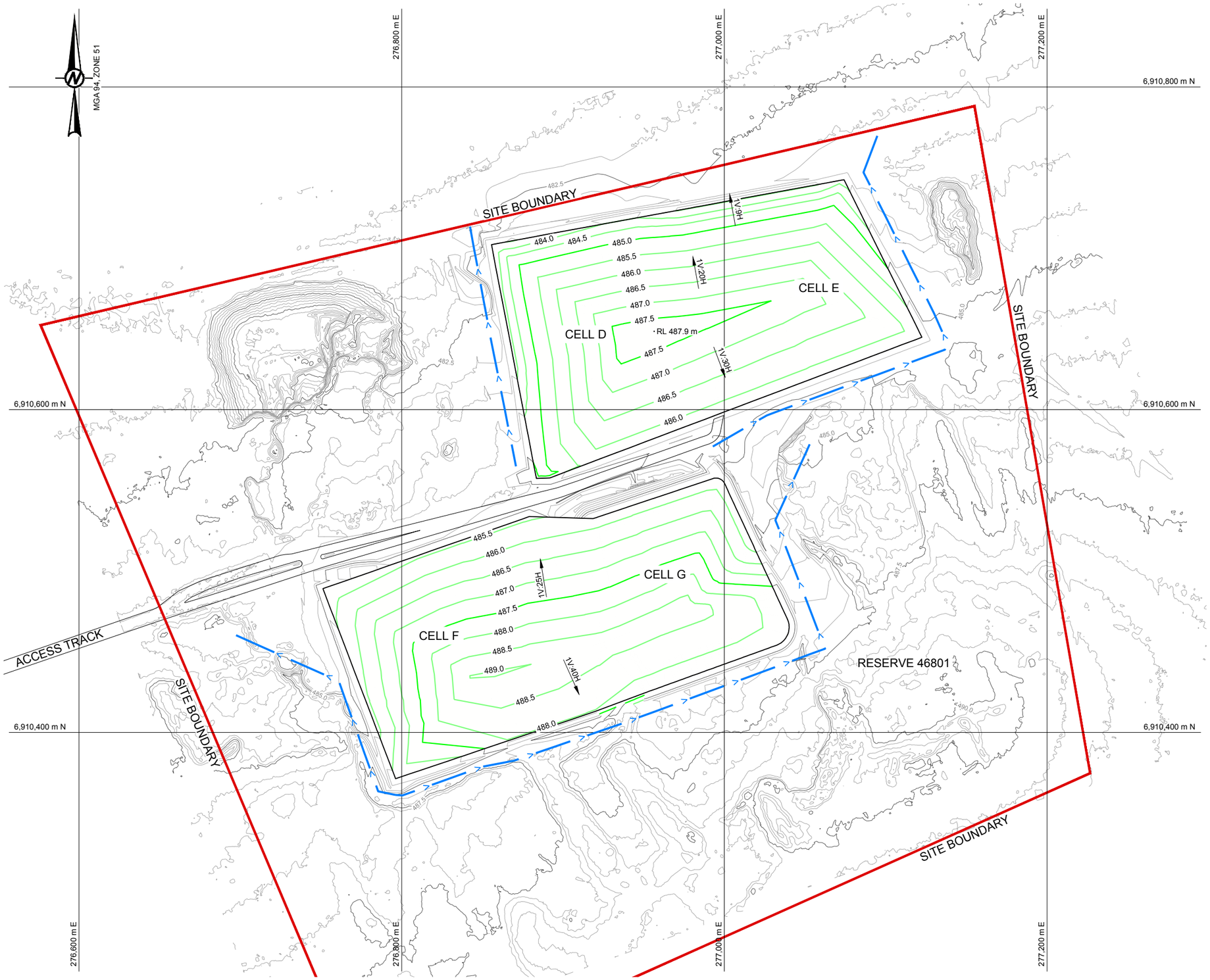
- Placement and compaction of waste in accordance with the fill plan.
- Provision of a minimum of 500 mm interim cover as soon as practical after the final top of waste height has been achieved (see Section 5.2) or over areas of waste that will not be filled for more than three months. The interim cap is intended to reduce leachate generation by excluding rainwater from the waste and grading to facilitate runoff of uncontaminated water to the surrounding stormwater drains.
- Construct final cap after waste settlement has minimised and not more than 10 years after final waste placement (see Section 5.2).

5.2 Final Landform Profile

For all areas disturbed by landfill activities, the objective of the final landform will be to restore the landform to enable reuse in accordance with the proposed future land use (see Section 3.0).

The final landform is shown in Figure 3. The final landform will be above the natural ground level and is designed to complement the existing surrounding topography. Post-settlement the landfill height is estimated to be less than 2.5 m above surrounding ground level.

As required under the fill plan, waste is to be placed above ground at a grade of 1V in 5H (from the perimeter bund) and 1V in 20H (within the centre of cells). The top of waste will be approximately 1.0 m below the final landform levels shown on Figure 3.



LEGEND

- 500 — EXISTING TOPOGRAPHICAL CONTOUR AND ELEVATION (mAHD)
- 500 — DESIGN TOPOGRAPHICAL CONTOUR AND ELEVATION (mAHD)
- STORMWATER DIVERSION DRAIN
- SITE BOUNDARY

GENERAL NOTES:

1. ALL LEVELS ARE IN METRES TO AUSTRALIAN HEIGHT DATUM (m AHD).
2. ALL CO-ORDINATES ARE IN METRES TO MAP GRID AUSTRALIA (MGA 94, ZONE 51).
3. ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
4. FEATURE SURVEY SUPPLIED BY BHP DATED 14/03/2019 CONDUCTED BY HORIZON SURVEYS.
5. LIDAR SURVEY SUPPLIED BY BHP DATED 13/03/2019 (USED WHERE FEATURE SURVEY DATA NOT AVAILABLE) CONDUCTED BY HORIZON SURVEYS.

CLIENT
BHP NICKEL WEST

CONSULTANT
GOLDER

YYYY-MM-DD	2019-08-01
DESIGNED	LB
PREPARED	JRP
REVIEWED	LB
APPROVED	LB

PROJECT
LEINSTER LANDFILL POST CLOSURE AND REHABILITATION PLAN

TITLE
INDICATIVE FINAL LANDFORM

PROJECT NO.	DOC.	REV.	FIGURE
1789044	012 R	0	3

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

0 25 mm

5.3 Closure Design

5.3.1 Capping System

The final capping system for Cells D to G will comprise at least a 1 m thick layer of engineered low permeability material (sourced locally) that will be placed over the interim cover after settle has minimised.

The capping for Cells A – C (location of current capping material stockpile) will be filled with other material (not waste) to achieve a positive capping gradient over the cell.

A typical cross section of the capping system is illustrated in Figure 4.

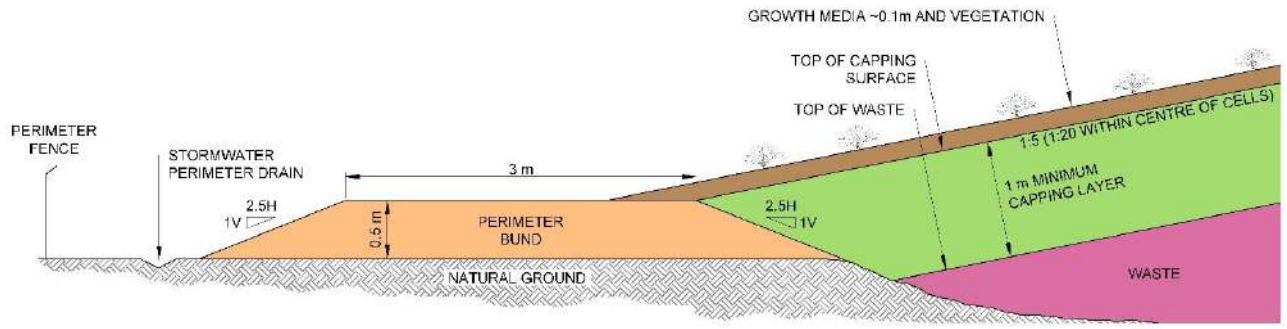


Figure 4: Typical Capping System Cross-section

The design intent of the proposed capping system is as follows :

- Limit the ingress of moisture through the placement of 1 m thick low permeability material.
- Provide a barrier between the waste and environment.
- Provide a base for the application of growth medium and establishment of native vegetation.
- Erosion control through limiting slopes of cap to 1 in 5 and revegetation.
- Facilitate surface water runoff and divert uncontaminated water to perimeter drains.
- Accommodate waste settlement so that the final landform (post settlement) will achieve a positive capping gradient.
- Allow for the passive landfill gas dispersion.

5.3.2 Drainage

A perimeter drain shall be provided around the toe of the landfill perimeter bund (see Figure 4) to direct overland stormwater flow and run-off from the capping away from the landfill cells. The open stormwater drains will be constructed to convey runoff resulting from the 5% AEP critical duration event with a minimum 300 mm freeboard and contain the 1% AEP critical duration event runoff with no freeboard. Open drains shall be designed with a minimum side slope of 1(V):1.5(H) at a longitudinal grade of 1V in 100H to reduce the risk of erosion and scouring.

5.3.3 Bunding

Each cell will be delineated by a minimum 0.5 m high, 3 m wide engineered bund wall. The intent of the bund is to exclude stormwater run-off from overland flows across the waste and reduce erosion around the toe of the capping system.

5.3.4 Revegetation

The capping system will be revegetated in accordance with Leinster Mine Closure Plan (BHP Nickel West, 2018). As such this will include:

- Native vegetation species will be selected that:
  - Are suitable for landfill capping
  - Are shallow rooted native species to minimise the risk of root penetration through the capping system
  - Can support erosion control of the cap
  - Can survive in local conditions, with nil to minimal maintenance or other intervention.
- Application of approximately 0.1 m thick of growth medium. Growth medium will comprise locally sourced topsoil and/or caprock
- Rip and sow ground using a 7 kg/ha native seed mix.

5.3.5 Fencing

A fence will remain around the perimeter of landfill facility during the closure monitoring and maintenance period until settlement of the landfill is stabilised. The fence is intended as a safety barrier (to prevent accidental or unauthorised access to the landfill) as well as to prevent wildlife entering the landfill and disturbing rehabilitation.

The fence will be removed when it can be demonstrated that the vegetation can support the proposed end land use.

5.3.6 Access Track

The access track to the landfill cells will remain *in situ* for monitoring and maintenance purposes. Prior to relinquishment of the site, the access track will be reshaped to remove windrows, ripped and seeded with native vegetation species.

5.4 Environmental Management

5.4.1 Landfill Gas Management

The generation of landfill gas is not expected to be a significant issue given the relative isolation of this facility, age and low volume of waste as well as the absence of underground services. The soil capping material will facilitate passive gas dispersion through the cap. Monitoring and management of landfill gas is therefore not proposed.

5.4.2 Leachate Management

Leachate generation will be reduced through progressively capping waste as soon as possible after the final top of waste is achieved (see Section 5.1). The risks of leachate generation and consequent impact is therefore considered to be low. Management techniques to minimise leachate generation includes:

- Reduce the volume of leachate generation through diverting uncontaminated surface water runoff to the perimeter drain and away from the waste through progressively constructing interim capping and final capping.
- The final landform contours and the proposed capping system are intended to minimise rainfall infiltration into the waste as the design allows for to drain off the cap and into the perimeter drains.

- Minimise the size of the active working face.
- Construct temporary stormwater control bunds within the cells to isolate contaminated stormwater from uncontaminated stormwater.

5.4.3 Surface Water Management

No permanent natural water bodies are present within the Leinster landfill site. A small ephemeral creek is present to the north-west of the landfill, approximately 300 m north-west of the landfill footprint.

Surface water management post-closure will consist of a perimeter diversion drain. The perimeter drain will intercept surface water and discharge it onto the ground surface away from the landfill. As described in Section 5.3, the final landform contours and proposed capping system is designed to direct runoff off the landfill and reduce ponding to minimise the infiltration of moisture.

5.4.4 Groundwater Management

The 11-Mile Borefield is located between approximately 2 and 5 km north/north-west of the Site and is considered to be the main potential receptor for impacts to groundwater quality from the landfill. The borefield provides potable water to the town of Leinster. The borefield is considered to be either up or cross gradient of the groundwater flow at the site and therefore not anticipated to be at risk.

The depth to groundwater ranges between approximately 11 and 13 m bgl which represents a reasonable degree of separation between the base of the landfill and the groundwater table. The site geology comprises alluvium (up to 5 m thick) underlain by saprolite clay (thickness ranging from 20 and 35 m) (Aquaterra, 2001).

As stated in Section 5.3.1 the landfill capping system will reduce the amount of rainfall infiltrating through underlying waste and hence reduce the likelihood of contaminated leachate entering the underlying groundwater system.

Groundwater monitoring will continue post-closure to monitor potential groundwater contamination as a result of the landfill (see Section 6.0).

5.4.5 Dust and Odour Management

Due to the relative isolation of the site, odour and dust are not expected to be issues of concern post-closure. The use of growth media and establishment of vegetation over time should act to minimise dust generation via wind erosion.

6.0 MONITORING

6.1 General Monitoring

Post-closure monitoring will be undertaken in accordance with the NLN MCP.

The anticipated duration of monitoring after the completion of closure execution activities is 10 years. This duration of monitoring is generally consistent with Section 4.13 of the 2015 Guidelines for Preparing Mine Closure Plans (DMP, 2015) and the NLN MCP. The actual timeframe will be dependent upon progressive monitoring results and upon how long it takes to demonstrate that closure objectives and completion criteria, as provided in the NLN MCP, have been met.

A schedule of proposed monitoring activities and performance measures is presented in Table 2.

Table 2: Monitoring Summary

Aspect	Description	Monitoring Years Post-Execution										Performance Measure
		1	2	3	4	5	6	7	8	9	10	
Safety	Annual inspections throughout the post-closure period will be undertaken of the landfill to confirm the condition of fencing, signage and bund integrity.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	No exposed material harmful to human health observed. No unacceptable safety risks from final landforms and land use/s are identified.
Groundwater	Monitoring bores positioned around the landfill facility will be monitored in accordance with groundwater monitoring plan provided in Section 6.2. Monitoring to be undertaken by a suitably qualified scientist or technician.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Local groundwater quality is within predicted quality ranges with no harm to sensitive receptors evident.
Rehabilitation	Monitoring of rehabilitated and analogue areas to assess plant cover, density and species richness against target criteria. Monitoring will also verify that established vegetation is self-sustaining (i.e. can survive independent of, or with minimal intervention). Field surveys/inspections and broad survey data will be utilised to undertake rehabilitation monitoring. Monitoring to be undertaken by a suitably qualified scientist or technician.	✓	✓	✓	✓	✓		✓		✓		Nil to minimal maintenance of revegetated areas is required beyond the establishment of perennial species. Perennial plant cover will achieve a level of performance generally consistent with the predominant analogue conditions. Perennial species richness will achieve a level of performance generally consistent with the predominant analogue conditions.
Weeds and Feral Animals	Monitoring of infestations of weeds and feral animals to inform maintenance activities.	✓	✓	✓	✓	✓		✓		✓		Weed cover will be less than perennial plant cover
Settlement of Cap	Capping will be monitored through topographic survey to measure top and slope of cap.	✓	✓	✓	✓	✓		✓		✓		Final landforms are constructed per design intent
Erosion of cap	Visual inspection of cap integrity and photographic monitoring by a suitably qualified landfill engineer or technician.	✓	✓	✓	✓	✓		✓		✓		Surface erosion is within predicted rates or the assimilative capacity of landforms.

6.2 Groundwater Monitoring

Regular groundwater monitoring will be undertaken for a range of parameters at monitoring bore locations surrounding the landfill. The purpose of the monitoring is to monitor local groundwater quality is within a predicted quality ranges and there is no adverse impact evident to (where applicable) any down-gradient sensitive receptors.

The monitoring regime will comprise field measurement, groundwater sampling and laboratory analysis at a NATA registered laboratory for a range of parameters that will be determined based a risk assessment of operational monitoring results.

7.0 MAINTENANCE

Post-closure maintenance will be undertaken in accordance with the NLN MCP.

Maintenance activities are associated with land management and will be responsive to monitoring data. The following land management tasks may be required post-closure:

- Installation or repair of signage installed to mitigate risks of public access to unsafe areas
- Repair or replacement of eroded capping system
- Grading and maintenance of access tracks
- Drainage maintenance
- Repairing of site fences
- Re-seeding of poorly vegetated areas
- Weed maintenance.

8.0 REVIEW

Review will be conducted to assess the effectiveness of the final landform design against closure objectives presented within this plan. As such this closure plan may be revised due to:

- Results and recommendations from the monitoring and maintenance programme
- Changes in legislation or environmental requirements
- Change in activities or operations associated with the site (e.g. further expansions)
- Deficiencies being identified.

This Closure Plan will not remain a standalone document and will be incorporated into future revisions of the NLN MCP.

9.0 REFERENCES

Aquaterra, 2001. Landfill Monitoring Bores – Bore Installation, Sampling and Hydraulic Testing.

BHP Nickel West, 2018. Leinster Mine Closure Plan.

DMP, 2015. Guidelines for Preparing Mine Closure Plans. Accessible: http://dmp.wa.gov.au/Documents/Environment/ENV-MEB-121.pdf

Golder, 2019a. Leinster Domestic Landfill – Landfill Operations Plan. Golder, Report 1789044-018-R-Rev0, 2019.

Golder, 2019b. Leinster Domestic Landfill – Landfill Filling Plan. Golder, Report 1789044-017-R-Rev0, 2019.

SMEC, 2006a. Leinster Nickel Operation – Leinster Domestic Landfill – Landfill Management Plan. SMEC, 2006.

SMEC, 2006b. Leinster Nickel Operation – Leinster Domestic Landfill – Scope of Works. SMEC, 2006.

Signature Page

Golder Associates Pty Ltd

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https://golderassociates.sharepoint.com/sites/26560g/documents/06 deliverables/012-r-landfill closure plan/1789044-012-r-rev0 landfill closure plan.docx

golder.com

Appendix C – Shire of Leonora Letter of Consent

From:	Parola, Lauren
Sent:	Wednesday, 16 October 2019 10:23 AM
To:	Jim Epis
Cc:	Cook, Stacey
Subject:	Request for Consent from Shire of Leonora to Undertake Works at the Leinster Landfill Site
Attachments:	DWER Application Form Rev A_Leinster Town Landfill.pdf; Leinster Town Landfill Works Approval Rev 015102019_3.pdf; Ltr to Shire of Leonora_Consent for Works Approval_Reserve 46801.pdf

Morning Jim,

Please find attached letter and supporting documentation with respect to planned expansion of the Leinster Landfill site which sits on Reserve 46801 under management order held by the Shire of Leonora.

We hereby seek the Shire's consent to undertake these works and apply for a Works Approval with DWER. A copy of the application is attached for your reference.

I'd be grateful if you can respond (email is fine) to this request. Please don't hesitate to contact me if you have any questions.

Thank you kindly,
Lauren

BHP

Lauren Parola

Superintendent Land and Tenure
Resource Development
Nickel West
Level 43 City Square, 125 St Georges Terrace Perth WA 6000
Mailto Lauren.parola@bhp.com
Internet http://www.bhpbilliton.com
Phone +61 (0) 8 6321 3979
Fax +61 (0) 8 6322 3979

[redacted]

Morning Lauren,

I acknowledge receipt of your email and official letter dated 16th October, 2019 regarding the above.
I am pleased to advise that the Shire of Leonora has no objection to BHP's proposal and as a consequence, Consent for Works Approval for the Leinster Landfill Site is hereby provided.

Regards,
Jim Epis
Chief Executive Officer

[redacted]

[redacted]

Morning Jim,

Please find attached letter and supporting documentation with respect to planned expansion of the Leinster Landfill site which sits on Reserve 46801 under management order held by the Shire of Leonora.

We hereby seek the Shire's consent to undertake these works and apply for a Works Approval with DWER. A copy of the application is attached for your reference.

I'd be grateful if you can respond (email is fine) to this request. Please don't hesitate to contact me if you have any questions.

Thank you kindly,
Lauren

BHP

Lauren Parola

Superintendent Land and Tenure
Resource Development
Nickel West
Level 43 City Square, 125 St Georges Terrace Perth WA 6000
[redacted]