Government of Western Australia
Department of Water and Environmental Regulation

Works Approval

Works approval number	W6814/2023/1
Works approval holder	City of Armadale
Registered business address	7 Orchard Avenue ARMADALE WA 6112
DWER file number	DER2023/000358
Duration	18/08/2023 to 17/08/2028
Date of issue	18/08/2023
Premises details	City of Armadale Landfill and Recycling Facility 145 - 147 Hopkinson Road HILBERT WA 6112 Legal description – Lot 600 on Deposited Plan 400460 Certificate of Title Volume 2828 Folio 800 As defined by the coordinates in Schedule 2

Prescribed premises category description (Schedule 1, ***Environmental Protection Regulations 1987***)	**Assessed design capacity**
Category 64: Class II or III putrescible landfill site	100,000 tonnes per annual period

This works approval is granted to the works approval holder, subject to the attached conditions, on 22/01/2024, by:

Marko Pasalich
Digitally signed by Marko Pasalich
Date: 2024.01.22 09:30:29 +08'00'

A/MANAGER WASTE INDUSTRIES
an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA)

Works approval history

Date	Reference number	Summary of changes
18/08/2023	W6814/2023/1	Works approval granted.
22/01/2024	W6814/2023/1	Works approval amended to include surface landfill gas monitoring when gas flare is disconnected and relocated during the period of the pond construction

Interpretation

In this works approval:

(a) the words 'including', 'includes' and 'include' in conditions mean "including but not limited to", and similar, as appropriate;

(b) where any word or phrase is given a defined meaning, any other part of speech or other grammatical form of that word or phrase has a corresponding meaning;

(c) where tables are used in a condition, each row in a table constitutes a separate condition;

(d) any reference to an Australian or other standard, guideline, or code of practice in this works approval:

  (i) if dated, refers to that particular version; and

  (ii) if not dated, refers to the latest version and therefore may be subject to change over time;

(e) unless specified otherwise, any reference to a section of an Act refers to that section of the EP Act; and

(f) unless specified otherwise, all definitions are in accordance with the EP Act.

NOTE: This works approval requires specific conditions to be met but does not provide any implied authorisation for other emissions, discharges, or activities not specified in this works approval.

Works approval conditions

The works approval holder must ensure that the following conditions are complied with:

Construction phase

Infrastructure and equipment

1. The works approval holder must:

(a) construct, install and/or decommission the infrastructure;

(b) in accordance with the corresponding requirements; and

(c) at the corresponding infrastructure location,

as set out in Table 1.

Table 1: Design and construction / installation requirements

Infrastructure		Requirements	Infrastructure location
1.	Stage 1 landfill capping	(a) Must be constructed according to the details in Figure 2, Figure 3, Figure 4 and Figure 5; (b) Must be installed according to the specifications set out in the *Capping and Other Works - Specifications*; (c) CQA activities must be undertaken according to the *Capping and Other Works - CQA Plan*; (d) The landfill cap must include the following components, installed in ascending order above the waste mass: (i) a minimum 500 mm thick final cover layer; (ii) a gas collection trench installed to at least 300 mm deep in the top of the final cover layer which contains gas extraction pipework and is backfilled with highly permeable material; (iii) a LLDPE synthetic liner that has a permeability of less than 2 x 10^{-10} m/s or equivalent; (iv) a geocomposite drainage net with a top and bottom geotextile, installed so as to provide sufficient drainage of infiltrating stormwater out of the capping layer; (v) a minimum 1.5 m thick protective layer of uncompacted soil growing medium; and (vi) surface vegetation comprised of sub-tropical cereal rye, native grass seeds and shallow rooted shrubs to provide erosion control and stabilisation of the soil capping layers.	As shown in Figure 2
2.	Stage 2 landfill capping		
3.	Stage 3 landfill capping		

Infrastructure		Requirements	Infrastructure location
4.	Stage 4 landfill capping	(e) The landfill capping layer must be installed at least 5 m beyond the extent of the waste mass so that infiltrating rainfall and runoff is conveyed beyond the waste mass; (f) All landfill gas infrastructure, leachate pipework or other protrusions through the LLDPE liner must be adequately sealed to prevent the movement of gas or moisture through the protrusion; (g) Any waste material that is exposed during installation must be immediately covered with a minimum of 500 mm of suitable soil cover; (h) Any works undertaken within 5 m of any landfill gas infrastructure must occur under the supervision of a landfill gas management specialist.	
5.	Leachate ponds 1 and 2	(a) Must be constructed according to the details in Figure 6, Figure 7 and Figure 8; (b) Must be lined with a minimum 2 mm thick single-sided textured HDPE liner that has a permeability of less than 2 x 10^{-10} m/s or equivalent; (c) Cushion geotextile must be installed below the HDPE liner and above the soil subgrade to provide protection; (d) Must be installed according to the specifications set out in the *Capping and Other Works - Specifications*; (e) CQA activities must be undertaken according to the *Capping and Other Works - CQA Plan*; (f) Each pond must provide a minimum storage capacity of 7,250 m^3; (g) Each pond must provide a minimum surface area of 3,625 m^2; (h) Pond embankments must be raised a minimum 1 m above surrounding ground level to prevent stormwater ingress; (i) Each pond must provide a minimum additional storage for a 1% annual exceedance probability 168-hour duration storm event and a design operational freeboard height of 0.5 m; and (j) Each pond must be provided with leachate surface sprays.	As shown in Figure 2 and Figure 6

Infrastructure		Requirements	Infrastructure location
6.	Leachate management pipework	(a) Leachate extraction pipework must be installed at the base of landfill stages 2, 3 and 4 according to the details in Figure 9.	As shown in Figure 9
7.	Landfill gas flare	(a) The existing landfill gas flare must be disconnected and relocated to its new permanent location as shown in Figure 10 by 21 February 2024. (b) Gas pressure under the landfill cap must be monitored by a landfill gas management specialist whilst the landfill gas flare is offline. (c) Any proposed venting of landfill gas must be reported to the CEO within24 hours prior to the event and be supported with the following information as a minimum: i. the reason for venting of landfill gas; ii. the duration of the proposed venting; iii. the type of monitoring that will be undertaken to ensure that the venting is conducted safely and not to cause offsite impacts. (d) Landfill gas monitoring must be undertaken in accordance with Condition 3, under the supervision of a landfill gas management specialist**.** (e) The permanent relocation of the landfill gas flare must occur to a location provided with sufficient footing and stabilisation; and (f) Any works undertaken within 5 m of any landfill gas infrastructure must occur under the supervision of a landfill gas management specialist.	As shown in Figure 10
8.	Vehicle washdown facility	(a) Must be constructed according to the details in Figure 11, Figure 12 and Figure 13; (b) Surfaces must be sufficiently bunded, graded and sealed to prevent seepage or runoff of washdown water from the facility; and (c) A wash-water drainage system must be installed that provides: (i) a screen for the separation of solid material; (ii) discharge of separated solids to an impervious container; (iii) discharge of liquid to an impervious sump fitted with a pump system and float switch; and (iv) pipework and associated connections to provide drainage from the sump to leachate ponds 1 and 2.	As shown in Figure 2 and Figure 11

Infrastructure		Requirements	Infrastructure location
9.	Vehicle washdown bay decommissioning	(a) Must be cleaned out and backfilled with engineered fill; (b) All removed contaminated solid material must be disposed of into the active landfill area or removed offsite; (c) Any odourous liquid material that is encountered must be removed via a vacuum truck and disposed off-site; and (d) Where odourous material is encountered, the size of the exposed excavation area and volume of material being removed at one time must be limited to reduced odour emissions.	As shown in Figure 2
10.	Stormwater drainage and management	(a) Any new infrastructure installed through the works subject to this works approval must provide stormwater drainage that generally conforms to the concept outlined in Figure 14.	As shown in Figure 2 and Figure 14
11.	Pipework, fittings, joints and pumps	(a) Any new pipework, fittings, joints and pumps installed through the works subject to this works approval must be: (i) constructed of impervious material that is free from leaks and/or defects; and (ii) tested and visually inspected to confirm they are free from leaks and defects prior to use.	N/A

2. The works approval holder must design, construct, and install or repair groundwater monitoring wells in accordance with the requirements specified in Table 2.

Table 2: Infrastructure requirements – groundwater monitoring wells

Infrastructure	Design, construction and installation requirements	Monitoring well locations	Timeframe
Groundwater monitoring wells SP4 and SP5; Groundwater monitoring well to replace damaged well SP1; and Repair or replacement of groundwater monitoring bores SP2-S and P1-S.	(a) Well design and construction: (i) Designed and constructed in accordance with ASTM D5092/D5092M-16; (ii) Each well must be nested and comprise a shallow and intermediate depth bore; (iii) The shallow bore must be sufficiently installed and screened[1] to allow representative groundwater samples to be taken from the seasonal perched feature when water is present during winter and spring; and (iv) The intermediate bore must be sufficiently installed and screened[1] to allow representative groundwater samples to be taken in a consistent manner with other intermediate bores at the premises;	As shown in Figure 15	Prior to July 2024

Infrastructure	Design, construction and installation requirements	Monitoring well locations	Timeframe
	(b) Logging of borehole: (i) Soil samples must be collected and logged during the installation of the monitoring wells; (ii) A record of the geology encountered during drilling must be described and classified in accordance with AS 1726; and (iii) Any observations of staining / odours or other indications of contamination must be included in the bore log; (c) Well construction log: (i) Well construction details must be documented within a well construction log to demonstrate compliance with ASTM D5092/D5092M-16; and (ii) The construction logs must include elevations of the top of casing position to be used as the reference point for water-level measurements, and the elevations of the ground surface protective installations; (d) Well development: (i) All installed monitoring wells must be developed after drilling to remove fine sand, silt, clay and any drilling mud residues from around the well screen to ensure the hydraulic functioning of the well; and (ii) A detailed record should be kept of well development activities and included in the well construction log; (e) Installation survey: (i) the vertical (top of casing) and horizontal position of each monitoring well must be surveyed and subsequently mapped by a suitably qualified surveyor; and (f) Well network map: (i) a well location map (using aerial image overlay) must be prepared and include the location of all monitoring wells in the monitoring network (including existing) and their respective identification numbers.		

Note 1: Refer to Section 8 of Schedule B2 of the ASC NEPM for guidance on well screen depth and length.

Landfill gas emissions

3. Within 7 calendar days of the gas flare being disconnected, the licence holder must undertake landfill gas surface monitoring in accordance with the requirements set out in Table 3 and Schedule 3.

4. Should surface landfill gas monitoring identify exceedances to the action levels specified in Schedule 3 then these must be reported to the CEO within 24 hours, along with a written action plan to address the matter.

Table 3 : Monitoring of Landfill Gas requirements

Monitoring point reference	Parameter	Units	Frequency	Monitoring Method
Landfill capping surface.	Hydrogen Sulphide (H_2S)	PPM	Every 7 days until gas flare has been reconnected and operational	Section 5 of the Environmental Protection Authority (EPA) Victoria February 2018 *Landfill gas fugitive emissions monitoring guideline*, Carlton, NSW
	Methane (CH_4)			

Compliance reporting

5. The works approval holder must within 30 calendar days of an item of infrastructure or equipment required by conditions 1 or 2 being constructed and/or installed:

(a) undertake an audit of their compliance with the requirements of conditions 1 and/or 2; and

(b) prepare and submit to the CEO an Environmental Compliance Report on that compliance.

6. The Environmental Compliance Report required by condition 5, must include as a minimum the following:

(a) certification by a suitably qualified civil engineer that the relevant item(s) of infrastructure or component(s) thereof, as specified in conditions 1 or 2, have been constructed and installed in accordance with the relevant requirements specified in conditions 1 or 2;

(b) as constructed plans and a detailed site plan for each item of infrastructure or component of infrastructure specified in condition 1;

(c) the well construction log and well network map specified in condition 2, where the report relates to any item(s) of infrastructure required by condition 2;

(d) photographic evidence of the installation of the infrastructure;

(e) evidence that pipework, fittings, joints and pumps have been tested and inspected to ensure the infrastructure is fit for purpose prior to use;

(f) a description of, and explanation for, any departure from the requirements specified in conditions 1 or 2; and

(g) be signed by a person authorised to represent the works approval holder and contains the printed name and position of that person.

7. Where the Environmental Compliance Report required by condition 5 relates to an item of infrastructure listed in Row 1, 2, 3, 4 or 5 of Table 1, the report must also include a CQA Validation Report from an independent third party that:

(a) is written and certified by a suitably qualified CQA engineer/consultant who has undertaken CQA activities for the relevant stage of landfill capping or leachate pond construction;

(b) details the CQA procedures and testing undertaken for the relevant works;

(c) confirms subgrade preparation and installation of geosynthetic or geotextile materials have met the relevant requirements specified in condition 1 and *Capping and Other Works - Specifications*;

(d) confirms the quality control and assurance measures specified in condition 1 and *Capping and Other Works - CQA Plan* have been completed and that satisfactory results have been demonstrated;

(e) includes evidence of quality assurance and conformance testing works;

(f) includes as constructed plans of geosynthetic or geotextile material for the relevant works that include roll numbers, panel layouts, seam locations and repair locations; and

(g) certifies that the relevant infrastructure is free of fault or defect, built to the design specification and fit for the intended purpose.

Time limited operations phase

Commencement and duration

8. The works approval holder may only commence time limited operations for an item of infrastructure identified in condition 1 and 10 where the Environmental Compliance Report as required by condition 5 and 6 has been submitted by the works approval holder for that item of infrastructure.

9. The works approval holder may conduct time limited operations for an item of infrastructure specified in condition 10:

(a) for a period not exceeding 180 calendar days from the day the works approval holder meets the requirements of condition 8 for that item of infrastructure; or

(b) until such time as a licence for that item of infrastructure is granted in accordance with Part V of the *Environmental Protection Act 1986*, if one is granted before the end of the period specified in condition 9(a).

Time limited operations requirements and emission limits

10. During time limited operations, the works approval holder must ensure that the premises infrastructure and equipment listed in Table 4 and located at the corresponding infrastructure location is maintained and operated in accordance with the corresponding operational requirement set out in Table 4.

Table 4: Infrastructure and equipment requirements during time limited operations

Infrastructure		Requirements	Infrastructure location
1.	Leachate ponds 1 and 2	(a) The integrity of the HDPE liner must be maintained at all times to achieve a permeability of less than 2 x 10^{-10} m/s; (b) An operational freeboard height equal to or greater than 500 mm must be maintained on all ponds; (c) Leachate volume within the ponds must be managed so that overtopping of ponds does not occur; and (d) Surface sprays must only be operated to enhance leachate evaporation during suitable weather and wind conditions.	As shown in Figure 2 and Figure 6
2.	Permanent landfill gas flare	(a) Must be operated according to the manufacturer's specifications.	As shown in Figure 10
3.	Vehicle washdown facility	(a) The integrity of all surfaces, containment infrastructure and pipelines must be maintained to prevent seepage or runoff of washdown water from the facility; (b) Solid material separated from wash-water must be stored in an impervious container prior to removal; and (c) The liquid sump pump and float switch must automatically actuate to convey liquids from the sump to leachate ponds 1 and 2, so that overtopping of the sump does not occur.	As shown in Figure 2 and Figure 11

11. During time limited operations, the works approval holder must ensure that the emissions specified in Table 5 are discharged only from the corresponding discharge point and only at the corresponding discharge point location.

Table 5: Authorised discharge points during time limited operations

Emission	Discharge point	Discharge point location
Landfill gas	Permanent landfill gas flare	As shown in Figure 10

Compliance reporting

12. The works approval holder must submit to the CEO a report on the time limited operations within 30 calendar days of the completion date of time limited operations or 30 calendar days before the expiration date of the works approval, whichever is the sooner.

13. The works approval holder must ensure the report required by condition 12 includes the following:

(a) a summary of the time limited operations, including timeframes;

(b) a summary of the environmental performance of all infrastructure as constructed or installed (as applicable), which includes records detailing the:

(i) the suitability of the leachate pond storage volume in consideration of leachate and rainfall generation during the period;

(c) a review of performance and compliance against the conditions of the works approval; and

(d) where the manufacturer's design specifications and the conditions of this works approval have not been met, what measures will the works approval holder take to meet them, and what timeframes will be required to implement those measures.

Records and reporting (general)

14. The works approval holder must record the following information in relation to complaints received by the works approval holder (whether received directly from a complainant or forwarded to them by the Department or another party) about any alleged emissions from the premises:

(a) the name and contact details of the complainant, (if provided);

(b) the time and date of the complaint;

(c) the complete details of the complaint and any other concerns or other issues raised; and

(d) the complete details and dates of any action taken by the works approval holder to investigate or respond to any complaint.

15. The works approval holder must maintain accurate and auditable books including the following records, information, reports, and data required by this works approval:

(a) the works and monitoring conducted in accordance with conditions 1, 2 and 3;

(b) any maintenance of infrastructure that is performed in the course of complying with condition 10; and

(c) complaints received under condition 14.

16. The books specified under condition 15 must:

(a) be legible;

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

(c) be retained by the works approval holder for the duration of the works approval; and

(d) be available to be produced to an inspector or the CEO as required.

Definitions

In this works approval, the terms in Table 6 have the meanings defined.

Table 6: Definitions

Term	Definition
AS 1726	means the Australian Standard *AS 1762 Geotechnical site investigations*.
ASC NEPM	means the *National Environment Protection (Assessment of Site Contamination) Measure 1999*.
ASTM D5092/D5092M-16	means the ASTM International Standard *Standard Practice for Design and Installation of Groundwater Monitoring Wells*.
books	has the same meaning given to that term under the EP Act.
Capping and Other Works - CQA Plan	means the document titled *Armadale Landfill and Recycling Facility: Landfill Capping and Other Works - Construction Quality Assurance Plan*, final revision dated 30 March 2023, prepared for the City of Armadale by IW Project Pty Ltd.
Capping and Other Works - Specifications	means the document titled *Armadale Landfill and Recycling Facility: Landfill Capping and Other Works – Specifications*, final revision dated 30 March 2023, prepared for the City of Armadale by IW Project Pty Ltd.
CEO	means Chief Executive Officer. CEO for the purposes of notification means: Director General Department administering the *Environmental Protection Act 1986* Locked Bag 10 Joondalup DC WA 6919 info@dwer.wa.gov.au
CQA	construction quality assurance
CQA Validation Report	means a report on the planned system of activities outlined in *Capping and Other Works - CQA Plan* and *Capping and Other Works - Specifications* that were undertaken to provide assurance that the components of the landfill capping and/or leachate pond were fabricated and installed in accordance with the requirements of the works approval and technical specifications.
Department	means the department established under section 35 of the *Public Sector Management Act 1994* and designated as responsible for the administration of Part V Division 3 of the EP Act.
discharge	has the same meaning given to that term under the EP Act.
emission	has the same meaning given to that term under the EP Act.
Environmental Compliance Report	means a report to satisfy the CEO that the conditioned infrastructure and/or equipment has been constructed and/or installed in accordance with the works approval.

Term	Definition
EP Act	*Environmental Protection Act 1986* (WA).
EP Regulations	Environmental Protection Regulations 1987 (WA).
HDPE	high-density polyethylene
LLDPE	linear low-density polyethylene
PPM	Parts Per Million
premises	the premises to which this works approval applies, as specified at the front of this works approval and as shown on the premises map (Figure 1) in Schedule 1 to this works approval.
prescribed premises	has the same meaning given to that term under the EP Act.
suitably qualified civil engineer	means a person who: (a) holds a Bachelor of Engineering recognised by Engineers Australia; and (b) has a minimum of five years of experience working in a supervisory area of civil or structural engineering; or (c) is otherwise approved in writing by the CEO to act in this capacity.
suitably qualified CQA engineer/consultant	means a person who: (a) holds a Bachelor of Engineering recognised by Engineers Australia; (b) has a minimum of five years of experience working in a supervisory area of construction quality assurance; and (c) is employed by an independent third-party external to the works approval holder's business and liner installation contractor; or (d) is otherwise approved in writing by the CEO to act in this capacity.
time limited operations	refers to the operation of the infrastructure and equipment identified under this works approval that is authorised for that purpose, subject to the relevant conditions.
waste	has the same meaning given to that term under the EP Act.
works approval	refers to this document, which evidences the grant of the works approval by the CEO under section 54 of the EP Act, subject to the conditions.
works approval holder	refers to the occupier of the premises being the person to whom this works approval has been granted, as specified at the front of this works approval.

END OF CONDITIONS

Schedule 1: Maps

Premises map

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

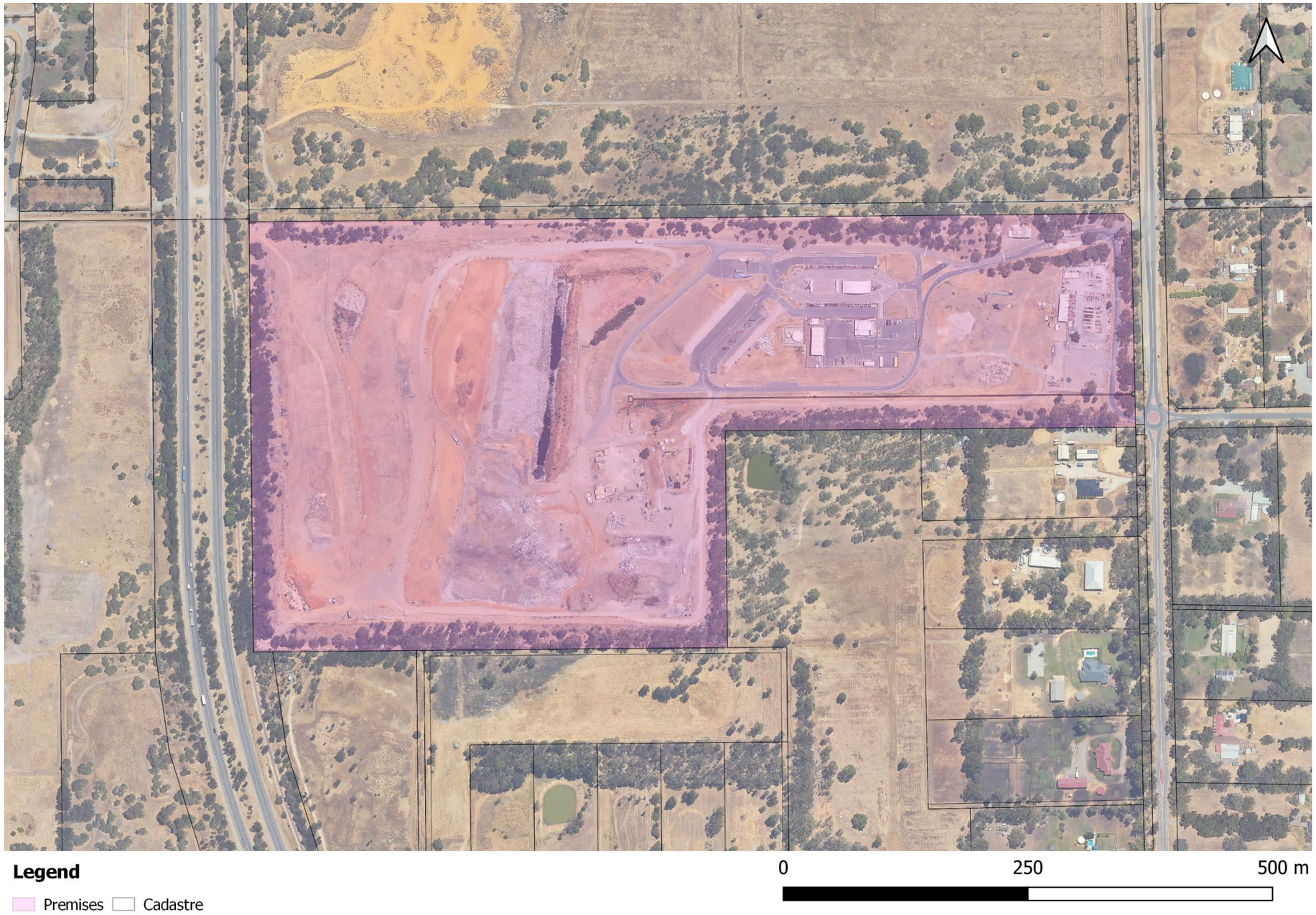


Figure 1: Map of the boundary of the prescribed premises

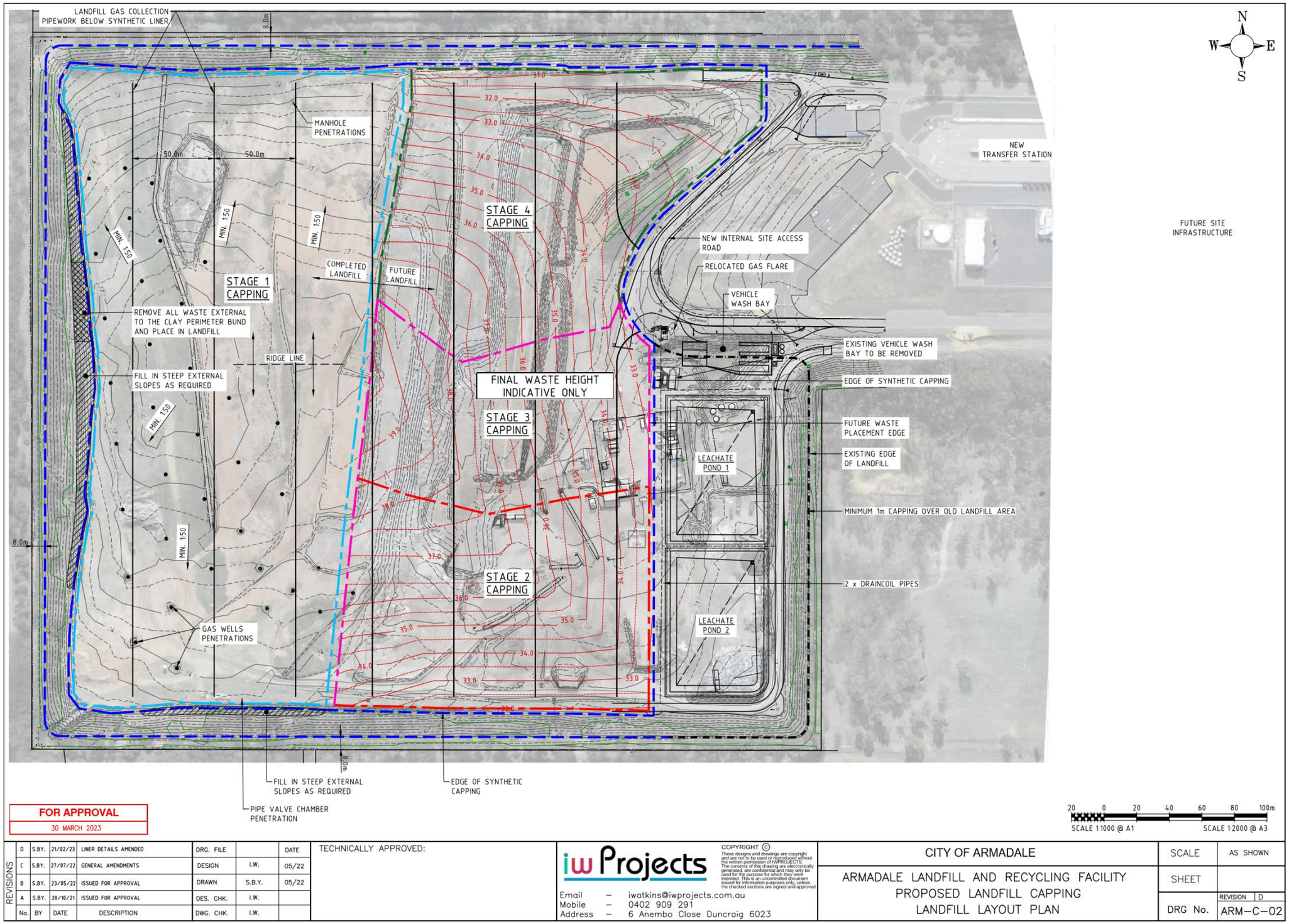


Figure 2: Works layout plan

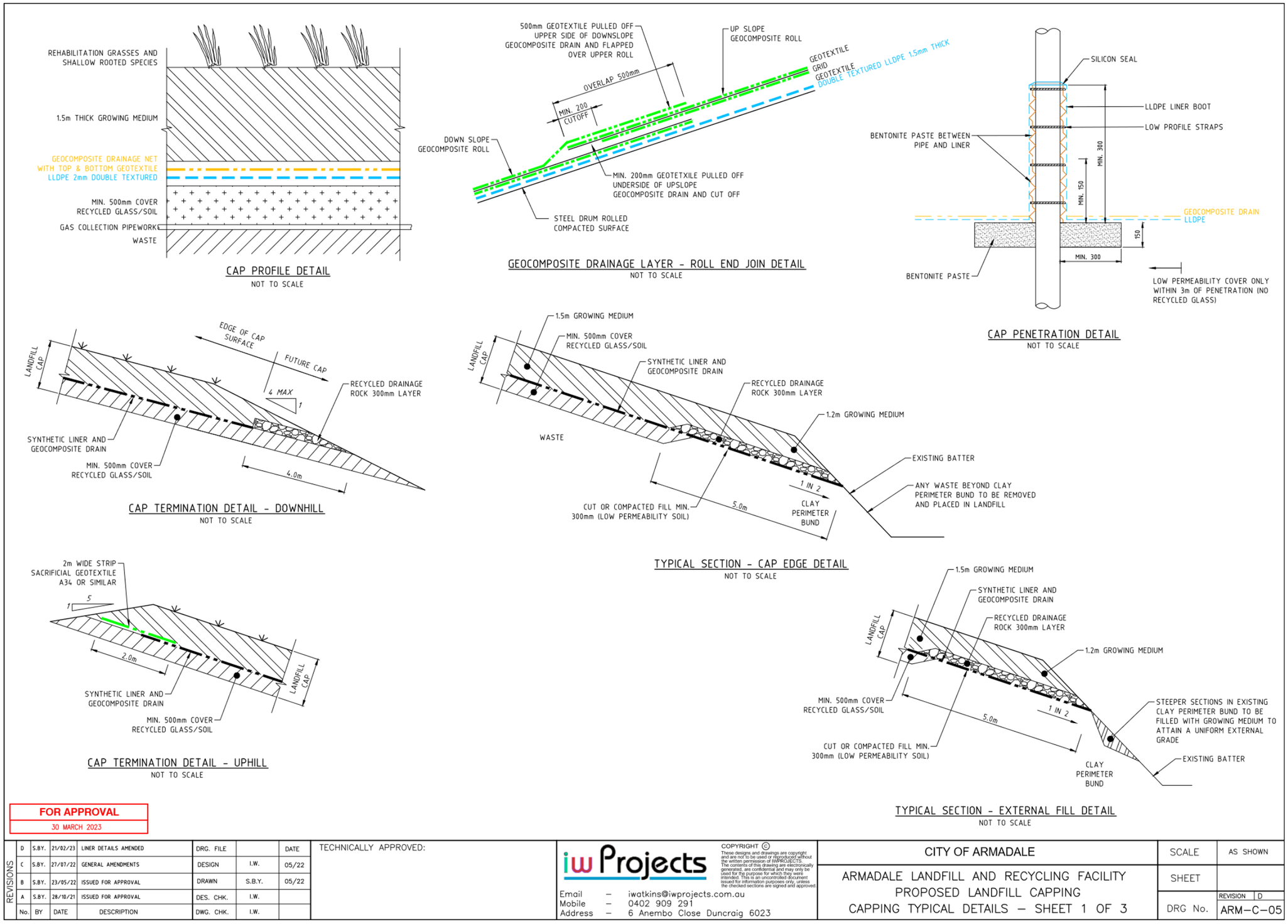


Figure 3: Capping typical details 1

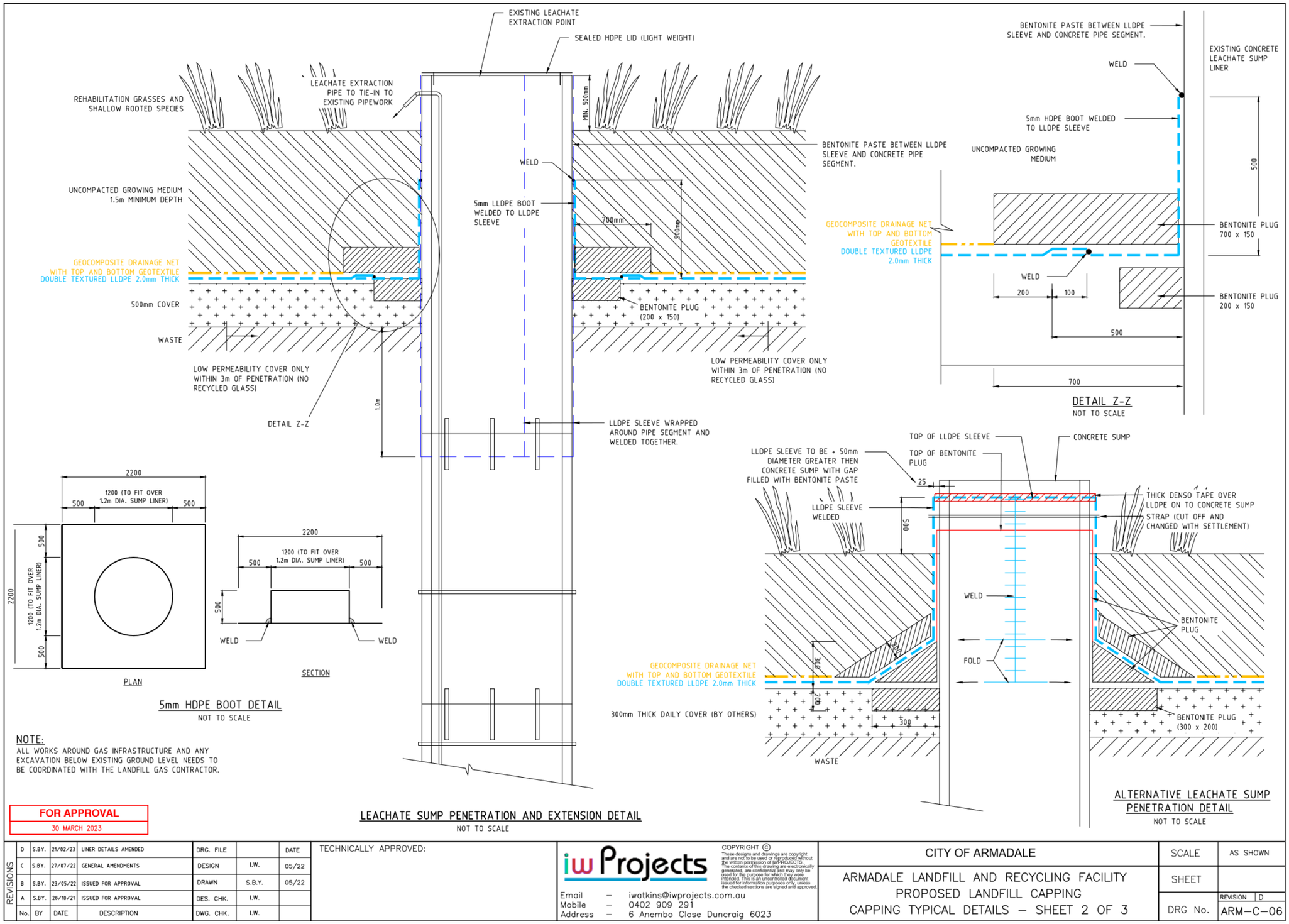
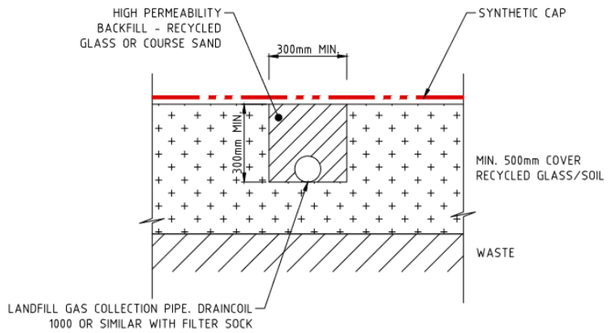
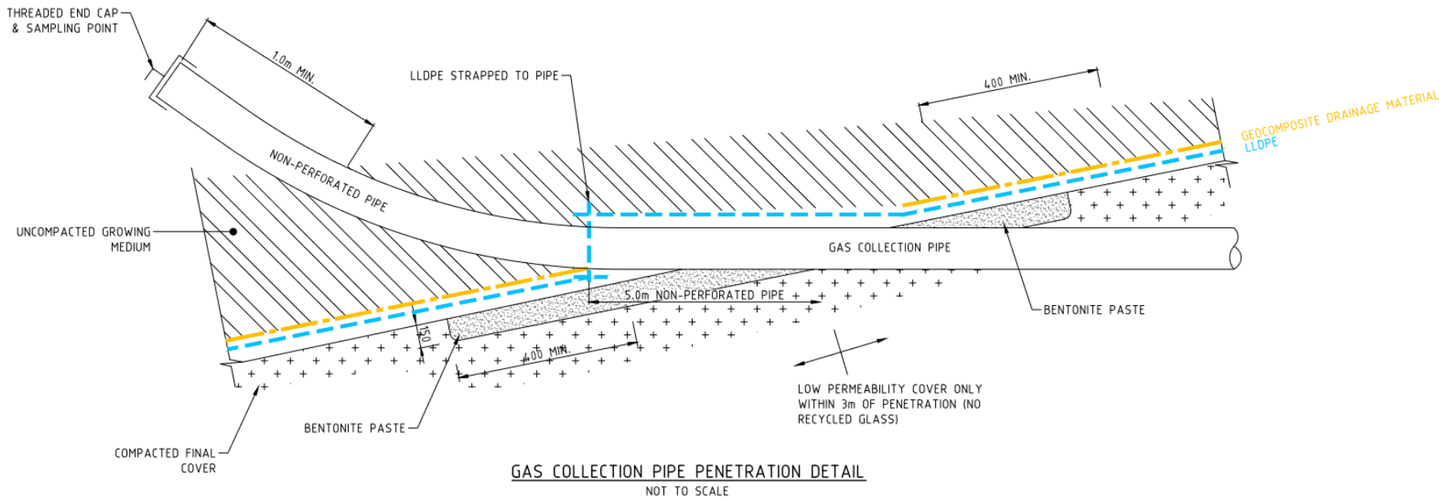


Figure 4: Capping typical details 2



LANDFILL GAS COLLECTION PIPE TRENCH DETAIL
NOT TO SCALE



GAS COLLECTION PIPE PENETRATION DETAIL
NOT TO SCALE

NOTE:
ALL WORKS AROUND GAS INFRASTRUCTURE AND ANY EXCAVATION BELOW EXISTING GROUND LEVEL NEEDS TO BE COORDINATED WITH THE LANDFILL GAS CONTRACTOR.

FOR APPROVAL
30 MARCH 2023

REVISIONS	No.	BY	DATE	DESCRIPTION
	D	S.B.Y.	21/02/23	LINER DETAILS AMENDED
	C	S.B.Y.	27/07/22	GENERAL AMENDMENTS
	B	S.B.Y.	23/05/22	ISSUED FOR APPROVAL
	A	S.B.Y.	28/10/21	ISSUED FOR APPROVAL

DRG. FILE			DATE
DESIGN	I.W.		05/22
DRAWN	S.B.Y.		05/22
DES. CHK.	I.W.		
DWG. CHK.	I.W.		

TECHNICALLY APPROVED:

iw Projects

Email – iwatkins@iwprojects.com.au
Mobile – 0402 909 291
Address – 6 Anembo Close Duncraig 6023

CITY OF ARMADALE

ARMADALE LANDFILL AND RECYCLING FACILITY
PROPOSED LANDFILL CAPPING
CAPPING TYPICAL DETAILS – SHEET 3 OF 3

SCALE: AS SHOWN
SHEET:
DRG No.: ARM–C–07
REVISION: D

Figure 5: Capping typical details 3

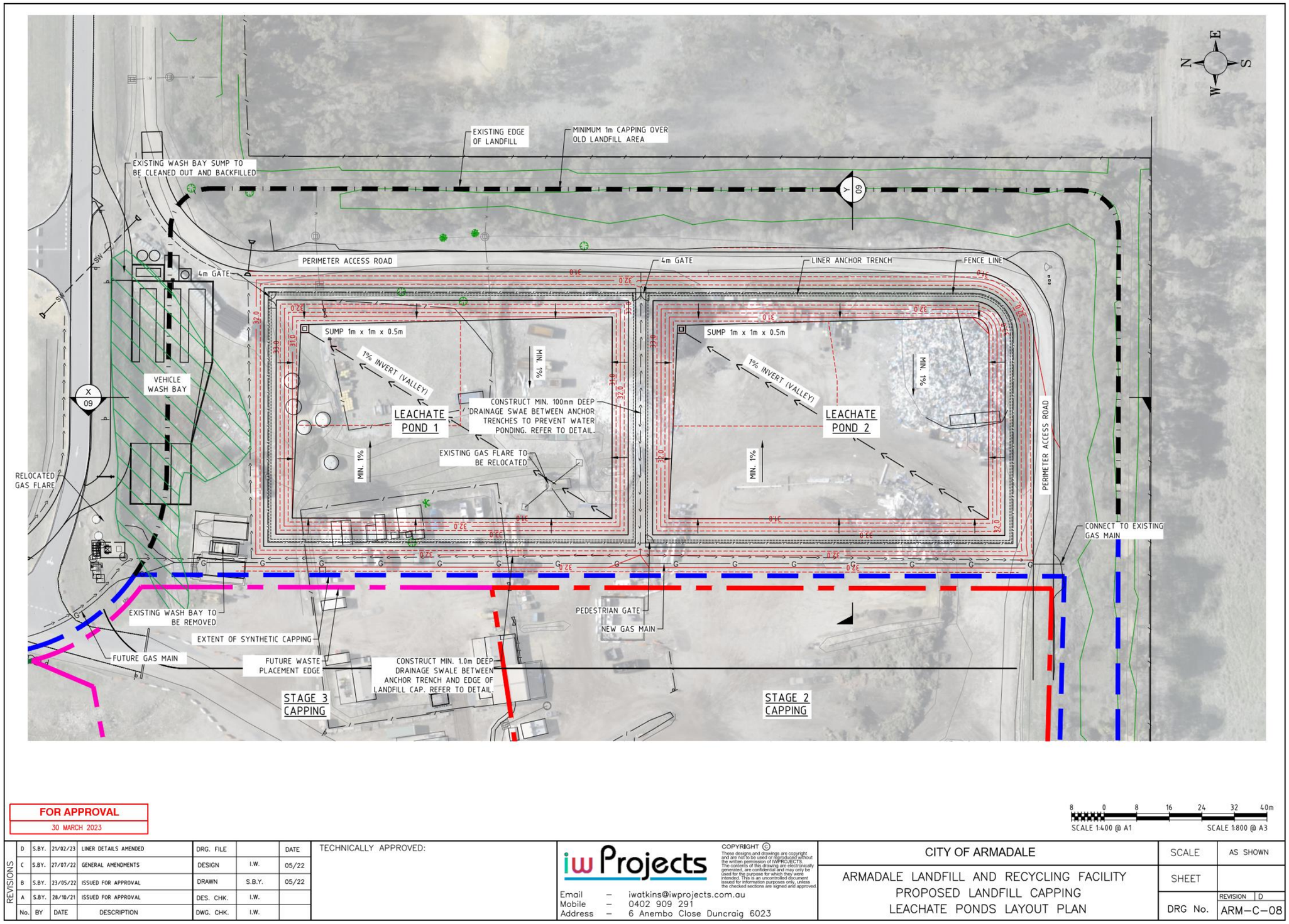
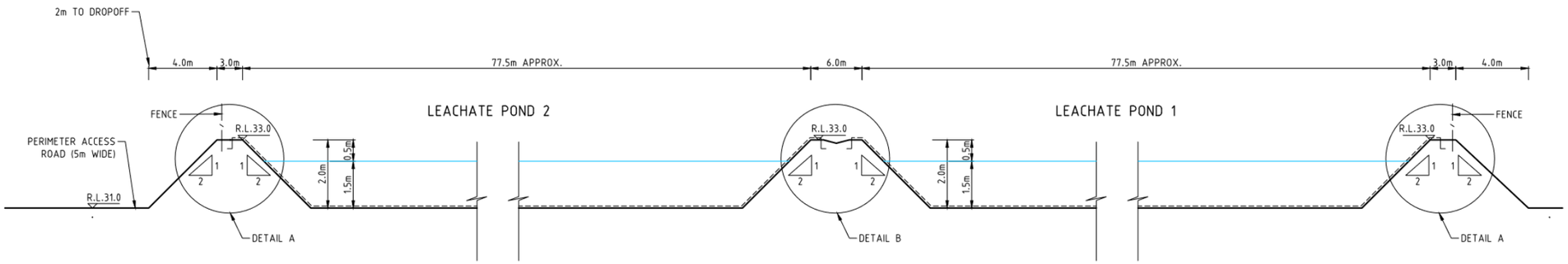
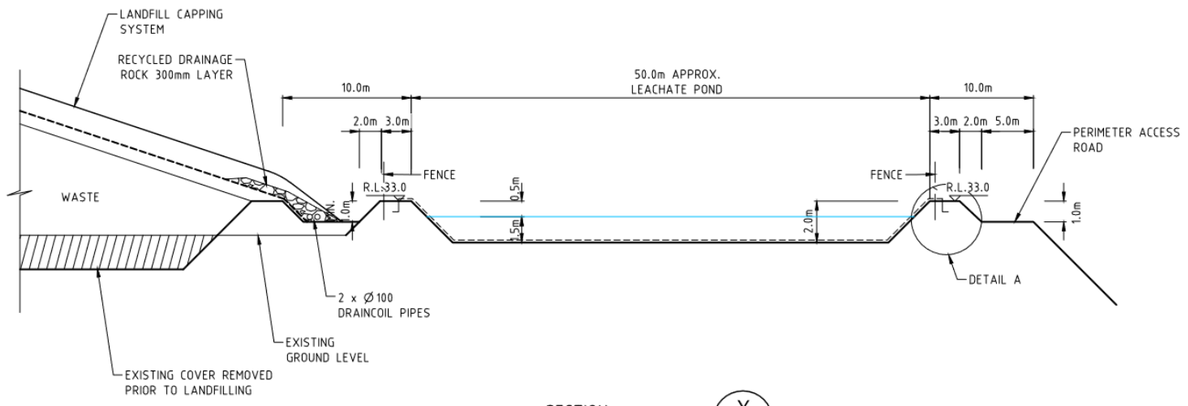


Figure 6: Leachate pond design



SECTION X 08
NOT TO SCALE



SECTION Y 08
NOT TO SCALE

FOR APPROVAL
30 MARCH 2023

NOTE:
SECTIONS ARE INDICATIVE ONLY AND SUBJECT TO DETAILED DESIGN OF INFRASTRUCTURE.

REVISIONS	No.	BY	DATE	DESCRIPTION
	D	S.B.Y.	21/02/23	LINER DETAILS AMENDED
	C	S.B.Y.	27/07/22	GENERAL AMENDMENTS
	B	S.B.Y.	23/05/22	ISSUED FOR APPROVAL
	A	S.B.Y.	28/10/21	ISSUED FOR APPROVAL

			DATE
DRG. FILE			DATE
DESIGN	I.W.		05/22
DRAWN	S.B.Y.		05/22
DES. CHK.	I.W.		
DWG. CHK.	I.W.		

TECHNICALLY APPROVED:

iw Projects

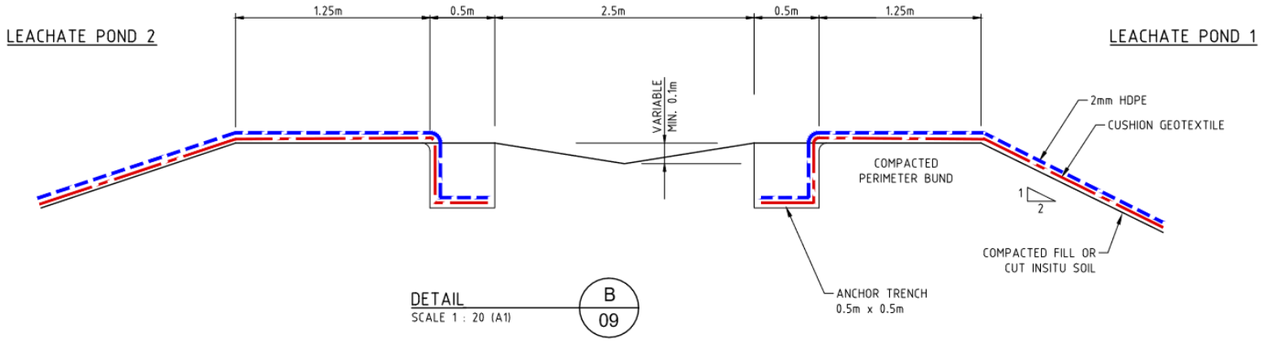
Email – iwatkins@iwprojects.com.au
Mobile – 0402 909 291
Address – 6 Anembo Close Duncraig 6023

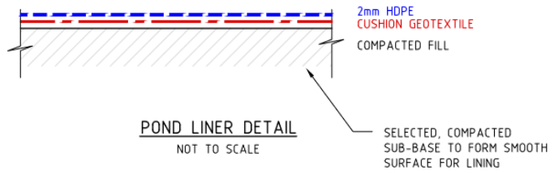
CITY OF ARMADALE

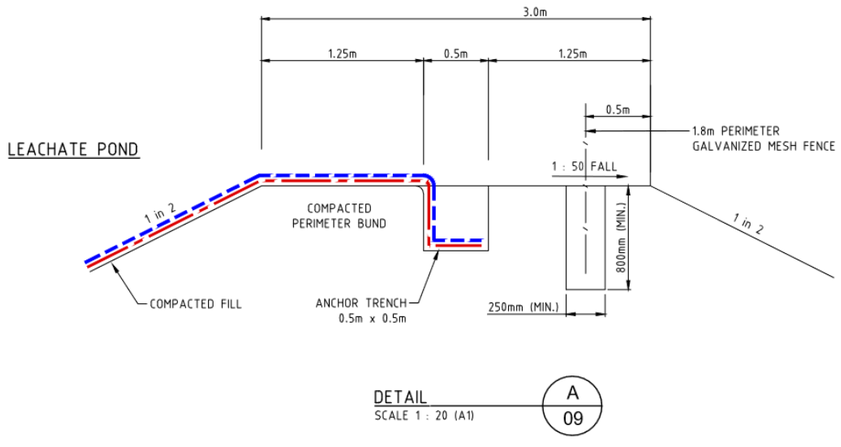
ARMADALE LANDFILL AND RECYCLING FACILITY
PROPOSED LANDFILL CAPPING
LEACHATE PONDS SECTIONS

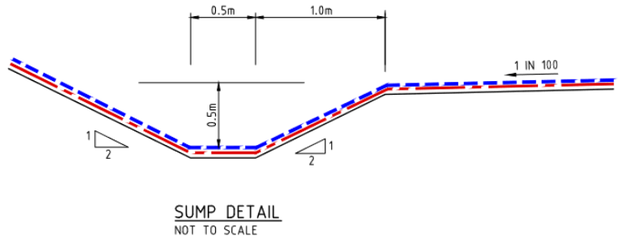
SCALE: AS SHOWN
SHEET:
DRG No.: ARM–C–09
REVISION: D

Figure 7: Leachate pond typical sections 1









FOR APPROVAL
30 MARCH 2023

REVISIONS	No.	BY	DATE	DESCRIPTION
	D	S.BY.	21/02/23	LINER DETAILS AMENDED
	C	S.BY.	27/07/22	GENERAL AMENDMENTS
	B	S.BY.	23/05/22	ISSUED FOR APPROVAL
	A	S.BY.	28/10/21	ISSUED FOR APPROVAL

			DATE
DRG. FILE			
DESIGN	I.W.		05/22
DRAWN	S.B.Y.		05/22
DES. CHK.	I.W.		
DWG. CHK.	I.W.		

TECHNICALLY APPROVED:

iw Projects
Email – iwatkins@iwprojects.com.au
Mobile – 0402 909 291
Address – 6 Anembo Close Duncraig 6023

CITY OF ARMADALE

ARMADALE LANDFILL AND RECYCLING FACILITY
PROPOSED LANDFILL CAPPING
LEACHATE POND DETAILS

SCALE: AS SHOWN
SHEET:
DRG No.: ARM–C–10
REVISION: D

Figure 8: Leachate pond typical sections 2

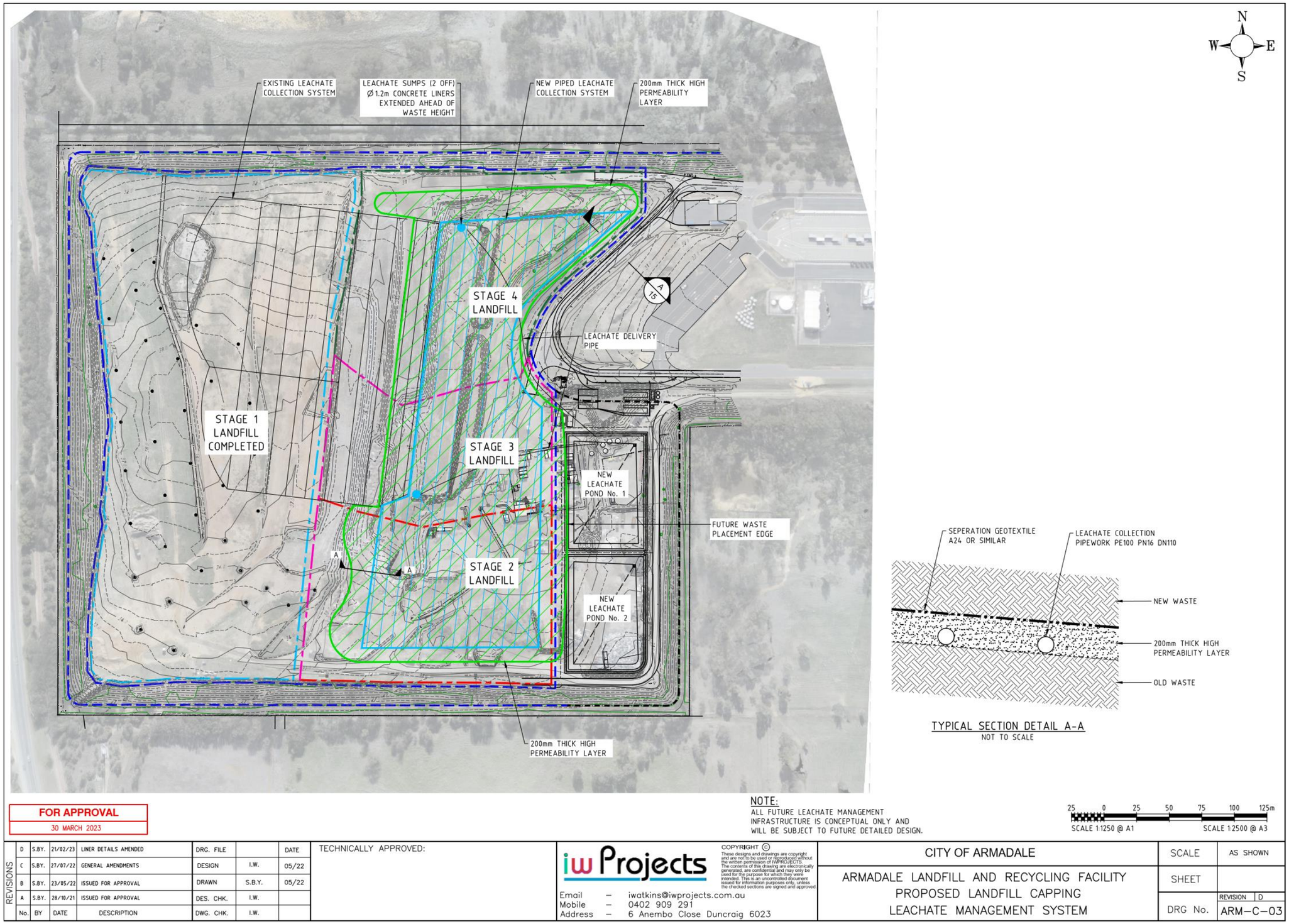


Figure 9: Layout of leachate pipework and typical section detail

MAPPING INFORMATION	
Coordinate System:	Australian Map Grid
Coordinate Units:	Metres
Zone:	50
NEARMAP INFORMATION	
Date:	16/07/2019

FIELD SUMMARY				
	PIPE SIZE	LENGTH	ITEM	TOTAL
HORIZ WELL	63mm	0	⊗	0
	90mm	0	⊕	0
	110mm	0	■	0
	125mm	0	●	0
	160mm	0	★	4
	200mm	0	⋈	1
FLOW	63mm	0	✳	0
	90mm	150	◉	0
	110mm	0	▬	0
	125mm	0	OKOP	0
LATERAL	90mm	0	◎	0
	125mm	20	▱	0
	160mm	290	A	
	200mm	0	A125	
AIR	32mm	0	MP1-1	
	63mm	0		
LEACHATE	63mm	0		
	90mm	0		
	125mm	0		
	160mm	0		
MAIN HEADER	90mm	0		
	110mm	0		
	125mm	0		
	160mm	0		
	200mm	0		
	225mm	0		
	250mm	0		
	280mm	0		
	315mm	0		
	355mm	0		
	400mm	0		
	450mm	0		
	500mm	0		

LEGEND

- ⊗ Well
- ⊕ Monitoring Bore
- ■ Wellhead Station - Standard
- ● J Trap
- ★ Barometric Trap
- ⋈ Isolation Valve
- ✳ Pit Pumpout
- ◉ Leachate Sump / Riser Pipes
- ▬ Standalone Well
- OKOP Knock Out Pot
- ◎ Dual Purpose Well
- ▱ Flare / Power Station
- A Wellhead Station Name
- A125 Well Number
- MP1-1 Main Gas Pipe
- Fence Line
- Cell Boundary
- Communication
- Power
- 63mm Flow Line
- 32mm Air Line
- 63mm Air Line
- 63mm Leachate Line
- 90mm Leachate Line
- 125mm Leachate Line
- 160mm Leachate Line
- 90mm Horizontal Well
- 90mm Main/Lateral Header
- 125mm Main/Lateral Header
- 160mm Main/Lateral Header
- 200mm Main Header
- 225mm Main Header
- 250mm Main Header
- 280mm Main Header
- 315mm Main Header
- 355mm Main Header
- 400mm Main Header
- 450mm Main Header
- 500mm Main Header

NOTES:

WELLS A001 - A030 ARE 50MM WELLS. NOT SURVEYED, LOCATIONS ARE APPROXIMATED FROM SUPPLIED DRAWINGS AND AERIAL PHOTOGRAPHY.
MP1-1 AND MP1-2 ARE 225MM BELOW GROUND MAIN HEADER LINES.
MP2-1, MP2-2 AND MP2-3 ARE ABOVE GROUND 125MM LATERAL. MAIN 225MM HEADER BURIED. NO ISOLATION VALVES, CONNECTION POINTS.
WELLS 032 - 040 DRILLED BUT NOT CONNECTED TO GAS COLLECTION SYSTEM

REV	DESCRIPTION	BY	CKD	APP	DATE
E					
D	Changed GCS installation from above ground to trenched.	ZB	RC	RC	12/06/2020
C	Added Baro Trap near valve	ZB			9/04/2020
B	Connect Wells B032 - B040	ZB	AD	AD	23/09/2019
A	Refer to Previous Drawing	KK	RC	RC	

REVISION HISTORY

runenergy
199C OSBORNE AVE, CLAYTON STH, VIC 3169
PH: (03) 9538 620
www.runenergy.com

PROJECT: Armadale Landfill

DRAWING TITLE: Gas Collection System Installation

DRAWING No: 139-DN-001
DRAWING TYPE: Design in Progress
DRAWN: ZB | CKD: RC
DATE: 12/06/2020 | APP: RC
DESIGNED: RC | APP DATE: 12/06/2020
SCALE: DNS | SHEET: 1 of 1 | REV: D | SIZE: A1

Figure 10: Landfill gas flare relocation

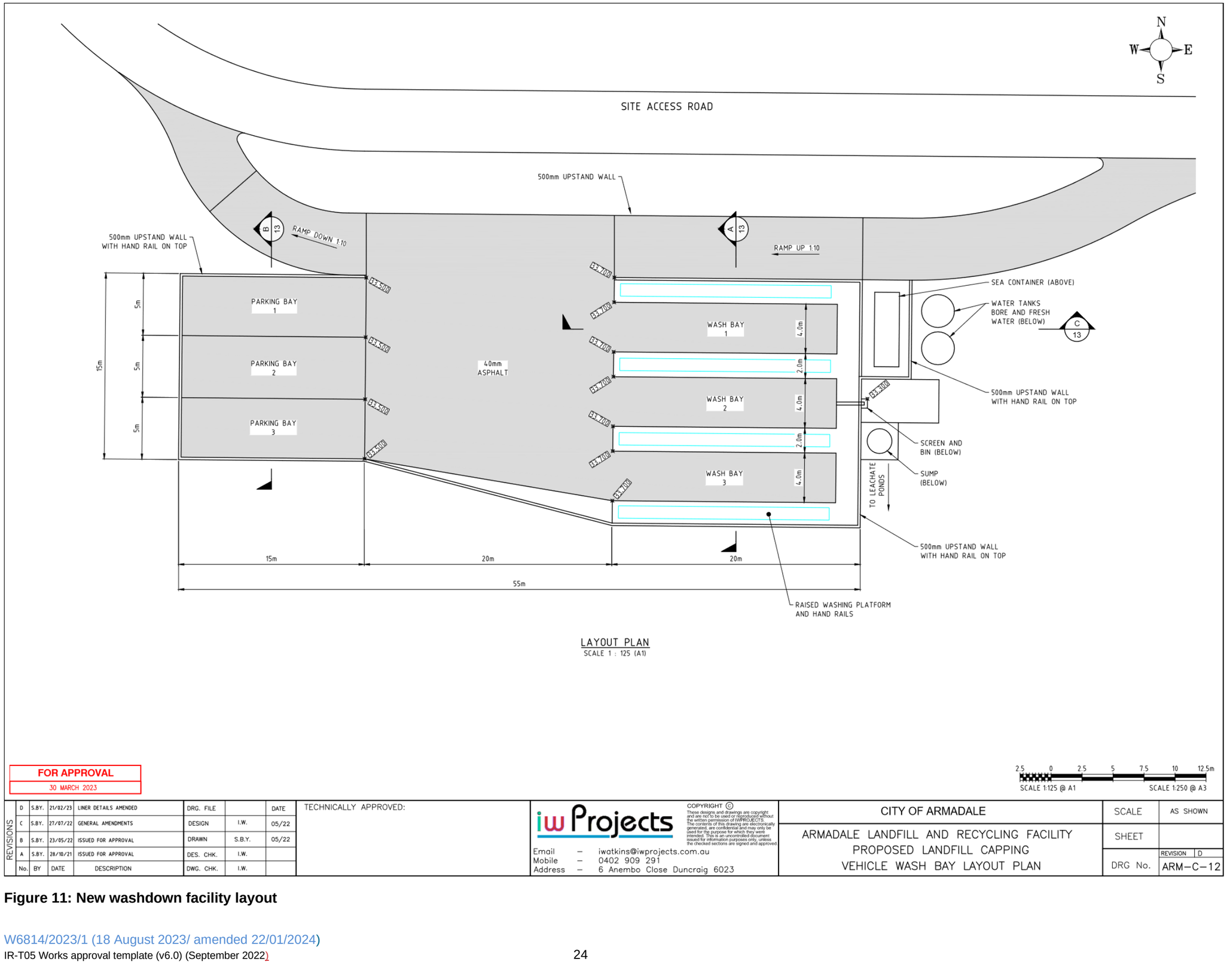
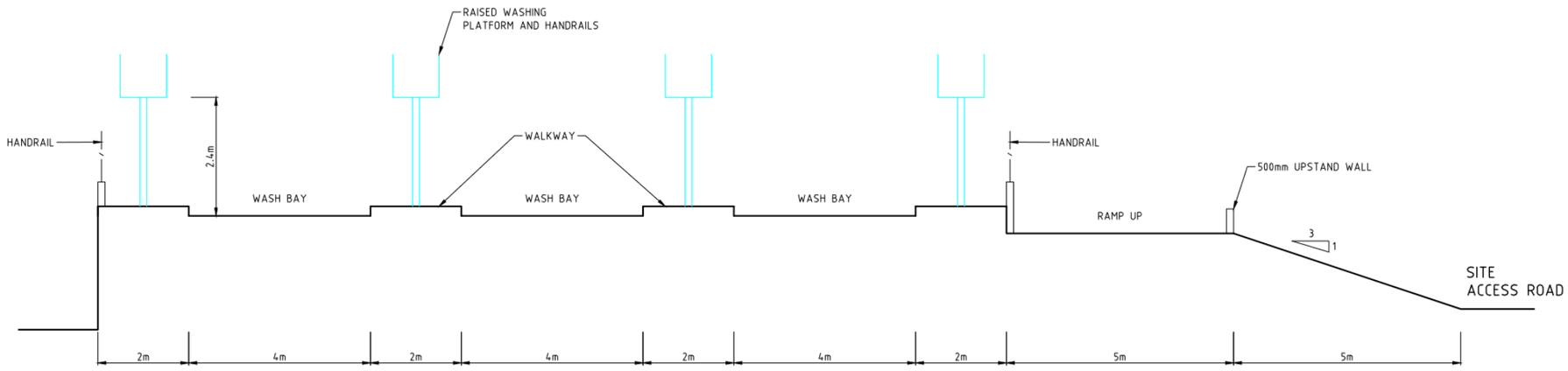


Figure 11: New washdown facility layout



SECTION B
NOT TO SCALE 12

FOR APPROVAL
30 MARCH 2023

NOTE:
SECTIONS ARE INDICATIVE ONLY AND SUBJECT TO DETAILED DESIGN OF INFRASTRUCTURE.

REVISIONS								
	D	S.BY.	21/02/23	LINER DETAILS AMENDED	DRG. FILE		DATE
	C	S.BY.	27/07/22	GENERAL AMENDMENTS	DESIGN	I.W.	05/22
	B	S.BY.	23/05/22	ISSUED FOR APPROVAL	DRAWN	S.B.Y.	05/22
	A	S.BY.	28/10/21	ISSUED FOR APPROVAL	DES. CHK.	I.W.	
	No.	BY	DATE	DESCRIPTION	DWG. CHK.	I.W.	

TECHNICALLY APPROVED:

iw Projects
Email – iwatkins@iwprojects.com.au
Mobile – 0402 909 291
Address – 6 Anembo Close Duncraig 6023

CITY OF ARMADALE

ARMADALE LANDFILL AND RECYCLING FACILITY
PROPOSED LANDFILL CAPPING
VEHICLE WASH BAY SECTIONS

SCALE AS SHOWN
SHEET
DRG No. ARM–C–13
REVISION D

Figure 12: New washdown facility typical sections

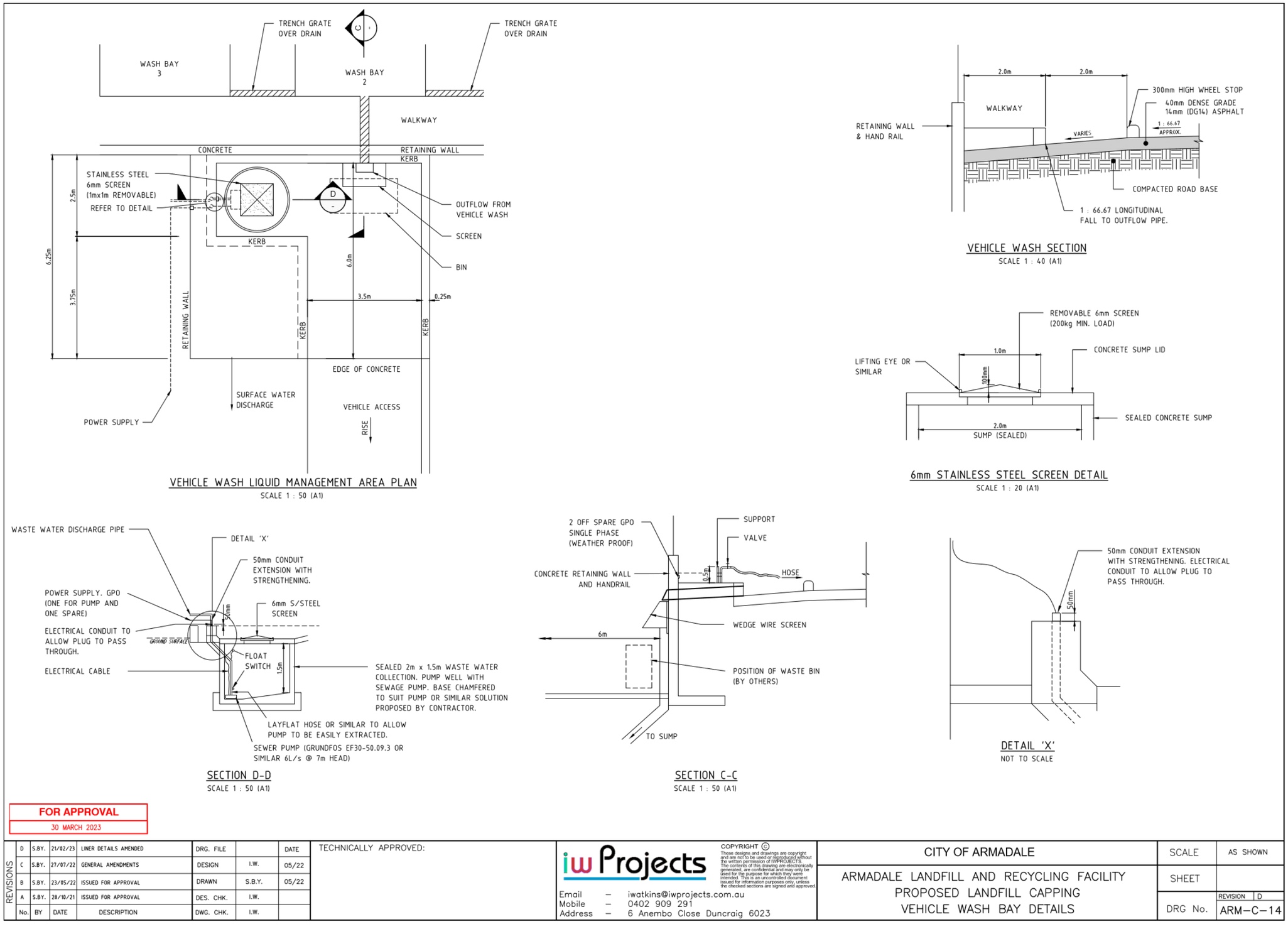


Figure 13: New washdown facility details

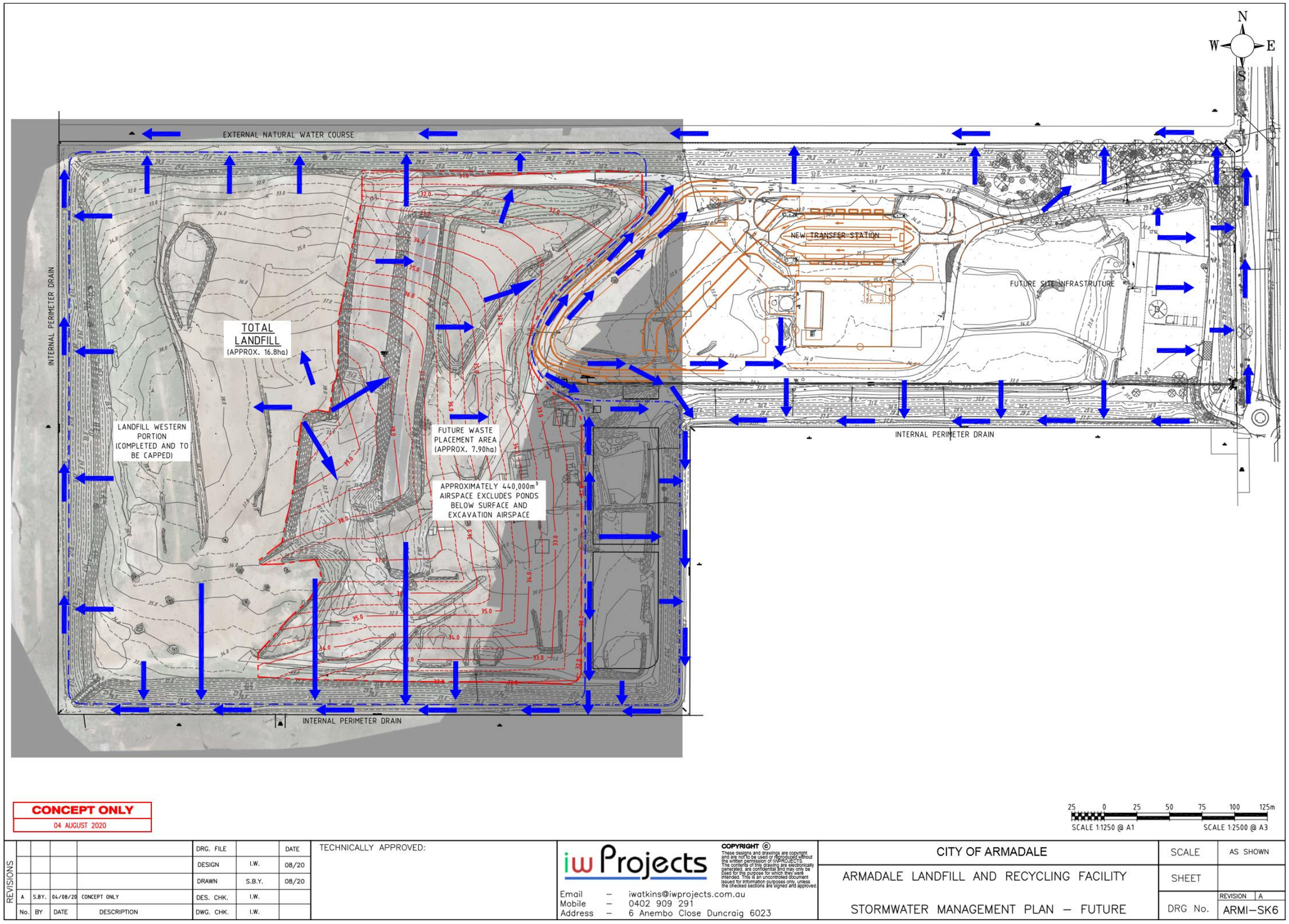


Figure 14: Stormwater management

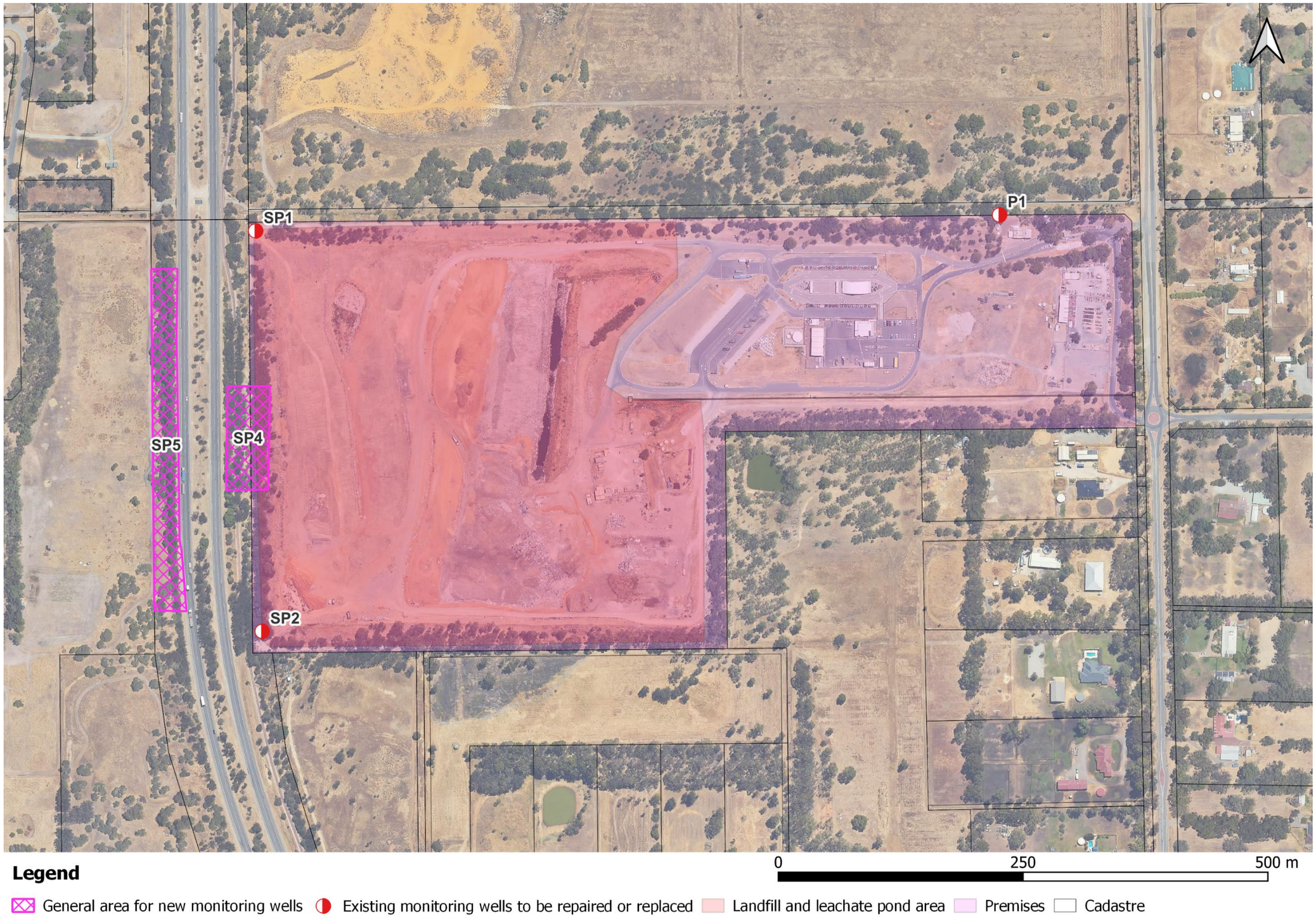


Figure 15: Groundwater monitoring wells to be installed, repaired or replaced

Schedule 2: Premises boundary

The premises boundary is defined by the coordinates listed in Table 7.

Table 7: Premises boundary coordinates (GDA2020 MGA Zone 50)

Point	Easting	Northing
1.	403138.7299	6437534.3869
2.	403141.7279	6437534.4495
3.	403142.3237	6437505.4657
4.	403142.3752	6437502.968
5.	403122.3818	6437502.7801
6.	403064.976	6437502.2434
7.	402965.416	6437501.3105
8.	402950.1802	6437501.1675
9.	402922.4189	6437500.908
10.	402723.0013	6437499.0387
11.	402724.8965	6437297.9238
12.	402725.0873	6437277.6526
13.	402551.3545	6437275.9938
14.	402414.8978	6437274.6915
15.	402407.4	6437274.6193
16.	402260.4221	6437273.2071
17.	402240.4973	6437273.0165
18.	402238.3587	6437494.5653
19.	402236.2611	6437712.701
20.	402721.0274	6437717.2762
21.	402936.8055	6437719.3143
22.	403130.781	6437721.1488
23.	403138.0352	6437714.0861
24.	403140.7824	6437580.4492

Point	Easting	Northing
25.	403141.6362	6437538.9462
26.	403138.6381	6437538.8851
27.	403138.6782	6437536.886
28.	403138.6997	6437535.8858

Schedule 3: Landfill gas action levels

Table 8: Landfill gas action levels[1]

Location	Parameter(s)	Action level
Landfill surface final cap	Methane concentration in air[2]	100 ppm[1]
	Hydrogen sulphide	15 ppm[5]
Within 50 mm of penetrations through the final cap	Methane concentration in air[3]	100 ppm[1]
	Hydrogen sulphide	15 ppm[5]
Landfill surface intermediate cover areas[4]	Methane concentration in air[2]	200 ppm[1]
	Hydrogen sulphide	15 ppm[5]
Within 50 mm of penetrations through the intermediate cover	Methane concentration in air[3]	1000 ppm[1]
	Hydrogen sulphide	15 ppm[5]

Note 1: Landfill gas action level has been sourced from the Environmental Protection Authority (EPA) Victoria 2015, *Best Practice Environmental Management: Siting, design, operation and rehabilitation of landfills*, Carlton, NSW
Note 2: Point of measurement is 50 mm above the landfill surface.
Note 3: Point of measurement is 50 mm from the point of discharge.
Note 4: Intermediate cover areas are those that do not have an engineered landfill cap and are not scheduled to receive waste during the next three months
Note 5: Hydrogen sulphide action level has been sourced from the Safe Work Australia workplace maximum short term exposure limit for hydrogen sulfide