Government of Western Australia
Department of Water and Environmental Regulation

Works Approval

Works approval number	W6886/2024/1
Works approval holder	South32 Worsley Alumina Pty Ltd
ACN	008 905 155
Registered business address	Gastaldo Road ALLANSON WA 6225
DWER file number	DER2024/000024
Duration	30/05/2024 to 29/05/2029
Date of issue	30/05/2024
Premises details	Worsley Alumina Refinery Gastaldo Road, ALLANSON WA 6225 Legal description - Lease No 3116/7574 being Wellington Locations 5314-5317 on Deposited Plan 220209 As defined by the premises maps in Schedule 1

Prescribed premises category description (Schedule 1, ***Environmental Protection Regulations 1987***)	**Assessed production / design capacity**
Category 46: Bauxite refining	4.7 million tonnes per annual period assessed production capacity
Category 52: Electric power generation	260 Mega Watts per annual period design capacity
Category 53: Flyash disposal	110,000 tonnes per annual period assessed production capacity
Category 54: Sewage facility	270 cubic metres per day design capacity
Category 61: Liquid waste facility	100 tonnes per annual period assessed production capacity
Category 63: Class I Inert landfill site	15,000 tonnes per annual period assessed production capacity
Category 89: Putrescible landfill site	500 tonnes per annual period assessed production capacity

This works approval is granted to the works approval holder, subject to the attached conditions, on 30 May 2024, by:

Caron Goodbourn Digitally signed by Caron Goodbourn Date: 2024.05.30 08:52:42 +08'00'

MANAGER, PROCESS INDUSTRIES

an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA)

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 and/or install the infrastructure and/or equipment;

(b) in accordance with the corresponding design and construction / installation requirements; and

(c) at the corresponding infrastructure location,

as set out in Table 1.

Table 1: Design and construction / installation requirements

	Infrastructure	Design and construction / installation requirements	Infrastructure location
1.	Embankment subgrade and residue surface works	<u>Upstream embankments</u> a) Includes ripping of the surface and where required treatment of localized soft areas through use of a geogrid reinforcement layer and grading of the ripped area of the width of the raise footprint; b) Bauxite residue will be confirmed at a minimum undrained shear strength of >100 kPa from the residue surface to 1m depth and >40 kPa below to 2m depth prior to upstream raises being positioned on existing bauxite residue.	Schedule 1 Figures 5, 6 and 10.
2.	Residue Underdrainage Infrastructure	<u>Downstream and centerline embankments</u> a) Sand fingers on batter slopes placed at 8m centers on the upstream face and be 0.4m thick and 4.0m wide; b) Internal residue drainage pipes consisting of slotted PVC pipes shall be placed in a sand drainage layer (sand fingers) on the batter slopes for every second finger for pipes at 8m intervals; c) The internal drainage pipes are connected to the residue underdrainage system which reports to the southern valley pipe head dam (SVPHD) for BRDA 5 and to the northern valley pipehead dam (NVPHD) for BRDA 4X. <u>Upstream embankments</u> d) Drains extend 50m from the embankment upstream toes (approximately 3 per 100m); e) Sand fingers on batter slopes placed at 16 and/or 32 m centers on the upstream face and be 0.4m thick and 4.0m wide;	Schedule 1 Figures 3 and 9.

	Infrastructure	Design and construction / installation requirements	Infrastructure location
		f) Internal residue drainage pipes consisting of slotted PVC pipes shall be placed in placed in a drainage layer (sand fingers or gravel) and a geofabric layer on the batter slopes at 16 and/or32m intervals on the upstream face of the upstream embankment raise; g) The internal drainage pipes are connected to the residue underdrainage system which reports to the southern valley pipe head dam (SVPHD) for BRDA 5 and to the northern valley pipehead dam (NVPHD) for BRDA 4X..	
3.	Tailings deposition infrastructure	a) Embankment perimeter will be fitted with a mudline, deposition pipeline that contains multiple discharge spigot attachment valves, located at nominal 72m intervals; b) Multiple spigots used to discharge bauxite residue sub-aerially on the upstream edge of the perimeter embankment; c) Bauxite residue discharge at low velocity and spigot locations changed periodically to maximise tailings beach consolidation around the edge of the embankment and minimise the size and location of the decant pond towards the centre of each cell; d) Constructed to allow a minimum 700mm operational freeboard; e) Beach length of approximately 500m long and 100m wide with tailings deposition average of 55% solids and an average 0.6% degree beach slope; f) Bauxite residue deposition will be managed within each cell to contain rainfall associated with a 1 in 5000 year, 72- hour duration Annual Recurrence Interval rainfall event; g) Use of amphirollers vehicles to accelerate drying and consolidation of bauxite residue on wet pour within 72hours to achieve an undrained shear strength of 28kPa for each 1.1m layer to achieve 72% final solids content, 50m out from the embankment.	Not Applicable
4.	Dewatering infrastructure	a) All decant towers and pump shafts causeway to be raised by 5m for BRDA 4X; b) Central decant town and pumpshaft causeway within BRDA5 Cell 6 to be raised and extended for BRDA 5 Cell 6; c) Constructed decant causeways fitted with mobile surface pumps with variable speed drives to maximise decant recovery; d) Recovered decant water will be recycled back into processing via the Refinery Catchment Lake	Schedule 1 Figures 1, 2, 3, 7, 8

	Infrastructure	Design and construction / installation requirements	Infrastructure location
		(RCL)	
5.	Pipelines, mudlines, drains and decant conveyance infrastructure	a) Bunding is provided on the downstream crest edge and crest sloped inward such that residue lost to the surface of crest reports into the BRDA; b) Configured to allow water transfer between site infrastructure, to allow stormwater from a 1:5000 year 72 hour duration Annual Recurrence Interval rainfall event to be contained within the onsite containment infrastructure on site.	Schedule 1 Figures 4, 5, 6 and 10.
6.	Stormwater diversion and drainage	a) Constructed along the toe of all embankments, discharging to gravel lined spoon drains, leading to rock lined drop structures and then to the Freshwater Lake. b) Surface water run off reports to the Northern Valley Pipe Head dam (NVPHD) for BRDA 4X and the Southern Valley Pipe Head Dam (SVPHD) for BRDA 5 Cell 6; c) Spacing between drop structures is limited to 150m in length and to maintain a Vertical 1:2 250 Horizontal gradient for; toe drainage. d) Batter slopes treated with 50:50 mixture of topsoil and mulch for erosion control. e) Toe drains to be constructed on down-stream side of embankments and consist of a spoon drain and rock lined – v drains-drain with 300mm vertical depth unless otherwise shown in drawings	Schedule 1 Figures 1, 5, 9, 10.
7.	Peizometers	a) Vibrating Wire Peizometer arrays placed in three locations underneath the proposed embankment to extend the existing monitoring network to monitor pore water pressure profile for the BRDA's	Not applicable

2. The works approval holder must:

(a) construct the critical containment infrastructure;

(b) in accordance with the corresponding design and construction requirements; and

(c) at the corresponding infrastructure location(s); and

(d) within the corresponding timeframe(s),

as set out in Table 2.

Table 2: Critical containment infrastructure design and construction requirements

	Infrastructure	Design and construction requirements	Infrastructure location
8.	BRDA 4X	a) Embankment raises from RL 304m AHD to RL	Schedule 1

	Infrastructure	Design and construction requirements	Infrastructure location
	Embankment lift of 5m To RL 309 m AHD	309 m AHD <u>Downstream construction (eastern perimeter)</u> b) Incorporate a minimum of 5m of low permeability clay compacted to a minimum 98% HILF PCWD placed within a moisture content tolerance of within 2% (+/-) of its optimum moisture content c) Batter slopes shall be shaped to 1 Vertical: 2:2 Horizontal (external) and 1 Vertical:1.5 Horizontal (internal) on downstream and centerline embankment unless otherwise shown in in drawings d) Crests with a 2% minimum fall with a 10m wide minimum if intended for traffic by Amphiroller vehicles e) Access ramps <u>Upstream construction (northern and western perimeter)</u> f) Constructed using in-situ soils and bauxite residue, rolled and compacted to a minimum 95% HILF PCWD placed within a moisture content tolerance of within 2% (+/-) of its optimum moisture content (alternative to zone 2B material compacted to 95% HILF); g) Batter sloped shaped to 1Verticle: 2.2 Horizontal (external) and 1 Vertical:1.5 Horizontal (internal) on upstream embankments unless otherwise shown in drawings. h) Crests with a 2% minimum fall with a 10m wide minimum if intended for traffic by Amphiroller vehicles i) Access ramps	Figures 1, 2, 4, 5 and 6
9.	BRDA 5 Cell 6 Embankment lift of 5 m To RL 290.5 m AHD	a) Embankment raise from RL 285.5m AHD to RL 290.5m AHD <u>Downstream and centreline construction (eastern perimeter)</u> b) Incorporate a minimum of 5m of low permeability clay compacted to a minimum 98% HILF PCWD placed within a moisture content tolerance of within 2% (+/-) of its optimum moisture content c) Batter slopes shall be shaped to 1 Vertical: 2:2 Horizontal (external) and 1 Vertical:1.5 Horizontal (internal) on downstream and centerline embankment unless otherwise shown in in drawings d) Crests with a 2% minimum fall with a 10m wide minimum if intended for traffic by Amphiroller vehicles e) Access ramps <u>Upstream construction (northern and western</u>	Schedule 1 Figures 7, 8, 9 and 10.

	Infrastructure	Design and construction requirements	Infrastructure location
		perimeter) f) Constructed using in-situ soils and bauxite residue, rolled and compacted to a minimum 95% HILF PCWD placed within a moisture content tolerance of within 2% (+/-) of its optimum moisture content (alternative to zone 2B material compacted to 95% HILF); g) Batter sloped shaped to 1Verticle: 2.2 Horizontal (external) and 1 Vertical:1.5 Horizontal (internal) on upstream embankments unless otherwise shown in drawings. h) Crests with a 2% minimum fall with a 10m wide minimum if intended for traffic by Amphiroller vehicles i) Access ramps	

Environmental compliance reporting

3. The works approval holder must within 60 calendar days of an item of infrastructure or equipment required by condition 1 being constructed and/or installed:

(a) undertake an audit of their compliance with the requirements of condition 1; and

(b) undertake an audit of compliance of condition 1 with the requirements of *070-Earthworks Specifications FY 2025-2027* (South32 Worsley Alumina, 2024)

(c) undertake an audit of compliance of condition 1 with the requirements *Design Report BRDA 5 – Stage 6A* (LOM Engineering, 17/10/2023) and Design *Report BRDA 4X – Stage 6* (LOM Engineering, 24/11/2023);

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

4. The Environmental Compliance Report required by condition 3, must include as a minimum the following:

(a) certification by a qualified geotechnical engineer that the items of infrastructure or component(s) thereof, as specified in condition 1, have been constructed in accordance with the relevant requirements specified in condition 1;

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

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

Critical containment Infrastructure report

5. The works approval holder must within 90 calendar days of the Critical Containment Infrastructure identified by condition 2 being constructed:

(a) undertake an audit of their compliance with the requirements of condition 2; and

(b) undertake an audit of compliance of condition 2 with the requirements of *070-Earthworks Specifications FY 2024-2027* (South32 Worsley Alumina, 2024)

(c) undertake an audit of compliance of condition 2 with the requirements detailed in *Design Report BRDA 5 – Stage 6A* (LOM Engineering, 17/10/2023) and Design *Report BRDA 4X – Stage 6* (LOM Engineering, 24/11/2023);

(d) prepare and submit to the CEO a Critical Containment Infrastructure Report on that compliance.

6. The Critical Containment Infrastructure Report required by condition 5 must include as a minimum the following:

(a) certification by a suitably qualified geotechnical engineer that each item of critical containment infrastructure or component thereof, as specified in condition 2, has been built and installed in accordance with the requirements specified in condition 2;

(b) as constructed plans and a detailed site plan showing the location and dimensions for each item of critical containment infrastructure or component thereof, as specified in condition 2;

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

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

(e) a Quality Control / Quality Assurance Certificate from an independent third party which demonstrates that specific components of critical containment infrastructure meet specifications

Limits to operation

7. Following completion of construction works specified in conditions 1 and 2, the works approval holder must:

(a) Within 12 months after completing construction of the works specified in condition 1 and 2, and annually thereafter, the Licence Holder must provide to the CEO an audit of BRDA 5 Cell 6 and BDRA 4X Stage 6. The audit must be carried out by a suitably qualified engineer or geotechnical specialist in accordance with Department of Mines and Petroleum (November 2015), Tailings Dam Audit – Guide; against the assumed design parameters in accordance with Tailings Storage Facility Audit – Guide; and the relevant parts of the ANCOLD (May 2012), Guidelines on Tailings Dams – Planning, Design, Construction, Operation and Closure; and Department of Mines and Petroleum (2013), Tailings storage facilities in Western Australia – code of practice

(b) Submit to the CEO the audit report by 31 December 2027

8. The works approval holder must not commence deposition into BRDA 5 Cells 6 or BRDA 4X Stage 6 if the audit required by condition 7(a) indicates the minimum factor of safety requirements of the BRDA embankments at the final fill level of 290.5 m AHD (for BRDA 5 Cell 6) and 309 m AHD (for BRDA 4x Stage 6) are not met.

9. The works approval holder must provide the audit report to the CEO at least 30 days prior to commencement of deposition into BRDA 5 Cell 6 Stage 6A and BRDA 4X Stage 6.

Records and reporting (general)

10. 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.

11. 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 conducted in accordance with conditions 1 and 2;

(b) any maintenance of infrastructure that is performed in the course of complying with condition 1 and 2; and

(c) complaints received under condition 10.

12. The books specified under condition 11 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 be available to be produced to an inspector or the CEO as required.

Definitions

In this works approval, the terms in Table 1 have the meanings defined.

Table 1: Definitions

Term	Definition
books	has the same meaning given to that term under the EP Act.
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
critical containment infrastructure	means the items of infrastructure listed in condition 1.

Term	Definition
Critical Containment Infrastructure Report	means a report to satisfy the CEO that works of critical containment infrastructure have been constructed in accordance with the works approval.
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.
EP Act	*Environmental Protection Act 1986* (WA).
EP Regulations	*Environmental Protection Regulations 1987* (WA).
FL	means the Freshwater Lake at the premises
HILF PCWD	is testing method for engineered soils which are required to meet compaction and density ratios and are subject to moisture variation
NVPHD	means Northern Valley Pipe Head Dam at the premises
premises	the premises to which this licence applies, as specified at the front of this licence 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.
RCL	means the Refinery Catchment Lake at the premises
SVPHD	means Southern Valley Pipe Head Dam at the premises
suitably qualified and experienced geotechnical engineer	means a person who: (a) holds an engineering degree; and (b) has a minimum of at least three years of experience working in the area / field of geotechnical assessment of tailings storage facilities or fly ash dams
Tailings Storage Facility Audit – Guide	means the document entitled “Tailings storage facility audit – guide”, Department of Mines, Industry Regulation and Safety, 26 June 2017
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	refers to the occupier of the premises being the person to whom this works approval has been granted, as specified at the front of

Term	Definition
holder	this works approval.

END OF CONDITIONS

Schedule 1: Maps

Premises map

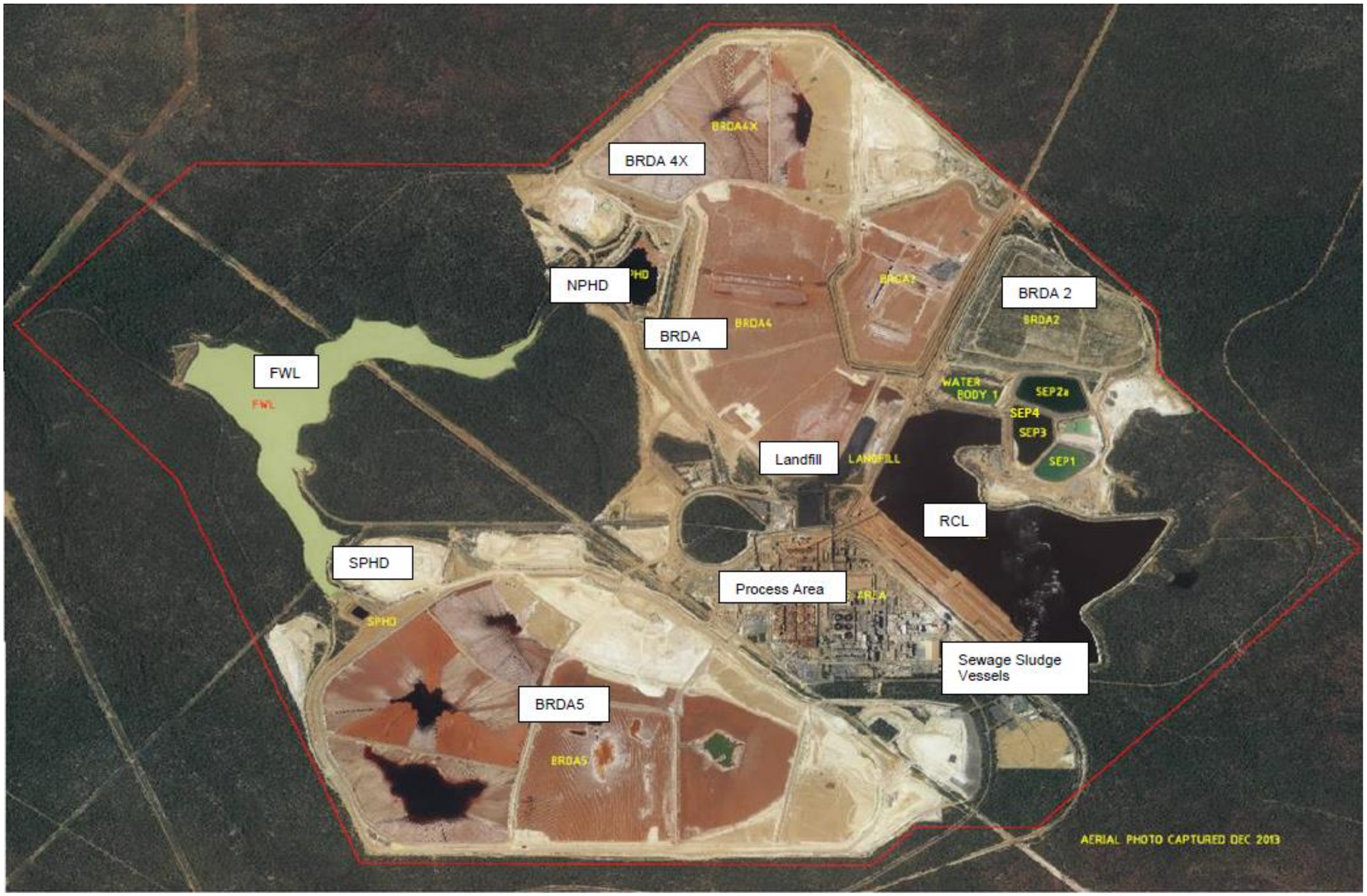

Figure 1: Map of the boundary of the prescribed premises shown in red outline

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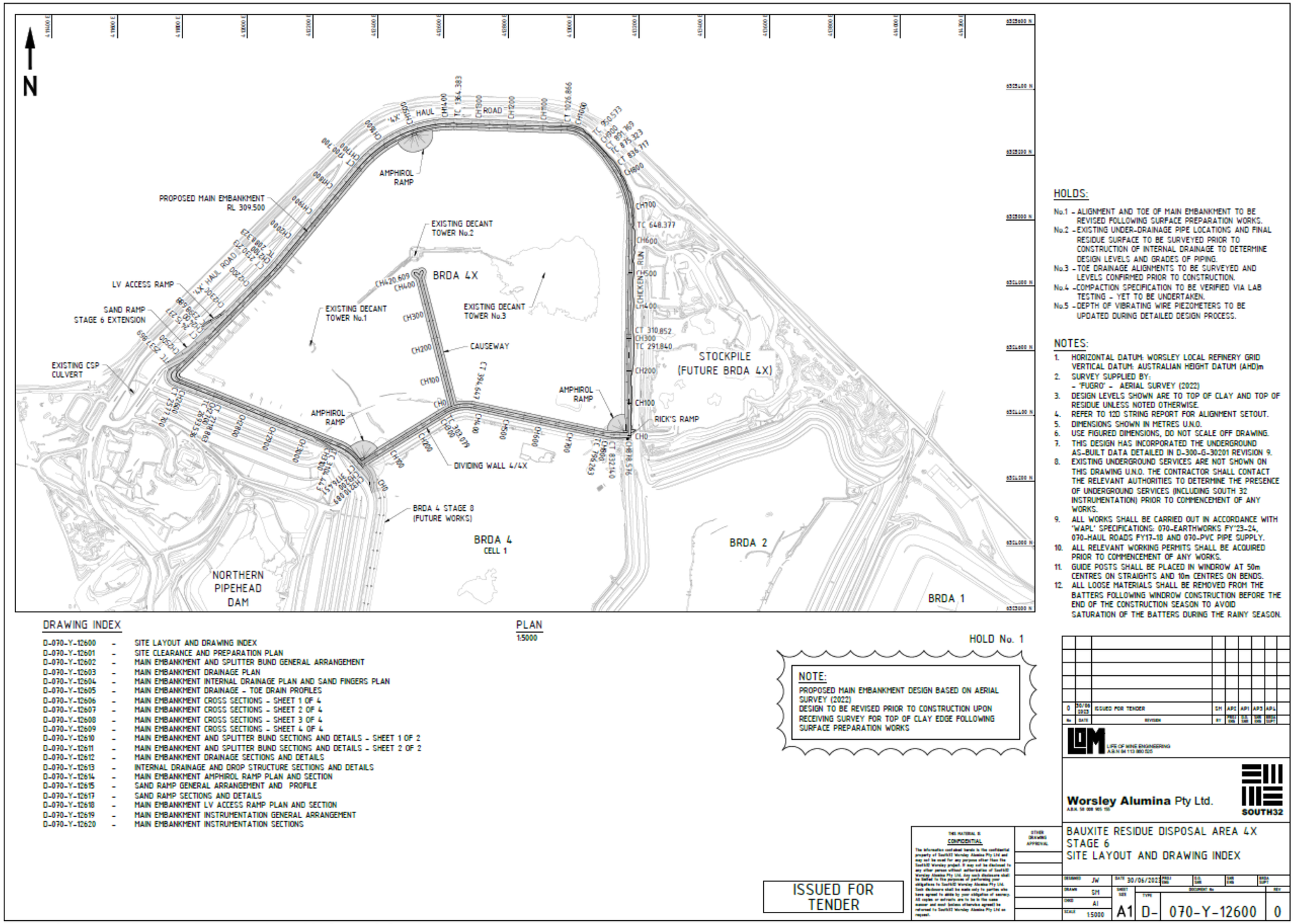

PLAN
1:5000

DRAWING INDEX

D-070-Y-12600	-	SITE LAYOUT AND DRAWING INDEX
D-070-Y-12601	-	SITE CLEARANCE AND PREPARATION PLAN
D-070-Y-12602	-	MAIN EMBANKMENT AND SPLITTER BUND GENERAL ARRANGEMENT
D-070-Y-12603	-	MAIN EMBANKMENT DRAINAGE PLAN
D-070-Y-12604	-	MAIN EMBANKMENT INTERNAL DRAINAGE PLAN AND SAND FINGERS PLAN
D-070-Y-12605	-	MAIN EMBANKMENT DRAINAGE - TOE DRAIN PROFILES
D-070-Y-12606	-	MAIN EMBANKMENT CROSS SECTIONS - SHEET 1 OF 4
D-070-Y-12607	-	MAIN EMBANKMENT CROSS SECTIONS - SHEET 2 OF 4
D-070-Y-12608	-	MAIN EMBANKMENT CROSS SECTIONS - SHEET 3 OF 4
D-070-Y-12609	-	MAIN EMBANKMENT CROSS SECTIONS - SHEET 4 OF 4
D-070-Y-12610	-	MAIN EMBANKMENT AND SPLITTER BUND SECTIONS AND DETAILS - SHEET 1 OF 2
D-070-Y-12611	-	MAIN EMBANKMENT AND SPLITTER BUND SECTIONS AND DETAILS - SHEET 2 OF 2
D-070-Y-12612	-	MAIN EMBANKMENT DRAINAGE SECTIONS AND DETAILS
D-070-Y-12613	-	INTERNAL DRAINAGE AND DROP STRUCTURE SECTIONS AND DETAILS
D-070-Y-12614	-	MAIN EMBANKMENT AMPHIROL RAMP PLAN AND SECTION
D-070-Y-12615	-	SAND RAMP GENERAL ARRANGEMENT AND PROFILE
D-070-Y-12617	-	SAND RAMP SECTIONS AND DETAILS
D-070-Y-12618	-	MAIN EMBANKMENT LV ACCESS RAMP PLAN AND SECTION
D-070-Y-12619	-	MAIN EMBANKMENT INSTRUMENTATION GENERAL ARRANGEMENT
D-070-Y-12620	-	MAIN EMBANKMENT INSTRUMENTATION SECTIONS

HOLDS:

No.1 - ALIGNMENT AND TOE OF MAIN EMBANKMENT TO BE REVISED FOLLOWING SURFACE PREPARATION WORKS.
No.2 - EXISTING UNDER-DRAINAGE PIPE LOCATIONS AND FINAL RESIDUE SURFACE TO BE SURVEYED PRIOR TO CONSTRUCTION OF INTERNAL DRAINAGE TO DETERMINE DESIGN LEVELS AND GRADES OF PIPING.
No.3 - TOE DRAINAGE ALIGNMENTS TO BE SURVEYED AND LEVELS CONFIRMED PRIOR TO CONSTRUCTION.
No.4 - COMPACTION SPECIFICATION TO BE VERIFIED VIA LAB TESTING - YET TO BE UNDERTAKEN.
No.5 - DEPTH OF VIBRATING WIRE PIEZOMETERS TO BE UPDATED DURING DETAILED DESIGN PROCESS.

NOTES:

1. HORIZONTAL DATUM: WORSLEY LOCAL REFINERY GRID VERTICAL DATUM: AUSTRALIAN HEIGHT DATUM (AHD)m
2. SURVEY SUPPLIED BY:
   - 'FUGRO' - AERIAL SURVEY (2022)
3. DESIGN LEVELS SHOWN ARE TO TOP OF CLAY AND TOP OF RESIDUE UNLESS NOTED OTHERWISE.
4. REFER TO 12D STRING REPORT FOR ALIGNMENT SETOUT.
5. DIMENSIONS SHOWN IN METRES U.N.O.
6. USE FIGURED DIMENSIONS, DO NOT SCALE OFF DRAWING.
7. THIS DESIGN HAS INCORPORATED THE UNDERGROUND AS-BUILT DATA DETAILED IN D-300-G-30201 REVISION 9.
8. EXISTING UNDERGROUND SERVICES ARE NOT SHOWN ON THIS DRAWING U.N.O. THE CONTRACTOR SHALL CONTACT THE RELEVANT AUTHORITIES TO DETERMINE THE PRESENCE OF UNDERGROUND SERVICES (INCLUDING SOUTH 32 INSTRUMENTATION) PRIOR TO COMMENCEMENT OF ANY WORKS.
9. ALL WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH 'WAPL' SPECIFICATIONS: 070-EARTHWORKS FY'23-24, 070-HAUL ROADS FY17-18 AND 070-PVC PIPE SUPPLY.
10. ALL RELEVANT WORKING PERMITS SHALL BE ACQUIRED PRIOR TO COMMENCEMENT OF ANY WORKS.
11. GUIDE POSTS SHALL BE PLACED IN WINDROW AT 50m CENTRES ON STRAIGHTS AND 10m CENTRES ON BENDS.
12. ALL LOOSE MATERIALS SHALL BE REMOVED FROM THE BATTERS FOLLOWING WINDROW CONSTRUCTION BEFORE THE END OF THE CONSTRUCTION SEASON TO AVOID SATURATION OF THE BATTERS DURING THE RAINY SEASON.

HOLD No. 1

NOTE:
PROPOSED MAIN EMBANKMENT DESIGN BASED ON AERIAL SURVEY (2022)
DESIGN TO BE REVISED PRIOR TO CONSTRUCTION UPON RECEIVING SURVEY FOR TOP OF CLAY EDGE FOLLOWING SURFACE PREPARATION WORKS

ISSUED FOR TENDER

0	30/06/2023	ISSUED FOR TENDER	SM	APC	AP1	AP3	AP4
No	DATE	REVISION	BY	PROJ ENG	CL ENG	DWG CHK	DESIGN APPR

LOM LIFE OF MINE ENGINEERING A.B.N 94 113 880 525

Worsley Alumina Pty Ltd. A.B.N. 56 008 905 150 — SOUTH32

THIS MATERIAL IS CONFIDENTIAL
The information contained herein is the confidential property of South32 Worsley Alumina Pty Ltd and may not be used for any purpose other than the South32 Worsley project. It may not be disclosed to any other person without authorisation of South32 Worsley Alumina Pty Ltd. Any such disclosure shall be limited to the purposes of performing your obligations to South32 Worsley Alumina Pty Ltd. Such disclosure shall be made only to parties who have agreed to abide by your obligation of secrecy. All copies or extracts are to be in the same manner and most factions otherwise agreed) be returned to South32 Worsley Alumina Pty Ltd on request.

OTHER DRAWING APPROVAL

BAUXITE RESIDUE DISPOSAL AREA 4X
STAGE 6
SITE LAYOUT AND DRAWING INDEX

DESIGNED	JW	DATE	30/06/2023	PROJ ENG	CL ENG	DWG CHK	BRDA SUPT
DRAWN	SM	SHEET SIZE	TYPE	DOCUMENT No.			REV
CHKD	AJ	A1	D-	070-Y-12600			0
SCALE	1:5000						

Figure 2: Bauxite Residue Disposal Area 4 X Stage 6 Site Layout

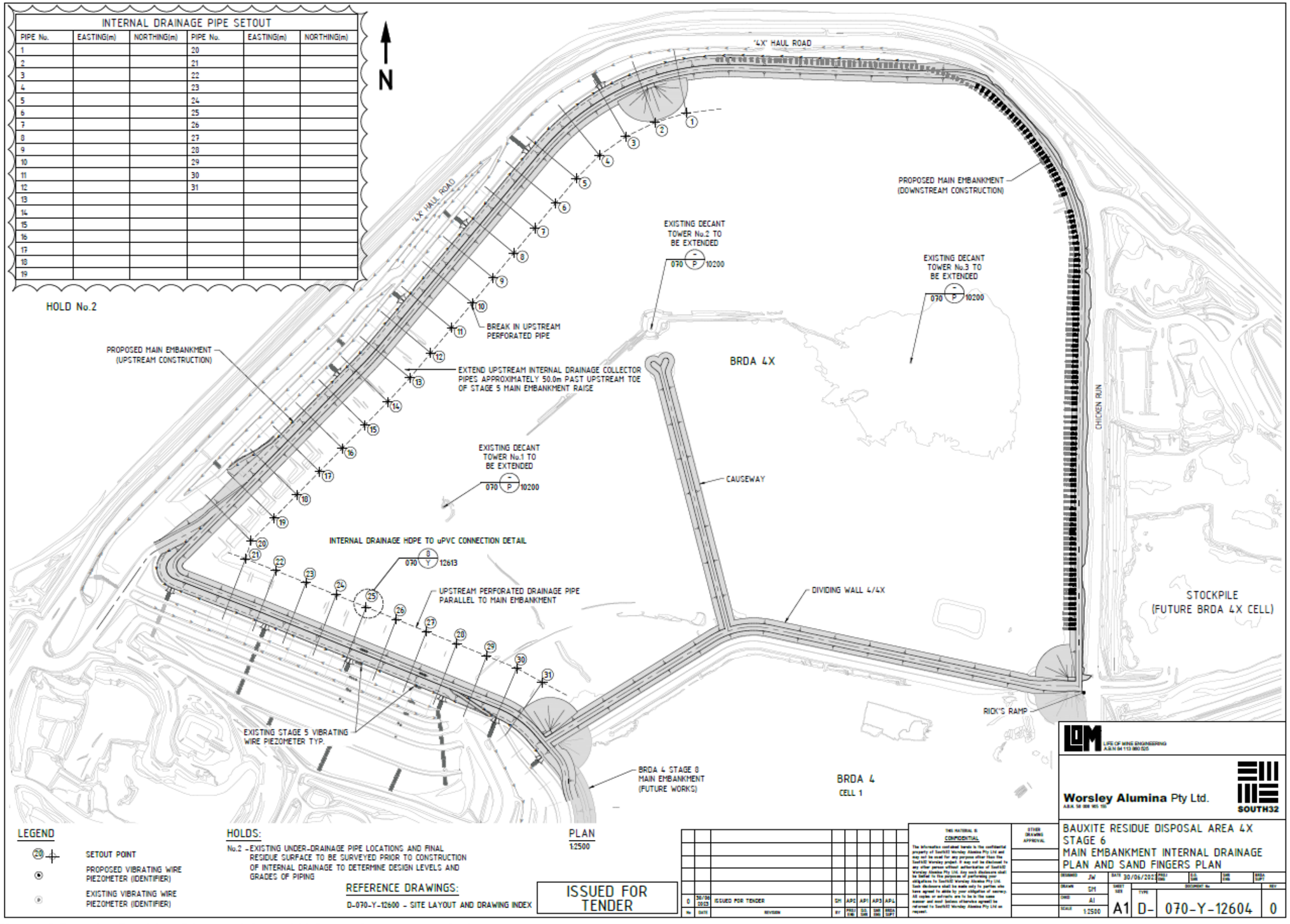

Figure 3 Bauxite Residue Disposal Area 4 X Stage 6 upstream drainage array

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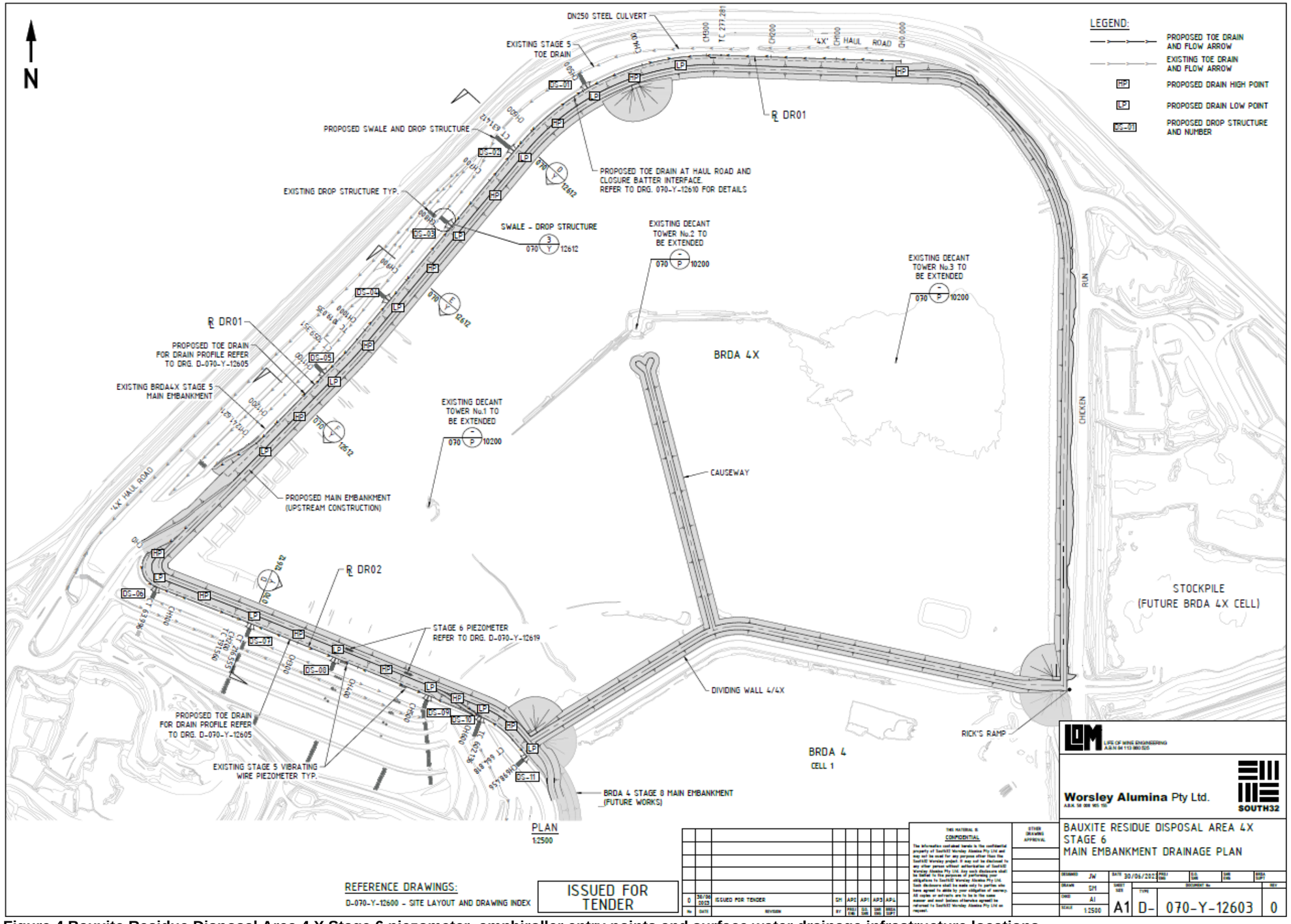
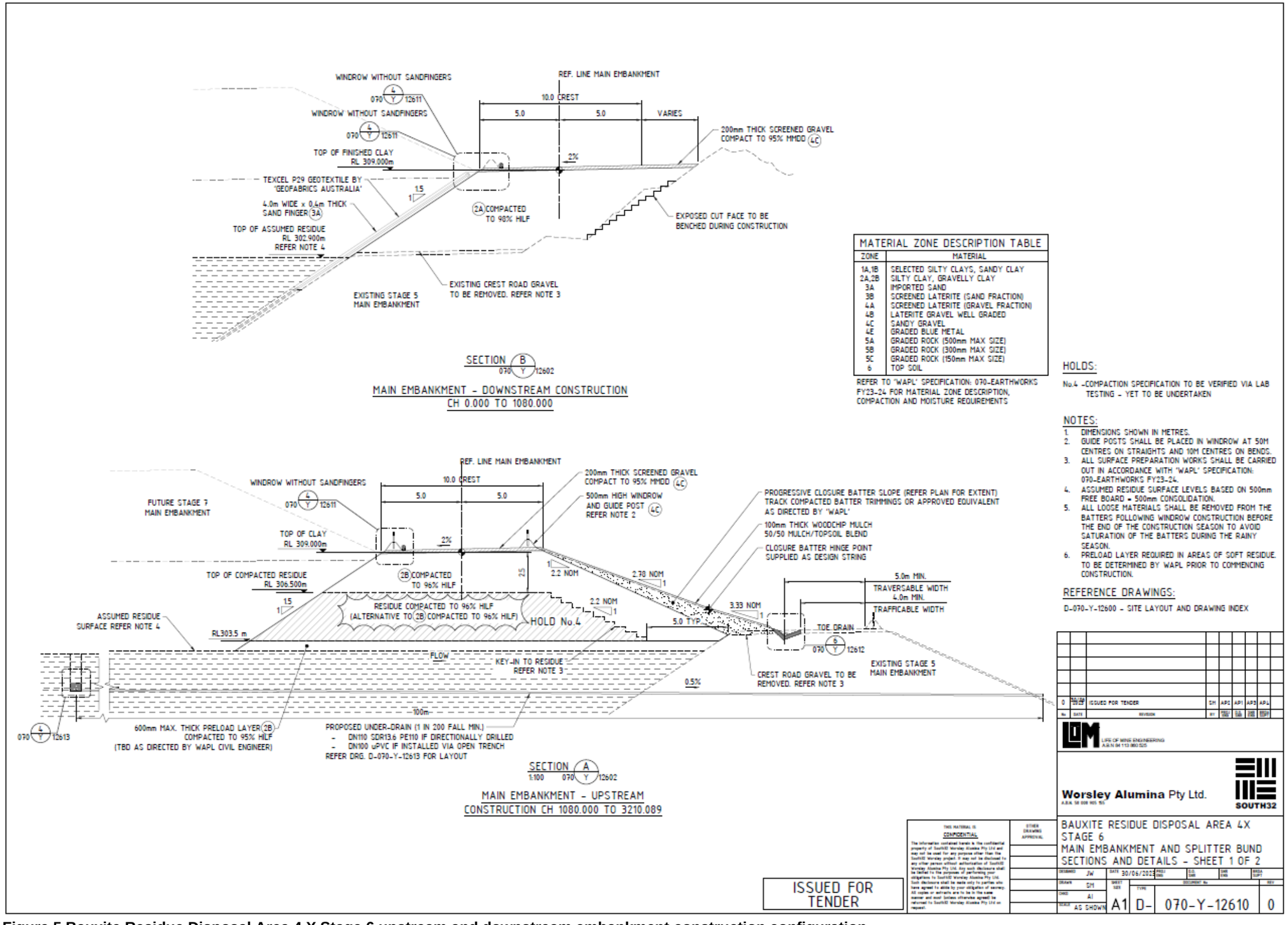


Figure 4 Bauxite Residue Disposal Area 4 X Stage 6 piezometer, amphiroller entry points and surface water drainage infrastructure locations



MATERIAL ZONE DESCRIPTION TABLE	
ZONE	MATERIAL
1A,1B	SELECTED SILTY CLAYS, SANDY CLAY
2A,2B	SILTY CLAY, GRAVELLY CLAY
3A	IMPORTED SAND
3B	SCREENED LATERITE (SAND FRACTION)
4A	SCREENED LATERITE (GRAVEL FRACTION)
4B	LATERITE GRAVEL WELL GRADED
4C	SANDY GRAVEL
4E	GRADED BLUE METAL
5A	GRADED ROCK (500mm MAX SIZE)
5B	GRADED ROCK (300mm MAX SIZE)
5C	GRADED ROCK (150mm MAX SIZE)
6	TOP SOIL

REFER TO 'WAPL' SPECIFICATION: 070-EARTHWORKS FY23-24 FOR MATERIAL ZONE DESCRIPTION, COMPACTION AND MOISTURE REQUIREMENTS

HOLDS:

No.4 -COMPACTION SPECIFICATION TO BE VERIFIED VIA LAB TESTING - YET TO BE UNDERTAKEN

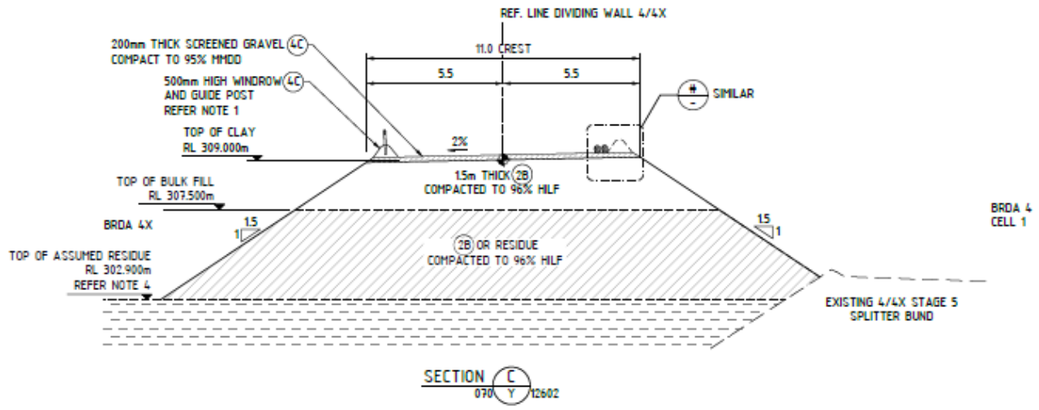
NOTES:

1. DIMENSIONS SHOWN IN METRES.
2. GUIDE POSTS SHALL BE PLACED IN WINDROW AT 50M CENTRES ON STRAIGHTS AND 10M CENTRES ON BENDS.
3. ALL SURFACE PREPARATION WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH 'WAPL' SPECIFICATION: 070-EARTHWORKS FY23-24.
4. ASSUMED RESIDUE SURFACE LEVELS BASED ON 500mm FREE BOARD + 500mm CONSOLIDATION.
5. ALL LOOSE MATERIALS SHALL BE REMOVED FROM THE BATTERS FOLLOWING WINDROW CONSTRUCTION BEFORE THE END OF THE CONSTRUCTION SEASON TO AVOID SATURATION OF THE BATTERS DURING THE RAINY SEASON.
6. PRELOAD LAYER REQUIRED IN AREAS OF SOFT RESIDUE. TO BE DETERMINED BY WAPL PRIOR TO COMMENCING CONSTRUCTION.

REFERENCE DRAWINGS:

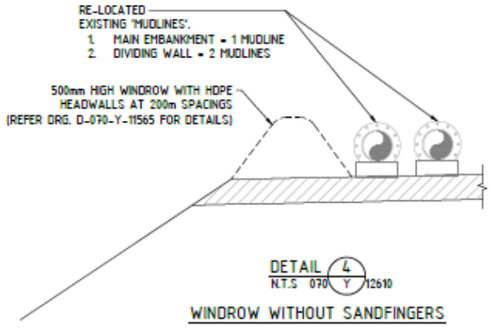
D-070-Y-12600 - SITE LAYOUT AND DRAWING INDEX

Figure 5 Bauxite Residue Disposal Area 4 X Stage 6 upstream and downstream embankment construction configuration



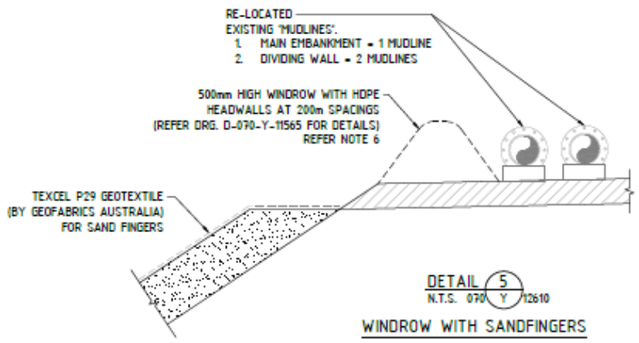
SECTION C 070 Y 12602

SPLITTER BUND - CH 0.000 TO 878.576



DETAIL 4 N.T.S 070 Y 12610

WINDROW WITHOUT SANDFINGERS



DETAIL 5 N.T.S. 070 Y 12610

WINDROW WITH SANDFINGERS

NOTES:

1. GUIDE POSTS SHALL BE PLACED IN WINDROW AT 50M CENTRES ON STRAIGHTS AND 10M CENTRES ON BENDS.
2. ALL SURFACE PREPARATION WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH 'WAPL' SPECIFICATION: 070-EARTHWORKS FY23-24.
3. ALL LOOSE MATERIALS SHALL BE REMOVED FROM THE BATTERS FOLLOWING WINDROW CONSTRUCTION BEFORE THE END OF THE CONSTRUCTION SEASON TO AVOID SATURATION OF THE BATTERS DURING THE RAINY SEASON.
4. ASSUMED RESIDUE SURFACE LEVELS BASED ON 500mm FREE BOARD - 500mm CONSOLIDATION.
5. PRELOAD LAYER REQUIRED IN AREAS OF SOFT RESIDUE. TO BE DETERMINED BY WAPL PRIOR TO COMMENCING CONSTRUCTION.
6. IN AREAS WHERE THERE ARE NO SAND FINGERS - WINDROW TO BE REMOVED IMMEDIATELY IN ADVANCE OF LAYING MUD PIPING. PAGE 31 OF EARTHWORKS SPECIFICATION.

REFERENCE DRAWINGS:

D-070-Y-12600 - SITE LAYOUT AND DRAWING INDEX

MATERIAL ZONE DESCRIPTION TABLE

ZONE	MATERIAL
1A,1B	SELECTED SILTY CLAYS, SANDY CLAY
2A,2B	SILTY CLAY, GRAVELLY CLAY
3A	IMPORTED SAND
3B	SCREENED LATERITE (SAND FRACTION)
4A	SCREENED LATERITE (GRAVEL FRACTION)
4B	LATERITE GRAVEL WELL GRADED
4C	SANDY GRAVEL
4E	GRADED BLUE METAL
5A	GRADED ROCK (500mm MAX SIZE)
5B	GRADED ROCK (300mm MAX SIZE)
5C	GRADED ROCK (150mm MAX SIZE)
6	TOP SOIL

REFER TO 'WAPL' SPECIFICATION: 070-EARTHWORKS FY23-24 FOR MATERIAL ZONE DESCRIPTION, COMPACTION AND MOISTURE REQUIREMENTS

No	DATE	REVISION	BY			
0	30/06/2023	ISSUED FOR TENDER	SM	APS	API	APS	APL

LOM LIFE OF MINE ENGINEERING A.B.N 84 113 880 505

Worsley Alumina Pty Ltd. A.B.N. 56 008 965 185

SOUTH32

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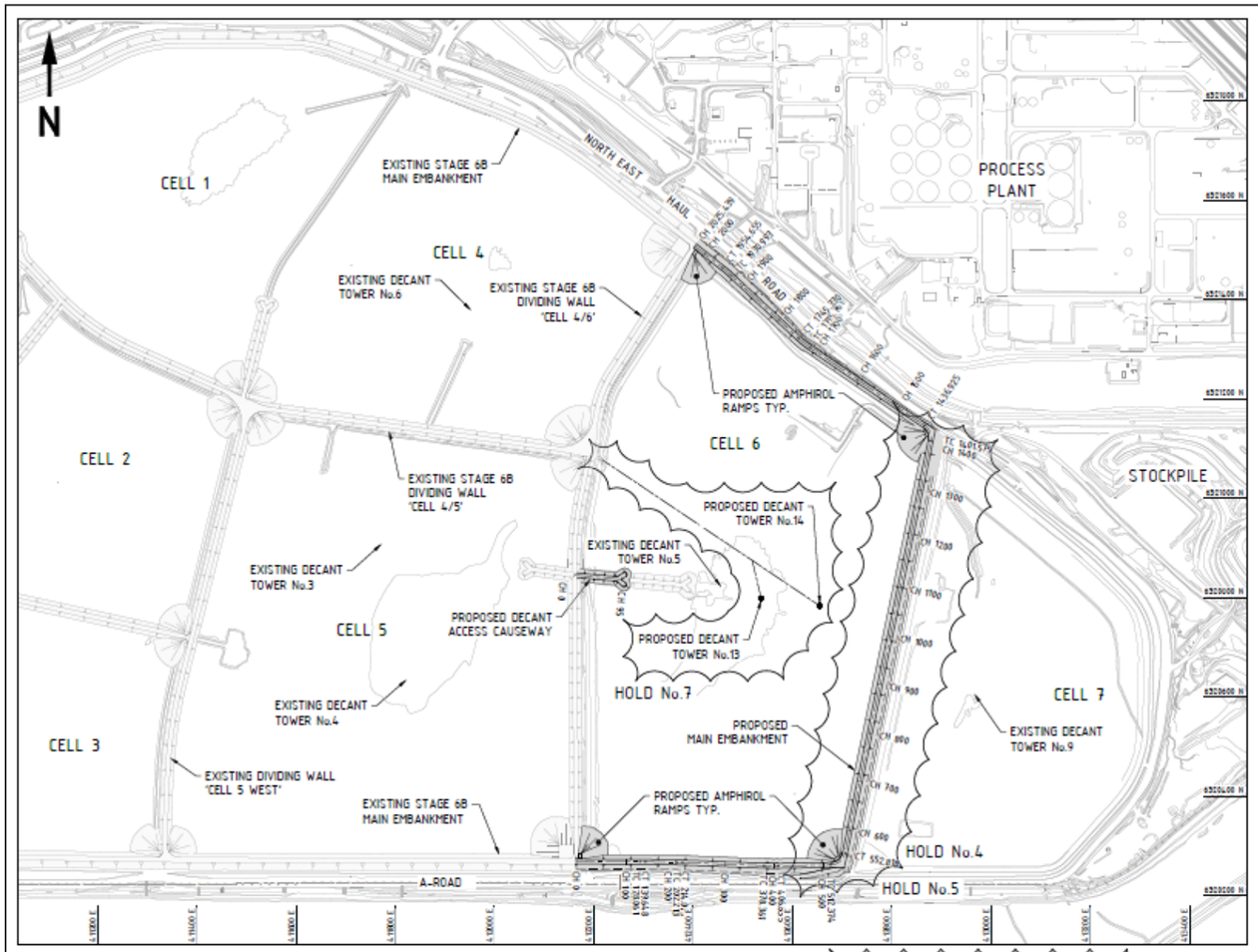
OTHER DRAWING APPROVAL

BAUXITE RESIDUE DISPOSAL AREA 4X
STAGE 6
MAIN EMBANKMENT AND SPLITTER BUND
SECTIONS AND DETAILS - SHEET 2 OF 2

DESIGNED	DRAWN	CHKD	ISSUED	DATE	SHEET SIZE	TYPE	DOCUMENT No.	REV
JW	SM	AI	AS SHOWN	30/06/2023	A1	D-	070-Y-12611	0

ISSUED FOR TENDER

Figure 6: Bauxite Residue Disposal Area 4X Stage 6 (Cell 6) centerline embankment configuration and windrows



PLAN
1:5000

MAIN EMBANKMENT SETOUT				
CHAINAGE	EASTING (m)	NORTHING (m)	RL (m)	RADIUS
0.000	412164.473	6320268.056	290.500	
128.061	412292.533	6320267.494	290.500	
133.054	412298.326	6320267.469	290.500	1000.0
139.648	412304.119	6320267.376	290.500	
202.213	412366.676	6320266.377	290.500	
208.114	412372.577	6320266.283	290.500	500.0
214.015	412378.473	6320266.049	290.500	
378.361	412542.691	6320259.547	290.500	
392.598	412556.920	6320258.904	290.500	500.0
406.835	412571.159	6320259.231	290.500	
512.374	412676.682	6320261.065	290.500	
532.596	412700.646	6320261.481	290.500	30.0
552.818	412705.531	6320284.945	290.500	
1401.575	412878.536	6321115.883	290.500	
1419.250	412882.623	6321135.512	290.500	30.0
1436.925	412866.049	6321146.796	290.500	
1715.761	412635.562	6321303.720	290.500	
1730.545	412623.317	6321312.057	290.500	192.5
1745.330	412612.492	6321322.169	290.500	
1930.993	412476.816	6321448.908	290.500	
1942.824	412468.166	6321456.989	290.500	307.5
1954.655	412458.920	6321464.380	290.500	
2025.439	412403.633	6321508.500	290.500	

HOLD No.1

NOTES:
1. HORIZONTAL DATUM: WORSLEY LOCAL REFINERY GRID
   VERTICAL DATUM: AUSTRALIAN HEIGHT DATUM (AHD)m
2. SURVEY SUPPLIED BY:
   - 'FUGRO' - AERIAL SURVEY (2022)
3. DESIGN LEVELS SHOWN ARE TO TOP OF CLAY AND TOP OF RESIDUE UNLESS NOTED OTHERWISE.
4. DIMENSIONS SHOWN IN METRES U.N.O.
5. USE FIGURED DIMENSIONS, DO NOT SCALE OFF DRAWING.
6. THIS DESIGN HAS INCORPORATED THE UNDERGROUND AS-BUILT DATA DETAILED IN D-300-G-30201 REVISION 9.
7. EXISTING UNDERGROUND SERVICES ARE NOT SHOWN ON THIS DRAWING U.N.O. THE CONTRACTOR SHALL CONTACT THE RELEVANT AUTHORITIES TO DETERMINE THE PRESENCE OF UNDERGROUND SERVICES (INCLUDING SOUTH 32 INSTRUMENTATION) PRIOR TO COMMENCEMENT OF ANY WORKS.
8. ALL WORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH 'WAPL' SPECIFICATIONS: 070-EARTHWORKS FY'23-24, 070-HAUL ROADS FY17-18 AND 070-PVC PIPE SUPPLY.
9. ALL RELEVANT WORKING PERMITS SHALL BE ACQUIRED PRIOR TO COMMENCEMENT OF ANY WORKS.
10. GUIDE POSTS SHALL BE PLACED IN WINDROW AT 50m CENTRES ON STRAIGHTS AND 10m CENTRES ON BENDS.
11. ALL LOOSE MATERIALS SHALL BE REMOVED FROM THE BATTERS FOLLOWING WINDROW CONSTRUCTION BEFORE THE END OF THE CONSTRUCTION SEASON TO AVOID SATURATION OF THE BATTERS DURING THE RAINY SEASON.

NOTE:
DESIGN TO BE REVISED PRIOR TO CONSTRUCTION UPON RECEIVING SURVEY FOR TOP OF CLAY EDGE FOLLOWING SURFACE PREPARATION WORKS.

HOLDS:
- No.1 - ALIGNMENT AND TOE OF MAIN EMBANKMENT TO BE REVISED FOLLOWING SURFACE PREPARATION WORKS.
- No.2 - TOE DRAINAGE ALIGNMENTS TO BE SURVEYED AND LEVELS CONFIRMED PRIOR TO CONSTRUCTION.
- No.3 - EXISTING UNDER-DRAINAGE PIPE LOCATIONS AND FINAL RESIDUE SURFACE TO BE SURVEYED PRIOR TO CONSTRUCTION OF INTERNAL DRAINAGE.
- No.4 - CELL 6/7 EMBANKMENT DESIGN ON HOLD PENDING DESIGN OF CELL 7 RCL EXTENSION
- No.5 - DETAILED DESIGN OF 'A' ROAD ACCESS/HAUL RAMP EXTENSIONS TO BE FINALISED FOLLOWING COMPLETION OF BRDA'S OVERALL ACCESS RAMP AND HAUL RAMP STRATEGY PLAN
- No.6 - COMPACTION SPECIFICATION TO BE VERIFIED VIA LAB TESTING - YET TO BE UNDERTAKEN
- No.7 - PROPOSED DECANT TOWER RAISES AND PIPELINES ON HOLD PENDING OUTCOME OF BRDA 5 DECANT SYSTEM RE-DESIGN STUDY

REFERENCE DRAWINGS

CIVIL
- D-070-Y-11900 - SITE LAYOUT PLAN AND DRAWING INDEX
- D-070-Y-11901 - SITE CLEARANCE AND PREPARATION PLAN
- D-070-Y-11902 - MAIN EMBANKMENT GENERAL ARRANGEMENT
- D-070-Y-11903 - MAIN EMBANKMENT DRAINAGE PLAN
- D-070-Y-11904 - MAIN EMBANKMENT INTERNAL DRAINAGE PLAN
- D-070-Y-11905 - MAIN EMBANKMENT CROSS SECTIONS SHEET 1 OF 3
- D-070-Y-11906 - MAIN EMBANKMENT CROSS SECTIONS SHEET 2 OF 3
- D-070-Y-11907 - MAIN EMBANKMENT CROSS SECTIONS SHEET 3 OF 3
- D-070-Y-11908 - MAIN EMBANKMENT SECTIONS AND DETAILS SHEET 1 OF 2
- D-070-Y-11909 - MAIN EMBANKMENT SECTIONS AND DETAILS SHEET 2 OF 2
- D-070-Y-11910 - MAIN EMBANKMENT DRAINAGE SECTIONS AND DETAILS
- D-070-Y-11911 - MAIN EMBANKMENT DRAINAGE TOE DRAIN PROFILES
- D-070-Y-11912 - PUMPED DECANT SHAFT No.2 GENERAL ARRANGEMENT (PART OF BRDA 5 STAGE 6B DRAWING SET)
- D-070-Y-11913 - MAIN EMBANKMENT AMPHIROL RAMP PLAN AND SECTION
- D-070-Y-11914 - MAIN EMBANKMENT INSTRUMENTATION GENERAL ARRANGEMENT
- D-070-Y-11915 - MAIN EMBANKMENT INSTRUMENTATION SECTIONS
- D-070-Y-11916 - MAIN EMBANKMENT CLOSED LIQUOR ARRANGEMENT (CELL 5) (PART OF BRDA 5 STAGE 6B DRAWING SET)
- D-070-Y-11917 - MAIN EMBANKMENT CLOSED LIQUOR ARRANGEMENT SHEET 1 OF 3
- D-070-Y-11918 - MAIN EMBANKMENT CLOSED LIQUOR ARRANGEMENT SHEET 2 OF 3
- D-070-Y-11919 - MAIN EMBANKMENT CLOSED LIQUOR ARRANGEMENT SHEET 3 OF 3
- D-070-Y-11920 - MAIN EMBANKMENT CLOSED LIQUOR UPSTREAM CONSTRUCTION SECTIONS AND DETAILS
- D-070-Y-11921 - MAIN EMBANKMENT CLOSED LIQUOR DOWNSTREAM CONSTRUCTION SECTIONS AND DETAILS

CONCRETE
- D-070-C-10060 - PUMPED DECANT SHAFT No. 2 EXTENSIONS SECTIONS AND DETAILS
- D-070-C-10061 - DECANT TOWER No. 10 AND 11 FOOTING ARRANGEMENT AND DETAILS

PIPING
- D-070-P-10220 - PUMPED DECANT SHAFT No. 2 RAISE PIPE AND SHAFT DETAILS
- D-070-P-10221 - DECANT TOWER No. 13 AND 14 PIPELINE PLANS AND PROFILES
- D-070-P-10222 - DECANT TOWER No. 13 AND 14 PIPELINE SECTIONS AND DETAILS
- D-070-P-10223 - DECANT TOWER No. 13 AND 14 DECANT PIPE AND CAGE DETAILS
- D-070-P-10224 - DECANT TOWER No. 13 AND 14 CAGE DETAILS
- D-070-P-10225 - DECANT TOWER No. 13 AND 14 CAGE ARRANGEMENT AND DETAILS
- D-070-P-10227 - DECANT TOWER No. 3, 4, 5 & 9 TWO CAGE EXTENSION SECTIONS AND DETAILS

ISSUED FOR TENDER

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OTHER DRAWING APPROVAL

No	DATE	REVISION	BY	PROJ ENG	S.E. SME	SME ENG	SME SUPT
0	31.05.2023	ISSUED FOR TENDER	SM	APG	API	AP3	AP4

LOM LIFE OF MINE ENGINEERING A.B.N. 94 113 880 525

Worsley Alumina Pty Ltd. A.B.N. 56 108 145 150

SOUTH32

BAUXITE RESIDUE DISPOSAL AREA 5
STAGE 6A
SITE LAYOUT PLAN AND DRAWING INDEX

DESIGNED	DATE	PROJ ENG	S.E. SME	SME ENG	BRDA SUPT
JW	12.02.2019	MDS	SLS		

DRAWN	SHEET SIZE	TYPE	DOCUMENT No.	REV
SM	A1	D-	070-Y-11900	0

CHKD: AI
SCALE: 1:5000

Figure 7 Bauxite Residue Disposal Area 5 Cell 6 Stage 6 Site layout

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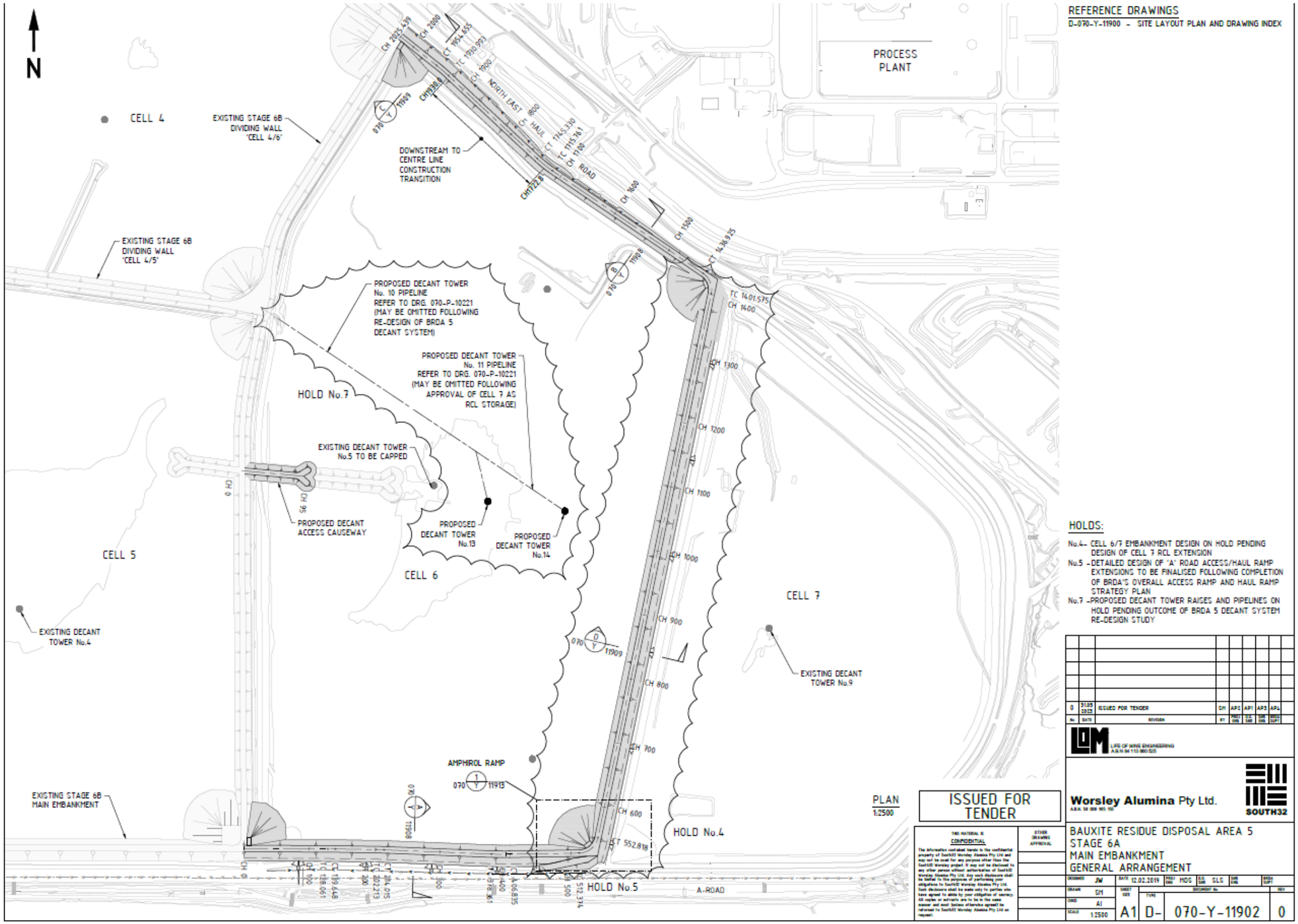

Figure 8 Bauxite Residue Disposal Area 5 Cell 6 Stage 6A changes to decant causeway and decant towers

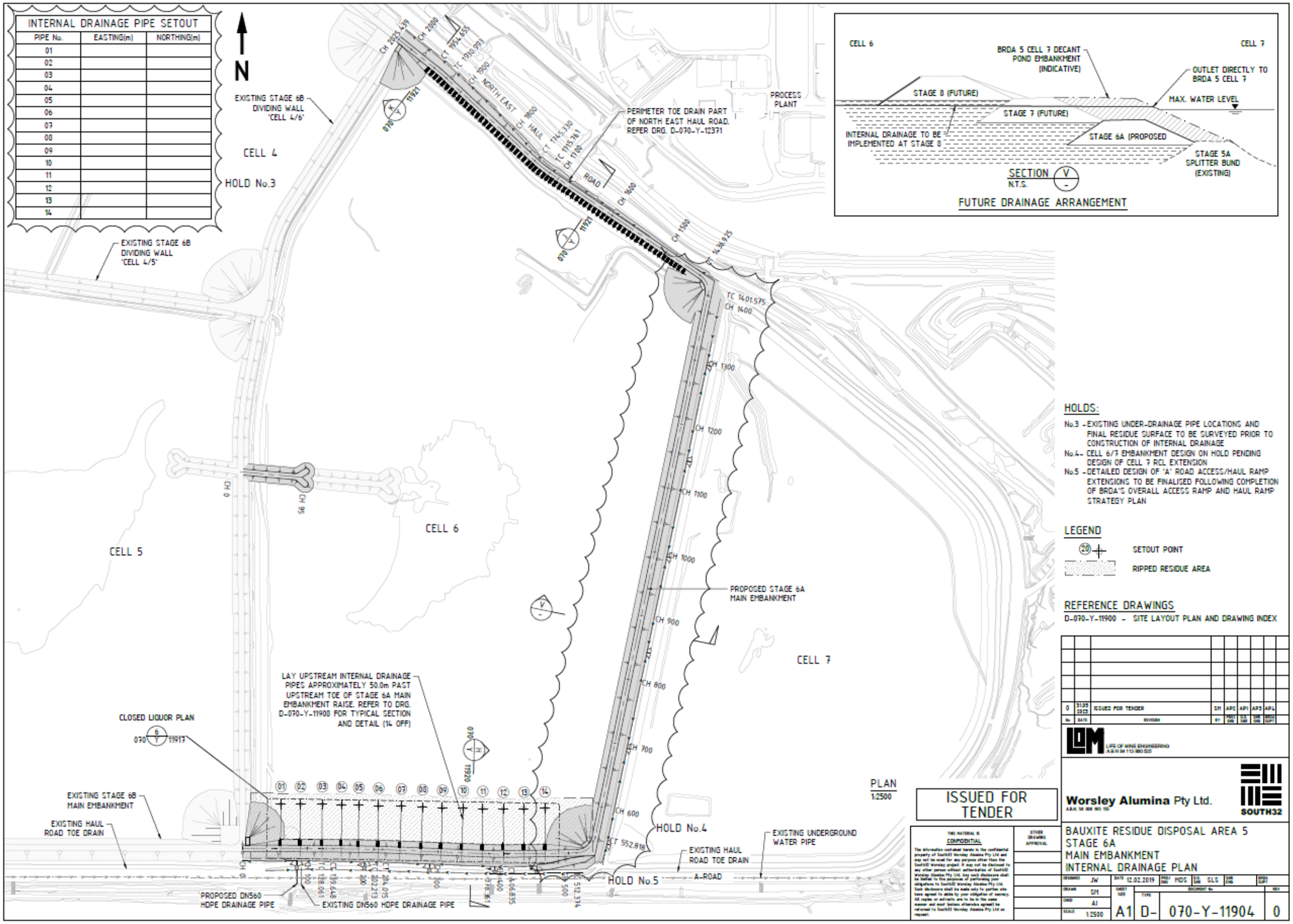

Figure 9 Bauxite Residue Disposal Area 5 Cell 6 Stage 6A upstream drainage configuration

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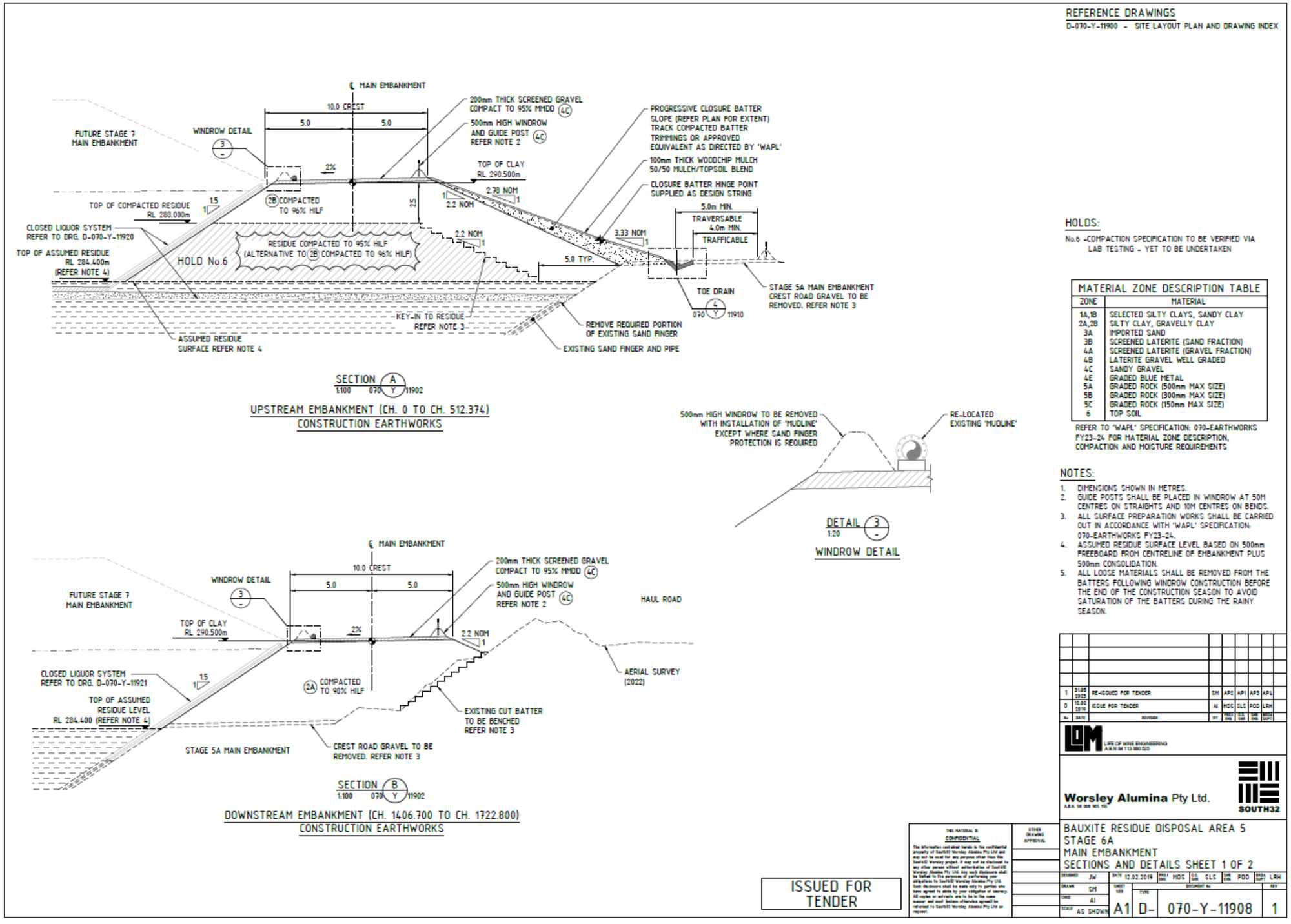

Figure 10 Bauxite Residue Disposal Area 5 Cell 6 Stage 6A upstream and downstream embankment configuration.