



**Works approval number** W2850/2025/1

**Works approval holder** South32 Worsley Alumina Pty Ltd

**ACN** 008 905 155

**Registered business address** Gastaldo Road  
ALLANSON WA 6225

**DWER file number** DER2017/001998-1~7

**Duration** 30/04/2025 to 30/04/2032

**Date of issue** 29/04/2025

**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

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

This works approval is granted to the works approval holder, subject to the attached conditions, on 29 April 2025, by:

**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 (Non-critical Containment Infrastructure)

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 | a) Bauxite residue will be confirmed at a minimum undrained shear strength of >40 kPa over a depth interval of 0.2 m to 2.0 m measured by in-situ vane shear testing in accordance with AS 1289 prior to construction of an embankment. | N/A                     |

|    | Infrastructure  | Design and construction / installation requirements   | Infrastructure location  |
|----|---|---|--|
|    |   | b) Vane shear testing shall be completed in the bauxite residue footprint   |  |
| 2. | Residue Underdrainage Infrastructure<br>BRDA 4 – Stage 8 and BRDA 5 Stage 7 | a) BRDA 4 Stage 8 includes <ul style="list-style-type: none"> <li>(i) Internal residue drainage pipes consisting of slotted PVC pipes shall be installed in accordance with AS/NZS 2032:2006 in a drainage layer (sand fingers or gravel) with a geofabric layer at intervals illustrated on Figure 2 on the upstream face of the upstream embankment raise;</li> <li>(ii) Drains extending 50m from the embankment upstream toes (approximately 3 per 100m);</li> <li>(iii) The internal drainage pipes are connected to the residue underdrainage system which drains to the northern valley pipe head dam (NVPHD).</li> </ul>  | Shown as 'Residue perforated drainage collection pipe' and 'residue internal drainage collector pipe' in Figure 4 of Schedule 1<br><br>Shown as 'Internal drainage Upstream perforated pipe' in Figure 5 of Schedule 1 |
|    |   | b) BRDA 5 Stage 7 includes <ul style="list-style-type: none"> <li>(i) Sand fingers on batter slopes placed at 32 m centers on the upstream face and be 0.4m thick and 4.0m wide</li> <li>(ii) Internal residue drainage pipes consisting of slotted PVC pipes shall be installed in accordance with AS/NZS 2032:2006 in a drainage layer (sand fingers or gravel) with a geofabric layer at intervals illustrated on Figure 4 on the upstream face of the upstream embankment raise;</li> <li>(iii) Drains extending 50m from the embankment upstream toes (approximately 3 per 100m) with exception of the eastern embankment of Cell 6 which will have drains installed during Stage 8</li> <li>(iv) The internal drainage pipes are connected to the residue underdrainage system which drains to the southern valley pipe head dam (SVPHD)</li> </ul> | Shown as 'Upstream internal drainage 'and 'collector pipe' in Figure 6 of Schedule 1<br><br>Shown as underdrainage trench' in Figure 7 of Schedule 1   |
| 3. | Tailings deposition infrastructure  | a) Embankment perimeter will be fitted with a mudline deposition pipeline that contains multiple discharge spigot attachment valves<br><br>b) The spigots are positioned approximately 72 m apart and are used to discharge bauxite residue sub-aerially around the cell perimeter of the embankment;   | N/A  |

|    | Infrastructure   | Design and construction / installation requirements  | Infrastructure location  |
|----|--|--|--|
|    |  | <p>c) Beach length of approximately 500m long with tailings deposition average of 55% solids and an average 0.6% degree beach slope;</p> <p>d) Use of amphibollers vehicles to accelerate drying and consolidation of bauxite residue on wet pour within 72hours to achieve an undrained shear strength of 28kPa for each layer to achieve 72% final solids content.</p>   |  |
| 4. | Surface dewatering infrastructure                      | <p>a) BRDA 4</p> <p>(i) Decant Towers 5 and 6 to be raised by 5m to 309m AHD and serve as the primary drainage feature</p> <p>(ii) Mobile surface pumps and floating turret systems to be installed to act as a secondary drainage feature</p> <p>b) BRDA 5</p> <p>(i) The primary drainage feature for BRDA 5 will be surface mounted pumps and floating uptake turrets will be used to manage the operational pond until a long term decant strategy has been finalized</p> <p>(ii) Decant towers 1, 2, 3, 4, 6, 12 and 13 at BRDA 5 to be raised to 295.5m AHD and serve as a secondary drainage feature;</p> <p>(iii) Capping of decant tower 7 in Cell 3 and 8 in Cell 1;</p> <p>(iv) BRDA 5's constructed decant causeways to be fitted with mobile surface pumps;</p> | Shown as 'Decant Tower' in Figures 2 and 3 of Schedule 1   |
| 5. | Pipelines, drains and decant conveyance infrastructure | <p>a) Bunding is provided on the upstream crest edge with surface water runoff collected via prefabricated HDPE drainage collectors attached to PVC droppers and directed into the BRDA;</p> <p>b) Conveyance infrastructure is configured to allow water transfer between site infrastructure, to allow stormwater from a 1:1000 year 72 hour duration Annual Recurrence Interval rainfall event to be contained within the onsite containment infrastructure on site.</p>  | Upstream crest edge bunding shown as 'high windrow' in Figures 18 and 19 of Schedule 1   |
| 6. | Stormwater diversion and drainage                      | <p>a) BRDA 4</p> <p>(i) Stormwater management infrastructure is installed to separately collect fresh water and residue impacted water and direct these separate streams to the Fresh Water Lake (FWL) and Refinery Catchment Lake (RCL), respectively.</p> <p>(ii) Infrastructure is installed to collect surface flowing stormwater from BRDA 4 and direct it via gravel lined spoon-drains at the toe of the</p>  | Shown as 'fresh water drain' and 'impacted water drain' in Figure 14 and as 'diversion drain', 'toe drain' and 'drop structure' in |

|    | Infrastructure | Design and construction / installation requirements   | Infrastructure location                 |
|----|----------------|---|---|
|    |                | <p>embankments leading to rock-lined drop structures to the base of BRDA.</p> <p>(i) Infrastructure is installed to direct surface flowing stormwater from the base of BRDA 4 to the Northern Valley Pipe Head Dam.</p> <p>b) BRDA 5</p> <p>(i) Stormwater to be collected via toe drains which are constructed on down-stream side of BRDA 5 embankments leading to rock-lined drop structures to the base of BRDA 5. From the base of BRDA 5, surface flowing stormwater will report to the diversion drain through the northern valley silt trap and into the southern arm of the freshwater lake.</p> | Figure 15 of Schedule 1                 |
| 7. | Piezometers    | a) Vibrating Wire Piezometers are installed beneath the proposed embankment in addition to the existing monitoring network to monitor pore water pressure profile for BRDA 4 Stage 8 and 5 Stage 7.   | Shown in Figure 16 and 17 of Schedule 1 |

### Environmental compliance reporting

2. 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) prepare and submit to the CEO an Environmental Compliance Report on that compliance.
3. The Environmental Compliance Report required by condition 2, 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.

### Infrastructure and equipment (Critical Containment Infrastructure)

4. 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),

as set out in Table 2.

**Table 2: Critical containment infrastructure design and construction requirements**

|    | Infrastructure   | Design and construction requirements   | Infrastructure location  |
|----|--|--|--|
| 8. | BRDA 4 Cells 1 and 2 (Stage 8)<br>Embankment lift of 5 m to RL 309 m AHD<br><br>And<br><br>BRDA 5 Cells 1, 2, 3, 5 and 6 (Stage 7)<br>Embankment lift of 5 m to RL 295.5 m AHD | <p>a) BRDA 4 Stage 8 – Main Embankment raise not to exceed RL 309m AHD</p> <p>b) Toe buttress to support the embankment lift of BRDA 4 constructed in accordance with the specifications documented in BRDA 4 Buttress Design Report (Life Of Mine Engineering, 2024)</p> <p>c) BRDA 5 Stage 7 – Main Embankment raise not to exceed to RL 295.5 m AHD</p> <p>d) Constructed using in-situ soils and bauxite residue, rolled and compacted to a minimum 96% Hilf PCWD placed within a moisture content tolerance of within 2% (+/-) of its optimum moisture content</p> <p>e) Crests with a 2% minimum fall towards the upstream edge with surface water runoff collected via prefabricated HDPE drainage collectors</p> <p>f) Batter slopes shaped to Vertical 1: 1.5 Horizontal unless otherwise shown on drawings;</p> <p>g) Main embankment crest to be 10m wide</p> <p>h) Construct amphiroller access ramps leading on to the crest of the embankments</p> | <p>Shown as 'Construction RL 309m' in Figures 8 and 9 of Schedule 1 and 'Construction RL 295.5m' in Figures 10 to 13 of Schedule 1</p> <p>Shown as 'crest' in Figures 18 and 19 of Schedule 1</p> <p>Shown as 'Amphirol ramp' in Figures 8 to 13 of Schedule 1</p> |
| 9. | Construction of dividing walls in BRDA 4 and BRDA 5  | <p>a) Dividing walls BRDA 4 and BRDA 5 to have a crest width of 9.2m</p> <p>b) Constructed using in-situ soils and bauxite residue, rolled and compacted to a minimum 96% PCWD (Hilf) and placed within a moisture content tolerance of within 2% (+/-) of its optimum moisture content. tested AS 1289 5.7.1.</p> <p>c) Batter slopes shaped to Vertical 1: 1.5 Horizontal unless otherwise shown on drawings;</p> <p>d) Minimum 2% cross fall towards upstream side of embankment</p>  | Shown as 'Dividing wall' and 'crest' in Figures 20 and Figure 21 of Schedule 1   |

### Critical containment Infrastructure report

5. The works approval holder must within 90 calendar days of the Critical Containment Infrastructure identified by condition 4 being constructed:
  - (a) undertake separate audits for BRDA 4 and BRDA5 of their compliance with the requirements of condition 4; and
  - (b) prepare and submit to the CEO separate Critical Containment Infrastructure Reports for BRDA 4 and BRDA5 on that compliance.
  
6. The Critical Containment Infrastructure Reports 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 4, has been built and installed in accordance with the requirements specified in condition 4;

- (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 4;
- (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 condition 4, the works approval holder must:
  - (a) Within 12 months after completing construction of the works specified in condition 4, the Licence Holder must provide to the CEO separate audits for BRDA 4 and 5. The audits 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 reports by 31 May 2032
8. The works approval holder must not commence deposition into BRDA 4 or BRDA 5 if the audits required by condition 7(a) indicates the minimum factor of safety requirements of the BRDA embankments at the final fill level of 309 and 295.5 m AHD respectively are not met.
9. The works approval holder must provide the audit reports to the CEO at least 30 days prior to commencement of deposition into BRDA 4 and 5.

### 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:
- be legible;
  - if amended, be amended in such a way that the original version(s) and any subsequent amendments remain legible and are capable of retrieval;
  - 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 3 have the meanings defined.

**Table 3: Definitions**

| Term                                       | Definition  |
|--|---|
| AS 1289                                    | Australian Standard 1289 - Methods of testing soil for engineering purposes   |
| AS/NZS 2032:2006                           | Installation of PVC pipe systems  |
| books                                      | has the same meaning given to that term under the EP Act.   |
| BRDA                                       | Bauxite residue drying area   |
| Centreline embankment construction         | The embankment crest is being raised vertically and does not move in relation to the upstream and downstream directions of subsequent raises  |
| CEO  | means Chief Executive Officer.<br>CEO for the purposes of notification means:<br><br>Director General<br>Department administering the <i>Environmental Protection Act 1986</i><br>Locked Bag 10<br>Joondalup DC WA 6919<br><br><a href="mailto:info@dwer.wa.gov.au">info@dwer.wa.gov.au</a> |
| critical containment infrastructure        | means the items of infrastructure listed in condition Table 2.  |
| 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 <i>Public Sector Management Act 1994</i> 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                              | means a report to satisfy the CEO that the conditioned infrastructure and/or equipment has been constructed and/or  |

| <b>Term</b>                      | <b>Definition</b>   |
|----------------------------------|---|
| Compliance Report                | installed in accordance with the works approval.  |
| EP Act                           | <i>Environmental Protection Act 1986 (WA).</i>  |
| EP Regulations                   | <i>Environmental Protection Regulations 1987 (WA).</i>  |
| Hilf density ratio               | Percentage ratio of the field wet density to that of peak converted wet density of the soil as determined by Hilf compaction test method                                |
| NVPHD                            | Northern valley pipe head dam.  |
| PCWD                             | Peak Converted Wet Density  |
| 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.   |
| TARP                             | Triggered Action Response Plan  |
| Total freeboard                  | Total freeboard is comprised of 300mm of operational freeboard and 200mm of beach freeboard.  |
| Upstream Embankment Construction | The tailings are usually discharged from the top of the dam crest creating a beach that becomes the foundation for future embankment raises.                            |
| 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.                 |

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**END OF CONDITIONS**

## Schedule 1: Maps

### Premises map

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

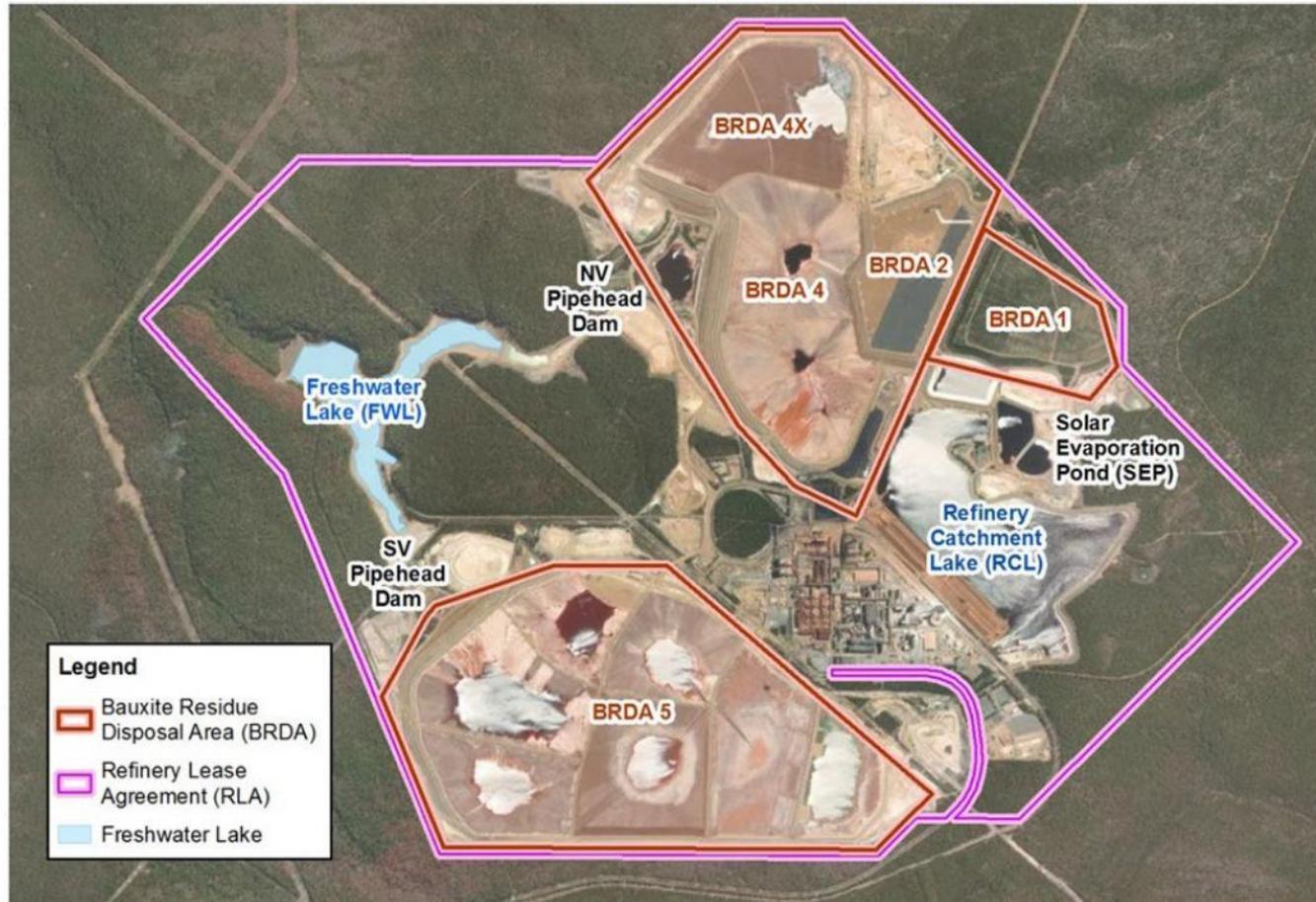


Figure 1: Map of the boundary of the prescribed premises

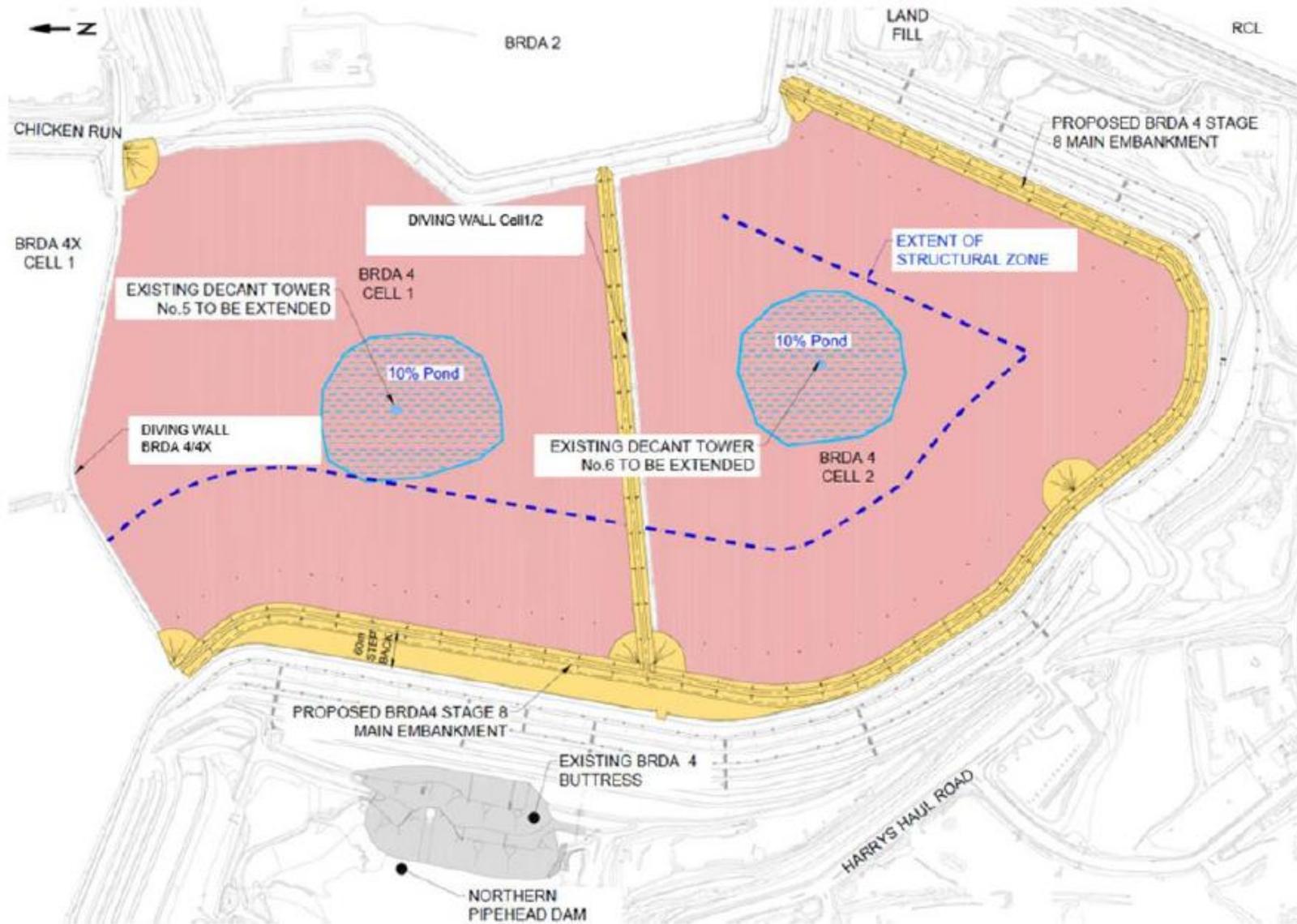


Figure 2: BRDA 4 Stage 8 Proposed Cell Configuration

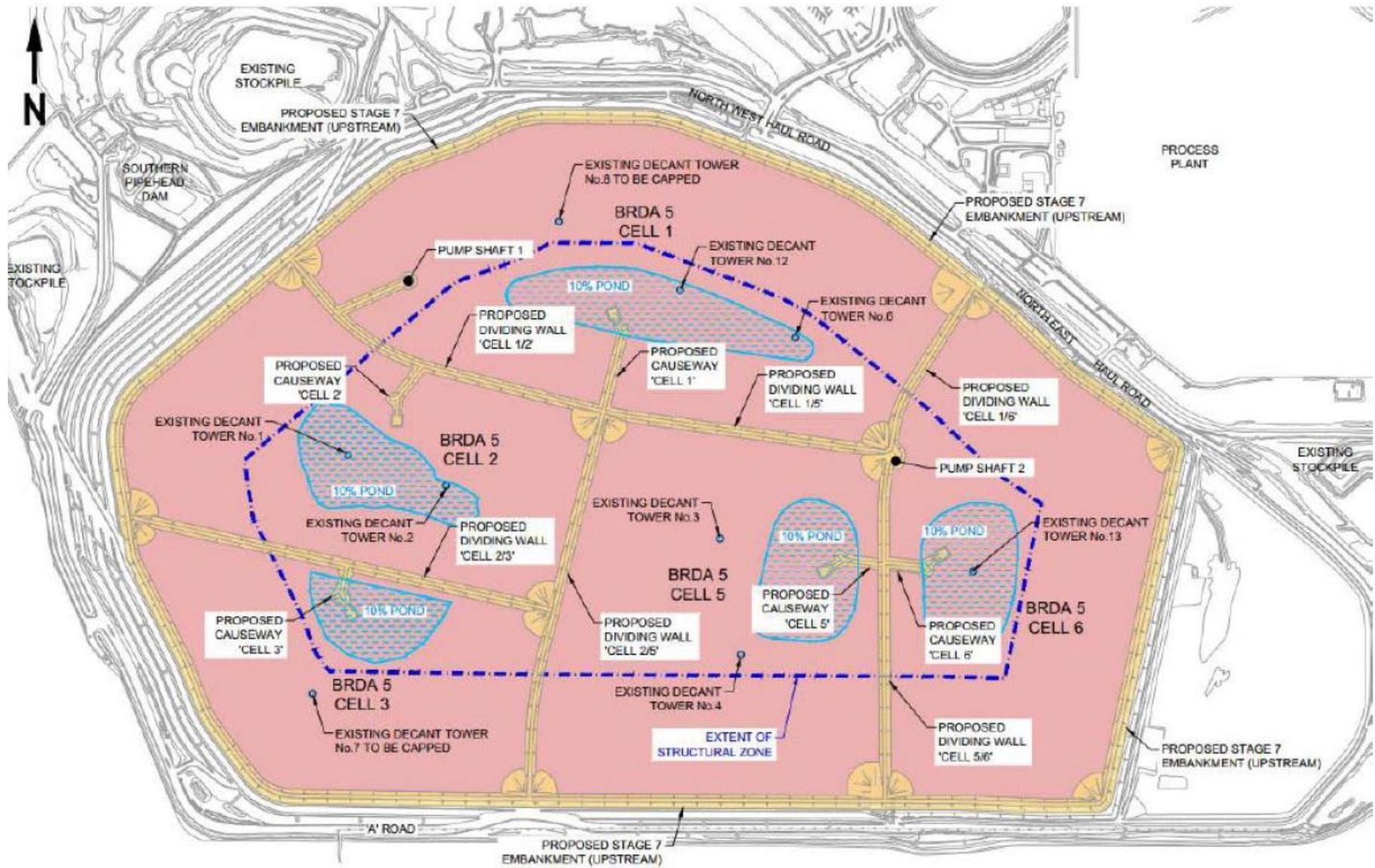


Figure 3: BRDA 5 Stage 7 Proposed Cell Configuration

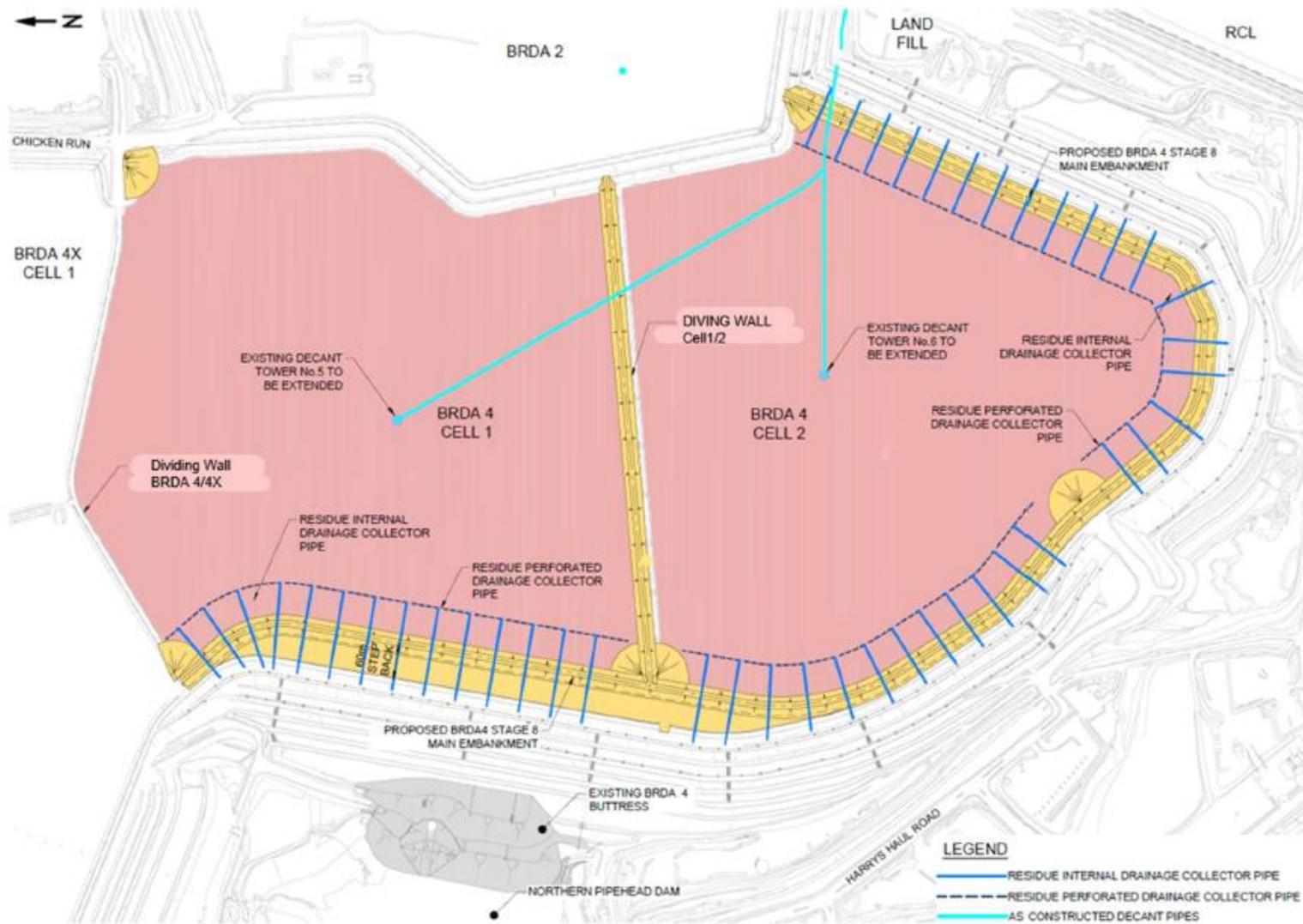
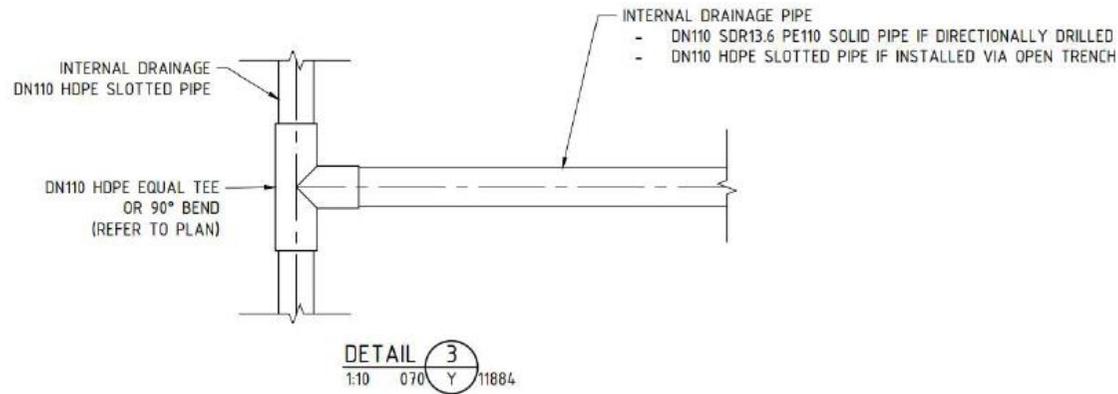


Figure 4: Residue Underdrainage Infrastructure - BRDA 4 Stage 8



INTERNAL DRAINAGE HDPE TO uPVC CONNECTION DETAIL

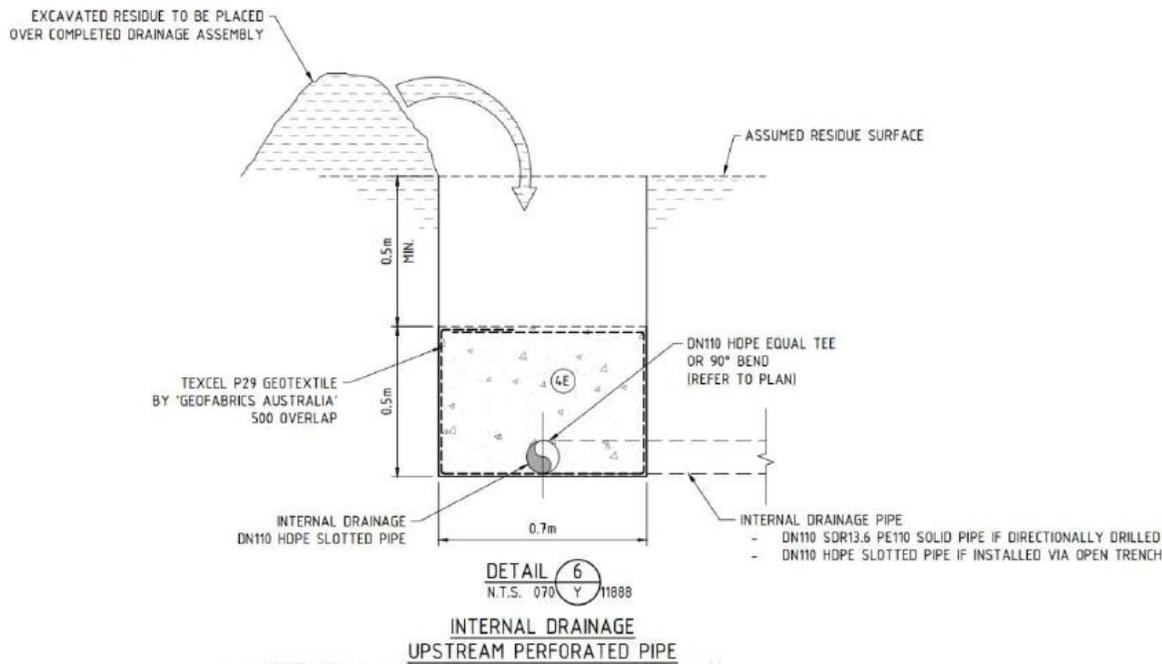


Figure 5: Connection of internal drainage connection pipes – BRDA 4 Stage 8

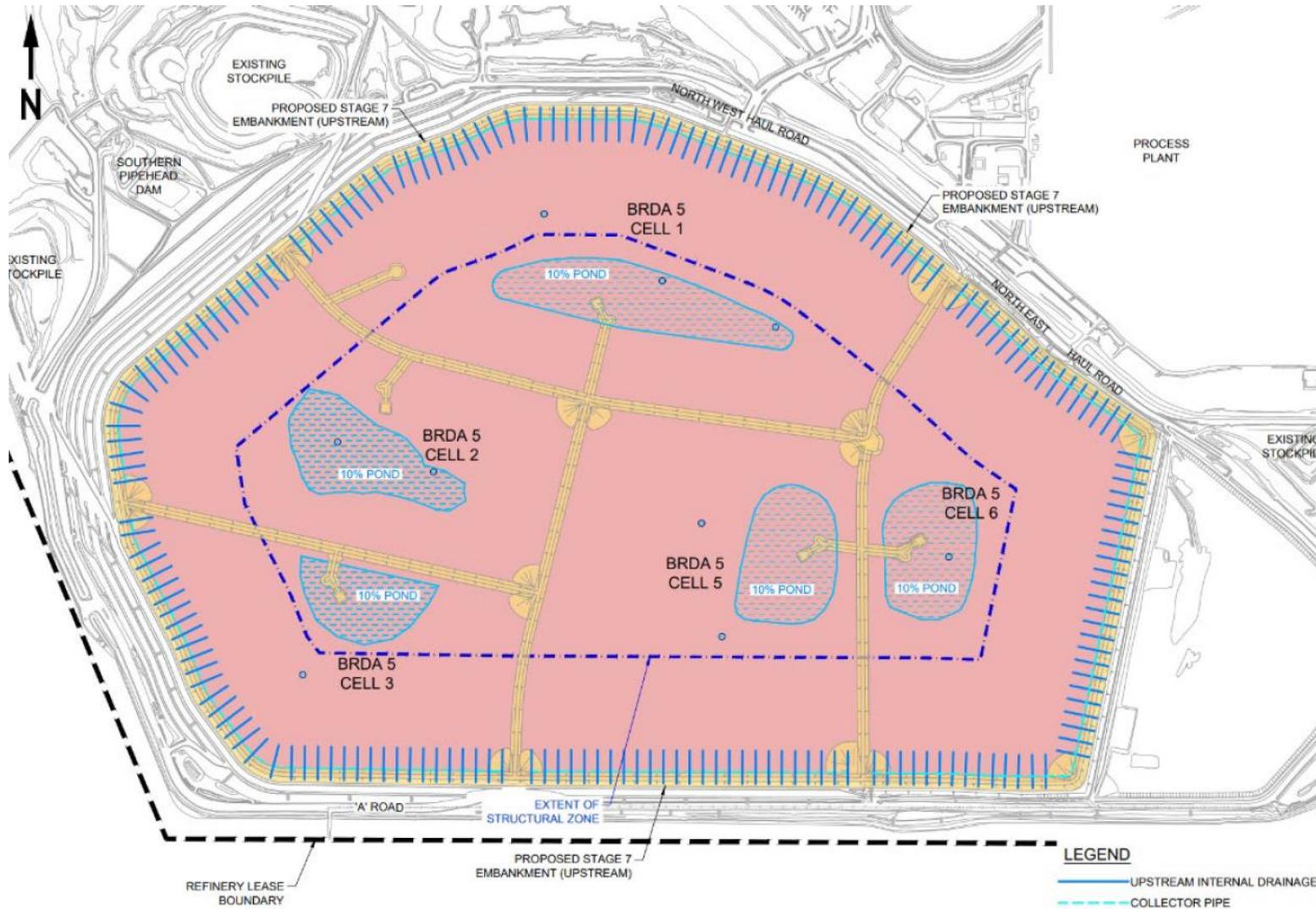


Figure 6: Residue Underdrainage Infrastructure - BRDA 5 Stage 7

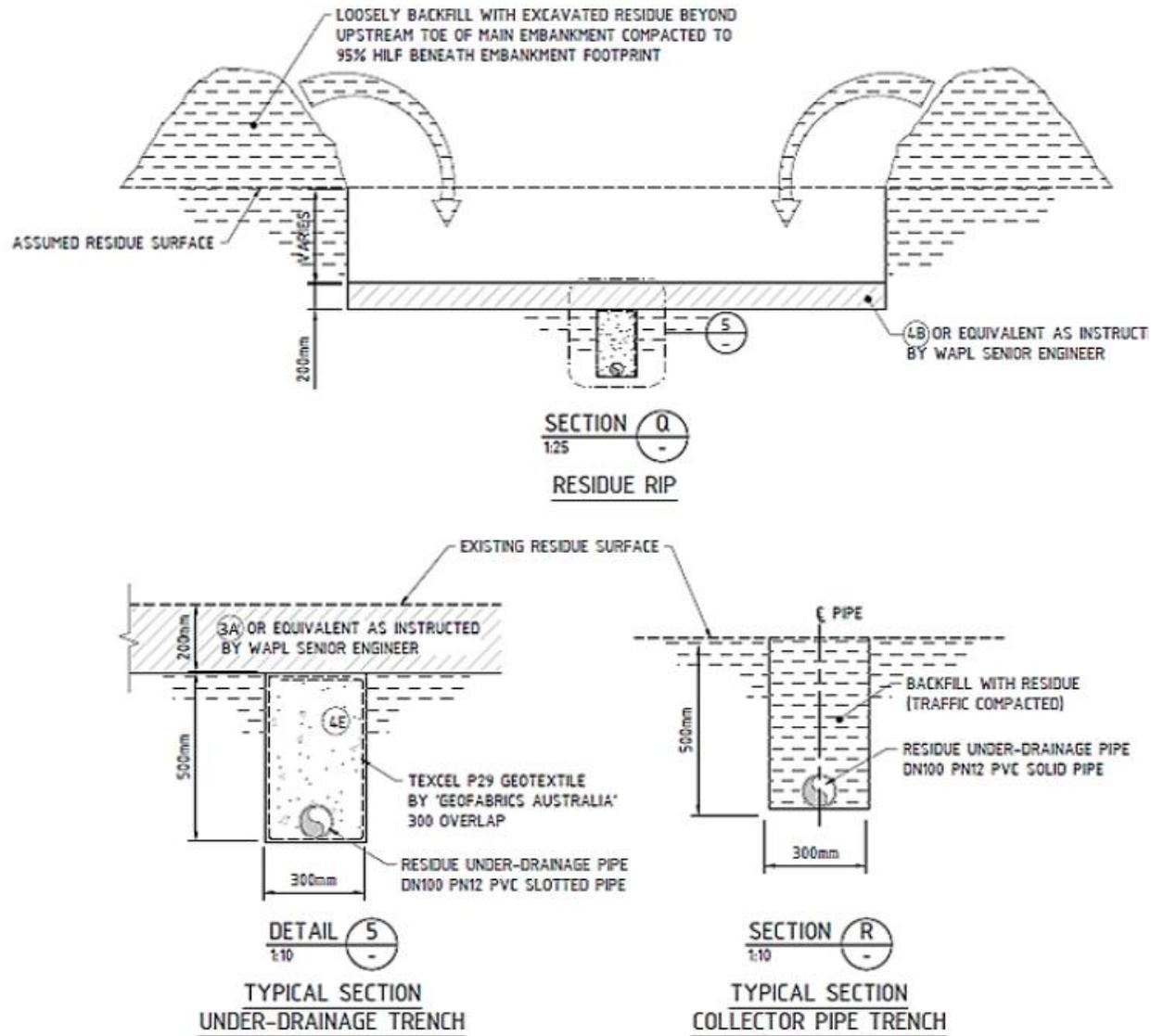


Figure 7: Underdrainage trench – BRDA 5 Stage 7







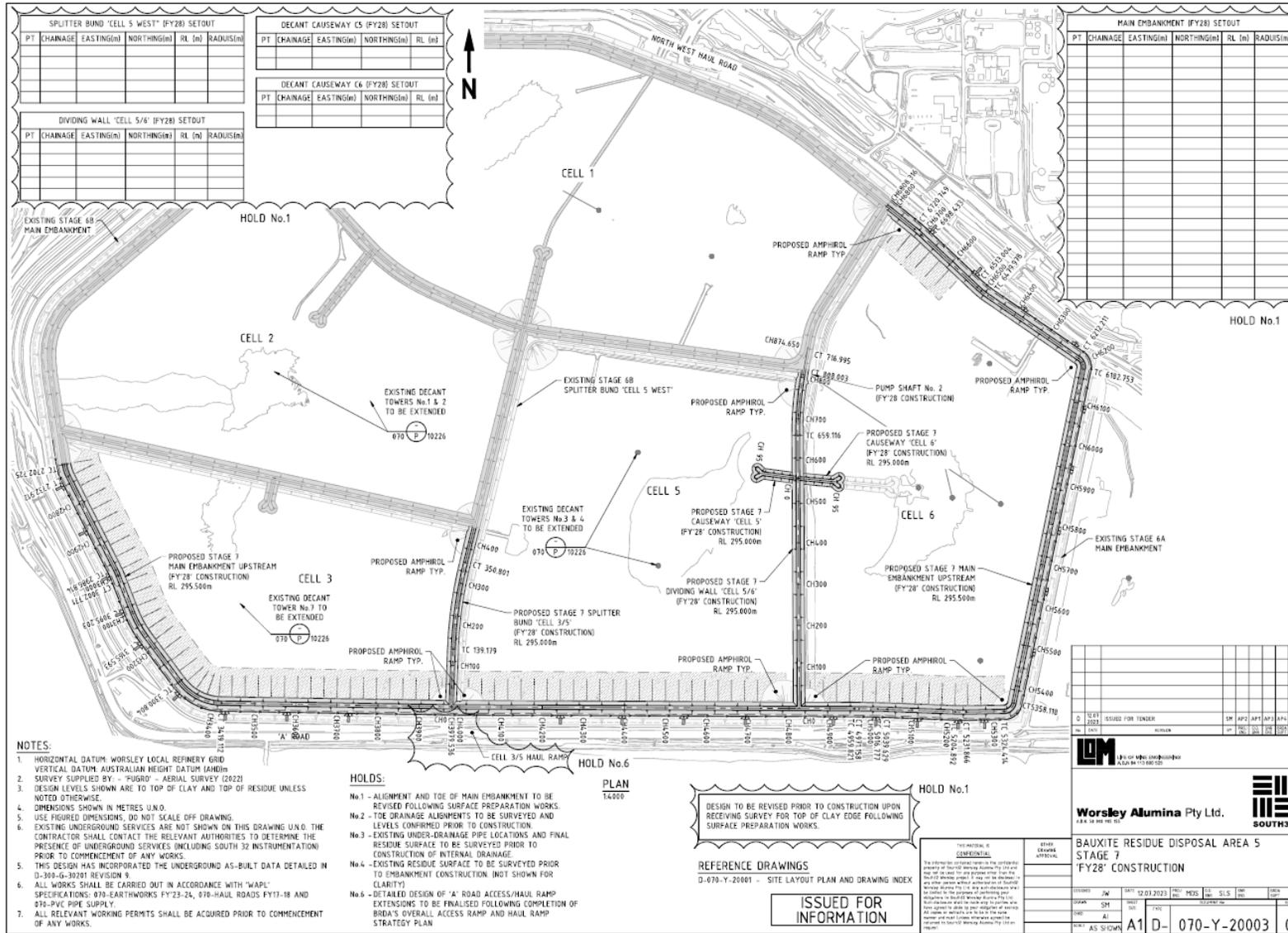


Figure 11: BRDA 5 Stage 7 FY2028- FY2029 works

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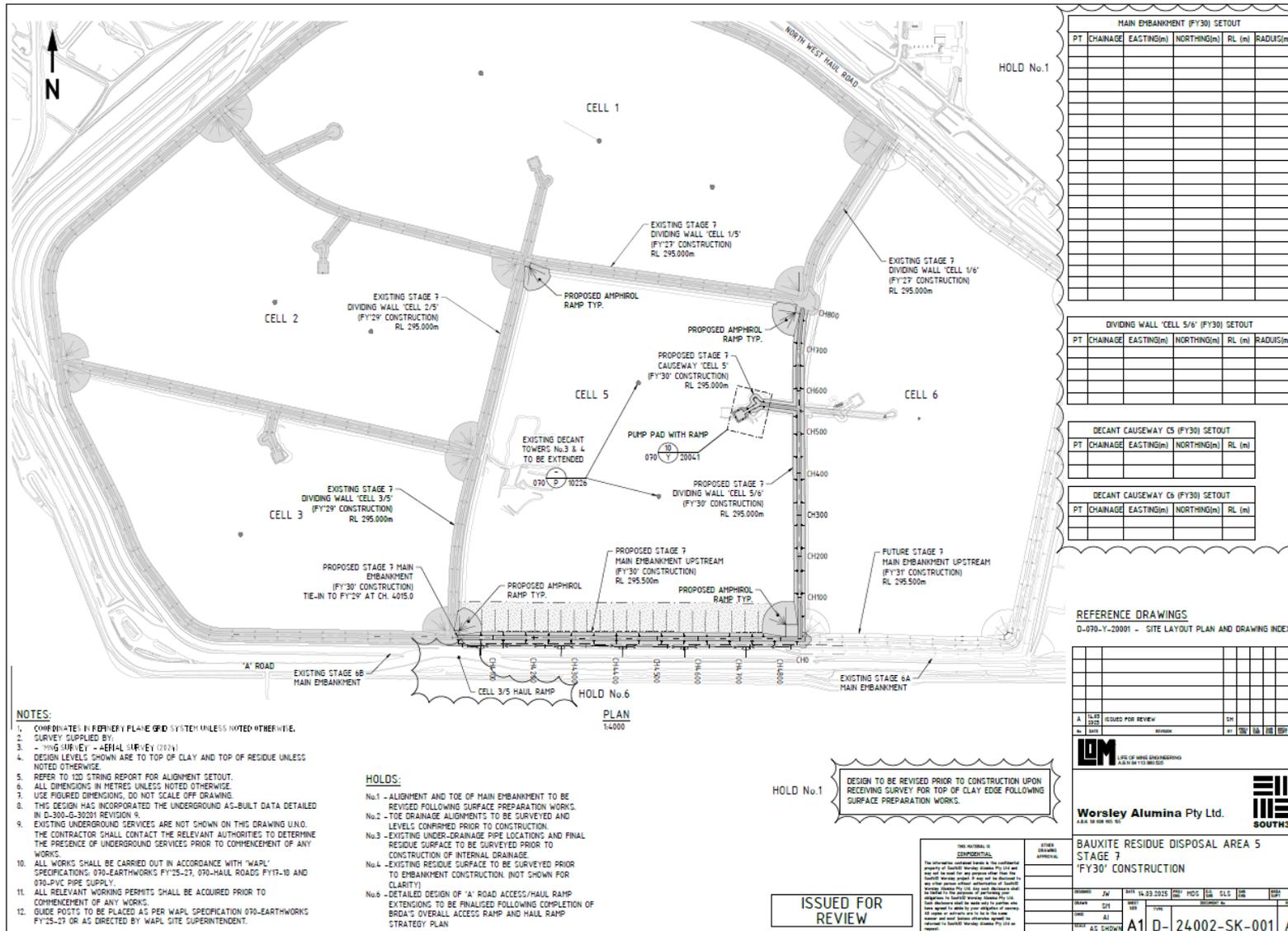


Figure 12: BRDA 5 Stage 7 FY2030 works

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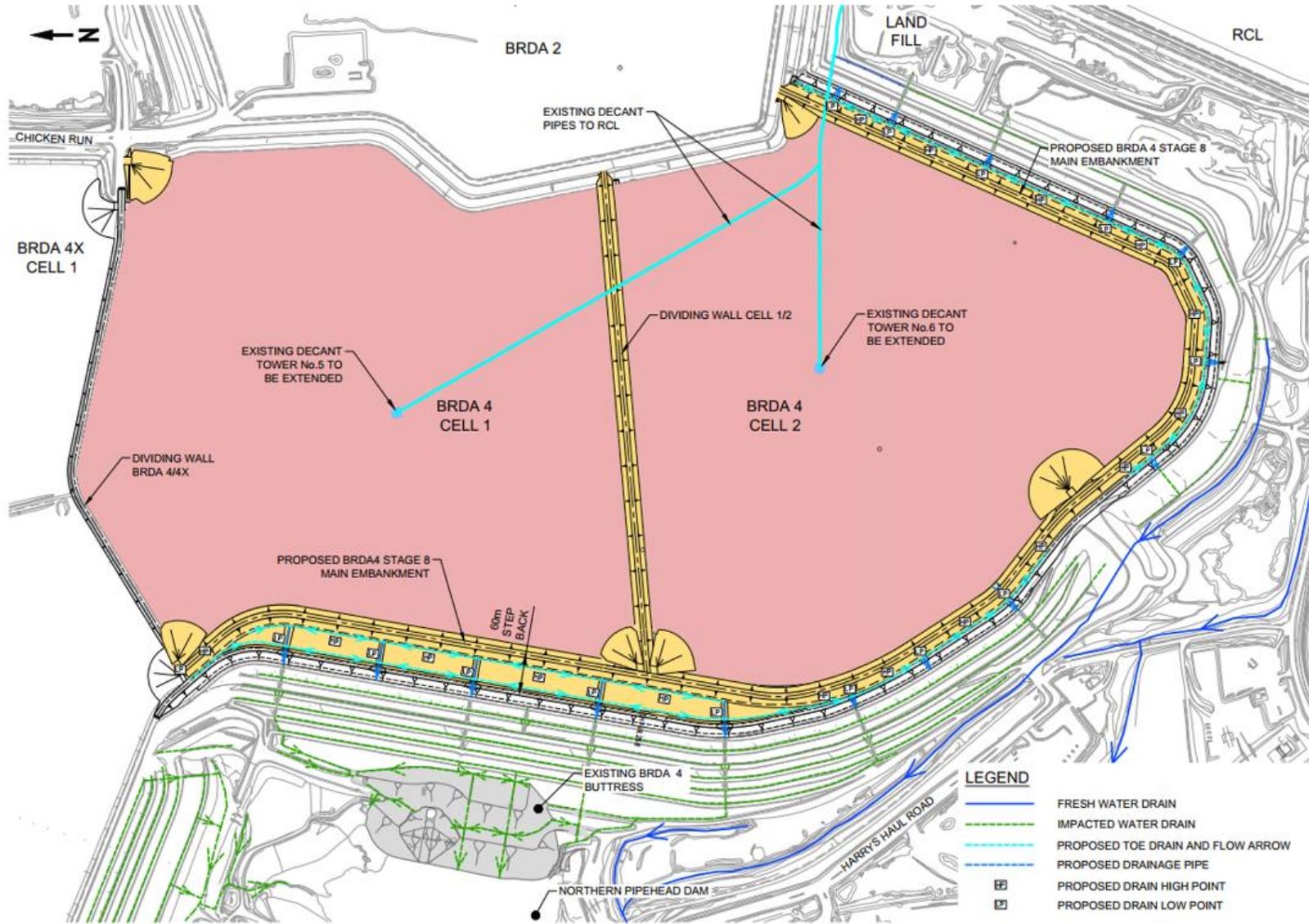


Figure 14: Stormwater (Freshwater) Drainage – BRDA4 Stage 8

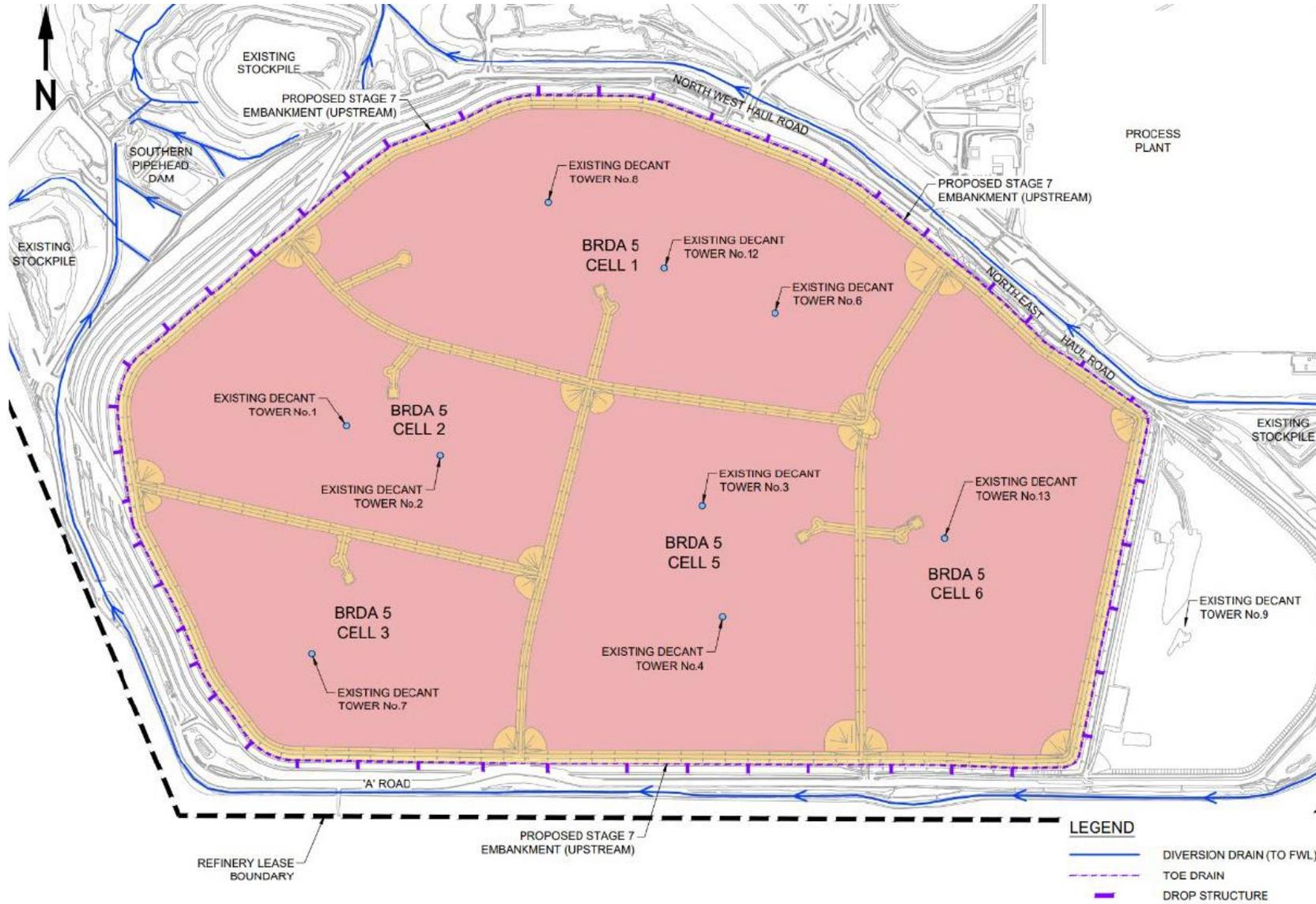


Figure 15: Diversion drain, toe drain and drop structure of BRDA 5 Stage 7



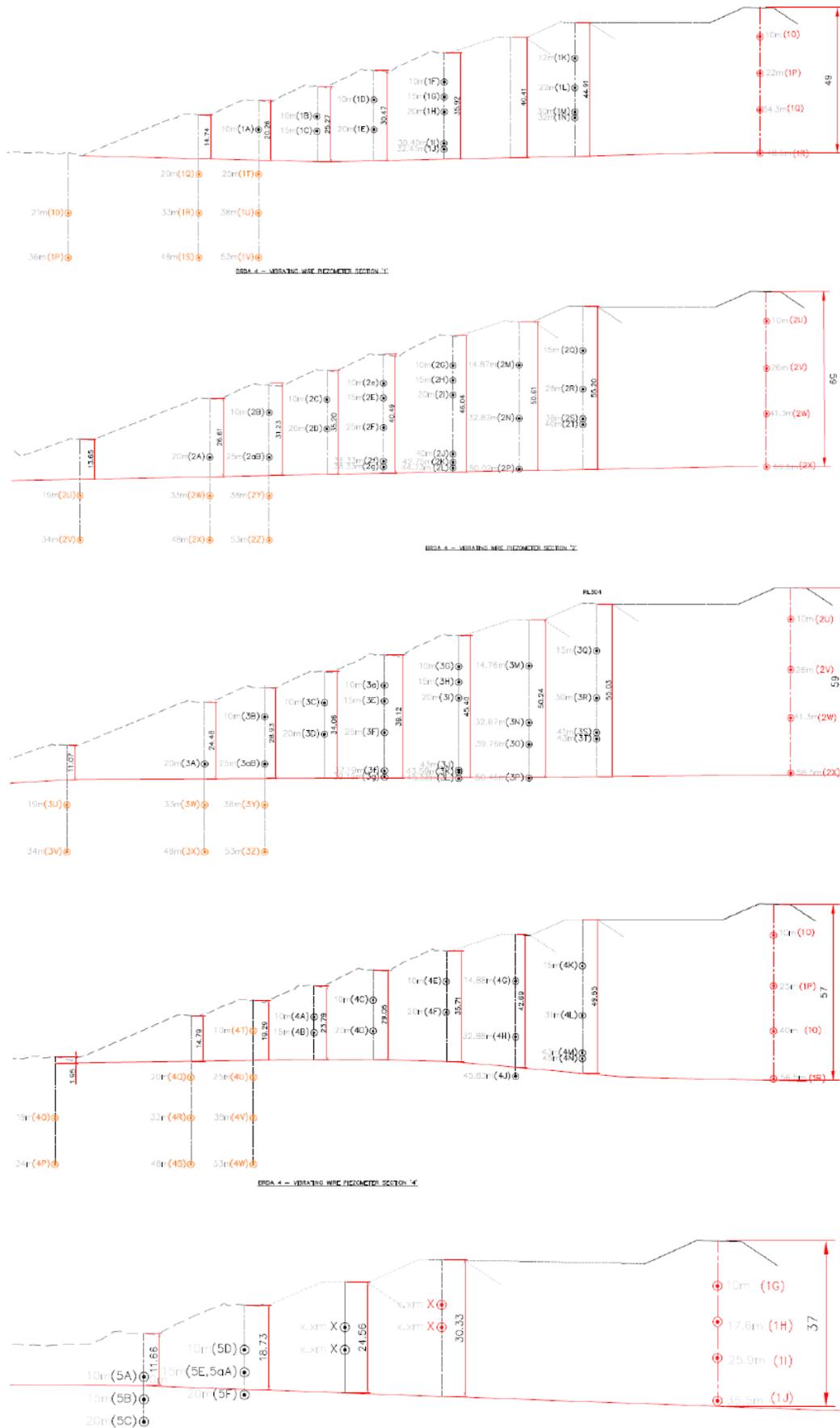
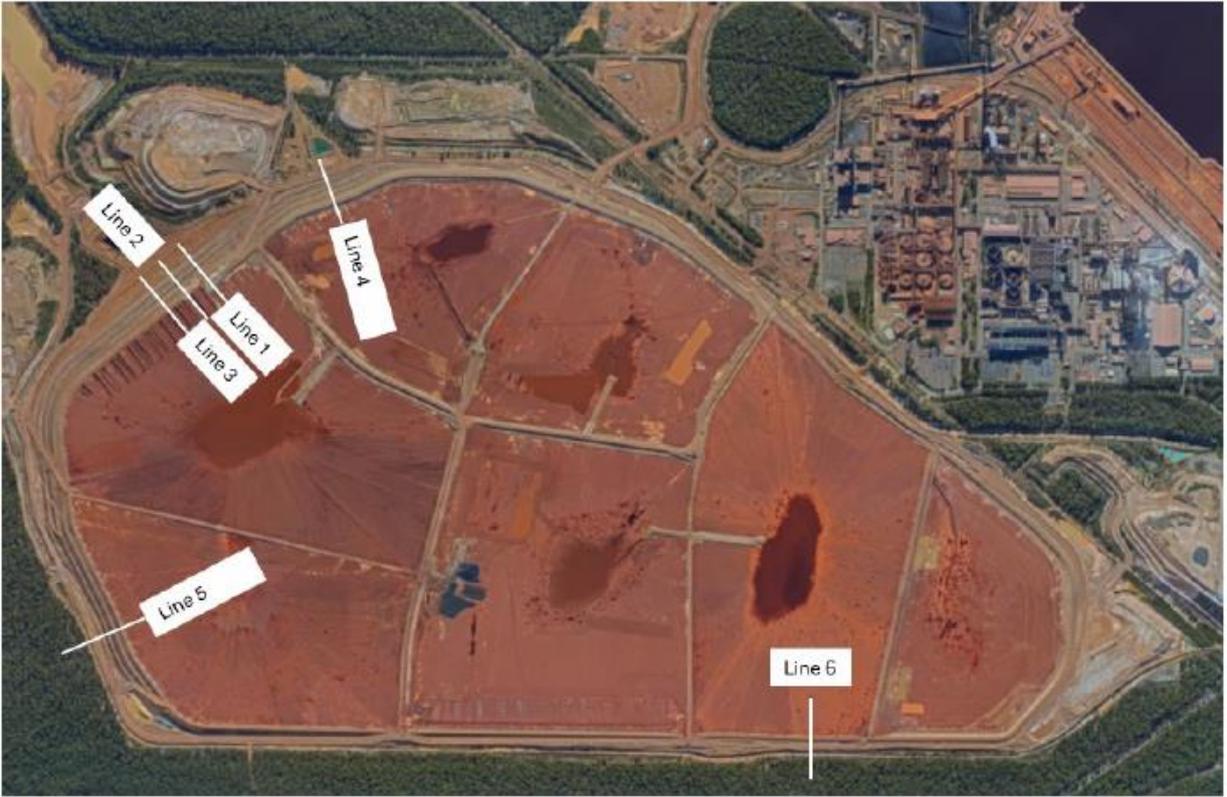


Figure 16: Piezometer locations BRDA 4 Stage 8



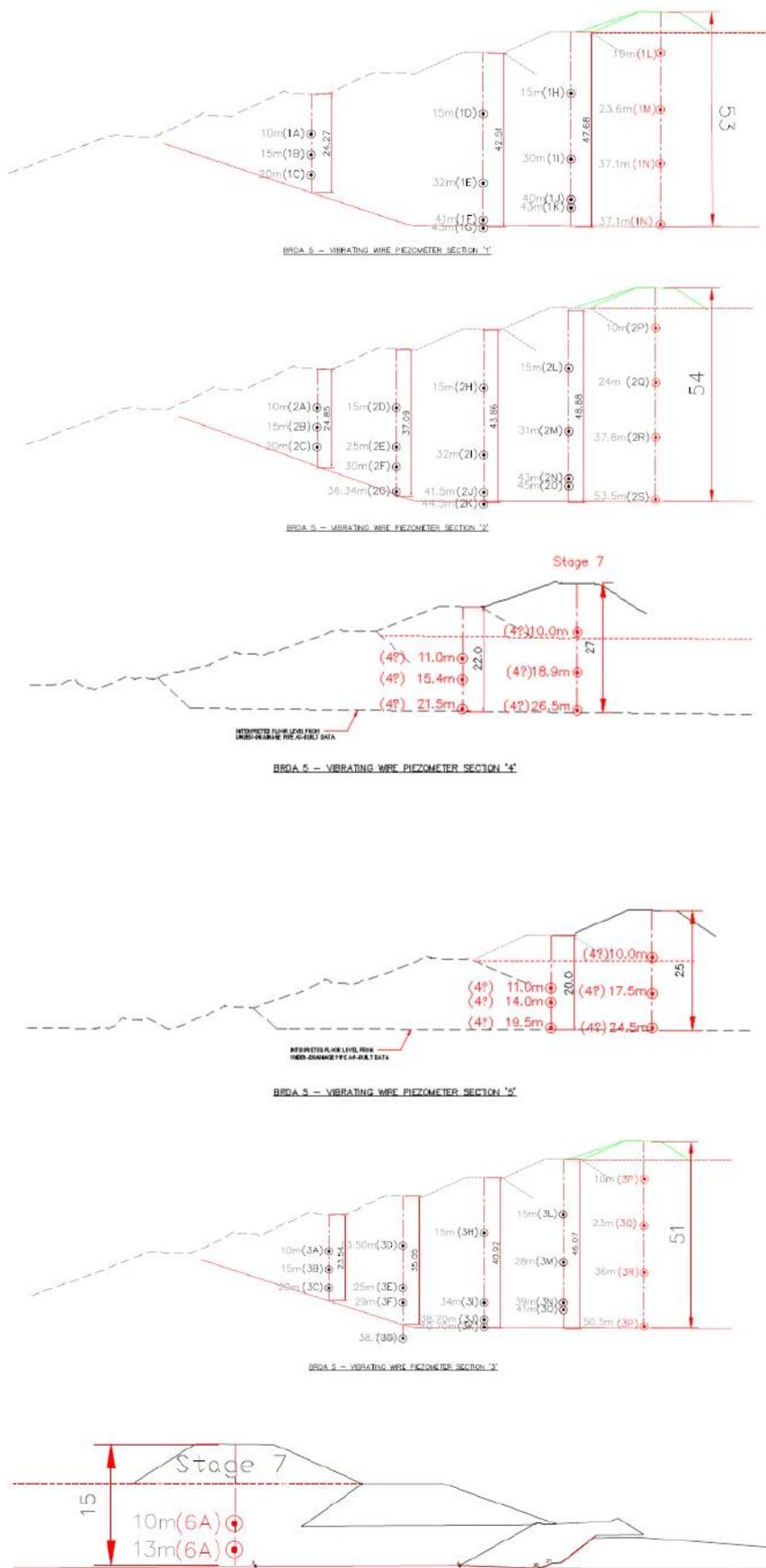


Figure 17: Piezometer locations BRDA 5 Stage 7

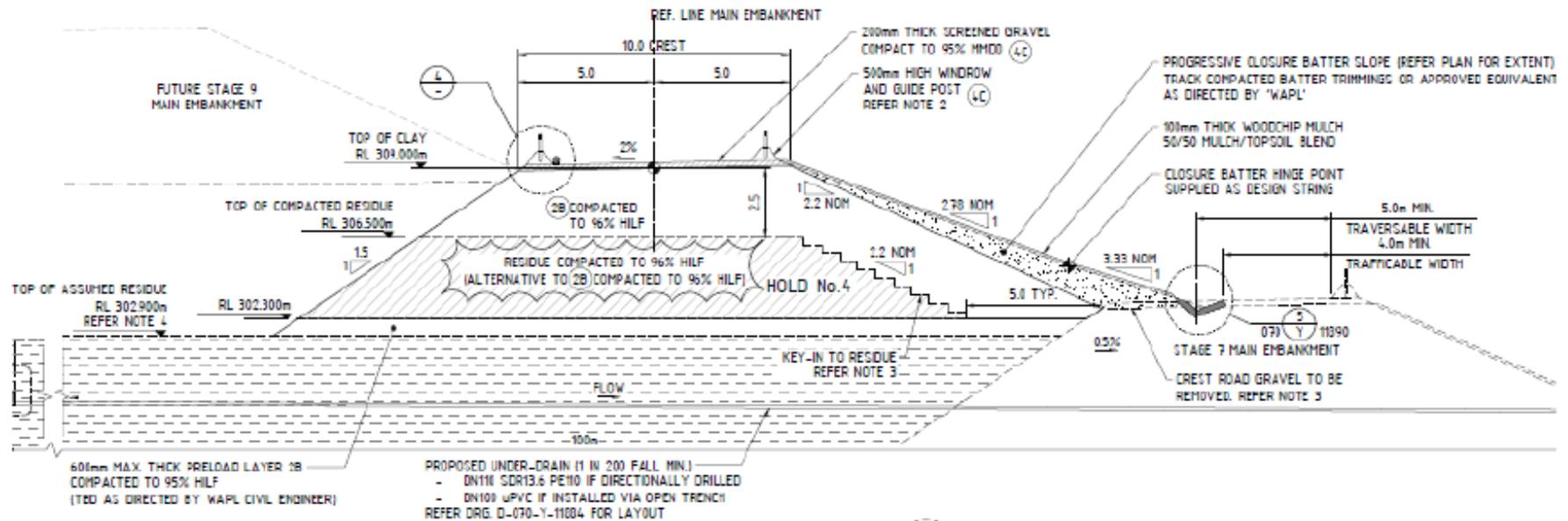


Figure 18: Embankment design – BRDA 4 Stage 8

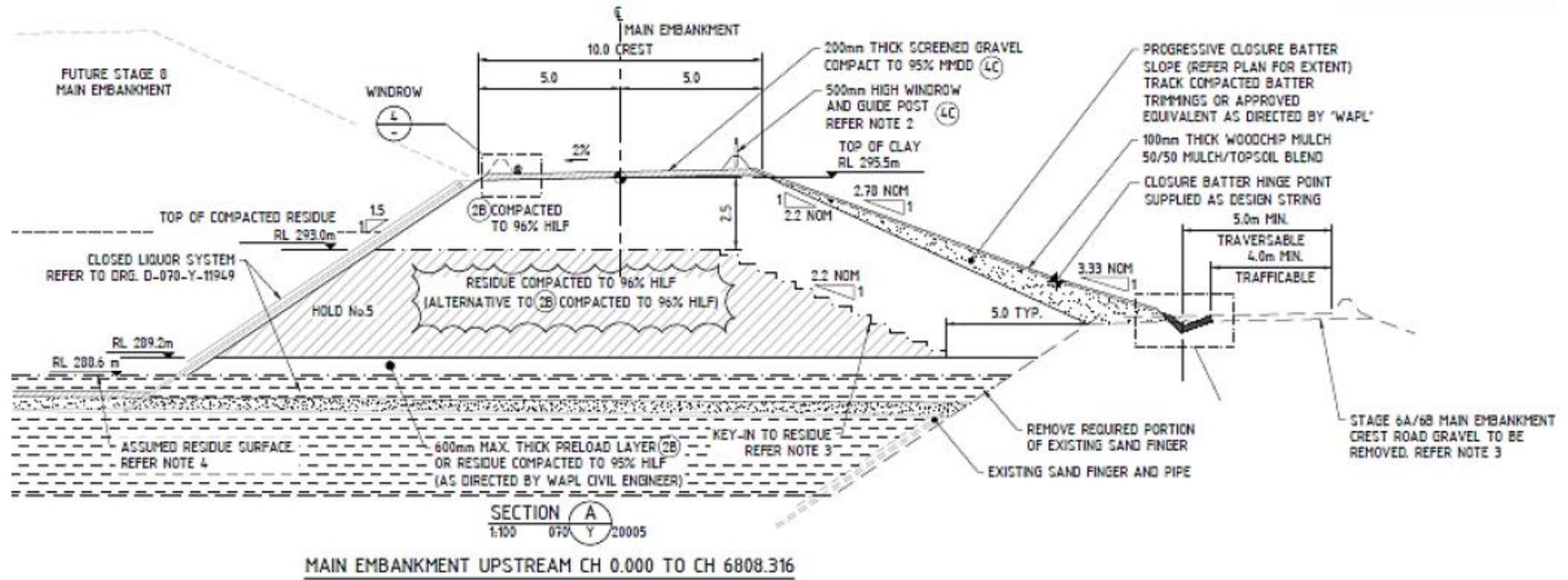


Figure 19: Embankment design – BRDA 5 Stage 7

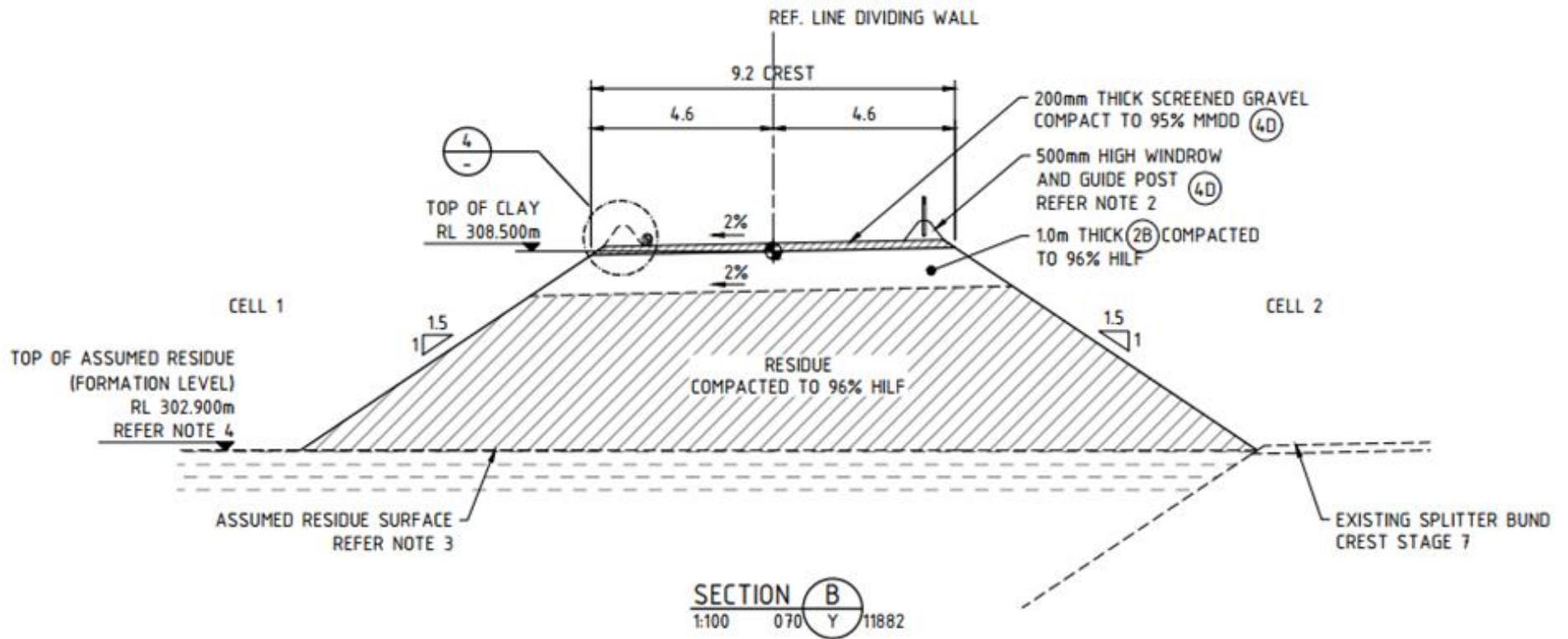


Figure 20: Dividing wall design – BRDA 4 Stage 8

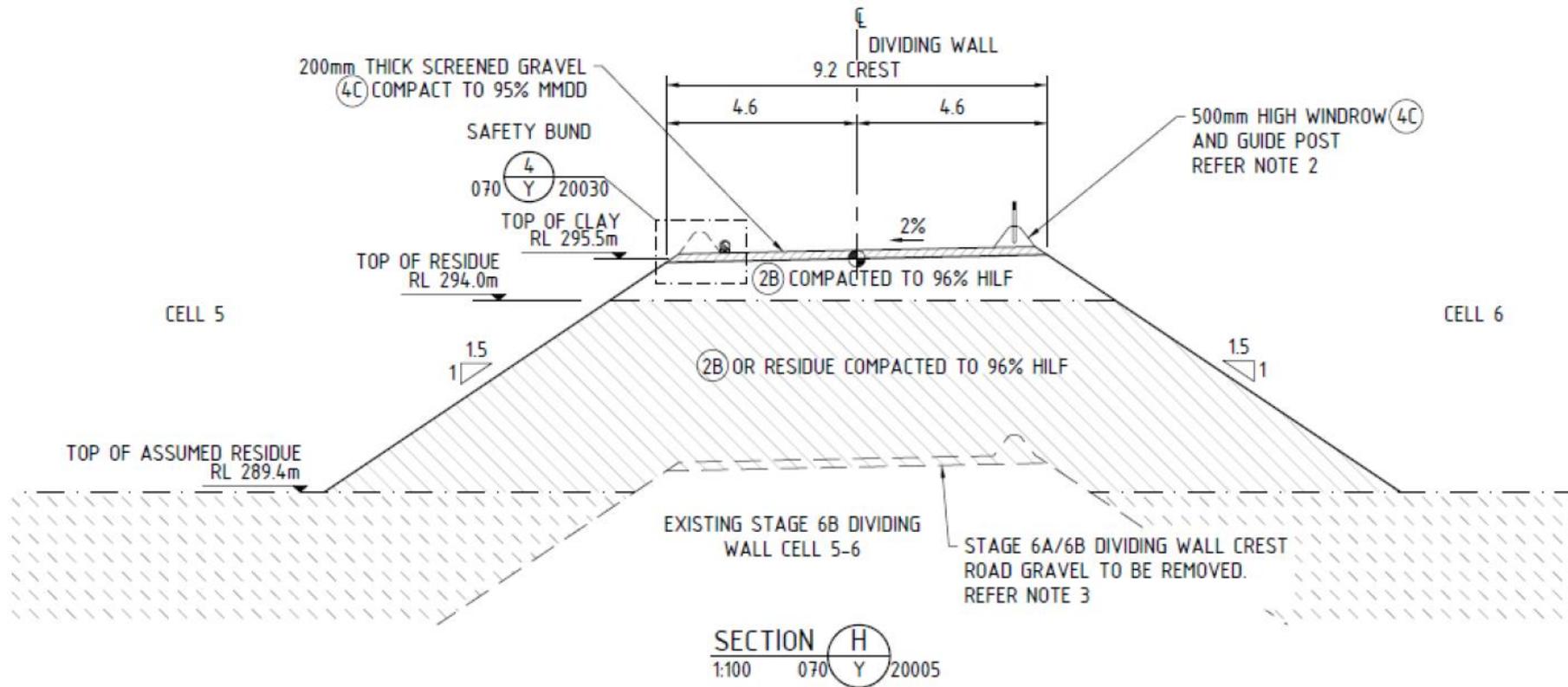


Figure 21: Dividing wall design – BRDA 5 Stage 7