Government of Western Australia
Department of Water and Environmental Regulation

Works Approval

Works approval number	W6626/2021/1
Works approval holder	Northern Star (Carosue Dam) Pty Ltd
ACN	116 649 122
Registered business address	Level 4, 500 Hay Street SUBIACO WA 6008
DWER file number	DER2021/000666
Duration	15 June 2022 to 14 June 2027
Date of issue	15 June 2022
Date of amendment	04 October 2024
Premises details	Carosue Dam Minesite Mining Tenements M28/269, M31/220 and M31/295 MENZIES WA 6436 As depicted by the Premises maps in Schedule 1

Prescribed premises category description (Schedule 1, *Environmental Protection Regulations 1987*)	**Assessed production / design capacity**
Category 5: Processing or beneficiation of metallic or non-metallic ore	4,000,000 tonnes per annual period

This works approval is granted to the works approval holder, subject to the attached conditions, on 04 October 2024, by:

Sonya Poor
Digitally signed by Sonya Poor
Date: 2024.10.04 08:05:35 +08'00'

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

Works approval history

Date	Reference number	Summary of changes
15/06/2022	W6626/2021/1	Works approval issued.
04/10/2024	W6626/2021/1	The amendment is for the following: • the modification of design parameters of ancillary drains and the drainage pond associated with TSF Cell 4, related to line item 1 '*Stormwater management infrastructure'*, under Table 1 of condition 1; and • change the erosion protection layer thickness of 500 mm to 300 mm due to a typographical error in the original works approval application (under Table 2, rows 1 and 3 of condition 2).

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 the infrastructure;

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

(c) at the corresponding infrastructure location;

as set out in Table 1.

Table 1: Design and construction requirements

	Infrastructure	Design and construction / installation requirements	Infrastructure location
1.	Stormwater management infrastructure	Western drain and bund: • Length 2,515m • Average height from drain toe to bund crest 2.7m • Average base width 1m • 380.0m RL at southern corner of the bypass haul road discharging into existing site drainage with an outlet elevation of approximately 365.5m RL Southern drain: • Length 1,020m • Average depth 1m • Average width 1m • 380.0m RL at southern corner of the bypass haul road discharging into existing site drainage with an outlet elevation of approximately 365.6m RL Drainage pond: • Volume 15ML, sufficient to hold runoff from the southern drain in a 1 in 10 AEP, 24-hour recurrence storm event. • Length 235m • Width 115m • Average depth 0.75m	As depicted in Schedule 1, Figure 11
2.	Pipelines carrying tailings and TSF return water	All pipelines will be: • double skinned PE100 and will be constructed and installed in accordance with AS4130 and AS413, and the Plastics Industry Pipe Association of Australia Limited (PIPA) Guideline POP003. • contained within bunded open trenches sufficient in	Not depicted

	Infrastructure	Design and construction / installation requirements	Infrastructure location
		capacity to contain leaks and spillages between routine inspections. • inspected twice daily as per DWER licence conditions. • fitted with Citect automatic leak detection and shut off systems to minimise discharge and allow for maintenance and recovery of materials.	

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,

as set out in Table 2.

Table 2: Design and construction/ installation requirements

	Construction stage	Infrastructure	Design and construction requirements	Infrastructure location
1.	1	Cell 3 Stage 4	Perimeter embankment raise by 3.5m to RL381.0m with: • Upstream construction from compacted Cell 3 tailings compacted to achieve a density ratio greater than 95% of the maximum dry density – Standard compaction as determined from laboratory test AS 1289.5.1.1. • an erosion protection layer of waste rock capping of nominal thickness 300 mm • 6m crest width with 2% cross fall • Upstream batter slope 1H:2V • Downstream batter slope 1H:2.75V • Decant structure and causeway raised by 3.5m.	Cell 3 as depicted in Schedule 1, Figure 3.
2.	2	Cell 4 starter embankment	• Base of TSF compacted to greater than $1x10^{-7}$ m/s. • walls constructed from compacted clay mine waste to a height of RL 375.5m; • cut off trench at base of wall 2m deep and 4m wide at base and filled with compacted clay mine waste; • a decant constructed from a slotted concrete pipe and clean rock fill	Cell 4 as depicted in Schedule 1, Figures 2 and 4 Perimeter wall construction as per Schedule 1, Figure 5.

	Construction stage	Infrastructure	Design and construction requirements	Infrastructure location
			filter, RL 372.5m. Decant causeway constructed with mine waste to RL372.5m ; • underdrainage across the entire base of the cell. The underdrainage lines will comprise slotted pipe (Megaflo 150 and 450 - slotted composite panel drain) covered in filter sand / fine aggregate wrapped in geotextile and stabilised with coarse aggregate or select rockfill. The minimum designated fall/gradient of the underdrainage pipe will be 0.2%; • a return water pond to collect outflow from underdrainage, lined with geotextile and HDPE; • 6 monitoring bores and 12 vibrating wire piezometers	Decant and causeway construction as per Schedule 1, Figure 6 Underdrainage construction as per Schedule 1, Figure 7 Return water pond as depicted in Schedule 1, Figure 8
3.	3	Cell 1-3 Stage 1	Outer perimeter embankments of Cell 1-2 and Cell 3 raised by 2m to RL 383 m with: • Upstream construction from tailings compacted to achieve a density ratio greater than 95% of the maximum dry density – Standard compaction as determined from laboratory test AS 1289.5.1.1. • an erosion protection layer of waste rock capping of nominal thickness 300 mm • 6m crest width with 2% cross fall • Upstream batter slope 1H:2V • Downstream batter slope 1H:2.75V • Cell 3 decant structure raised by 2m; • New decant causeway constructed from midpoint of Cell 1-3 west wall.	Cell 1-3 as depicted in Schedule 1, Figures 2 and 10.

3. The works approval holder must design, construct, and install groundwater monitoring wells in accordance with the requirements specified in Table 3.

Table 3: Infrastructure requirements – groundwater monitoring wells

Infrastructure	Design, construction, and installation requirements	Monitoring well location(s)	Timeframe
Groundwater monitoring well(s) **MB 12** **MB 13** **MB 14** **MB 15** **MB 16** **MB 17**	<u>Well design and construction:</u> Designed and constructed in accordance with *ASTM D5092/D5092M-16: Standard practice for design and installation of groundwater monitoring bores*. Well screens must target the part, or parts, of the aquifer most likely to be affected by contamination[1]. Where temporary/seasonal perched features are present, wells must be nested, and the perched features individually screened.	As depicted in Schedule 1, Figure 9: Map of groundwater monitoring well locations.	Must be constructed, developed (purged), and determined to be operational no later than 14 calendar days prior to the discharge of tailings to TSF Cell 4.
	<u>Logging of borehole:</u> Soil samples must be collected and logged during the installation of the monitoring wells. A record of the geology encountered during drilling must be described and classified in accordance with the Australian Standard Geotechnical Site Investigations AS1726. Any observations of staining / odours or other indications of contamination must be included in the bore log.		
	<u>Well construction log:</u> Well construction details must be documented within a well construction log to demonstrate compliance with *ASTM D5092/D5092M-16*. The construction logs shall 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.		
	<u>Well development:</u> 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. A detailed record should be kept of well development activities and included in the well construction log.		
	<u>Installation survey:</u> the vertical (top of casing) and horizontal position of each monitoring well must be surveyed and subsequently mapped by a suitably qualified surveyor.		
	<u>Well network map:</u> a well location map (using aerial image overlay) must be prepared and include the location of all monitoring wells in the monitoring network and their respective identification numbers.		

Note 1: refer to Section 8 of Schedule B2 of the *Assessment of Site Contamination NEPM* for guidance on well screen depth and length.

4. The works approval holder must, within 60 calendar days of the monitoring wells being constructed, submit to the CEO a well construction report evidencing compliance with the requirements of condition 3.

Compliance reporting

5. The works approval holder must within 30 calendar days of an item of infrastructure required by condition 1 being constructed:

(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.

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

(a) certification by a suitably 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

7. The works approval holder must within 60 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) prepare and submit to the CEO a Critical Containment Infrastructure Report on that compliance.

8. The Critical Containment Infrastructure Report required by condition 7 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; and

(e) monitoring data indicating the baseline ambient environmental conditions at the premises prior to and immediately following construction of the Cell 4 starter embankment.

9. The monitoring of the baseline ambient environmental conditions required under condition 8(e) must:

(a) be undertaken in accordance with Table 4; and

(b) all sample analysis must be undertaken by laboratories with current accreditation from the National Association of Testing Authorities (NATA) for the relevant parameters.

Table 4: Determination of baseline ambient environmental conditions

Parameter	Monitoring location	Unit	Frequency	Averaging period	Method
Standing water level[1]	TSF monitoring bores MB 12 MB 13 MB 14 MB 15 MB 16 MB 17	mbgl	Once prior to commencement of time limited operations of TSF Cell 4. No later than 7 calendar days prior to discharge to TSF Cell 4.	Spot sample	In accordance with AS/NZS 5667.11
pH[1]		-			
Electrical conductivity		µS/cm			
Total dissolved solids		mg/L			
Weak acid dissociable cyanide					
Arsenic					
Cadmium					
Chromium					
Lead					
Nickel					
Zinc					

Note 1: In-field non-NATA accredited analysis permitted.

Time limited operations phase

Commencement and duration

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

11. The works approval holder may only commence time limited operations for an item of critical containment infrastructure identified in condition 2 where the CEO has notified the works approval holder that the Critical Containment Infrastructure Report for that item of infrastructure as required by condition 7 meets the requirements of that condition.

12. The works approval holder may conduct time limited operations for an item of infrastructure specified in condition 13 (as applicable):

(a) for a period not exceeding 180 calendar days from the day the works approval holder meets the requirements of condition 10 or 11 (as applicable) 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 12(a).

Time limited operations requirements

13. During time limited operations, the works approval holder must ensure that the premises infrastructure and equipment listed in Table 5 and located at the corresponding infrastructure location is maintained and operated in accordance with the corresponding operational requirement set out in Table 5.

Table 5: Infrastructure and equipment requirements during time limited operations

	Site infrastructure and equipment	Operational requirement	Infrastructure location
1.	Cell 3 Stage 4	• To be operated at RL 381.0m • A minimum 500mm total freeboard and a 300mm operational freeboard must be maintained at all times.	TSF Cell 3 as depicted in Schedule 1, Figure 3
2.	Cell 4 starter embankment	• To be operated at RL 375.5m • A minimum 500mm total freeboard and a 300mm operational freeboard must be maintained at all times.	TSF Cell 4 as depicted in Schedule 1, Figure 2 and Figure 4
3.	Cell 1-3 Stage 1	• To be operated at RL 383.0m • A minimum 500mm total freeboard and a 300mm operational freeboard must be maintained at all times.	TSF 1-3 as depicted in Schedule 1, Figure 2 and Figure 10

Monitoring during time limited operations

14. The works approval holder must monitor the groundwater during time limited operations for concentrations of the identified parameters in accordance with Table 6.

Table 6: Monitoring of ambient concentrations during time limited operations

Parameter	Monitoring location	Unit	Frequency	Averaging period	Method
Standing water level[1]	TSF monitoring bores MB 12 MB 13 MB 14 MB 15 MB 16 MB 17	mbgl	Monthly	Spot sample	In accordance with AS/NZS 5667.11
pH[1]		-	Quarterly		
Electrical conductivity		µS/cm			
Total dissolved solids		mg/L			
Weak acid dissociable cyanide					
Arsenic					
Cadmium					
Chromium					
Lead					
Nickel					
Zinc					

Note 1: In-field non-NATA accredited analysis permitted.

15. The works approval holder must record the results of all monitoring activity required by condition 14.

Compliance reporting

16. The works approval holder must submit to the CEO a report on the time limited operations within 60 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.

17. The works approval holder must ensure the report required by condition 16 includes the following:

(a) a summary of the time limited operations, including timeframes and amount of tailings discharged;

(b) a summary of groundwater monitoring results obtained during time limited operations under condition 14.

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

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

(e) 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)

18. 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.

19. 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 condition 1 and 2;

(b) any maintenance of infrastructure that is performed in the course of complying with condition 13;

(c) monitoring programmes undertaken in accordance with condition 14; and

(d) complaints received under condition 18.

20. The books specified under condition 19 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 7 have the meanings defined.

Table 7: Definitions

Term	Definition
AEP	means Annual Exceedance Probability.
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 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 *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 has been constructed in accordance with the works approval.
EP Act	*Environmental Protection Act 1986* (WA).
EP Regulations	*Environmental Protection Regulations 1987* (WA).
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.
Quarterly	means the four inclusive periods from 1 April to 30 June, 1 July to 30 September, 1 October to 31 December and in the following year, 1 January to 31 March.

Term	Definition
Suitably qualified geotechnical engineer	means a person who: a) holds a Bachelor of Engineering recognised by the Australian Institute of Engineers; and b) has a minimum of five years of experience working in geotechnical engineering including experience in the design of tailings storage facilities.
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.
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).

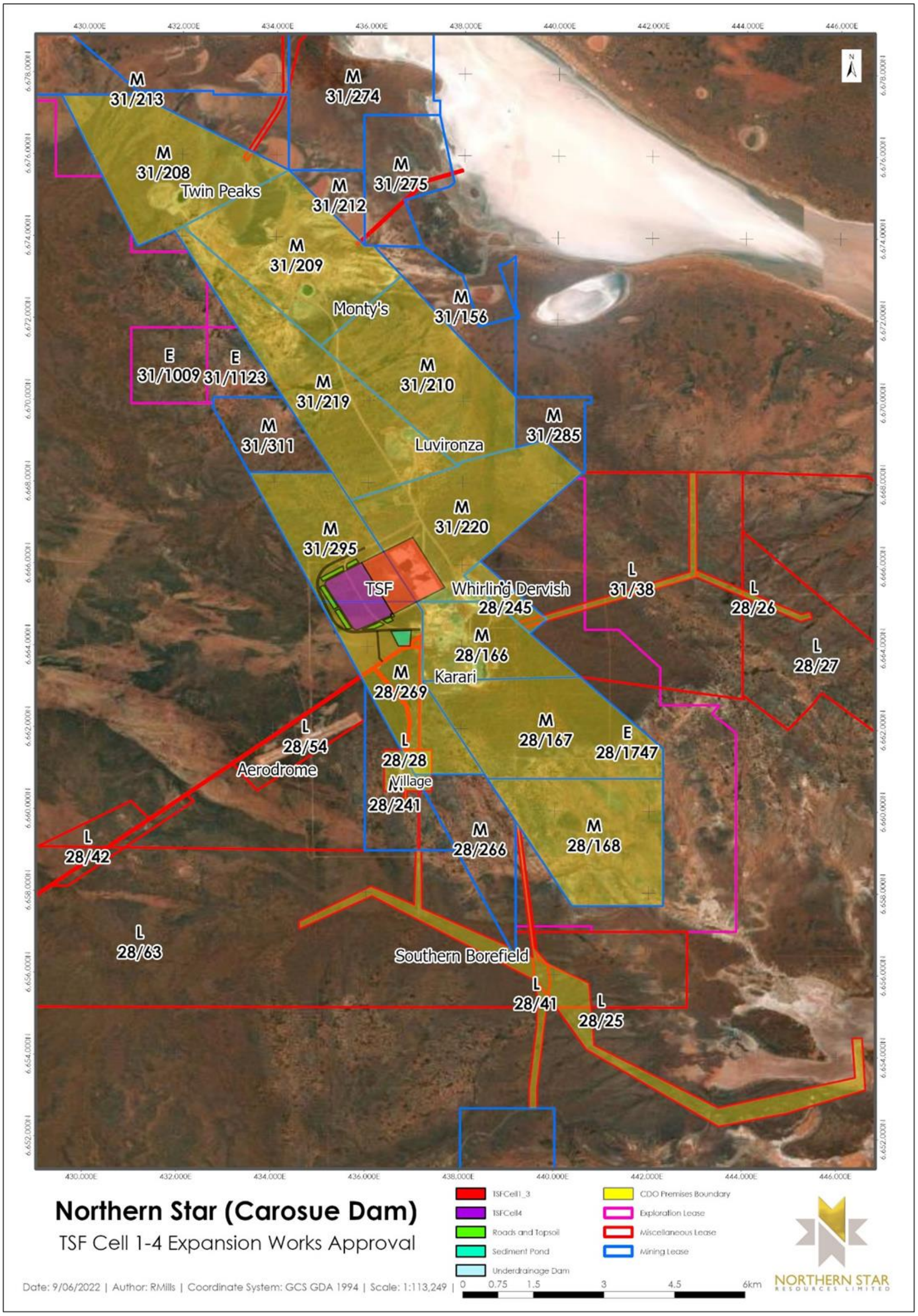

Figure 1: Map of the boundary of the prescribed premises

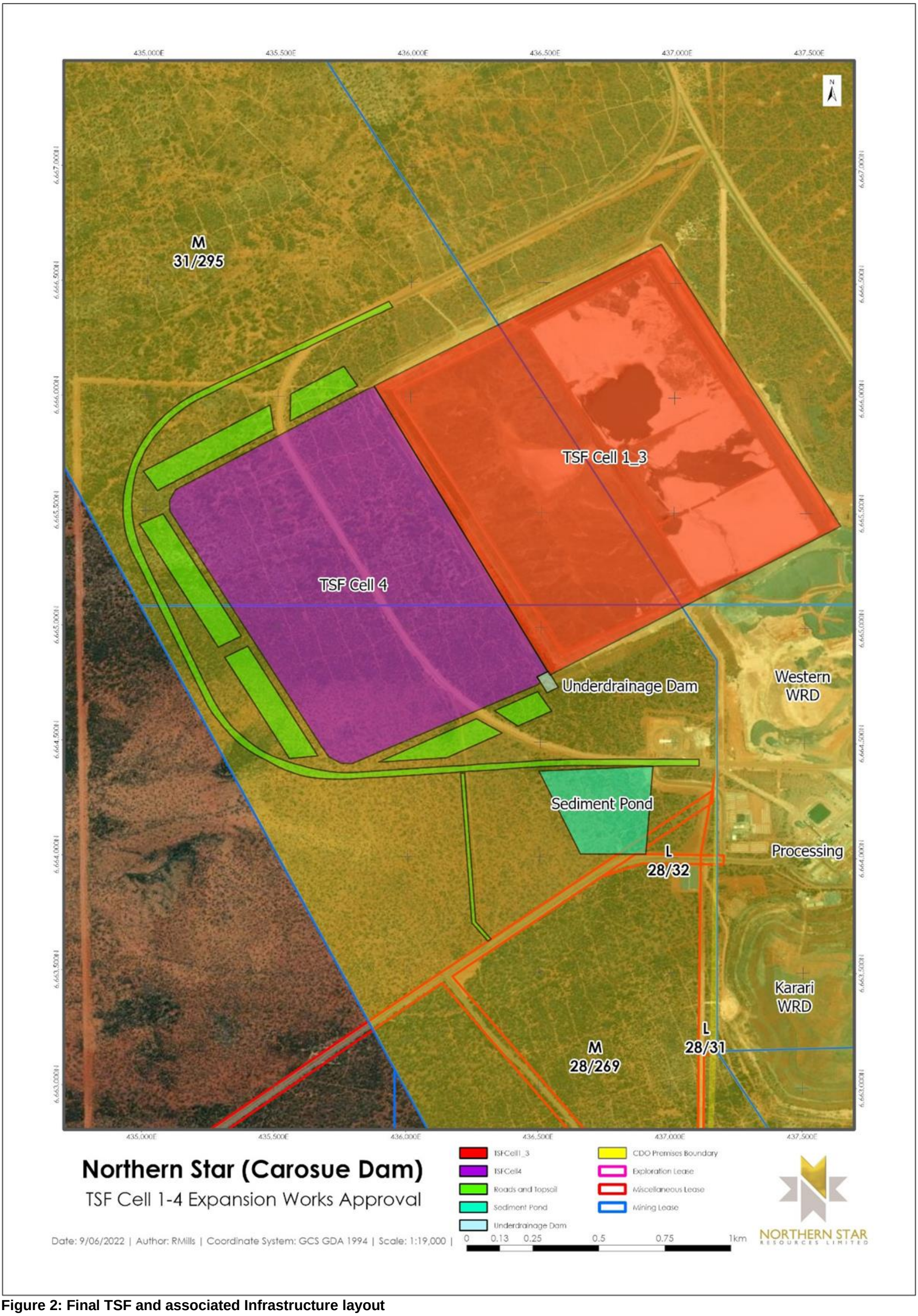

Figure 2: Final TSF and associated Infrastructure layout

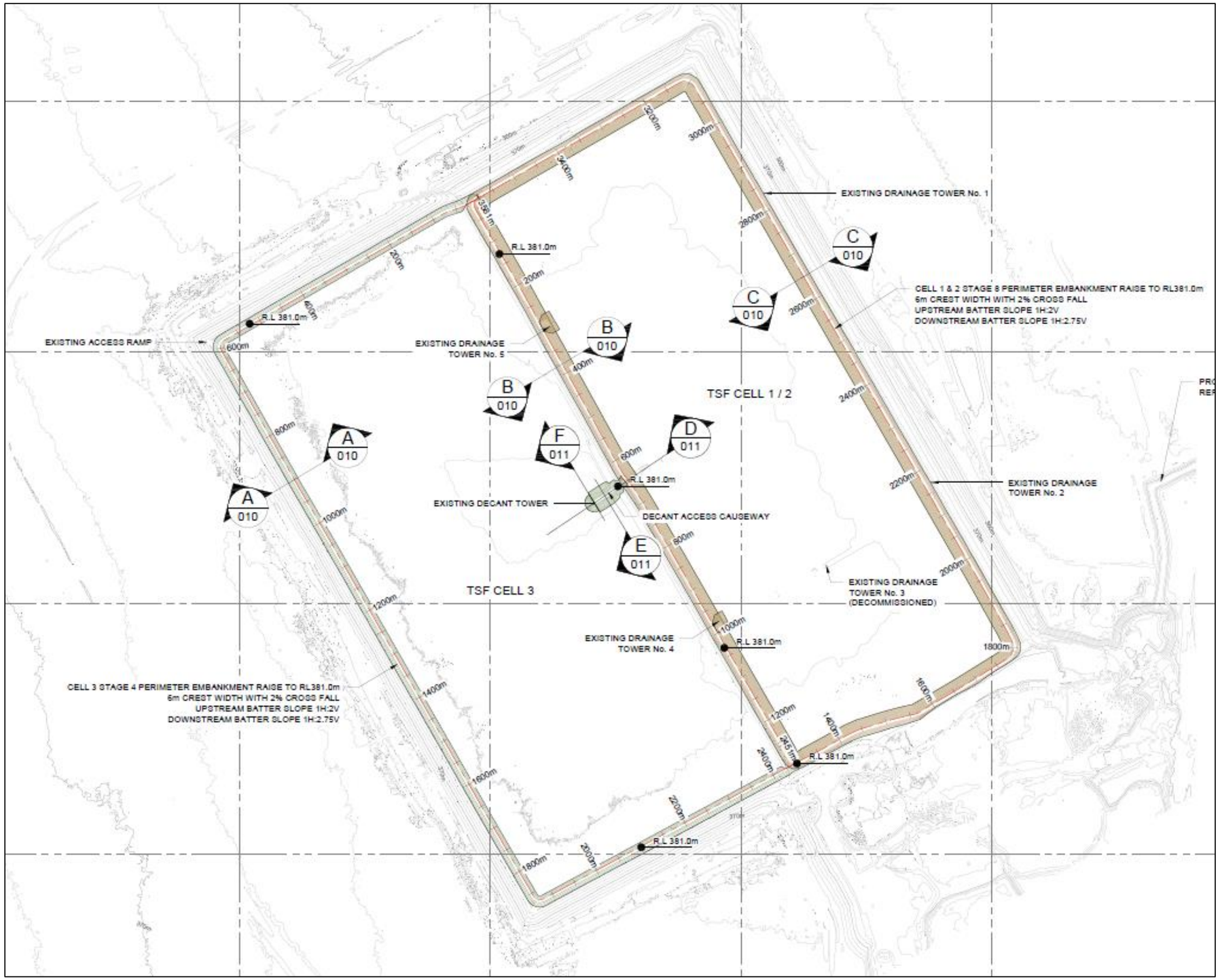

Figure 3: Cell 3 Stage 4 design

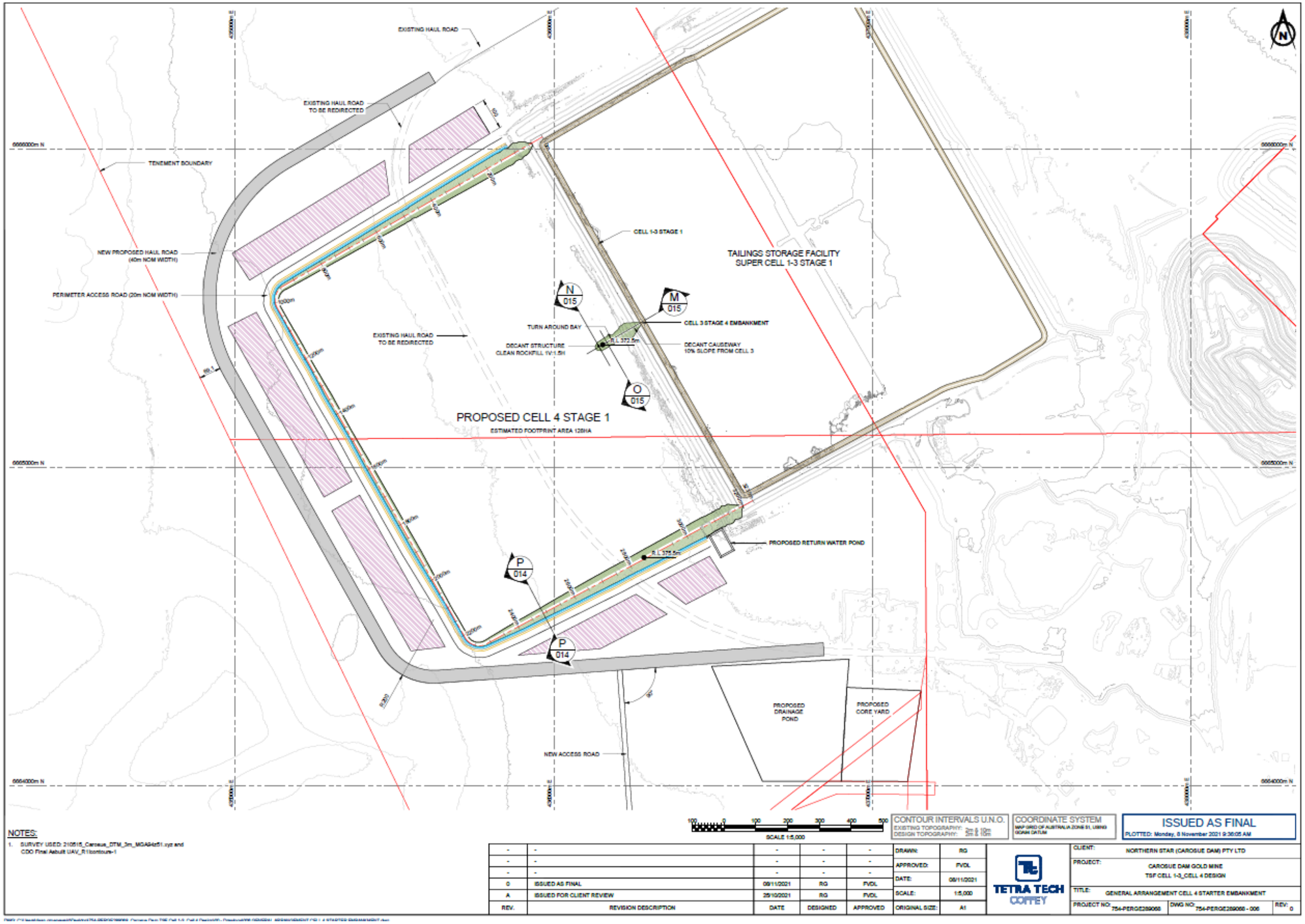

Figure 4: Cell 4 starter embankment

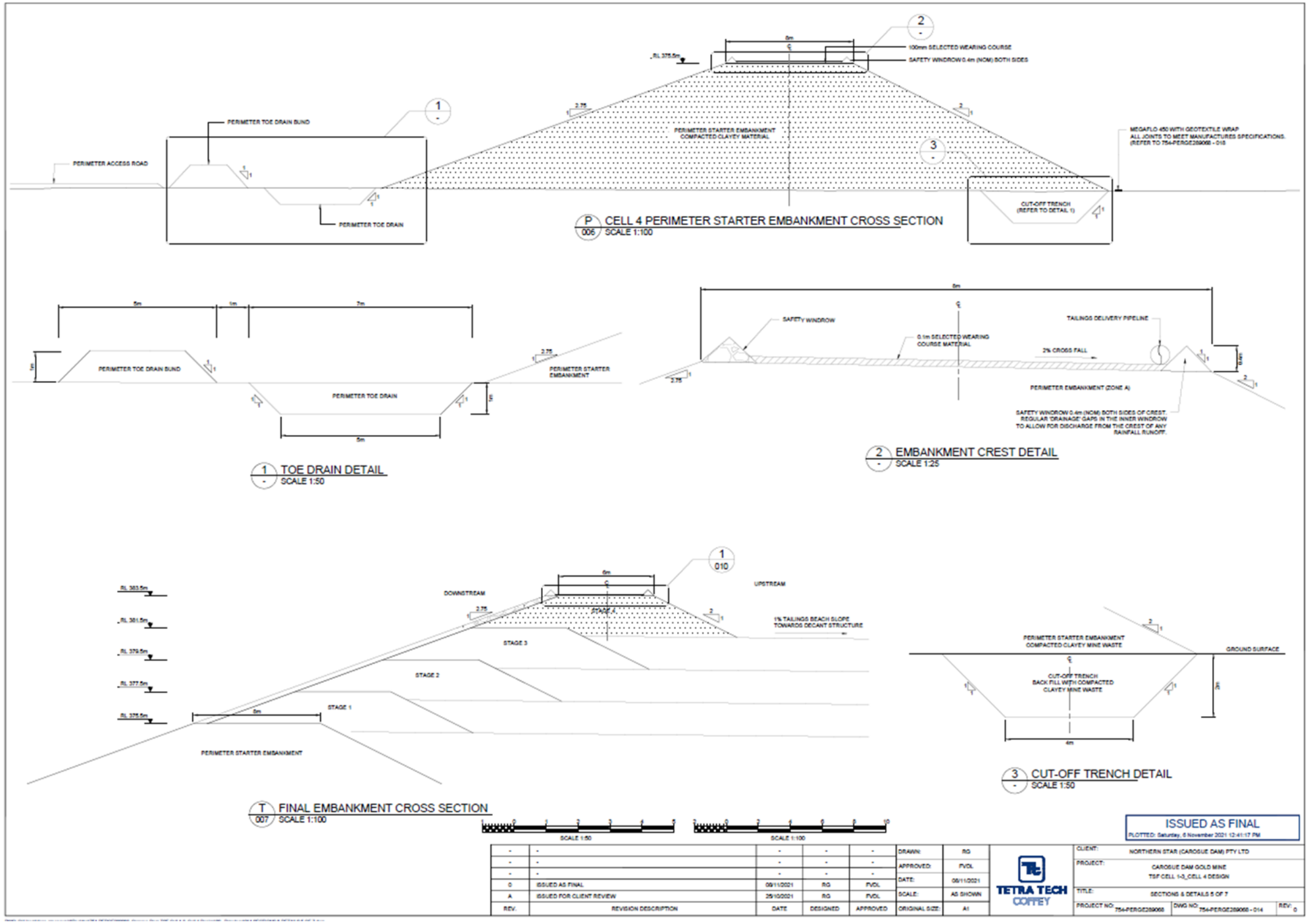

Figure 5: Cell 4 Perimeter wall design with toe drain and cut off trench details

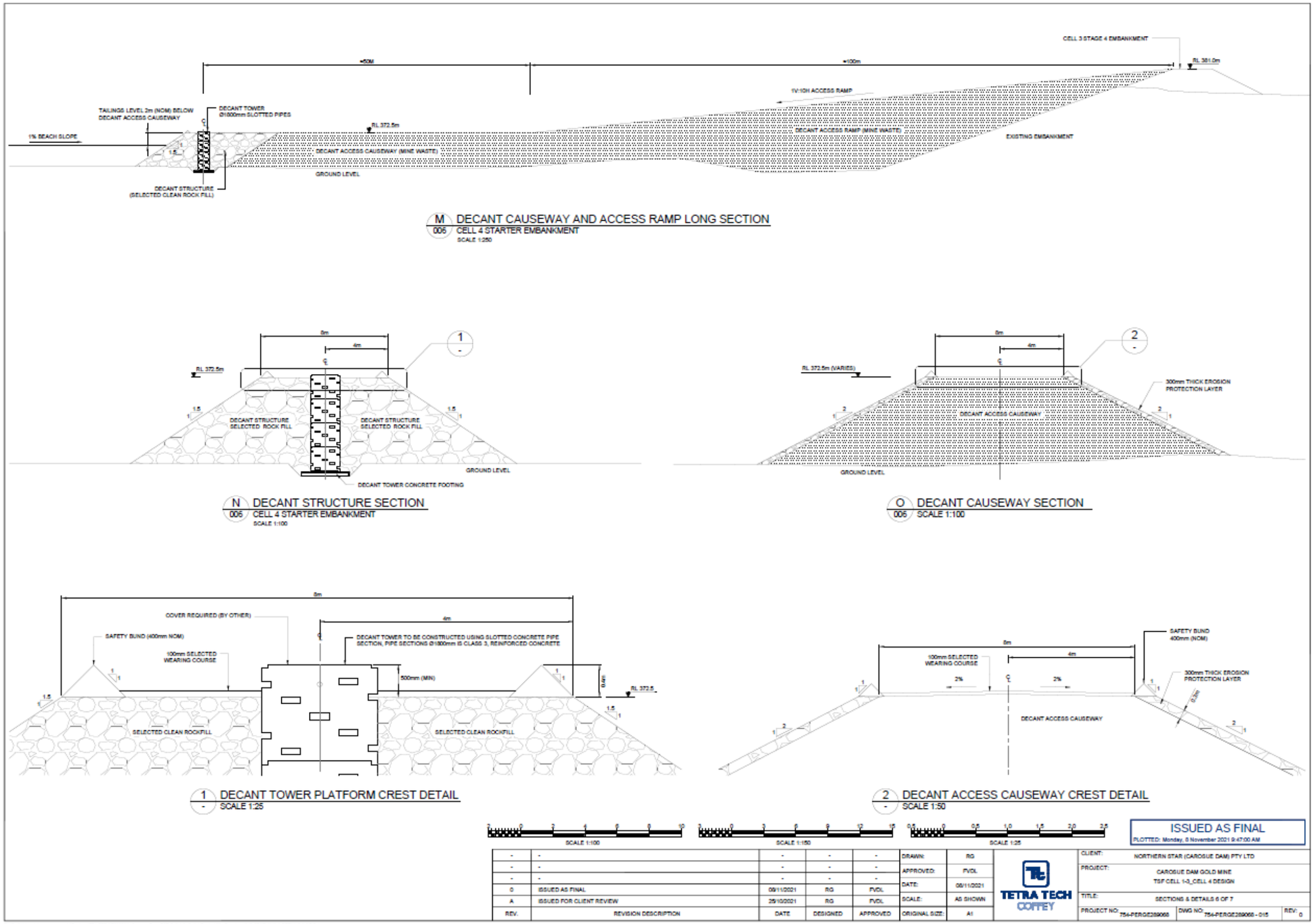

Figure 6: Cell 4 decant structure and decant causeway

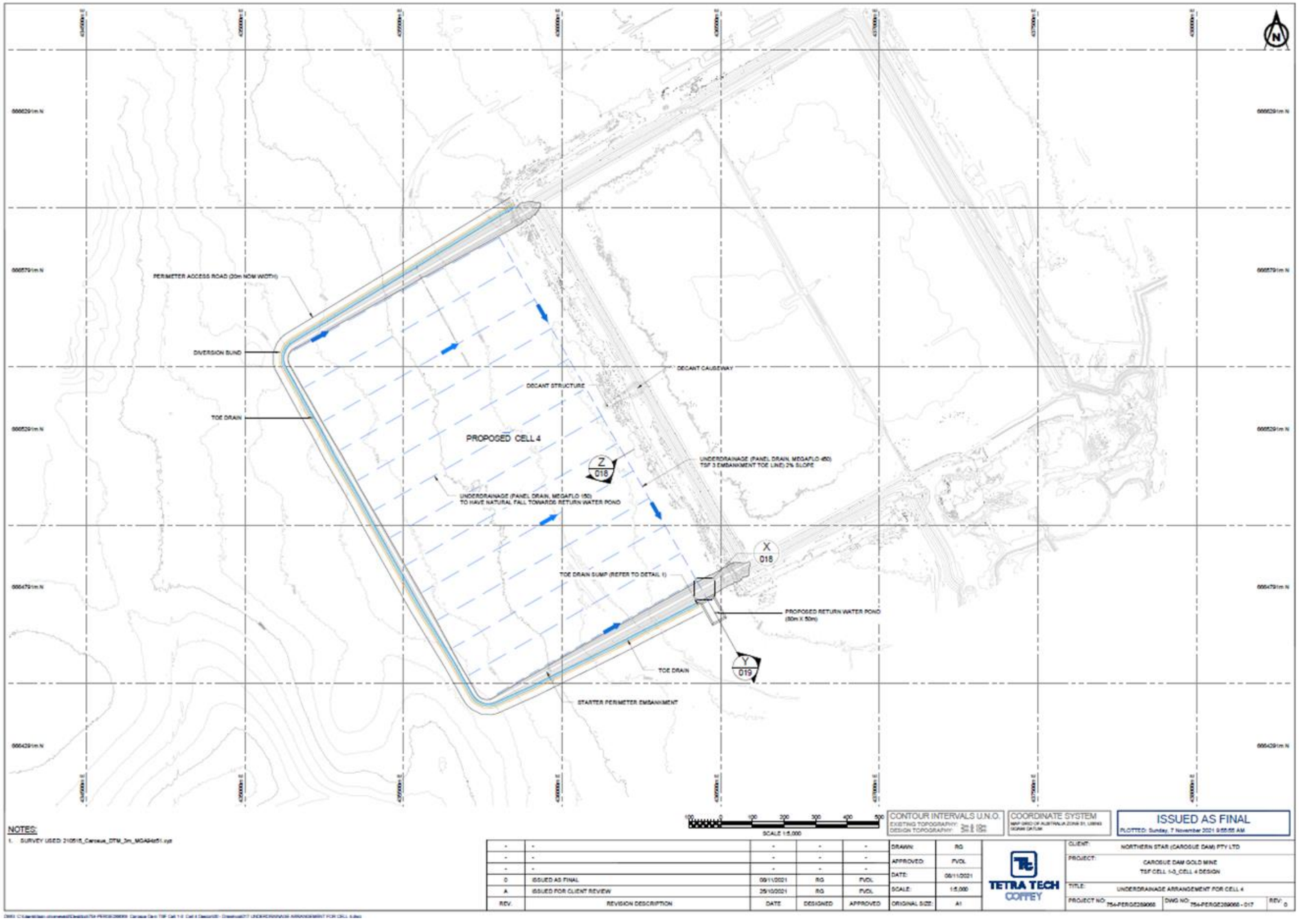

Figure 7: Cell 4 underdrainage

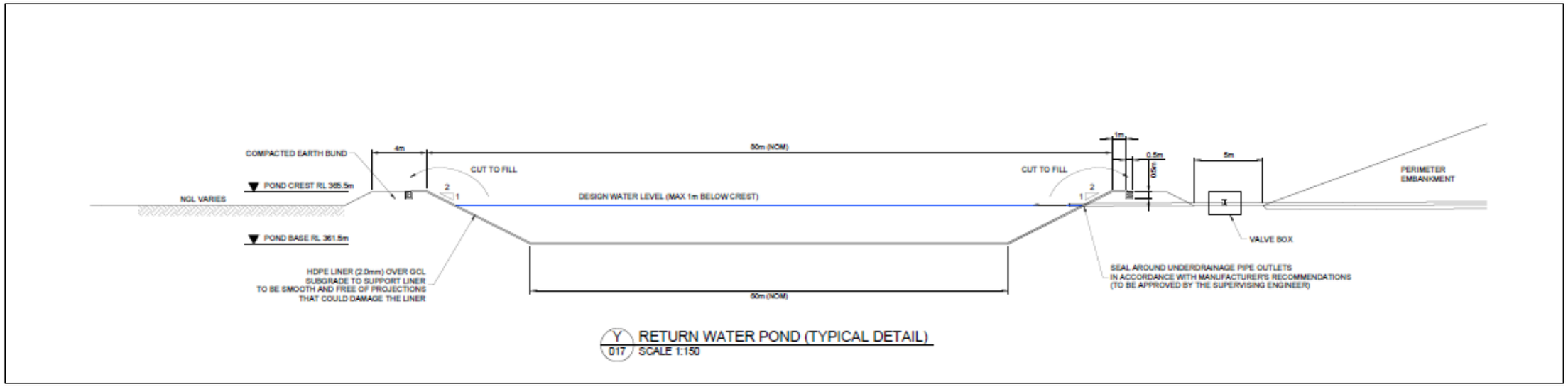

Figure 8: Cell 4 return water pond

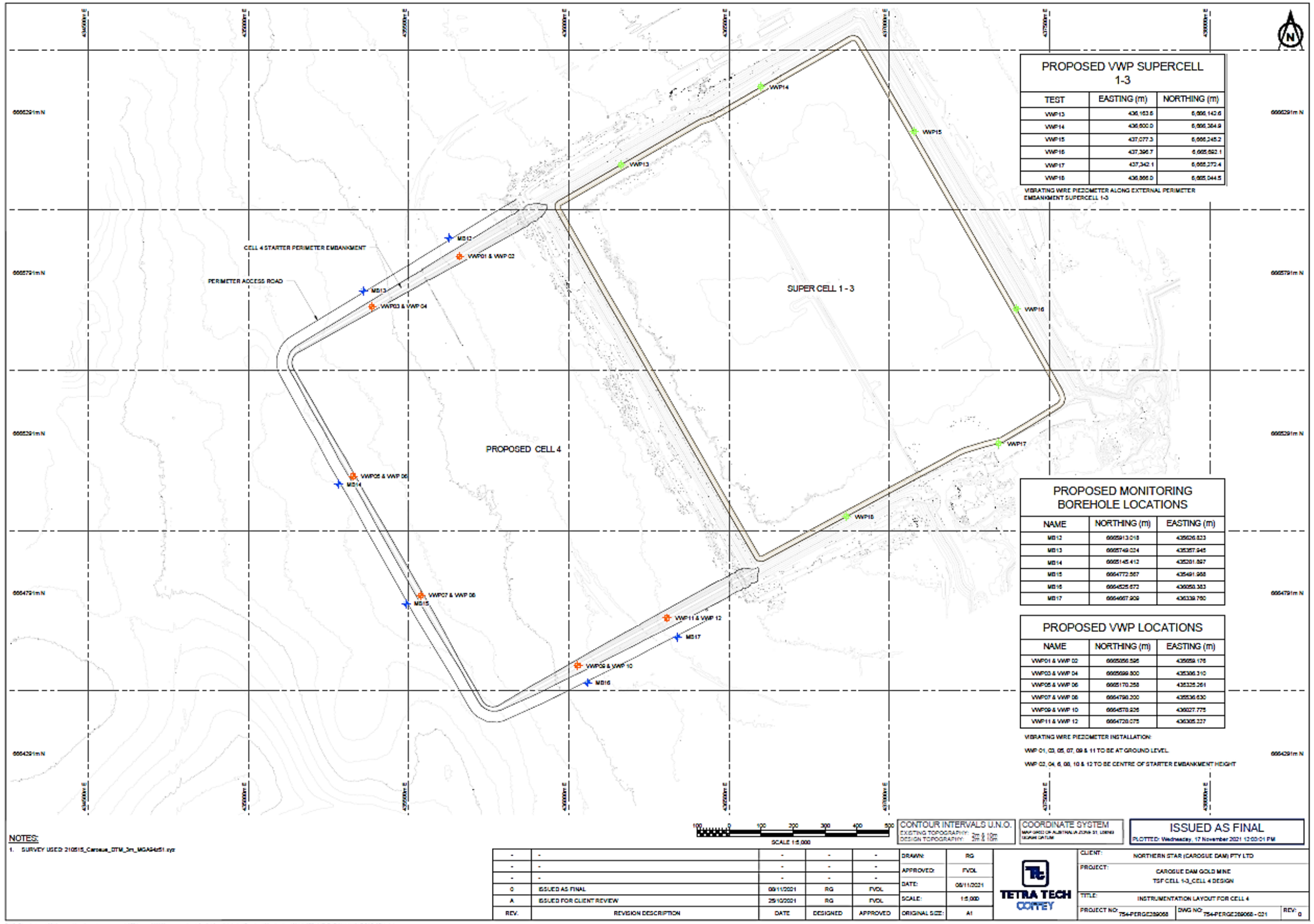

Figure 9: Cell 4 new bores and piezometer positions

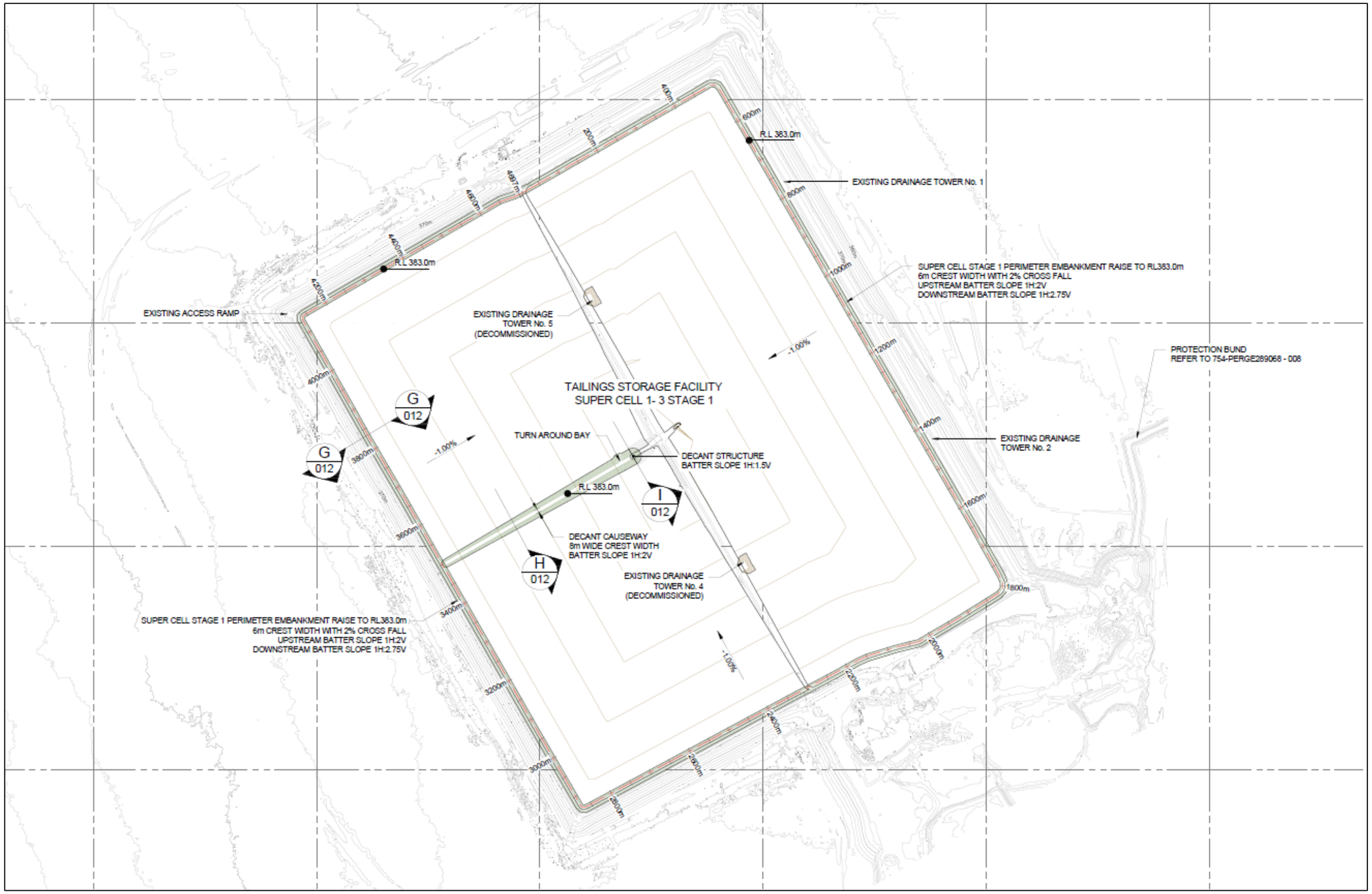

Figure 10: Cell 1-3 design

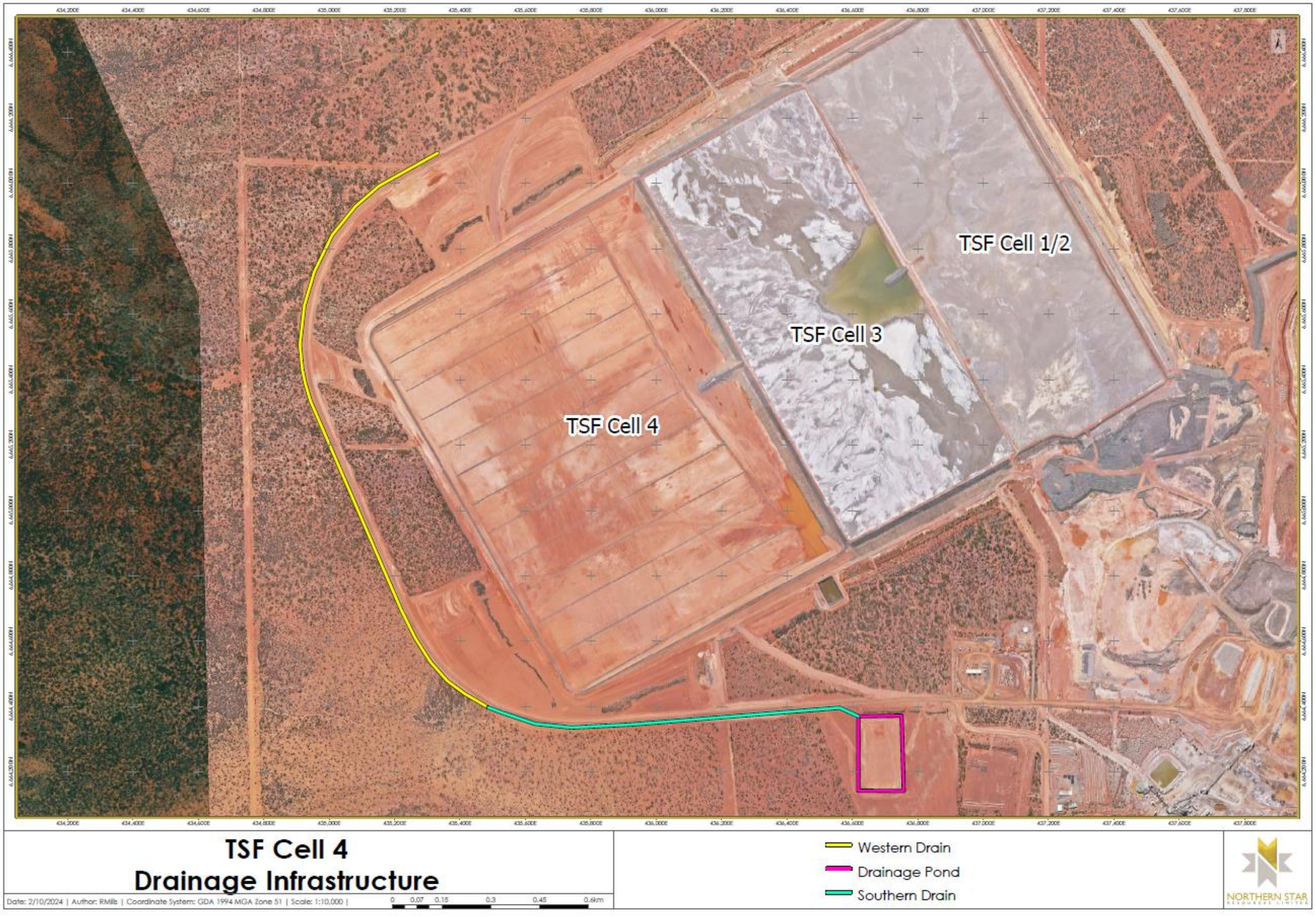

Figure 11: Stormwater management infrastructure