APPENDIX H - GEOTECHNICAL ASSESSMENT - FINAL LANDFORM

Isaac Downs Extension

EIS Final Landform Geotechnical Assessment

April 2026

BMS-P25038C-SMR-IDE-R-1-V1.0

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DOCUMENT CONTROL SHEET

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2 ACRONYMS & ABBREVIATIONS

Term	Description
2D	Two-Dimensional
BHWE	Base of Weathering
BMS	Blackrock Mining Solutions
BUTE	Base of Tertiary
EIS	Environmental Impact Statement
FCCM	Fort Cooper Coal Measures
FoS	Factor of Safety
GLE/M-P	General Limit Equilibrium/Morgenstern-Price
IDE	Isaac Downs Extension
IPS	In-Pit Spoil
LE	Limit Equilibrium
mAHD	Metres Above Australian Height Datum
mbgl	Metres Below Ground Level
ML	Mining Lease
PMLU	Post-Mining Land Use
RF	Rewan Formation
PRCP	Progressive Rehabilitation and Closure Plans
RCM	Rangal Coal Measures
SMR	Stanmore Resources Ltd
SWC	South Walker Creek
YT	Yarrabee Tuff

3 DISCLAIMER

This assessment is based on the geotechnical and geological conditions and parameters detailed in the report. These conditions and parameters have been incorporated into the assessment and are used directly from provided approved reports and sources with no additional interpretation.

The assumptions used by Blackrock Mining Solutions Pty Ltd (Blackrock) to formulate recommendations are subject to approval by Stanmore Resources Ltd (Stanmore), and it is assumed that Stanmore accept full responsibility if these assumptions prove different to what is found at the site due to undisclosed variations in ground conditions or deviations from the expected conditions due to reliance on the assumptions.

The study therefore assumes that all relevant data currently in the possession of Stanmore has been made available to Blackrock.

We expect that should Project personnel disagree with any of these assumptions, or become aware of any additional relevant information, Stanmore will promptly notify Blackrock, to enable the conclusions to be revised accordingly.

1 INTRODUCTION

Stanmore ID Extension Pty Ltd (ID Extension), wholly owned subsidiary of Stanmore Resources Ltd (Stanmore), proposes to develop the Isaac Downs Extension (IDE) Project (the Project). ID Extension has prepared an environmental impact statement (EIS) for the Project. As part of the EIS, this report provides a geotechnical assessment for the final landform design of the Project

A geotechnical assessment for the residual highwall and final landform was carried out by Blackrock Mining Solutions Pty Ltd (Blackrock).

The results of the geotechnical assessment were used in the development of design acceptance and completion criteria for the final landform. In this case, a key geotechnical performance criterion for the final void and landform slopes is the Factor of Safety (FoS).

Slope stability geotechnical models were developed using the 2D Limit Equilibrium Method in Slide2 (Rocscience) for long-term closure scenarios.

1.1 Statement of Intent

The geotechnical assessment aims to demonstrate that the proposed post-mining land uses (PMLUs) for the Project would be supported by a landform that is geotechnically stable.

It should be noted that the geotechnical assessment does not consider future erosional or geomorphological processes that may affect geotechnical stability. Therefore, we would recommend further assessment be carried out if any significant change to the final landform occurs in the future.

For the purposes of this report, it is suggested that the assessment would be valid for a period of between 60 – 200 years (Simmons et al, 2024).

2 SCOPE OF WORK

The proposed scope of works for the highwall and final landform geotechnical assessment was set out as per Blackrock's proposal, which comprised:

- Review of existing geological and groundwater datasets, reports, and regional geology.
- Development of nominated sections through the Project final landform and application of appropriate shear strength parameters (largely assumed from industry-accepted frameworks).
- Limit equilibrium (LE) slope stability modelling of representative sections:
    - to examine modes of failure.
    - to determine the FoS for current final landform geometries.
    - to identify areas of potential geotechnical risk.
    - to develop an appropriate slope design criteria for long-term geotechnical stability, based on the assumed parameters.

- Provision of geotechnical analysis results and key recommendations for the final landform, and in accordance with the ACARP guidelines (Simmons et al, 2024).

3 CONCEPTUAL FINAL LANDFORM GEOMETRY

Stanmore has provided the pit shell and final landform geometry for the Project area. This assessment focuses on one main residual void comprising:

- Exposed residual highwall slope.
- Re-profiled ex-pit and in-pit spoil dumps.

The geometry for the proposed final void landform is shown in Figure 3-1.

Other features of the Project include potential post mining land use options (i.e. infrastructure to support pumped hydroelectric energy storage facility and algae production) located to the south and east of the residual void crest, respectively. These are not included in the geotechnical assessment as they are surface infrastructure.

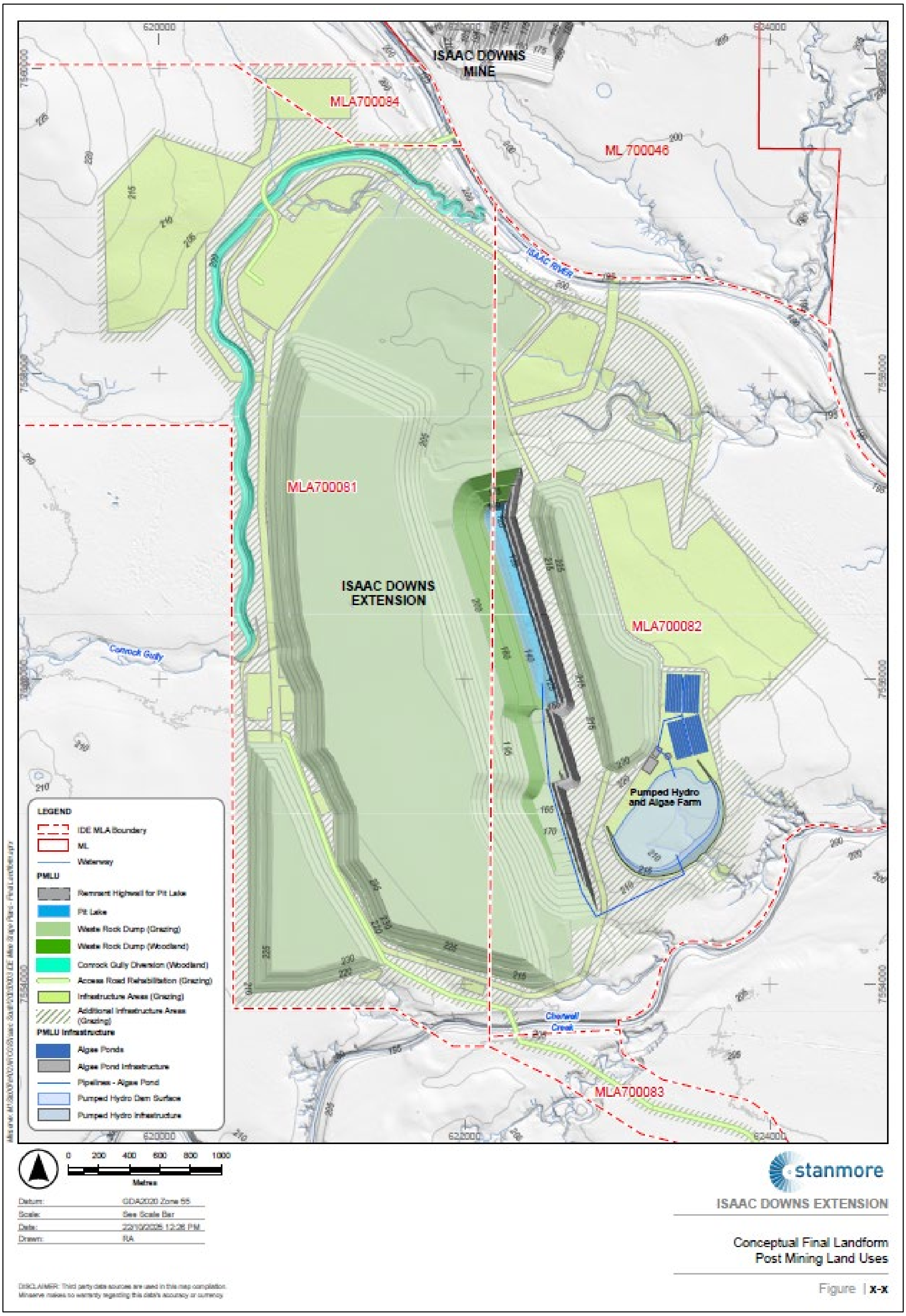

Figure 3-1: Conceptual Final Landform – Land Uses (Stanmore, 2025a)

4 GEOLOGICAL & GEOTECHNICAL CONDITIONS

4.1 Local Geology

Quaternary sediments (depth of Tertiary) range in thickness from 2 to 20 m (average 8 m) in the deposit area. To the northwest of the Project area (the IDE mining lease (ML) application areas), close to the LOX line of the Vermont seam, the Tertiary appears to thicken, posing potential paleochannel risks. Some thicker Tertiary is seen along the banks of the Isaac River in the north and a minor amount along Cherwell Creek to the south (Stanmore, 2025b).

Modelling indicates that the base of weathering (BHWE) ranges from 15 to 30 m, averaging 22 m over the Project area.

The Late Permian to Early Triassic Rewan Formation (RF) is characterised by grey-green sandstone, transitioning upwards into red-brown siltstone and sandstone.

The Rangal Coal Measures (RCM) mainly comprise pale grey, cross-bedded, fine to medium grained, labile sandstones, grey siltstones, mudstones and coal seams. Two main seams occur within the RCM, which are the principal economic targets of the Project. In stratigraphic sequence, these are:

Leichhardt Seam – LHD, L1, L2.

Vermont Seam – V1, V2, V31 and V32.

The Leichhardt Seam occurs approximately 15 to 60 m below the RF - RCM transition, and approximately 25 m above the Vermont Seam. In the north of the Project area the two seams coalesce (Geotek Solutions, 2013). The Yarrabee Tuff typically separates the V1 and V2 seam plies.

The main stratigraphic units present within the Project area are summarised in .

Table 4-1: Main Stratigraphic Units for IDE

Period	Group	Sub-group /Formation	Dominant Lithology	Occurrence
Quaternary /Tertiary	-	Surficial	Unconsolidated sand, gravel, and clay	Typically localised, occurring near watercourses or paleo-channels and laterally limited in extent
Permian	Blackwater Group	Rangal Coal Measures	Coal with sandstone, siltstone, and mudstone	NW-SE trending strip along the western edge of the Project area. Dips to the east. The Yarrabee Tuff separates the RCM from the FCCM.
		Fort Cooper Coal Measures	Coal with sandstone, siltstone,	NW-SE trending strip along the western edge of the Project area. Dips to the east

Period	Group	Sub-group /Formation	Dominant Lithology	Occurrence
			mudstone, and tuff	

4.2 Geological Structures

In the Project area, coal dips to the east at 2° to 8°. Dips steepen in the vicinity of moderate to large faults. East of the deposit, a major thrust system - the Isaac Thrust has been regionally interpreted to the east of the Isaac River.

Several NNW trending thrust/reverse faults, and orthogonal transverse faults feature in the resource area. A major thrust fault (easterly dipping) with a throw up to 25 m occurs in the middle of the deposit area. A significant NE trending normal fault with throws of 5 - 15 m occurs in the northern portion of the deposit area.

No igneous intrusions are present in the mining area.

No geological structures are anticipated to interact with the final landform.

4.3 Groundwater and Void Water Levels

The predicted void water level for the final void base case scenario (Hydrobalance 2026) was approximately 150 m AHD.

Groundwater levels range between 10 to 35 mbgl.

5 GEOTECHNICAL ANALYSIS

5.1 Final Landform Representative Sections

Representative cross-sections were cut through the final void landform layouts of the Project pit area, including backfilled in-pit dump, as presented in Figure 5-1.

Sections 1 represents the northern void area across the lowwall and highwall, and Section 2 represents the southern void area that has been partially backfilled.

Section 3 and 4 represent re-profiled in-pit spoil dump cut on the western side and southern end, respectively.

Section 5 and 6 represent the ex-pit dumps on the southwestern side of the in-pit spoil and to the east of the residual highwall.

Section 7 represents the re-profiled in-pit dump across the backfilled lowwall adjacent to the highwall crest and corresponding to the operational endwall.

Slope stability models were subsequently developed for all final landforms, using Rocscience's software - Slide2 v9.038. Slope stability geometries are presented in Figure 5-2 to Figure 5-8. The results of the analysis are presented in Table 5-5.

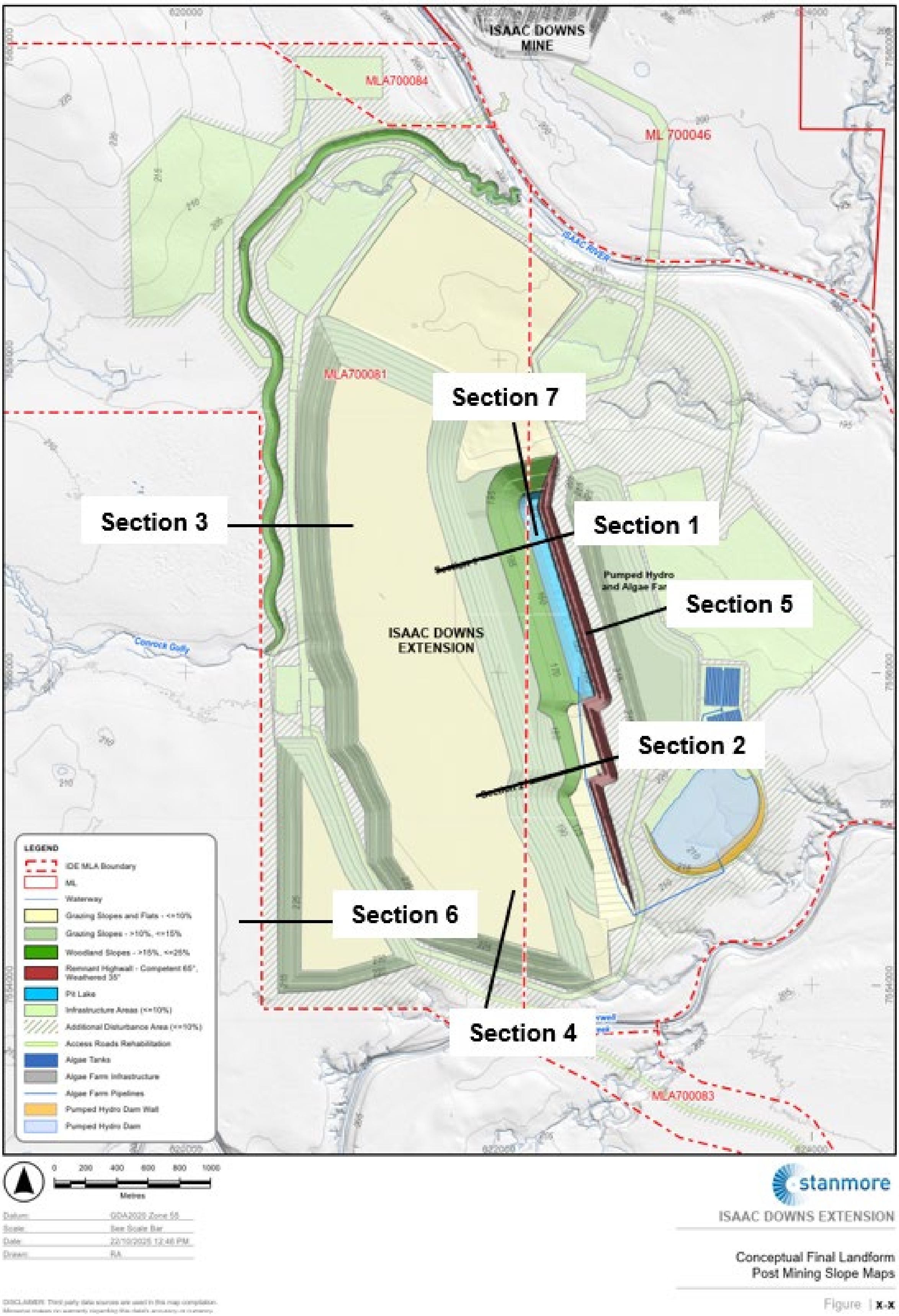

Figure 5-1: Isaac Downs Extension - Final Landform and Representative Sections

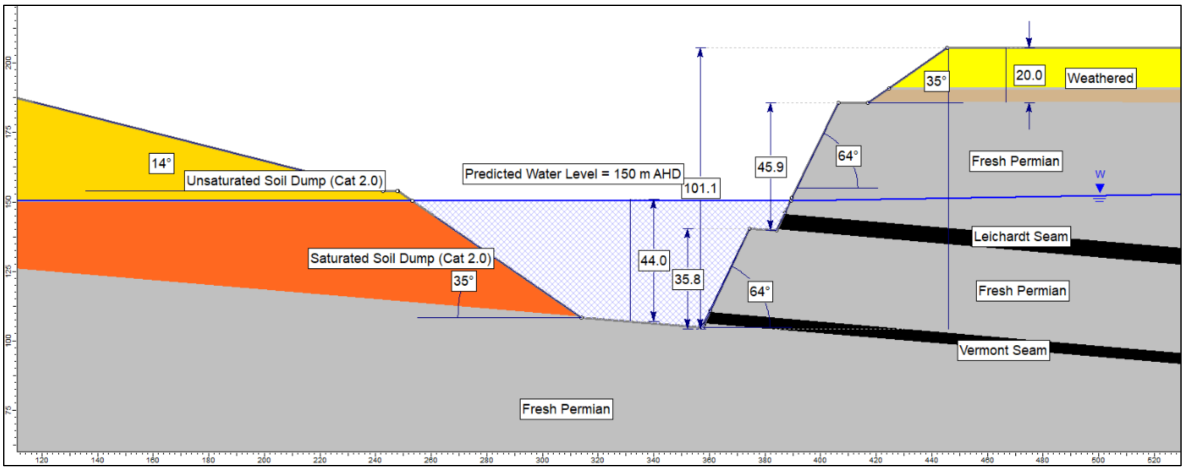

Figure 5-2: Northern Void (Lowwall and Highwall) – Section 1 (North Facing)

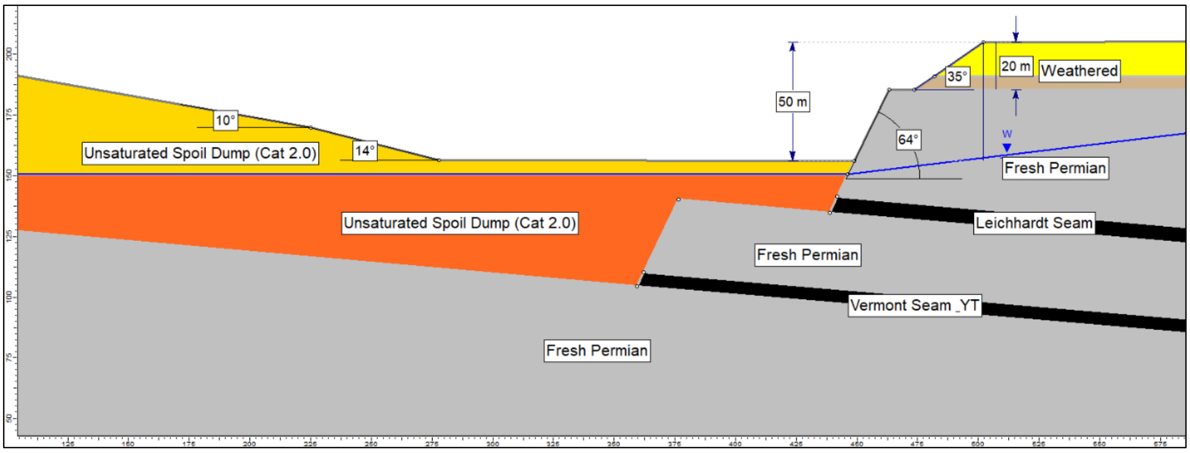

Figure 5-3: Southern Void (Low wall and Highwall) – Section 2 (North Facing)

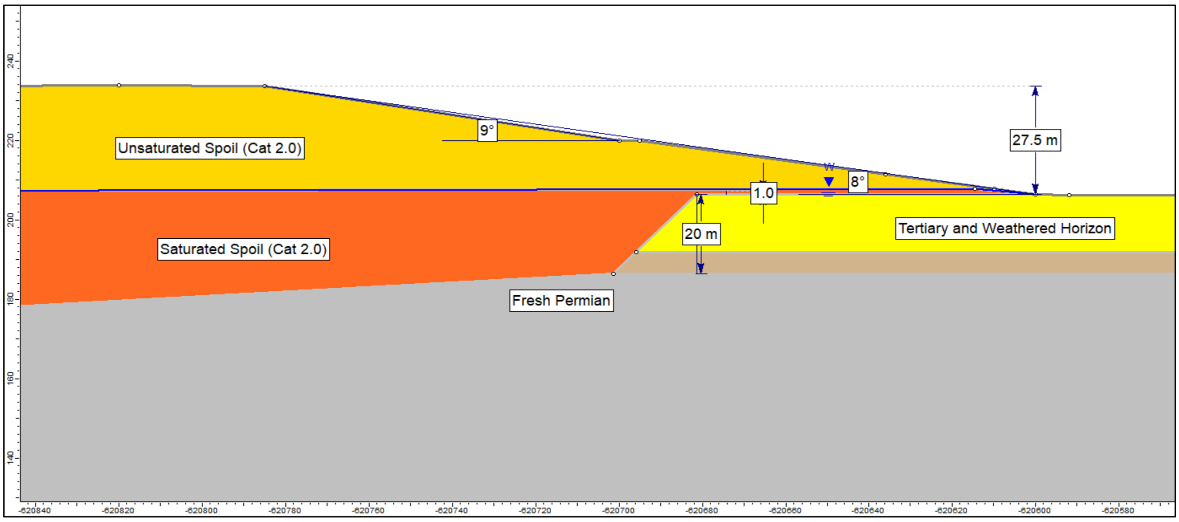

Figure 5-4: Northern In-Pit Spoil Dump - Section 3 (South Facing)

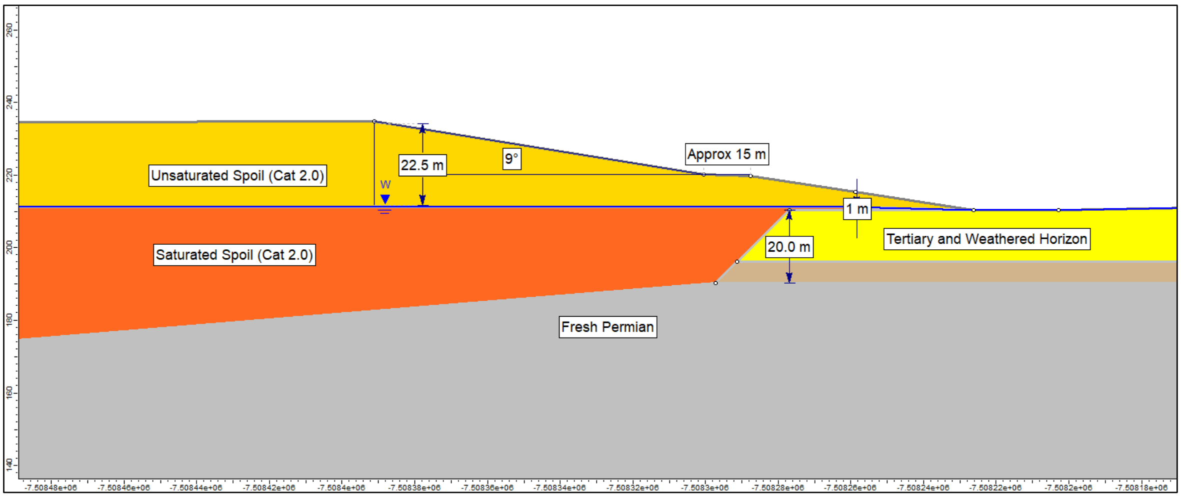

Figure 5-5: Southern In-Pit Spoil Dump - Section 4 (Southeast Facing)

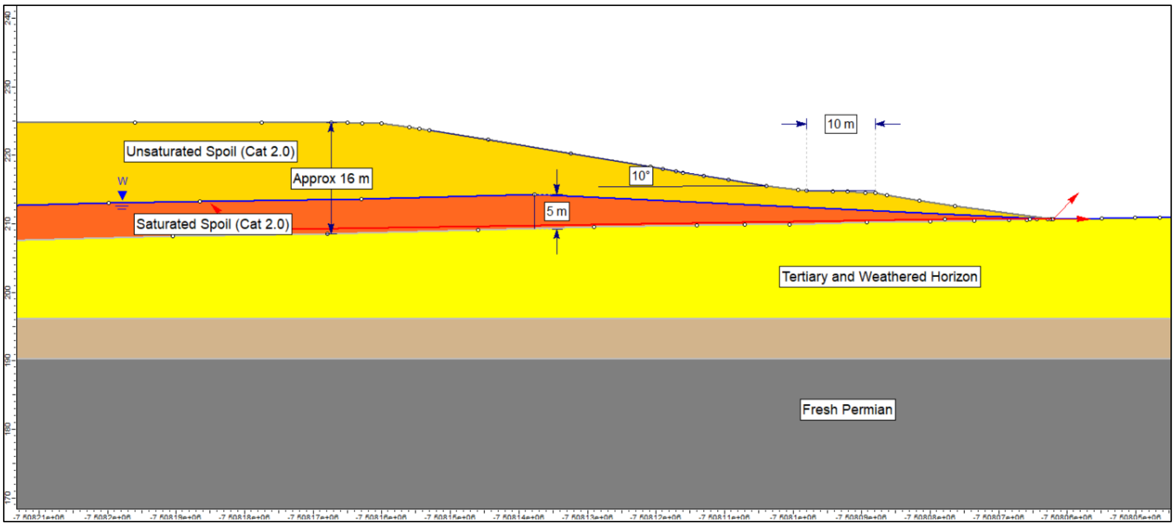

Figure 5-6: Northern Ex-Pit Spoil Dump - Section 5 (Southeast Facing)

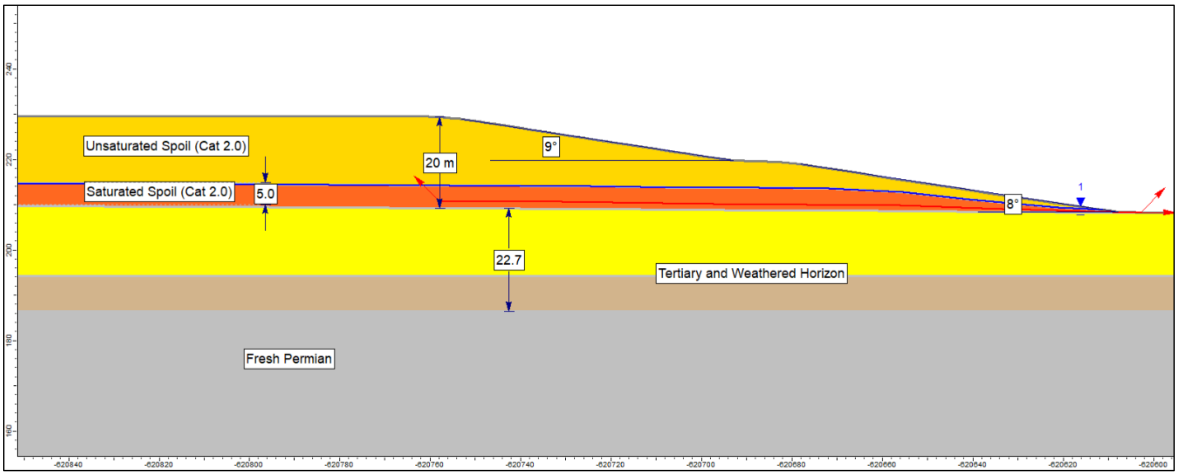

Figure 5-7: Northern Ex-Pit Spoil Dump - Section 6 (South Facing)

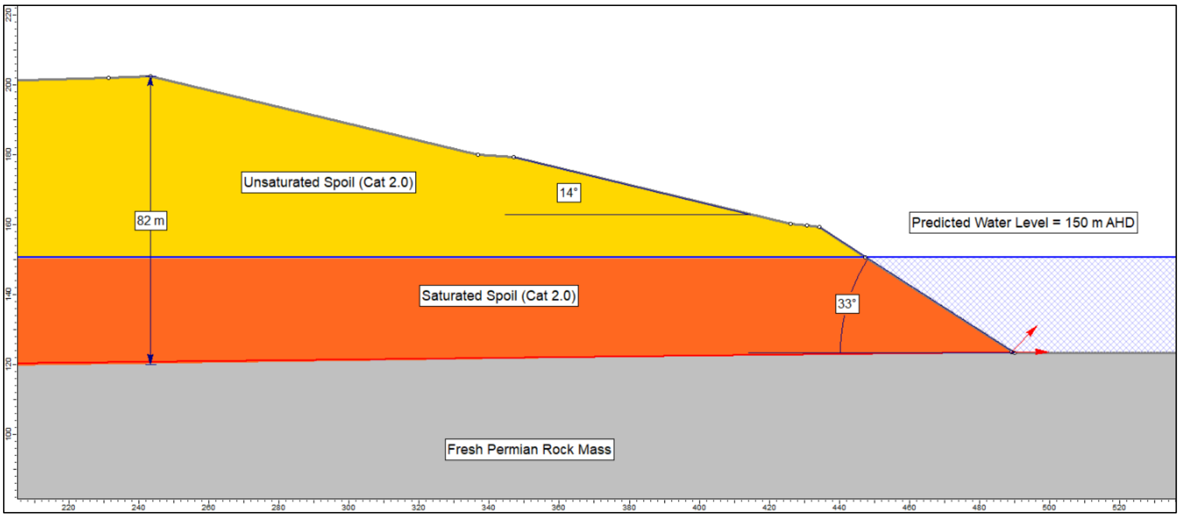

Figure 5-8: Lowwall Spoil Dump - Section 7 (Northeast Facing)

5.2 Model Uncertainty Statement

Model uncertainty was scored following the ranking system suggested by Simmons et al. (2024) (see Appendix A) in the Guidelines for the Geotechnical Assessment of Final Landforms.

- **Strata and Landform Profile Information**

Broader geological surfaces including the designed final landform, base of Tertiary (BUTE), base of weathering (BHWE), and coal seam roof/floor layers have been provided by Stanmore, but detailed sub-geotechnical units (e.g., different lithology units within the Tertiary/weathered material and fresh rock strata) inferred from site investigation campaigns were not available. (**Medium uncertainty: max. score 10 × weighting 0.6 = ranking score 6.0**).

- **Structural Model**

The models presented do not incorporate rock mass structure. For example, joint patterns/planes/fracture networks etc can be a driving mechanism of slope instability – kinematic failures, which are not able to be accounted for in the current LE analyses. Pit scale faults defined (**Medium uncertainty: max. score 15 × weighting 0.6 = ranking score 9.0**).

- **Strata Complexity**

The Project area is characterised by 7 representative cross-sections to consider localised strata variability and slope designs. Anticipated long-term pit void water levels are below the spoil dump horizon; however, short-term heavy precipitation may change the saturation conditions of the Tertiary & weathered horizon and the spoil dump, by increasing pore pressure response and the risk of instability. (**Low uncertainty: max. score 5 × weighting 1.0 = ranking score 5.0**).

- **Strength Properties**

The current assessment is based on the Mohr-Coulomb shear strength parameters derived from assumptions commensurate with those commonly applied in the Bowen Basin. (**Low uncertainty: max. score 10 × weighting 1.0 = ranking score 10.0**).

- **Deformation Properties**

Deformation properties are not incorporated in the LE analysis, as the method determines the factor of safety based on equilibrium and does not simulate deformation behaviour. (**Introductory uncertainty: max. score 5 × weighting 0.0 = ranking score 0.0**).

- **Groundwater Pressure Model**

Groundwater model only preliminary based on drillhole intercepts and field testing. Predicted groundwater and void water levels were employed for the analysis. (**Low uncertainty: max. score 20 × weighting 0.2 = ranking score 4.0**).

- **Method of Analysis**

Potential or actual failure mechanisms for site conditions is reasonably understood and generally accepted across the industry based on operational experience and peer reviews (**Medium uncertainty: max. score 10 × weighting 0.6 = ranking score 6.0**).

- **Reported Field Performance Observations**

The length of regular periodic field observations of the slopes in question was unknown or less than 2 years. (**Introductory uncertainty: max. score 25 × weighting 0.0 = ranking score 0.0**).

In summary, the model uncertainty rating is categorised as **HIGH (40)**, primarily due to information about the structural model, deformation properties, and reported field performance observations.

Future actions to reduce the uncertainty (a higher score per Table 5-1) in the geotechnical model would be to increase the confidence in the datasets used to form the geotechnical model, especially using the stress-deformation analysis. Given the mine is still to be developed, a high uncertainty ranking for the geotechnical model is to be expected.

Model uncertainty ranking criteria is summarised in Table 5-1.

Table 5-1: Model Uncertainty Ranking Criteria (after Simmons et al 2024)

Rating	Ranking	Safety and Stability Implications
80 - 100	Low Uncertainty	Risk management to an ALARP standard is possible with due allowances for model elements ranked as medium or high uncertainty level.
50 - 79	Medium Uncertainty	Risk management to an ALARP standard may not be possible without some combination of improvements to the model, significant increases in design acceptance criteria, or uncertainty allowances in observational stability acceptance criteria.
< 50	High Uncertainty	Risk management to an ALARP standard is not likely to be possible. Assessment must be qualified accordingly, or significant improvements made to the model, significant increases in design acceptance criteria, or uncertainty allowances in observational acceptance criteria prior to finalising assessment.

5.3 Northern Low wall Stability Under Q1000 Flood Conditions

Under the final landform conditions, the flood levee that protected the pit from the 1:1000-year (Q1000) flood event during operations will be rehabilitated and will not form part of the final landform. Under this scenario, the Q1000 flood event is predicted to result in surface water flowing across the backfilled pit in proximity to final landform lowwall, as illustrated in Figure 5-9.

The peak water level associated with the Q1000 flood event is estimated to reach approximately 202.5 m AHD, with a duration of approximately 43 hours (Hydrobalance, 2026). This timeframe is generally insufficient to allow significant infiltration of surface water into the underlying subsurface materials or to induce a measurable phreatic level response.

However, to assess a conservative (worst-case) scenario, a model has been developed to evaluate the potential impacts of an elevated phreatic surface resulting from a Q1000 flood event, as illustrated in Figure 5-10 for section 7 (see Figure 5-1). It should be noted that this scenario was developed based on numerous assumptions.

The result of the analysis is presented in Table 5-5.

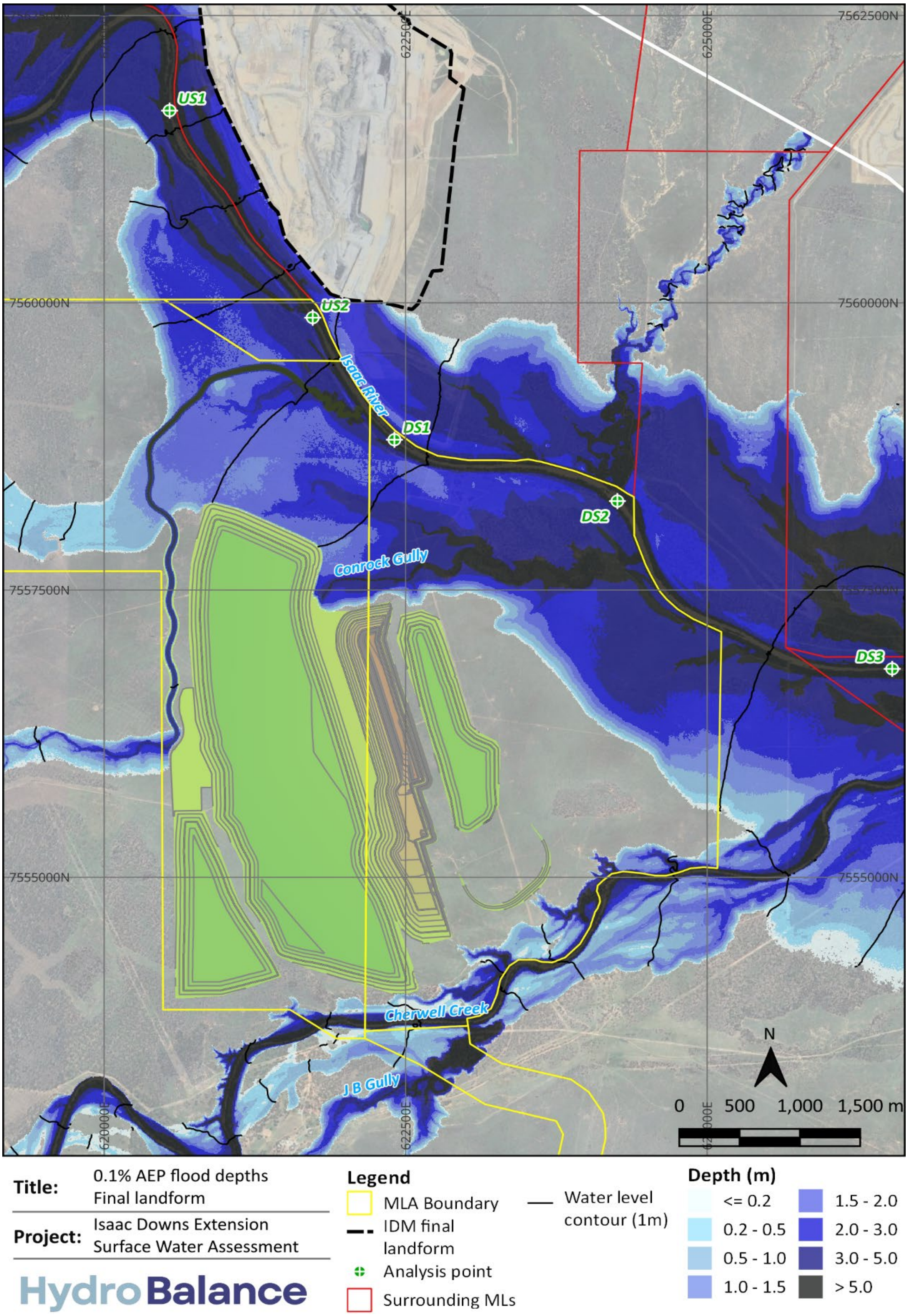

Figure 5-9: Q1000 Flood Extent

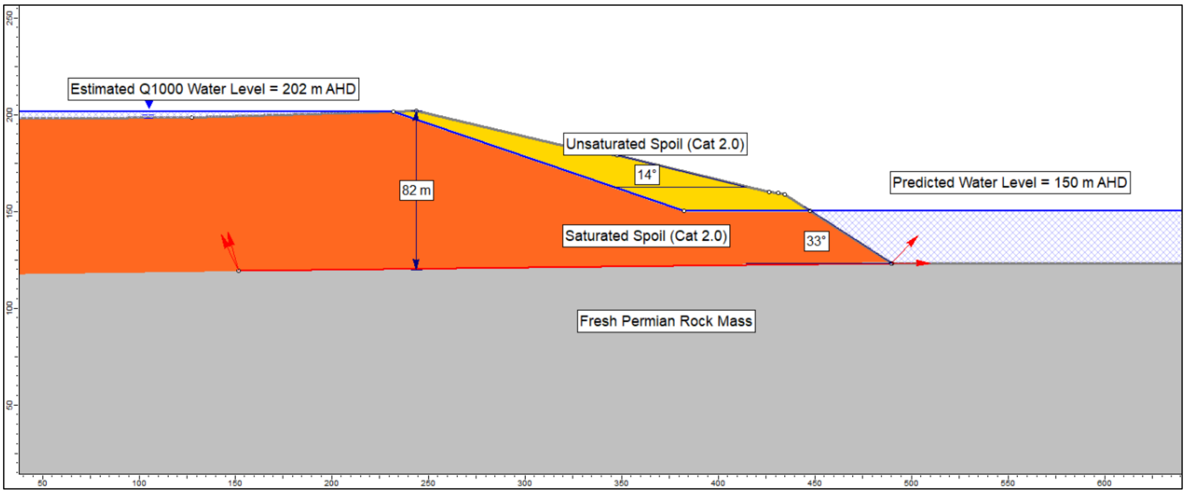

Figure 5-10: Q1000 Flood Section (Refer Figure 5-1)

5.4 Consequence Assessment

A consequence assessment was conducted for the Project's final pit geometry following the guidelines suggested by Simmons et al. (2024).

Generally, the highwall, lowwall and spoil dump slopes have negligible to low consequence of geotechnical instability, based on the available data provided and the assumptions. This means any such geotechnical instability is expected to result in minimal risk to personnel, the environment and critical infrastructure, based on the consequence categories presented in Table B-1 (Appendix B). This assessment examines exposure and associated impacts which is divided into zones or areas i.e., crest, body of the slope and at the toe of each slope.

The consequence assessment is presented in Table B-2 and Table B-3 (Appendix B).

Table 5-2 summarises the consequence assessment.

Table 5-2: Geotechnical Instability Consequence Assessment

Scenario	Impact (Harm)	Consequence of Geotechnical Instability
Highwall instability that extends into PMLUs behind crest	Environmental	Negligible
	Humans	Negligible
Lowwall/endwall/ex-pit dump instability extends into grazing PMLU	Environmental	Low to Negligible
	Humans	Low
Lowwall/endwall/ex-pit dump instability extends into woodland PMLU	Environmental	Negligible
	Humans	Negligible

5.5 Design Acceptance Criteria

Instability along potential slip surfaces is generally evaluated using limit equilibrium analyses, with outcomes expressed as a Factor of Safety (FoS). For slope design, typical FoS values range from 1.3 to 1.5, with lower values considered acceptable where model uncertainty is low or the potential consequences are minor.

Given that the geotechnical model has been classified as having **High Uncertainty**, and in accordance with the consequence levels described in Section 5.3, the minimum Factors of Safety adopted for design are summarised in Table 5-3.

Table 5-3: Design Acceptance Criteria

Scenario	Minimum Critical Factor of Safety (FoS) – Design Acceptance Criteria
Geotechnical instability extending to critical infrastructure (e.g. watercourse channels, pumped hydro or algae ponds) behind crest	1.5
Geotechnical instability extending to grazing PMLU	1.5
Geotechnical instability extending to woodland PMLU	1.5
Geotechnical instability contained within the void (remnant highwall) – below void water level	1.5

5.6 Methodology & Assumptions

Two-dimensional (2D) LE analyses were performed to determine the overall slope stability in terms of a FoS, which is a commonly employed measure in slope stability analysis to determine the likelihood of slope failure.

The FoS is a measure of driving forces versus resisting forces in a system, where a FoS of 1 equates to a 50% probability that failure will occur. FoS values > 1 are indicative of a system likely to be stable.

The following methodology and assumptions were used for the assessment:

- Failure analyses using General Limit Equilibrium/Morgenstern-Price (GLE/M-P) method for all slopes.
- Auto Refine and Block search algorithms for the final landform slopes to evaluate different search method outcomes. The Block search method assumes shearing along a weak basal contact and is generally applied to lowwall spoil on dipping floors and failure mechanisms involving coal floor contacts, whereas the Auto Refine method is applied to highwalls/endwalls.

- In situ material parameters, such as Cainozoic material and Permian coal measure rock shear strengths, were derived from assumptions commensurate with those commonly applied in the Bowen Basin, as shown in Table 5-4, with the exception of fresh Permian rock, which has been assigned a cohesion of 200 kPa, as per Stanmore (2024). It should be noted that this is a conservative cohesion value adopted by Stanmore, due to limited available data. The normally accepted cohesion value for the fresh Permian rock in the Bowen Basin, and in the absence of testing is 450 kPa.
- Spoil material parameters were largely assumed in accordance with the coal spoil shear strength framework, developed by Simmons & McManus (2004). For this assessment, we have assumed that the spoil will degrade from the current assumed Category 2.5 classification to a Category 2 (Cat 2) classification, which would be applicable as a long-term classification.
- Pseudo-static conditions were not examined due to the very low risk of seismic activity in the area.

Limitations of the current slope stability modelling approach are as follows:

- 2D LE analyses do not consider out-of-plane forces; therefore, the analysis is typically conservative. When considering the three-dimensional (3D) effects of the proposed geometry, these are likely to provide additional confinement of the pillar leading to an increased FoS.
- 2D LE analysis does not consider stress or strain. In this case, only force and moment equilibrium form the basis of the analysis.
- The models presented do not incorporate rock mass structure. For example, joint patterns/planes/fracture networks etc can be a driving mechanism of slope instability – kinematic failures, which are not accounted for in the current LE analyses. Instead, kinematic analysis would need to be carried out when more data becomes available from operations.

Table 5-4: IDE Project - Mohr-Coulomb Shear Strength Parameters

Material Name	Color	Unit Weight (kN/m3)	Strength Type	Cohesion (kPa)	Phi (°)
Tertiary		20	Mohr-Coulomb	50	30
Coal		15	Mohr-Coulomb	30	35
Fresh Permian		25	Mohr-Coulomb	450	42
Weathered		24	Mohr-Coulomb	75	30
Saturated Spoil Dump (Cat 2.0)		20	Mohr-Coulomb	15	23
Unsaturated Spoil Dump (Cat 2.0)		18	Mohr-Coulomb	30	28
Yarrabee Tuff		24	Mohr-Coulomb	5	17

5.7 Analysis Results

LE analyses reported critical FoS values of 1.5 to 4.5 for all cross-sections, based on the assumptions. These results meet or exceed the design acceptance criteria for final landform (i.e. FoS ≥ 1.5) and are therefore considered satisfactory for the long-term stability of the final landforms, based on the assumptions.

The results of the LE analyses are summarised in Table 5-5, and presented in Appendix C, for different analysis sections, respectively.

For excavated slopes (i.e., highwalls and endwalls), kinematic mechanisms are an important mode of failure i.e., wedge, planar and toppling mechanisms, which are not represented when using LE techniques. Given the operation is yet to commence, there is no data that allows the examination of these failure modes. In this case, strip by strip face mapping and further assessment of kinematic mechanisms would need to be completed when enough data has been procured through operational processes. i.e., pit wall mapping and photogrammetry assessment.

Table 5-5: IDE Project - Final Landform Stability Analysis Results

Sections	Void Slope#	Surface Type	Search Method	Factor of Safety*
1	Highwall (HW)	Non-Circular	Block	1.6
	Lowwall (LW)	Non-Circular	Block	2.6
2	HW	Non-Circular	Auto-Refine	2.5
	LW	Circular	Auto-Refine	3.0
3	Batter Slopes = In-Pit Dump	Circular	Auto-Refine	4.0
4				3.8
5	Ex-Pit Dump	Non-Circular	Block	4.5
6				4.3
7	Final Landform LW	Non-Circular Block		1.9
	Final Landform LW (Q1000)			1.7

* GLE/Morgenstern-Price FoS reported
# HW=highwall; LW=lowwall; EW=Endwall
Green cell indicates analysis FoS ⩾1.5

6 LONG TERM GEOTECHNICAL STABILITY – FINAL LANDFORMS

6.1 Time Dependent Degradation and Erosion

Over the long-term, pit slope faces are expected to erode to some extent due to natural weathering processes; however, these should maintain a similar profile as the stronger sandstone layers generally act as reinforcement within the slope.

It is difficult to ascribe a timeframe for weathering; however, similar studies carried out at Bowen Basin sites in Queensland show a possible degradation rate of approximately 40 to 50 mm/year on exposed pit walls, which is equivalent to approximately 1 m every 20 years (Ward, 2016). This rate of degradation is also highly dependent on the long-term water level in the void, which typically prevents exposure of the slopes and reduces the rate of weathering and erosion.

Overall, these processes are unlikely to prejudice the geotechnical stability of the entire slope; however, is likely to result in localised shallow failures, or undercutting of the slope.

6.2 Global Geotechnical Stability – Rock Slopes

Geotechnical stability in rock slopes is generally controlled by geological structure, as the rock itself is too strong to permit shear failure. However, rock mass strength is scale-dependent, and if the block size produced by the discontinuities is small enough compared to the slope height, steep slip pathways could be generated in high faces by linking through the discontinuities without shearing the rock itself (Simmons, 1995). This is unlikely at IDE for the following reasons:

- The base of weathering (BHWE) across the site is approximately 20 m deep; however, where this horizon is assessed to be thicker (i.e., greater than approximately 20 m deep), failures have the potential to occur if the slope angle is above approximately 50° for weathered rock and approximately 45° for unconsolidated Cainozoic sediments.
- Rock mass strength failures are unlikely to occur at slope heights below 300 m under normal conditions (Simmons, 1995), which usually implies good rock mass conditions and minimal faulting or geological structure behind the highwall/endwall slopes. Given the maximum height of approximately 100 m for the residual void, the buttressed highwalls and endwalls are likely to be stable from mass failures in the absence of adverse geological structures and geometries on the slope faces.
- Weathered and fresh Permian coal measure rocks are generally less susceptible to erosion, compared to the Tertiary and/or Quaternary (Cainozoic) units.
- Non-weathered Permian rock units, typically mudstone and claystone and weathered Permian units are likely to be susceptible to slaking, which occurs when material breaks down upon exposure to moisture and wetting and drying cycles.
- Sandstone is typically less susceptible to degradation caused by weathering in comparison to siltstone, mudstone, or unconsolidated Cainozoic materials. In the context of an open pit slope, preferential slaking of the less-resistant material above or below a more durable sandstone, for example, is likely to occur over time, and lead to undercutting. This introduces the risk of ongoing rockfalls and localized steepening of the slope.
- Generally, detached blocks would be small and inconsequential from a global stability perspective, with the blocks reporting directly to the void. Treatment of the slope in this situation is often impracticable, as the residual void would be filled with water.

6.2.1 Structurally Controlled Geotechnical Failure Modes

Mass failure of rock will require the presence of pre-existing discontinuities to create the freedom of movement. Conditions of instability can be generated by the presence of adversely oriented geological structures such as faults, major joints, or steep bedding, if present in the IDE void.

6.3 Geotechnical Stability – In-Pit Spoil Dumps

Fresh Permian spoil is generally blocky, but this material can be susceptible to rapid slaking, particularly as the void fills with water, which may result in a significant proportion of fines being generated.

Spoil dump surfaces, including lowwalls, will be rehabilitated to achieve acceptable erosion rates. Nevertheless, some erosion and fines may report to the enclosed void, which is unlikely to have a significant effect on stability (Ward, 2016).

7 FINAL VOID COMPLETION CRITERIA – GEOTECHNICAL STABILITY

Completion criteria were developed, based on a FoS, to demonstrate the geotechnically stable of the final landform. The Progressive rehabilitation and closure plan (PRCP) Guidelines (DESI 2023) require that final voids and surrounding landforms must be geotechnically stable, as well as considering the effects of long-term erosion and weathering of the slopes.

Whilst the requirements for final slopes are not specific in terms of geotechnical design parameters, slope designs typical of those used throughout the coal industry are considered suitable for closure purposes, with remedial modifications sometimes required, particularly in the Cainozoic and weathered horizons to achieve stable slopes.

Remedial slope modifications often involve re-grading the slope to a shallower angle and the installation of surface drains to reduce erosion, where required.

Overall, the final landform is required to be geotechnically stable, with safety and environmental risks minimized to the extent practicable. Table 7-1 below outlines the set of possible actions to consider based on the adopted FoS design acceptance criteria.

Table 7-1: Completion Criteria Actions

Geotechnical Scenario	Critical infrastructure and grazing PMLU (FoS)	Woodland (FoS)	Void Highwall (FoS)	Action
Static FoS Criteria	≥ 1.5			No action required.
	< 1.5 > 1.05			Periodic inspections and geotechnical assessment to confirm geotechnical stability prior to closure. Treatment of slope if practicable. Risk assessment by appropriately qualified expert. Assessment of offset between critical minimum FoS and slip surface that reports FoS ≥1.5.
	< 1.05			Treatment of high-risk slopes to be considered, if practicable. Regular inspections to confirm geotechnical stability prior to closure. Further risks assessment by appropriately qualified expert.

As a general guideline for final void/landform slopes, the following design criteria is recommended:

- Highwall and endwall batter angles up to 70°, with an inter-ramp angle (IRA) <50°.
- Weathered slopes ≤ 45°.
- For in-pit and ex-pit spoil dumps, a maximum overall slope angle (OSA, toe to crest) not greater than approximately 25°.

The Project's final landform achieves the recommended design criteria. A summary of the proposed completion criteria for geotechnical stability of the Project's final landform is presented in Table 7-2, based on the results of the slope stability analyses (refer to Table 5-5).

Table 7-2: Proposed Completion Criteria – Static Condition

Sections	Void Slope	Design Meets Criteria	Action/ Proposed Remediation
1	HW	YES	No action required.
	LW	YES	No action required.
2	HW	YES	No action required.
	LW	YES	No action required.
3	Batter slope Ex-Pit	YES	No action required.
4	Batter slope Ex-Pit	YES	No action required.
5	Ex-Pit Dump	YES	No action required.
6	Ex-Pit Dump	YES	No action required.
7	Final Landform LW	YES	No action required.
	Final Landform LW (Q1000)	YES	No action required.

8 SURFACE WATER MANAGEMENT

8.1 Surface Water Management

Run-off over the highwall is likely to have minimal impact on the stability of the rock benches; however, concentrated run-off will erode and gully the upper weathered horizon. Additionally, ponded water is likely to infiltrate the surface layers and cause piping erosion which is difficult to manage once the process has commenced.

This process would be dependent on the nature and thickness of the Tertiary material, and measures designed to encourage diversion of surface water away from these areas should be considered as a priority.

The Project proposes measures to divert surface water runoff away from the highwall (e.g. bunds), which are typical final landform design practices for mines within the Bowen Basin.

8.2 Exclusion Bund Offsets

According to the Guidelines for the Geotechnical Assessment of Final Landforms, fencing or bunding should be established at a sufficient offset from where the limit of crest instability is anticipated. In this case, because the calculated minimum FoS is ≥ 1.5 for all slopes analysed, a minimum offset distance of 15 m from the final crest position is sufficient (Simmons et al 2024).

Exclusion bunds for the purpose of restricting access should have a minimum height of 2 m, and should be constructed of non-dispersive material, or alternatively by placing hard barriers or fencing which would prevent access without restricting run-off if water is being directed away from the void (Ward 2016).

9 CONCLUSIONS

It can be concluded from the geotechnical assessment and analyses that:

- The final void slopes, ex-pit spoil dumps and in-pit spoil dump slopes were assessed to be geotechnically stable in the long term, based on the assumptions.
- The upper weathered slopes are generally stable; however, these material types will likely erode quicker than fresh rock slopes. Changes to the geochemical and geotechnical characteristics of materials in this horizon can be expected should materials become saturated, resulting in lower shear strengths and higher pore pressures; however, this would need to be monitored as part of the closure process, and in the absence of definitive erosion modelling. The primary monitoring mode would involve periodic inspections.

10 RECOMMENDATIONS

Based on the outcomes of the analyses and assessment, recommendations are as follows:

- Surface drainage behind the crest line of each final landform feature should be well established to prevent ponding and to encourage surface water away from the crest which will minimise the impacts of erosion.
- Periodic inspections throughout the closure process to identify any areas of concern prior to closure, to confirm assumptions and parameters used for slope stability modelling and to confirm the performance of the slope(s).

11 REFERENCES

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APPENDIX A:
MODEL UNCERTAINTY STATEMENT

Table A-1: Model Uncertainty Statement Rating Worksheet

	Score	Uncertainty Level and Weighting			
Model Element		Introductory	High	Medium	Low
		0.0	0.2	0.6	1.0
Strata & Landform Profile Information	10	Basic surfaces with unreliable or absent data.	Assessment based on 'typical' regional conditions.	Geological surfaces extracted from site geological model.	Use of information such as drill logs and field mapping to define sub geotechnical units within broader geological units.
Structural Model	15	No information.	Structure assumed typical of the region.	Structure broadly understood from observation and experience at the site.	Either no dominant structure OR structure well understood from mapping and drilling.
Strata Complexity	5	No information.	Strata or structure are highly variable with distance OR properties are greatly affected by moisture content.	Strata and structure do not vary rapidly with distance, AND properties not greatly affected by moisture content changes.	Strata quite uniform in thickness and properties AND structure clearly defines slip surfaces.
Strength Properties	10	No information.	Derived from published data for the material classifications, without specific regional data.	Derived from tests on key strata sampled from sites within the region.	Derived from site specific tests on key strata.
Deformation Properties	5	No information, or not considered in stability assessment.	Derived from published data for the material classifications, without specific regional data.	Derived from tests on key strata sampled from sites within the region.	Derived from site specific tests on key strata.
Groundwater Pressure Model	20	No site measurements; conceptual hydrogeological assessment only.	Pre-mining groundwater study OR sensitivity analyses included in stability analyses.	>2 years measurement for site groundwater network, with interpretation.	>2 years measurement of at least 2 piezometers at the slope in question, with associated groundwater analysis.
Method of Analysis	10	No quantitative analyses.	Able to accurately represent the failure mechanism BUT there is limited industry experience interpreting the results.	Able to approximately represent the failure mechanism AND there is wide industry experience in interpreting the results.	Able to accurately represent the failure mechanism AND there is wide industry experience in interpreting the results.
Reported Field Performance Observations	25	<2 years visual observation of the slope in question.	2-5 years visual observation of the slope in question.	>5 years visual observation OR > 2 years movement measurement at the slope in question.	> 5 years movement measurement at the slope in question.

MODEL UNCERTAINTY RATING = 6.0 + 9.0 + 5.0 + 10.0 + 0.0 + 4.0 + 6.0 + 0.0 = 40 (High Uncertainty, Simmons et al. 2024)

APPENDIX B:
CONSEQUENCE ASSESSMENT

Table B-1: Consequence Categories

	N/A or Negligible	Low	Medium	High
Harm to Humans				
	People are not routinely present in the impacted area or only injuries requiring first aid are likely.	Loss of life is not expected and only short-term disabling injuries are expected.	Single loss of life or long-term disabling injuries are expected.	Multiple loss of life expected.
Environmental Harm				
	Minor, temporary impact to the environment.	Measurable impact to an area ≤ 1km2; where remediation of damage is likely to take ≤ 1 year.	Impact to an area ≤ 5km2; where remediation of damage is likely to take ≤ 5 years.	Impact to an area > 5km2; where remediation of damage is likely to take > 5 years.
Property Loss & Damage				
	Minor, temporary community impact that recovers with little intervention; Damage to property or compensation or repair costs < $0.5M.	Measurable but limited community impact lasting less than six months; Damage to property or compensation or repair costs $0.5M - $10M.	Serious impact on community lasting up to 12 months; Damage to property or compensation or repair costs $10M - $50M.	Severe impact on community lasting more than 12 months; Damage to property or compensation or repair costs > $50M

Table B-2: Consequence Category Assessment – Highwall

Extent of Instability *(length or area affected)*	Exposure *(people, ecosystems & property within extent)*	Harm to Humans		Environmental Harm		Property Loss & Damage	
		Potential Impacts	*Cat.*	*Potential Impacts*	*Cat.*	*Potential Impacts*	*Cat.*
Crest Zone – Highwall Area							
PMLU infrastructure	Highwall instability affecting PMLU infrastructure (e.g. algae production and/or pumped hydro)	People are not routinely present in the impacted area or only injuries requiring first aid are likely	Neg	Minor, temporary impact to the environment	Neg	Damage to property repair costs < $0.5M.	Neg
Body of Slope – Highwall Area							
Within Void	No people to access the highwall – fencing to be established. No features of environmental significance. No property within void	People are not routinely present in the impacted area or only injuries requiring first aid are likely.	Neg	Minor, temporary impact to the environment.	Neg	Minor, temporary community impact that recovers with little intervention.	Neg
Toe Zone of Highwall Area							
Within Void	No people to access the highwall – fencing to be established. No features of environmental significance. No property within void	People are not routinely present in the impacted area or only injuries requiring first aid are likely.	Neg	Minor, temporary impact to the environment.	Neg	Minor, temporary community impact that recovers with little intervention.	Neg

Table B-3: Consequence Category Assessment – Lowwall, Endwall & Ex-Pit Dumps

Extent of Instability *(length or area affected)*	Exposure *(people, ecosystems & property within extent)*	Harm to Humans		Environmental Harm		Property Loss & Damage	
		Potential Impacts	*Cat.*	*Potential Impacts*	*Cat.*	*Potential Impacts*	*Cat.*
Crest Zone – Lowwall/Endwall/Ex-Pit Dumps							
Grazing PMLU (includes northern low wall)	People will have access to the area when cattle grazing. Grassland ecosystems to be established as part of rehabilitation. No property within the grazing PMLU.	Loss of life is not expected, and only short-term disabling injuries are expected.	Low	Measurable impact to an area < 1km2; where remediation of damage is likely to take <1 year.	Low	Damage to property repair costs < $0.5M.	Neg
Body of Slope and Toe Area – Lowwall/Endwall/Ex-Pit Dumps							
Grazing PMLU	People will have access to the area when cattle grazing. Grassland ecosystems to be established as part of rehabilitation. No property within the grazing PMLU	Loss of life is not expected, and only short-term disabling injuries are expected.	Low	Minor, temporary impact to the environment.	Neg	Minor, temporary community impact that recovers with little intervention.	Neg
Woodland PMLU (low wall)	Area generally not accessed by people. No property within the woodland PMLU on the lo wall.	People are not routinely present in the impacted area or only injuries requiring first aid are likely.	Neg	Minor, temporary impact to the environment.	Neg	Damage to property repair costs < $0.5M.	Neg

APPENDIX C:
STATIC 2D LIMIT EQUILIBRIUM MODEL OUTPUTS

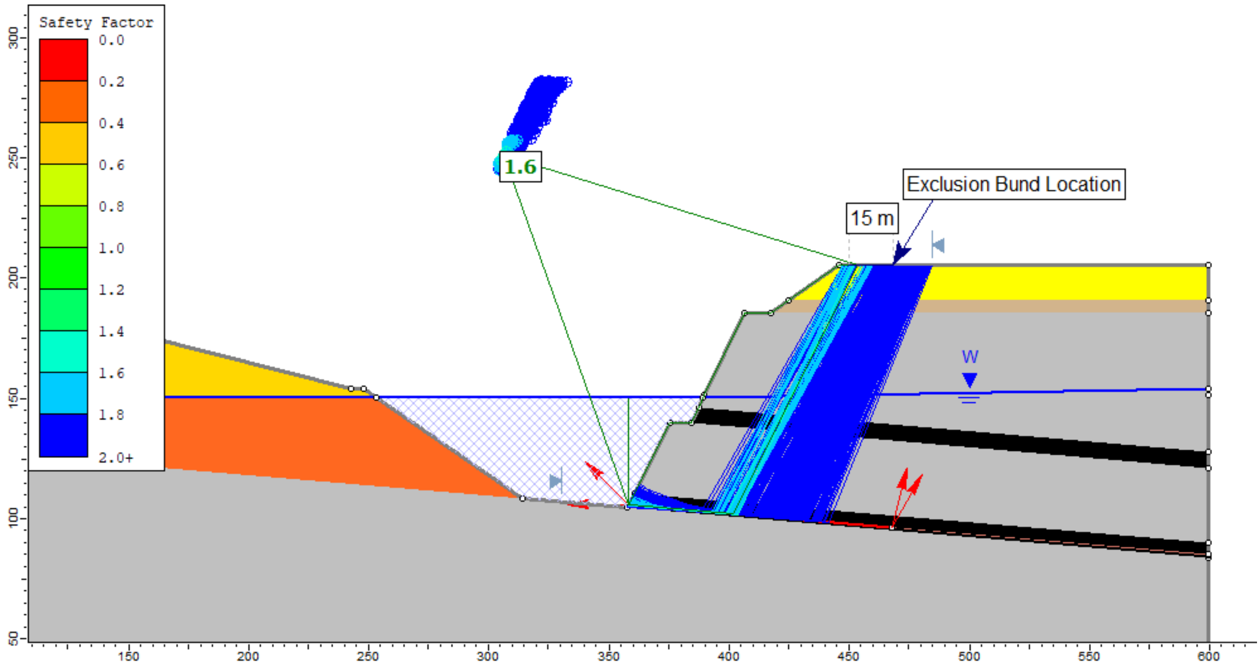

Figure C - 1: Section 1 Highwall (Block) - FoS = 1.6

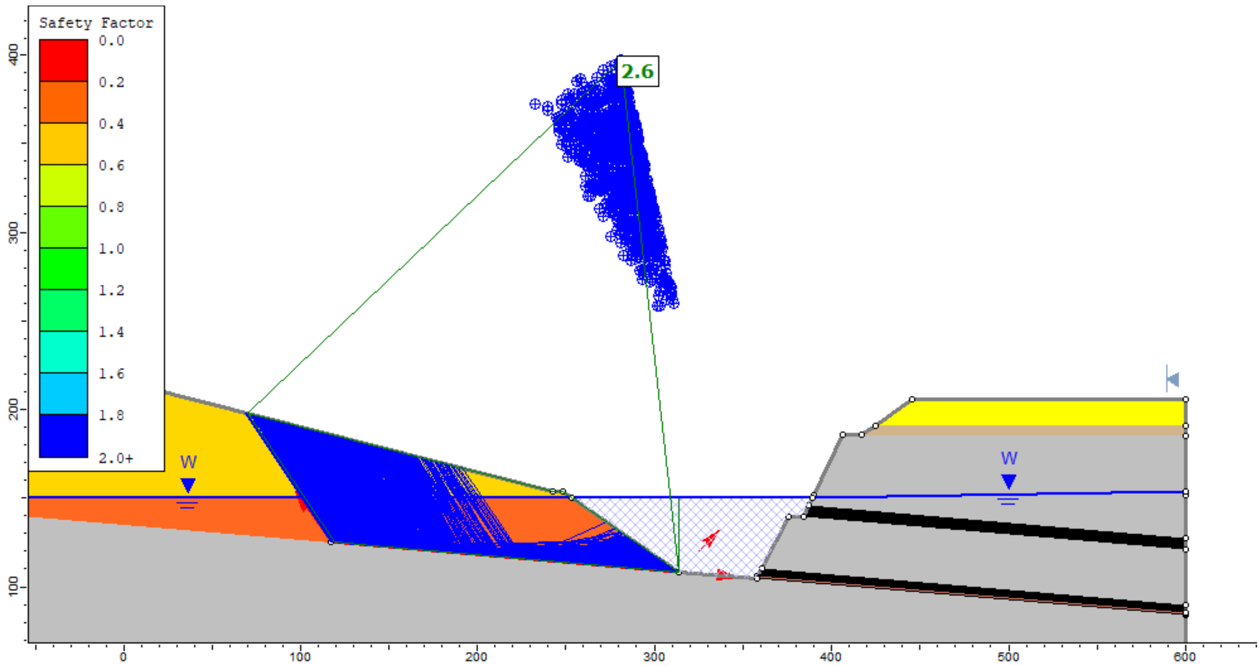

Figure C - 2: Section 1 Lowwall (Block) - FoS = 2.6

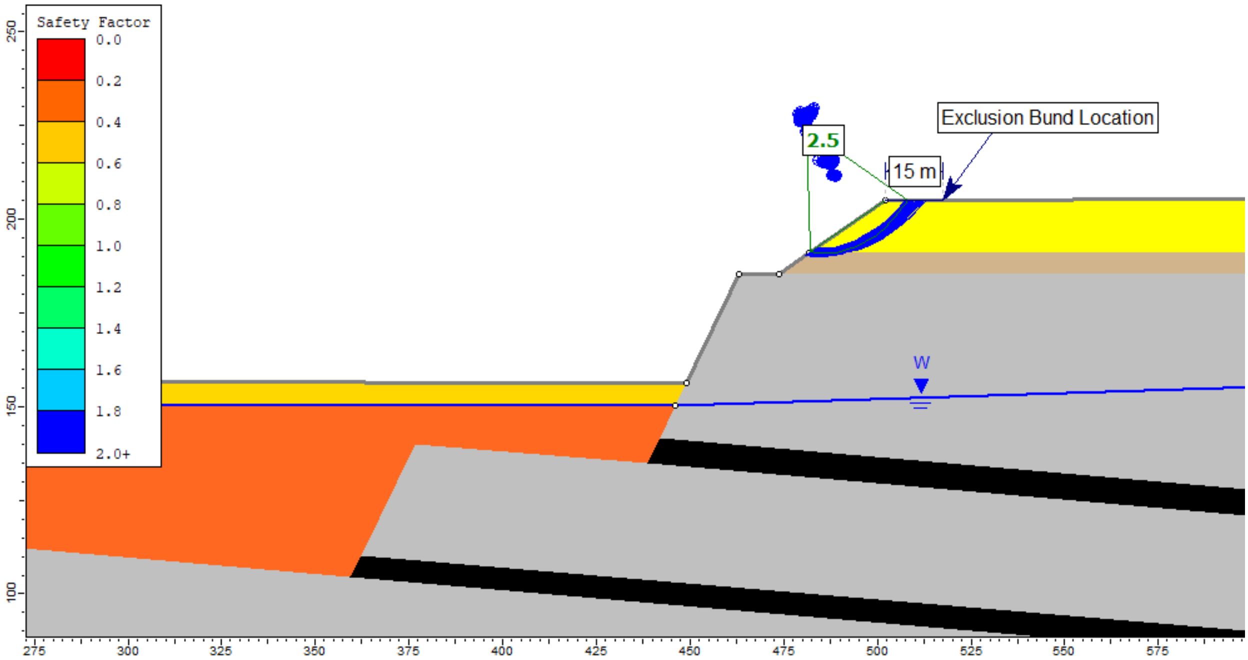

Figure C - 3: Section 2 Highwall (Auto Refine) - FoS = 2.5

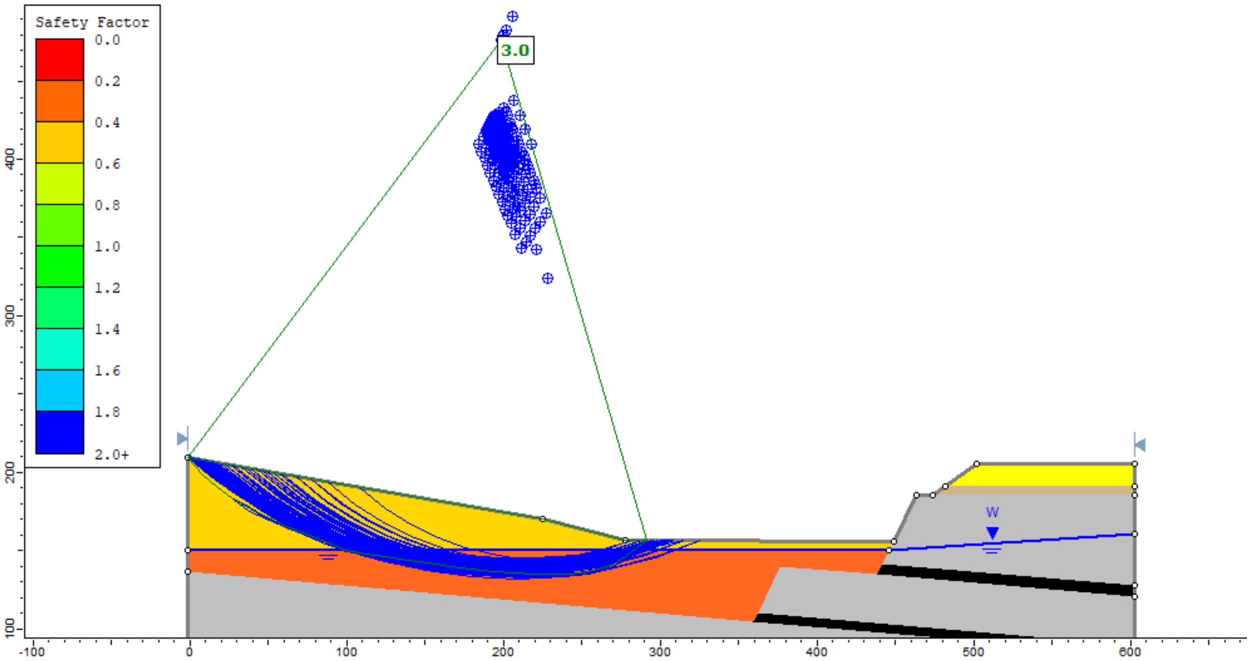

Figure C - 4: Section 2 Lowwall (Auto Refine) - FoS = 3.0

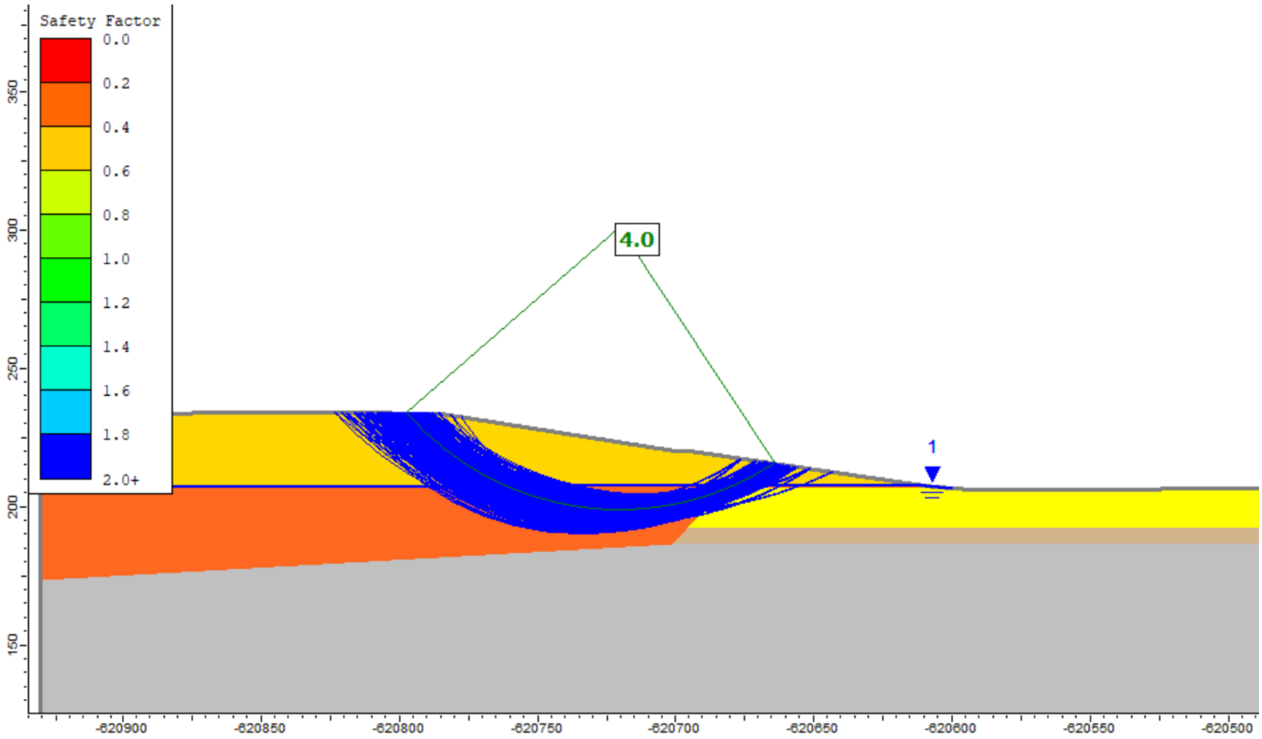

Figure C - 5: Section 3 Batter Slopes In-Pit Dump (Auto Refine) - FoS = 4.0

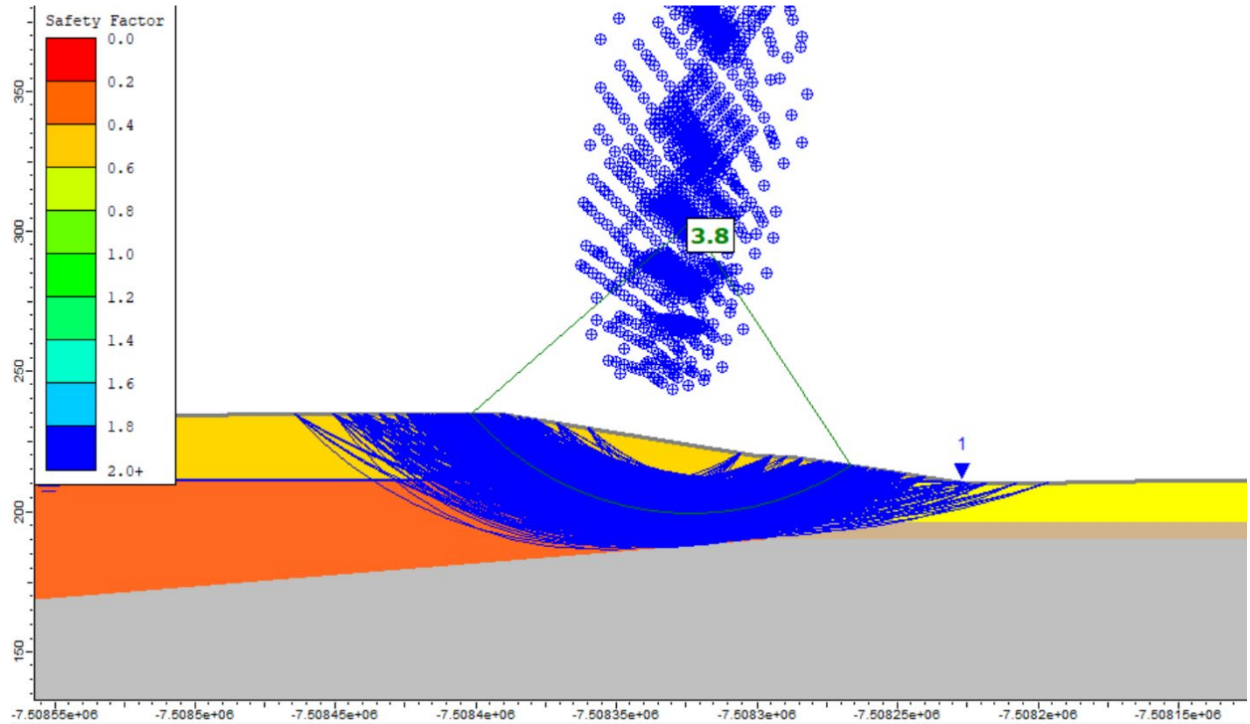

Figure C - 6: Section 4 Batter Slopes In-Pit Dump (Auto Refine) - FoS = 3.8

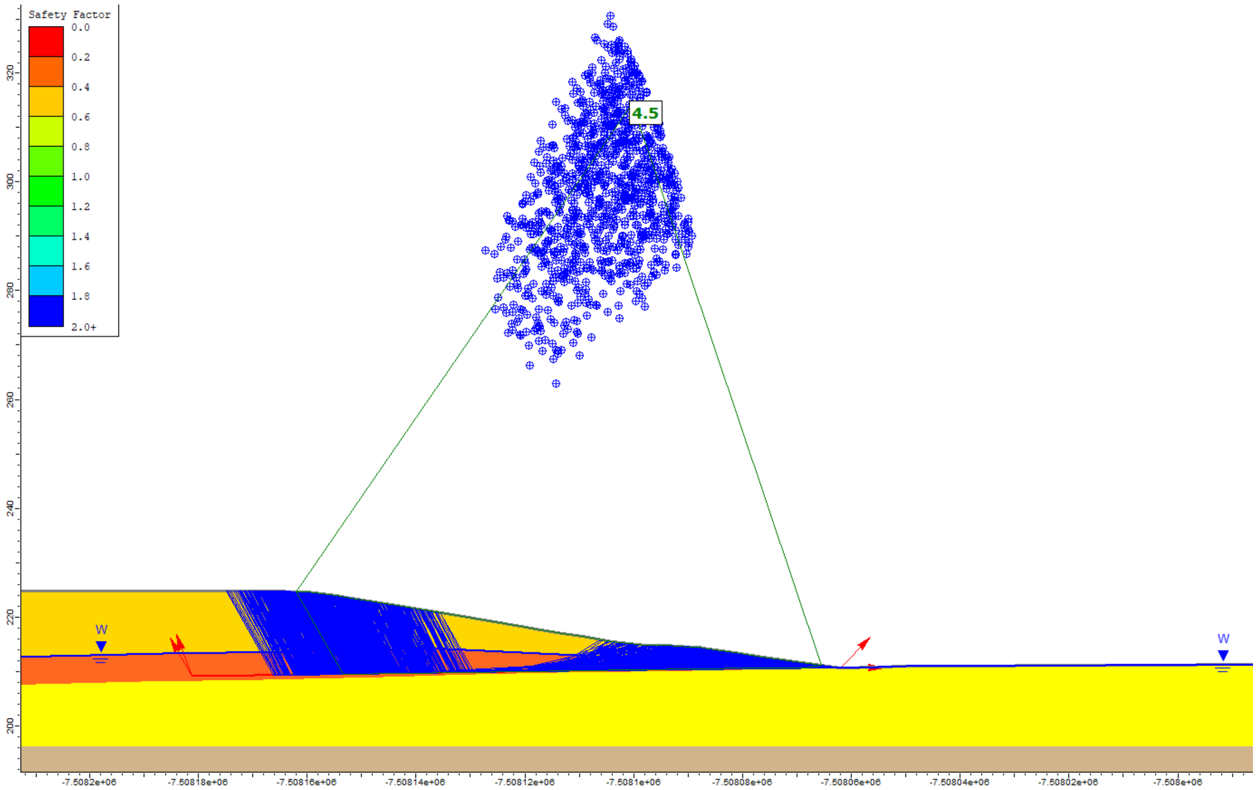

Figure C - 7: Section 5 Batter Slopes Ex-Pit Dump (Block) - FoS = 4.5

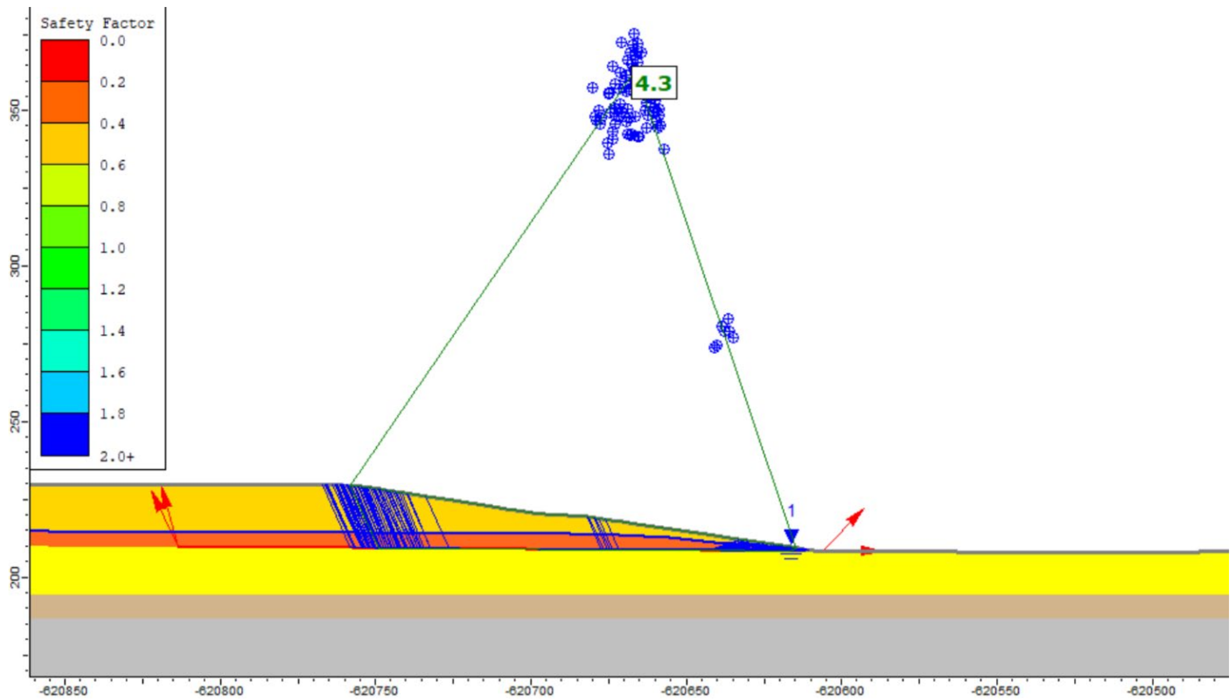

Figure C -8: Section 6 Batter Slopes Ex-Pit Dump (Block) FoS = 4.3

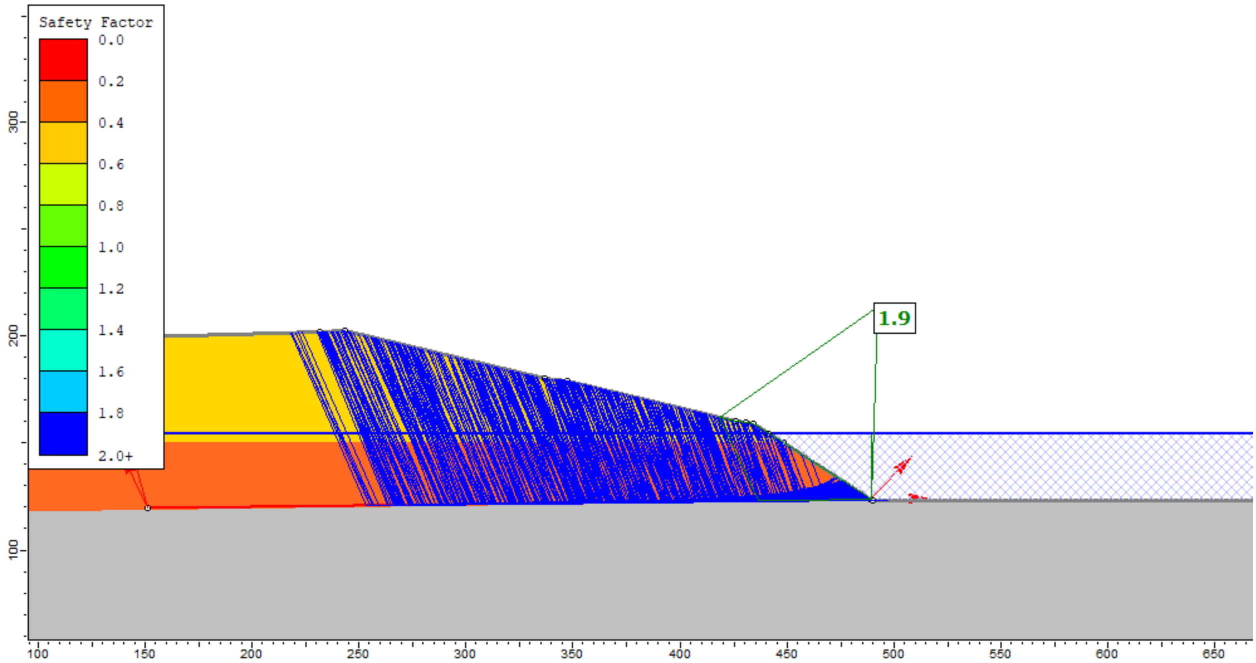

Figure C -9: Section 7 Lowwall In- Pit Dump (Block) - FoS = 1.9

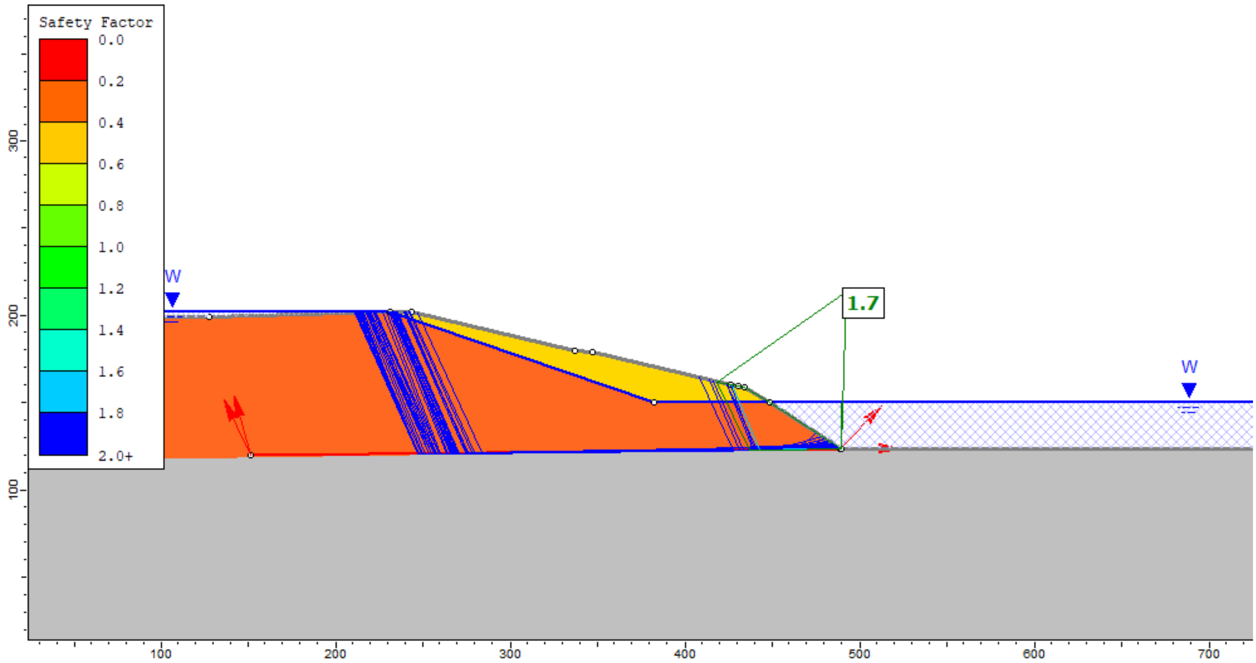

Figure C -9: Section 7 Lowwall In- Pit Dump (Block) (Q1000) - FoS = 1.7