Bowdens Silver Project

Preliminary Design of PAF Waste Rock Emplacement, Oxide Ore Stockpile and the Southern Barrier

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Synopsis

This report discusses the Preliminary Design of the Waste Rock Emplacement proposed for the containment of the Potentially Acid Forming (PAF) waste rock that will be derived from the development of the Bowdens Silver Project near Lue, in New South Wales. The design is to accommodate approximately 26.6 Million tonnes of PAF waste rock generated over the approximately 16.5 year mine life. The facility will also collect the low pH leachate generated for further treatment.

In addition, the treatment, storage and handling of low-grade ore, oxide ore and non-acid forming waste rock material generated over the Project life is also discussed in this report.

Disclaimer

Project No: 201010-00790--REP-002 – Preliminary Design of PAF Waste Rock Emplacement, Low Grade Ore and Oxide Ore Stockpiles and the Southern Barrier

Rev	Description	Author	Review	Advisian Approval	Date
0	Issue for use	F Canzian	L Gray	D Haskins	22-08-19
1	Issue for use	F Canzian	L Gray	D Haskins	07-05-20

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1 Introduction

Bowdens Silver Pty Limited (Bowdens Silver, a wholly owned subsidiary of Silver Mines Limited) is developing the Bowdens Silver Project (the "Project") located near Lue, approximately 26km east of Mudgee in central New South Wales, Australia. The Project is a low-sulphidation, epithermal silver deposit principally hosted in siliceous volcanic rocks with silver mineralisation associated with zinc and lead sulphides.

The Project comprises a main open cut pit and two satellite open cut pits, a processing plant, Tailings Storage Facility (TSF), temporary and permanent waste rock landforms, accesses and haul roads, acoustic barriers and associated infrastructure. Figure 1 presents the general site layout of the Project.

Advisian has been engaged by Bowdens Silver to provide Conceptual and Preliminary Design of the Waste Rock Emplacement (WRE) for the management of potential acid forming (PAF) waste rock and associated landforms such as the oxide ore stockpile, low-grade ore stockpile, waste rock haul road and the temporary non-acid forming (NAF) waste rock stockpile (southern barrier).

1.1 Information supplied

The Preliminary Design was based on the following information supplied by Bowdens Silver:

- Digital topographical data (LiDAR) files (flown January 2017);
- Proposed mine site layout;
- Proposed mine schedule separated by PAF, NAF (oxide and fresh waste rock), Low Grade Ore (LGO) and Oxide Ore;
- Tailings Storage Facility – Feasibility Study, undertaken by ATC Williams (October 2018)[1];
- Price Creek 1:100 AEP (Annual Exceedance Probability) base case flood extents from WRM Water & Environment in a 3D format (provided on 11 May 2018).

The geochemical composition of the waste rock and tailings was established by Graeme Campbell and Associates (GCA) in 2020. GCA tested representative samples of waste rock, ore, low grade ore, tailings and composite soil samples. The testing identified that approximately 57% of waste rock comprises PAF material, with the remaining being NAF.

The PAF waste rock was found to include iron sulphide minerals (FeS_2) such as pyrite and marcasite, with sulphide concentrations greater than 0.3% Total-Sulphur (Total-S). Due the potential for acid generation when exposed to environmental conditions, the PAF waste rock needs to be fully encapsulated at closure (i.e. within a lined and capped facility) with leachate water properly managed throughout the operation of the mine.

The NAF waste rock (i.e. that material which comprises <0.3% Total-S) was determined to either be absent of sulphide minerals or have a presence of ankerite, a carbonate mineral that provides circum-neutral buffering during weathering. Additionally, the presence of interstratified smectitic and illitic clays may limit sulphide oxidation of the sulphide minerals, thus retarding the rate of oxidation. As a result, the NAF material is not required to be stored in a lined facility.

[1] This report has since been updated (ATC Williams, 2020)

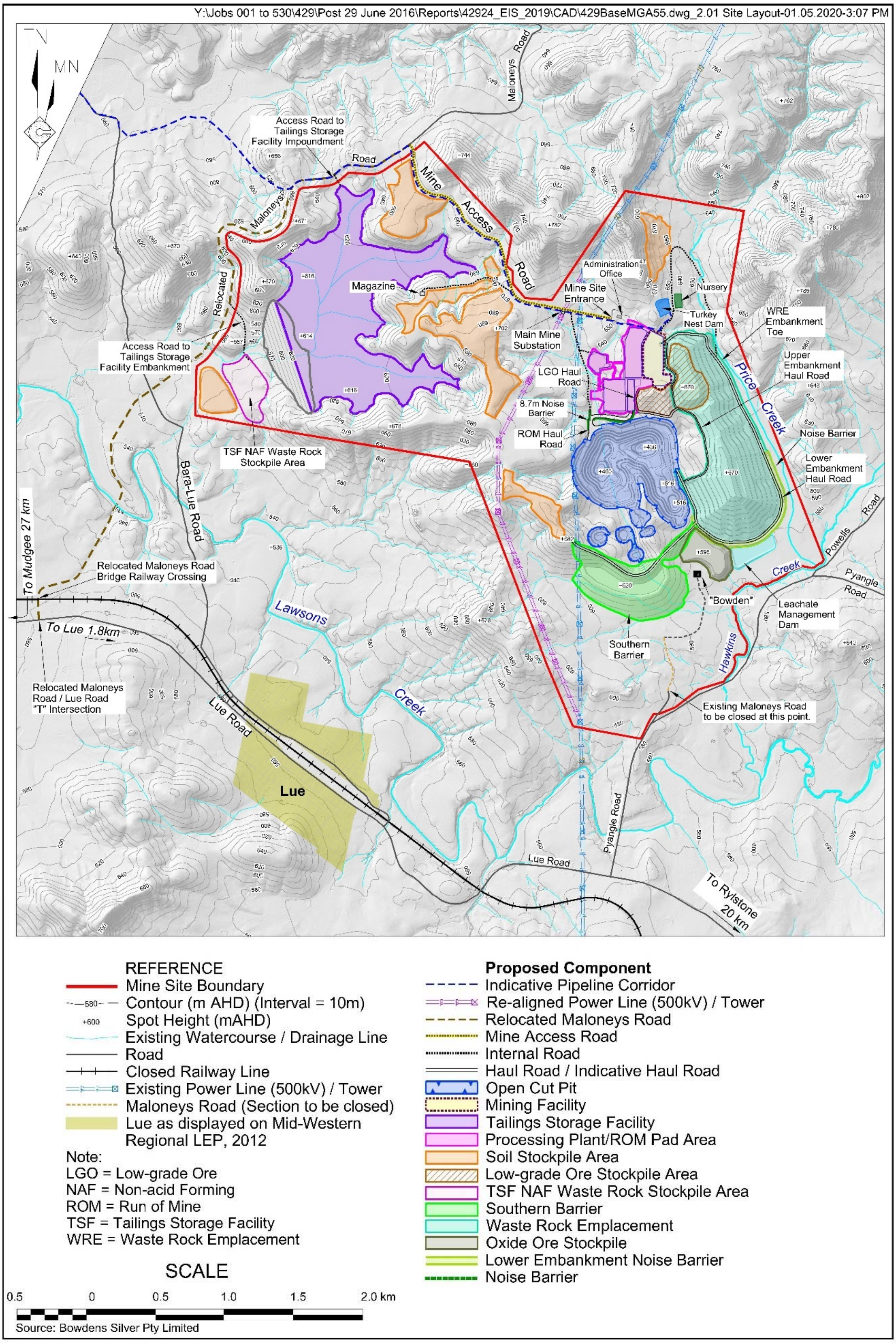

Figure 1 – Mine Site layout (source: R.W. Corkery & Co. Pty Limited, 2020).

2 Design criteria and constraints

A number of design criteria and constraints were applied to the development of the design, with specific emphasis on:

- full encapsulation on closure (i.e. lined and capped);
- avoidance of flood level envelopes from Hawkins Creek and Price Creek;
- blending with the natural topography;
- progressive WRE landform construction and vegetation;
- provision of temporary storage of internal runoff for up to a 72-hour duration 1:100 AEP (Annual Exceedance Probability) rain event, percolating through the placed PAF from uncapped portions of the WRE.
- collection of the leachate from incident rainfall percolating through the placed PAF;
- construction of a haul road around the liner embankment of the WRE;
- integration of an oxide-ore stockpile with a capacity of 0.9 million m^3 within the landform. This stockpile may or may not be reclaimed;
- inclusion of a low-grade ore stockpile with a minimum capacity of 1.3 million within the design. This material may be reclaimed for processing or the stockpile integrated to the final WRE landform;
- development of an acoustic barrier for noise mitigation, located south of the open cut pits; and
- use of the NAF waste rock for the TSF embankment raises, acoustic barrier, WRE haul road and final cover of the WRE and TSF.

2.1 Design Rainfall Event

Rainfall data used to estimate the potential volume of rainfall runoff generated during the operational life of the WRE, was obtained from the IFD (Intensity–Frequency–Duration) data system of the Bureau of Meteorology (BOM). The data was retrieved on 15 May 2018 from the BOM webpage (www.bom.gov.au). The rainfall data was obtained using the design rainfall calculator with the coordinates for the WRE (32.6375° S, 149.8875° E) used as the location input. The rainfall data obtained which is applicable to the Project is presented in Table 1 below:

Table 1 - Infrequent and rare design rainfall depth (millimetre).

Duration (hr)	AEP – Annual Exceedance Probability (years), after BOM (2018)				
	1 in 100	1 in 200	1 in 500	1 in 1000	1 in 2000
24	146	168	196	219	244
30	160	185	218	245	274
36	172	199	234	264	296
48	192	220	259	291	327
72	**217**	245	287	322	359
96	231	259	302	337	375
120	238	267	310	345	382
144	241	270	313	349	386
168	242	272	315	350	388

The 72-hour duration event with an AEP of 1:100 was selected as the appropriate design rainfall event for the WRE design. This is discussed further in Section 3.5.

2.2 Production schedule

NAF and PAF waste rock

The waste rock production forecast is based on 186 months (16.5 years) of mine production and totals:

- 19.8 million tonnes (Mt) of NAF waste rock (10.0 Mt of oxide and 9.8 Mt of fresh rock); and
- 26.6 Mt of PAF waste rock (4.1 Mt of oxide and 22.5 Mt of fresh rock).

It is noted that approximately 64% of fresh NAF (equivalent to 32% of all NAF) was assessed to have a Total-S content of between 0.1% and 0.3%, while the remaining fresh NAF (3.5 Mt, equivalent to nominally 18% of all NAF) presents a Total-S content of <0.1%.

Figure 2 and Figure 3 respectively provide the NAF and PAF waste rock production forecast for the Project.

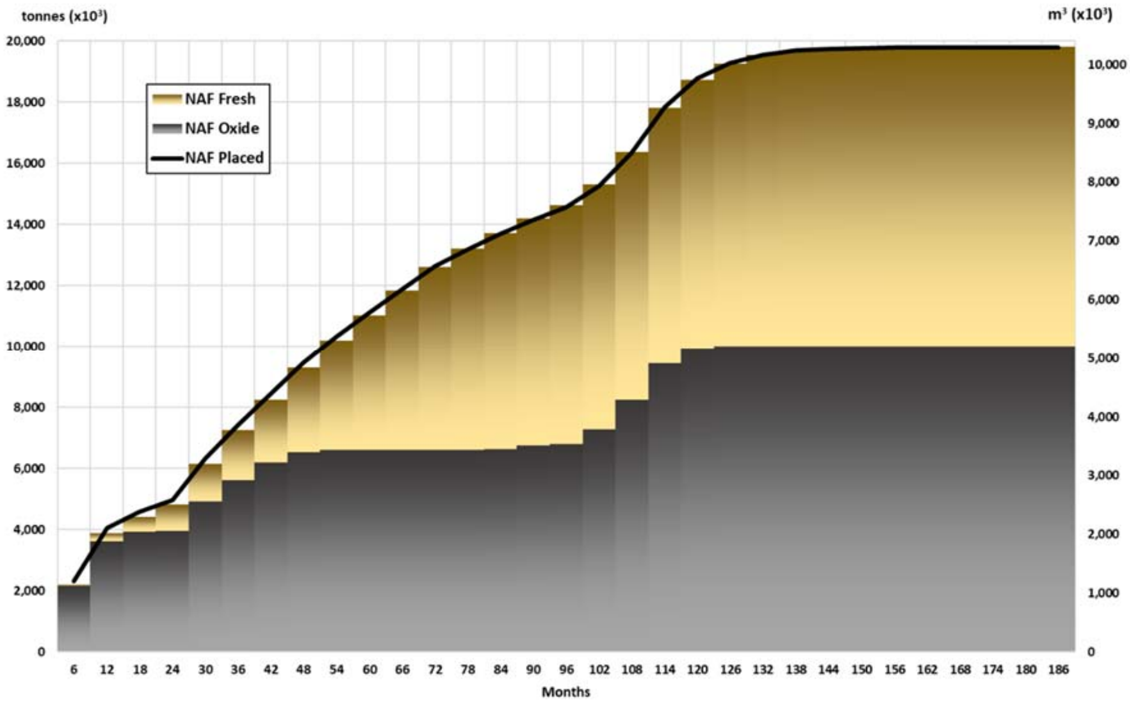

Figure 2 – NAF production forecast

Waste rock materials at the Project have been assessed as having a 'loose' density of 1.84 t/m^3 (fresh) and 1.67 t/m^3 (oxide). The design of the WRE and associated structures and stockpiles have also factored for 10% shrinkage after placement, compaction and settlement of the material. This equates to an average stored density of 1.96 t/m^3, which is considered conservative when compared to similar projects. However, given the importance of achieving the necessary storage capacity in the WRE, 1.96t/m^3 is considered appropriate for this level of design.

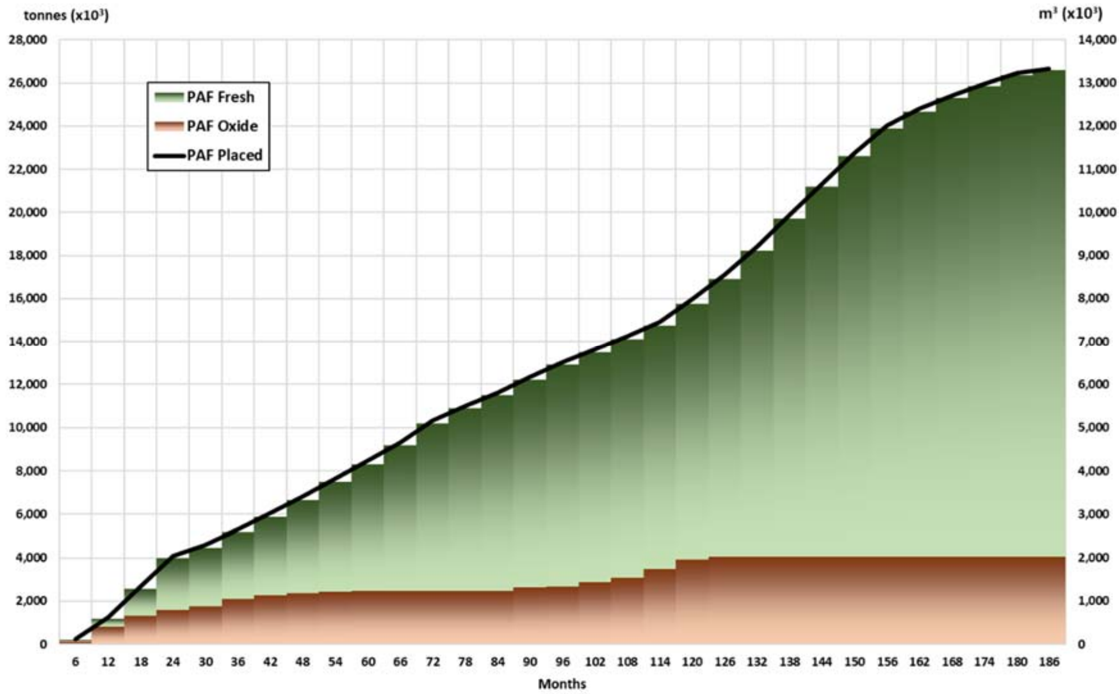

Figure 3 – PAF production forecast

Table 2 presents the calculations used to assess the expected placed waste rock volumes for both NAF and PAF, with the target storage volume for the encapsulated PAF being in the order of 13.34 Mm^3.

Table 2 – Expected placed volumes for NAF and PAF volumes.

Material	Million tonnes	Loose density (t/m^3)	Loose volume	Placed volume 10% shrinkage[1]
			Mm^3	Mm^3
NAF Oxide	10.01	1.67	5.99	10.29
NAF Fresh	9.81	1.84	5.33	
PAF Oxide	4.06	1.67	2.43	13.34
PAF Fresh	22.52	1.84	12.24	

[1] Assumes oxide and fresh compacted to achieve an average density of 1.96 t/m^3

Further details of the WRE design and construction schedule are discussed in Section 3.

Low Grade Ore (LGO)

The current mine schedule forecasts 6.06 Mt of Low Grade Ore (LGO) would be generated over the 16.5 years of mining (Figure 4). Nevertheless, the mining schedule accounts for the periodic reclamation of LGO with a maximum required temporary storage of 2.6Mt or the equivalent to 1,33Mm^3 at a density of 1.96 t/m^3.

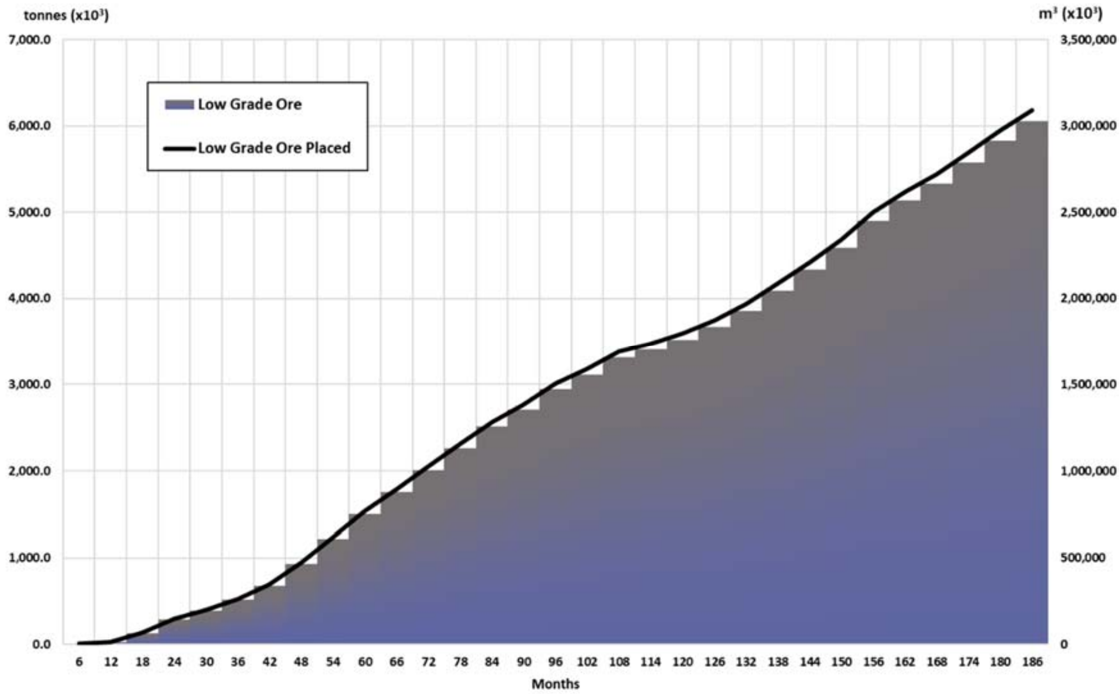

Figure 4 – LGO production forecast

Oxide Ore

The current mine schedule forecasts the production of 1.78 Mt of Oxide Ore over an 11-year (132 month) production window (Figure 5). This is equivalent to 0.91 Mm^3 of placed fill (at a density of 1.96 t/m^3).

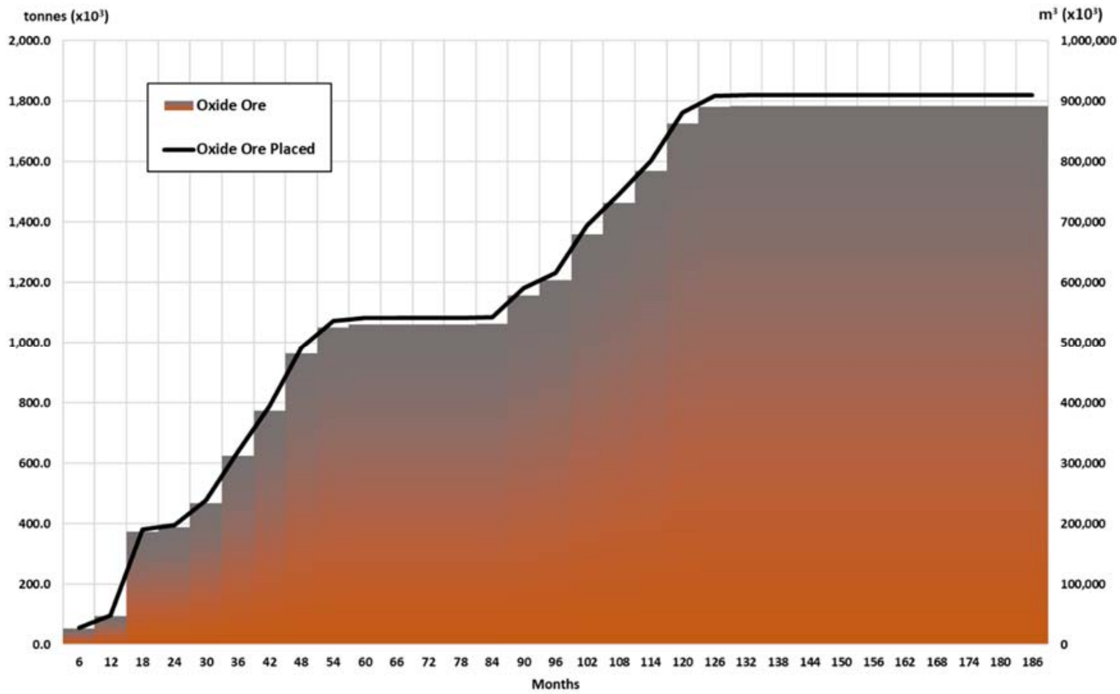

Figure 5 – Oxide Ore production forecast

3 Waste Rock Emplacement

3.1 Overview

The PAF waste rock generated by the mining operation will need to be encapsulated within a Waste Rock Emplacement (WRE) which comprises a low-permeability liner incorporated into both its base and cover layers. The liner beneath the PAF waste rock (the basal liner) will be anchored within embankments that will be constructed along the toe (lower perimeter) of the WRE and on the upper perimeter of the WRE (along the western ridge of Price Creek). Constructing in this way permits any leachate which may pool within the WRE to remain fully contained by the liner.

The PAF waste rock is to be placed in 10 m high lifts, with a 4 m wide berm and back slope of 2% at each 10 m lift. The outer slope of the WRE will be at 1(V): 3(V) (significantly less than the angle of repose of the emplaced waste rock), which facilitates the installation of the capping layer to clad the outer slopes progressively as the WRE is developed.

Progressive capping of the outer slopes would occur following the placement of PAF waste rock with the outer face covered with a 1 m thick (minimum) of PAF oxide material to provide a smooth surface for installation of the geosynthetic liner (GCL). A store and release cover will be placed above the GCL (Figure 6) and vegetation established. Progressive capping and cover will limit the exposed area over which rainfall runoff could percolate into the placed PAF waste rock, thus limiting the overall leachate volume which will be generated over the life of the WRE development.

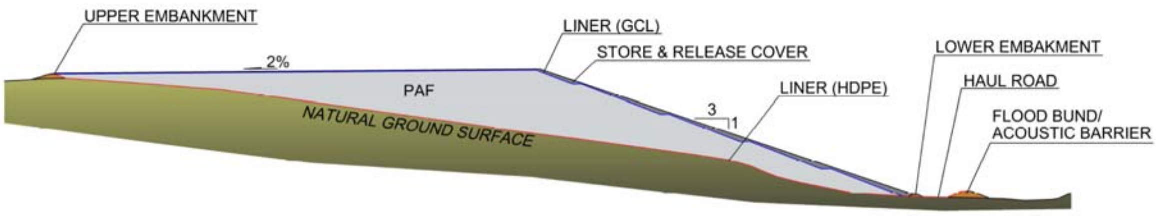

Figure 6 – Typical East-West section through the WRE.

One of the main objectives of placing a cover system over reactive (PAF) waste rock is to protect the downstream receiving environment following closure of the mine. This is achieved by limiting the net percolation of water into the encapsulated waste rock, thereby reducing seepage volumes. In addition to limiting seepage, the aims of cover systems also include promoting the chemical stabilisation of the encapsulated waste rock by limiting the ingress of atmospheric oxygen, limiting the upward movement of pore water into the cover, and providing a suitable growth medium for the establishment of sustainable vegetation.

The outer slopes of the WRE will generally follow a similar profile to the underlying natural surface, avoiding straight sides with drainage lines and depressions evident. Coupled with the shallow outer slopes (1V:3H) this will reduce the "engineered" appearance of the WRE. The crest level of the WRE will also vary according to the top level of the underlying ridge, avoiding extensive flattened plateaus. Therefore, erosion and runoff management will remain an important consideration for the subsequent, detailed design phases of the WRE design to limit any long-term impact of erosion of the capped surface of the WRE as the result runoff. Refer to the '*TSF and WRE Closure Cover Design Report'* (Advisian, 2019) for further details of the proposed capping and cover system.

3.2 Construction Sequence

The placement methodology of the PAF waste rock is critical in achieving the required compacted density (1.96t/m^3) and ensuring that the WRE will provide sufficient storage capacity for the PAF waste rock. Achieving the required compacted density is also critical to achieving long-term stability of the structure.

It is proposed the PAF waste rock is placed progressively in 2 m thick layers until the design lift height is achieved. It is anticipated the waste rock will be paddock placed by the mining fleet, spread to level using a bulldozer and compacted using the bulldozer and by trafficking of the mining fleet across the full width of the levelled PAF layer. Raising in layers no greater than 2 m height will ensure effective compaction is achieved throughout the WRE.

The WRE is to be constructed progressively throughout the life of the operation. Construction is to be staged over seven cells, where each cell is constructed and capped so as to limit the volume of leachate generated (Figure 7). Construction in this manner will also enable progressive rehabilitation of the WRE over Project life.

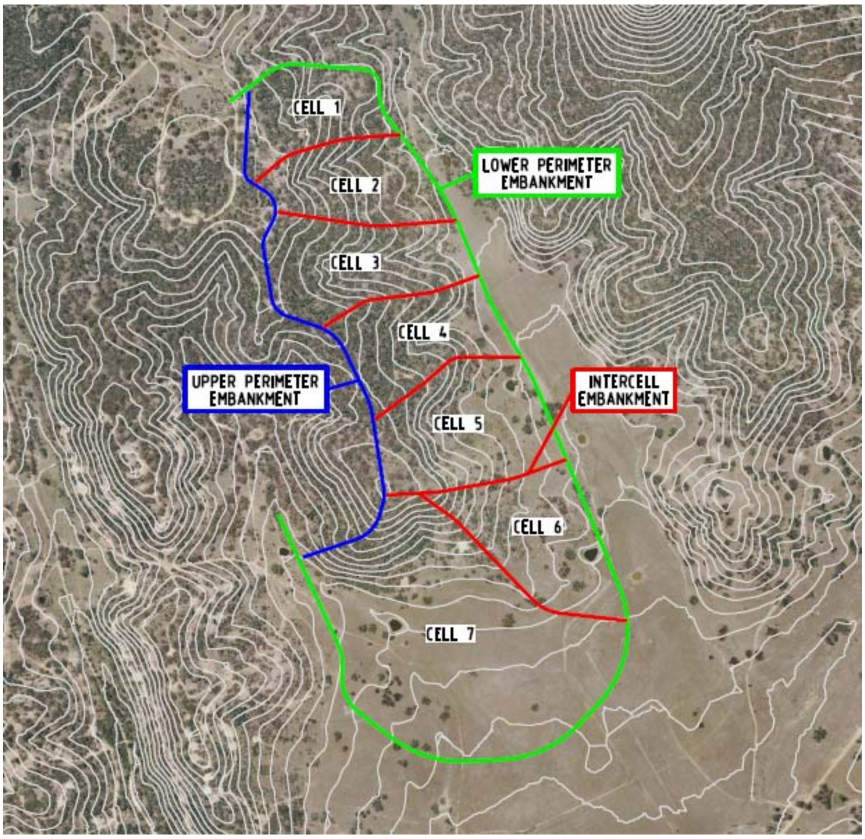

Figure 7 –WRE cells layout.

A number of small ridges and drainage depressions extending west to east along the western slope of the Price Creek valley naturally subdivide the footprint of the WRE into separate sub-catchment areas. The WRE design utilises these topographical features to develop a WRE development sequence comprised of seven cells that facilitate the staged development (and rehabilitation) of the WRE. The use of the ridges in this way enables the creation of discrete areas to manage leachate captured in the WRE.

Small embankments, referred to as intercell embankments (Figure 7) are included within the design of each cell to manage leachate within both the active and completed cells These intercell embankments are to be located above the ridges (which are apparent beneath the intercell embankments in Figure 7). and provide a location for anchoring the low permeability basal liner. Table 3 provides the characteristics of each cell.

Table 3 – WRE cells' characteristics.

Cell	Footprint area (m^2)	Crest Elevation (m AHD)	Storage capacity (m^3)	Operation period (years)
Cell 1	50,810	660	303,705	1
Cell 2	58,740	660	667,110	1 to 2
Cell 3	79,125	650	771,730	2
Cell 4	63,330	650	706,230	2 to 3
Cell 5	88,610	650	1,355,560	3 to 5
Cell 6	74,830	650	1,083,990	5 to 6
Cell 7	243,670	670	8,589,520	6 to 16
Total	**659,115**		**13,477,845**	

3.3 Basal Liner

In order to limit seepage from and manage leachate within the WRE and overlying LGO stockpile, a 1.5mm thick HDPE liner will be installed as an underlying low-permeability membrane at the base of the WRE. The liner would be covered by a protective layer comprising geofabric (Bidim A64 or equivalent) and overlain by a 500 mm thick cushion layer of crushed PAF rock (see Figure 8). The geotextile and cushion layer are necessary to provide protection from damage during the placement of the PAF waste rock. Given the permeable nature of the cushion layer, this layer has an added benefit of providing drainage along the base to collect any leachate which migrates through the PAF waste rock.

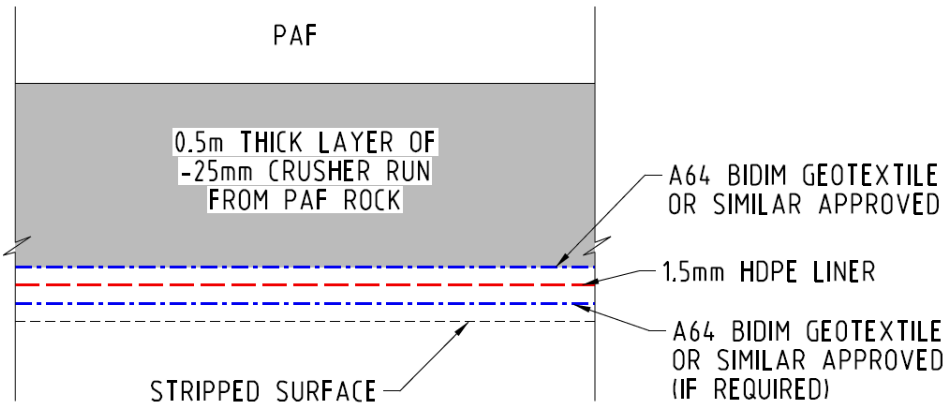

Figure 8 – Base of the WRE with liner, geotextile and cushion/drainage layer.

In general terms, the footprint of the WRE presents a rocky surface above the Price Creek floodplain (Figure 9). Based on current information, it is expected that the underlying geotextile will be required across approximately half of the WRE footprint, with the in-situ subsoil material across the remainder of the WRE footprint suitable as a subgrade for HDPE liner installation. In the absence of additional site investigation to confirm the extensive presence of rock after the stripping, a geotextile (Bidim A64 or equivalent) is to be placed beneath the HDPE where the rocky ground surface presents risk of puncture to the liner.

The total surface area to be covered by the basal liner, including Area 1 of the LGO (see Section 4.1) but not considering any overlap or loss due to jointing, is approximately 790,000 m^2.


Figure 9 – Typical surface conditions along the WRE footprint.

Perimeter Embankments

Perimeter embankments have been designed to contain and control the leachate generated within the PAF waste rock during the WRE development. These embankments, located around the full perimeter of the WRE, also function as anchorage structures for the basal liner. The perimeter embankments are to be constructed from compacted NAF waste rock material. There are two types of perimeter embankments which are utilised in the design: an upper embankment and a lower embankment.

The upper embankment will have a minimum height of 1.5m and, as far as practically possible, will follow the drainage divide (watershed) along the western ridge of the Price Creek valley. This would create a top surface of the WRE that follows the ridge profile over its entire surface and maintain a projected slope of 2% to be included into the final capping layout to facilitate surface drainage of rainfall runoff from the WRE to the west during WRE development and over the rehabilitated surface for closure. The crest of the upper embankment would be 8 m wide and covered with a 150 mm thick gravel wearing course layer which would serve as light vehicle access for inspection and operation of the WRE.

Figure 10 presents a typical cross section of the upper perimeter embankment. Further details are presented in drawing 201010-00790-CI-DSK-1003 included in Appendix A.

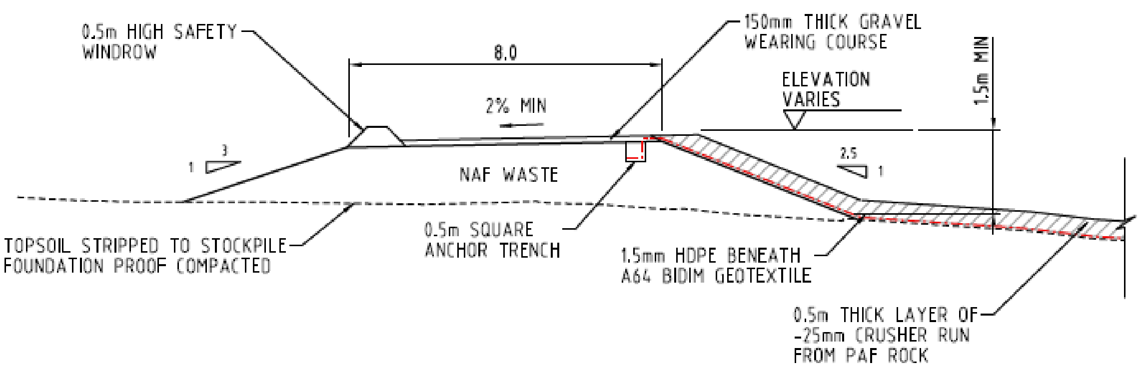

Figure 10 – Typical cross section of the upper perimeter embankment.

The lower perimeter embankment, located at the lowest point within each cell, provides containment of leachate generated within the WRE, and separates the WRE from the haul road and represents the downstream toe of the WRE. The lower perimeter embankment allows for the direction of contained leachate to the leachate collector pipe, located at the lowest point in each cell (refer to Section 3.5 for more details on the leachate collector pipe system).

Figure 11 presents a typical cross section of the lower perimeter embankment. Further details are presented in drawing 201010-00790-CI-DSK-1004 included in Appendix A.

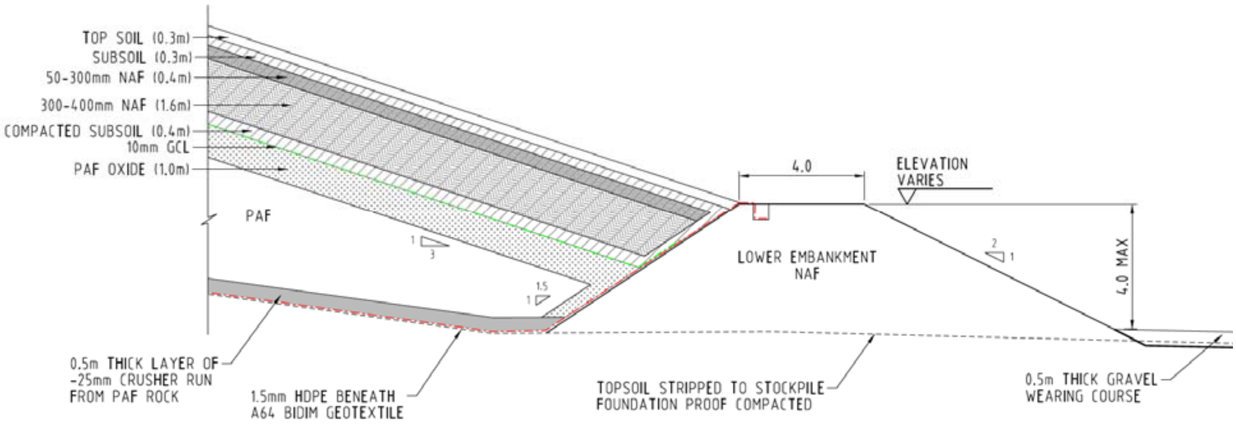

Figure 11 – Typical cross section of the lower perimeter embankment.

Intercell embankments

The WRE is to be developed as a sequence of cells separated by intercell embankments which connect with the upper and lower embankments and provide leachate containment within the cells. The intercell embankments separate the active cell from external runoff as well as providing an elevated platform for the basal liner to be anchored to. The height of the intercell embankments is driven by the surrounding topography and varies, with a minimum height of 2 m. The intercell embankments have a crest width of 6 m.

Figure 12 presents a typical cross section of the intercell embankment. Further details are presented in drawing 201010-00790-CI-DSK-1004 included in Appendix A.

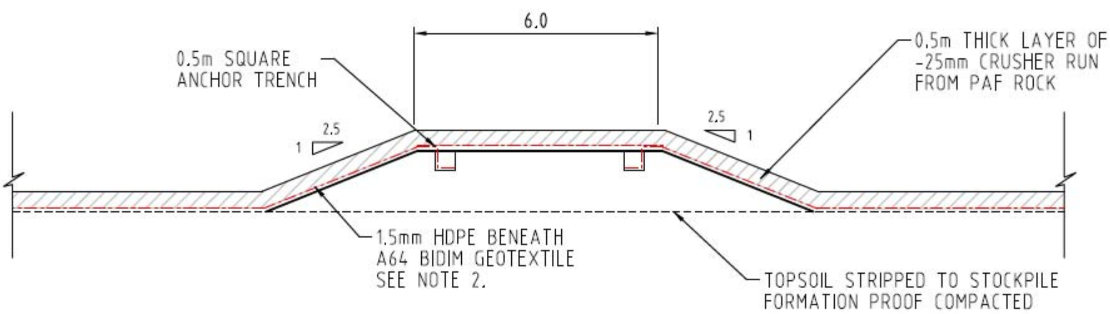

Figure 12 – Typical cross section of the intercell embankment.

As the WRE waste rock emplacement progresses, the intercell embankments will be fully covered by the emplaced PAF waste rock material as shown in Figure 13.

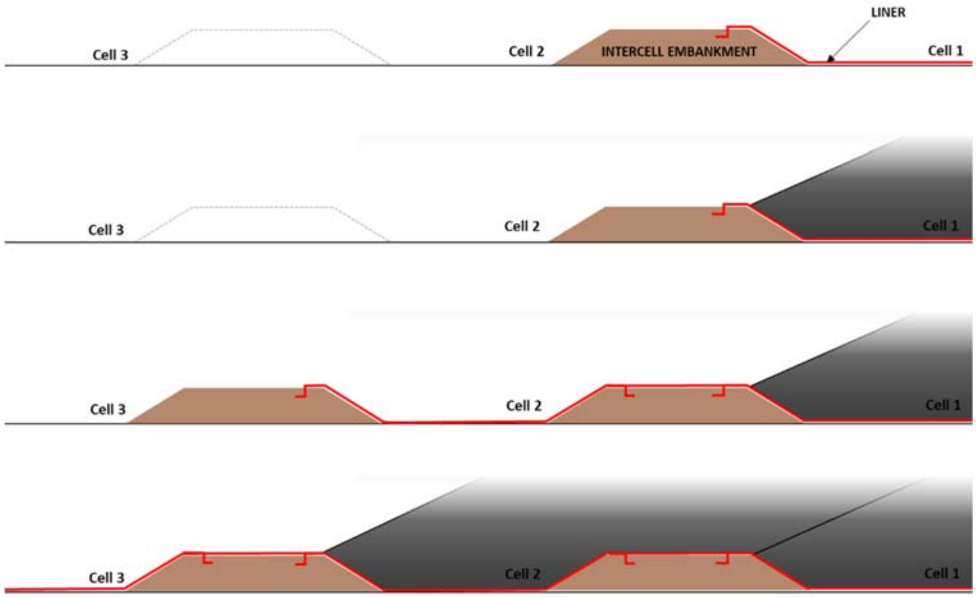

Figure 13 – Progression of the intercell embankments.

Table 4 presents the volume of NAF waste rock material to be used for the construction of the perimeter embankments.

Table 4 – Perimeter embankment volumes.

Perimeter embankment	**Volume (m^3)**
Upper	33,700
Lower	62,215
Intercell	30,750
Total	126,665

3.4 Haul Road and Flood Bund/Acoustic Barrier

A haul road, extending from the main open cut pit around the total length of the WRE lower embankment, is incorporated into the design of the WRE (Figure 1). The haul road also provides access to the southern barrier and the oxide ore stockpile. The haul road will provide access for all stages of the WRE development and incorporates a flood protection bund as well as a roadside acoustic barrier along a section of the haul road. Rock armour would also be provided along the toe of the bunds in the Hawkins Creek and Price Creek valleys.

Figure 14 presents a typical cross section of the haul road, flood protection bund and roadside acoustic barrier. Further details are presented in drawing 201010-00790-CI-DSK-1004 included in Appendix A.

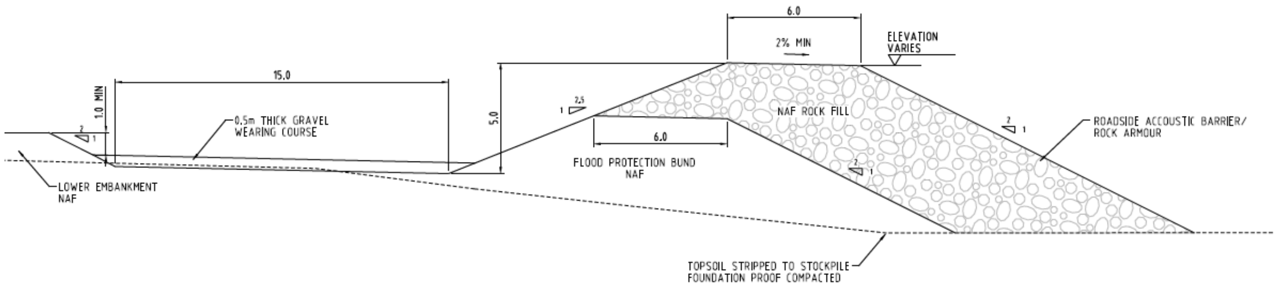

Figure 14 – Typical cross section of the haul road and flood protection bund/roadside acoustic barrier.

The haul road would be 15 m wide covered with a 500 mm thick gravel wearing course from fresh NAF waste rock. The wearing course thickness is considered as preliminary, with a trafficability assessment to be carried out as part of detailed design.

The flood protection bund is designed to provide flood protection to the WRE, including the haul road for events up to a 1:100 AEP flood. The flood protection bund, which also includes a roadside acoustic barrier along a section of the haul road, will have upstream slope of 1V: 2.5H and downstream slope of 1V: 2H and will be constructed from NAF waste rock. Due to limitations with footprint in the area downstream of the WRE, the outer slope of the flood protection bund infrequently extends into the modelled 1:100 AEP floodplain. However, during rehabilitation and closure of the WRE, the haul road and flood protection bund/acoustic barrier would be removed, thus keeping the final landform of the WRE out of flood envelope. It is these areas where the rock armour is also included in the design, to provide protection against erosion in times of flooding.

The rock armour is to comprise of NAF waste rock material. The rock armour will extend from the stripped surface to above the modelled 1:100 AEP flood level. The sizing specification of the rock armouring will be determined as part of detailed design.

The haul road and the flood protection bund/acoustic barrier are to be constructed in the early stages of the WRE operation, totalling approximately 150,000 m^3 of NAF, and will be decommissioned and removed as part of the closure works.

3.5 Leachate Management

The WRE design allows for the WRE cells to be developed progressively in a north to south direction, following the downhill slope of the natural surface. Sequencing in this way will permit the final surface of the WRE to be capped and rehabilitated progressively. Adopting this sequence also assists in controlling and managing leachate water.

Throughout the development of the WRE, leachate generated will need to be effectively managed to ensure that the volumes do not exceed the minimum storage capacity requirements (72-hour 1:100 AEP event, equivalent to a rainfall depth of 217 mm, refer to Section 2.1).

Each cell will need to be fully lined before PAF placement starts in order to protect the stripped surface from runoff and to ensure all leachate remains fully contained within the WRE. Table 5 presents the design leachate volumes generated following a 72 hour 1:100 AEP event for each cell.

Table 5 – Potential leachate volume of each cell (72-hour 1:100 AEP)

Cell	Footprint[1] (m²)	Volume[2] (m³)	Residual[3]	Total m³
Cell 1	50,810	11,026	n/a	11,026
Cell 2	58,740	12,747	1,103	13,850
Cell 3	79,125	17,170	1,275	18,445
Cell 4	63,330	13,743	1,717	15,460
Cell 5	88,610	19,228	1,374	20,602
Cell 6	74,830	16,238	1,923	18,161
Cell 7	243,670	52,876	1,624	54,500

[1] footprint includes the southern surface of the previous cell that remains open (i.e. has not been capped/enclosed yet).
[2] 217 mm rainfall – runoff coefficient of 1.
[3] residual water coming from the previous enclosed cell which is yet to completely drain from the system.

Given the importance of ensuring that sufficient leachate storage capacity is provided, the design conservatively utilised a runoff coefficient of 1 to determine the total volume of water to be contained in each cell. Although the average runoff coefficient of the cells will reduce as the material is placed, in the early stages of operation the runoff coefficient will be 1 (or appreciably close to) as the surface will have low permeability due to the liner. A schematic cross-section showing a section through the WRE and the associated runoff from the upstream lined area is shown in Figure 15.

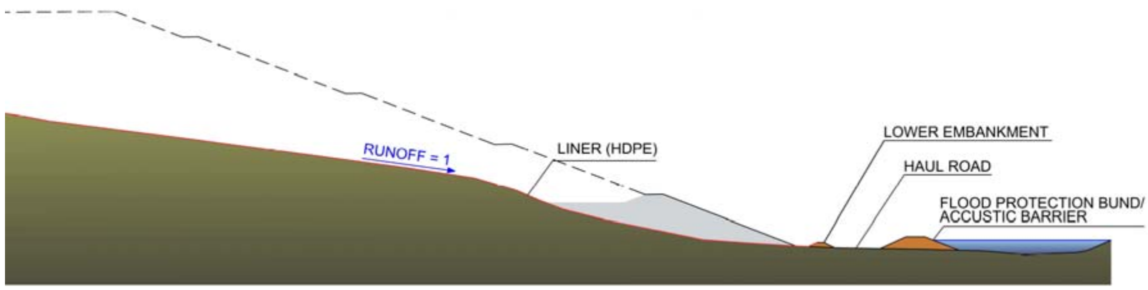

Figure 15 – Schematic cross section (vertical exaggeration).

As the PAF waste rock placement reaches the final height in each cell, the cells are to be progressively capped (enclosed) and an impermeable GCL (capping layer) and store and release cover installed. Once the store and release capping is placed, the surface will be vegetated.

Enclosing the completed WRE cells in this sequence will limit the surface area open at any one time and in turn will limit the capture of incident rainfall which will need to be managed. However, due to the sequential fill placement approach, the southern face of Cells 1 to 6 will remain exposed as the PAF waste rock material that would be placed as part of the development of the subsequent cell will need to be placed directly against the PAF waste rock from the preceding completed cell.

The leachate volumes presented in Table 5 also allows for leachate from the exposed southern face of the preceding cell and also considers an additional volume of leachate from the preceding cell which has not had sufficient time to effectively permeate through the placed PAF waste rock and allows for all leachate to be diverted to the leachate management dam via the pipework. Leachate volumes are expected to vary throughout the life of the WRE and will be influenced by the weather conditions experienced as the PAF waste rock is placed. An allowance of 10% of the leachate from the preceding cell has been included in the estimate.

The proposed PAF waste rock placement sequence is presented in Figure 16. Due to the need to commence stacking in the lowest section of each cell (to ensure sufficient densities are achieved), any incident rainfall captured in the cells will pool on the upslope side of the placed PAF waste rock, prior to migrating through the fill and being captured and discharged via the leachate pipework to a leachate management dam located south of Cell 7.

The leachate management dam is designed with a storage capacity of 65,000 m^3 (65 ML) plus a 1 m freeboard. The designed crest will be 4m wide with the downstream toe located above the above the 1:100 AEP design flood level. The pond is to be fully lined (HDPE) with a pumping system installed to recover the leachate and pump it for use / treatment within the processing plant. A sediment sump may be required to ensure any suspended sediment is removed from the leachate before pumping.

The leachate management dam (Figure 17) will require approximately 48,000 m^3 of excavation and 26,660 m^3 of fill, with a maximum embankment height of 8 m.

Each active and completed cell will be connected to the leachate management dam via a HDPE transfer pipe which extends along the eastern side of the WRE from Cell 1. This will ensure that each cell continues to “drain” fully in the years following capping and will remove any leachate which would otherwise remain within the cell. The proposed piping arrangement is presented in Figure 17.

Figure 16 – Schematic construction sequence

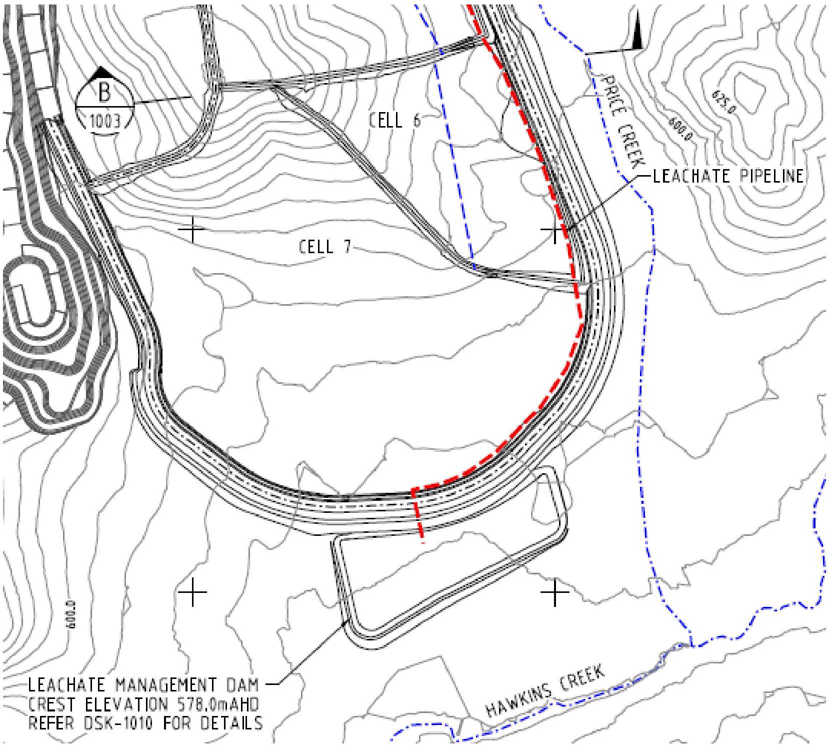

Figure 17 – Ultimate leachate management dam.

Table 6 provides an estimate of the HDPE pipe diameters and lengths required to transfer the leachate from each cell to the next cell and ultimately to the leachate management dam. Pipe diameters were calculated to transfer the 72-hour 1:100 AEP rainfall event during the entire event (72 hours) and include consideration of minor head loss. The pipe sizing will need to be confirmed during the detailed design phase for the WRE.

Table 6 – Indicative leachate pipe diameter and lengths

Cell	Length (m)	Diameter (mm)
Cell 1 – Cell 2	220	250
Cell 2 – Cell 3	140	300
Cell 3 – Cell 4	200	350
Cell 4 – Cell 5	250	300
Cell 5 – Cell 6	380	350
Cell 6 – Cell 7	390	350
Cell 7 - pond	50	500

In Cells 2 to 6 however, the elevation of the lower embankment will be maintained no lower than 4 m high at the lowest point, thus providing temporary storage capacity for leachate and permits the development of some hydraulic head to enable leachate flows under gravity. Table 7 also provides the temporary storage capacity at each cell.

Table 7 – Temporary storage capacity at each cell

Cell	Temporary Storage Capacity (m^3)
Cell 1	0
Cell 2	890
Cell 3	2,800
Cell 4	1,100
Cell 5	7,000
Cell 6	8,310
Cell 7	0

To enable inspection and monitoring, a transfer point is to be constructed in the downstream end of each cell where the leachate pipe passes below the intercell embankment (Figure 18). This configuration provides the following benefits.

- The leachate recovery system of the active cell is located in a single place not requiring movement of the operational equipment (pumps, electrical supply system and pipework) as the cells are developed;
- The liner finishes at the lower embankment, separating the leachate drainage system from the haul road;
- The haul road can be built in a single stage detached to the WRE;
- The haul road can have a separate surface drainage system that prevents mixing with leachate; and
- The effectiveness of the cover and capping can be monitored and assessed.

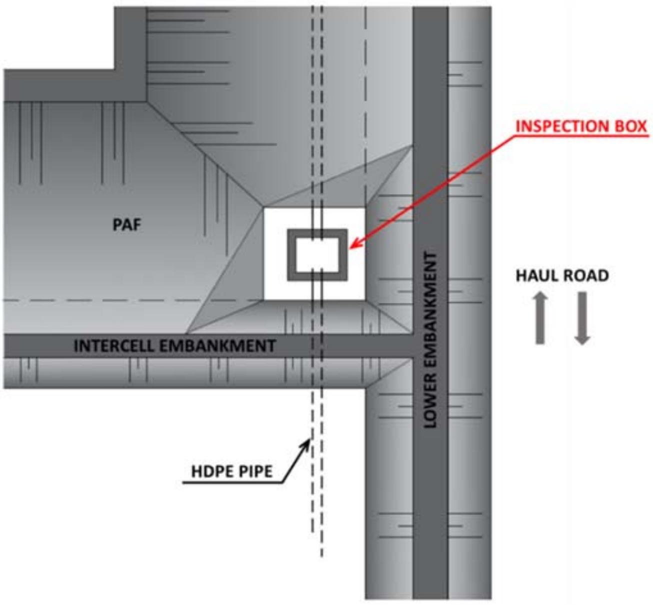

Figure 18 – Inspection point.

An alternative, to reduce the volume of leachate captured in the active cell, is to construct temporary diversion bunds in each cell as part of the construction works (refer to dashed blue lines in drawing 201010-00790-CI-DSK-1001 included in Appendix A). This would enable separation of clean runoff from WRE leachate and would reduce the volume of leachate captured and requiring treatment. These temporary diversion bunds could also be used as a temporary anchor structure for the low-permeability liner, allowing a staged lining process. The implementation of the temporary diversion bunds will be evaluated as part of the detailed design phase.

It should be noted that, as the eastern slopes of the completed cells are progressively capped and covered, the haul road will receive runoff from these areas and appropriate drainage infrastructure would be required to manage this runoff.

3.6 Stability Analysis

A preliminary analysis was completed to assess the global stability of the WRE. The assessment was completed utilising the 2-dimensional limit equilibrium programme SLOPE/W v.2018, developed by GeoSlope International. The computer model calculated the stability of potential circular and optimized slip surfaces within the mass of the facility using the Morgenstern-Price method. SLOPE/W is a limit equilibrium program for 2-dimensional modelling only and does not consider 3-dimensional effects.

Geotechnical Parameters

Due to the limited data available, assumptions have been made for the geotechnical parameters of the materials, including foundation material and depth of the bedrock. The assumptions are based on knowledge of similar materials and previous experience for these types of applications. As further information is obtained for the materials (WRE and foundation) the analysis will need to be revisited during detailed design to confirm these assumptions. The assumed geotechnical properties used in the assessment are presented in Table 8.

Table 8 – Assumed geotechnical model

Material	Weight (kN/m^3)	Cohesion c′ (kPa)	Internal Friction Angle ϕ' (°)	Comments
Bedrock	Impenetrable			
Residual "Soil"	19	10	25	Up to 4 m thick
PAF / LGO	20	0	35	Mainly fresh rock
Liner	n/a	n/a	20	Textured

In consideration of the design and the requirements for the stability analysis, the friction angle of the basal liner is known to play an important role in the general stability of the emplaced waste rock as it may act as a preferential slip surface. Howell & Kirsten (2016) compiled 143 direct and ring shear tests on various interface materials including HDPE liner. The results identified that textured geomembranes improve the interface friction angle by at least 10°, with peak/residual friction angles along a HDPE textured liner and geotextile interface being approximately 25°/17°, respectively. A 20° interface friction angle value was selected for the stability analysis.

Seismic Parameters

A Peak Ground Acceleration (PGA) of 0.06g was adopted for this assessment. This value was adopted for the Mine Site using the 2012 Australian Earthquake Hazard Map (Burbidge, 2012) as shown in Figure 19.

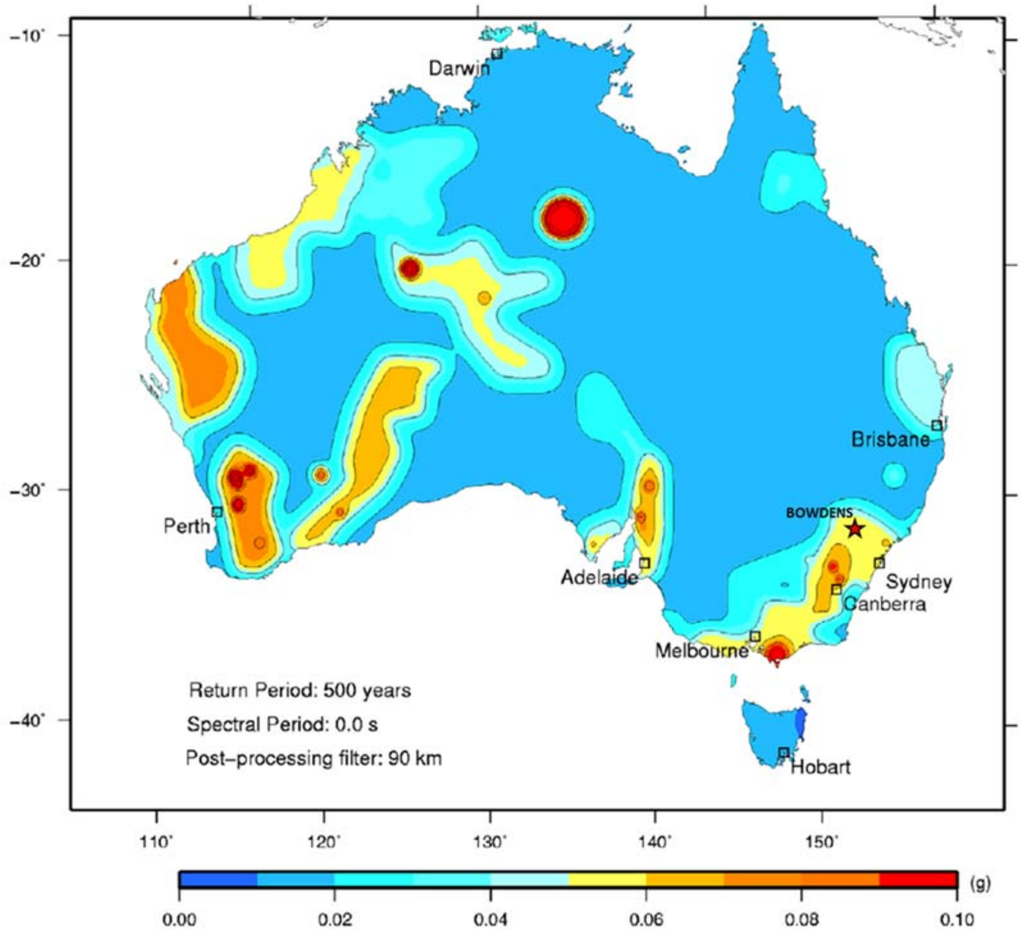

Figure 19 – Bowdens project location at the 2012 Australian Earthquake Hazard Map (Burbidge, 2012).

This acceleration equates to an Annual Exceedance Probability (AEP) of 1 in 500 years which is in accordance with the recommendations provided in 'Guidelines for Mine Waste Dump and Stockpile Design (Hawley & Cunning, 2017). It is recommended that the PGA is reassessed when a Probabilistic Seismic Hazard Assessment (PSHA) for the Mine Site becomes available. This will need to be completed as part of the detailed design phase of works.

Model Geometry

A cross section through Cell 3 was chosen as a representative section of the WRE (refer to Figure 20). The stability analysis was completed under both static and seismic conditions and with no phreatic surface.

The analysis focused on two model conditions namely:

i) the presence of residual "soil" (up to 4m thick) throughout the base of the WRE; and
ii) the WRE constructed directly on outcropping rock. This condition was considered to simulate the slip surface developed along the liner which, considering its lower geotechnical parameters, is considered the worst-case scenario.

In total, four different cases were analysed with the description and Factor of Safety (FoS) results presented in Table 9. Stability analysis plots are shown in Figure 20.

Table 9 – Slope stability analysis cases and results

Case	Condition	Residual Soil Thickness	Factor of Safety (FoS)
1.1	Static	4 m	1.92
1.2	Seismic	4 m	1.58
2.1	Static	0 m	1.54
2.2	Seismic	0 m	1.25

Although preliminary and subject to confirmation of the assumed parameters, the stability analysis results have shown satisfactory performance in all cases, indicating that the WRE would be a stable landform.

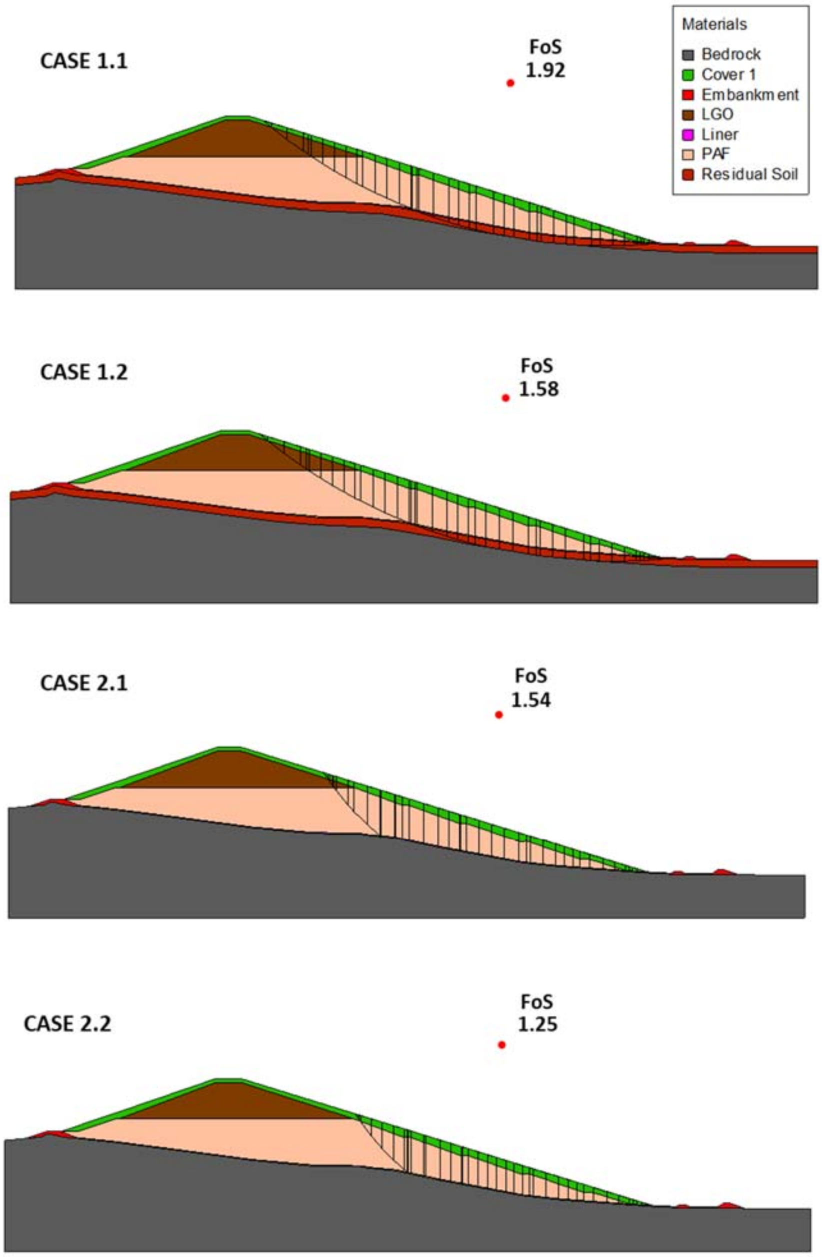

Figure 20 – Stability analysis plots.

4 Other Stockpiles

4.1 Low-grade Ore (LGO) Stockpile

A low-grade ore stockpile with a maximum storage capacity of 1.34 Mm^3 (equivalent to 2.63 Mt of ore at a placed density of 1.96 t/m^3) was designed in two areas, one located over the WRE and another southeast of the processing plant as the current mining schedule accounts for the LGO to be periodically reclaimed and processed, or if uneconomical to process, the stockpile would be integrated into the final WRE landform. The construction of the LGO stockpile at this location will help to reduce the haulage distance and costs associated with stockpiling.

The proposed development sequence of the LGO stockpile are summarised in Table 10. The general layout of the LGO stockpile is presented in Figure 21. Details of the LGO stockpile are presented in Drawings 201010-00790-CI-DSK-1008 and 1009 included in Appendix A.

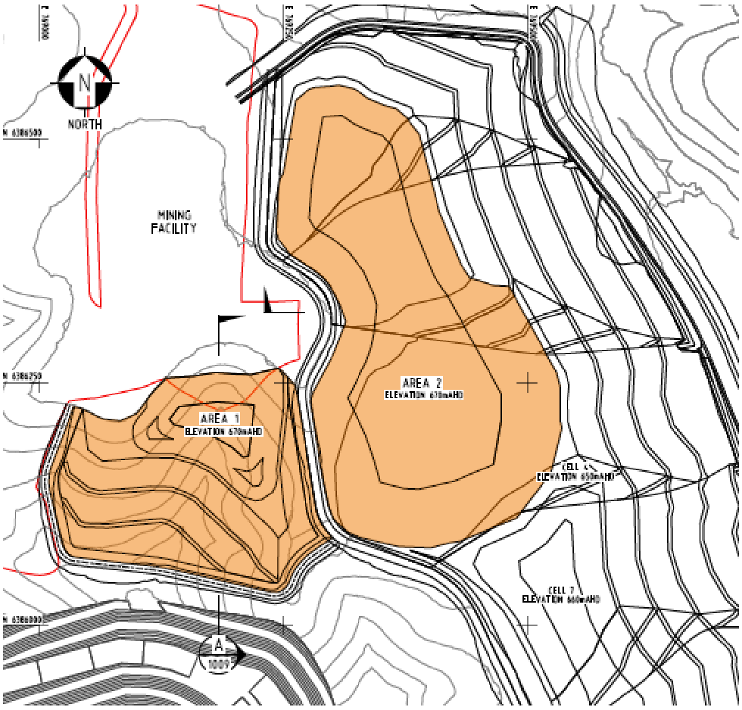

Figure 21 – Low-grade ore stockpile areas.

Table 10 – LGO areas storage capacity

Area	Volume (Mm^3)		Maximum Elevation (m AHD)
	Per area	Cumulative	
1	0.39	0.39	670
2	0.95	1.34	670
	Total	**1.34**	

The LGO stockpile is to be partially developed over the encapsulated WRE with the drainage directed towards the upper embankment where it will be captured and diverted to the main open cut pit for further management.

Area 1 of the LGO stockpile is to be contained by a perimeter embankment and will also require the use of a HDPE liner which will be anchored to the perimeter embankment and connected to the liner covering the WRE. Area 2 will be located directly above the WRE crest with LGO placed over the WRE cell that would be lined and capped with a 500 mm layer of crushed PAF waste rock to help protect the liner from the LGO material placed above and with the drainage contained by the upper embankment of the WRE.

The LGO material would be moved from the open cut pits to the stockpile area by haul truck with placement of the LGO in accordance with the methodology presented in Section 3.2.

Should the LGO stockpile remain in place after closure (i.e. it is not economical to process), the stockpile will require capping in a manner similar to the WRE and integrated into the final WRE landform.

4.2 Oxide Ore Stockpile

The oxide ore stockpile, with a storage capacity of 1.0 Mm^3 and a crest at 600 m AHD is to be developed between the southern barrier and the southwestern extent of the WRE. This location enables the integration of the oxide ore stockpile into the final WRE landform should the processing of this material be identified as uneconomical.

The footprint of the oxide ore stockpile was developed to avoid the Bowdens Silver core library and exploration office, as shown in Figure 22. Additional storage capacity is achievable within this footprint by increasing the height of the stockpile. Further details are presented in drawings 201010-00790-CI-DSK-1005 and 1007 included in Appendix A.

The oxide ore would move from the open cut pits by haul truck via the southern section of the haul road and placed in layers in accordance with the methodology presented in Section 3.2.

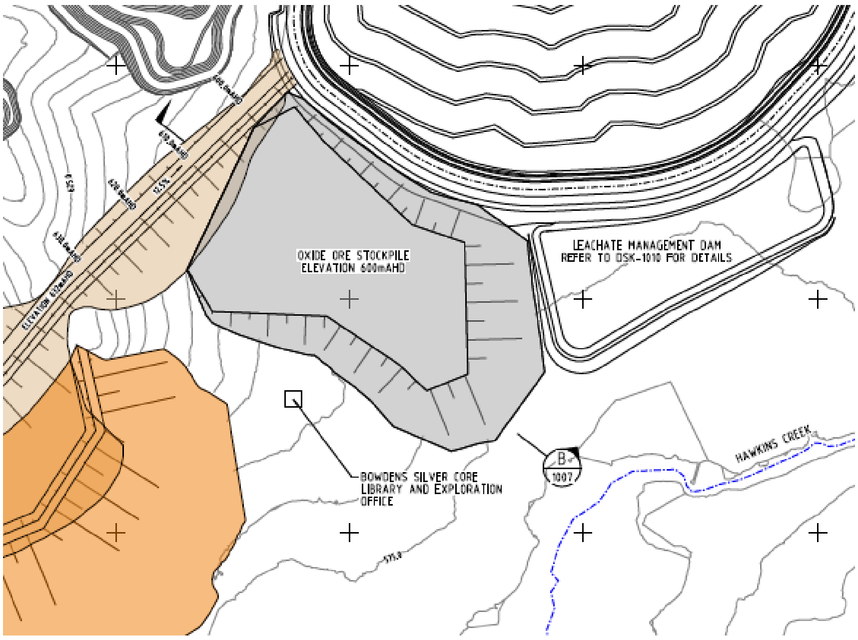

Figure 22 – Oxide Ore stockpile layout.

4.3 Southern Barrier

The southern barrier would initially be developed to mitigate potential noise impacts from the mining and processing operations. As mining progresses, the southern barrier will be increased in size to effectively become a NAF waste rock stockpile following the use of the NAF waste rock in all other priority infrastructure, such as the flood protection bund, upper and lower embankments, inter-cell embankments, TSF embankments and TSF and WRE/LGO capping.

The current NAF material movement schedule (refer to Section 2.2) identifies that maximum volume storage requirements in the southern barrier will be approximately 5.23 Mm^3 (Year 12) when the production of NAF reduces significantly and the material is recovered for use in the capping of the WRE and TSF.

Figure 23 presents the maximum size of the southern barrier. Further details are presented in drawings 201010-00790-CI-DSK-1005 to 1007 included in Appendix A.

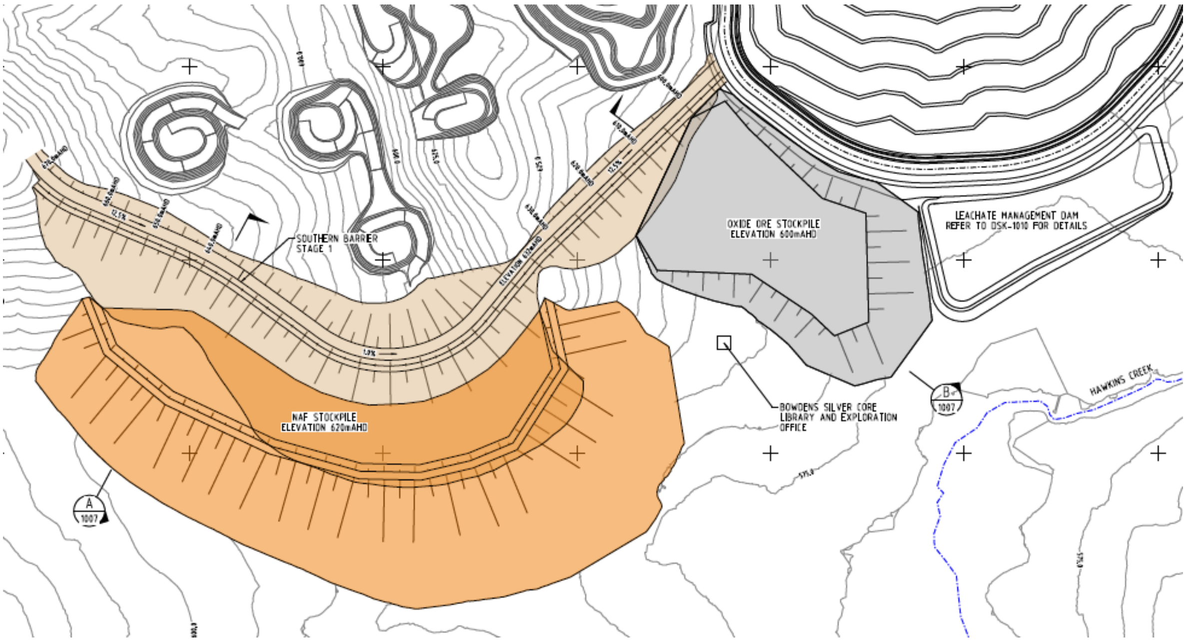

Figure 23 – Southern barrier maximum development (Year 12).

Due to the need for future reuse, it is important that during development, the southern barrier is developed in zones, with the oxide and fresh NAF material separated. This will ensure that during recovery, material selection can be readily implemented. With this in consideration, the section of the barrier which encroaches on the current alignment of Blackmans Gully will need to use the coarser oxide rock available to create a zone of permeable fill which will reduce the impoundment of water from the upstream catchment.

The proposed method of placement of the NAF waste rock in the southern barrier involves transporting the material by haul truck via the southern portion of the haul road directly from the open cut pits. The material placement methodology is further discussed in Section 3.2.

Details of the southern barrier progression in relation to the available NAF is further discussed in Section 6.

5 WRE Closure

It is envisaged that each WRE cell is covered as soon as practically possible so that the volume of leachate generated within the cell is minimised, rainfall runoff from the WRE is effectively managed and the early rehabilitation of the completed cell is achieved. A further benefit of early capping will be a reduction in dust generation from the WRE.

A preliminary assessment of the cover design completed by Advisian (Advisian, 2020) identified a capping design with thickness potentially varying from 2.2 m to 3.0 m (perpendicular to the sloping surface). The capping layer, to be constructed from NAF waste rock placed between two layers of subsoil and covered by a layer of topsoil, is designed to be a store-and-release cover system which will control runoff and promote the establishment of vegetation as part of the rehabilitation.

The NAF waste rock layer of the cover is sub-divided into two layers (see Figure 24), as follows.

- A basal layer comprising boulders grading from 300 mm to 400 mm size with the thickness of the layer varying from 0.4 m to 1.6 m depending on the availability of NAF.
- An upper layer comprising material that grades upwards from 50 mm to 300 mm sizes, with designed thickness of 400 mm.

The capping layer is to be placed over a 400 mm layer of subsoil or oxide NAF that will physically protect the Geosynthetic Clay Liner (GCL) liner from the coarser material placed in the store-and-release cover layer and the machinery used for the capping earthworks. The 400 mm layer is also designed to retain some moisture above the GCL, avoiding the development of shrinkage cracking in long dry periods. To ensure that the GCL is not damaged from the PAF waste rock emplacement, it is envisaged that a 1 m thick layer of Oxide PAF material is to be placed above the general PAF to create a smoother cushion layer.

The store-and-release layer over the top of the WRE is to be capped with a 300 mm thick topsoil layer to promote vegetation growth. Additional details of the WRE cover system is presented in the assessment report (Advisian, 2019).

The revegetation plan for the WRE is to be developed as part of the rehabilitation management planning for the Project.

Figure 24 presents a cross section for the top and side slope of the WRE with the maximum NAF waste rock layer thickness of 2.0 m, which provides a safe workable platform of 9.5 m wide. Reduction in the NAF thickness will create constructability challenges given the reduced platform.

The volume of oxide PAF is included as general PAF material presented in the material movement schedule (Section 2.2).

Should the LGO stockpile remain in place at closure, it will also require capping similar to the WRE. In this instance, the LGO will be integrated into the final WRE landform. If deemed economically feasible to process, and the LGO is removed, the exposed final surface of the WRE will be covered with the store-and-release cover as described above.

As part of the closure works, the haul road and the flood protection bund/roadside acoustic barrier are to be removed and the footprint rehabilitated. The leachate management dam would remain in place until all remaining leachate from the WRE cells is recovered or until the leachate volume being recovered reduces to a volume that is manageable via the inspection boxes. Ultimately, the leachate management dam will be able to be removed.

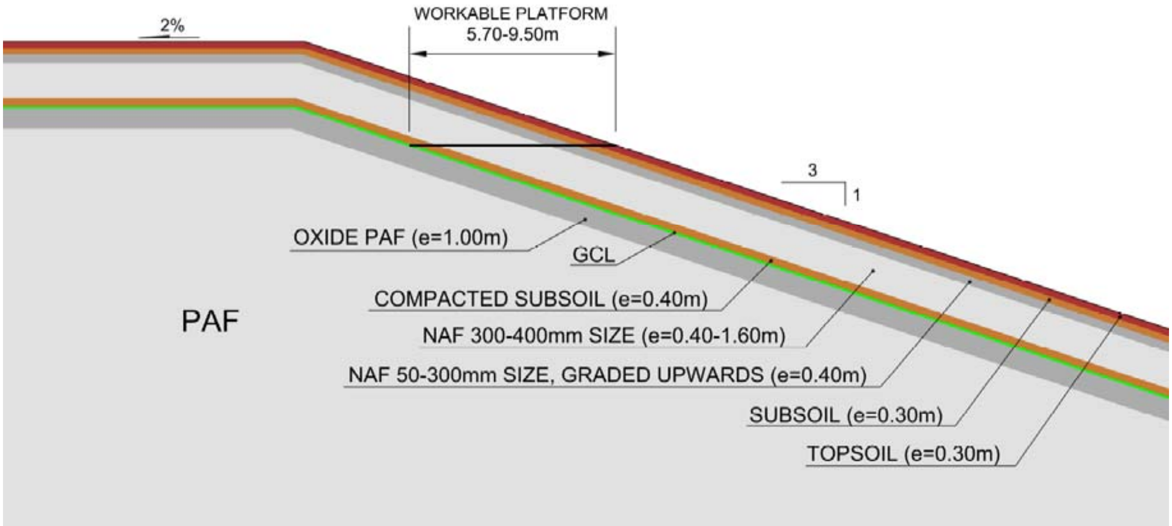

Figure 24 – Schematic cover cross section (thicknesses perpendicular to the surface).

6 Conclusion and recommendations

This report presents the preliminary design for the WRE for the Bowdens Silver Project. This report also presents conceptual designs for the LGO Stockpile, the Oxide Ore Stockpile and the southern barrier. The WRE is to be developed progressively from north to south in a series of seven adjacent cells, each of which can be developed in succession. The preliminary design of the WRE demonstrates that the WRE will have sufficient capacity within the nominated footprint to accommodate the forecast PAF waste rock material that would be produced over the Project life. However, this will only be achieved if the target placed density of 1.96 t/m^3 is met and using the proposed placement methodology.

The footprint of the WRE invariably does not encroach upon the 1:100 AEP floodplain of Price Creek and therefore allows for the free discharge from the Price Creek catchment. The design of the haul road and flood protection bund also incorporates rock protection which would be incorporated into the final landform as part of the closure activities for the Project.

The western side of the WRE largely extends to the watershed of the ridge and avoids the collection of surface water against the upper embankment. The preliminary design facilitates runoff that will drain away from the capped WRE and prevent any ponding of water on the surface or against the embankments of the WRE.

Areas 1 and 2 of the LGO stockpile have a combined storage capacity of 1.34 Mm^3. Should the LGO stockpile remain in place after closure (i.e. it is not economical to process the LGO), the stockpile will require capping similar to the WRE and to be integrated into the final WRE landform.

A construction schedule for the WRE has been developed, as has a material movement schedule for the NAF waste rock material considering a 2.00 m thick NAF layer in the store and release capping layer. This schedule will need to be followed during operation to minimise the leachate generated and reduce the extent of leachate water management required from the WRE.

Specific aspects of the design will require additional detailing in the next phase of the design process. These aspects include:

- leachate management system designed in light of the water balance for the WRE;
- a site specific Probabilistic Seismic Hazard Assessment (PSHA);
- material fragmentation and compacted fill trials on both oxide and fresh materials (NAF and PAF) to confirm assumed placed densities; and
- additional geotechnical investigation within the WRE footprint for detailed assessment of the subsurface conditions; and
- updated stability assessment based on additional geotechnical data (foundations, fragmentation, densities after compaction, etc.) and the PSHA.

7 References

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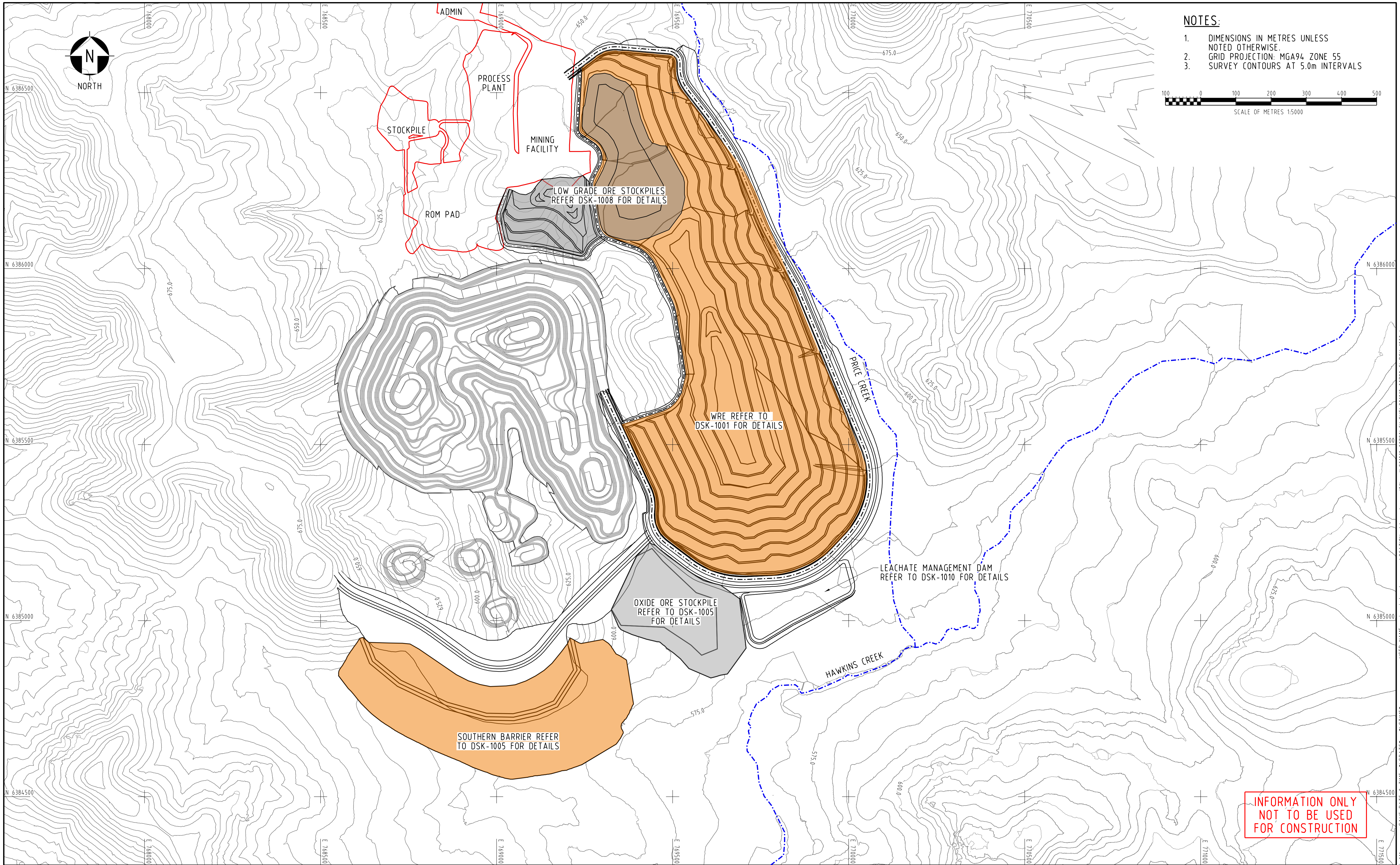
BOWDENS SILVER

Appendix A - Preliminary Design Drawings



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WRE, SOUTHERN BUND & STOCKPILES
SITE PLAN

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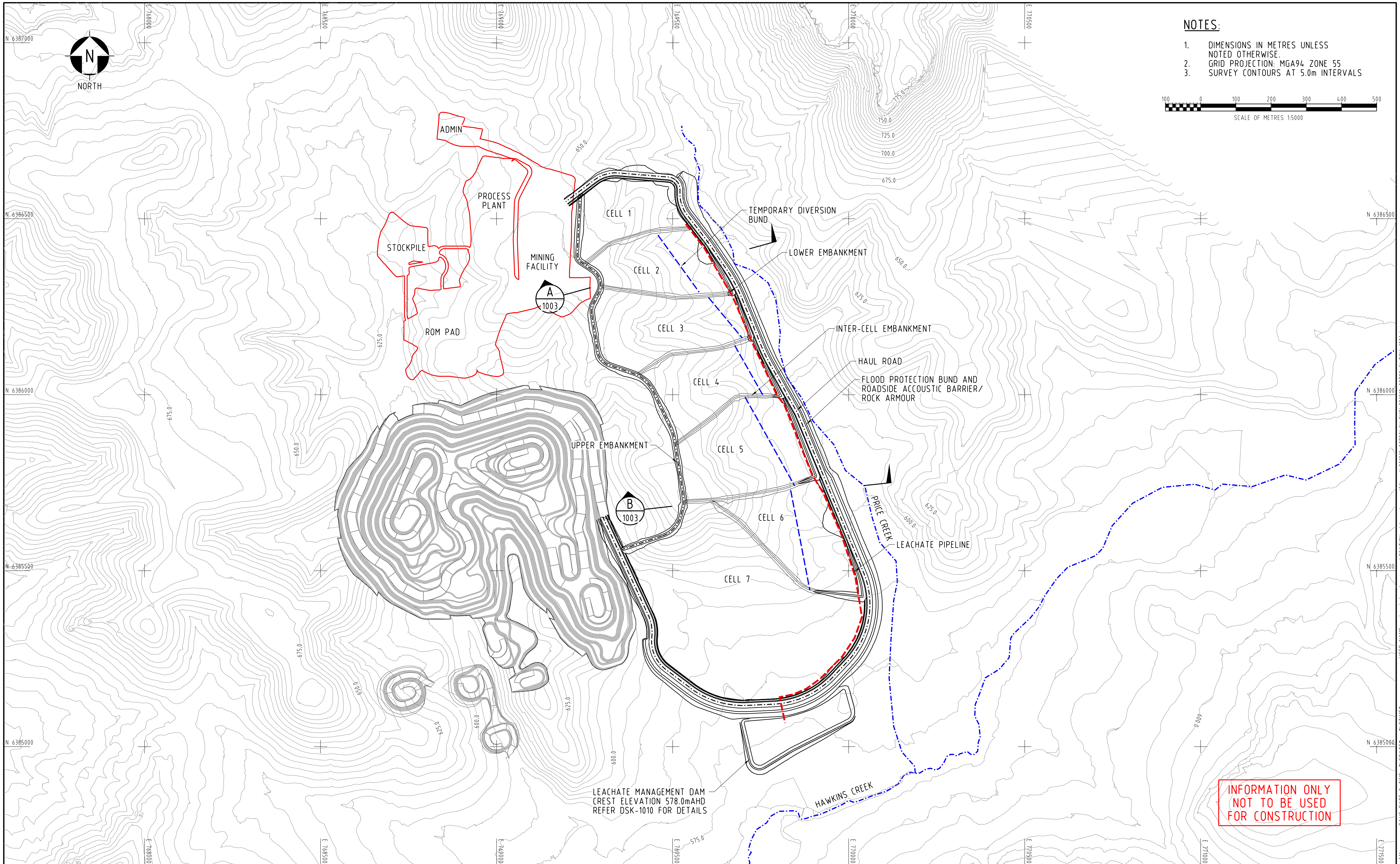

NOTES:

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3. SURVEY CONTOURS AT 5.0m INTERVALS

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WRE - BASE EMBANKMENTS
GENERAL ARRANGEMENT

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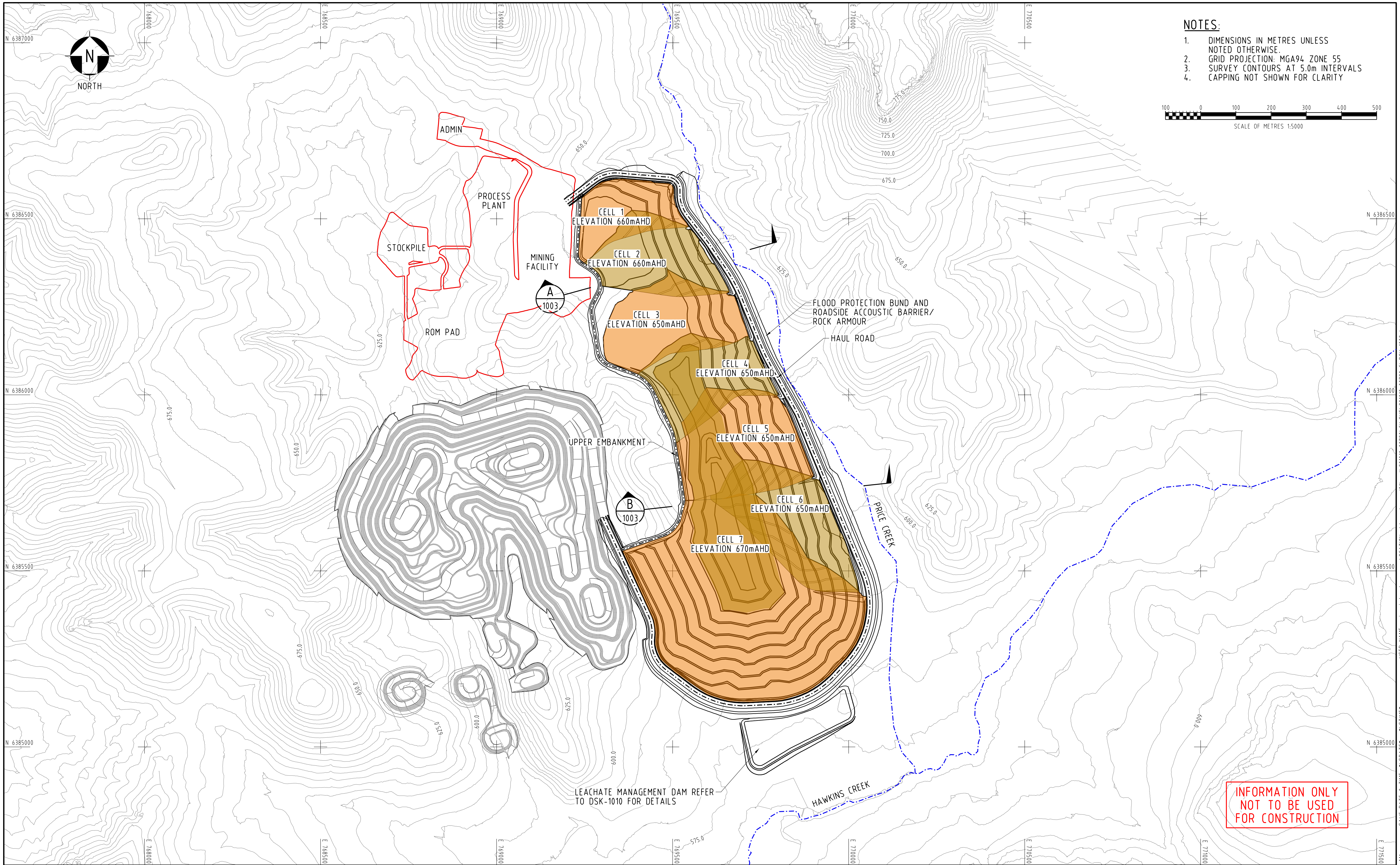

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GENERAL ARRANGEMENT

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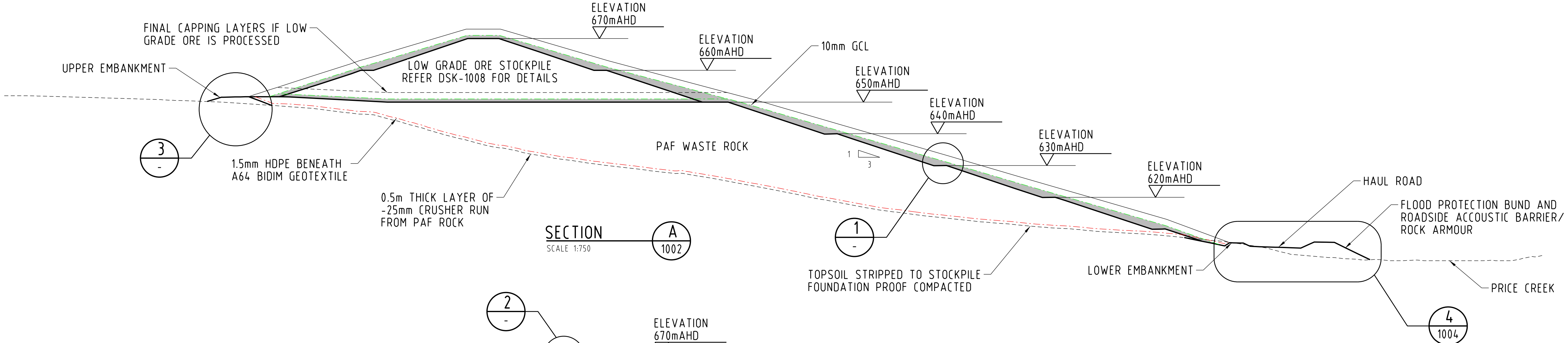

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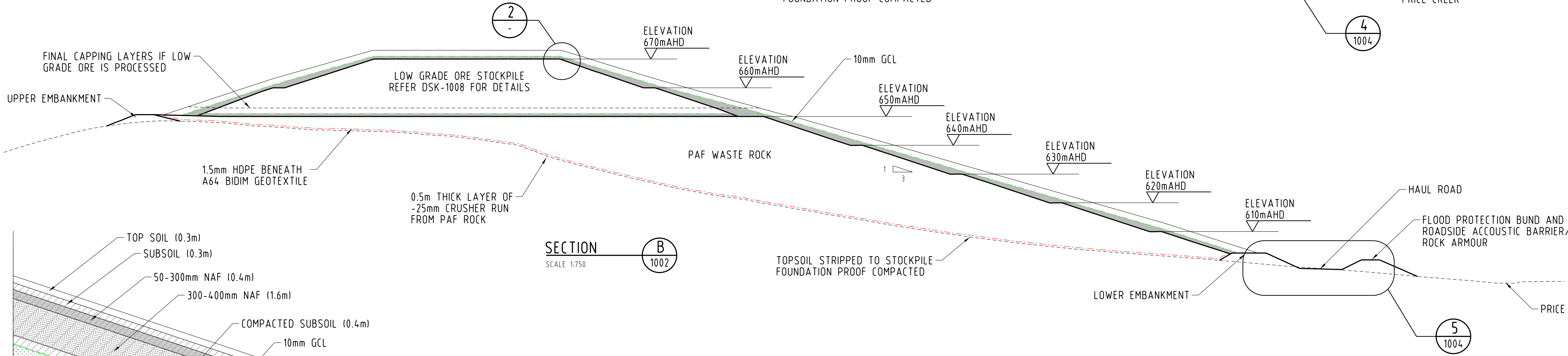

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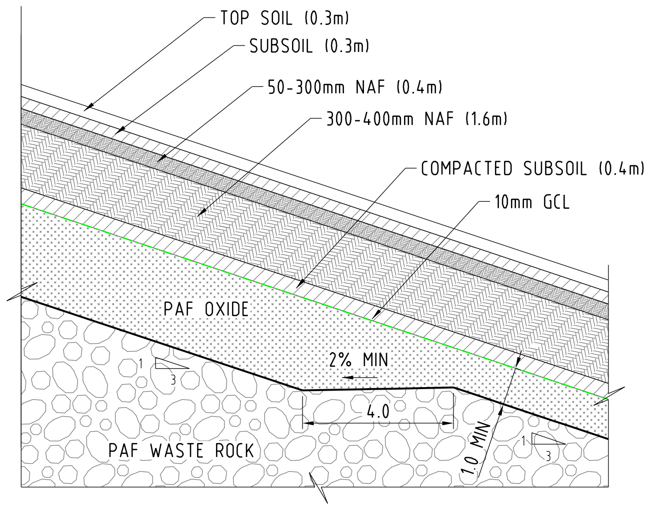

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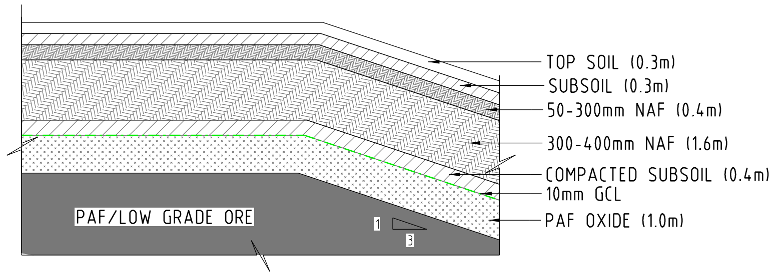

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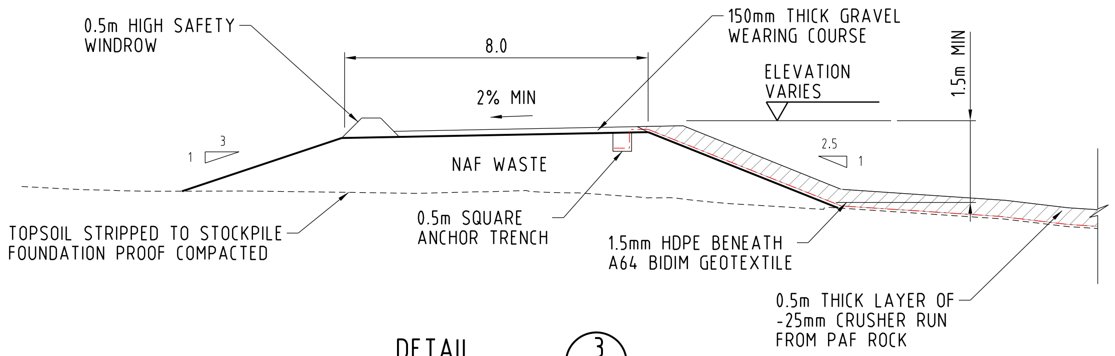

DETAIL 3
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- 1.5mm HDPE BENEATH A64 BIDIM GEOTEXTILE
- 10mm GCL

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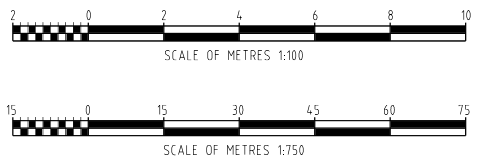
2. ALL FILL TO BE PLACED IN 2.0m HORIZONTAL LAYERS



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WRE - TYPICAL SECTIONS
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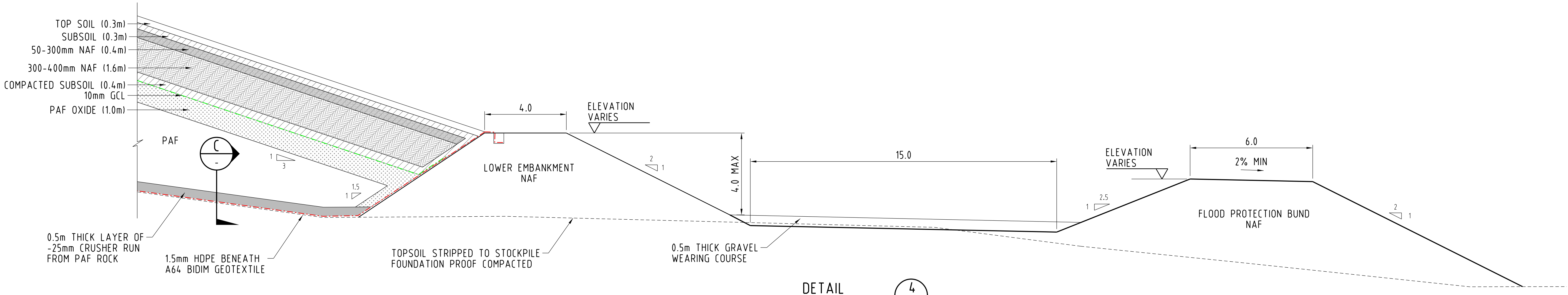
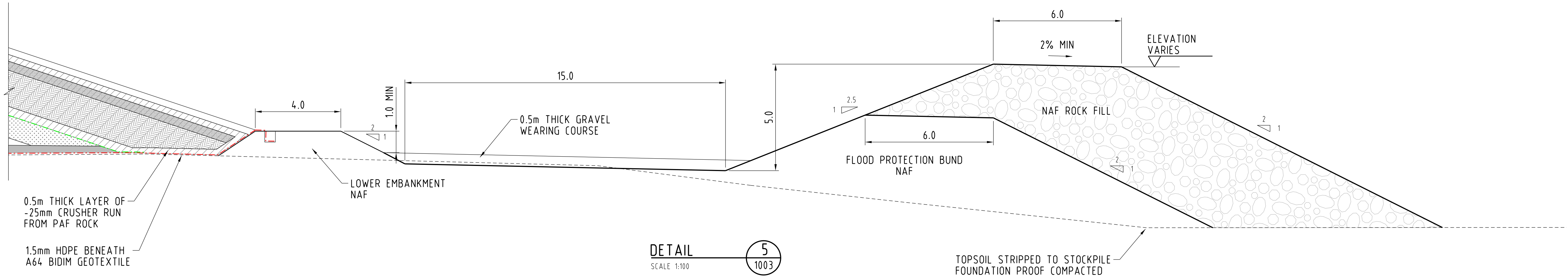
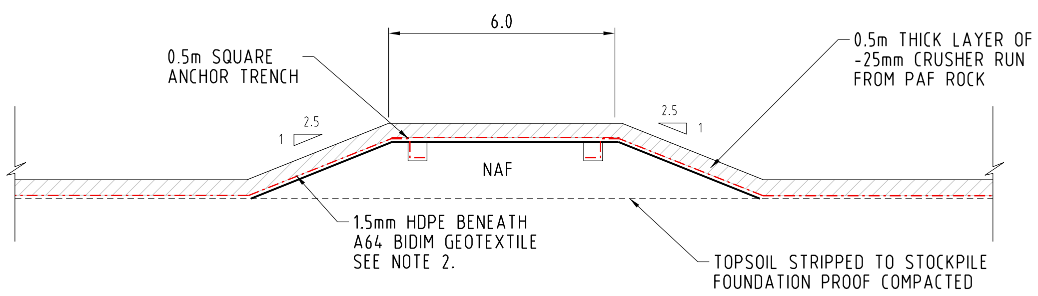


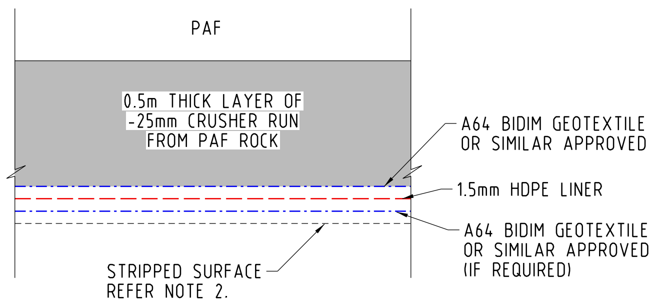
DETAIL 4/1003
SCALE 1:100



DETAIL 5/1003
SCALE 1:100



INTER-CELL EMBANKMENT AND TEMPORARY DIVERSION BUND
TYPICAL SECTION
SCALE 1:100



SECTION C/-
SCALE 1:15

INFORMATION ONLY
NOT TO BE USED
FOR CONSTRUCTION

LEGEND:

- 1.5mm HDPE BENEATH A64 BIDIM GEOTEXTILE
- 1.5mm HDPE LINER
- A64 BIDIM GEOTEXTILE OR SIMILAR APPROVED
- 10mm GCL

NOTES:

1. DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
2. TOPSOIL TO BE STOCKPILED FOR REUSE IN CAPPING
3. ALL FILL TO BE PLACED IN 2.0m HORIZONTAL LAYERS

SCALE OF METRES 1:100

REV	DATE	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CLIENT
0	21-AUG-19	ISSUED FOR USE	SL					

REF DRAWING No | REFERENCE DRAWING TITLE

A1 SHEET SCALE AS SHOWN
OneWay to zero harm

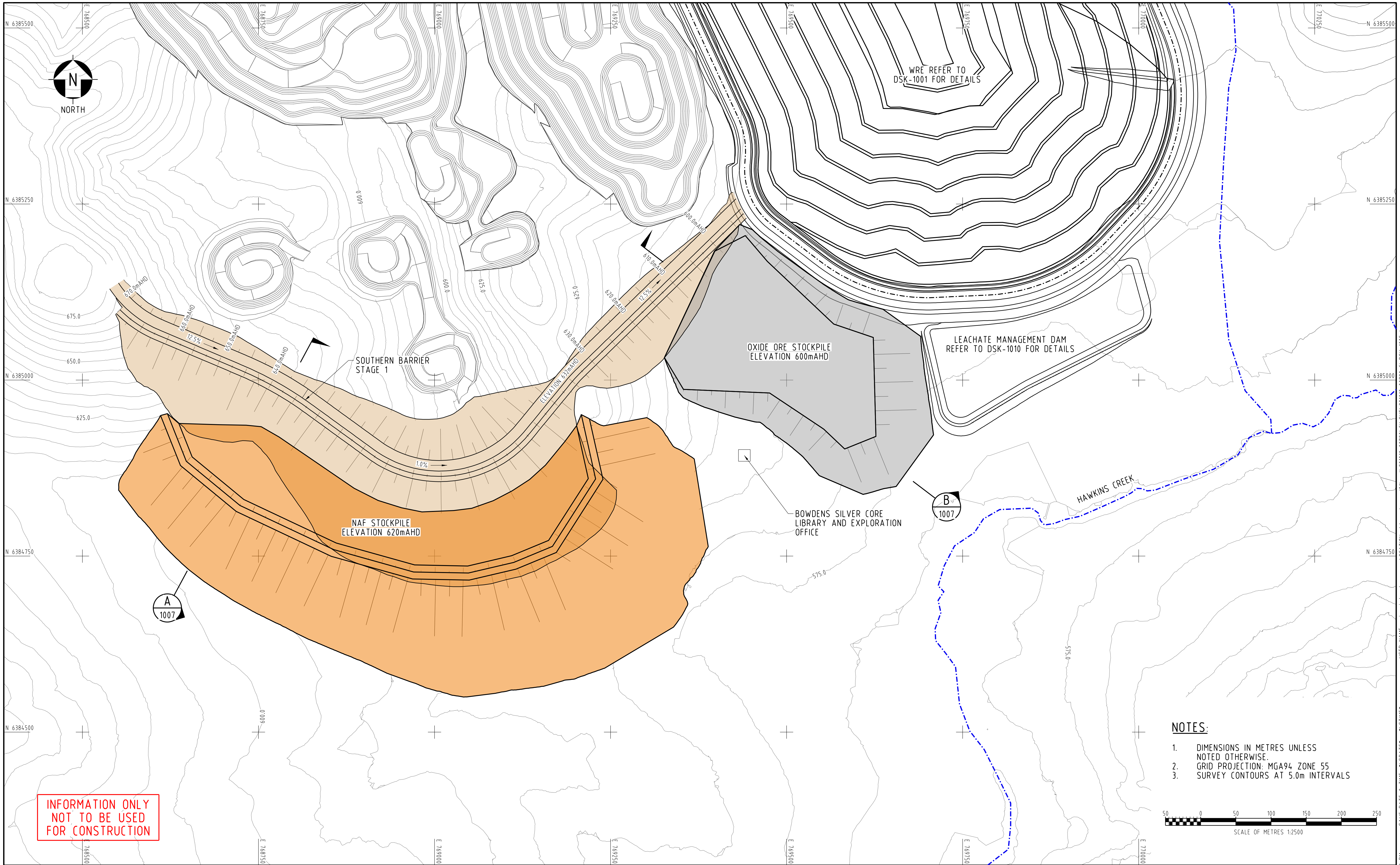
ADVISIAN PROJECT No. 201010-00790
ENGINEERING AND PERMIT STAMPS (As Required)
CLIENT
BOWDENS SILVER

Advisian
WorleyParsons Group

BOWDENS SILVER PTY LTD
BOWDENS SILVER PROJECT
WRE - TYPICAL SECTIONS
SHEET 2 OF 2

DRG No 201010-00790-CI-DSK-1004
REV 0
ADVISIAN_A1

PLOT DATE & TIME: 21/08/2019 12:40:03 PM SAVE DATE & TIME: $LSDATE$ $LSTIME$ USER NAME: simonie.laval LOCATION: \\aupdcwpcad01\cad\201010-00790\CI\SKE\201010-00790-CI-DSK-1004.dgn



REV	DATE	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CLIENT	REF DRAWING No	REFERENCE DRAWING TITLE
0	21-AUG-19	ISSUED FOR USE	SL							

A1 SHEET SCALE AS SHOWN

OneWay to zero harm

ADVISIAN PROJECT No. 201010-00790

ENGINEERING AND PERMIT STAMPS (As Required)

CLIENT

BOWDENS SILVER

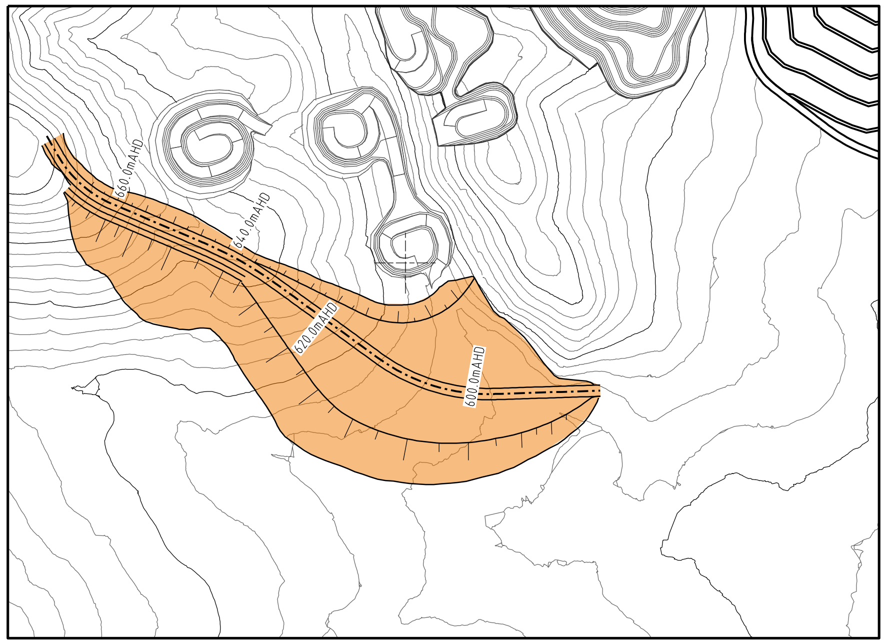
Advisian WorleyParsons Group

BOWDENS SILVER PTY LTD
BOWDENS SILVER PROJECT
SOUTHERN BARRIER & STOCKPILES
GENERAL ARRANGEMENT

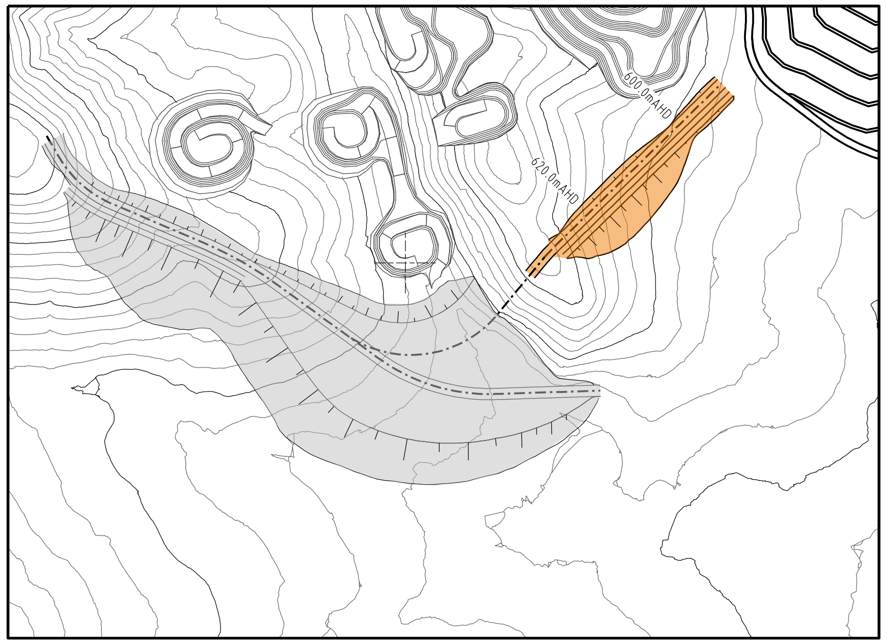
DRG No 201010-00790-CI-DSK-1005 REV 0

ADVISIAN_A1

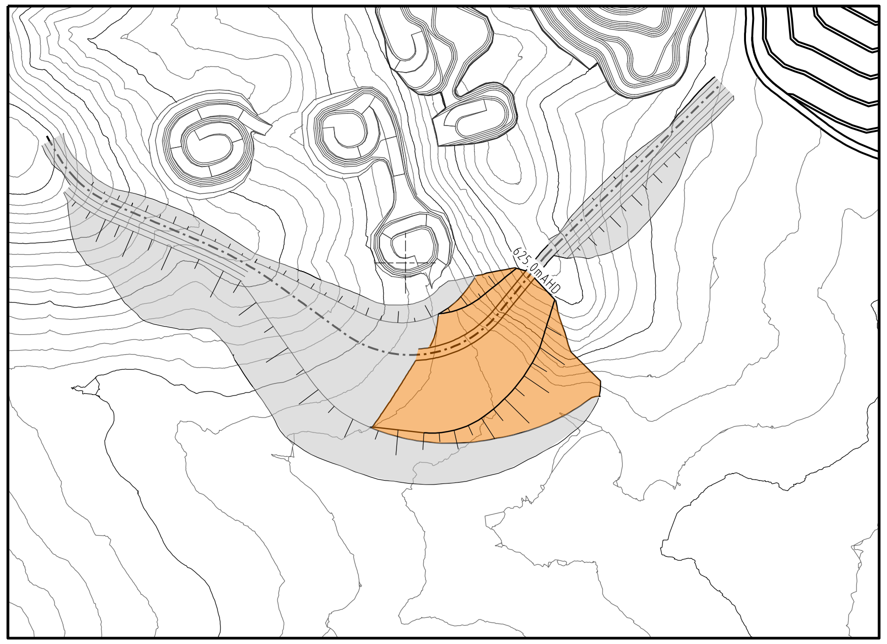
LOCATION: \\aupdcwpcad01\cad\201010-00790\CI\SKE\201010-00790-CI-DSK-1005.dgn USER NAME: simonie.laval SAVE DATE & TIME: $LSDATE$ $LSTIME$ PLOT DATE & TIME: 21/08/2019 12:41:58 PM



STAGE 1
SCALE 1:5000

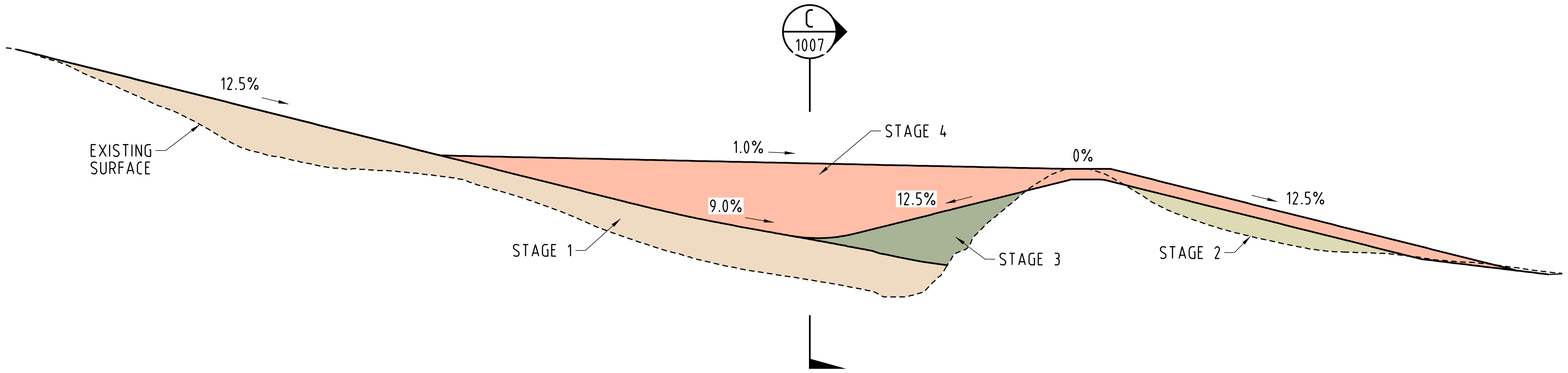


STAGE 2
SCALE 1:5000

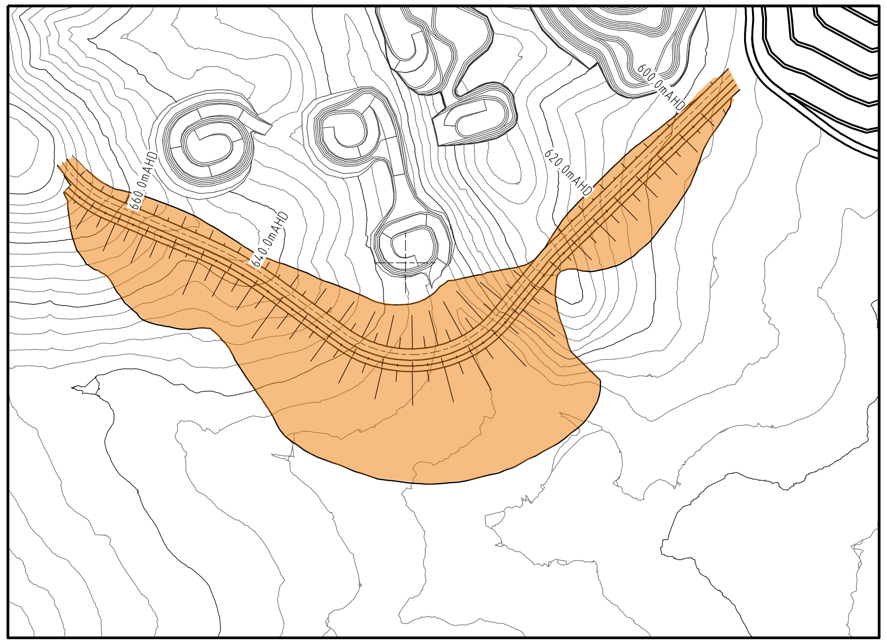


STAGE 3
SCALE 1:5000

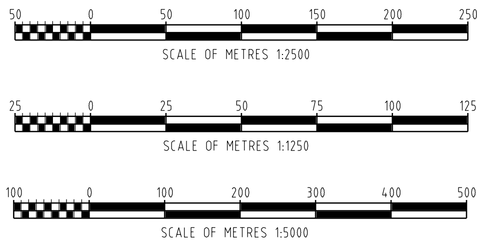
NORTH



SOUTHERN BARRIER STAGE 1 - CENTRELINE PROFILE
HORIZONTAL SCALE 1:2500
VERTICAL SCALE 1:1250



STAGE 4
SCALE 1:5000



NOTES:

1. DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
2. GRID PROJECTION: MGA94 ZONE 55
3. SURVEY CONTOURS AT 5.0m INTERVALS
4. ALL FILL TO BE PLACED IN 2.0m HORIZONTAL LAYERS

INFORMATION ONLY
NOT TO BE USED
FOR CONSTRUCTION

REV	DATE	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CLIENT
0	21-AUG-19	ISSUED FOR USE	SL					

REF DRAWING No	REFERENCE DRAWING TITLE

A1 SHEET SCALE AS SHOWN

OneWay to zero harm

ADVISIAN PROJECT No.
201010-00790

ENGINEERING AND PERMIT STAMPS (As Required)

CLIENT
BOWDENS SILVER

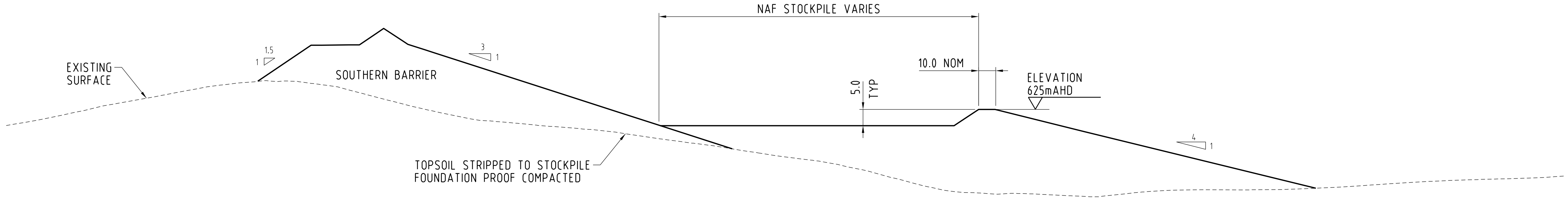
Advisian
WorleyParsons Group

BOWDENS SILVER PTY LTD
BOWDENS SILVER PROJECT
SOUTHERN BARRIER - STAGE 1
STAGING - PLAN AND PROFILE

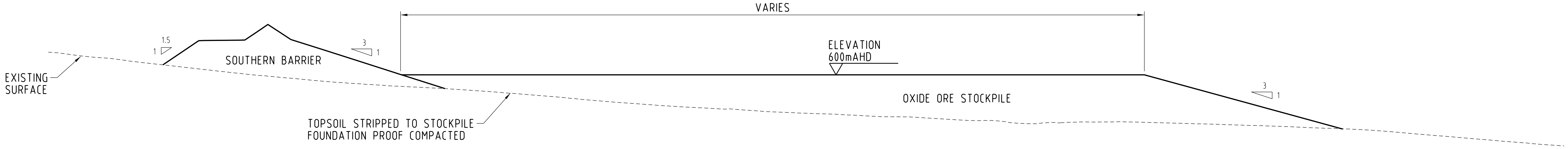
DRG No 201010-00790-CI-DSK-1006
REV 0

ADVISIAN_A1

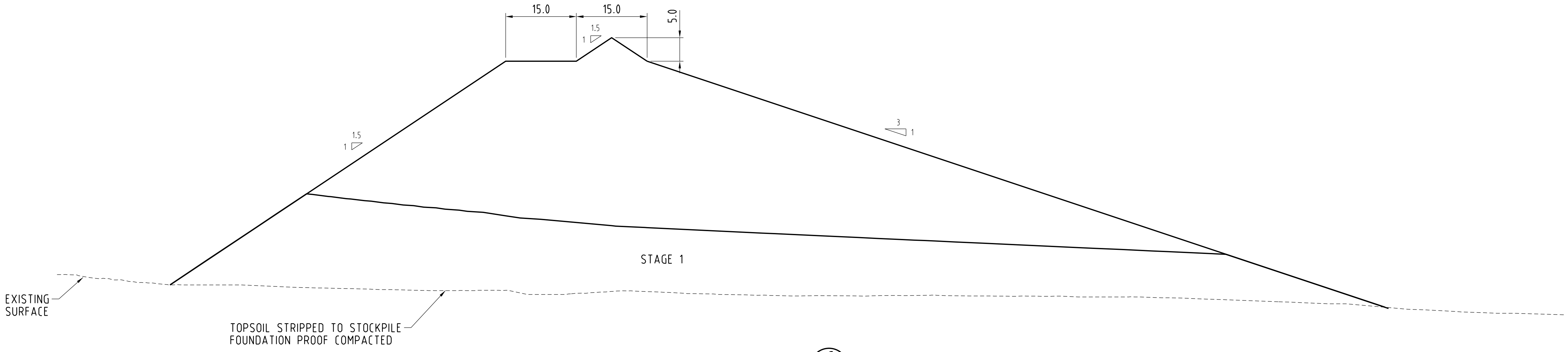
LOCATION: \\aupdcwpcad01\cad\201010-00790\CI\SKE\201010-00790-CI-DSK-1006.dgn
USER NAME: simonie.laval
SAVE DATE & TIME: $LSDATE$ $LSTIME$
PLOT DATE & TIME: 21/08/2019 12:43:06 PM



SECTION A / 1005
SCALE 1:750



SECTION B / 1005
SCALE 1:750



SECTION C / 1006
SCALE 1:500

SOUTHERN BARRIER TYPICAL SECTION

5 0 5 10 15 20 25
SCALE OF METRES 1:250

10 0 10 20 30 40 50
SCALE OF METRES 1:500

NOTES:

1. DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
2. ALL FILL TO BE PLACED IN 2.0m HORIZONTAL LAYERS.

INFORMATION ONLY
NOT TO BE USED
FOR CONSTRUCTION

REV	DATE	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CLIENT	REF DRAWING No	REFERENCE DRAWING TITLE
0	21-AUG-19	ISSUED FOR USE	SL							

A1 SHEET SCALE AS SHOWN

OneWay to zero harm

ENGINEERING AND PERMIT STAMPS (As Required)

ADVISIAN PROJECT No. 201010-00790

CLIENT

BOWDENS SILVER

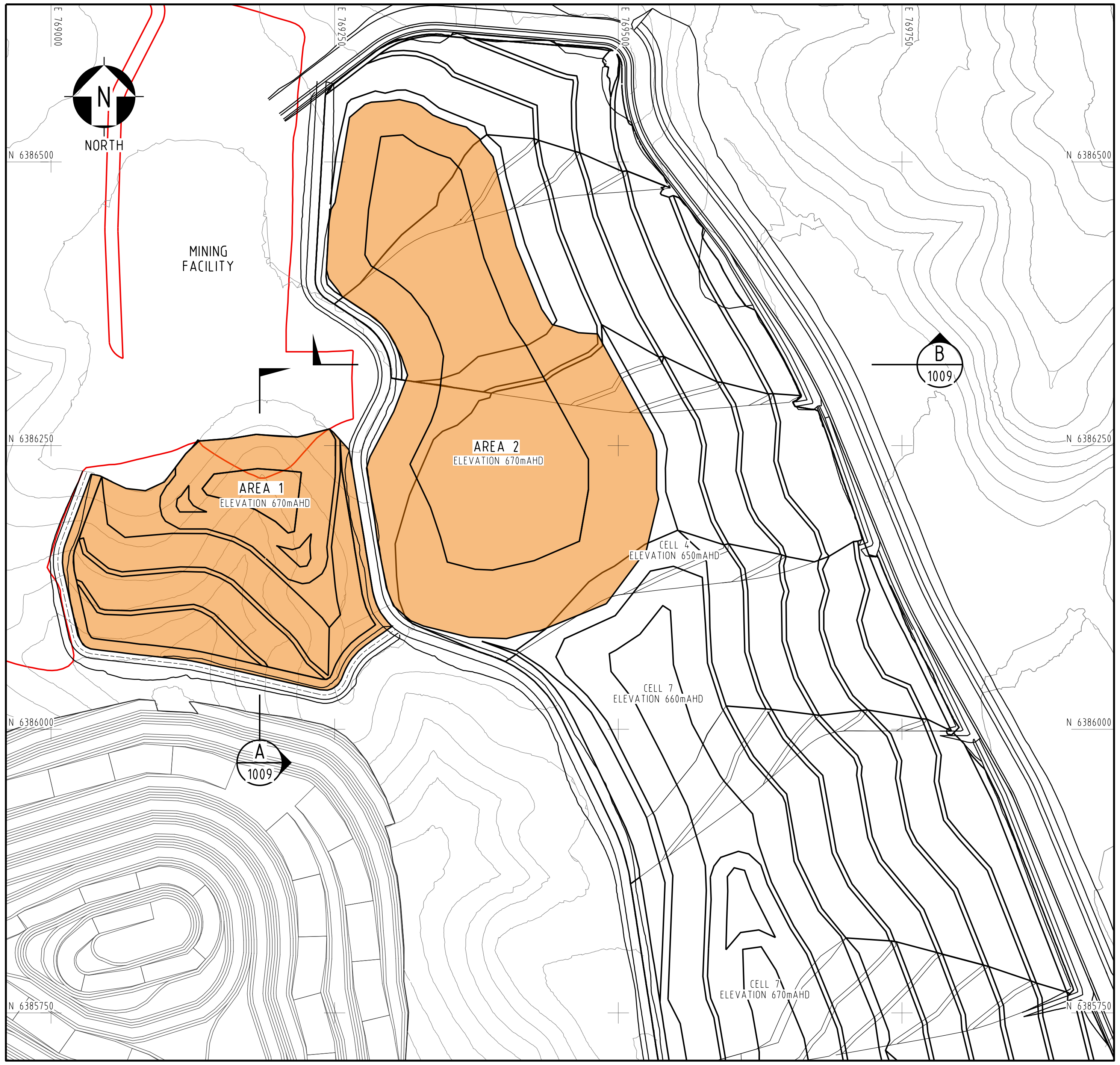
Advisian
WorleyParsons Group

BOWDENS SILVER PTY LTD
BOWDENS SILVER PROJECT
SOUTHERN BARRIER & STOCKPILES
TYPICAL SECTIONS

DRG No 201010-00790-CI-DSK-1007
REV 0

PLOT DATE & TIME: 21/08/2019 12:44:06 PM SAVE DATE & TIME: $LSDATE$ $LSTIME$ USER NAME: simonie.laval LOCATION: \\aupdcwpcad01\cad\201010-00790\CI\SKE\201010-00790-CI-DSK-1007.dgn

ADVISIAN_A1



PLAN
SCALE 1:2500

INFORMATION ONLY
NOT TO BE USED
FOR CONSTRUCTION

NOTES:

1. DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
2. GRID PROJECTION: MGA94 ZONE 55
3. SURVEY CONTOURS AT 5.0m INTERVALS

SCALE OF METRES 1:2500

REV	DATE	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CLIENT	REF DRAWING No	REFERENCE DRAWING TITLE
0	21-AUG-19	ISSUED FOR USE	SL							

A1 SHEET SCALE AS SHOWN

ENGINEERING AND PERMIT STAMPS (As Required)

ADVISIAN PROJECT No. 201010-00790

CLIENT

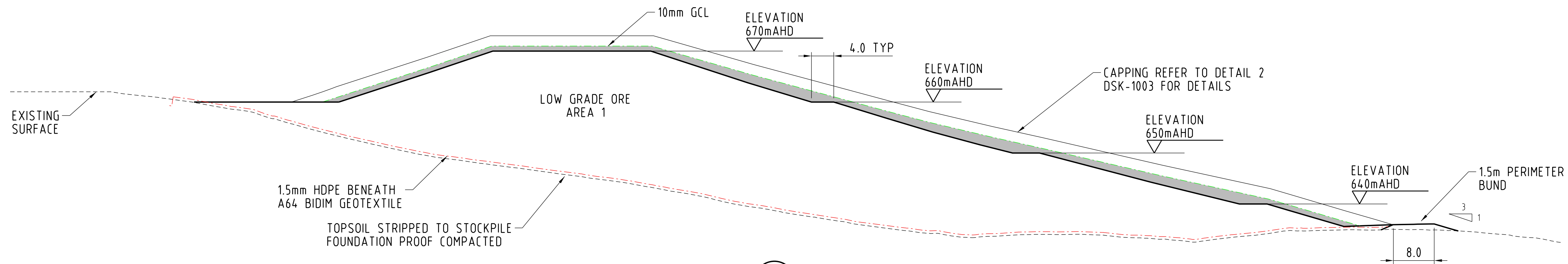
BOWDENS SILVER PTY LTD
BOWDENS SILVER PROJECT
LOW GRADE ORE STOCKPILE
GENERAL ARRANGEMENT

DRG No 201010-00790-CI-DSK-1008

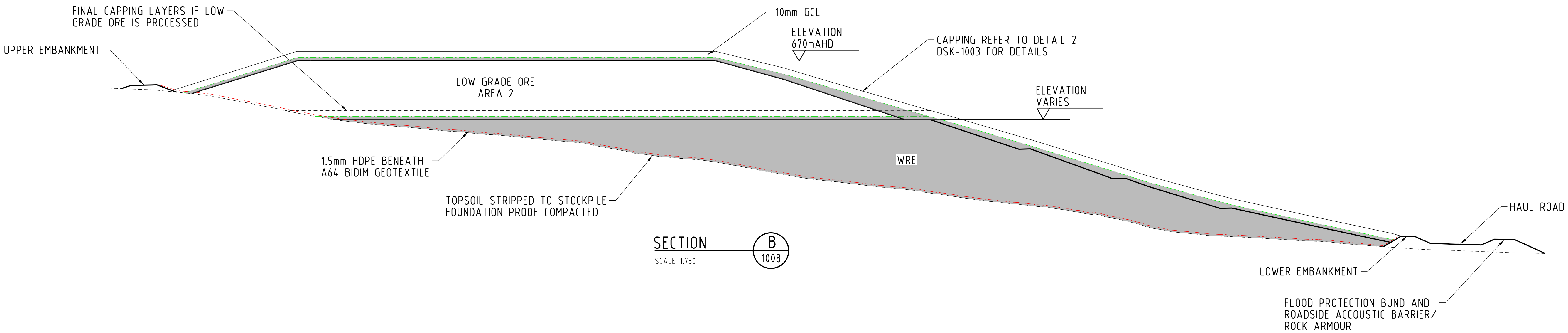
REV 0

ADVISIAN_A1

PLOT DATE & TIME: 21/08/2019 12:45:11 PM



SECTION A 1008
SCALE 1:500



SECTION B 1008
SCALE 1:750

LEGEND:

1.5mm HDPE BENEATH A64 BIDIM GEOTEXTILE

10mm GCL

NOTES:

1. DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
2. ALL FILL TO BE PLACED IN 2.0m HORIZONTAL LAYERS

15 0 15 30 45 60 75
SCALE OF METRES 1:750

10 0 10 20 30 40 50
SCALE OF METRES 1:500

INFORMATION ONLY
NOT TO BE USED
FOR CONSTRUCTION

REV	DATE	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CLIENT	REF DRAWING No	REFERENCE DRAWING TITLE
0	21-AUG-19	ISSUED FOR USE	SL							

A1 SHEET SCALE AS SHOWN

OneWay to zero harm

ADVISIAN PROJECT No. 201010-00790

ENGINEERING AND PERMIT STAMPS (As Required)

CLIENT

BOWDENS SILVER

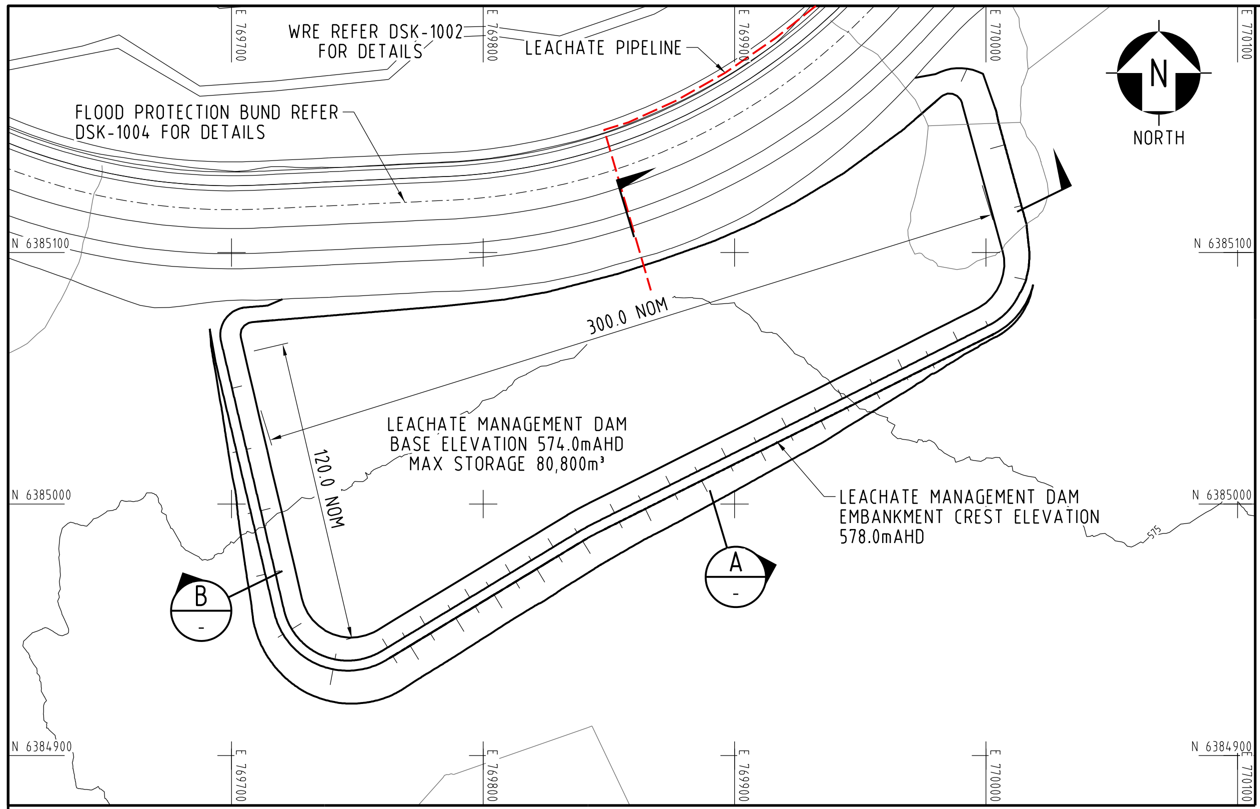
Advisian
WorleyParsons Group

BOWDENS SILVER PTY LTD
BOWDENS SILVER PROJECT
LOW GRADE ORE STOCKPILE
TYPICAL SECTIONS

DRG No 201010-00790-CI-DSK-1009 REV 0

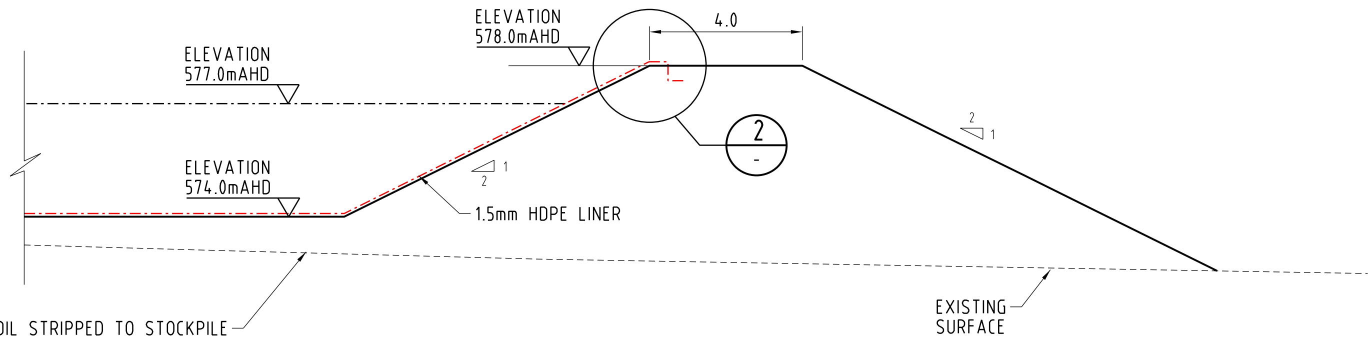
ADVISIAN_A1

PLOT DATE & TIME: 21/08/2019 12:46:23 PM SAVE DATE & TIME: $LSDATE$ $LSTIME$ USER NAME: simonie.laval LOCATION: \\aupdcwpcad01\cad\201010-00790\CI\SKE\201010-00790-CI-DSK-1009.dgn

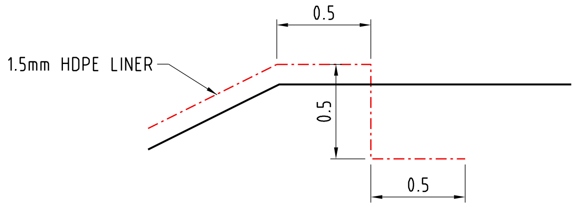


PLAN
SCALE 1:1500

INFORMATION ONLY
NOT TO BE USED
FOR CONSTRUCTION

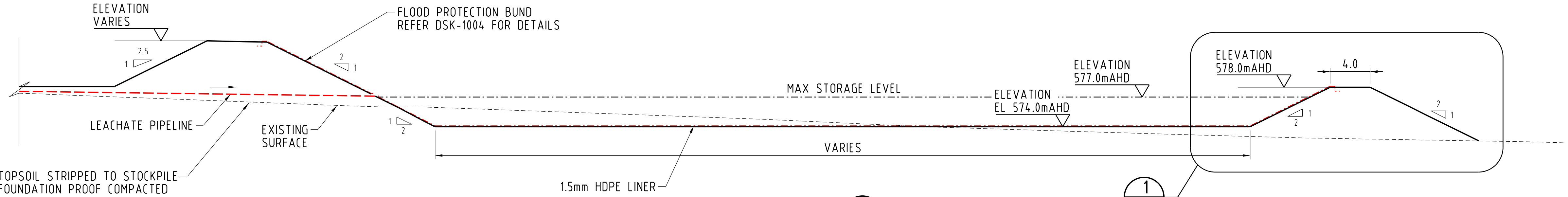


DETAIL 1
SCALE 1:100

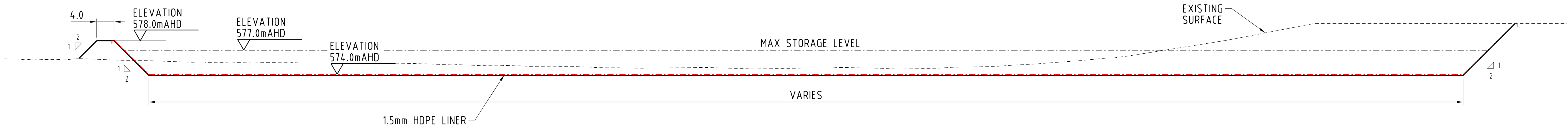


DETAIL 2
SCALE 1:100

ANCHOR DETAIL



SECTION A
SCALE 1:250



SECTION B
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:250

SCALE OF METRES 1:1500
SCALE OF METRES 1:100
SCALE OF METRES 1:20
SCALE OF METRES 1:250
SCALE OF METRES 1:500

NOTES:

1. DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
2. GRID PROJECTION: MGA94 ZONE 55
3. SURVEY CONTOURS AT 5.0m INTERVALS
4. EMBANKMENT FILL MATERIAL FROM WITHIN THE DAM FOOTPRINT

REV	DATE	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CLIENT	REF DRAWING No	REFERENCE DRAWING TITLE
0	21-AUG-19	ISSUED FOR USE	SL							

A1 SHEET SCALE AS SHOWN

ENGINEERING AND PERMIT STAMPS (As Required)

OneWay to zero harm

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ADVISIAN PROJECT No. 201010-00790

CLIENT

BOWDENS SILVER

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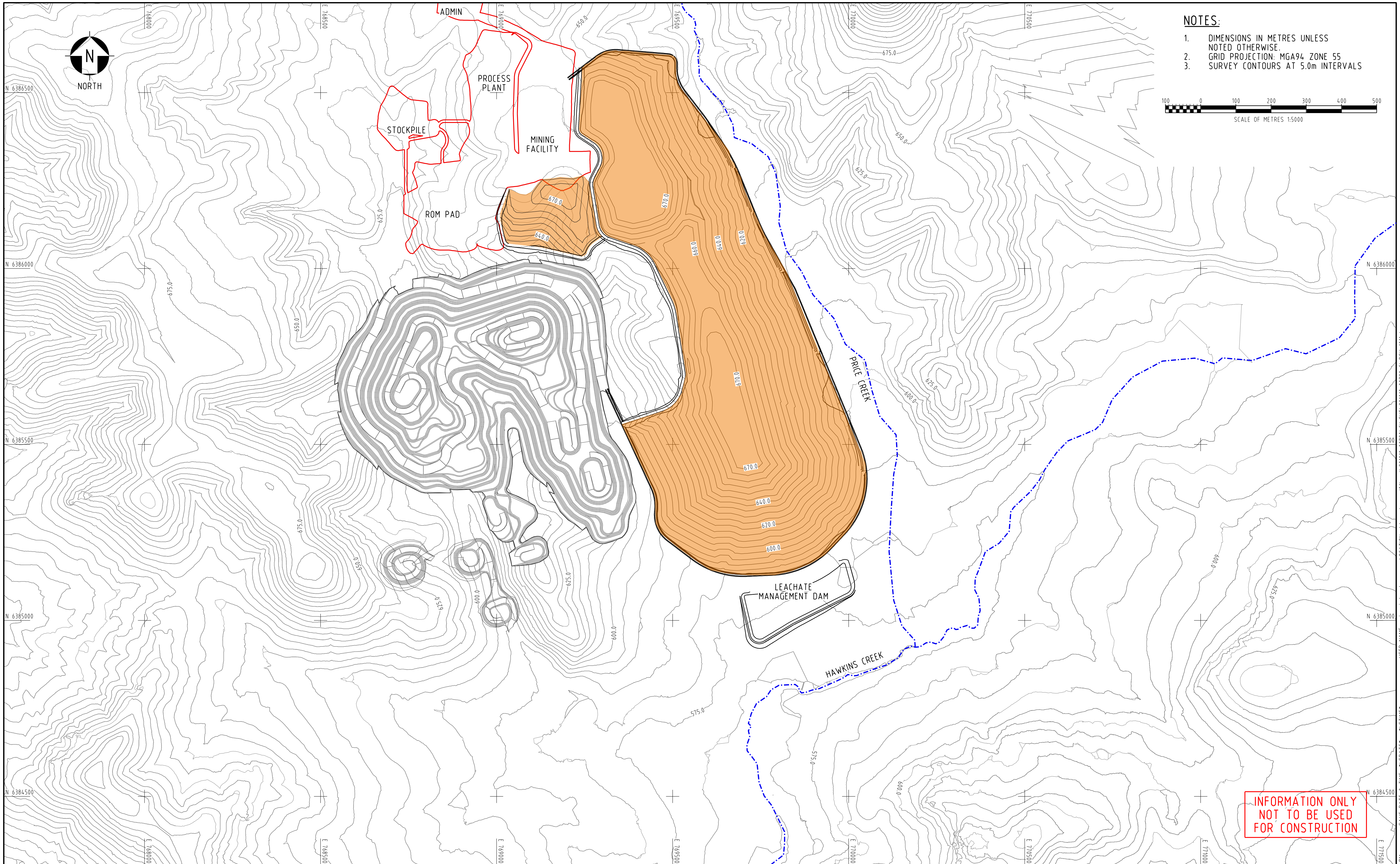
Advisian
WorleyParsons Group

BOWDENS SILVER PTY LTD
BOWDENS SILVER PROJECT
WRE - LEACHATE MANAGEMENT DAM
PLAN AND DETAILS

DRG No 201010-00790-CI-DSK-1010 REV 0

ADVISIAN_A1

LOCATION: \\aupdcwpcad01\cad\201010-00790\CI\SKE\201010-00790-CI-DSK-1010.dgn USER NAME: simonie.laval SAVE DATE & TIME: $LSDATE$ $LSTIME$ PLOT DATE & TIME: 21/08/2019 12:49:10 PM



NOTES:

1. DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.
2. GRID PROJECTION: MGA94 ZONE 55
3. SURVEY CONTOURS AT 5.0m INTERVALS

REV	DATE	REVISION DESCRIPTION	DRAWN	DRAFT CHK	DESIGNED	ENG CHK	APPROVED	CLIENT	REF DRAWING No	REFERENCE DRAWING TITLE
0	21-AUG-19	ISSUED FOR USE	SL							

A1 SHEET SCALE AS SHOWN

OneWay to zero harm

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ENGINEERING AND PERMIT STAMPS (As Required)

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Advisian WorleyParsons Group

BOWDENS SILVER PTY LTD
BOWDENS SILVER PROJECT
WASTE ROCK EMPLACEMENT
FINAL LANDFORM - SITE PLAN

DRG No 201010-00790-CI-DSK-1011 REV 0

ADVISIAN_A1

LOCATION: \\aupdcwpcad01\cad\201010-00790\CI\SK\201010-00790-CI-DSK-1011.dgn USER NAME: simonie.laval SAVE DATE & TIME: $LSDATE$ $LSTIME$ PLOT DATE & TIME: 21/08/2019 12:51:11 PM