GRAYMONT

Calliope PRCP Final Landform Report

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1. INTRODUCTION

The Calliope Limestone Quarry is operated by Graymont (Calliope) Pty Ltd. The Project involves the operation of an open cut limestone quarry that produces approximately 0.8 million tonnes per annum (Mtpa) of limestone products. The Project commenced operations in 1967 and, noting potential future changes in reserves and yearly sales quantities, has a planned end of mine life (EOML) in 2100. The Project is located approximately 11 kilometres (km) south of the township of Calliope and 30 km south of Gladstone in Central Queensland within the Gladstone Local Government Area.

This report has been prepared to address the final landform design requirements of the Progressive Rehabilitation and Closure Plans Guideline (ESR/2019/4964) and appends to the Rehabilitation Planning Part prepared by Epic Environmental. This report includes discussion on the 3D design plan and methods for closure, limitations and assumptions, considerations for de-risking design and minimising footprint size, material balance, material available for landform rehabilitation, and the waste placement strategy.

2. 3D DESIGN AND METHODS FOR CLOSURE

There are approximately 30 landholders within a 5 km radius of the site, however, based on the topography, and the rural location of the quarry, there is not expected to be any visual impact from rehabilitation at these sensitive receptors. The quarry is surrounded by grazing land to the north, west, and south, and Lake Awoonga to the east. There was no feedback received during community consultation undertaken at the Quarry Open Day on 4th March 2023 that impacts the final landform design.

The long-term stability of the landforms has been considered within design and described further in the Geotechnical Assessment (GA) prepared by Rocktest for the Progressive Rehabilitation and Closure Plan (PRCP) and an erosion assessment included in the Rehabilitation Planning Part. Hydrological and hydrogeological assessments have informed the final landform design. Further discussion is provided in the hydrogeological assessment (Graymont).

2.1 PIT 3-4

Pit 3-4 is the main pit being currently mined at Calliope and will make up the largest void at closure. A mine optimisation study was completed to define the size of the economic pit limits. As the modelled ore body is massive and extends beyond mining leases and other surface constraints, the pit is planned to be mined to the full extent that these constraints allow. For this reason, there is no way that the final void can be reduced in surface area disturbance without sterilising viable reserves.

Pit 3-4 is planned to be mined in four stages, with indicative timeframes as follows:

Stage 1- 2027 - 2060

Stage 2- 2050 – 2070

Stage 3- 2060 - 2090

Stage 4- 2080 - 2100

Conceptual plans for the 4 stages are shown in Section 7 - Waste Placement Strategy of this report.

As the quarry produces between 10% and 20% waste material during mining and processing operations, it is not deemed feasible to fully backfill the pit. Furthermore, due to the depth of the limestone reserve, a minimum volume of rock is required to be mined before access to in-pit backfill room becomes available. **Figure 1** shows how the pit is planned to be mined in such a way as to provide in-pit backfill room as soon as practicable to minimise the quantity of waste material required to be spoiled outside the void.

Stage 1 and 2 will occur over 35 years focusing on the northern extent of the Pit. To provide in-pit backfill room at final pit floor level, a large portion of the full pit surface extent will need to be disturbed in Stage 1. Stage 3 will commence approximately 10 years prior to Stage 1 and 2 being finalized. During Stage 3, Pit 3-4 will become amalgamated, with the eastern and western walls of the central Pit being pushed out to the maximum disturbance extent. Similarly, Stage 4 will commence approximately 10 years prior to Stage 3 being finalized and will involve final mining operations in the southern extent of the Pit.

Vertical and lateral expansion of Pit 4 is projected to occur in the form of a range of cutbacks (using conventional drilling and blasting methods) on the current pit. Blasting occurs approximately once a month within the confines of ML3594, ML3604, ML3608 and ML80190, and trucks transport loose material from Pit 4 to the ROM pad for processing. To efficiently mine Pit 3-4, access roads are required to be maintained above the eastern and western sides of the pit for the life of mine. Expansion of Pit 4 is proposed to occur in four stages from north to south, over a period of approximately 68 years. Expansion will involve widening Pit 4 to the final east and west limits and progressing to the south, with Pit 3 being amalgamated with Pit 4 to form the final pit shell. A south to north mining approach has also been considered in the final landform design report.

As mining progresses, undisturbed areas will need to be stripped and topsoil stockpiled in zones adjacent to mining. Stockpiling areas will be spread out around the pit limit to allow for efficient rehabilitation.

The final Pit 3-4 void dimensions will be approximately 1,700m long by average 650m wide by up to 117m deep. Following further pit optimisation, it is possible that an updated design will propose to mine deeper than the current pit limit of -56mRL as ore exists below this level. Overall toe to toe slope angles are designed to be less than 38 degrees to comply with the GA. This void will be largely filled with water following closure.

Backfill in the Pit 3-4 void will be mostly constructed using waste material from mining, processing, and removal of the Northern Waste Rock Dump. Backfill is not required to provide stability of the final pit slopes, however it will generally be placed in layers less than 10m thick and either tracked with dozers or wheel rolled with trucks to provide a level of compaction. Consideration will be given to spreading the backfill over a large surface area to provide a wide distribution of toe support of the final pit slopes.

Pit structures will not require a lining to prevent water or air ingress as it is planned that the pit will be flooded and there is no contaminated or acid generating mine waste material (refer to the Waste Characterisation report appended to the PRCP) within the pit void.

An abandonment bund has been allowed for as close to the final pit crest as practicable considering geotechnical setback recommendations. These bunds are designed to be constructed out of well graded coarse limestone in accordance with GA recommendations and will help to prevent inadvertent access to the void following closure.

As described in the GA some of the strategies employed in the closure plan to derisk the final landform are:

- Installing abandonment bunds behind the crests of each pit.
- Reducing batter angles of sections of the upper benches comprising extremely weathered rocks and soil.
- Installation of a lockable gate to prevent unauthorised access to the void
- Filling karst caverns then covering the stripped ground with broken rocks.
- Installing warning signs around the pits and restricting public access to the site.

2.2 PITS 1 AND 2

Pit 1 was a small void to the northeast of Pit 3-4 which has been backfilled with clean rock waste material from operations. The final landform of this area will be flat to gently inclined to make it suitable for the grazing post mine land use.

Pit 2 is an historic void mined from the mid ‘60s until the mid ‘70s. The pit is used to store water for operation of plant and facilities and therefore will be required to remain as a void till EOML. The pit is 435m

long and 235m wide and approximately 37m deep. At the end of operations upper slopes will be regraded in accordance with the recommendations in the GA and the pit allowed to fill with water.

2.3 SOUTHERN WRD

The Southern WRD will be constructed initially up to 72mRL which is below the highest level of ~74m RL of the existing landform to the east of the dump. Construction will be generally undertaken using a bottom-up approach in layers. At the end of mine life the WRD will be reprofiled with a maximum height of 23m at 62mRL and have slopes less than 12 percent. Stability of the final landform will be achieved following recommendations in the GA.

The final Southern WRD footprint within the mining lease is 19.7Ha. Access tracks around the base of the dump have been included to provide access to various parts of the site predominantly for monitoring purposes.

The cores of the outer slopes of the dump will be constructed in a series of lifts from the bottom up, beginning on the natural surface. The procedure used to do so will compact the materials, so they achieve their greatest practical strength and lowest practical permeability:

1. Strip topsoil and vegetation from the natural surface.
2. Trucks dump waste materials in a pile.
3. The material is spread in a near horizontal layer as thin as practical.
4. Moisture condition (i.e., damp) the material.
5. Use repeated passes of equipment to compact the material until no further compaction occurs with additional passes.
6. Repeat stages 2 to 5 for subsequent lifts.

The slopes are advanced in the same directions as the topography. No major drainage paths are blocked by the toes of the dump. As the Southern WRD is designed for grazing the slopes have very high factors of safety as calculated indicated in the GA.

After the EOML, the principal strategies to reduce the risks applicable to the WRD will be:

- Ensuring all slopes have acceptable stabilities and the toe of the northern slope is a sufficient distance from the crest of the south wall of Pit 4.
- Visually monitoring the performance of the dump over the medium to long-terms to ascertain whether the design continues to perform acceptably.
- Preparedness to modify plans, designs and/or site works if the dump deviates from the design and/or its performance does not comply with the completion criteria.

Other completion criteria for the southern WRD are shown in tables 9 and 10 of the GA.

2.4 VOID CLOSURE PLAN

Geotechnical requirements for void closure are considered in the GA.

3. DOCUMENTED TESTING REGIME

The documented monitoring regime is described in the GA and is shown in **Table *1*** below.

Landform	Rehabilitation milestone reference	Rehabilitation milestone reference	Milestone criteria
Residual voids (Pit 2 and Pit 3-4)	RM3	Landform development and reshaping / re-profiling of residual void	• An Appropriately Qualified Person (AQP) has confirmed that geotechnical stability of the residual void walls (i.e., a factor of safety value of ≥1.2) has been achieved. • Pit 3-4 batter slopes meet final design specifications (18° in weathered rock, 65° in unweathered rock) • Pit 2 maximum overall slope angle meets final design specifications (34°) • Perimeter abandonment bund and safety signage installed offset, as specified by an AQP, from the crest of the voids • Locked gates and signage installed at access points to the residual voids to prevent unauthorised access • AQP certifies that void final landform design intent has been achieved
	RM10	Achievement of post-mining land use to stable condition (water storage)	• Visual inspection by an AQP provides evidence that the stabilities of the residual void crests and walls have remained constant or increased following cessation of mining and rehabilitation activities
Southern WRD	RM4	Landform development and reshaping / re-profiling of waste rock dump	• As built inspection by an AQP confirms that the final landform design intent has been achieved, and batter slopes do not exceed 12%
	RM11	Achievement of post-mining land use to stable condition (grazing)	• Visual inspection by an AQP provides evidence that the geotechnical stability of the southern WRD has remained constant or increased following completion of rehabilitation activities

Table 1: Proposed geotechnical rehabilitation milestone criteria for the residual voids and SWRD at Calliope

4. LIMITATIONS AND ASSUMPTIONS OF THE FINAL LANDFORM DESIGN

Quarrying activities in future Pit 3-4 will continue for approximately 80 years until EOML in 2100. Therefore, waste percentages and calculations for available reserve volumes including identifying further reserves, will be updated periodically over the LOM. A detailed mine plan is prepared for Calliope for a five-to-ten-year period, and it is likely that future mine plans and unforeseen mine parameters might delay or change intended schedules for future Pit 3-4.

Assumptions have been made about these mine parameters include the extent of known reserves, future changes in saleable product quantities and other variables that may impact on operational mine scheduling, and consequently, rehabilitation scheduling, for the purposes of providing the required information for the purpose of the PRC Plan for Calliope Limestone Quarry. It is noted that conservative estimates of the LOM, with an EOML of 2100, have been prepared based on the material balance and final landform design. However, if refinements from future calculations will impact when Pit 3-4 can cease quarrying activities, an amendment to this PRC Plan will occur to ensure consistency with mine planning.

5. MATERIAL BALANCE

The material balance for the current LOM design as of the18th Nov 24 survey is shown in **Table 2**. The total waste quantity has been calculated from the 2025 geological block model. It is noted that the actual waste generated over time may vary from that predicted in this model based on geological uncertainty, ore recovery and markets for ore and waste products.

The mass balance shows that the full Interim Southern WRD volume of 2.9 Mm3 is required to provide time to create in-pit backfill room. It is assumed that some in-pit backfill room will be available prior to completing each cut stage as shown in **Table 2**.

Calliope LOM Plan Cut vs Fill Material Balance							
Cut			Waste Rock Dump Capacity				
	Description	Waste lcm	South WRD Initial m3	Stage 1 Floor m3	Stage 2 Floor m3	Stage 3 Floor m3	In-Pit North & In-Pit South Dump m3
			2,858,945	**653,185**	**1,593,267**	**2,446,138**	**3,810,880**
Stage 1	Stage 1 cut to Southern WRD	2,936,373	2,858,945	77,428			
Stage 2	Stage 2 cut to Stage 1 floor	844,414		575,757	268,657		
Stage 3	Stage 3 cut to Stage 2 floor	1,476,049			1,324,610	151,439	
Stage 4	Stage 4 cut to Stage 3 floor	3,216,935				2,294,699	922,236
North Out of Pit WRD	North out of pit WRD to Stage 4 floor	1,081,159					1,081,159
Southern WRD reprofile	SWRD to South in-pit dump	1,423,490					1,423,490
Dump balance remaining room			-	-	-	-	**383,995**

Table 2: Calliope Material Balance

6. MATERIAL AVAILABLE FOR LANDFORM REHABILITATION

Material available for landform rehabilitation is overburden from the upper 5-30m and waste material from processing of the limestone. Total waste is expected to be in the vicinity of 10-20% of the total mined quantity. The approximate waste produced from the site including exiting waste that needs to be relocated from 2025 to the end of mine life is shown in **Table 2**.

No material will be required to complete rehabilitation of Pit 2 and Pit 3-4. The Interim Southern WRD will be formed with nominal 13° slopes using truck excavator and dozer push and reprofiled to 12 percent at the end

of mine life. As the overburden rock in this area will be used to form the final landform, no other additional material is required. Topsoil quality is considered further in the main PRCP document.

7. WASTE PLACEMENT STRATEGY

The conceptual LOM quarry and dump staging is shown in figures 1 to 7 below.

7.1 PIT 4N CUT STAGE 1 AND SOUTHERN WASTE ROCK DUMP

Pit 4N Cut Stage 1 concentrates on the northern end of Pit 4 to provide a void for placement of in-pit backfill as shown in **Figure *1***. During this stage backfill will be placed in the Southern WRD to the full dump footprint extent as shown in **Figure 2**. It is possible that a small amount of material may be able to be placed in the pit prior to mining the full stage 1 block.

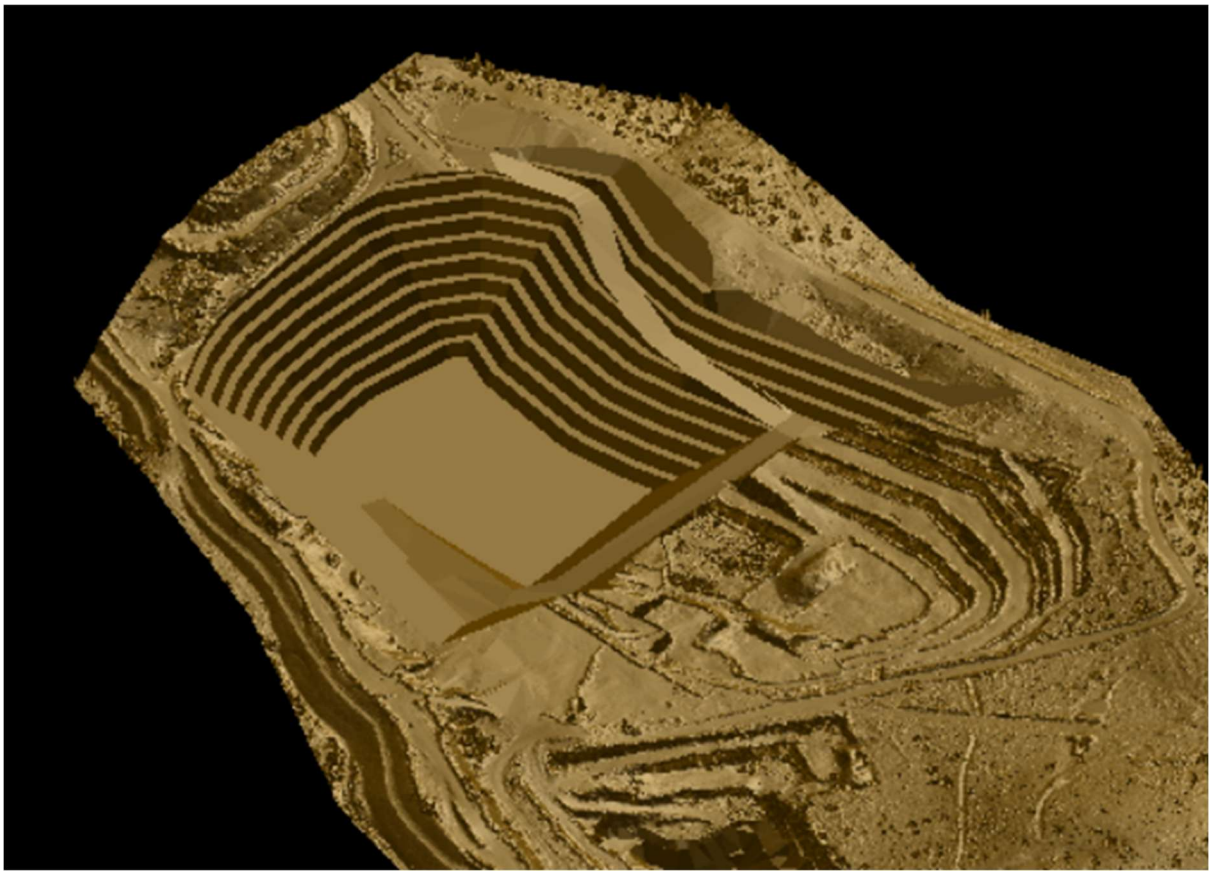

Figure 1. Pit 4 cut stage 1

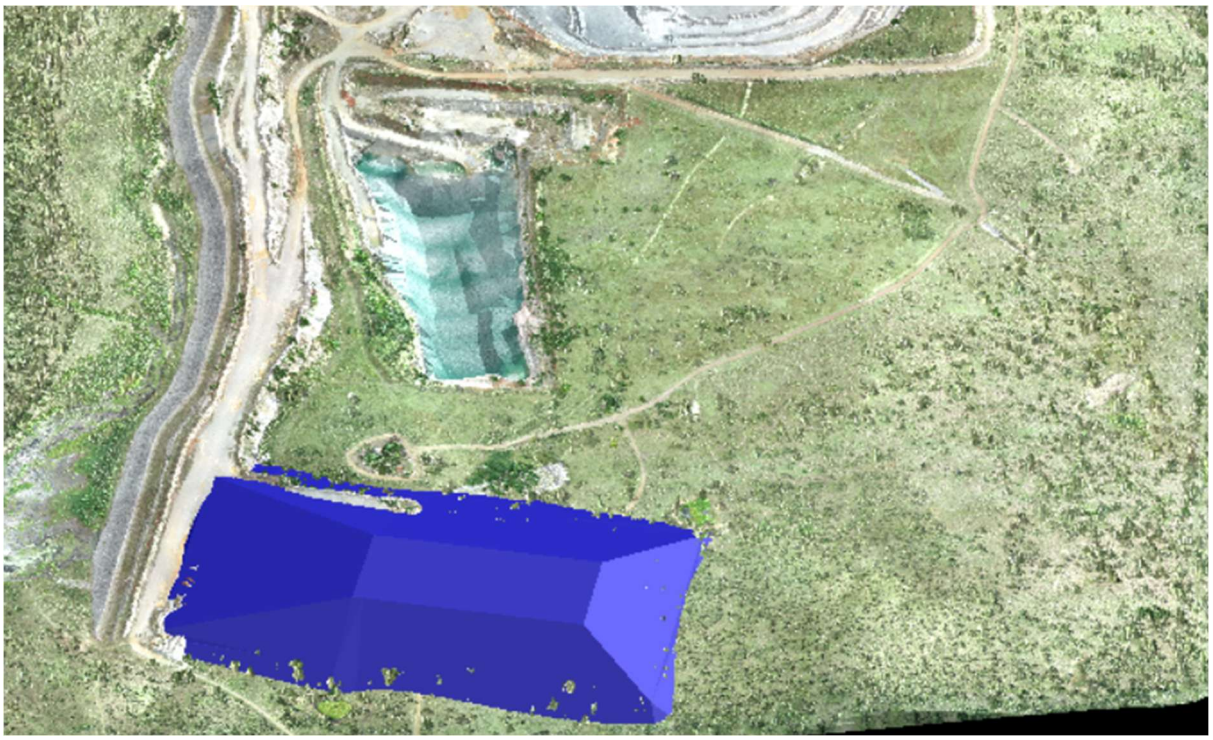

Figure 2. Southern Waste Rock Dump (Full Dump Footprint Extent)

7.2 PIT 4N CUT STAGE 2 / INPIT BACKFILL STAGE 1

Pit 4N Cut Stage 2 expands the Stage 1 cut to the south. This material is placed in the void that was created during Cut Stage 1 as shown in **Figure 3**.

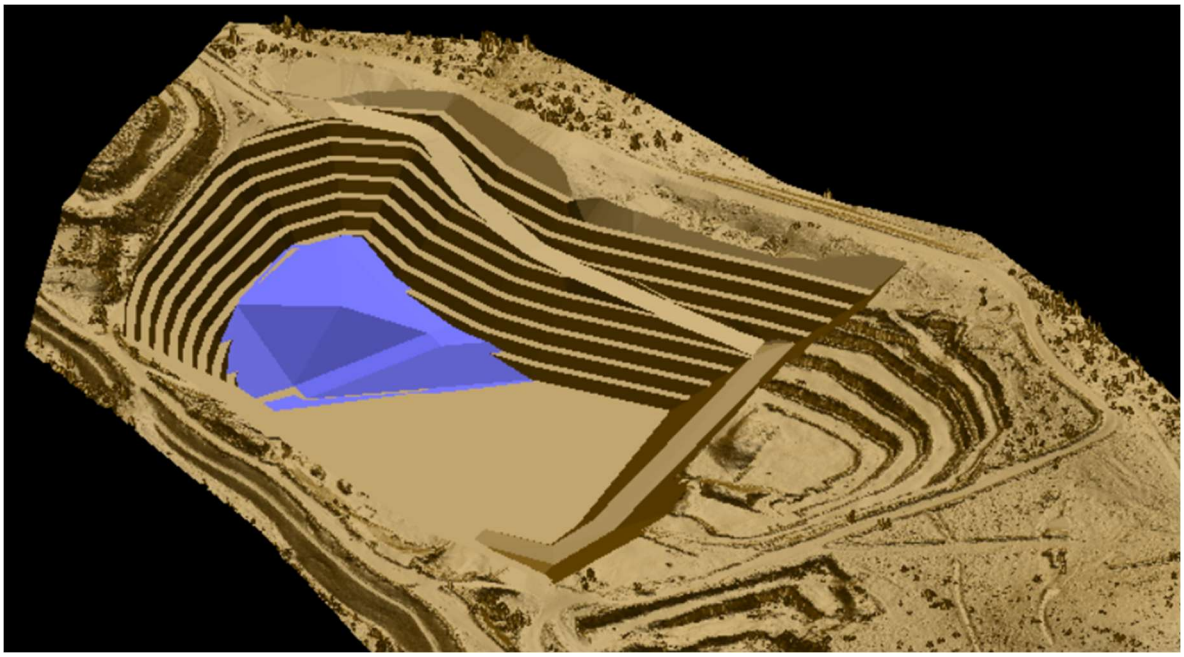

Figure 3. In-pit backfill after north cut stage 2.

7.3 PIT 4N CUT STAGE 3 / INPIT BACKFILL STAGE 2

Pit 4N Cut Stage 3 widens the stage 2 cut to the south. This material is placed in the void create during Stage 1 and 2 Cuts as shown in **Figure 4**. Access is maintained to the southern upper benches with a south-eastern ramp.

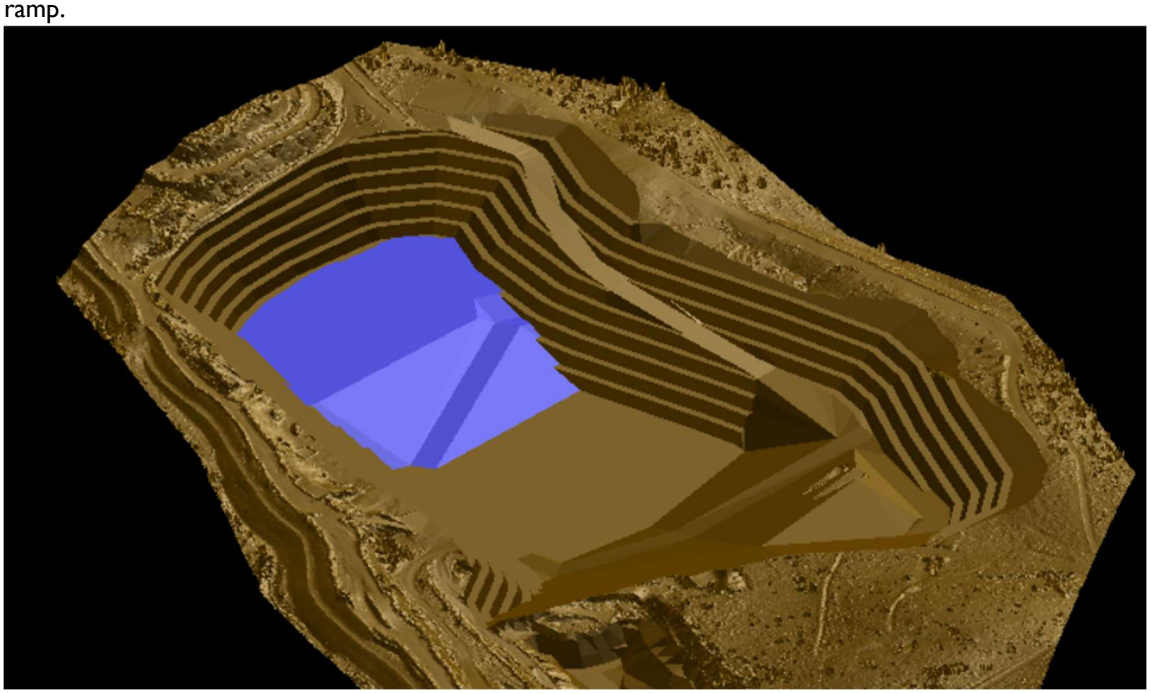

Figure 4. In-pit backfill after north cut stage 3

7.4 PIT 4N CUT STAGE 4 / INPIT BACKFILL STAGE 3

Pit 4N Cut Stage 4 takes out the highwall between Pit 4 and Pit 3 and completes mining of the combined pit to full extent. This material is placed in the void created during Cut Stage 3 as shown in **Figure *5***.

A void will remain in the southern end of the pit down to -56mRL as backfill cannot be placed on the floor while mining is still occurring during Cut Stage 4.

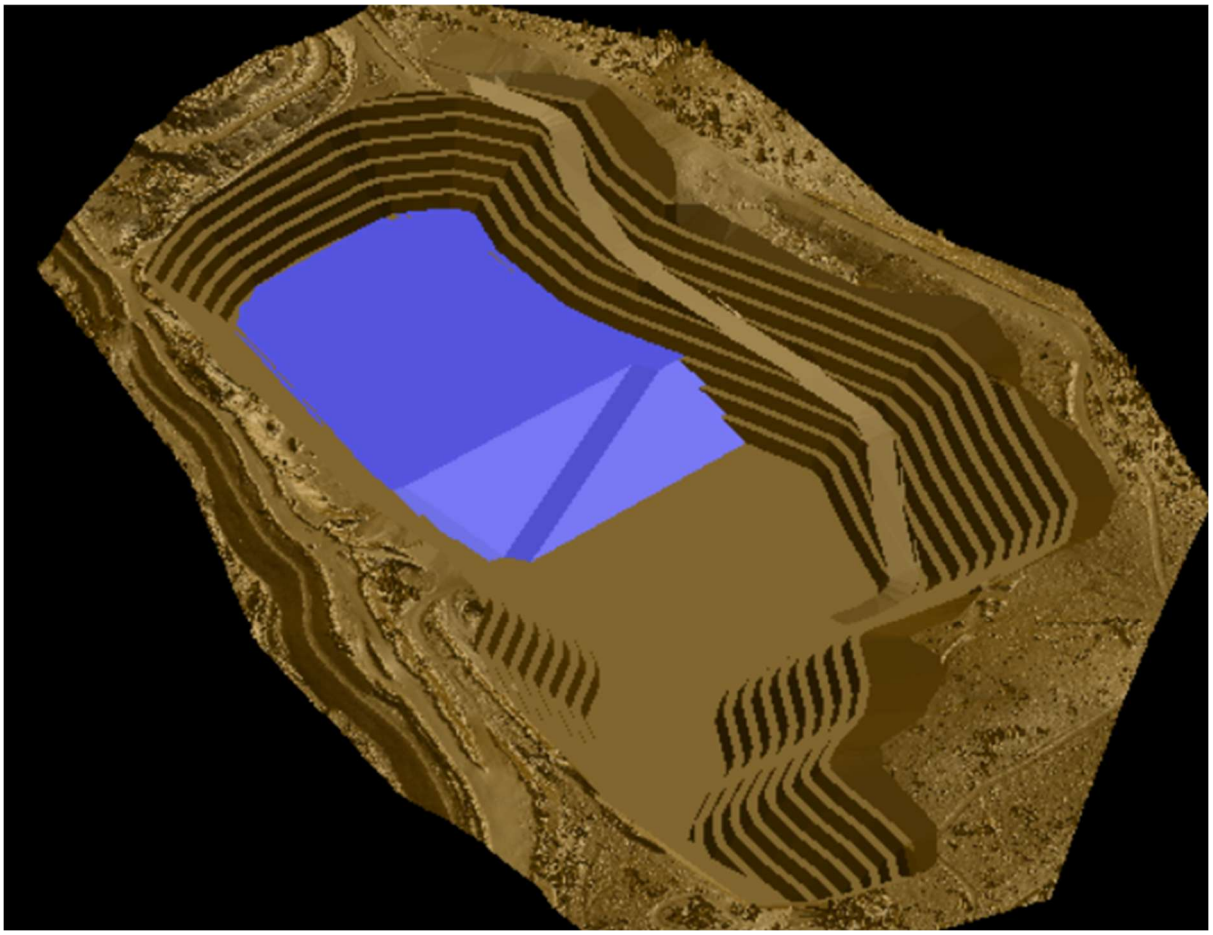

Figure 5. In-pit backfill after north cut stage 4

7.5 NORTH OUT OF PIT DUMP, LAYDOWN AREA AND ABANDONMENT BUND

During the final stages of mining, the northern out of pit dump is backfilled into the northern end of Pit 4 and the laydown area is levelled as shown in **Figure 6**.

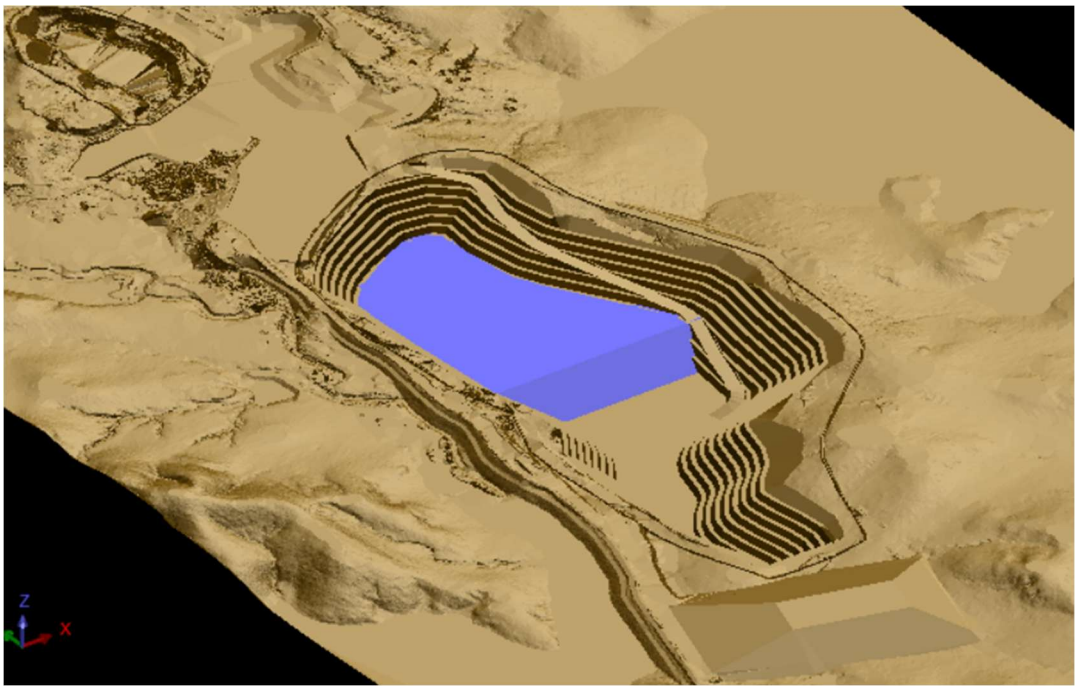

Figure 6. Inpit backfill at end of mine life, removal of the northern out of pit dump and levelling laydown area

7.6 REPROFILING SOUTHERN WASTE ROCK DUMP

At the end of mine life the Southern WRD is reprofiled, so the slopes are less than 12 percent. Any excess material will be placed in the southern end of the pit 3-4 void. The amount of excess material and size of the southern in-pit dump will vary depending on the actual quantity of waste produced during operations. Finally, an abandonment bund will be constructed around the top of pit 2 and pit 3-4 as shown in **Figure 7**.

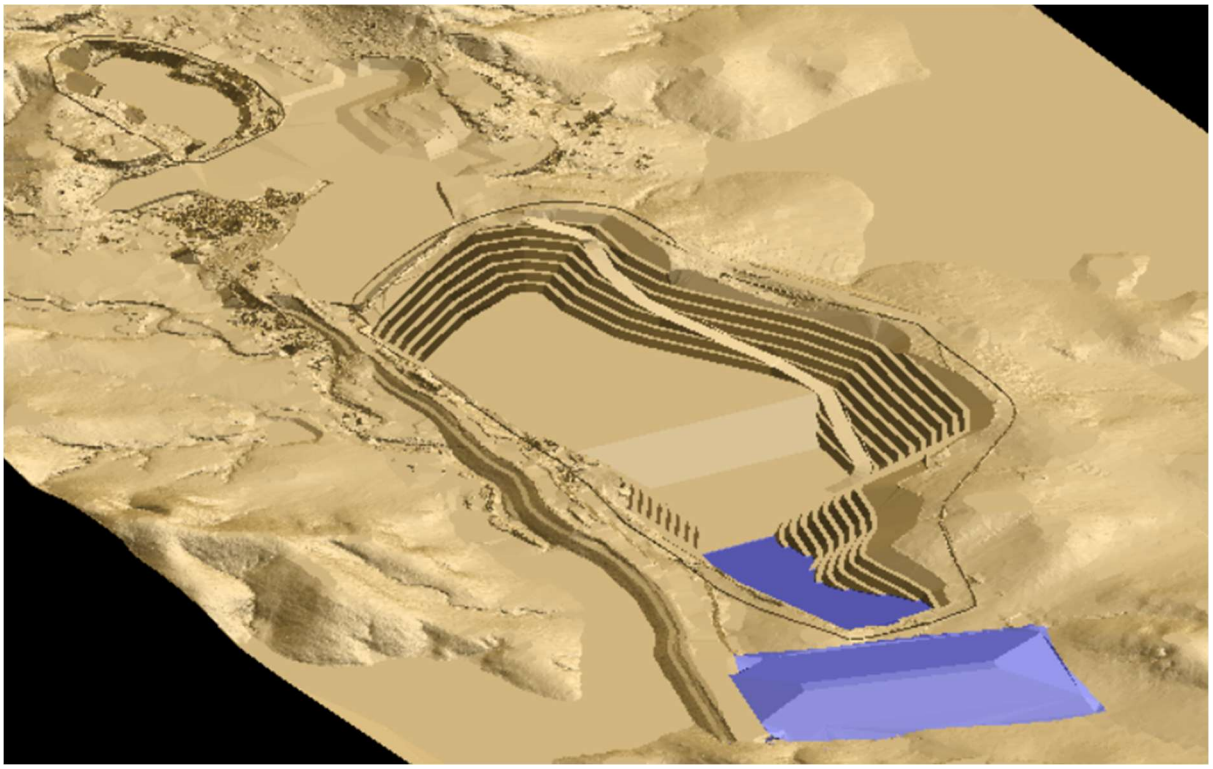

Figure 7 Reprofile Southern WRD, southern in-pit fill and abandonment bund

7.7 OPTION 2 WORKING THE PIT FROM SOUTH TO NORTH

Pit 3-4 may also be worked from south to north rather than north to south. To determine the best direction to mine the pit further consideration will be given to potential added limestone reserves in the area, water management of Pit 2 and further economic assessment of N-S and S-N scenarios.

A south to north mining direction will follow a similar strategy as described in figures 1 to 6 but in reverse. The southern end of the pit will be mined first to establish in-pit backfill room. Waste generated during this phase will be placed in the Southern WRD.

8. FINAL LANDFORM

The proposed final landform at closure is shown in **Figure *8***.

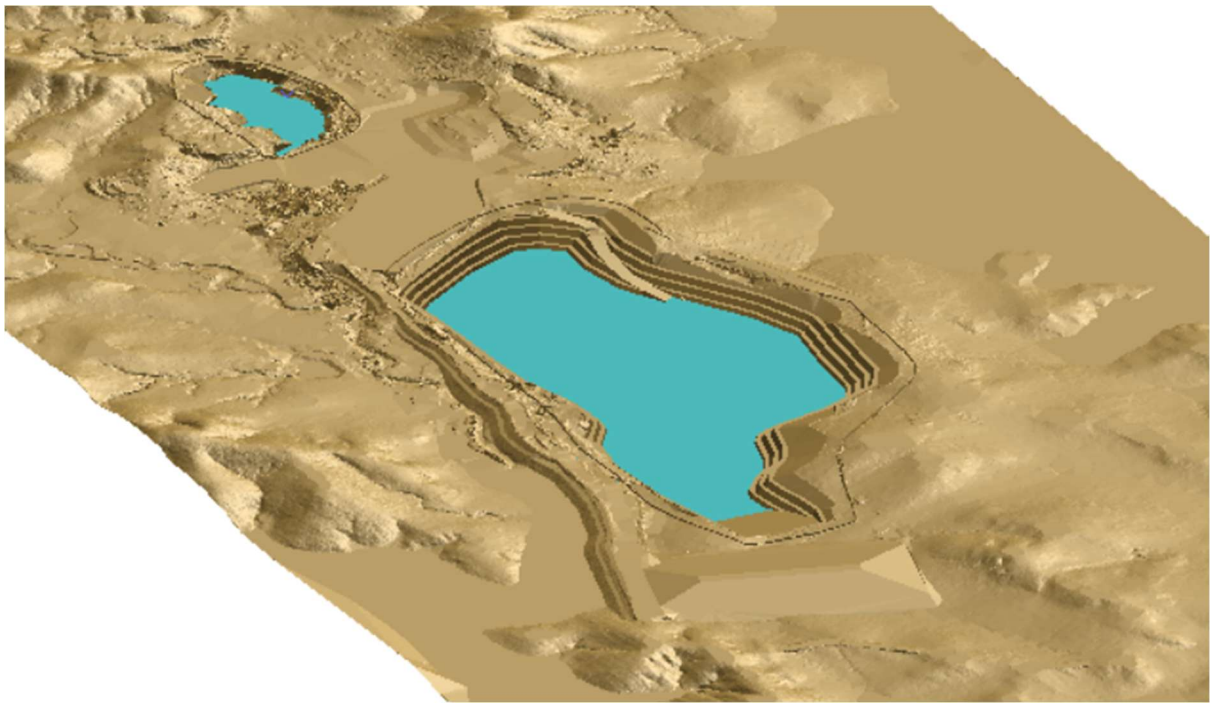

Figure 8. Final Landform