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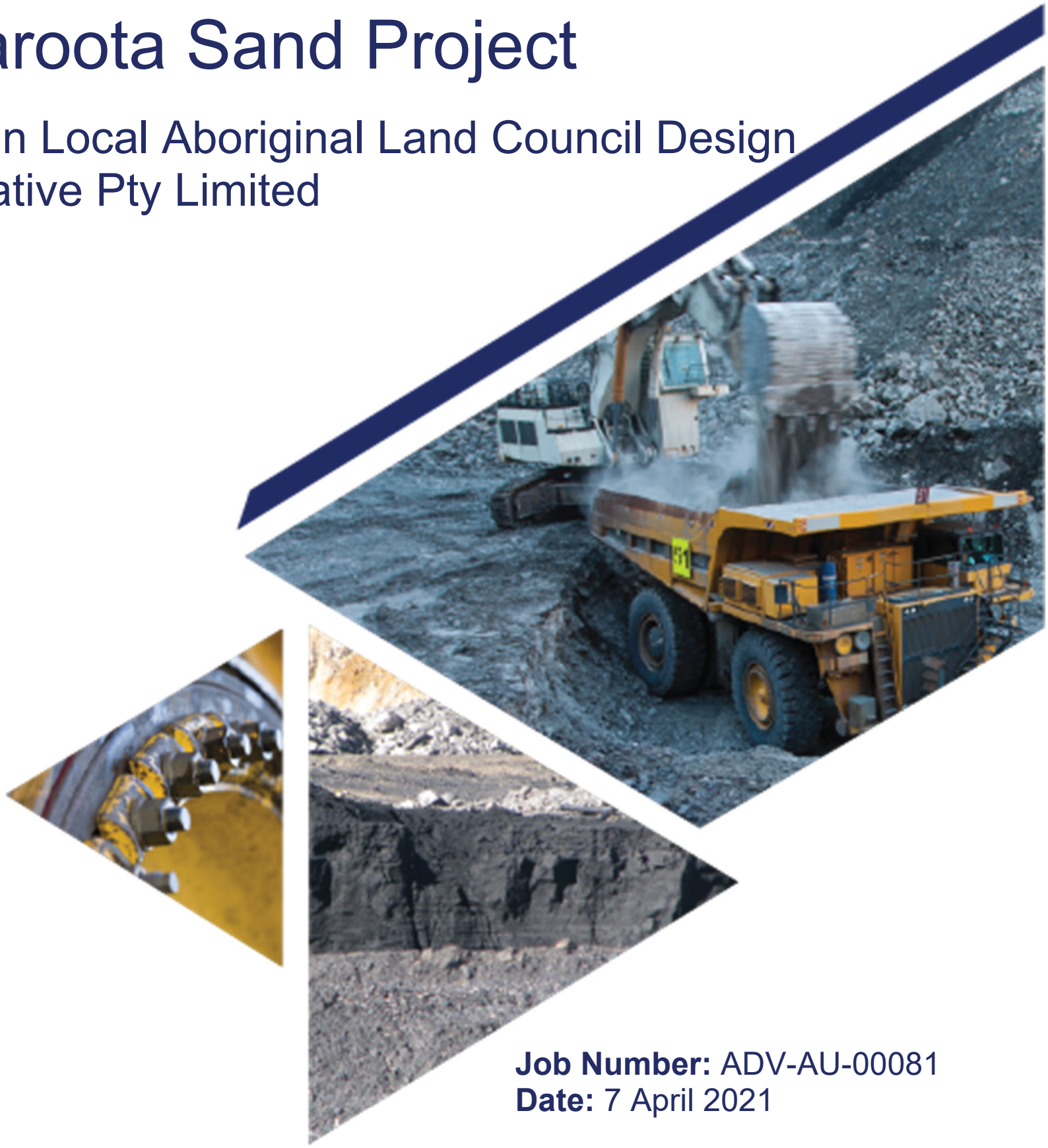
Extraction and Rehabilitation Plan for Maroota Sand Project

Deerubbin Local Aboriginal Land Council Design Collaborative Pty Limited



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Date: 7 April 2021

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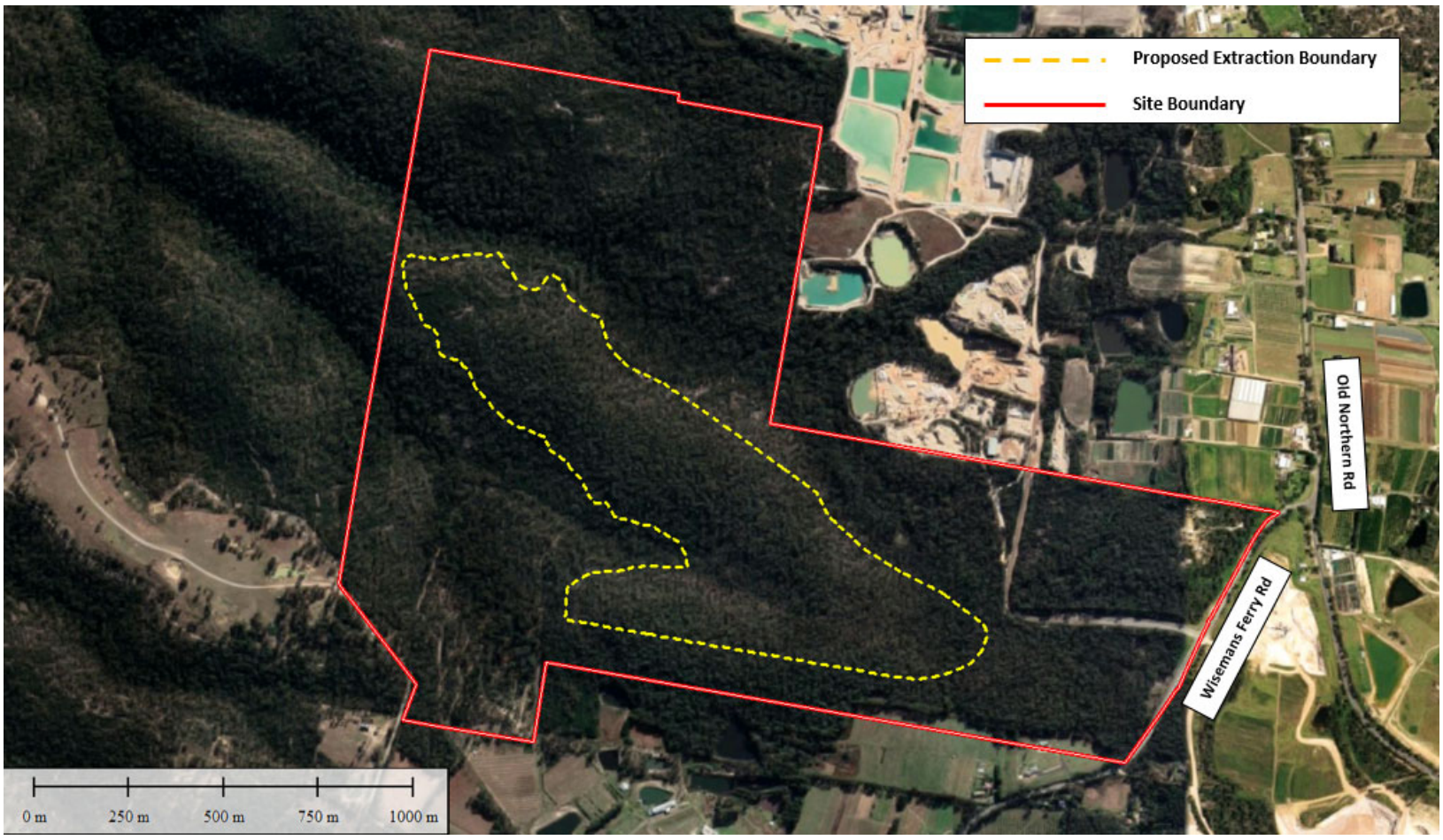
1. Introduction

1.1 Study Background

RPM Advisory Services Limited ("RPM") has been engaged by the Deerubbin Local Aboriginal Land Council and Design Collaborative Pty Limited (collectively referred to hereafter as "the Client") to complete an extraction and rehabilitation plan for the proposed Maroota Sand Project (hereafter referred to as "the Project").

The proposed Project is a state significant sand quarry within a 180.7 ha parcel of land located within the township of Maroota, NSW. The Project is anticipated to use 50 ha of the subject site for the extraction, processing and delivery of up to 500,0000 tonnes of product sand per annum. The Site's eastern boundary is located just south of Wisemans Ferry Road and Old North Road intersection. The site extends approximately 2 km west from Wisemans Ferry Road and approximately 600 m to 1,500 m in a roughly north-south direction. The proposed development area is illustrated in **Figure 1-1**.

Figure 1-1 Proposed Development Area



The purpose of the study is to support the proposed development of the Project by providing engineering guidance and project definition to support the development approval process. The plan has been completed to a Scoping Study level of engineering accuracy. Final detailed engineering is required prior to implementation.

1.2 Scope of Work

The scope of work for the study involved:

- **Data Collection and Kick Off and Communication**

Kick-off meeting was help between RPM and the Client to provide guidance on the study purpose, gain alignment of the scope of work and agreement on deliverables. The Client provided project critical data such as the Resource Statement, topographic survey information and proposed quarry operating and design criteria.

- **Sequence Plan**

RPM developed a detailed extraction schedule using its Open Pit Metals Solution Scheduling software. An extraction plan showing the key stages of extraction for the development, being the Initial Box Cut, Year 1, Year 2, Year 3, Year 4, Year 5, Year 10, Year 15, Year 20, end of quarry life.

- **Rehabilitation Plan**

A plan was completed showing the progressive rehabilitation for each key stage as well as the final rehabilitated landform

- **Cross Sectional Plans**

Plans and cross sections were prepared showing the existing landform, extraction sequence and the final rehabilitated landform. These are provided in Appendix A of this report.

- **Haul Roads**

A plan showing the location of haul roads was prepared. To further support the proposed development, RPM worked with Design Collaborative to also include major infrastructure such as the processing plant on the plans.

- **Deliverables**

RPM prepared this brief Report to document the approach, key design assumptions and summarise the planning outcomes such as inventory of extraction quantities and rehabilitation volumes.

1.3 Acknowledgements

RPM acknowledges and thanks Design Collaborative for their guidance and input to the Study.

1.4 Inherent Mining Risks

Mining is carried out in an environment where not all events are predictable.

Whilst an effective management team can identify the known risks and take measures to manage and mitigate those risks, there is still the possibility for unexpected and unpredictable events to occur. It is not possible therefore to totally remove all risks or state with certainty that an event that may have a material impact on the operation of a mine, will not occur.

2. Quarry Planning Assumptions

This report chapter summarises the planning assumptions for the quarry wall design, the extraction schedule and the landform design.

2.1 Quarry Resource Model

A resource model was prepared by Graham Lee and Associates.

A ten hole drilling programme, comprising five diamond cored and five open holes, was completed in 2017. Four of the diamond core holes (DMDDH07, DMDDH09, DMDDH10 and DMDDH11) have been used for resource estimation, while all of the other holes were drilled for ground water studies. Total raw sandstone resource estimates is shown in **Table 2-1**.

Table 2-1 Total Raw Sandstone Resource

Pit Area (m^2)	498,882
Ashfield Shale (m^2)	23,380

	RAW SANDSTONE (m^3)	DENSITY (t/m^3)	RAW SANDSTONE (t)	SANDSTONE Less Fe+C/Sh (%)	SANDSTONE Less Fe+C/Sh (t)	Wastes (t)
Pit Volume	9,273,673					
Less Ashfield Shale	73,250	2.2				161,150
Less Soil/unmined	237,751	2.2				523,052
TOTAL	**8,962,672**	2.2	19,717,878	95.4	18,810,856	907,022
SANDSTONE (Rounded)			**20 Million**		**19 Million**	**1.6 Million**

Estimates (Source 170423_GLA_Report)

The program also included sonic logging velocity to estimate rippability. From the sonic logs the in situ bulk density of the sandstone within the extraction boundary was determined to be 2.2t/m3. The sonic log has shown the non-rippable sandstone (>3200m/s) within the extraction boundary is: DMDDH07 = 11%, DMDDH09 = 18.6%, and DMDDH11 = 35.1%. All other rock is considered rippable or marginally rippable as indicted in the Caterpillar Handbook for a D10R dozer.

This information was used by RPM to estimate the quarry floor based on rippable, extractable sandstone. As only three holes were evaluated in this initial program, further engineering testing is required prior to operations to confirm rippable limits.

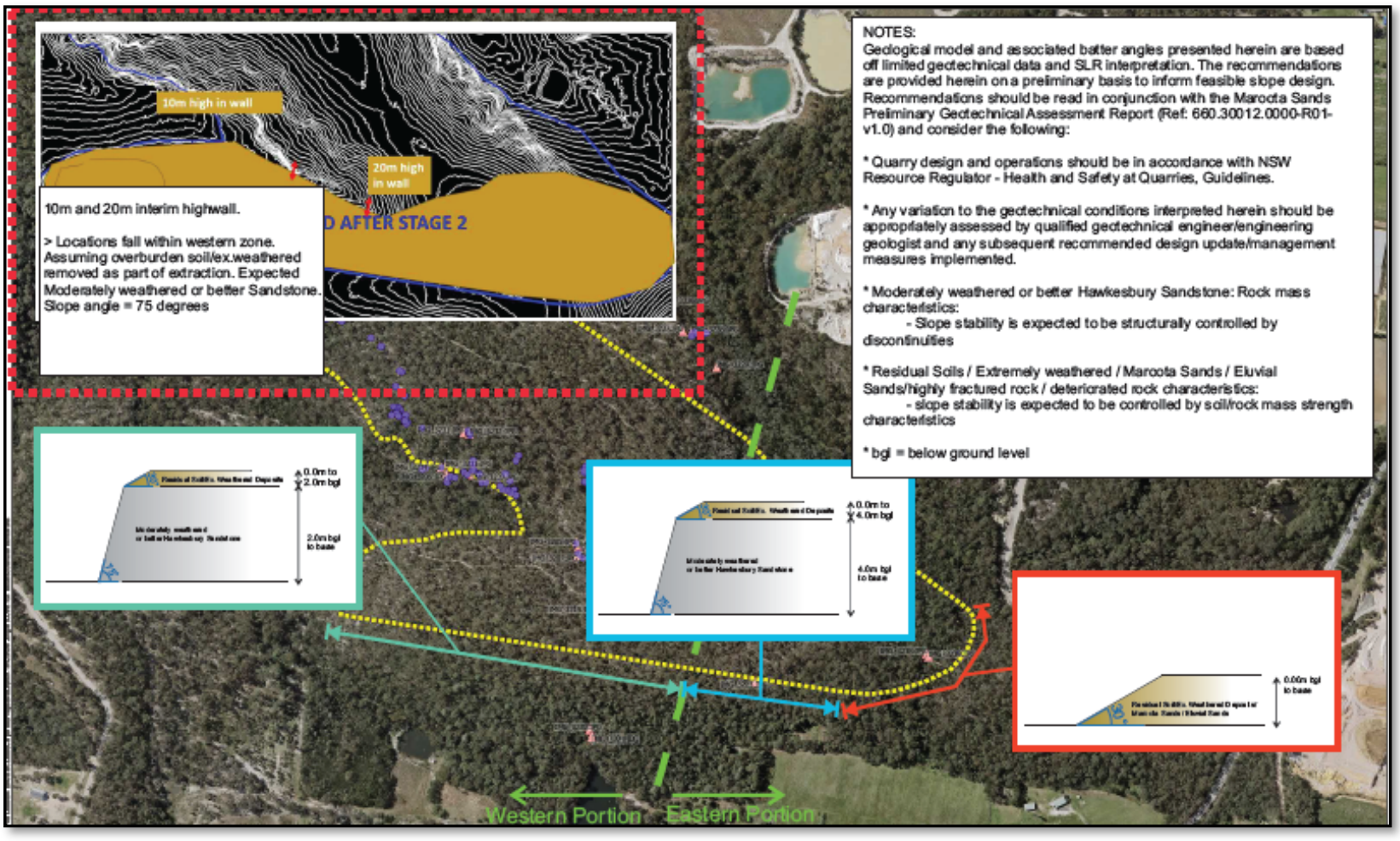
2.2 Quarry Design Assumptions

The quarry wall design parameters including bench heights and batter angles are based on geotechnical recommendations by SLR Consulting Australia Pty Ltd (SLR). A summary SLR recommended parameters are set out in **Table 2-2** and their application illustrated in **Figure 2-1**. In additional to the recommended geotechnical criteria, RPM has included a 5m berm between the upper overburden / soft soil and the more competent region.

Table 2-2 Quarry Design Parameters

Item	Units	Value
Batter Angle – Hawkesbury Sandstone	degree	75
Batter Angle – Maroota Sand	degree	30
Batter Angle – Overburden / Soils	degree	30
Bench Height	-	Full stratigraphic height
Berm Width	m	5

Figure 2-1 Application of Geotechnical Slope Parameters



Source SLR Consulting Pty Limited

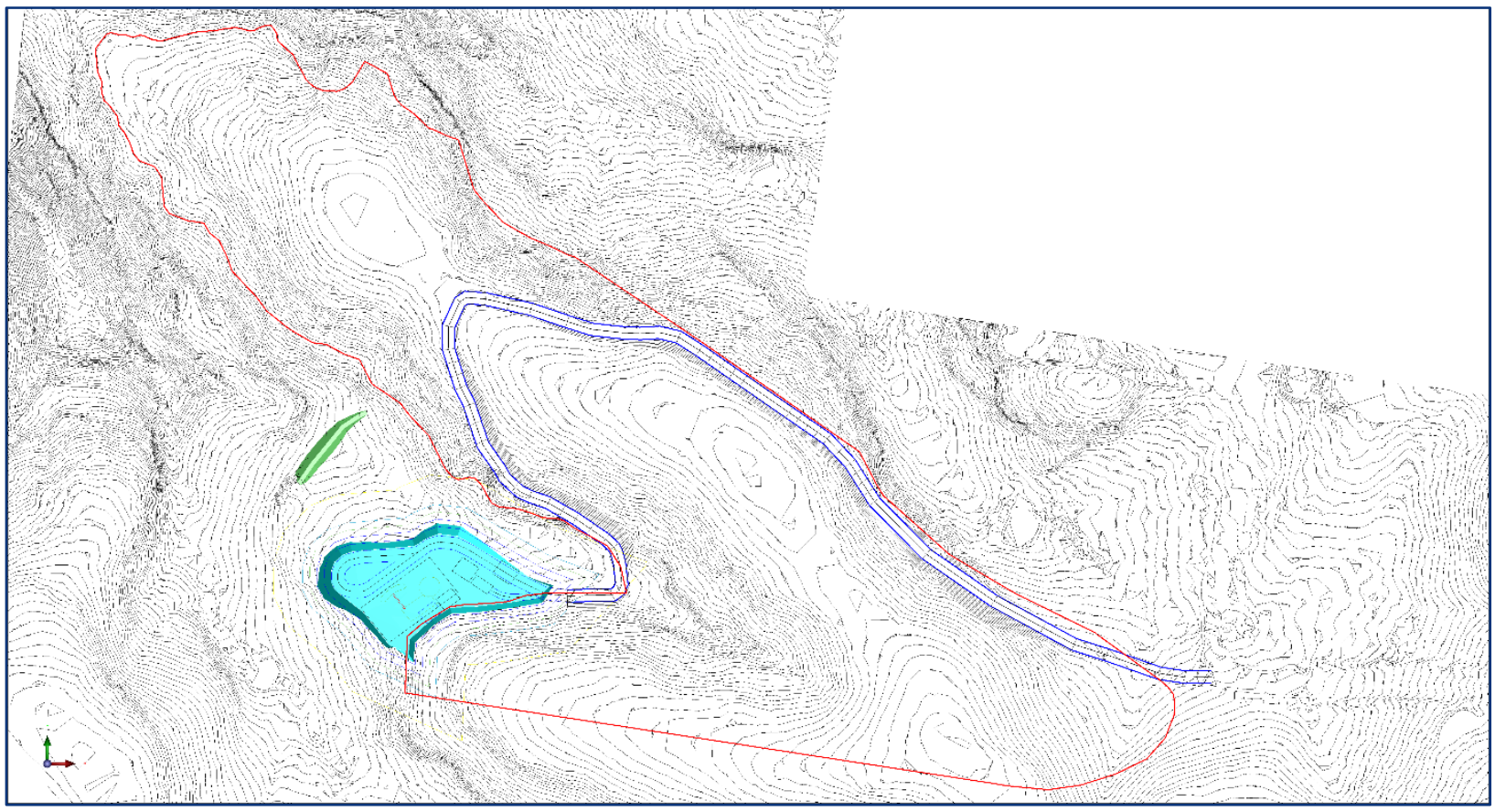
Design criteria for the general operations are:

- Haul road width of 15 m;
- Maximum grade of 10%, and
- Extraction on 5 m bench intervals.

The location and design of the product haul road and site infrastructure area is illustrated in **Figure 2-2**. The product haul road within location aimed to minimise the environmental impact by separating the haulage from the adjacent community to reduce noise and visual impact and it also minimises disturbance as much of the road is located within the extraction footprint.

The plant area was set at 155 mRL to reduce environmental disturbance and also achieve a better balance of cut and fill excavation. It was assumed 35% of the overburden cut from the construction of the product road would be placed in the infrastructure area.

Figure 2-2 Site Layout



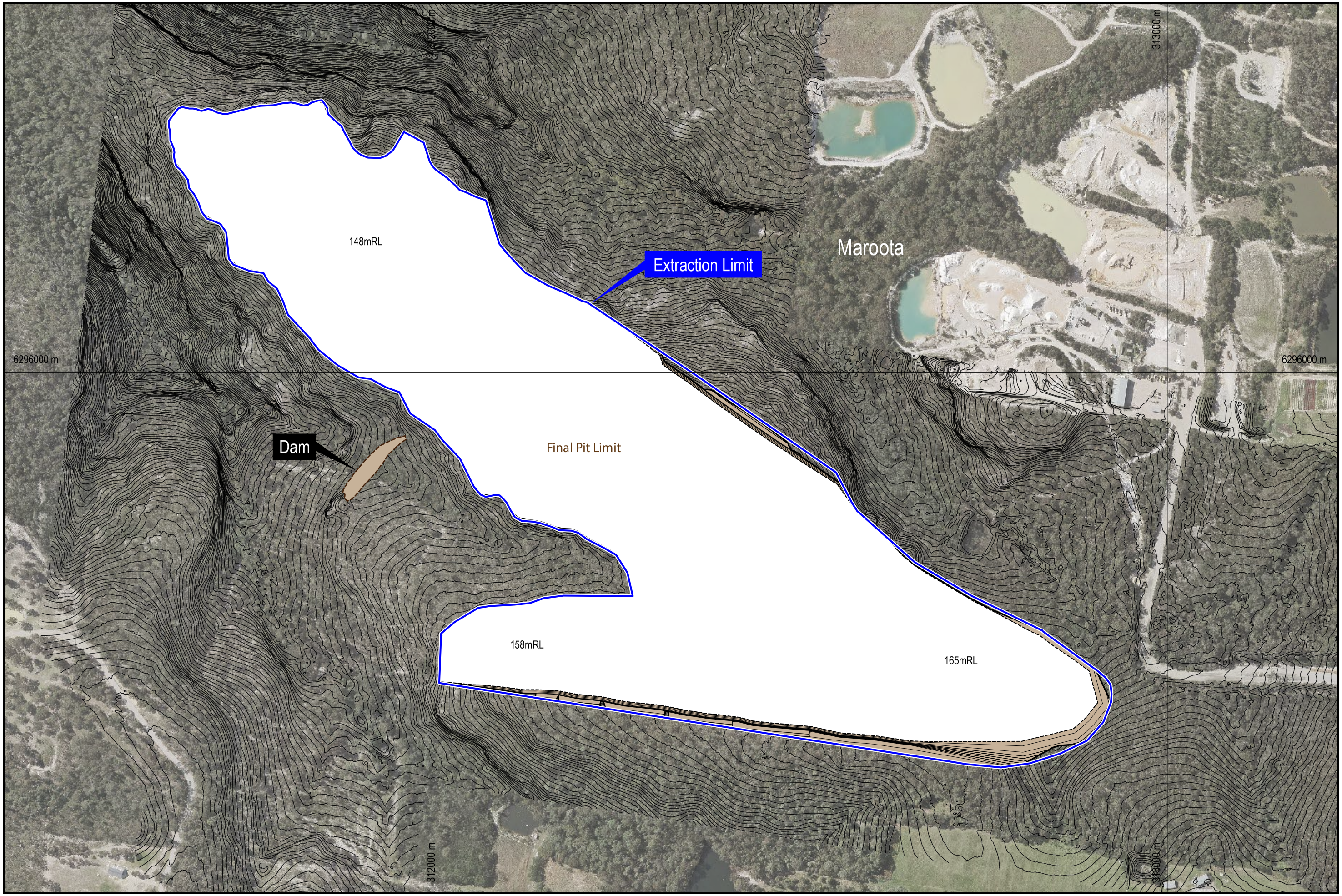
The above design criteria will need to be confirmed once operating and engineering considerations are confirmed. Detailed site infrastructure engineering design will be required as part of the final implementation process.

The project has an estimated life of 28 years operation, the quantities within the final quarry extraction is summarised in **Table 2-3**. The quarry excavation is illustrated in **Figure 2-3**. The final excavation is estimated 1.5 km in long and 500 m in width and 35 m in thickness around the central area. The southern and northern final high-wall are around 30 m in height. The extraction quantities are set out in **Table 2-3**.

Table 2-3 Extraction Quantities

Rock Type	Density	Volume (kBCM)	Tonnage (kt)
Shale	2.20	73	161
Overburden / topsoil	2.20	168	370
Sandstone	2.20	**6,909**	**15,200**
Total		**7,150**	**15,731**

The final excavation depth is based on the outcomes of the geological modelling, which examined selecting sandstone of suitable quality and also a rock hardness amenable to excavation by ripping and dozing. Further test work is required to confirm the engineering properties of the rock and the depth horizon amenable to ripping and dozing.



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CLIENT

PROJECT

NAME
MAROOTA SAND PROJECT EXTRACTION PLAN

DRAWING
FINAL PIT LIMIT

FIGURE No.	PROJECT No.	Date
2-3	ADV-AU-00081	April 2021

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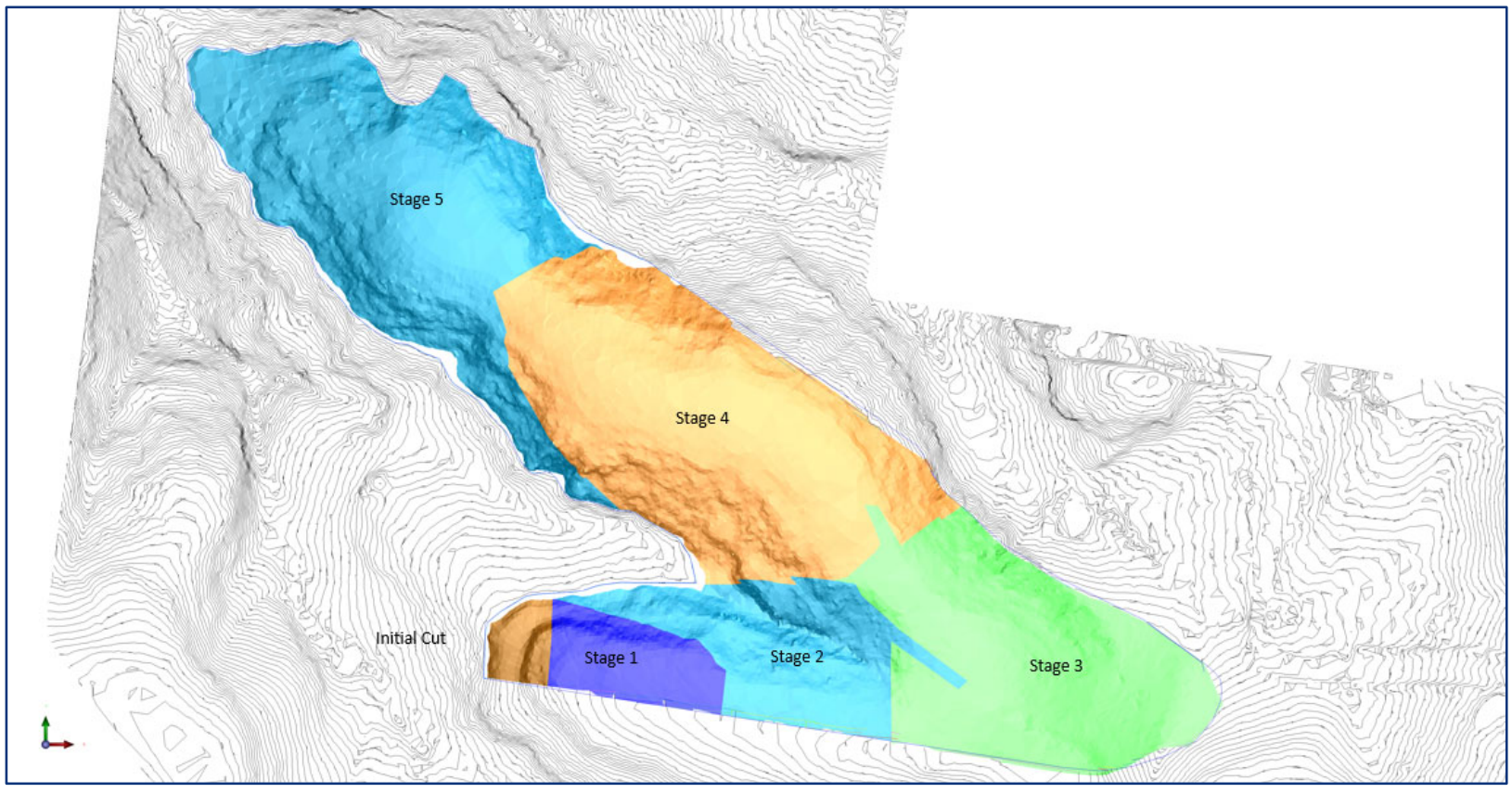
2.3 Quarry Extraction Schedule Assumptions

RPM examined a number of extraction sequence options, with the two preferred approaches being:

- Option 1 mining from south to north and toward the hill in east. This has an advantage of having a short haul to process plant, enable easy progressive backfill into final void.
- Option 2 mining started from the top of the hill (top-down mining) which is generally efficient, but this option creates more overburden and may generate insufficient void to support initial landform construction.

In consultation with the Client, Option 1 was selected as the preferred development sequence as it provided early access to high quality of sandstone and had improved opportunities for landform construction along the southern high-wall. The selected sequence of development is shown in **Figure 2-4**.

Figure 2-4 Extraction Stages to Guide Schedule



A project schedule has been completed by RPM with a production target of saleable sandstone 500 ktpa. The approach, assumptions and key outcomes of the production schedule are outlined in Section 3.2.

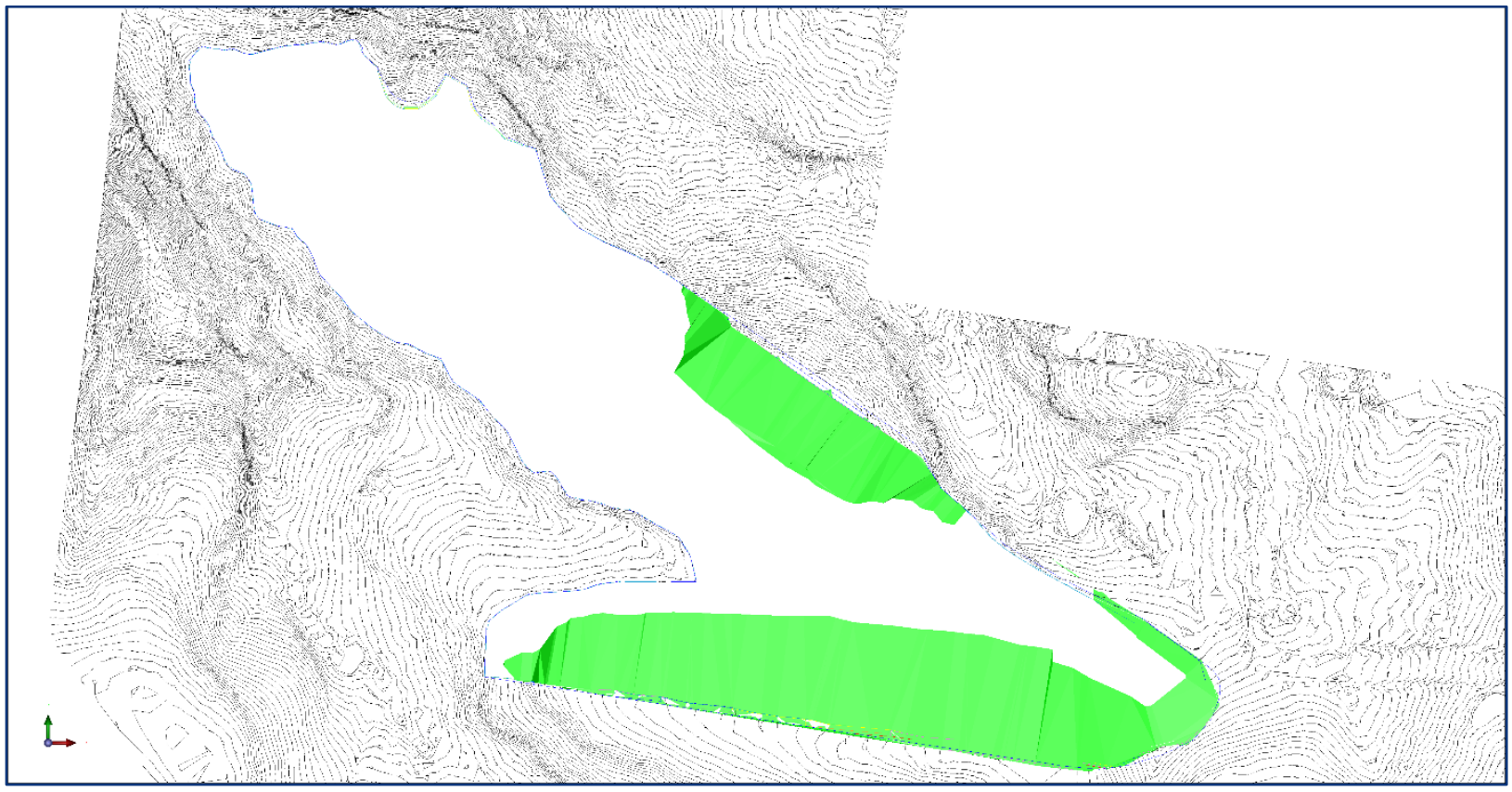
2.4 Landform Design Assumptions

Final landform and rehabilitation of the exposed wall surfaces will be undertaken by the placement of waste rock and tailings material. The key design assumptions for the construction of landform are:

- All waste rock during typical quarrying activities, being overburden and shale, is directed to landform construction;
- Waste rock density is 2.2 t/bcm;
- Tailings is assumed to be 10% of total sandstone processed,
- Tailings density is 2 t/bcm;
- Swell factor from back cubic metres to loose cubic metres is 1.15, and
- Final rehabilitated slope of 1 in 5 (11.3 degrees) angle.

The final landform design is shown in **Figure 2-5**, which it utilised the southern and northern high-wall. The project has sufficient space for overburden and tailing placement with minimal area disturbance, staged landform is designed and shown in next section.

Figure 2-5 Final Landform Design



It is understood during construction the landform construction and rehabilitation will also involve:

- Cut off drain above the fill;
- Contour bank mid-slope, and
- Conventional broadcast seeding for revegetation.

Table 2-4 compares the estimated volume of waste rock and tailings generated against the maximum landform volume available for the life of quarry. It indicates a very good balance with material generate being within 10% of the available volume.

Table 2-4 Landform Design Volume and Material to Landform

Landform Design Volume (MLCM)	Total Material to landform (MLCM)
1.29	1.14

3. Quarry Extraction and Rehabilitation Schedule

3.1 Stages of Extraction

RPM has assumed 6 major stages of extraction, refer **Figure 2-4**, to guide the schedule, being the “Initial cut”, followed by Stages 1 to 5. Stage 5 is the final quarry extraction layout.

3.2 Quarry Extraction Schedule

A life-of-quarry schedule has been developed using RPM’s Open Pit Metals Solution scheduling software. The schedule is based on the targets specified by the Client during the Study. A key schedule driver is delivering sufficient saleable sandstone per annum.

Key inputs and assumptions to the schedule are:

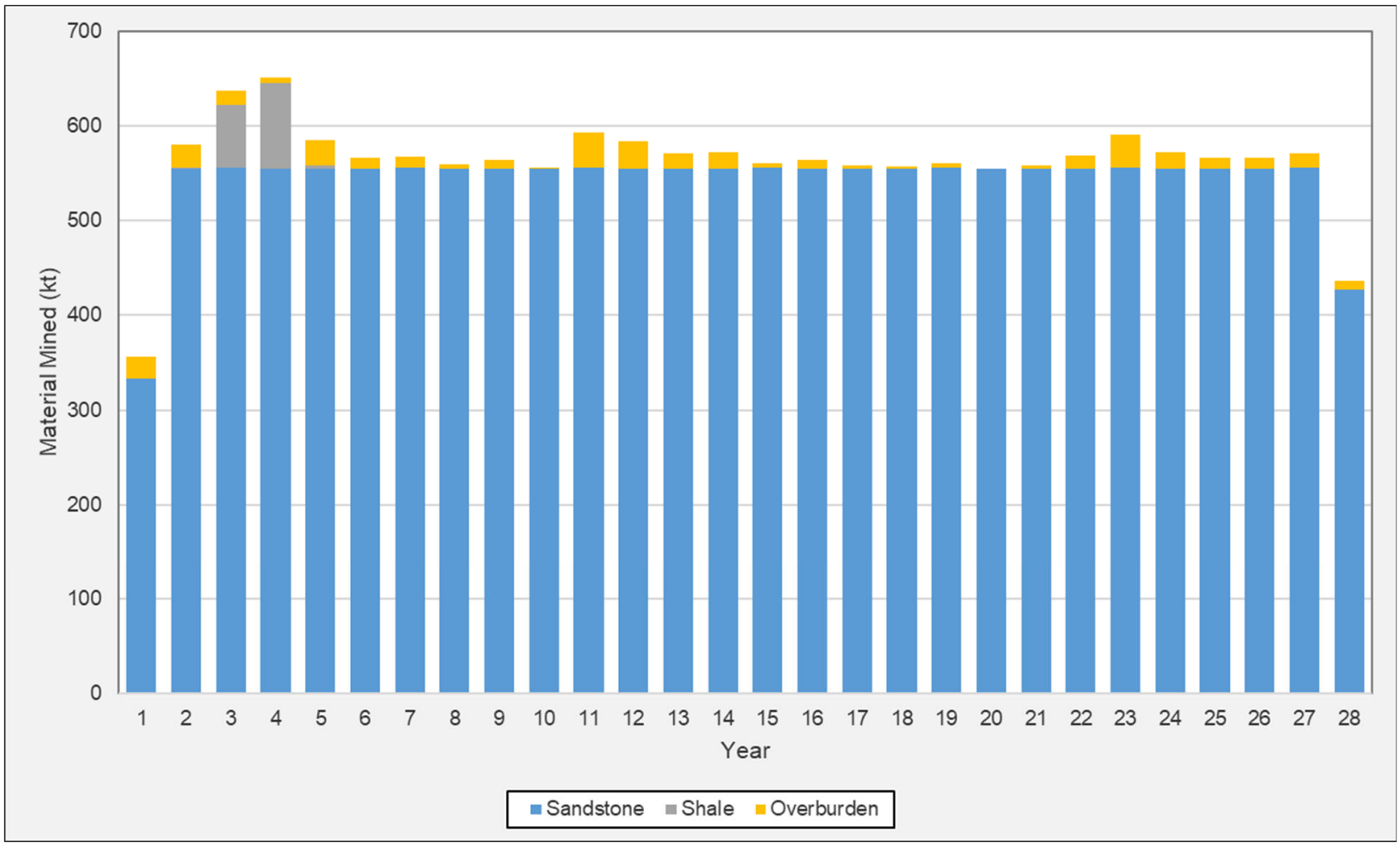
- 500 kt of saleable product per annum;
- Year 1 production 60% of annual target, being 300 kt;
- As tailings production is assumed to be 10% of run-of-mine (ROM) feed, ROM production target of 555 kt per annum of sandstone.
- Mining block size of 50(x) by 50(y) by 5(z);
- Quarrying on bench by bench basis, and
- Final material/rock swell to landform assumption of 1.15.

Total Material Movement

The total material movement over the life of quarry is shown in **Figure 3-1**. The key schedule outcomes are:

- Production targets achieved;
- 28 year operating life;
- Consistent total material movement each year;
- Shale in the eastern side of the quarry is mined between Year 2 to 5;
- 60% of waste rock is mined by Year 5 due to the presence of the shale in the southern region, and
- Minimal amount of waste rock is mined over the quarry life with strip ratio of 0.04:1.

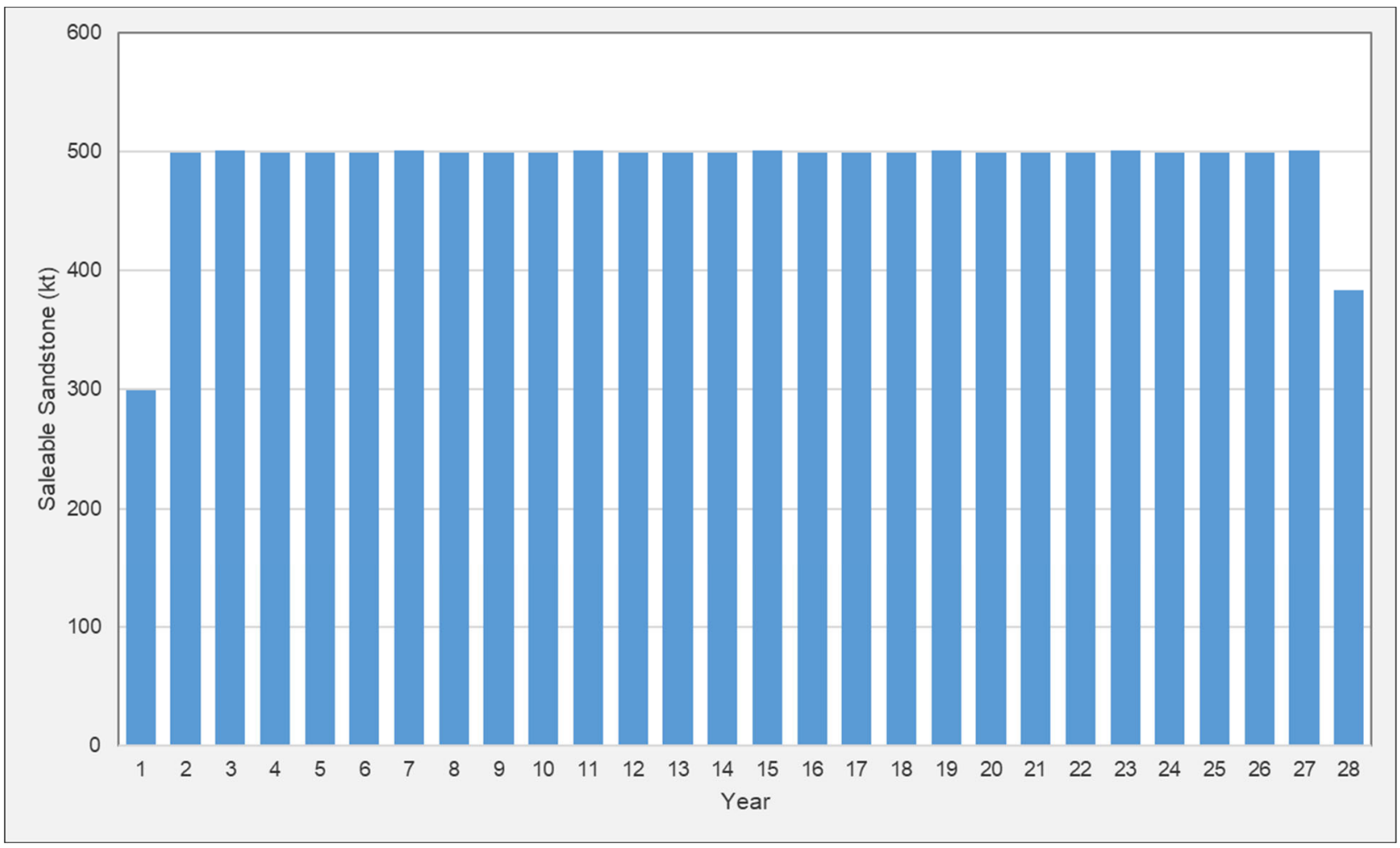
Figure 3-1 Total Material Mined by Year



Saleable Product

The saleable product of life of quarry is illustrated in **Figure 3-2** and shows the target of 500kt of sandstone per year following the Year 1 start-up is consistently achieved.

Figure 3-2 Saleable Sandstone by Year



The annual extraction schedule results are summarised in **Table 3-1** and the detailed extraction schedule result is presented in **Appendix A.**

Table 3-1 Extraction Schedule

Period		1	2	3	4	5	6-10	11-15	16-20	21-28	Total
Sandstone	kt	333	555	557	555	555	2777	2778	2777	4313	15,200
Shale	kt	0	1	66	90	3	0	0	0	0	160
Overburden	kt	24	25	15	6	27	37	103	19	115	370
Total Waste	kt	24	25	81	96	30	37	103	19	115	530
Total	kt	357	580	637	651	585	2814	2881	2796	4428	15,731
Strip Ratio	t:t	0.07	0.05	0.15	0.17	0.05	0.01	0.04	0.01	0.03	0.03
Saleable Product	**kt**	**300**	**500**	**501**	**500**	**500**	**2,499**	**2,500**	**2,499**	**3,881**	**13,680**

Stage plans were produced for Years 1 to 5, and Year 10, Year 15, Year 20 and final quarry, refer **Figure 3-4** to **Figure 3-12**, which demonstrate that the quarry development is both practical and achievable.

Landform Construction Schedule

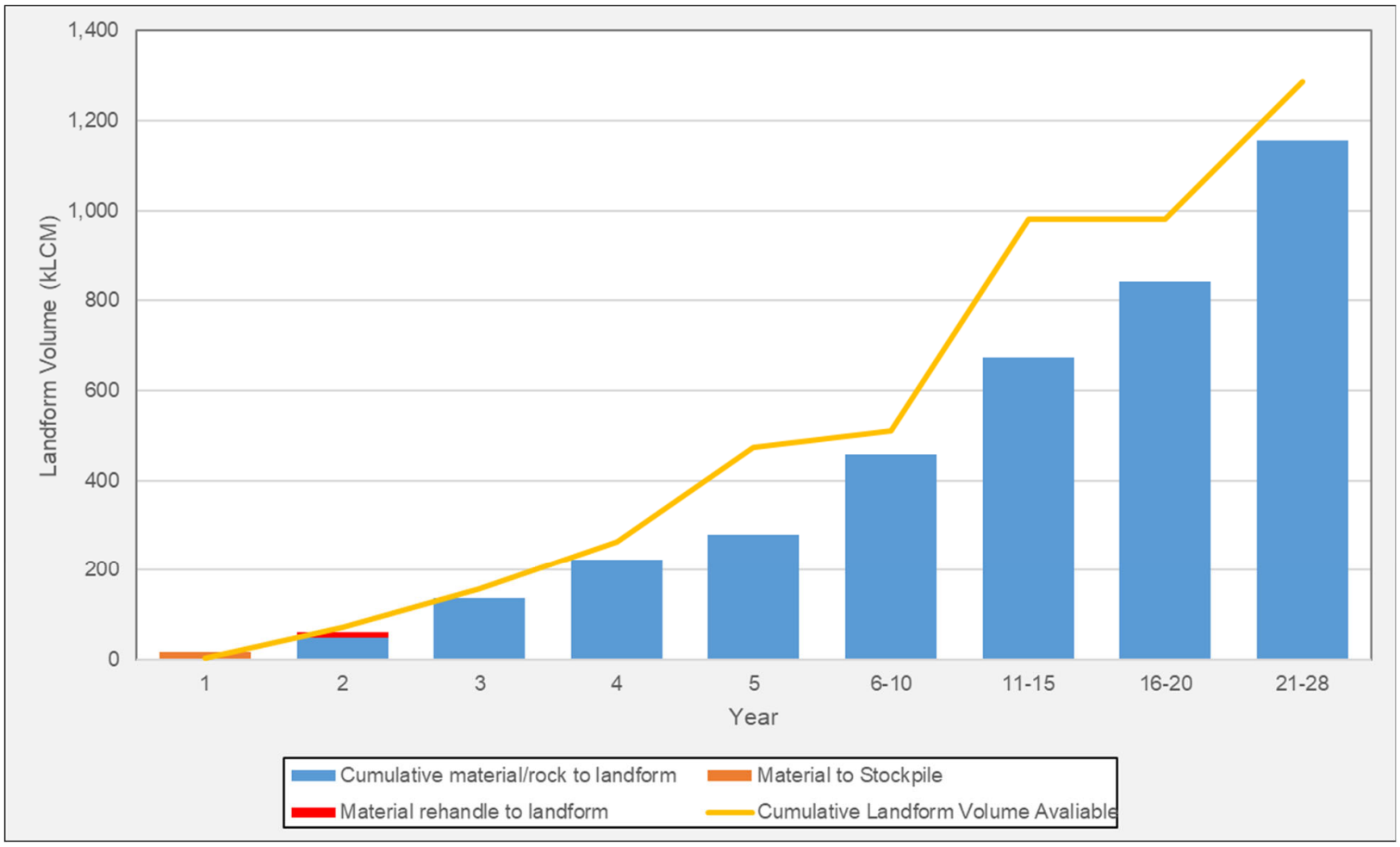
RPM has prepared a landform construction schedule based on the extraction plan quantities. A key concept for the development of the quarry is to expose sufficient southern high-wall area to facilitate landform construction at time to balance the generation of waste materials and minimise rehandle.

The landform construction schedule results are summarised in **Table 3-2** and shown in **Figure 3-3**. The detailed landform schedule results are provided in **Appendix A**.

Table 3-2 Landform Placement Schedule

Period		1	2	3	4	5	6-10	11-15	16-20	21-28	Total
Material/Rock to fill											
Overburden from Quarry	klcm	12	13	42	50	16	20	54	10	60	277
Tailings (@ 10% of sandstone)	klcm	19	32	32	32	32	160	160	160	248	874
Overburden from infrastructure	klcm	34	0	0	0	0	0	0	0	0	34
Total material to fill	klcm	65	45	74	82	48	179	213	170	308	1,185
Cumulative material to fill	**klcm**	**65**	**110**	**184**	**266**	**314**	**493**	**705**	**876**	**1,185**	**1,185**
Landform volume available	**klcm**	**3**	**71**	**159**	**263**	**473**	**512**	**981**	**981**	**1,287**	**1,287**
Material/Rock to Landform											
To Infrastructure	klcm	48									
To Landform	klcm	3	58	74	82	51	179	213	170	308	
Total Material to fill	klcm	52	58	74	82	51	179	213	170	308	1,188
Cumulative material to fill	klcm	52	110	184	266	317	496	709	879	1188	1,188
Cumulative material to landform	**klcm**	**3**	**62**	**136**	**218**	**269**	**448**	**662**	**831**	**1,140**	**1,140**
To Temporary Stockpile	klcm	13	0	0	0	0	0	0	0	0	0
From Temporary Stockpile	klcm	0	13	0	0	0	0	0	0	0	0
Balance	klcm	13	0	0	0	0	0	0	0	0	0

Figure 3-3 Landform Placement Schedule



As illustrated in **Figure 3-3**, there is a small amount of overburden of ~13 kt that will need to be stored in Year 1 in a temporary stockpile because of limited highwall available for landform construction. This temporary stockpile is rehandling into landform in Year 2.

3.3 Quarry Development

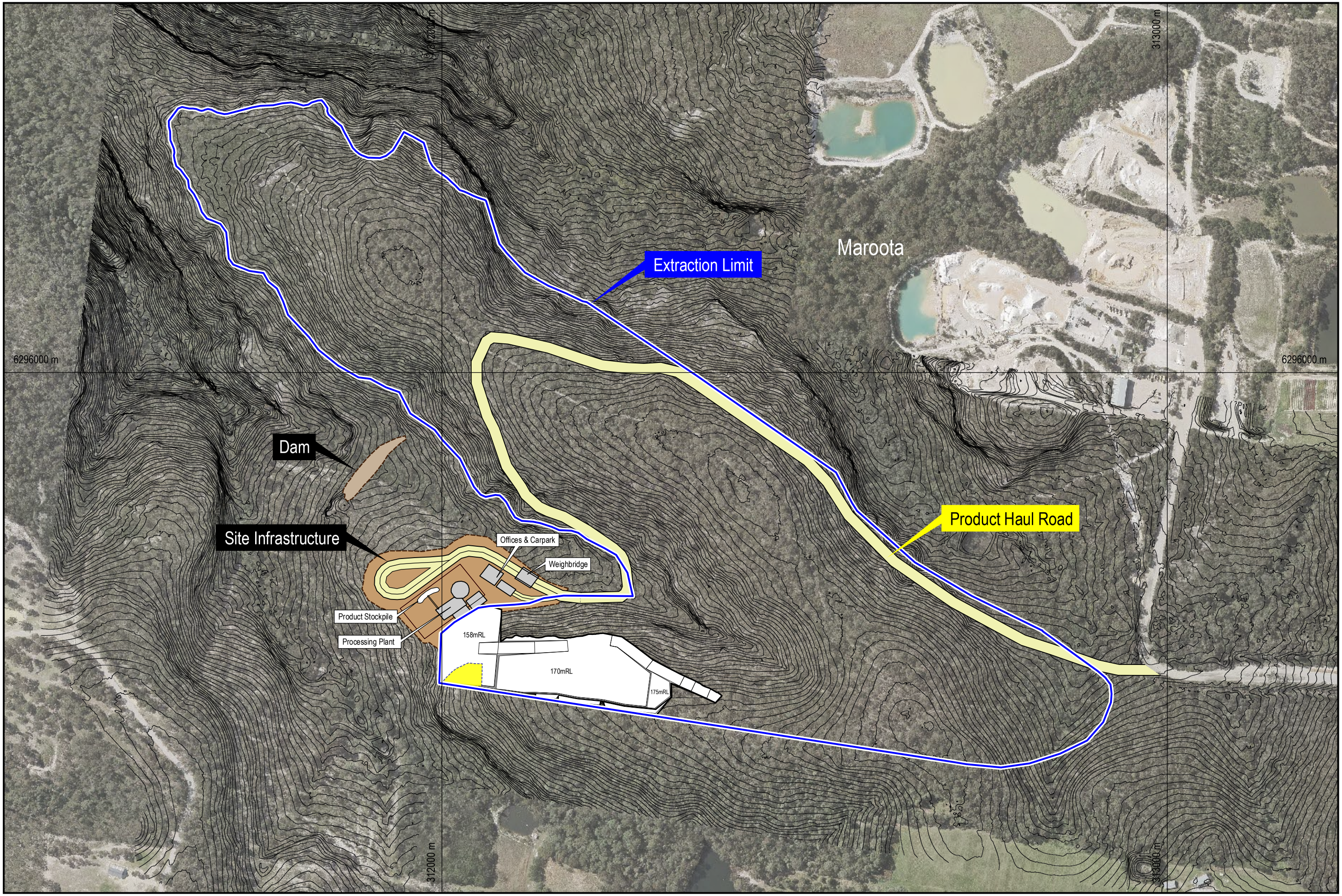
Stage plans were produced for the Years 1 to 5, and Year 10, Year 15 and Year 20, as illustrated in **Figure 3-4** to **Figure 3-12**. General plans and cross-sections of the quarry development is presented in **Appendix A**.

A brief description of each stage is as follows:

- The pre-Operation stage involves construction of the product haul road and fixed site infrastructure. It is assumed 35% of the product road construction overburden will be used as site fill. Initial ROM stockpiles can be created by dozer push as the plant is located adjacent to the initial cut. Any excess overburden can be dozed into the adjacent valley and then rehandled to landform construction in Year 2.
- Year 1 expands from the initial cut continuing the dozer push to the ROM stockpile. Once working room is established the mining will transition to a loader and truck mining. There is likely to remain a requirement for ripping and dozing for much of the sandstone material mined through the quarry life. Highly likely that a rockbreaker will be required on site for pockets of harder rock. In Year 1 there is still limited highwall is available for placement of overburden and tailings into landform construction, requiring further waste rock to be directed to a temporary stockpile. In total the temporary stockpile is estimated to comprise 13 kt.
- Year 2 expands quarrying to East and targets the high quality sandstone associated with Drillhole 10. Year 2 exposed sufficient highwall to accommodate all overburden and tailings into landform construction, including the Year 1 stockpile material.
- Year 3 and 4 expand further into the East with high quality of sandstone extracted, as well as some of the shale in southern region. Critical to note is that quarrying preferentially targets areas of extraction

adjacent to the southern highwall to enable continued landform construction. As landform construction expands, opportunities will arise to progressively rehabilitate the area.

- Year 5 commences excavation of the south-eastern side of the quarry from the highpoint of Bench 185 mRL. Approximately 60% of the total waste rock is mined just in the first five years due to the presence of the shale in the southern region. Where possible, extraction also continues to preferentially targets areas adjacent to the southern highwall to establish room for landform construction.
- Year 10 continues extraction in the large southeast area with only final bench remaining by the end of this period.
- At Year 15, the southern high-wall is fully exposed for overburden and rock fill. An opportunity exists to relocate the process plant after Year 10 to the south-eastern side of quarry to reduce product haul as well as tailings haul for landform placement.
- To Year 20 has quarry expanding to the north with the last bench of stage 4 being mined at the end of this period. Progressive rehabilitation continues, and
- End of quarry is at Year 28 and final rehabilitation takes place.



LEGEND

Landform Construction

N

0 250m

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CLIENT

PROJECT

NAME
MAROOTA SAND PROJECT EXTRACTION PLAN

DRAWING
MAROOTA STAGE DESIGN - YEAR 1

FIGURE No.	PROJECT No.	Date
3-4	ADV-AU-00081	April 2021

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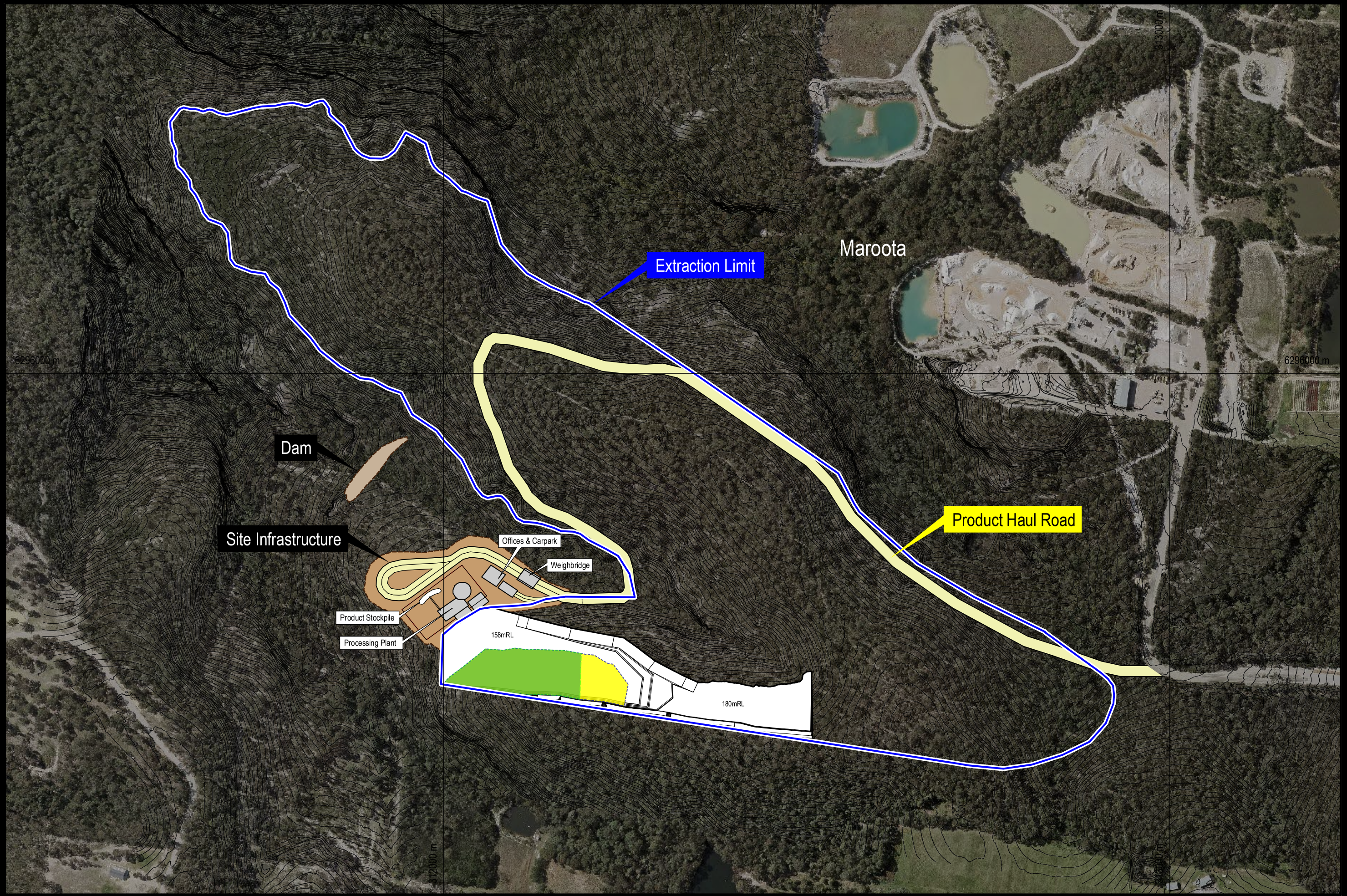

LEGEND

Landform Construction

Rehabilitated Area

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PROJECT

NAME: MAROOTA SAND PROJECT EXTRACTION PLAN

DRAWING: MAROOTA STAGE DESIGN - YEAR 2

FIGURE No.	PROJECT No.	Date
3-5	ADV-AU-00081	April 2021

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Maroota

Extraction Limit

Dam

Site Infrastructure

Offices & Carpark

Weighbridge

Product Stockpile

Processing Plant

158mRL

175mRL

Product Haul Road

6296000 m

6296000 m

6312000 m

6312000 m

LEGEND

Landform Construction

Rehabilitated Area

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PROJECT

NAME

MAROOTA SAND PROJECT EXTRACTION PLAN

DRAWING

MAROOTA STAGE DESIGN - YEAR 3

FIGURE No.	PROJECT No.	Date
3-6	ADV-AU-00081	April 2021

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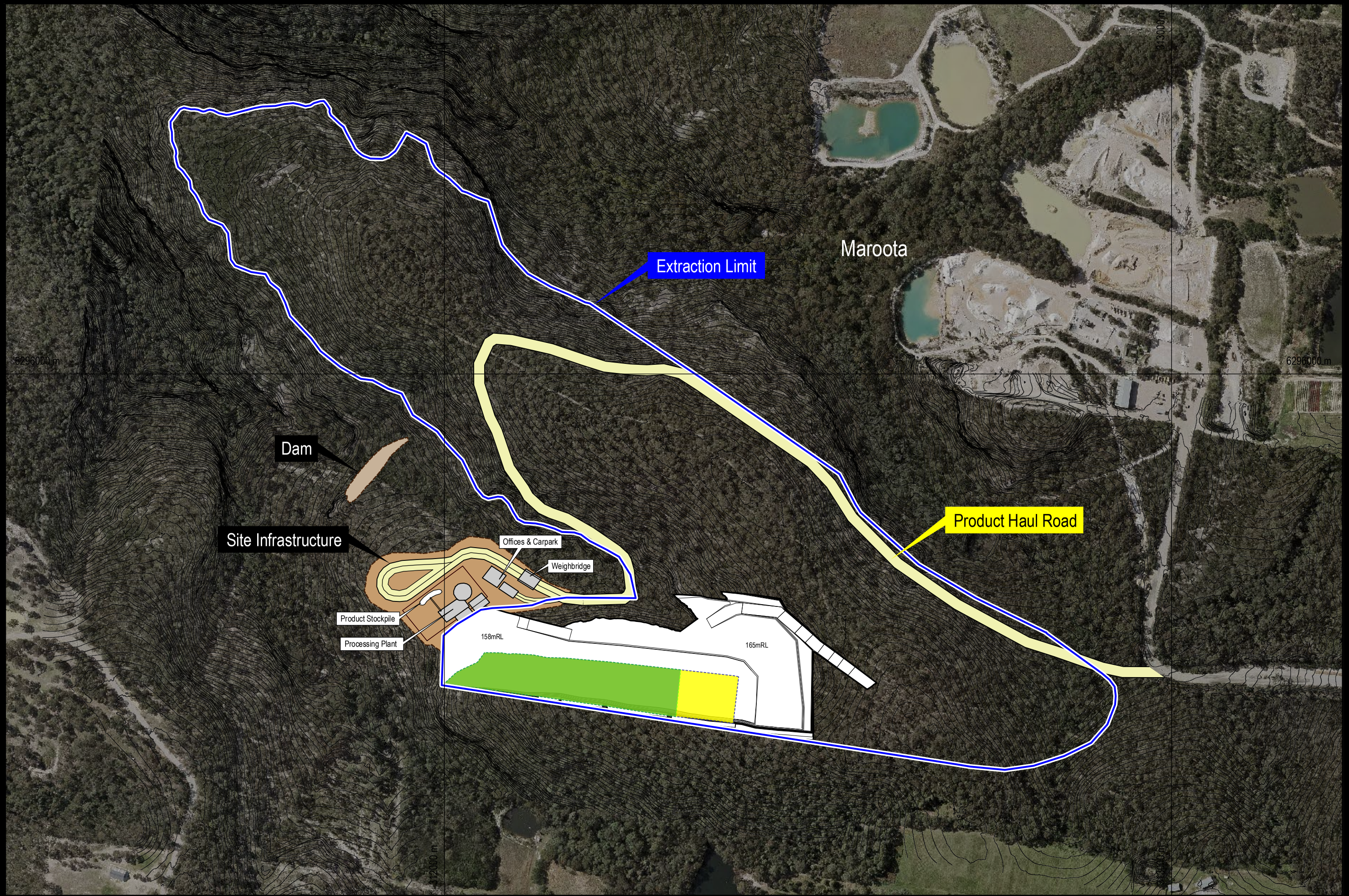

LEGEND

Landform Construction

Rehabilitated Area

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CLIENT

PROJECT

NAME
MAROOTA SAND PROJECT EXTRACTION PLAN

DRAWING
MAROOTA STAGE DESIGN - YEAR 4

FIGURE No.	PROJECT No.	Date
3-7	ADV-AU-00081	April 2021

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Maroota

Extraction Limit

Dam

Site Infrastructure

Offices & Carpark

Weighbridge

Product Stockpile

Processing Plant

158mRL

184mRL

Product Haul Road

6296000 m

6296000 m

312000 m

313000 m

LEGEND

Landform Construction

Rehabilitated Area

DO NOT SCALE THIS DRAWING - USE FIGURED DIMENSIONS ONLY. VERIFY ALL DIMENSIONS ON SITE

CLIENT

PROJECT

NAME
MAROOTA SAND PROJECT EXTRACTION PLAN

DRAWING
MAROOTA STAGE DESIGN - YEAR 5

FIGURE No.	PROJECT No.	Date
3-8	ADV-AU-00081	April 2021

RPMGLOBAL

Maroota

Extraction Limit

Dam

Site Infrastructure

Offices & Carpark

Weighbridge

Product Stockpile

Processing Plant

Product Haul Road

170mRL

158mRL

6296000 m

6296000 m

6312000 m

6312000 m

LEGEND

Landform Construction

Rehabilitated Area

DO NOT SCALE THIS DRAWING - USE FIGURED DIMENSIONS ONLY. VERIFY ALL DIMENSIONS ON SITE

CLIENT

PROJECT

NAME
MAROOTA SAND PROJECT EXTRACTION PLAN

DRAWING
MAROOTA STAGE DESIGN - YEAR 10

FIGURE No.	PROJECT No.	Date
3-9	ADV-AU-00081	April 2021

RPMGLOBAL

Maroota

Extraction Limit

Dam

Potential Location for Site Infrastructure after Year 10

Product Haul Road

170mRL

158mRL

165mRL

6296000 m

6296000 m

6293000 m

6292000 m

LEGEND

Landform Construction

Rehabilitated Area

DO NOT SCALE THIS DRAWING - USE FIGURED DIMENSIONS ONLY. VERIFY ALL DIMENSIONS ON SITE

CLIENT

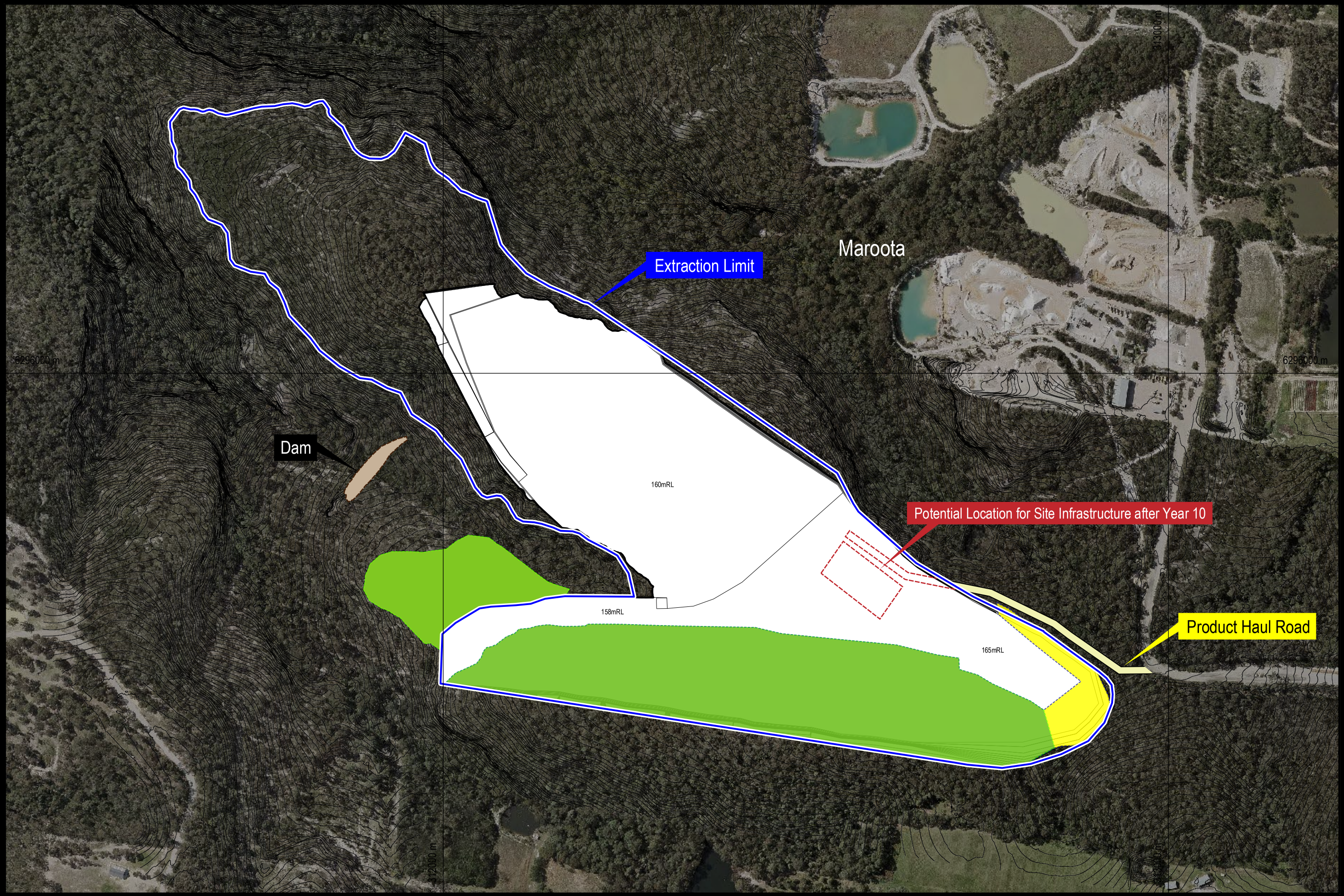
PROJECT

NAME
MAROOTA SAND PROJECT EXTRACTION PLAN

DRAWING
MAROOTA STAGE DESIGN - YEAR 15

FIGURE No.	PROJECT No.	Date
3-10	ADV-AU-00081	April 2021

RPMGLOBAL



LEGEND

Landform Construction

Rehabilitated Area

DO NOT SCALE THIS DRAWING - USE FIGURED DIMENSIONS ONLY. VERIFY ALL DIMENSIONS ON SITE.

CLIENT

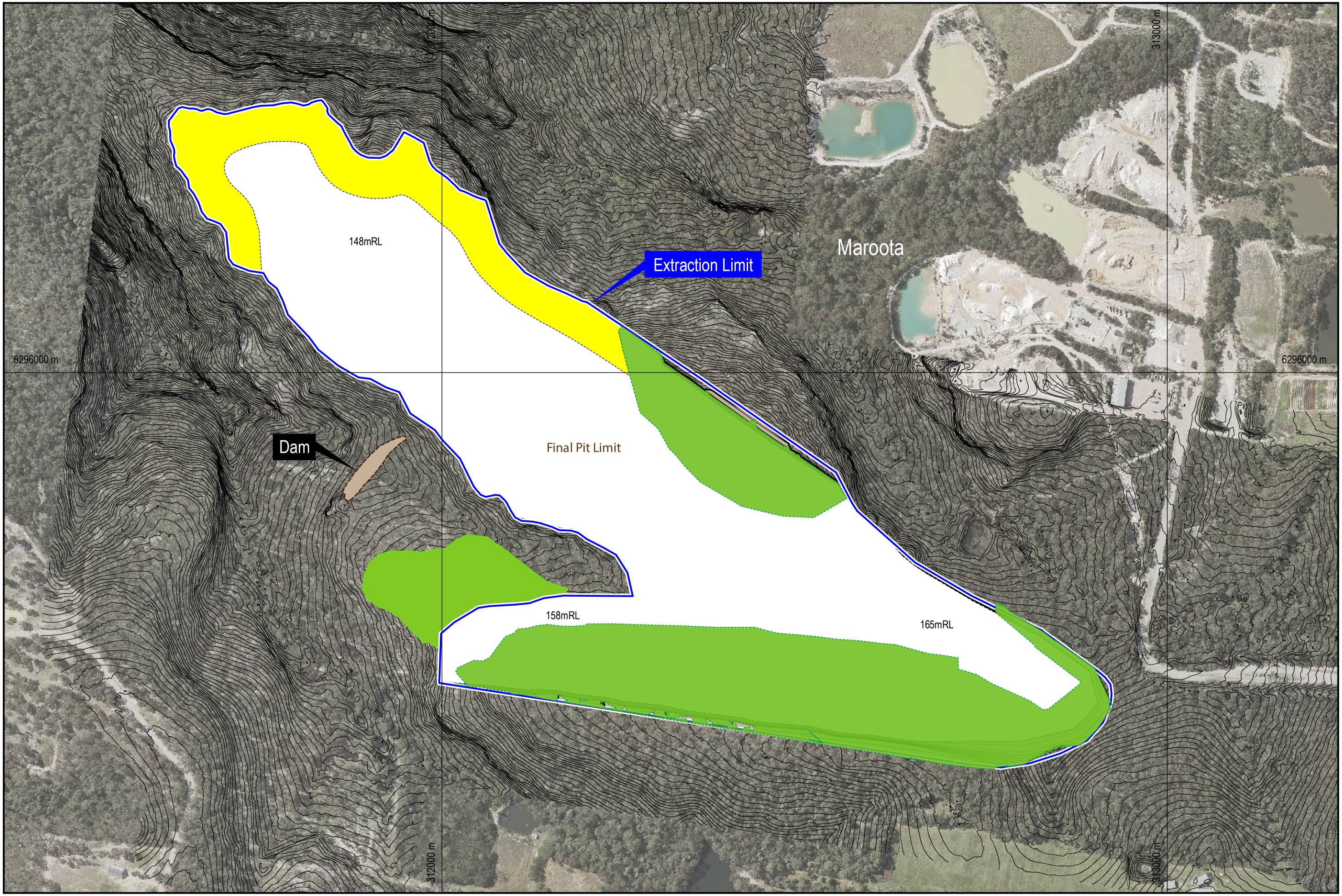
PROJECT

NAME
MAROOTA SAND PROJECT EXTRACTION PLAN

DRAWING
MAROOTA STAGE DESIGN - YEAR 20

FIGURE No.	PROJECT No.	Date
3-11	ADV-AU-00081	April 2021

RPMGLOBAL



LEGEND

- Rehabilitation Bushland
- Rehabilitated Area

N

0 250m

DO NOT SCALE THIS DRAWING - USE FIGURED DIMENSIONS ONLY. VERIFY ALL DIMENSIONS ON SITE

CLIENT

PROJECT

NAME
MAROOTA SAND PROJECT EXTRACTION PLAN

DRAWING
MAROOTA STAGE DESIGN - FINAL

FIGURE No.	PROJECT No.	Date
3-12	ADV-AU-00081	April 2021

RPMGLOBAL

4. Recommendations

The Maroota Sands extraction plan has demonstrated that the proposed development is practical to implement and targets are achievable. Prior to commencing operations, RPM highly recommends:

- Testwork to confirm engineering properties of rock and in particular excavateability and rippability of the rock;
- Confirmation of geotechnical design criteria for quarry walls and associated construction areas;
- Confirmation of suitable equipment to meet production targets and with capability to quarry the rock;
- Confirmation of landform construction design criteria;
- Detailed plant and site infrastructure engineering, including potential relocation of the plant after Year 10, and
- Detailed start-up planning.

Appendix A.

Detailed extraction schedule and Landform Cross-sections

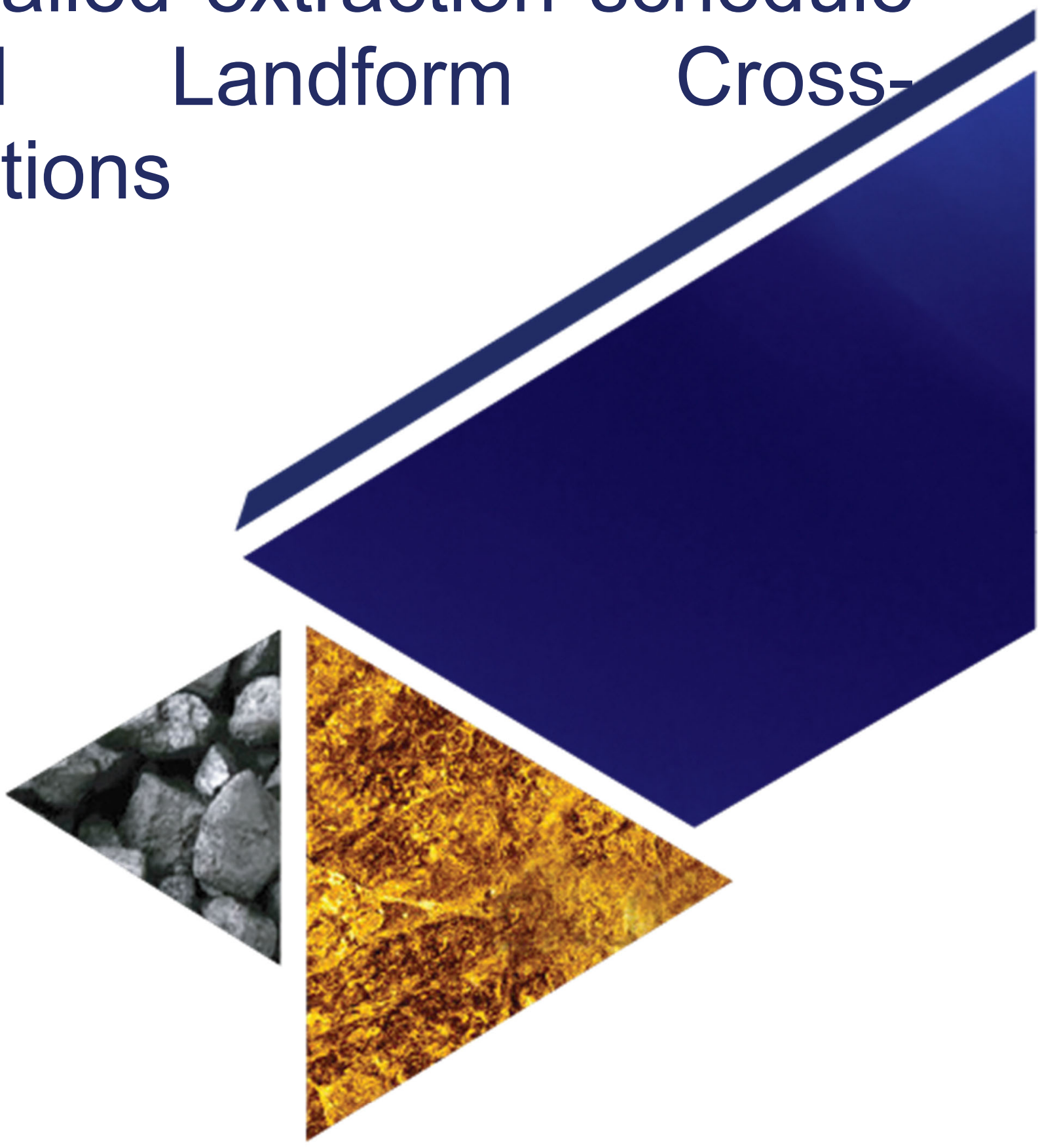


Table A-1 Extraction Schedule (Year 1 – 15)

Period		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Sandstone	kt	333	555	557	555	555	555	557	555	555	555	557	555	555	555	557
Shale	kt	0	1	66	90	3	0	0	0	0	0	0	0	0	0	0
Overburden	kt	24	25	15	6	27	11	11	5	9	1	37	29	16	17	4
Total Waste	kt	24	25	81	96	30	11	11	5	9	1	37	29	16	17	4
Total	kt	357	580	637	651	585	566	567	560	564	556	593	584	571	572	560
Strip Ratio	t:t	0.07	0.05	0.15	0.17	0.05	0.02	0.02	0.01	0.02	0.00	0.07	0.05	0.03	0.03	0.01
Saleable Product	**kt**	**300**	**500**	**501**	**500**	**500**	**500**	**501**	**500**	**500**	**500**	**501**	**500**	**500**	**500**	**501**

Table A-2 Extraction Schedule (Year 16 – 28)

Period		16	17	18	19	20	21	22	23	24	25	26	27	28	Total
Sandstone	kt	555	555	555	557	555	555	555	557	555	555	555	557	427	15,200
Shale	kt	0	0	0	0	0	0	0	0	0	0	0	0	0	160
Overburden	kt	9	3	2	4	0	3	13	35	18	12	11	14	9	370
Total Waste	kt	9	3	2	4	0	3	13	35	18	12	11	14	9	530
Total	kt	564	558	557	561	555	558	568	591	573	567	566	571	436	15,731
Strip Ratio	t:t	0.02	0.01	0.00	0.01	0.00	0.01	0.02	0.06	0.03	0.02	0.02	0.03	0.03	0.04
Saleable Product	**kt**	**500**	**500**	**500**	**501**	**500**	**500**	**500**	**501**	**500**	**500**	**500**	**501**	**384**	**13,680**

Table A-3 Landform Placement Schedule (Year 1 – 15)

Period		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Material/Rock to fill																
Overburden from Quarry	klcm	12	13	42	50	16	6	6	2	5	1	19	15	8	9	2
Tailings (@ 10% of sandstone)	klcm	19	32	32	32	32	32	32	32	32	32	32	32	32	32	32
Overburden from infrastructure	klcm	34	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total material to fill	klcm	65	45	74	82	48	38	38	34	37	33	51	47	40	41	34
Cumulative material to fill	**klcm**	**65**	**110**	**184**	**266**	**314**	**352**	**389**	**424**	**461**	**493**	**545**	**592**	**632**	**673**	**707**
Landform volume available	**klcm**	**3**	**71**	**159**	**263**	**473**	**473**	**473**	**473**	**473**	**512**	**512**	**650**	**650**	**650**	**981**
Material/Rock to Landform																
To Infrastructure	klcm	48														
To Landform	klcm	3	58	74	82	51	38	38	34	37	33	51	47	40	41	34
Total Material to fill	klcm	52	58	74	82	51	38	38	34	37	33	51	47	40	41	34
Cumulative material to fill	klcm	52	110	184	266	317	355	393	427	464	497	548	595	635	676	710
Cumulative material to landform	**klcm**	**3**	**62**	**136**	**218**	**269**	**307**	**344**	**379**	**416**	**448**	**500**	**547**	**587**	**628**	**662**
To Temporary Stockpile	klcm	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0
From Temporary Stockpile	klcm	0	13	0	0	0	0	0	0	0	0	0	0	0	0	0
Balance	klcm	13	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table A-4 Landform Placement Schedule (Year 16 – 28)

Period		16	17	18	19	20	21	22	23	24	25	26	27	28	Total
Material/Rock to fill															
Overburden from Quarry	klcm	5	2	1	2	0	1	7	18	9	6	6	8	5	277
Tailings (@ 10% of sandstone)	klcm	32	32	32	32	32	32	32	32	32	32	32	32	25	874
Overburden from infrastructure	klcm	0	0	0	0	0	0	0	0	0	0	0	0	0	34
Total material to fill	klcm	37	34	33	34	32	33	39	50	41	38	38	40	29	1,185
Cumulative material to fill	**klcm**	**744**	**777**	**810**	**844**	**876**	**910**	**949**	**999**	**1,040**	**1,078**	**1,116**	**1,155**	**1,185**	**1,185**
Landform volume available	**klcm**	**981**	**981**	**981**	**981**	**981**	**981**	**981**	**981**	**1,287**	**1,287**	**1,287**	**1,287**	**1,287**	**1,287**
Material/Rock to Landform															
To Infrastructure	klcm														
To Landform	klcm	37	34	33	34	32	33	39	50	41	38	38	40	29	
Total Material to fill	klcm	37	34	33	34	32	33	39	50	41	38	38	40	29	1,188
Cumulative material to fill	klcm	747	780	814	848	880	913	952	1,002	1,043	1,081	1,119	1,159	1,188	1,188
Cumulative material to landform	**klcm**	**699**	**732**	**765**	**799**	**831**	**865**	**904**	**954**	**995**	**1,033**	**1,071**	**1,110**	**1,140**	**1,140**
To Temporary Stockpile	klcm	13	0	0	0	0	0	0	0	0	0	0	0	0	0
From Temporary Stockpile	klcm	0	13	0	0	0	0	0	0	0	0	0	0	0	0
Balance	klcm	13	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure A-1 Year 1 Landform Cross-section

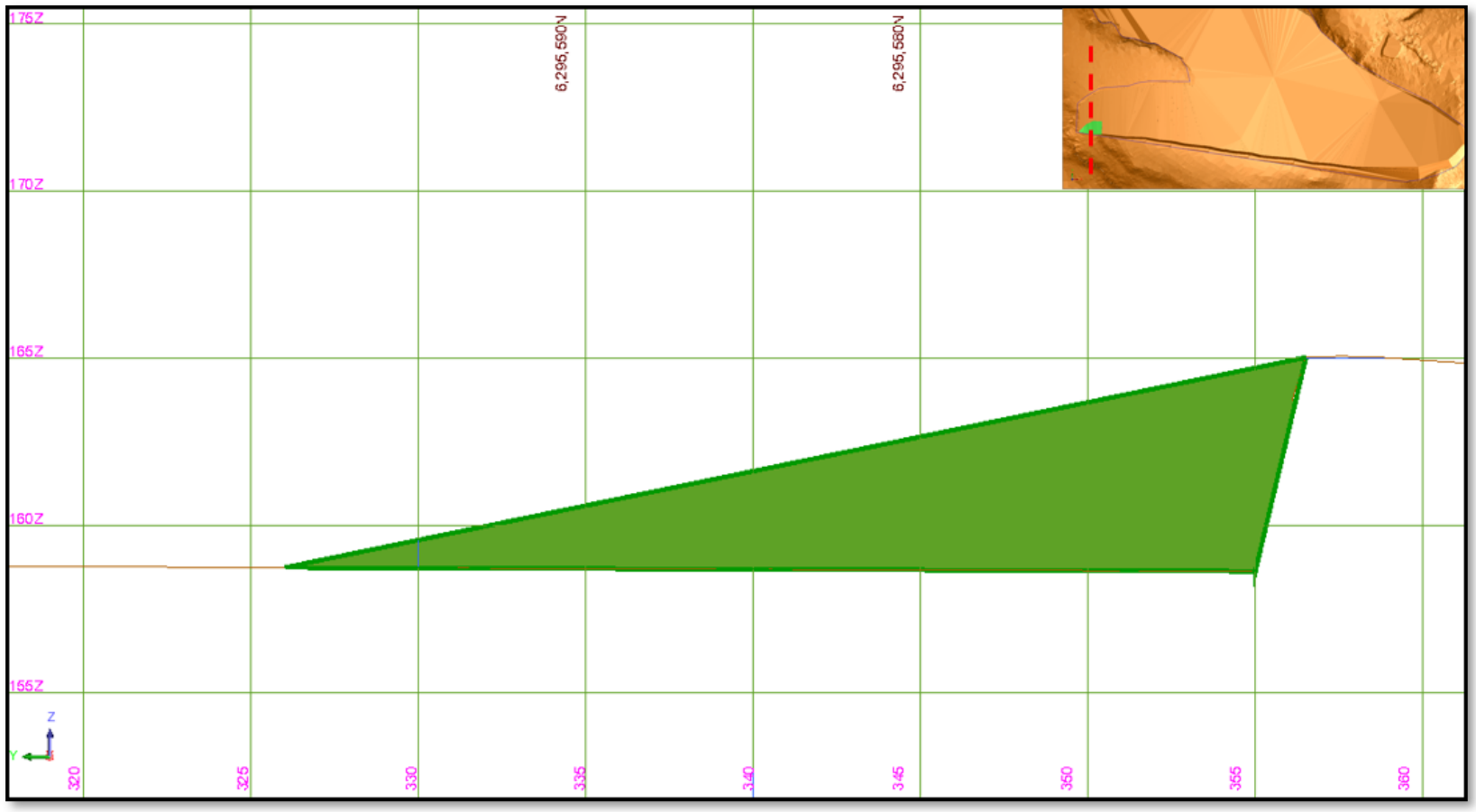


Figure A-2 Year 2 Landform Cross-section

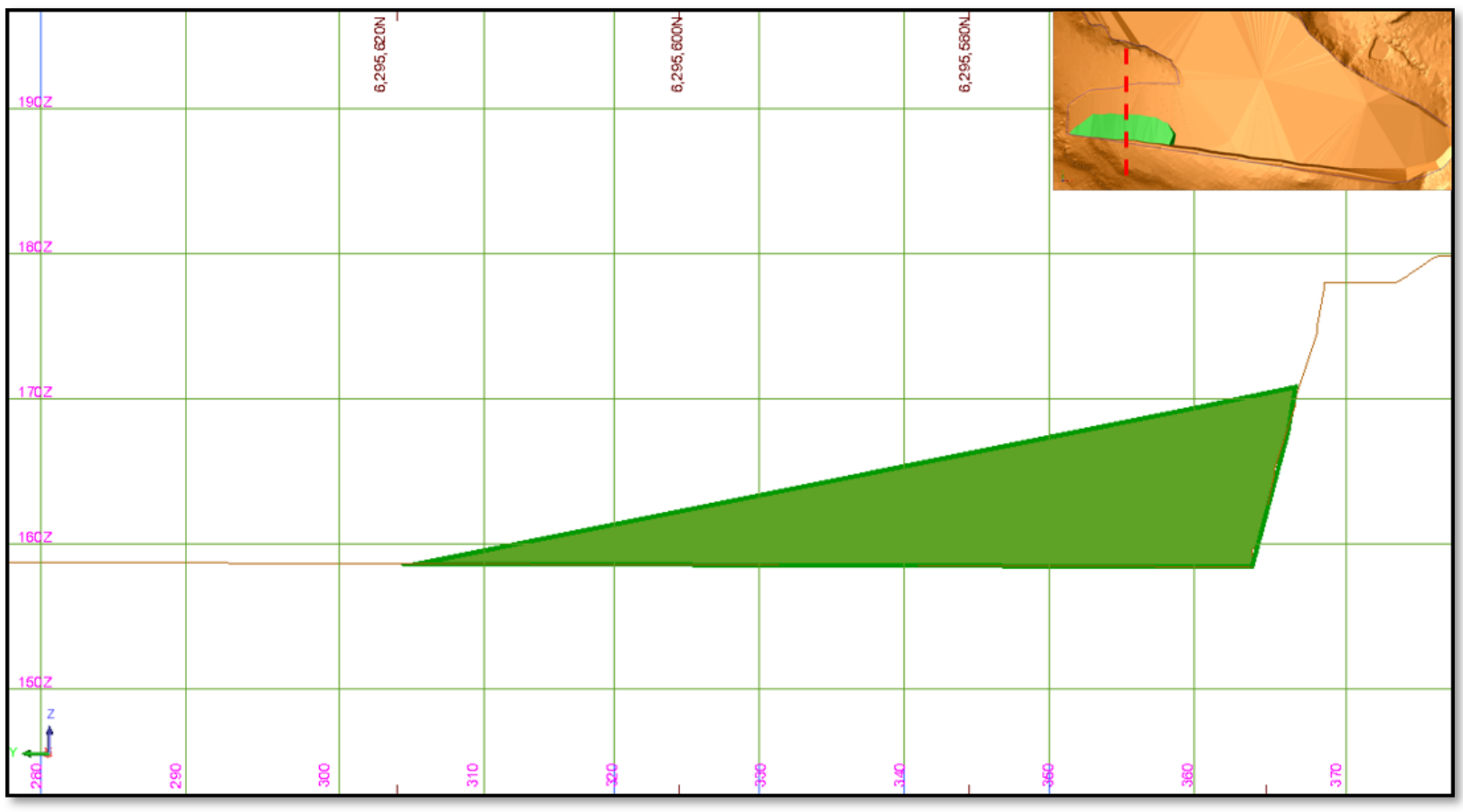


Figure A-3 Year 3 Landform Cross-section

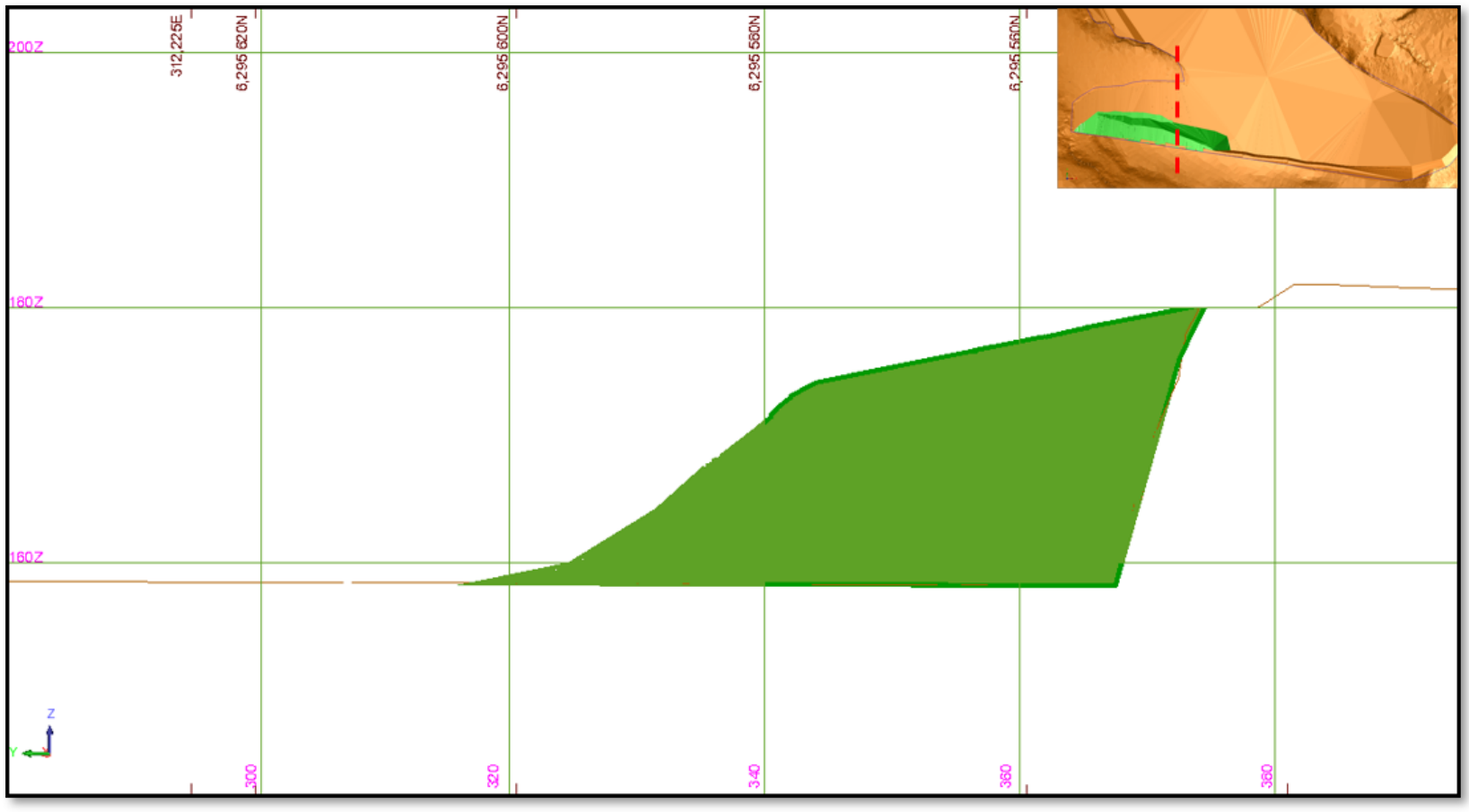


Figure A-4 Year 4 Landform Cross-section

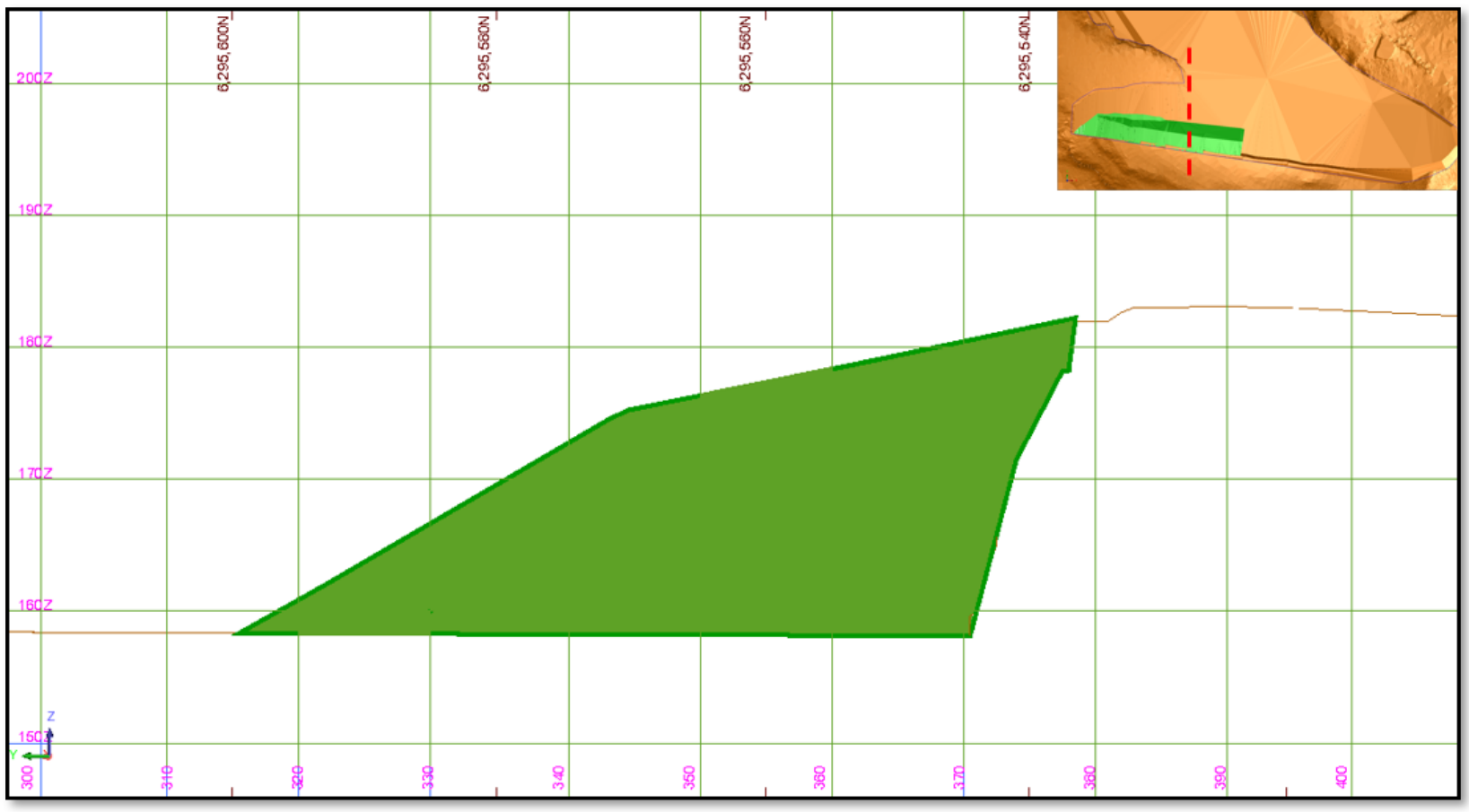


Figure A-5 Year 5 Landform Cross-section

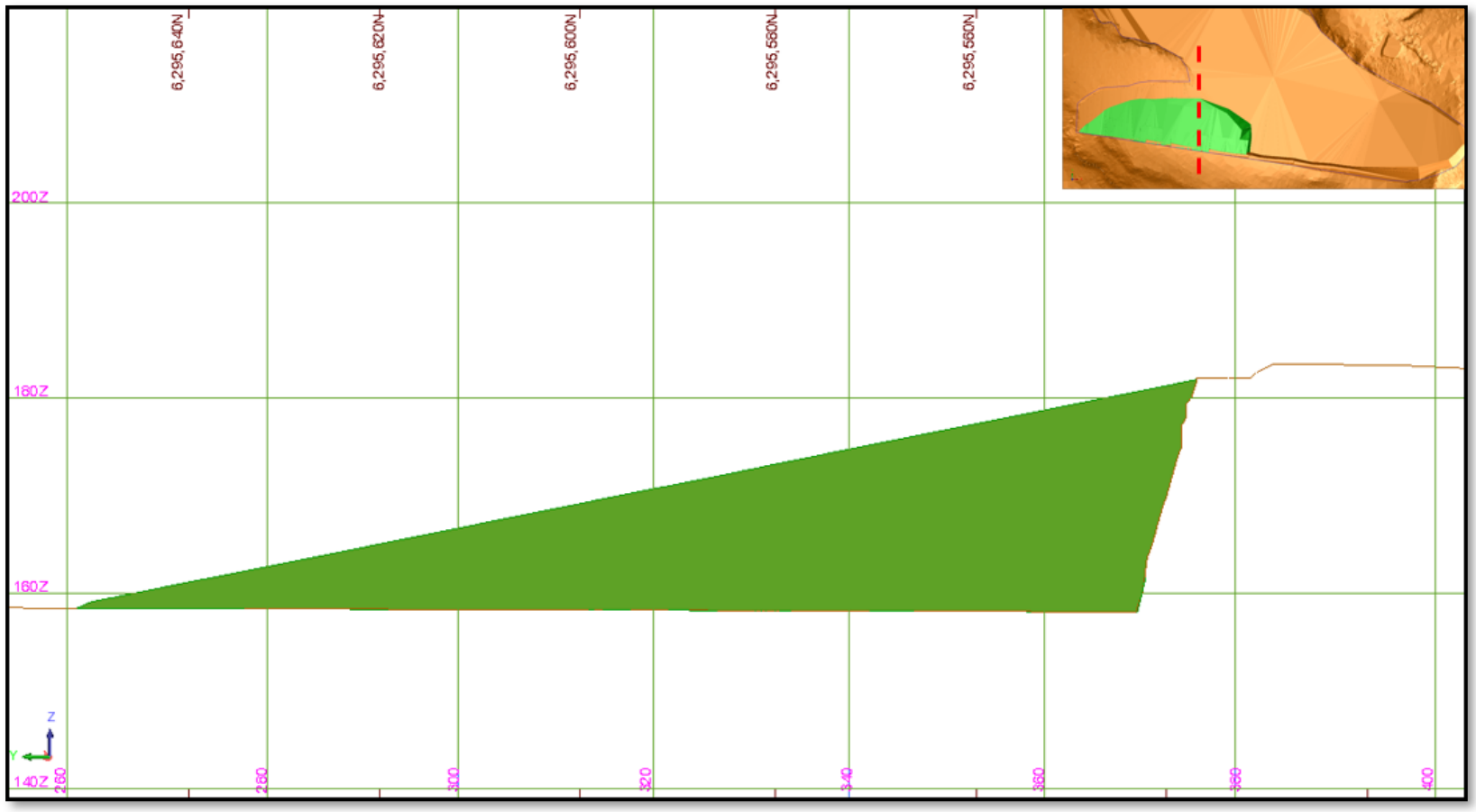


Figure A-6 Year 10 Landform Cross-section

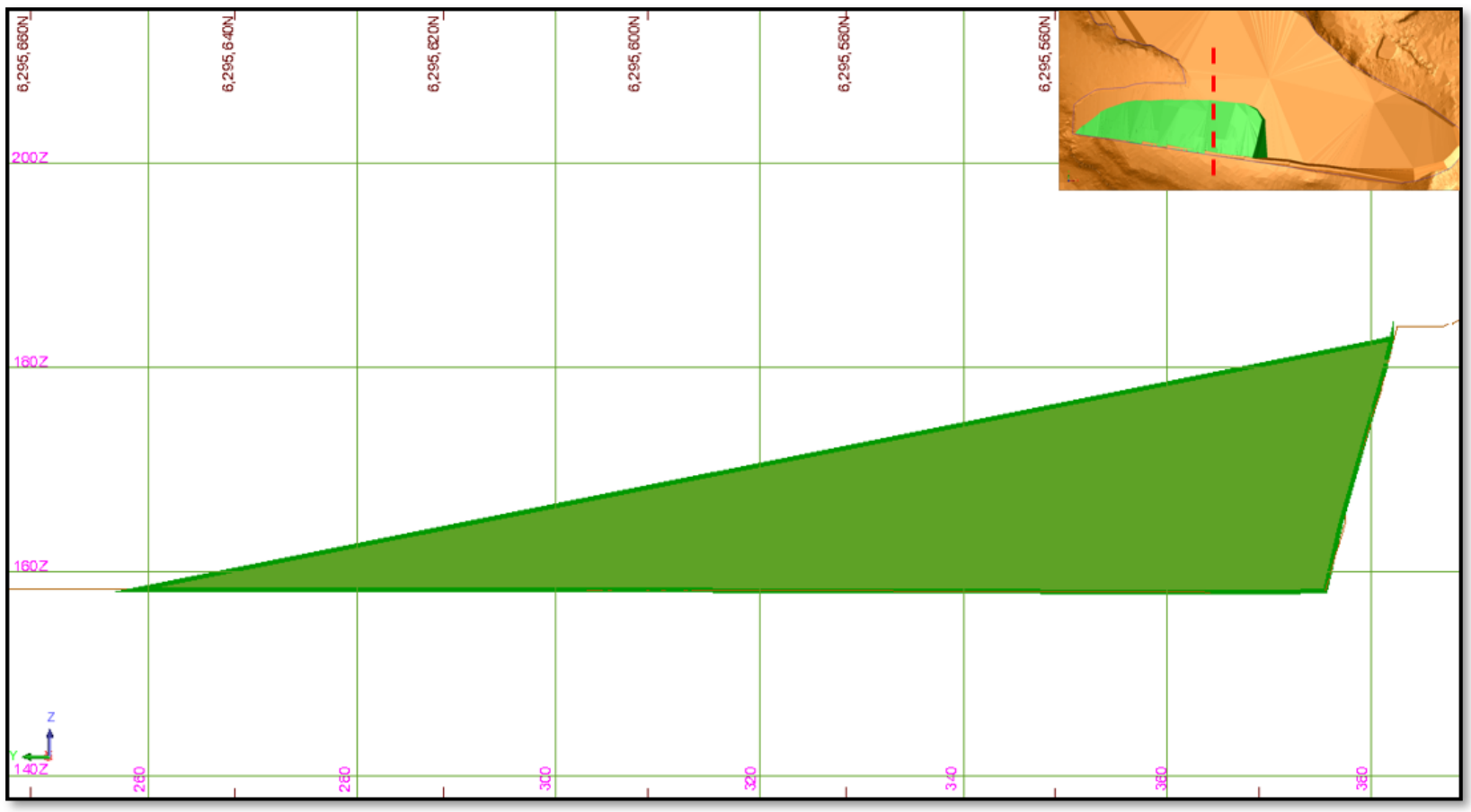


Figure A-7 Year 15 Landform Cross-section

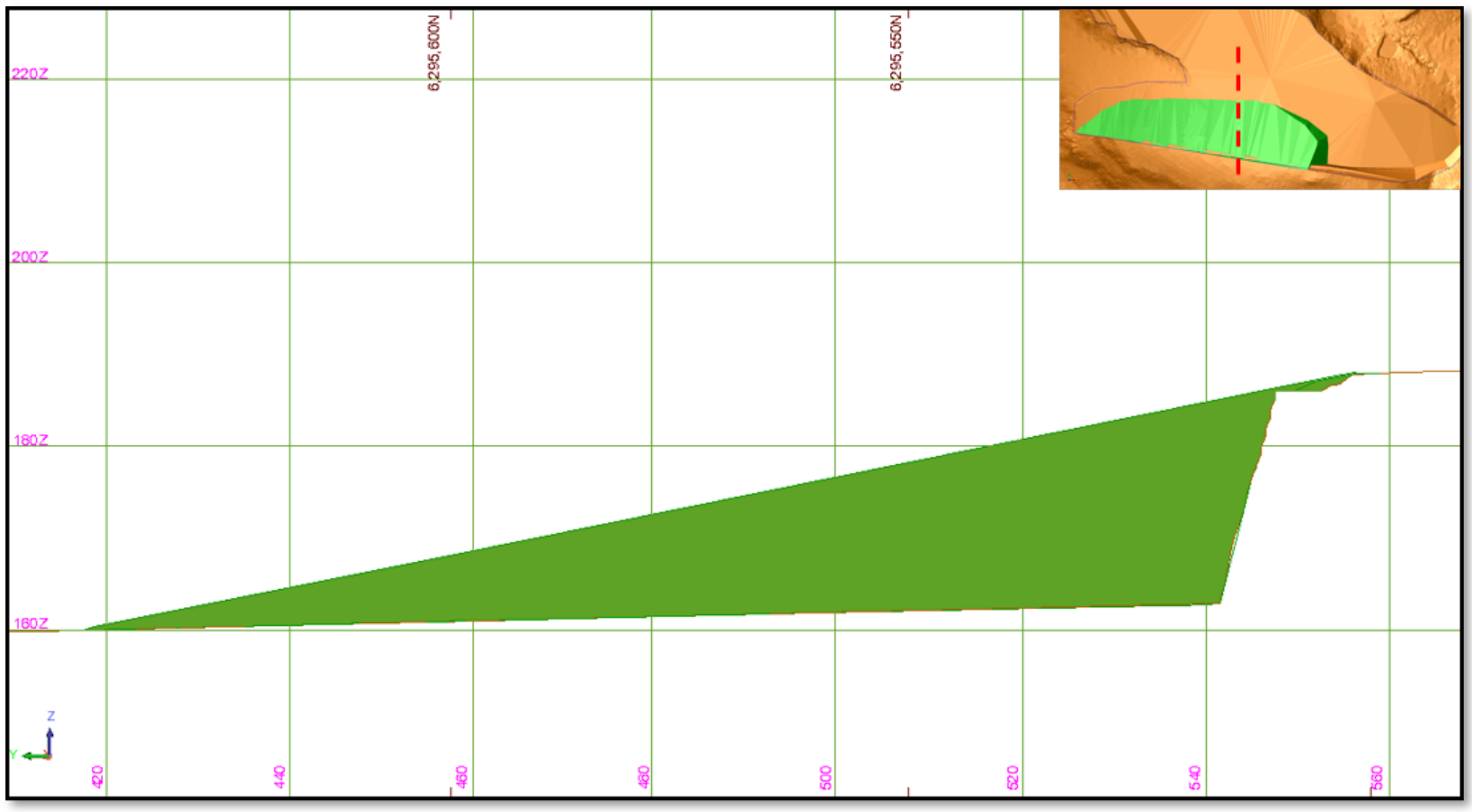
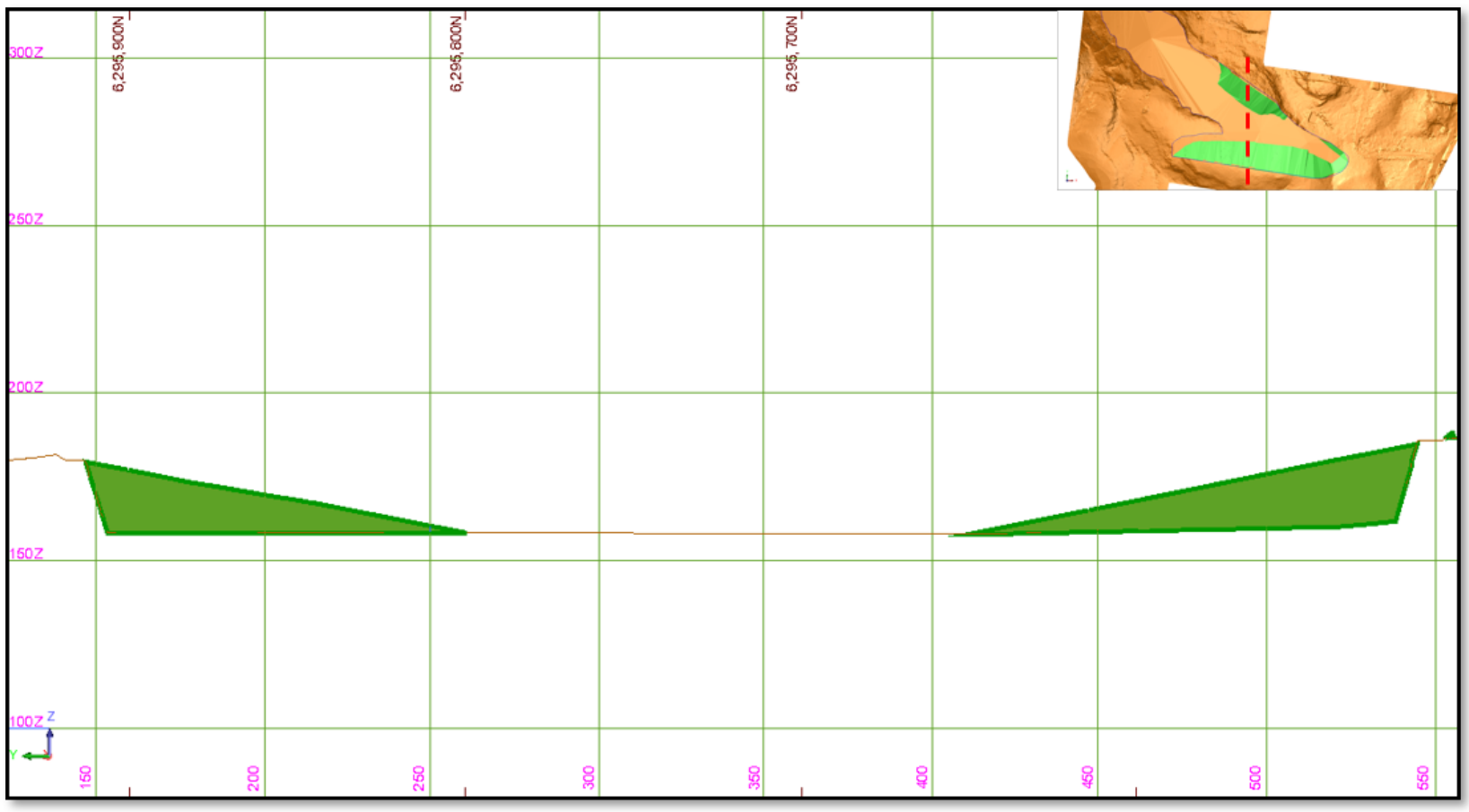


Figure A-8 Final Landform Cross-section (Year 28)



– END OF REPORT –

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