Appendices

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Appendix 1

Geotechnical Review of Overburden Emplacement and Structure Redesign

(Total No. of pages including blank pages = 44)

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To:	Darryl Thiedeke & Nicholas Warren	From:	Rod Huntley
Cc:	Lee Attard, Rodd Welsh & Craig McDonald		
Address:	391 Jenolan Caves Road, Hartley, NSW 2790	Date:	20th May 2019
Re:	Emplacement Structure Redesign	File Ref.:	1517_260_007

Project Background

Site inspection and review of the emplacement storage structure at Hartley Quarry was completed, after it was noticed by site management that ponding of water was intermittently occurring between the emplacement structure, and the original landform, thus providing a potential mechanism for shear failure. While no instability was noted, given the design life of the structure is >35 years, and when the potential consequences of failure are considered, (significant potential for environmental harm), it is regarded both prudent and necessary to redesign the structure to remove this potential failure mechanism.

The revised design in plan view, with approximate GPS points is shown on Drawing 1517_162 while the design in cross section is shown on Drawing 1517_154.

Key Design Elements

- The areas which are proposed to be filled are shown on Plate 1. The redesign will fill this area and also involves construction of a diversion drain adjacent to the current access road to direct water away from the structure. On Plate 1 the yellow arrow shows where water occasionally ponds and can overtime seep along the interface between the current landform and the structure. Filling this area and diverting water away from the structure will engineer out this risk.

- The area will be filled to the previously approved height of approximately 828m AHD, and apart from the geometry of this new contact area and the width of the upper bench, which is necessarily wider at the top to accommodate these design changes, all other relevant design criteria will not change, as they have been demonstrated to be both stable and suitable for approximately 25 years. Batter heights of approximately ten metres, placed at the angle of repose of the material, outer bench widths at approximately 6 metres, and with a maximum total slope angle of the structure being 25 degrees will

continue to be used, refer Plate 2. These design criteria have been previously modelled by both PSM and Groundwork and have been demonstrated to be stable, over the design life and long term of the structure and are considered of a very low risk for instability. The structure using these design criteria has a Factor of Safety of approximately 2 which denotes high levels of stability, commensurate with a Probability of Failure less than 0.3% which similarly shows a very low chance of total slope failure occurring. Note during construction individual lifts could be as much as 20 meters high before they are re-profiled to a final landform geometry. The previous PSM design report is provided as Attachment 1.

- Fines, clay and lower strength material will continue to be placed in the core of the structure and then be encapsulated by higher strength rubbles, refer Plate 3.

- Upon completion of the structure the design will not limit post-operational rehabilitation outcomes There will be no nett change to the rehabilitation area or the capacity of the landform to support native vegetation including the threatened plant *Eucalyptus pulverulenta* that we understand has been successfully cultivated in rehabilitation areas to date, refer Plates 4 to 6.

- Benches will continue the current practice of grading at a gentle inclination (nominally at 3-5^0) toward the centre of the emplacement structure to help manage water quality and to stop erosion and scour from occurring in an uncontrolled fashion across the batter.

Emplacement Structure Audit

- Review of the recent survey data for the structure demonstrates that no significant or material movement is occurring in the emplacement structure. This information has been included as Attachment 2. No significant movement has been recorded in the structure since the surveys were commenced.

- Site inspection of selected parts of the structure further confirms no material movement is occurring in the structure and no significant vectors for movement were recognised.

- Aerial imagery over a period of years was reviewed and further confirms construction is general accordance with the approved plan. It also shows the progression of rehabilitation works and also further shows no failures have occurred since construction commenced in 2002, refer Plates 7 to 9.

- Six cross sections were cut through the emplacement structure and assessed against design criteria, refer Sections A-A' to F-F', Drawings 1517.156 and 1517.156B. These sections confirm the total slope angle toe to crest ranges between 23 and 25 degrees, with Sections B-B' and D-D' being the most relevant.

- Geotechnical risk elsewhere on site has been domained, and colour coded for risk on the geotechnical Risk and Hazard register refer Drawing 1517.155. This document forms part of the Principal Hazard Plan Ground and Strata Control for the site.

Should you require clarification on this summary please do not hesitate to contact me.

Yours Sincerely

Rod Huntley

Enc

Drawing 1517_162 Emplacement Structure Plan View

Drawing 1517_154 Emplacement Design Cross Section

Drawing 1517_156 Cross Section Location Plan and Chainage

Drawing 1517_156B Total Slope Angles

Drawing 1517_155 Geotechnical Risk and Hazard Plan Ground and Strata Control

Attachment 1 PSM Emplacement Design Report

Attachment 2 Slope Monitoring

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E 235600 m
E 235800 m
E 236000 m
E 236200 m
E 236400 m
E 236600 m
N 6281600 m
N 6281400 m
N 6281200 m
N 6281000 m
N 6280800 m
N 6280600 m
N 6280400 m

Lease 1

Lot 1
DP100511

RL 828m

1
2
3
4
5
6
7

Area removed from previous design

Lease 2

Lot 2
DP100511

Setout Points [Decinimal Degrees]

ID	Longitude	Latitude
1	E150.155673	S33.580987
2	E150.154592	S33.580678
3	E150.153598	S33.580701
4	E150.153128	S33.579939
5	E150.152652	S33.579167
6	E150.152913	S33.578694
7	E150.152973	S33.578283

Legend:
- Cadastral Boundary
- Approved Extraction Area Boundary
- Approved Overburden Emplacement
- Proposed Overburden Emplacement
- Preserved For Quarry Viewing Area

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JOB SUB #:
CREATED: 20 May 2019

REV	DESCRIPTION	DATE	BY
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Photography: UAV Survey, 2018-11-25
Topography: UAV Survey, 2018-11-25, UAV Survey, 2016-06-30
Cadastre:
Ecosystem:
Other:

PROJECT: Hartley Quarry

CLIENT: HY-TEC Industries NSW

TITLE: Overburden Emplacement Structure Redesign

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SCALE: 1:4,000 When Printed On A3 — 0 — 80m
DRAWING NUMBER: 1517.162
REVISION: 1
DATE: 20 May 2019 | DRAWN: JHV
PRINTED: 20 May 2019 | CHECKED: RH
DATUM: HORIZONTAL / VERTICAL / ZONE
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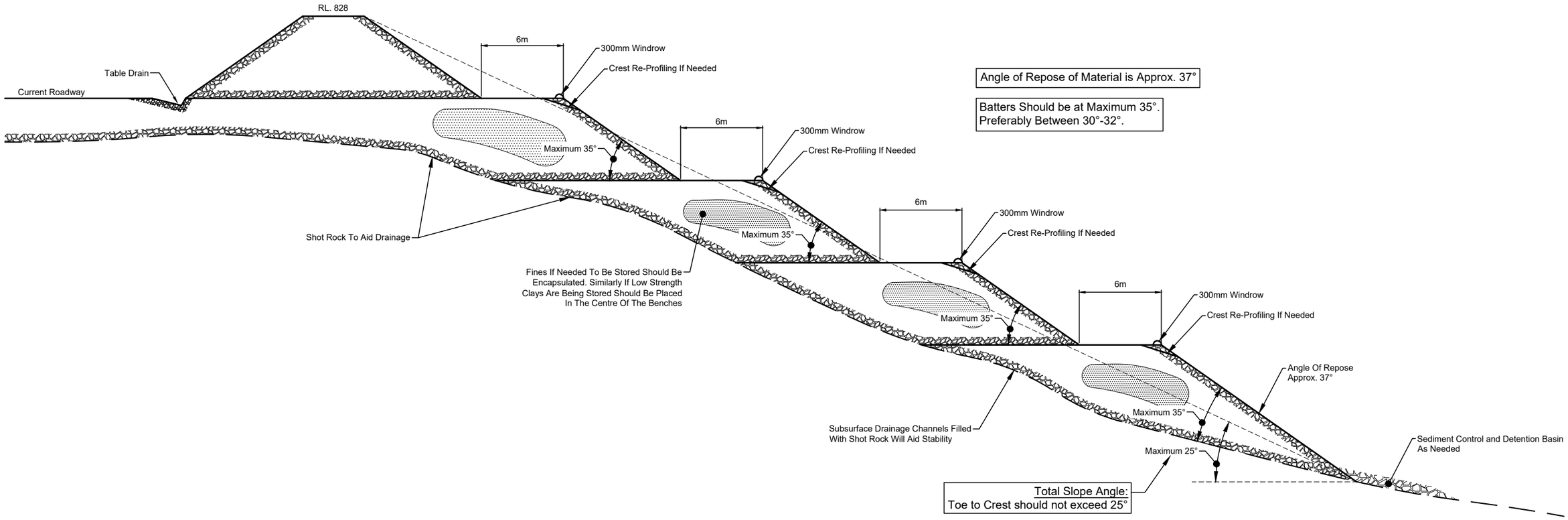

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CREATED: 20 May 2019 JOB SUB #:

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Photography:
Topography:
Cadastre:
Ecosystem:
Other:

PROJECT: Austen Quarry

CLIENT: Hy-Tec Industries Pty Ltd

TITLE: Figure 1 - Overburden Dump Design Cross Section

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REVISION: 1
DATE: 20 May 2019 DRAWN: JHV
PRINTED: 20 May 2019 CHECKED: RH
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Topography: UAV Survey, 2018-11-25, UAV Survey, 2016-06-30
Cadastre:
Ecosystem:
Other:

Legend:
- Cadastral Boundary
- Extraction Area
- Overburden Area
- Preserved For Quarry Viewing Area

PROJECT: Austen Quarry

CLIENT: Hy-Tec Industries Pty Ltd

TITLE: Cross Sections Layout

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DRAWING NUMBER: 1517.156
REVISION:
DATE: 15 January 2019
DRAWN: JHV
DATUM: HORIZONTAL / VERTICAL / ZONE
PRINTED: 15 January 2019
CHECKED: RH
MGA / AHD / 56

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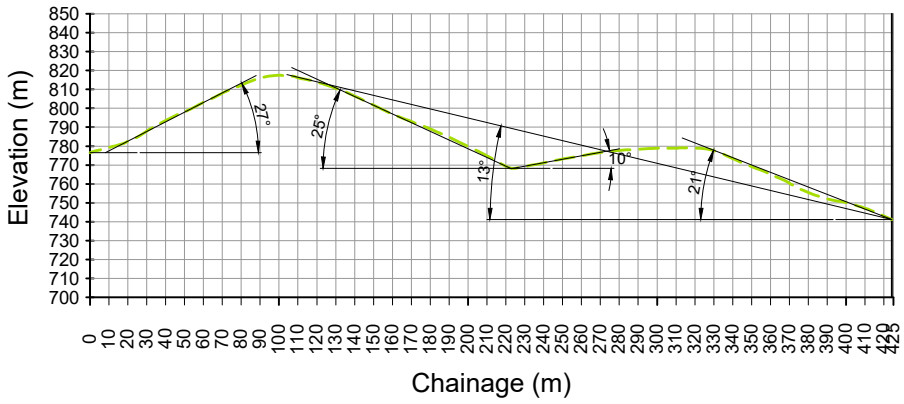

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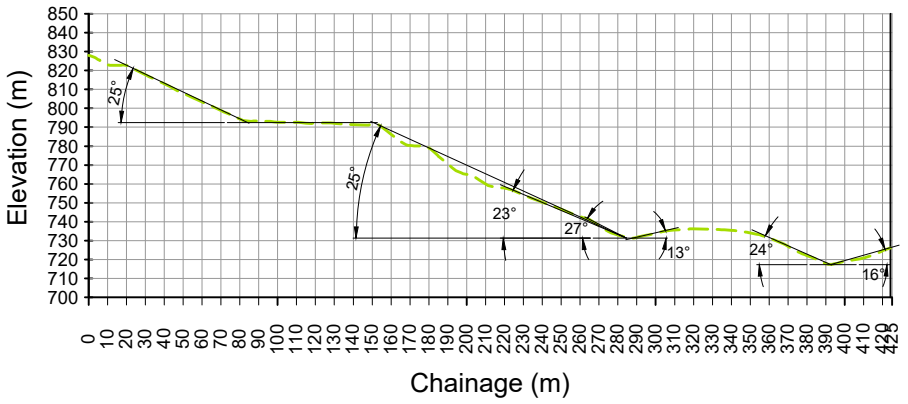

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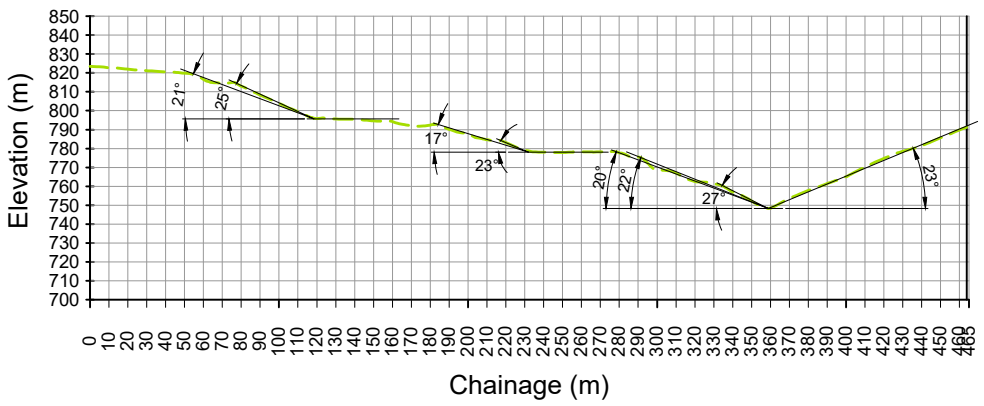

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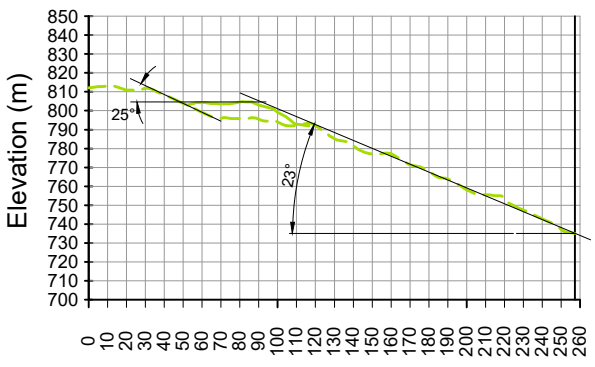

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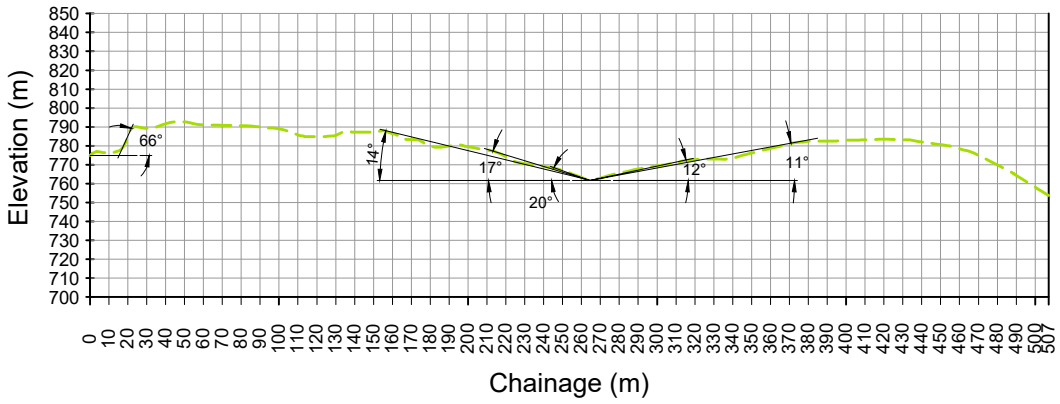

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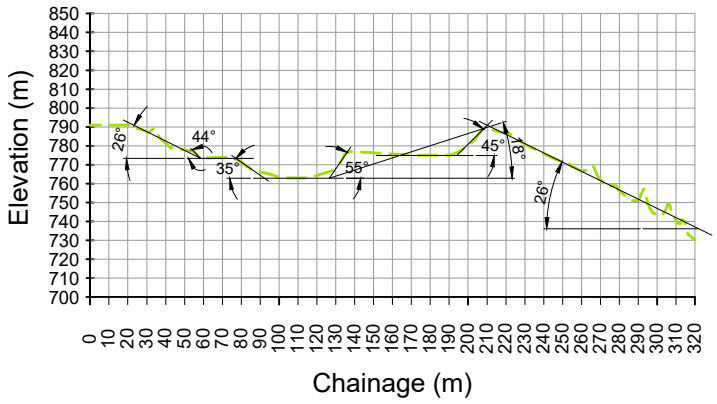

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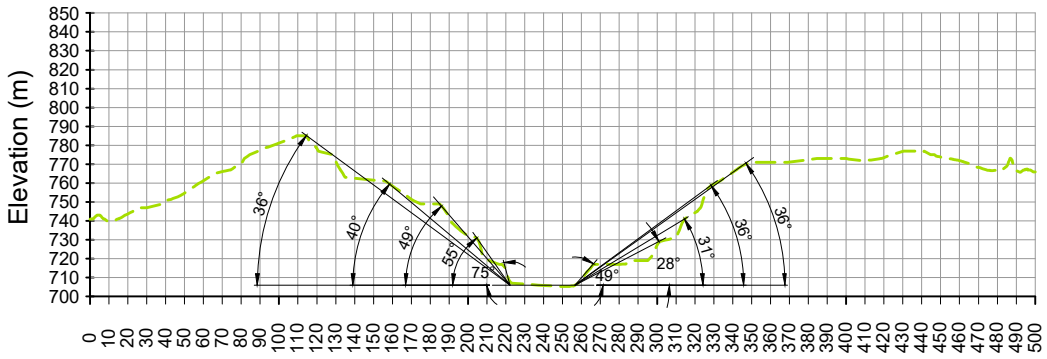

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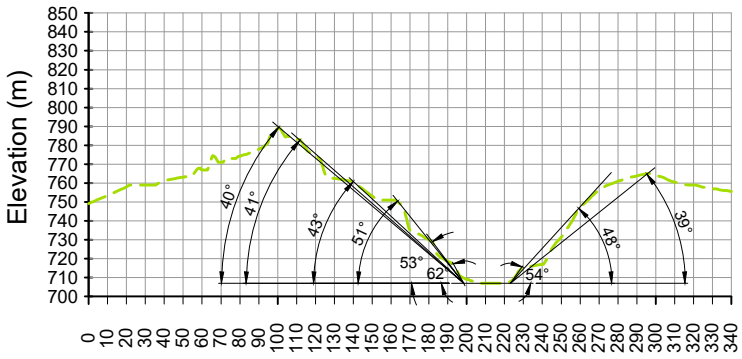

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Photography:
Topography:
Cadastre:
Ecosystem:
Other:

PROJECT: Austen Quarry

CLIENT: Hy-Tec Industries Pty Ltd

TITLE: Total Slope Angle Cross Sections

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DRAWING NUMBER: 1517.156B

REVISION:

DATE: 21 December 2018 | DRAWN: JHV

PRINTED: 21 December 2018 | CHECKED: RH

DATUM: HORIZONTAL / VERTICAL / ZONE
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Domain	Potential Modes of Failures	Ongoing Works	Monitoring	Geotechnical Risk
1	Minor Rockfall western bench area	Nil	Visual	Low
2	Minor rockfall western bench area	Nil	Visual	Low
3	Rotational or pavement deflection	Maintain widths and grades as needed	Visual	Low
4	Minor rockfall eastern highwall	Ensure adequate bench width and scale large blocks as necessary	Visual after large rainfall	Low
5	Hackly Ground and Rockfall Potential	Scale and remove poor ground when needed	When active	Moderate
6	Toppling and Rotational	Nil	Visual	Low
7	Toppling	Finalise rehab	Visual	Moderate
8	Hackly Ground and Rockfall Potential	Finalise rehab	Visual	Moderate
9	Rockfall from highwalls	Install impact bunds at toe when bench finalised	Visual after blasting	Low
10	Steep ground equipment slide	Finalise rehab	Visual	Low
11	Toppling	Toe bunds as needed for eastern wall	Visual	Low
12	Minor rockfall and crest damage	Maintain widths and grades as needed	Visual	Low
13	Minor rockfall and crest damage	Install impact bunds at crest	Visual	Low
14	Fill and Hackly Ground with some Planar Structures	Toe bunding as needed	Visual after large rainfall	Moderate
15	Fill and Hackly Ground with some Planar Structures	Toe bunding as needed	Visual after large rainfall	Moderate
16	Large Planar Structures	Toe bunding as needed	Visual after large rainfall	Moderate
17	Rockfall, Planar and Topple	Consider redeveloping for long term access	Visual daily	Low
18	Mixed generally minor planar, topple, crest damage and rockfall potential	Scale and remediate as needed	Visual	Moderate
19	Mixed generally minor planar, topple, crest damage and rockfall potential	Scale and remediate as needed	Visual	Low
20	Mixed generally minor planar, topple, crest damage and rockfall potential	Scale and remediate as needed	Visual	Low
21	Planar and Topple Failure Area	Maintain widths and grades as needed	Visual daily	Low
22	Mixed generally minor planar, topple, crest damage and rockfall potential	Scale and remediate as needed	Visual	Low
23	Crest and Planar Failure risk	Scale and remove blocks as needed	When active	Moderate
24	Mixed generally minor planar, topple, crest damage and rockfall potential	Scale and remediate as needed	Visual	Low
25	Mixed generally minor planar, topple, crest damage and rockfall potential	Scale and remediate as needed	Visual	Low
26	Crest and Planar Failure risk	Scale and remove blocks as needed	When active	Moderate
27	Steep ground equipment slide	develop as needed	Visual	Low
28	Shear and Rotational Failure	Ensure adequate drainage at all times	Quarterly	Moderate
29	Erosion and Scour	Ensure adequate drainage at all times	Visual	Low
30	Minor Erosion Scour and Rotational	Continues rehabilitation	Annual	Very Low
31	Minor Erosion Scour and Rotational	Continues rehabilitation	Annual	Very Low
32	Shear and Rotational Failure	Ensure adequate drainage at all times	Quarterly	Moderate
33	Shear and Rotational Failure	Ensure adequate drainage at all times	Quarterly	Moderate

Work Only Near Face if Required

Exclusion Zones:
An exclusion zone should be delineated at an acceptable distance from the toe of the face. No work should be conducted within the exclusion zone without specific geotechnical inspection and risk assessment.

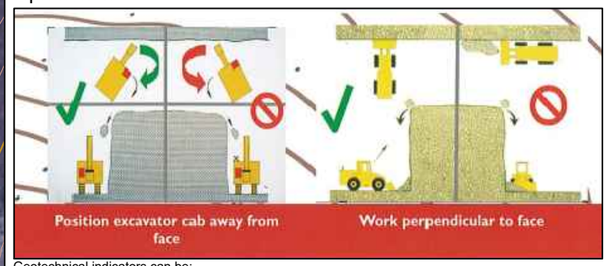
The exclusion zone should be demarcated by bunding or another form of delineation.

When determining the appropriate distance to position the exclusion zone, consider loose rocks, cracks, water running form the face, back break, overhang and factors such as vehicle vibration, rainfall events and blasting.

Vehicles should not park inside exclusion zone.

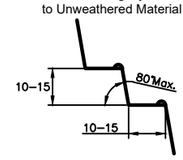
Planned maintenance of sumps should be located so that workers assessing them are not exposed to the hazard of rockfalls from face.

Operations

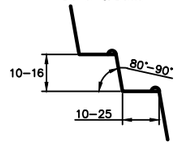


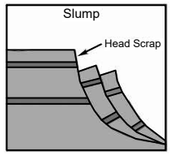
Geotechnical indicators can be:
1. Increased and unexplained water flow
2. Increased small to moderate scale rock fall events
3. Unexplained noises and movement of rock
4. Crest and bench slumping
5. Closure of drillholes

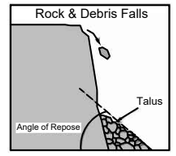
Recommended Terminal Bench & Batter Profile In Slightly Weathered to Unweathered Material

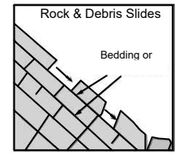


Recommended Operational Bench & Batter

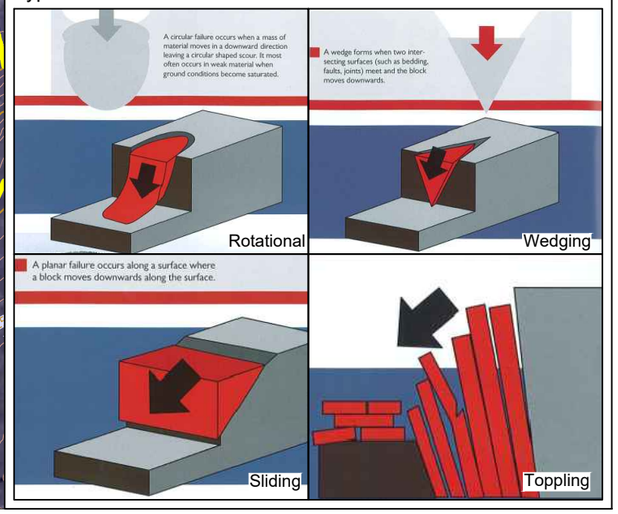








Typical Failure Mechanisms



REV	DESCRIPTION	DATE	BY

Data Sources:
Photography: UAV Survey, 2018-11-25
Topography: UAV Survey, 2018-11-25, UAV Survey, 2016-06-30
Cadastre:
Ecosystem:
Other:

Legend:
- Cadastral Boundary
- Extraction Area
- Overburden Area
- Preserved For Quarry Viewing Area

Geotechnical Risk
- Very Low Risk
- Low Risk
- Moderate Risk
- High Risk

Areas not shown are of very low risk

Haul Road Gradients:
- 12.5% / 1:8 or Greater
- 12.5% to 10% / 1:8 to 1:10
- 10% / 1:10 or Shallower

PROJECT: Austen Quarry

CLIENT: Hy-Tec Industries Pty Ltd

TITLE: Geotechnical Risk and Hazard Plan

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SCALE: 1:3,000 When Printed On A3 — 0 — 60m
DRAWING NUMBER: 1517.DRG.155
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DATE: 21 January 2019 DRAWN: JHV
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FILE NAME: P:\Jobs\1500\1517 AdBright, Austen2 Hartley\000 Generic\Drawings\1517 155_Geotechnical Risk And Hazard Plan.dwg
JOB SUB #:
CREATED: 21 January 2019

Attachment 1

Pells Sullivan Meynink
Engineering Consultants
ck-Soil-Water

G3 56 Delhi Road
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www.psm.com.au

Our Ref: PSM167-007R
Date: 19 November 2013

Hy-Tec Industries Pty Limited
391 Jenolan Caves Road
HARTLEY QLD 2790

ATTENTION: DARRYL THIEDEKE

Dear Darryl,

RE: AUSTEN QUARRY STAGE 2 - OVERBURDEN EMPLACEMENT CONCEPT DESIGN

Please find enclosed our report on the concept design of the Austen Quarry Stage 2 Overburden Emplacement. We trust this report is in keeping with your requirements and would be pleased to discuss any aspect.

For and on behalf of
PELLS SULLIVAN MEYNINK

TIM SULLIVAN

Distribution: 1 pdf copy Hy-Tec Industries Pty Limited
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Hy-Tec Industries Pty Limited

AUSTEN QUARRY STAGE 2
OVERBURDEN EMPLACEMENT CONCEPT DESIGN

Report PSM167-007R **November 2013**

CONTENTS

1. INTRODUCTION

This report presents the results of a planning assessment, geotechnical strategy and concept design for the Stage 2 Overburden Emplacement for Austen Quarry, Hartley. This assessment forms part of the overall planning for Stage 2 extension of the quarry, with extraction extending out to 35 years.

Figure 1 shows the existing Stage 1 overburden emplacement, the existing pit, the final Stage 2 pit perimeter and the site topography.

The existing quarry development is termed Stage 1 and the new planned extraction out to year 35 is termed Stage 2. The existing and the new planned overburden emplacements have been given similar names, Stage 1 and 2 respectively. However, within that, the pit development itself will proceed through a number of stages and these stages relate to various volumes of overburden. The sequence of pit development in Stage 2 are termed Pit Stage A to G.

The overburden emplacement strategy was developed separately and entails a number of separate placements in different areas, termed emplacement phases. Figure 2 shows the overburden and waste rock generation through the quarry life. The relationship between the overburden and waste rock generation, pit stages and the various emplacement phases is also shown in Figure 2. It is noted that the emplacement phases do not match the pit production stages exactly, but merely illustrate concept phasing of the construction of the emplacement.

2. BACKGROUND

2.1. History

The author of this document has been associated with the overburden emplacement since it was first planned in around 1996. The history of geotechnical studies and assessments of the overburden emplacement at Austen Quarry comprises:

1. The overburden emplacement for Stage 1 of the Austen Quarry was designed by the author of this document in 1996 during the initial quarry planning.
2. The geotechnical design included consideration of:
   a) siting
   b) foundation conditions
   c) local drainage
   d) locations of any groundwater seepages or springs in the area
   e) assessment of topography
   f) assessment of local ephemeral watercourses affected by the emplacement and any likely water impacts
   g) assessment of the overburden material and likely performance in the emplacement.

3. The design considerations for the Stage 1 emplacement also included liaison with Mr S. Brooks of the NSW Soil Conservation Service regarding design and minimisation of any downstream impacts.
4. The emplacement was inspected and reviewed in January 2007, soon after the quarry commenced operation and after the first lift had been placed.
5. The emplacement was inspected and reviewed again in August 2009 and earlier this year in May.

2.2. Existing Emplacement Design and Construction Considerations

The Stage 1 emplacement was designed as a permanent structure and had a number of the design and construction considerations comprising:

- A maximum overall slope on the downstream face of 26°.
- Individual lifts constructed at the angle of repose, assumed 35° to 40°.
- The surface of individual lifts graded at 3° to 5° away from downstream face, in order to control erosion.
- The materials in the lifts is placed such that the coarser more competent rock is located towards the outside of the emplacement.
- The emplacement was constructed from the bottom lift up.
- Water management around the emplacement is a key element.
- A sedimentation dam was required.

This emplacement has performed well and is stable with minimal erosion on rehabilitated faces.

2.3. Overburden and Waste Rock Emplacement Requirements

Stage 2 overburden and waste rock generation volumes are presented in Table 2.1 and Figure 2. The Stage 2 emplacement storage requirements are:

- An additional insitu 2.2 Mm^3 of overburden and waste rock will be generated.
- Assuming a conservative swelling factor of 1.3, this translates to an additional loose volume of 2.9 Mm^3.
- Assuming an insitu density of 2.0 t/m^3, this translates to an additional 4.4 Mt.

TABLE 2.1
PIT DEVELOPMENT STAGE VOLUMES AND TONNAGES
(Provided by RW Corkery & Co Pty Limited)

TIMELINE	INSITU VOLUME	INSITU VOLUME	AGG QUALITY VOLUME	AGG QUALITY	WASTE ROCK VOLUME	WASTE ROCK TONNES
	(bcm)	(bcm)	(bcm)	tonnes	(bcm)	tonnes
	Cumulative	Per Stage				
Year 0	1,992,200	1,992,200	1,593,760	4,143,776	398,440	796,880
Stage A (EP1)	2,457,100	464,900	371,920	966,992	92,980	185,960
Stage B (EP2)	2,800,900	343,800	275,040	715,104	68,760	137,520
Stage C (EP3)	4,034,900	1,234,000	987,200	2,566,720	246,800	493,600
Stage D (EP4)	5,845,700	1,810,800	1,448,640	3,766,464	362,160	724,320
Stage E (EP5)	9,874,400	4,028,700	3,625,830	9,427,158	402,870	805,740
Stage F (EP6)	13,720,300	3,845,900	3,461,310	8,999,406	384,590	769,180
Stage G (EP7)	16,379,900	2,659,600	2,393,640	6,223,464	265,960	531,920
Total	**16,379,900**	**16,379,900**	**14,157,340**	**36,809,084**	**2,222,560**	**4,445,120**

Note: table taken from RW Corkery & Co Pty Limited email of 19 November 2013.
bcm = bank cubic metres

2.4. Design Constraints

There are some environmental constraints on the emplacement design including:

- The quarry development area is environmentally and ecologically sensitive, due to its proximity to Coxs River, and the surrounding native vegetation.
- Consideration must also be given to the sight lines from the surrounding vantage points, resulting in the need for progressive vegetated external slopes when the emplacement is above 790mAHD, in order to minimise visual impacts.
- Sediment runoff must be controlled to minimise impact to existing waterways.

In addition, for emplacement planning and design there are a number of logistical and geotechnical constraints including:

- The overburden and weathered materials are mainly produced in the upper elevations and with larger quantities earlier in the extraction schedule.

- The valley floors are located well below the initial development of the extraction area.
- Because of the topography, access to the floor of valleys is difficult.
- The valley sides are quite steep.
- All the valley locations close to extraction area have topographic constraints.

3. CONCEPT DESIGN AND DEVELOPMENT

3.1. Introduction

The Stage 2 emplacement design and strategy builds on the good performance of Stage 1 to date, but of necessity includes some changes and differences. The Stage 1 emplacement was designed and constructed from the bottom up as a final landform in a particular topographic setting. The Stage 2 emplacement:

1. Entails larger volumes of overburden and weathered rock generated over the 35 years of extraction.
2. Completely fills a valley, which contained a number of separate branches.
3. Takes place in difficult topography with steep valley side slopes up to around 30°.

This means it is important for stability and economic considerations that the Stage 2 strategy and design needs to be modified compared to Stage 1.

The strategy for the Stage 2 emplacement will involve the following:

4. The emplacement is located in the valley immediately adjacent to the extraction area on the south western side, which allows short hauls, Figure 3.
5. This emplacement completely fills the valley, Figure 3.
6. The emplacement entails two elements, the main emplacement, and where necessary, rehabilitation above 790mAHD constructed in a form to marry into the existing topography.
7. The emplacement is constructed by end tipping across the valley.
8. A more substantial sediment pond is constructed well downstream of the emplacement.
9. The “downstream” face of each lift of the final Stage 2 emplacement needs to be designed in the field, based on the materials available at that time and including the emplacement performance to date and the local hydrology.

These aspects are discussed in the following sections.

3.2. Siting

Due to the sensitivity of the surrounding area, geometry and economic factors, it is proposed that the Stage 2 emplacement be located as close to the extraction area as possible. Therefore, the emplacement is located in the valley to the immediate west and south of the extraction area, Figure 3. This location benefits from being naturally screened from many surrounding areas.

The Stage 2 emplacement, together with the rehabilitation of both Stage 1 and 2 emplacements, have a combined volume of 3 Mm^3 and follows the valley line down to 700mAHD, Figure 3.

3.3. Planned Quarry Development

The quarry development entails the existing extraction area and a separate area on a ridge further south, which join to form a single pit after Pit Development Stage 2.

The development in the existing extraction area to the north will comprise:

- Develop the Stage 1 extraction area out to its full plan, extent except for the retention of the northern barrier.
- Continue the development of the floor from 750mAHD (current) to 730mAHD (Stage B), to 715mAHD (Stage E).
- A haul road (to 795mAHD) on the southwest pit face.
- In Stage E, once the "hill" of the southern extraction area has been excavated, the two parts will be merged into a single pit.
- This single pit will progress to 685mAHD in Stage G.

In the South, the development will comprise the following components:

- Flatten the existing ridges, from 804mAHD to 745mAHD in Stages A to E.
- Develop the floor, from 745mAHD to 685mAHD in Stages E to G.
- Develop an ex-pit haul road in Stage 1 downhill across the natural topography from 772mAHD to 730mAHD, which is around the toe of the overburden emplacement.

Appendix A presents the quarry development plans.

Until the ex-pit haul road is developed in Stage A, filling of the overburden emplacement will be from the north along the existing haul road, which is used for access to the valley west of the Stage 1 emplacement.

3.4. Emplacement Concept and Development

The concept for the Stage 2 emplacement of the overburden and waste rock has been developed around the planned quarry and other constraints set out above, including:

1. Filling the valley adjacent to the extraction area, Figure 3. This valley is visually screened from the surrounding areas to an elevation of 790mAHD and therefore there is minimal visual impact.
2. Keeping the in-situ “rock ridge” between the pit and the overburden emplacement which allows valley storage to be maximised.
3. The emplacement is constructed from two directions:
    a) By filling from the haul road along the existing emplacement to the north. This is the initial phase of filling, and will incorporate all overburden materials until the construction of the sediment dam and the ex-pit haul road is complete by the end of Pit Development Stage A, Figure 5.
    b) By filling across the valley from the end of the ex-pit haul road. This effectively fills the valley floor and provides a stable base for advancing further lifts from the ex-pit haul road, Figure 6.
    c) Filling above 770mAHD will be from both sides.
    d) This will be constructed up to 790mAHD.
4. This allows flat access or downhill haulage, and is the shortest haul option.
5. The emplacement would be constructed in lifts up to 20m high, at angle of repose.
6. This temporary downhill face would be rehabilitated progressively from the bottom up at an overall angle of 25° in 10m batter heights; Figures 5 to 11 shows the final downhill batters when completed.
7. Any filling about 790mAHD is potentially not visually screened from the east. Therefore, should additional capacity be required by placing overburden above 790mAHD, some visual screening is required with a bund, between the existing northern extraction area and the emplacement.
8. In this case, the geometry of the rehabilitation areas above 790mAHD is designed to fit with surrounding landforms by incorporating gentle sloping curves that resemble the surrounding natural landform.
9. This top rehabilitation will be progressively vegetated as it is constructed.
10. The top of this rehabilitation will be up to 810mAHD.
11. When rehabilitated, it will return the emplacement to a natural state visually.
12. This strategy allows a single permanent sediment dam to be constructed further down the valley at 700mAHD to act as “catch storage” for both dirty water and any erosion generated from filling higher up the valley.

Figure 3 presents the concept design for the Stage 2 emplacement in plan. Figure 4 presents a sectional view of the emplacement and the existing valley floor topography. Figure 2 presents the volume of the Stage 2 emplacement with time.

Figures 5 to 11 present the Stage 2 emplacement development phasing plans.

The emplacement should be advanced as follows:

- Filling at the point of unloading.
- Overall advance downslope to the south.
- Individual lifts advancing normal to the direction of overall advance, across the valley towards the west.
- Conventional lifts as follows:
  - surface of individual lifts graded at 3 to 5% away from the free face
  - placement of coarser blocky rock towards the outside of the slope
  - berms between lifts sized to fit within the overall angle constraint.

3.5. Surface Water Management

Surface water management is very important and needs to be in place prior to the development of the Stage 2 emplacement.

This will entail construction of the main permanent sediment pond or a sediment control dam structure at the downstream location, see Figure 3. This structure needs to be designed and constructed with consideration for its importance to both sediment control and downstream erosion control.

The sediment dam at the toe of the valley is located a distance downstream from the emplacement along a flat valley floor. This ensures:

- The sediment dam capacity is maximised.
- Any sediment from the emplacement is contained.
- An added safety as a catch berm for any debris.

As a result, any potential adverse outcomes are effectively controlled and managed at the downstream end.

3.6. Rehabilitation

Rehabilitation of the existing and proposed emplacement is as follows:

Stage 1 Emplacement (Emplacement Phase 1)

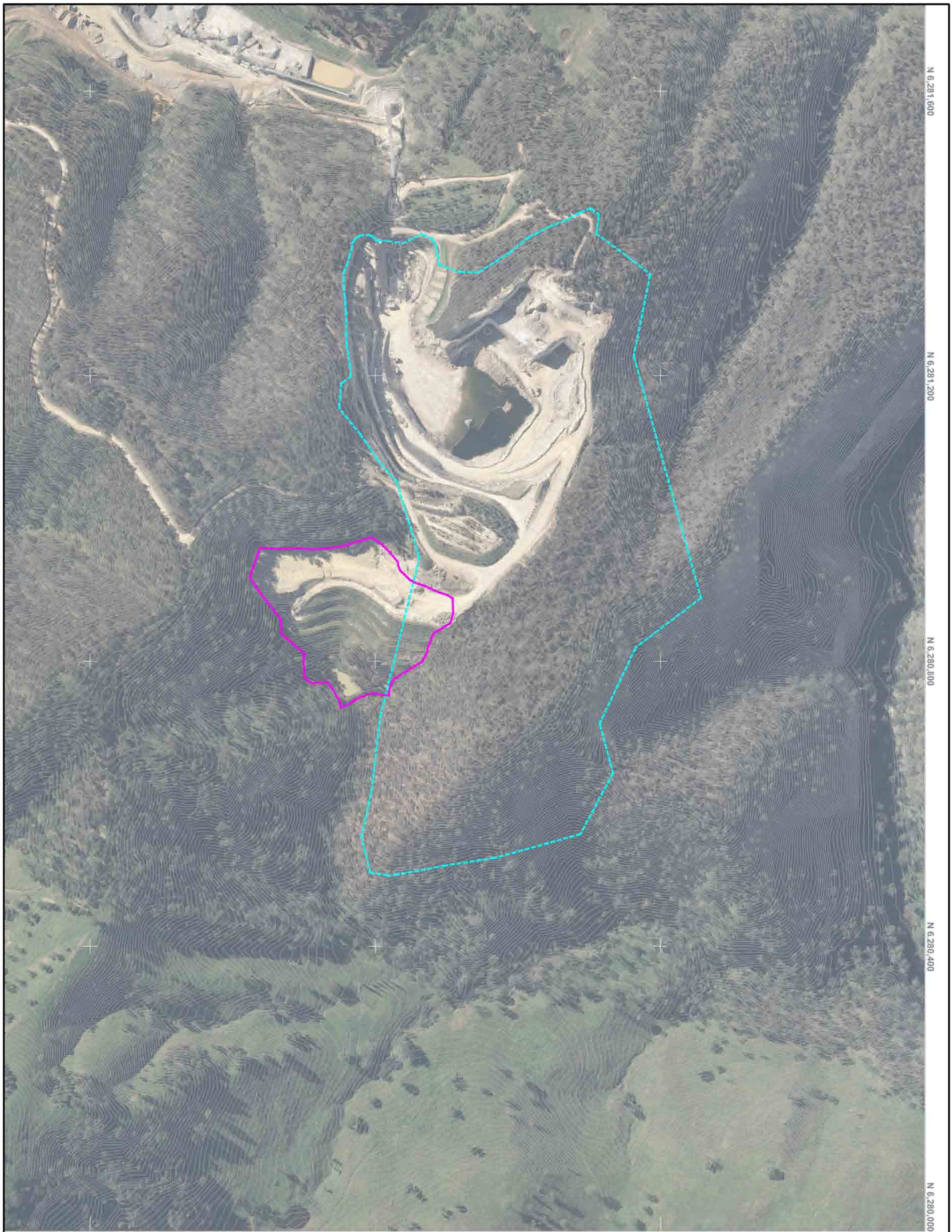
- The existing emplacement is to be rehabilitated initially, prior to construction of the proposed emplacement, by rehabilitation up to 810mAHD.
- The geometry of the rehabilitation areas above 790mAHD is designed to fit with surrounding landforms by incorporating gentle sloping curves that resemble the surrounding natural landform.
- This rehabilitation of the existing emplacement provides visual screening between the existing northern extraction area and the existing and proposed emplacements.

Stage 2 Emplacement (Emplacement Phase 7)

- The rehabilitation for the proposed emplacement will be up to 810mAHD, should the volumes be required.
- The geometry of the rehabilitation areas above 790mAHD is designed to fit with surrounding landforms by incorporating gentle sloping curves that resemble the surrounding natural landform.
- The rehabilitation will be undertaken in sections, with full strips constructed to the final level, rehabilitated and vegetated.
- It is anticipated that the outer-most strip will be constructed first, to provide screening for construction of subsequent strips.

For and on behalf of
PELLS SULLIVAN MEYNINK

TIM SULLIVAN



Legend

Extraction limit (Year 35)

Existing overburden emplacement

0 50 100 150 200

Scale (m)

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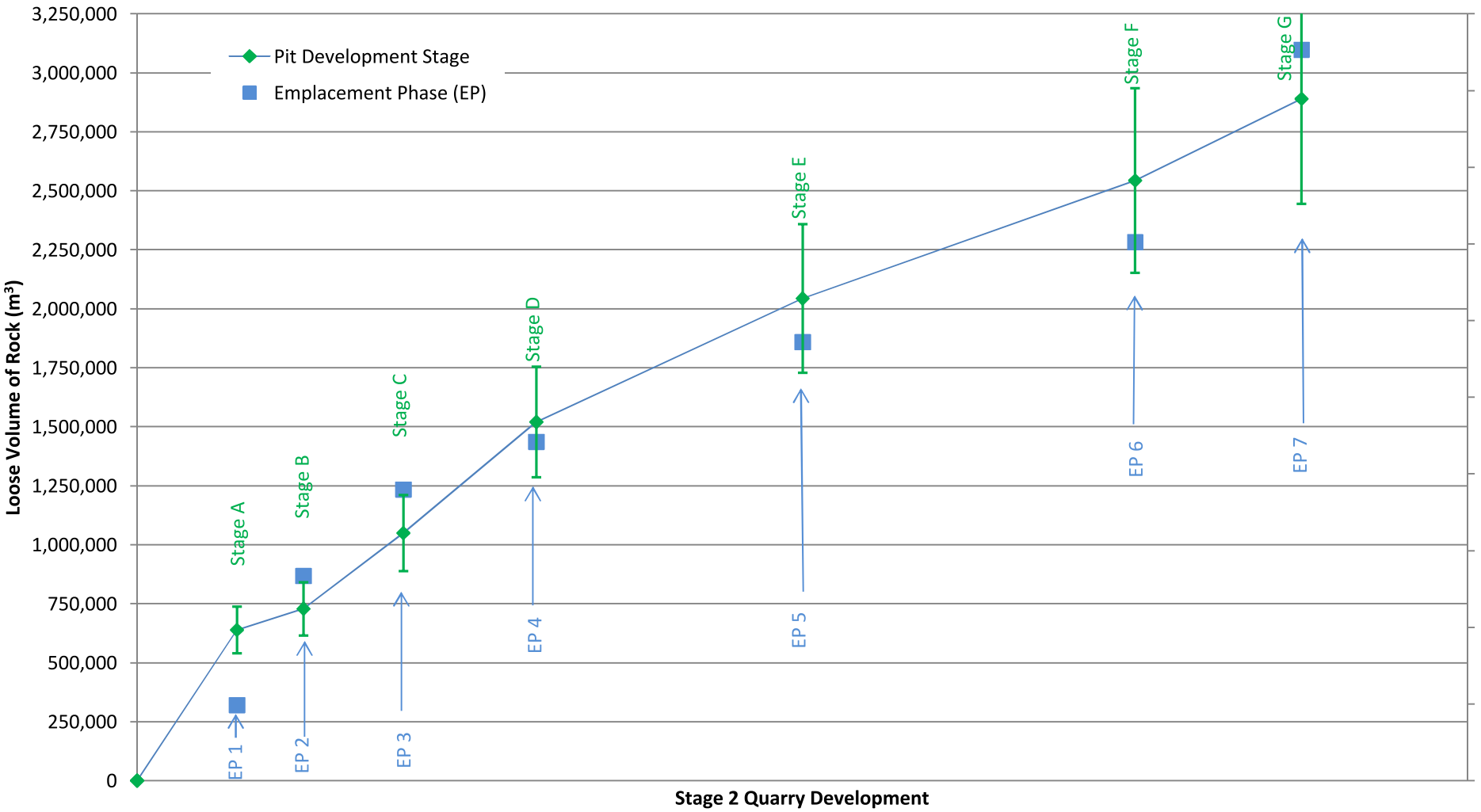
Austen Quarry, Hartley
Stage 1 and Stage 2 Overburden Emplacement

LOCATION PLAN

PSM167-007R | Figure 1



Note
1. Assume swell factor = 1.3
2. Loose volume range +/- 0.2 swell factor (error bar)
3. Pit development stages - A to G
4. Emplacement phases - EP 1 to EP 7

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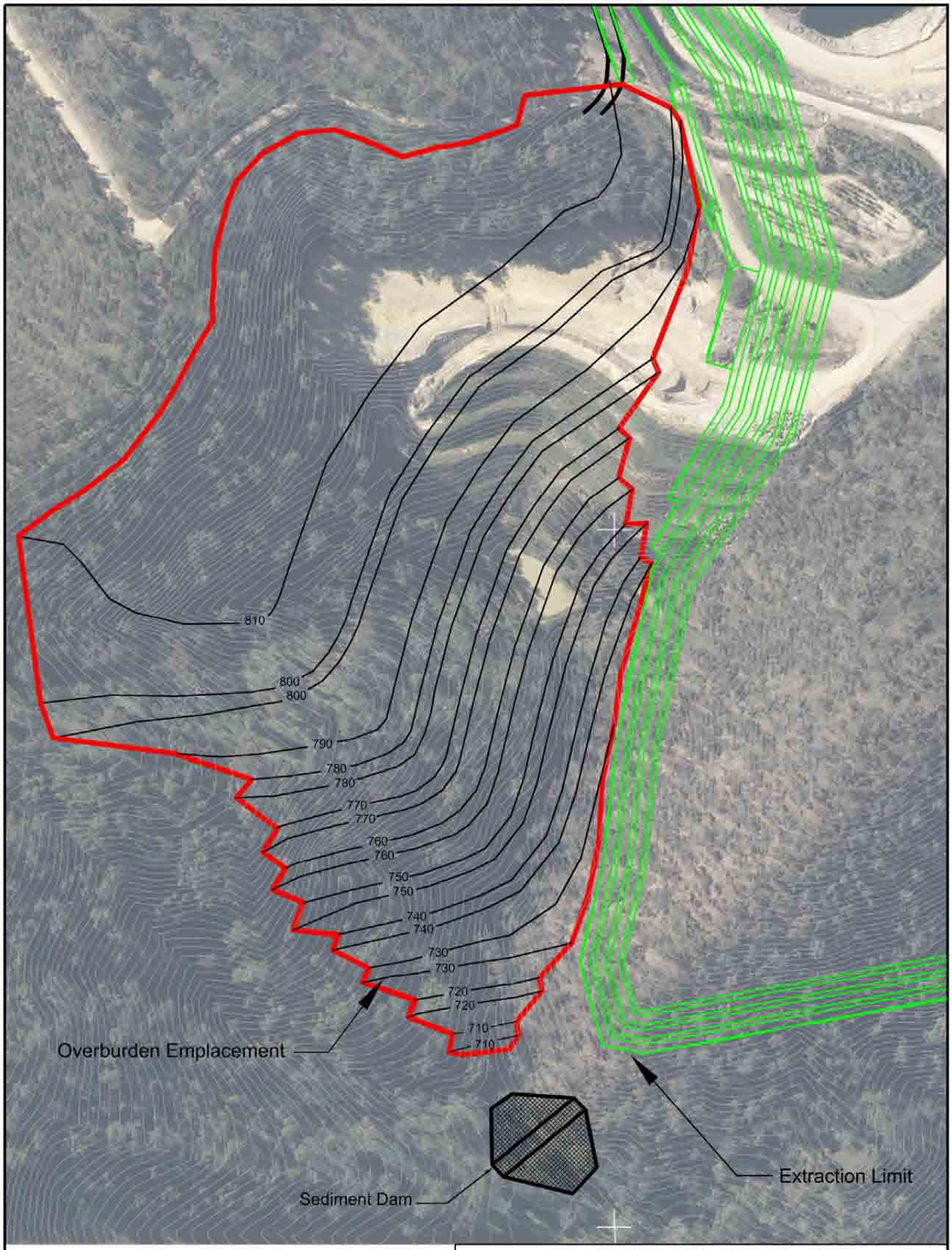
Stage 2 Overburden Emplacement

OVERBURDEN GENERATION & EMPLACEMENT PHASING

PSM167-007R	Figure 2

U:\J0001 to 1000\PSM167\Eng\Figures\PSM167-007R Figures\[PSM167-007R FIGURE 2 Vol v Time.xlsx]Figure



0 50 100

Scale (m)

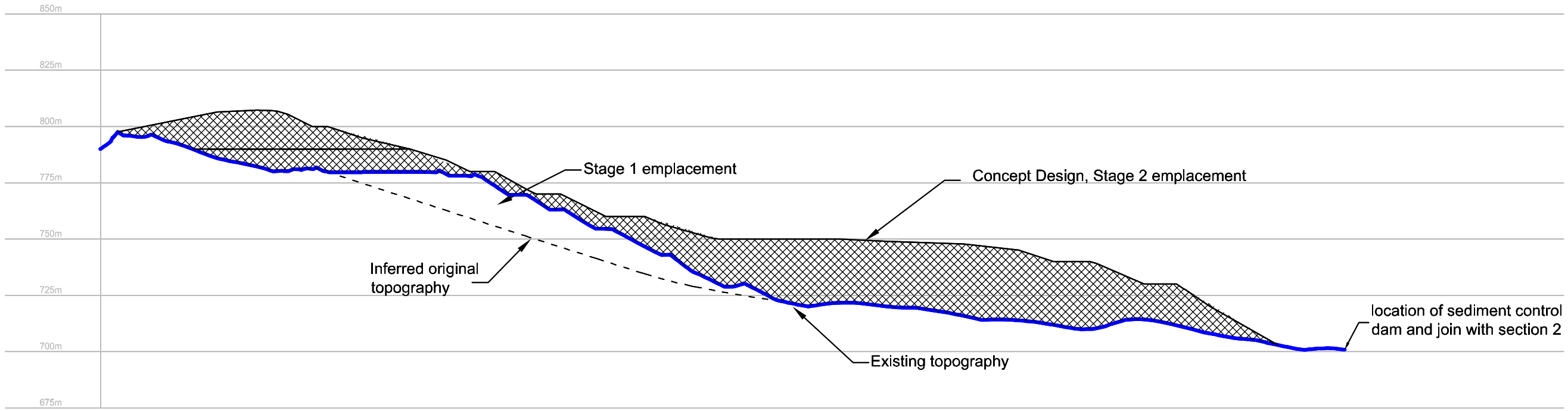
Hy-Tec Industries Pty Limited
Austen Quarry, Hartley
Stage 2 Overburden Emplacement

OVERBURDEN EMPLACEMENT
STAGE 2

Pells Sullivan Meynink

PSM167-007R | Figure 3

SECTION 1



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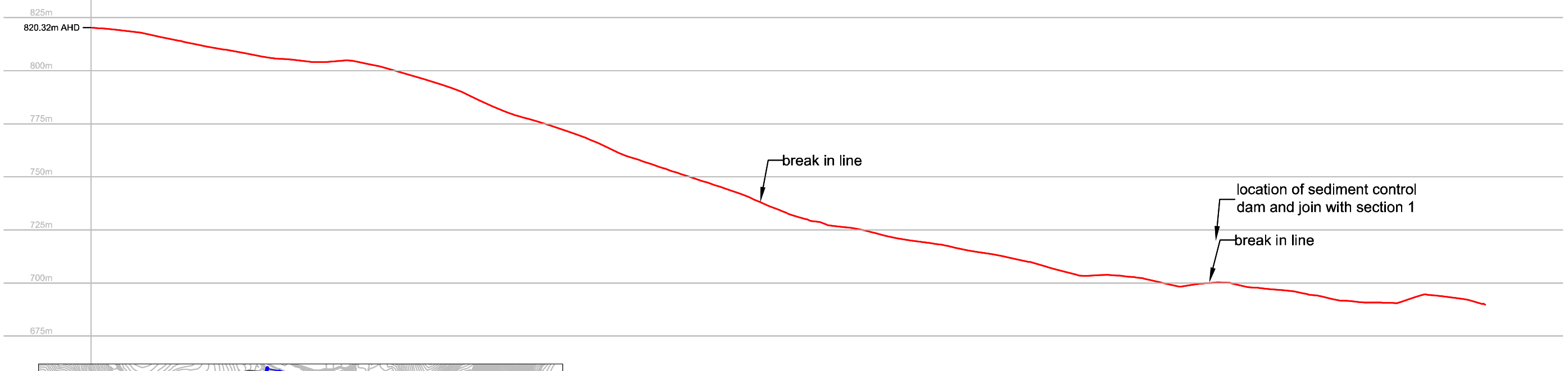

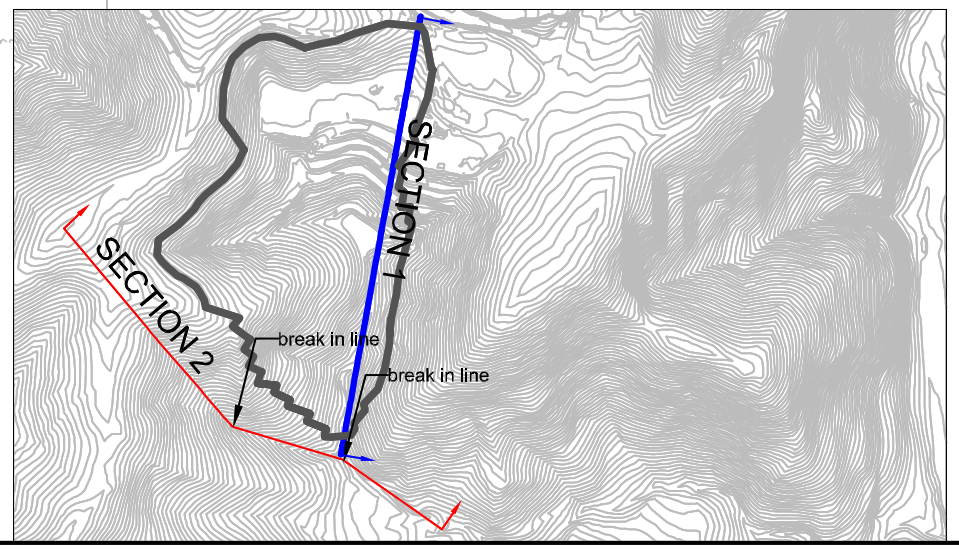

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Plan Scale (m)

0 50 100
Section Scale (m)

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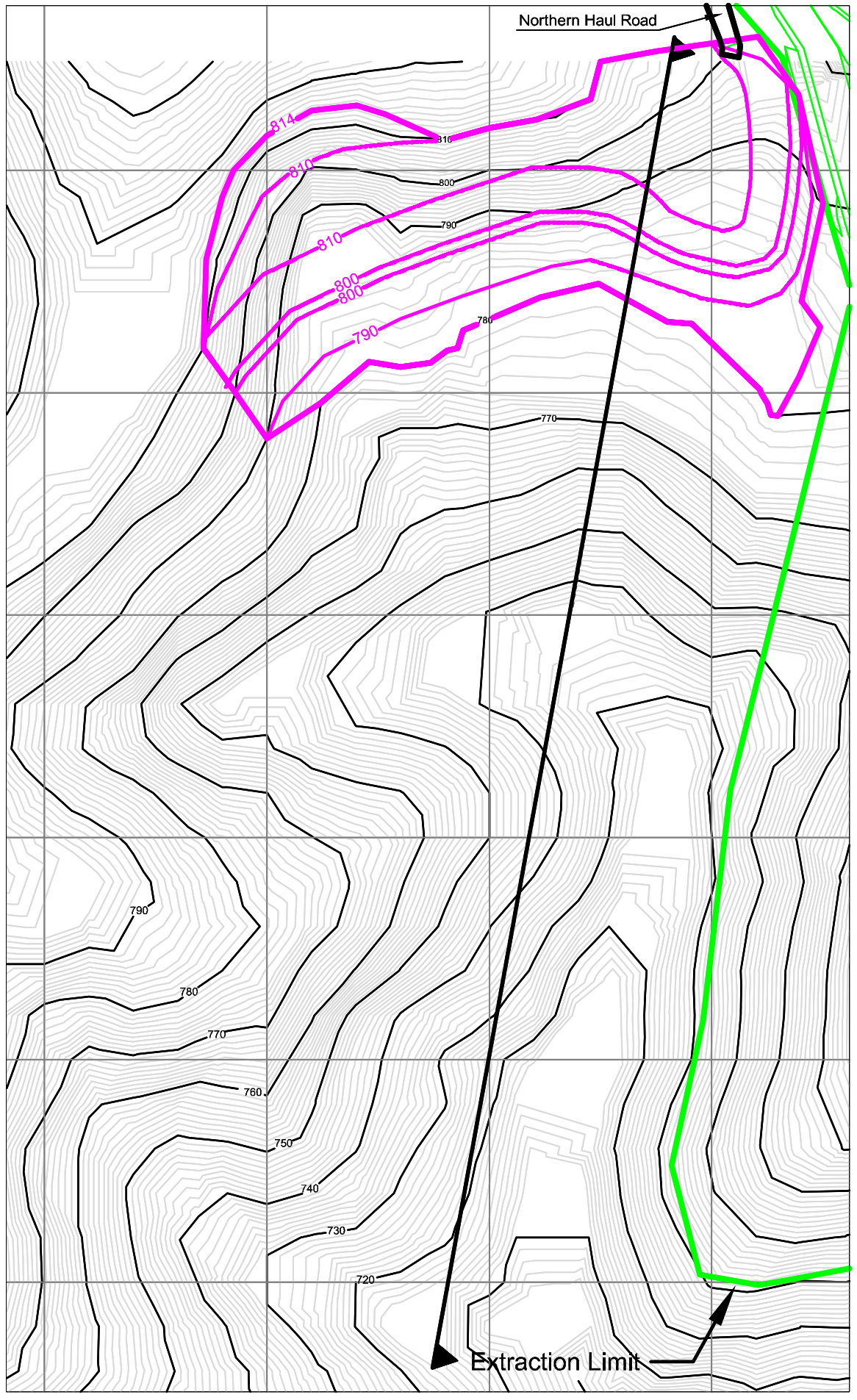
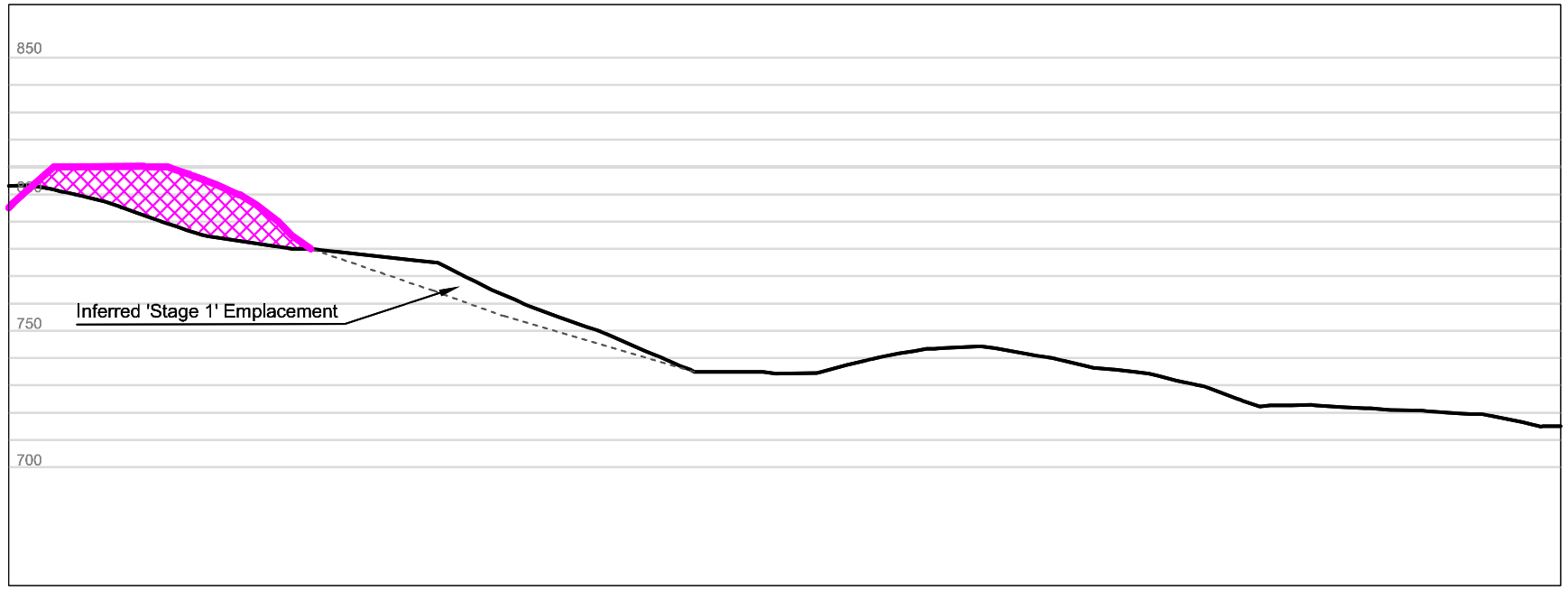
Austen Quarry, Hartley
Overburden Emplacement Concept Design

SECTIONS 1 AND 2
ALONG VALLEY FLOOR

PSM167-007R | Figure 4





0 50 100
Section Scale (m)

1:1 Vertical and Horizontal Scale

Emplacement Phase 1 - Rehabilitation of Stage 1 Emplacement

Access from northern haul road
Reshape existing hillside to create
natural looking landform
Lift from 790mAHD

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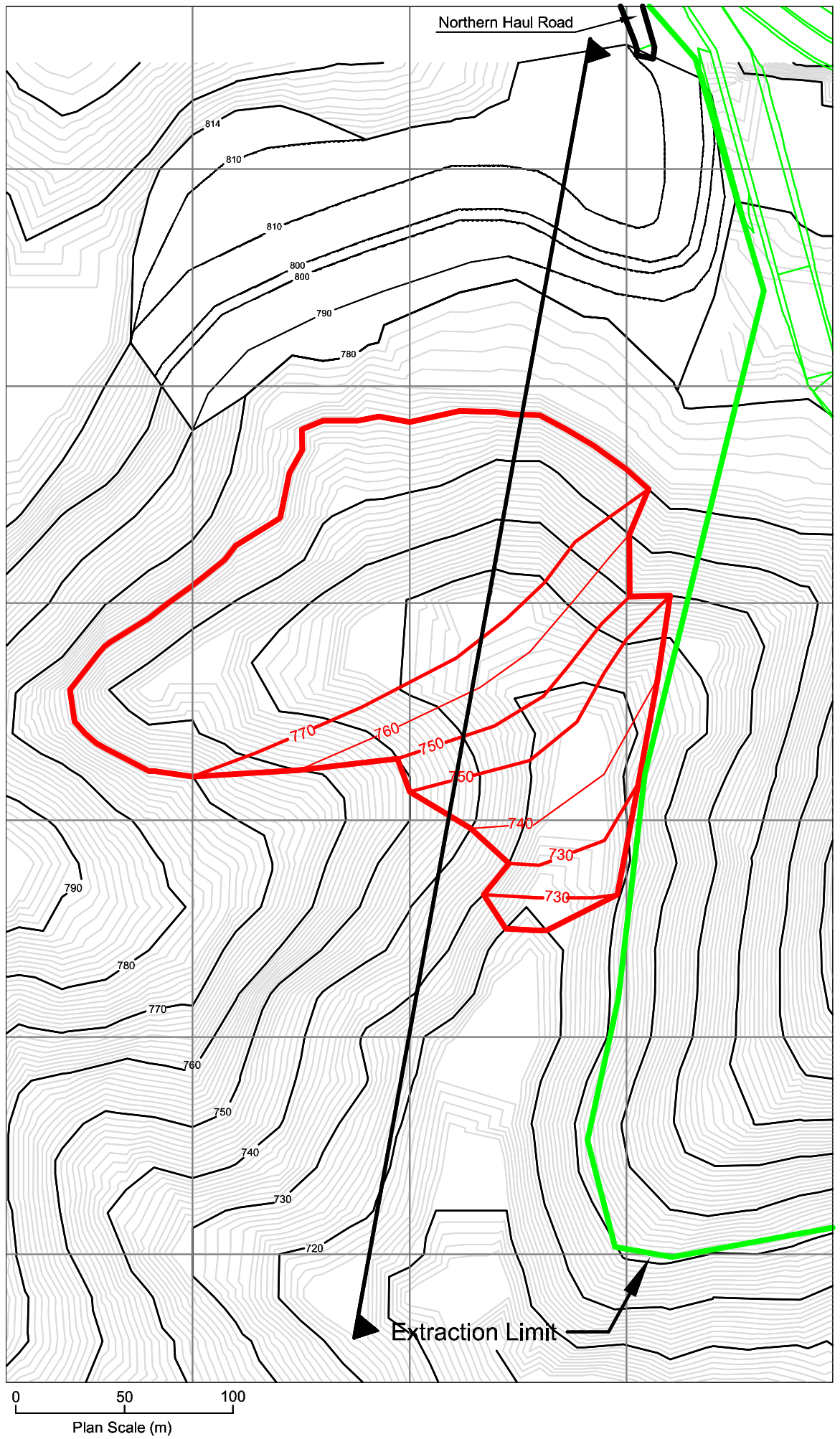
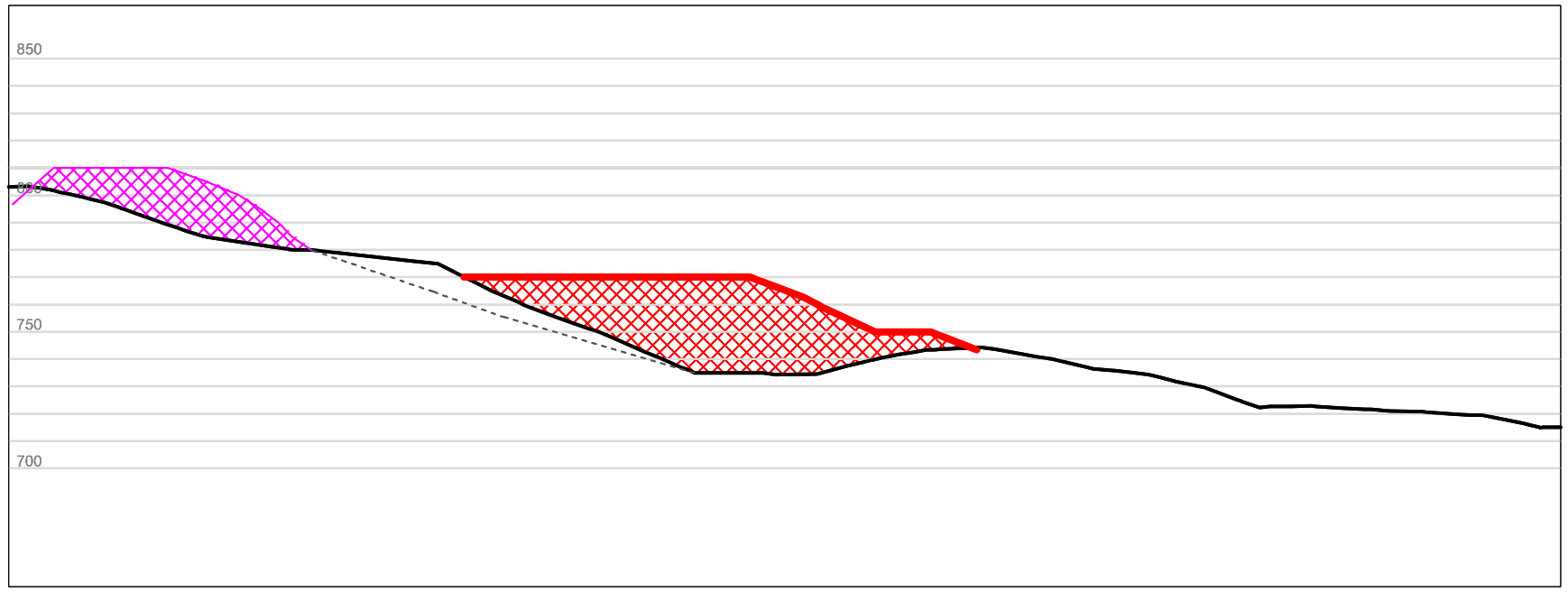
Austen Quarry, Hartley
Stage 1 Overburden Emplacement

EMPLACEMENT PHASE 1, REHABILITATION OF STAGE 1 EMPLACEMENT

PSM167-007R	Figure 5





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Section Scale (m)

1:1 Vertical and Horizontal Scale

Emplacement Phase 2

Access from northern haul road
First lift from 750mAHD
Second lift from 770mAHD

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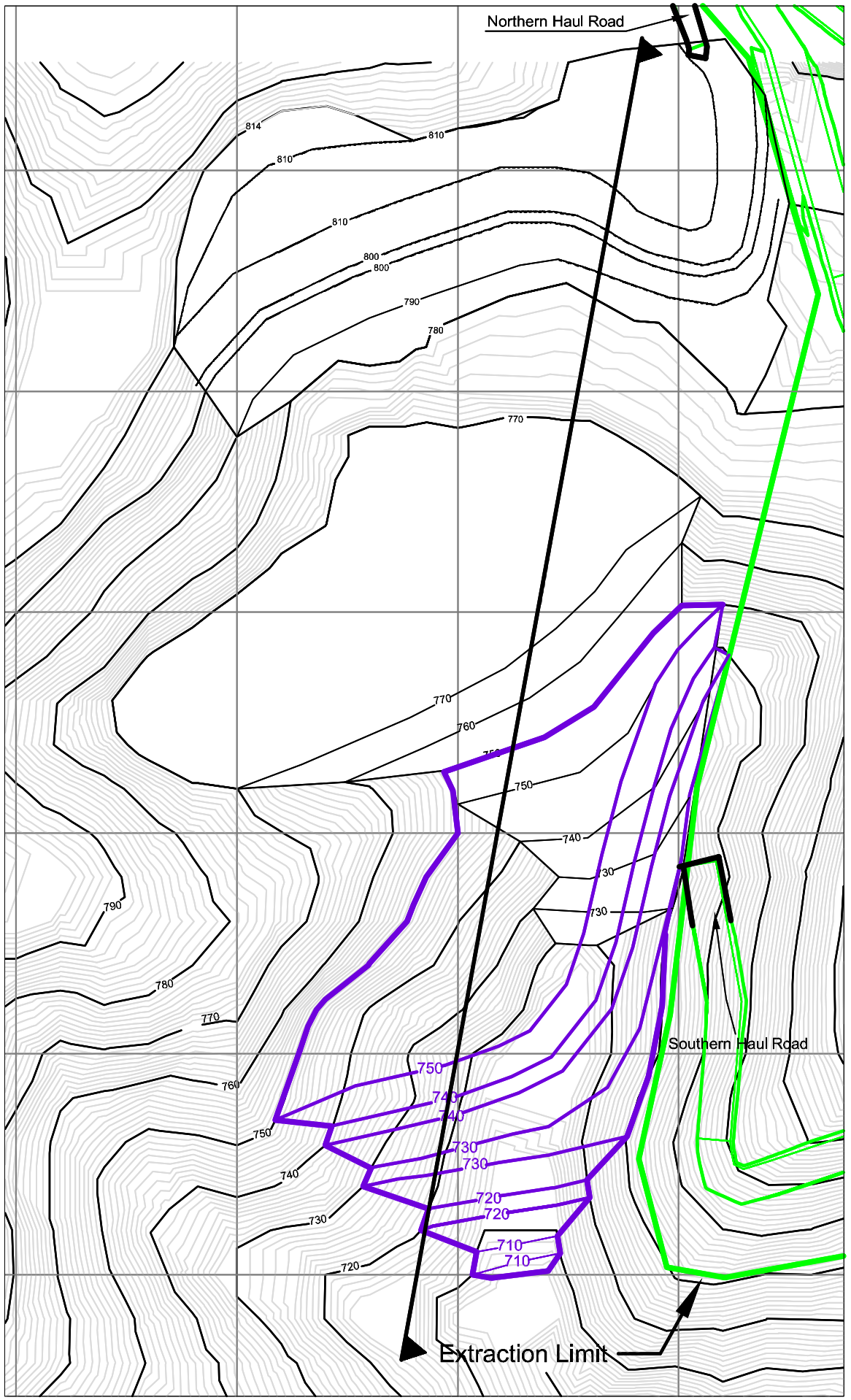
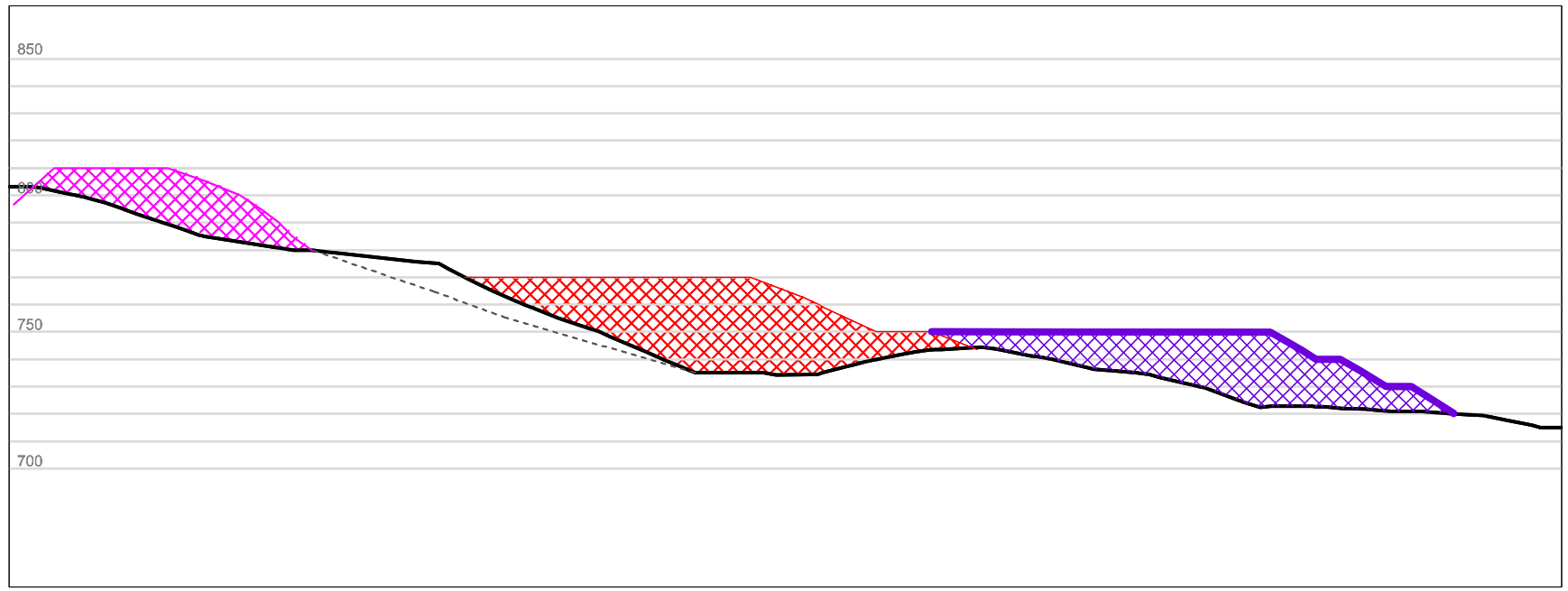
Stage 2 Overburden Emplacement

EMPLACEMENT PHASE 2

PSM167-007R | Figure 6





0 50 100
Section Scale (m)

1:1 Vertical and Horizontal Scale

Emplacement Phase 3

Access from southern haul road
First lift from 730mAHD
Second lift from 750mAHD
Final landform slope at 10m lifts

Hy-Tec Industries Pty Limited
Austen Quarry, Hartley
Stage 2 Overburden Emplacement

EMPLACEMENT PHASE 3

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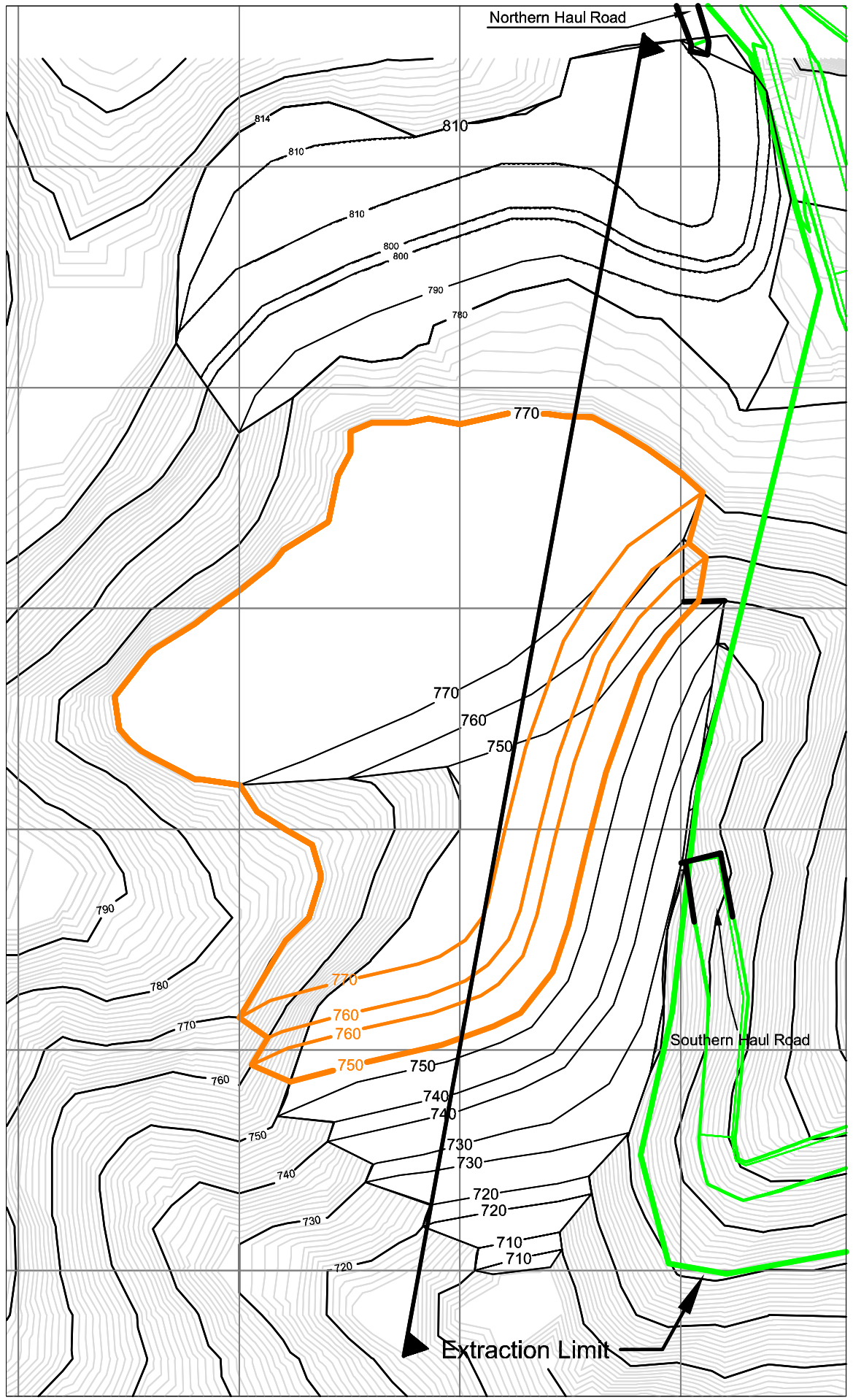
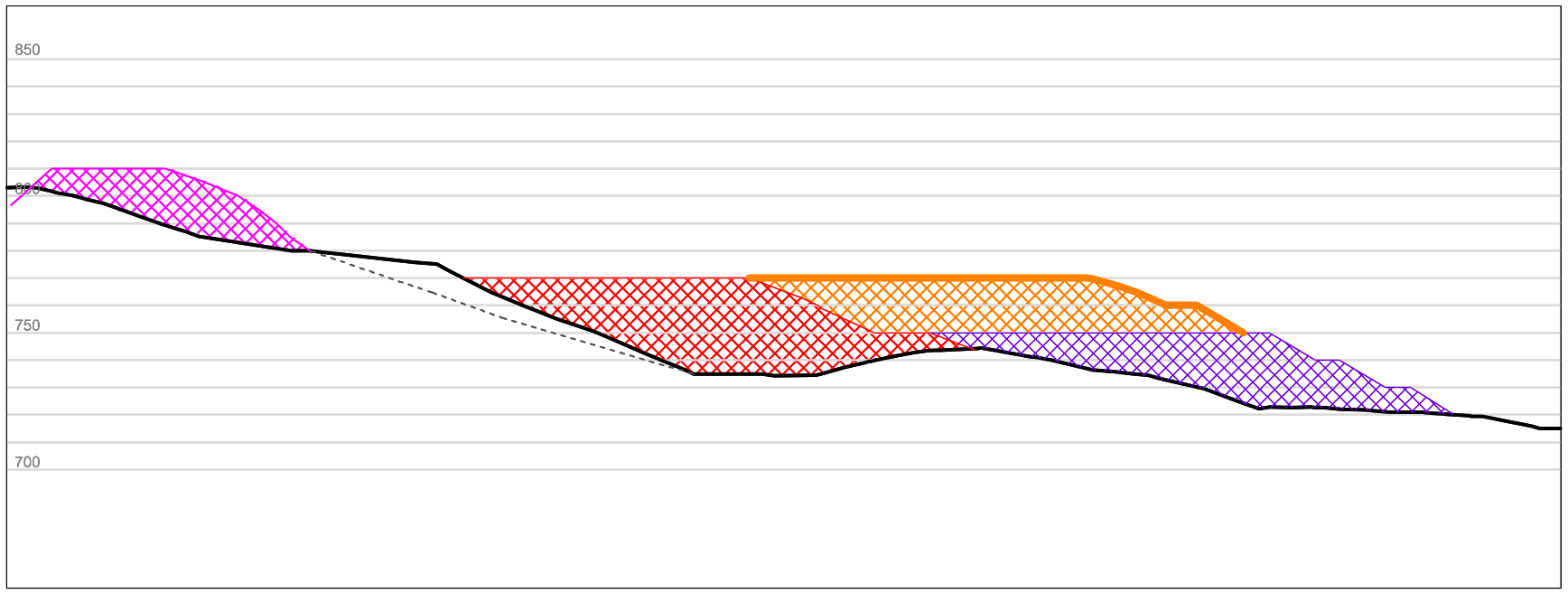
PSM167-007R | Figure 7





Emplacement Phase 4

Access from southern haul road
Lift from 770mAHD
Final landform slope at 10m lifts

0 50 100
Section Scale (m)

1:1 Vertical and Horizontal Scale

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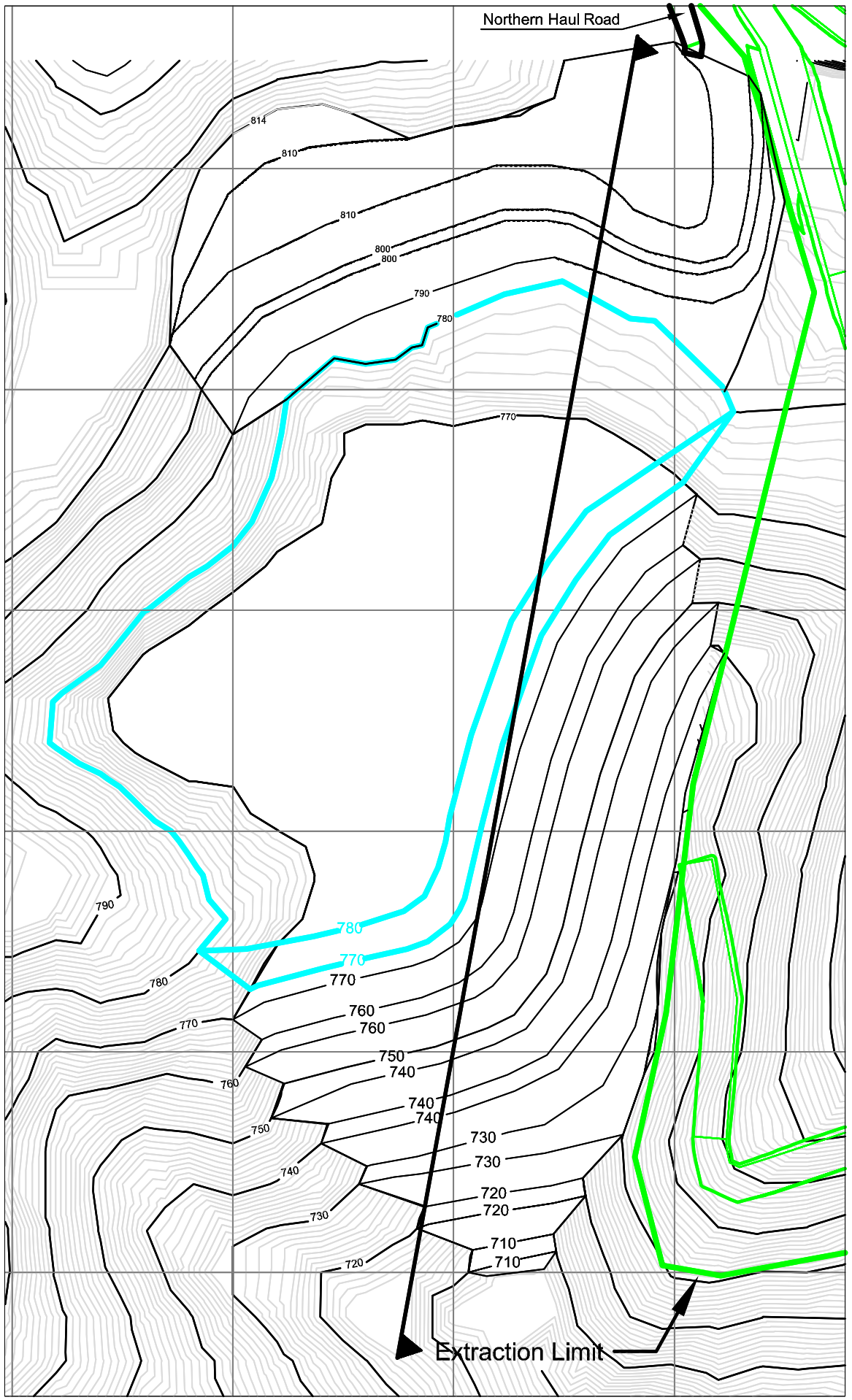
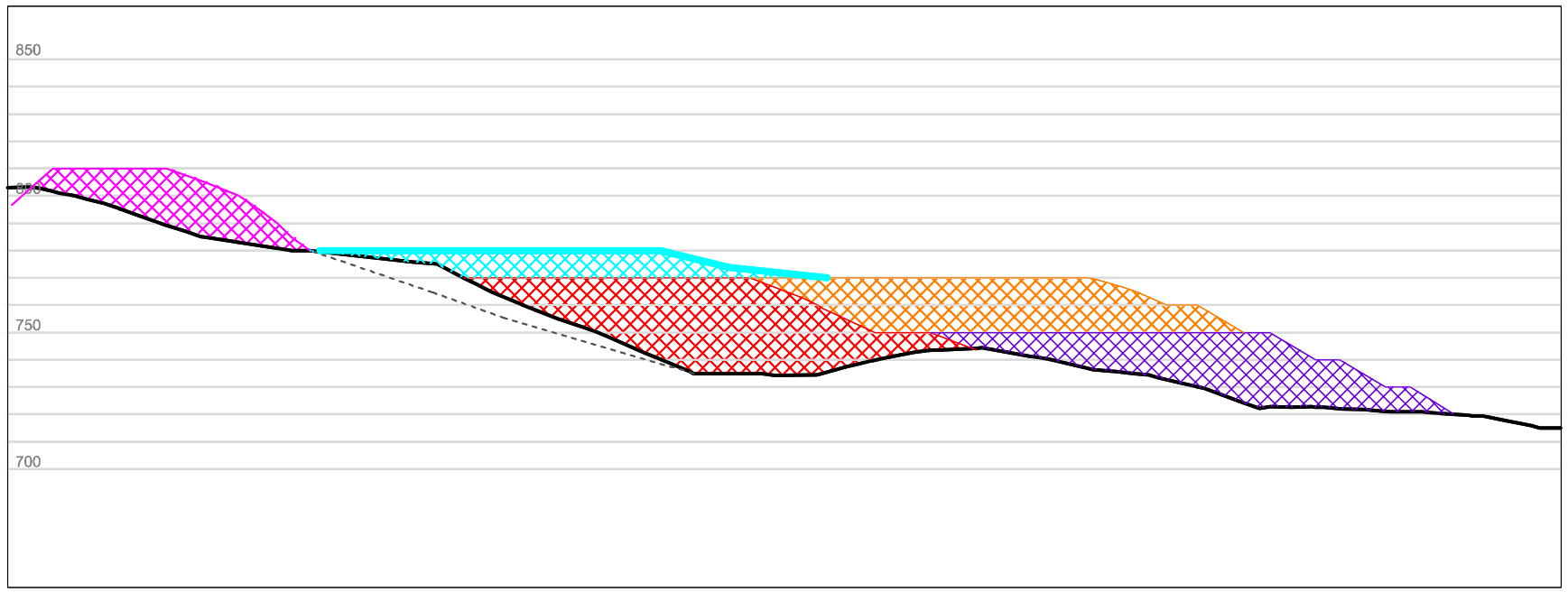
Austen Quarry, Hartley
Stage 2 Overburden Emplacement

EMPLACEMENT PHASE 4

PSM167-007R | Figure 8





0 50 100
Section Scale (m)

1:1 Vertical and Horizontal Scale

Emplacement Phase 5
Access from northern haul road
Lift from 780mAHD
Final landform slope at 10m lifts

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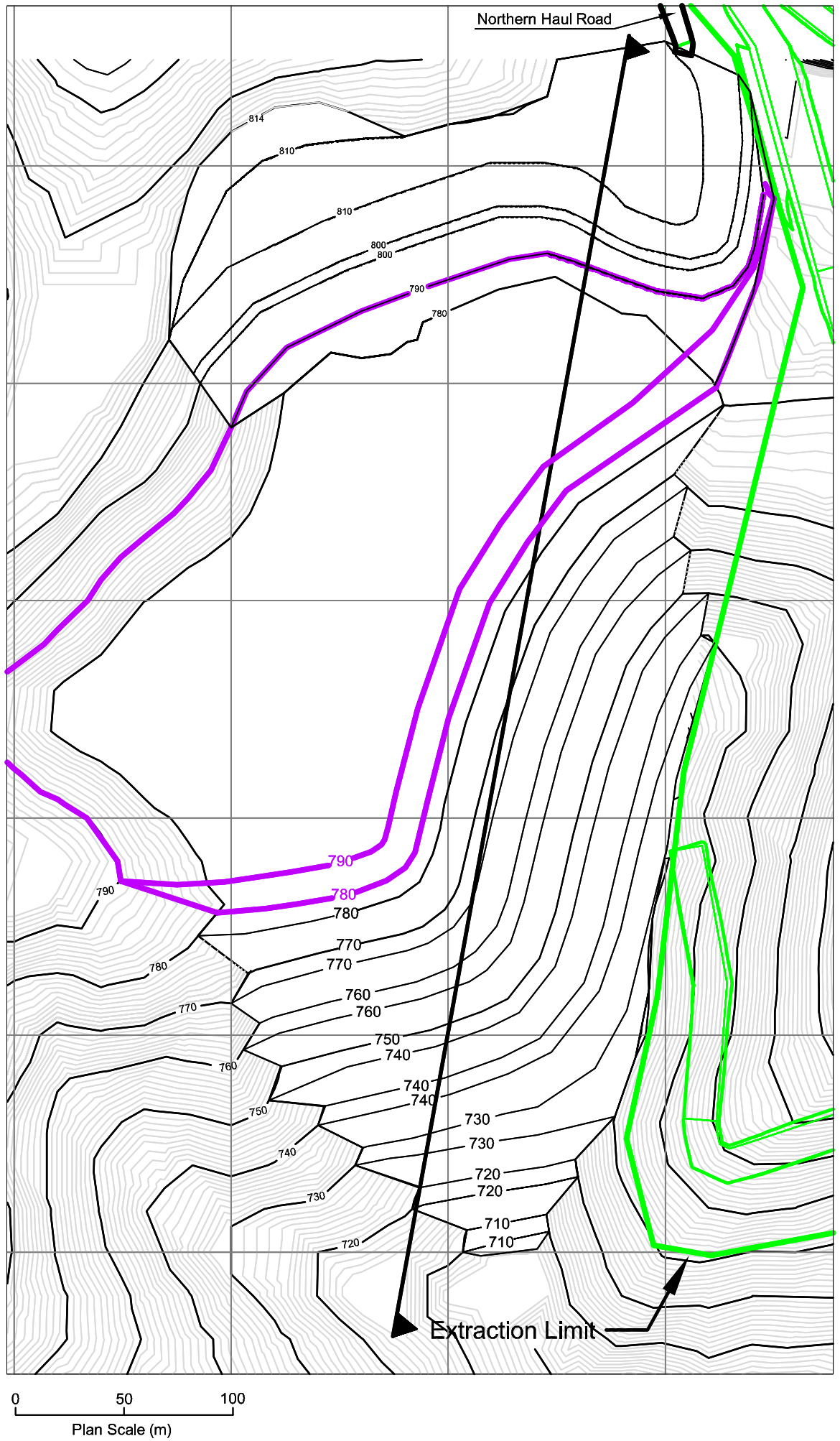
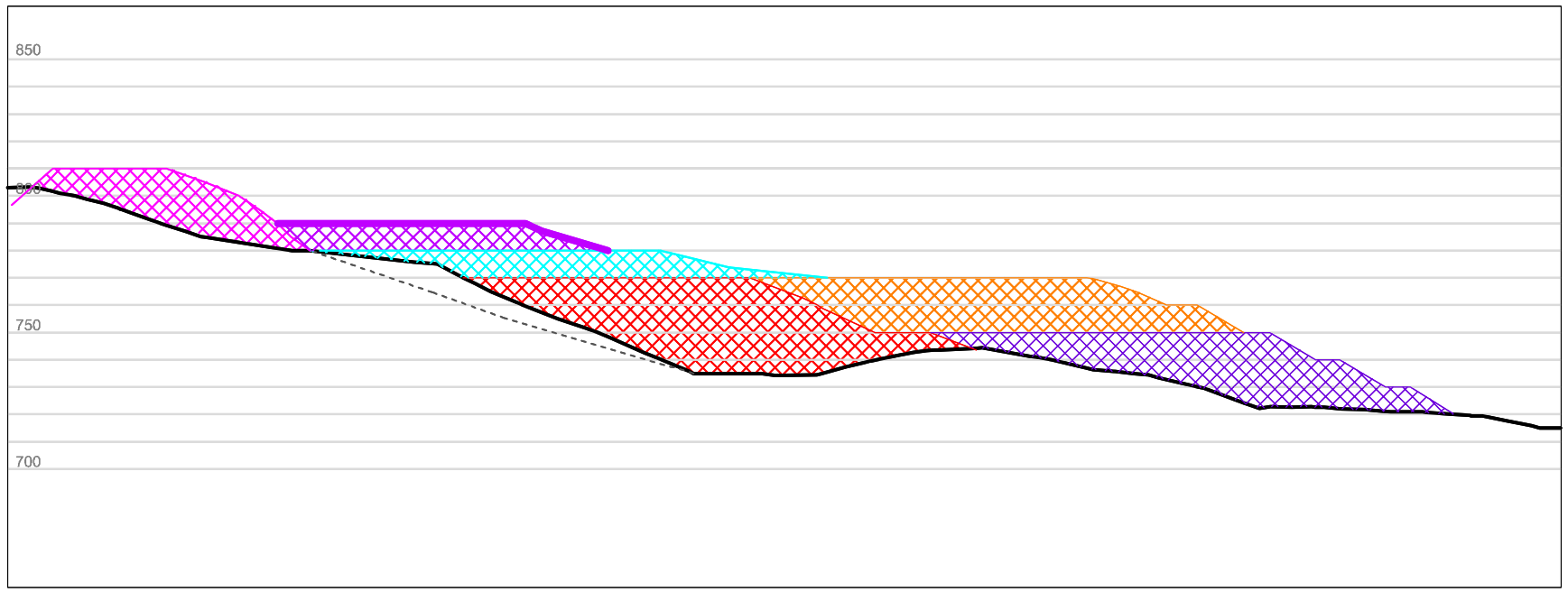
Hy-Tec Industries Pty Limited
Austen Quarry, Hartley
Stage 2 Overburden Emplacement

EMPLACEMENT PHASE 5

PSM167-007R | Figure 9





0 50 100
Section Scale (m)

1:1 Vertical and Horizontal Scale

Emplacement Phase 5
Access from northern haul road
Lift from 790mAHD
Final landform slope at 10m lifts

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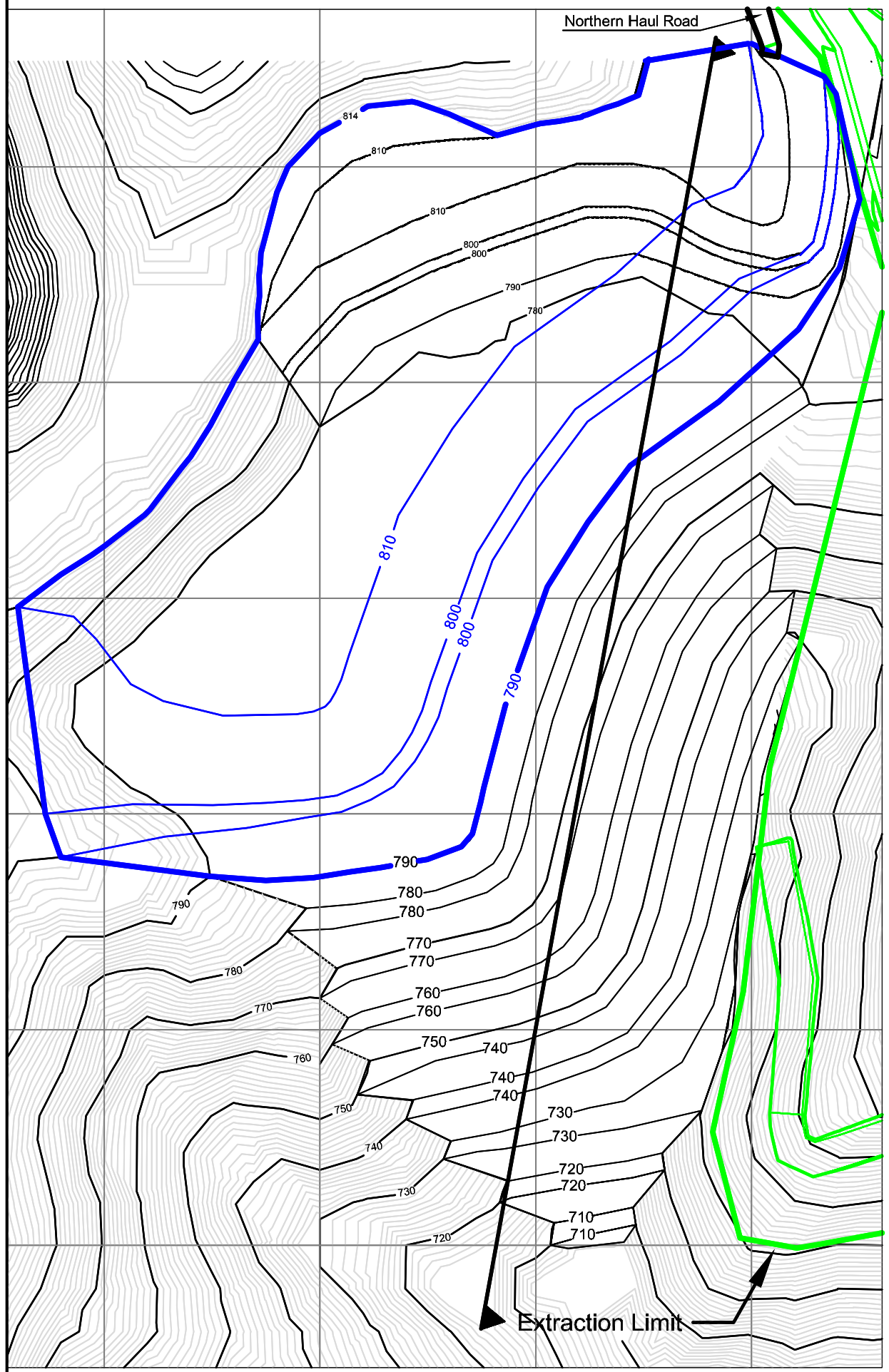
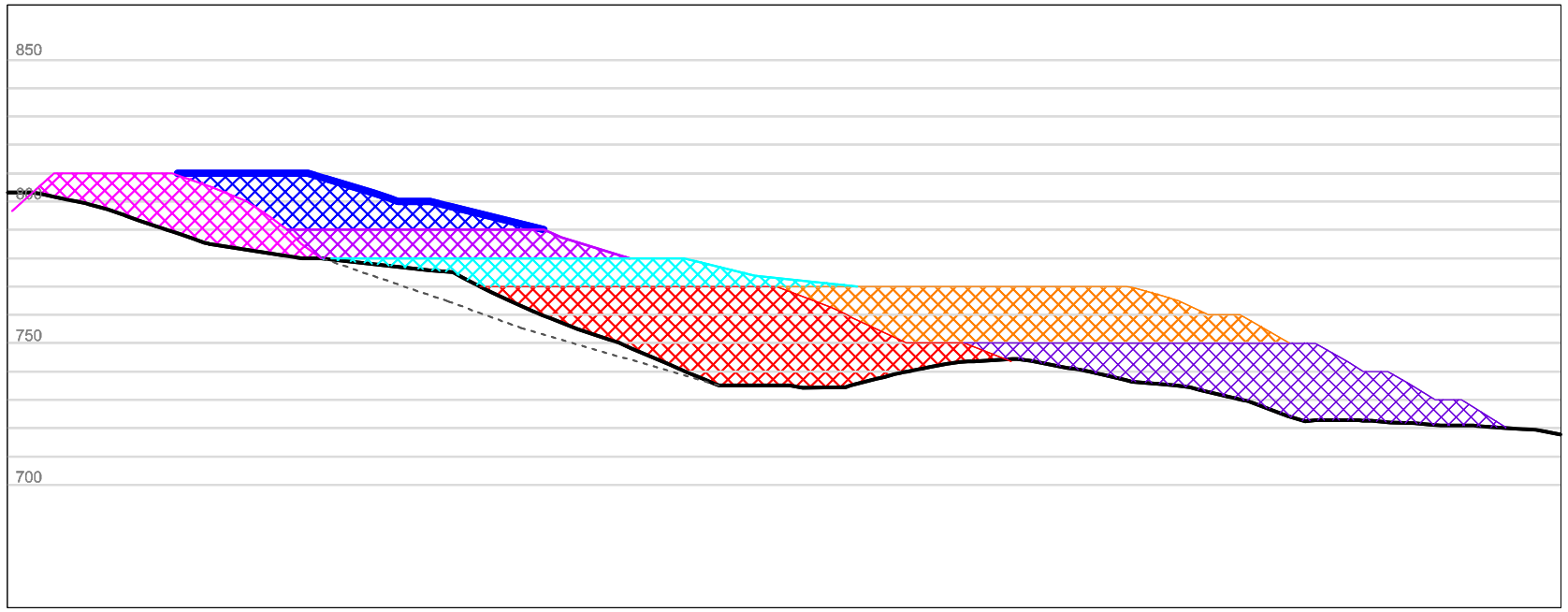
Austen Quarry, Hartley
Stage 2 Overburden Emplacement

EMPLACEMENT PHASE 6

PSM167-007R | Figure 10





0 50 100
Section Scale (m)

Emplacement Phase 7 - Rehabilitation of Stage 2 Emplacement

Access from northern haul road

Build natural landform at 10m lifts

1:1 Vertical and Horizontal Scale

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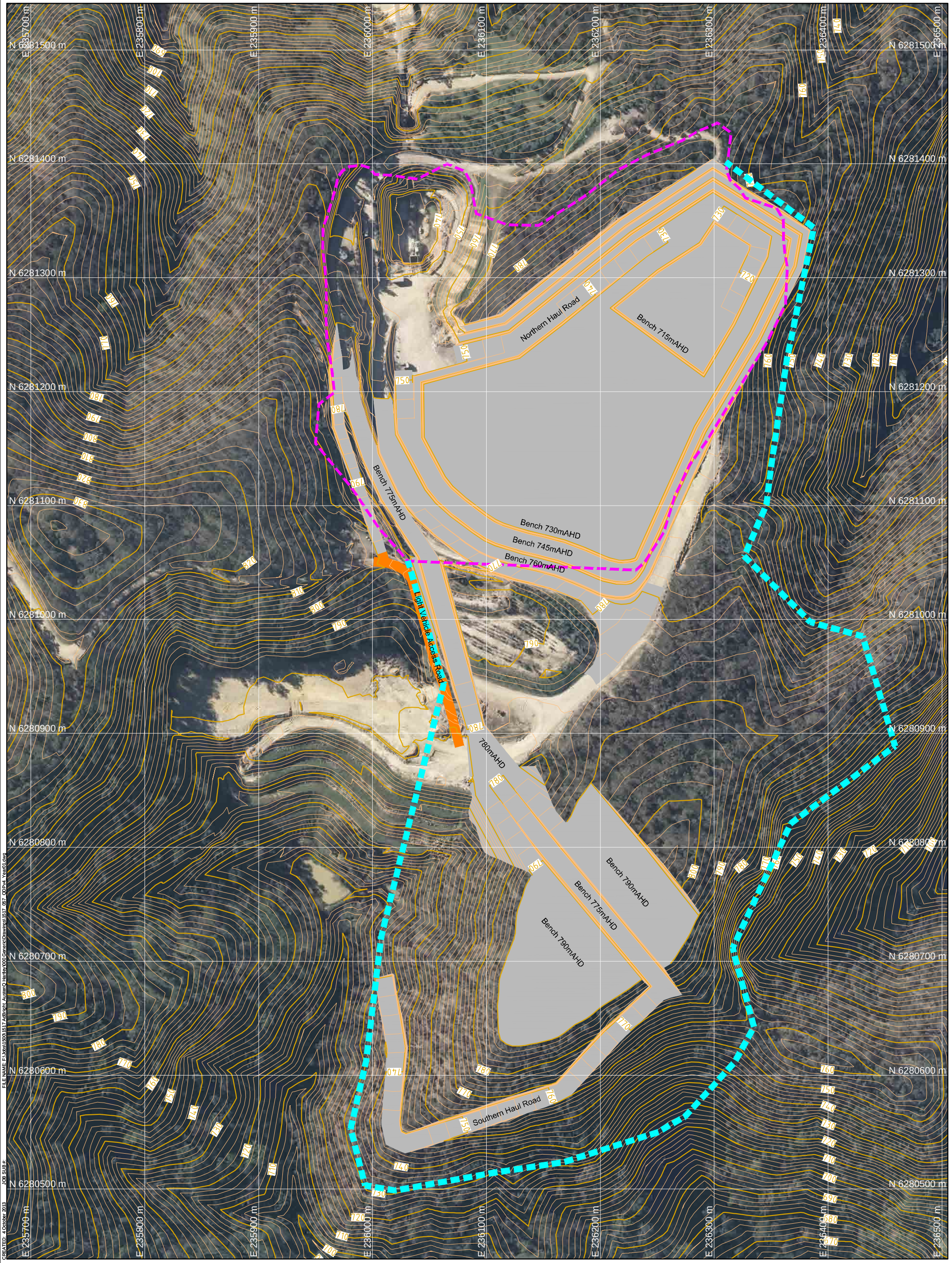
Austen Quarry, Hartley
Stage 2 Overburden Emplacement

EMPLACEMENT PHASE 7, REHABILITATION OF STAGE 2 EMPLACEMENT

PSM167-007R | Figure 11

APPENDIX A

QUARRY PIT DEVELOPMENT PLANS



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Ecosystem:
Other:

Legend:
- Approved Stage 1 Pit Boundary
- Proposed Stage 2 Pit Boundary

PROJECT: Austen Quarry

CLIENT: Hy-Tec Industries Pty Ltd

TITLE: Conceptual Pit Development v4 Stage A

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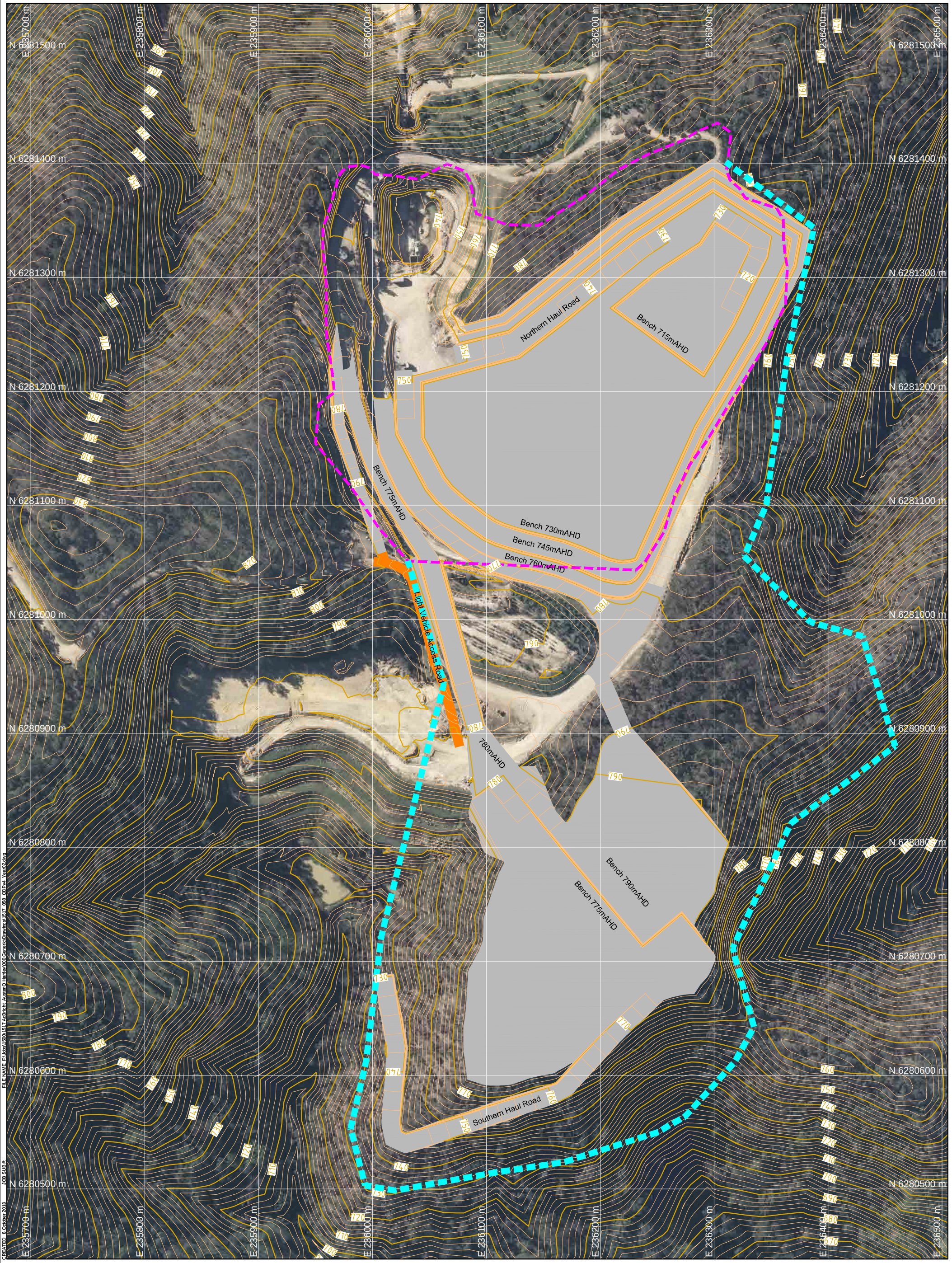

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Ecosystem:
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Legend:
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- Proposed Stage 2 Pit Boundary

PROJECT: Austen Quarry

CLIENT: Hy-Tec Industries Pty Ltd

TITLE: Conceptual Pit Development v4 Stage B

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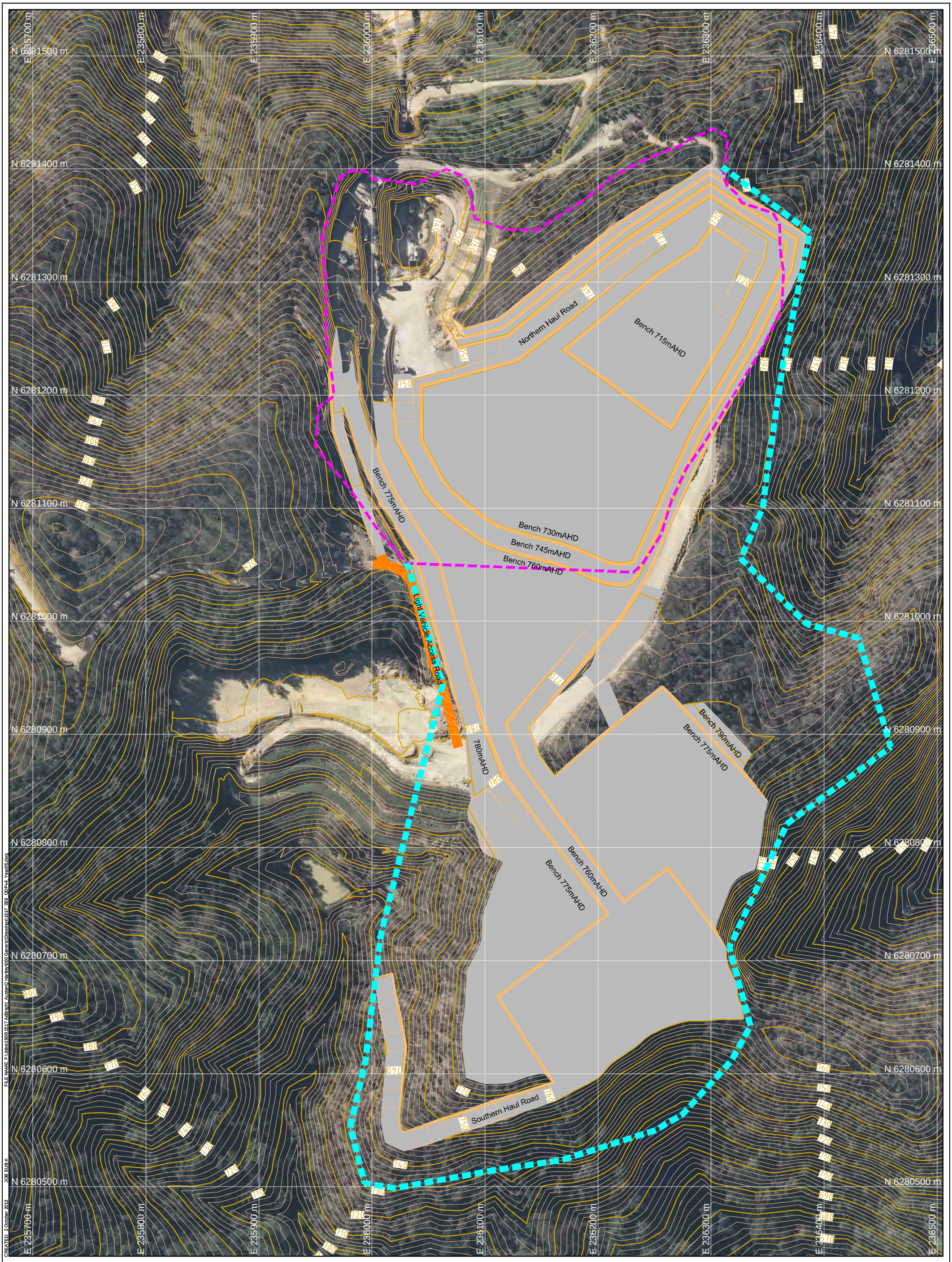

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Ecosystem:
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Legend:
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- Proposed Stage 2 Pit Boundary

PROJECT: Austen Quarry

CLIENT: Hy-Tec Industries Pty Ltd

TITLE: Conceptual Pit Development v4 Stage C

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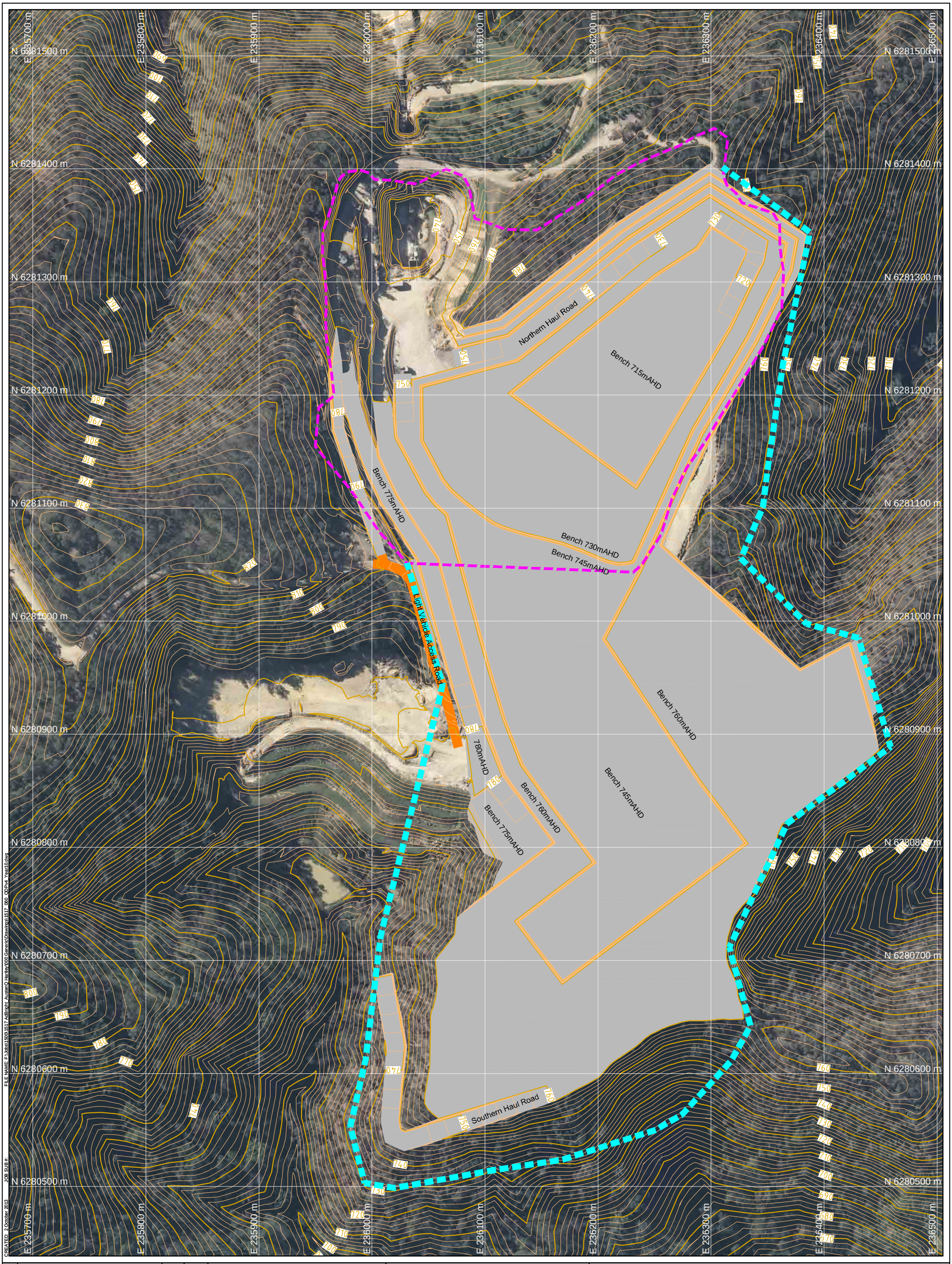

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Ecosystem:
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- Proposed Stage 2 Pit Boundary

PROJECT: Austen Quarry

CLIENT: Hy-Tec Industries Pty Ltd

TITLE: Conceptual Pit Development v4 Stage D

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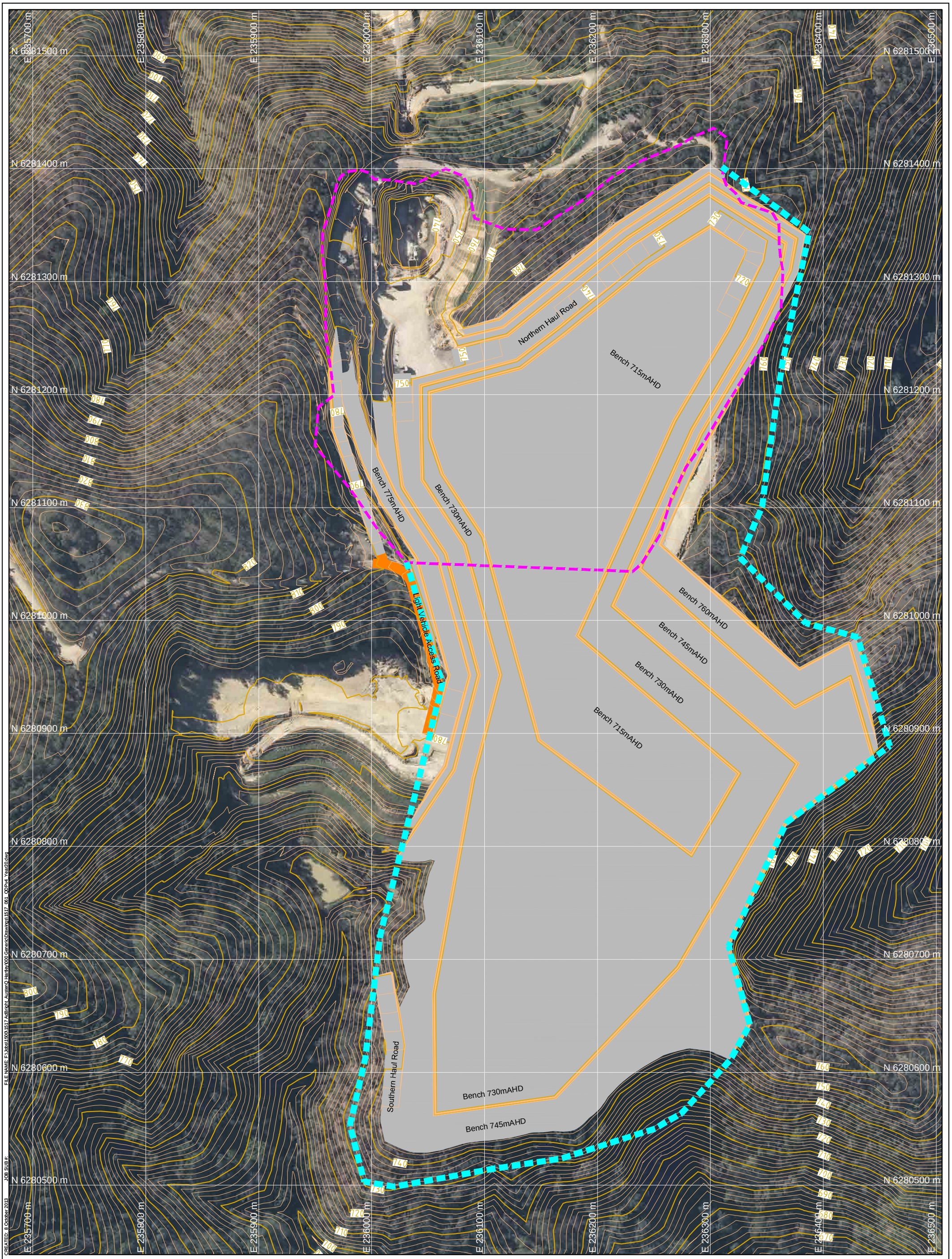

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Topography: Geo-Spectrum (Aust) Pty Ltd. Image date: 2012-04-13
Cadastre:
Ecosystem:
Other:

Legend:
- Approved Stage 1 Pit Boundary
- Proposed Stage 2 Pit Boundary

PROJECT: Austen Quarry

CLIENT: Hy-Tec Industries Pty Ltd

TITLE: Conceptual Pit Development v4 Stage E

GROUNDWORK plus
PH: +61 7 3871 0411
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SCALE: 1:3,000 When Printed On A3 (0 – 60)

DRAWING NUMBER: 1517.061A

REVISION:

DATE: 11 November 2013 DRAWN: MH

PRINTED: 19 November 2013 CHECKED:

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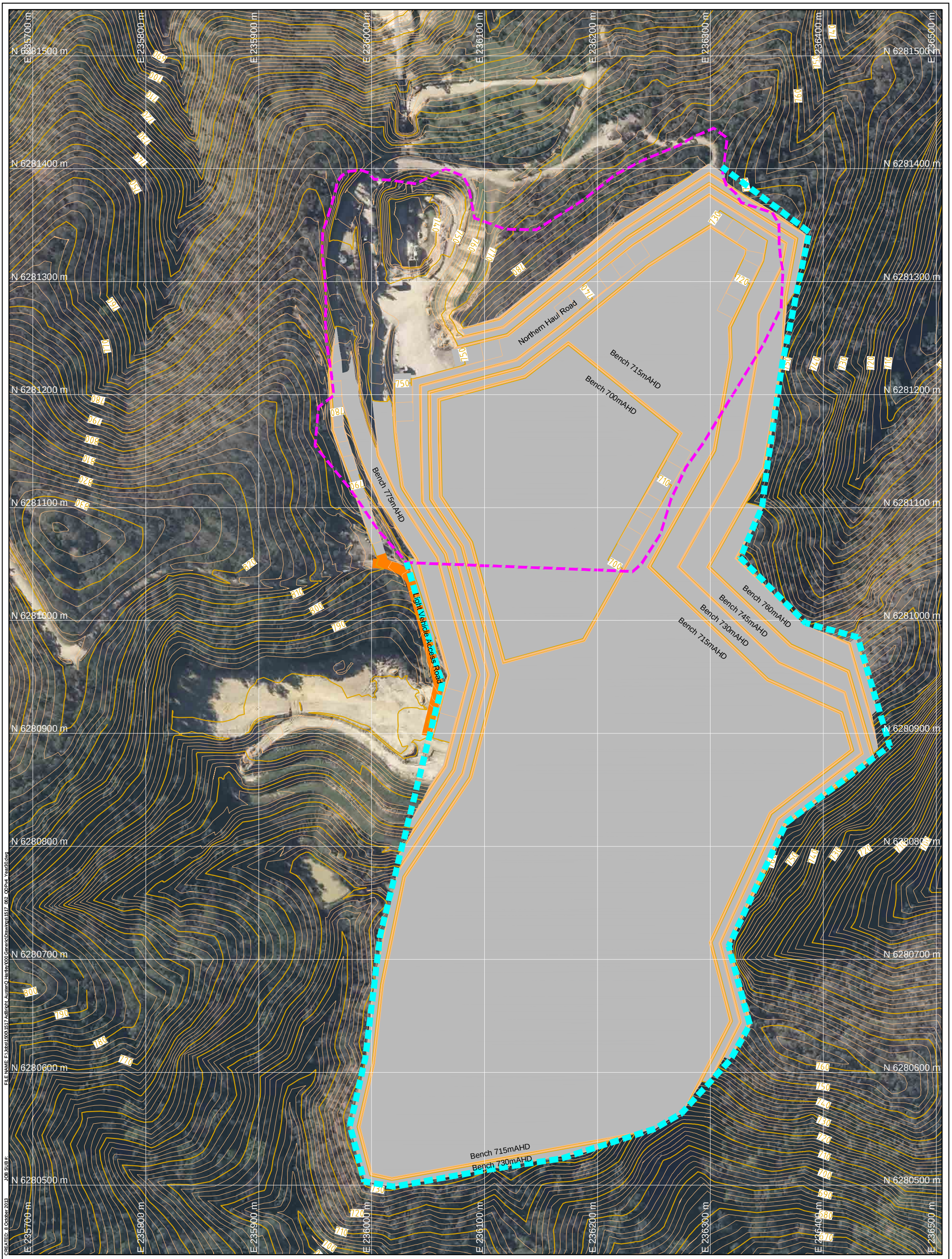

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JOB SUB #:

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Data Sources:
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Cadastre:
Ecosystem:
Other:

Legend:
- Approved Stage 1 Pit Boundary
- Proposed Stage 2 Pit Boundary

PROJECT: Austen Quarry

CLIENT: Hy-Tec Industries Pty Ltd

TITLE: Conceptual Pit Development v4 Stage F

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SCALE: 1:3,000 When Printed On A3 (0 – 60)
DRAWING NUMBER: 1517.062A
REVISION:
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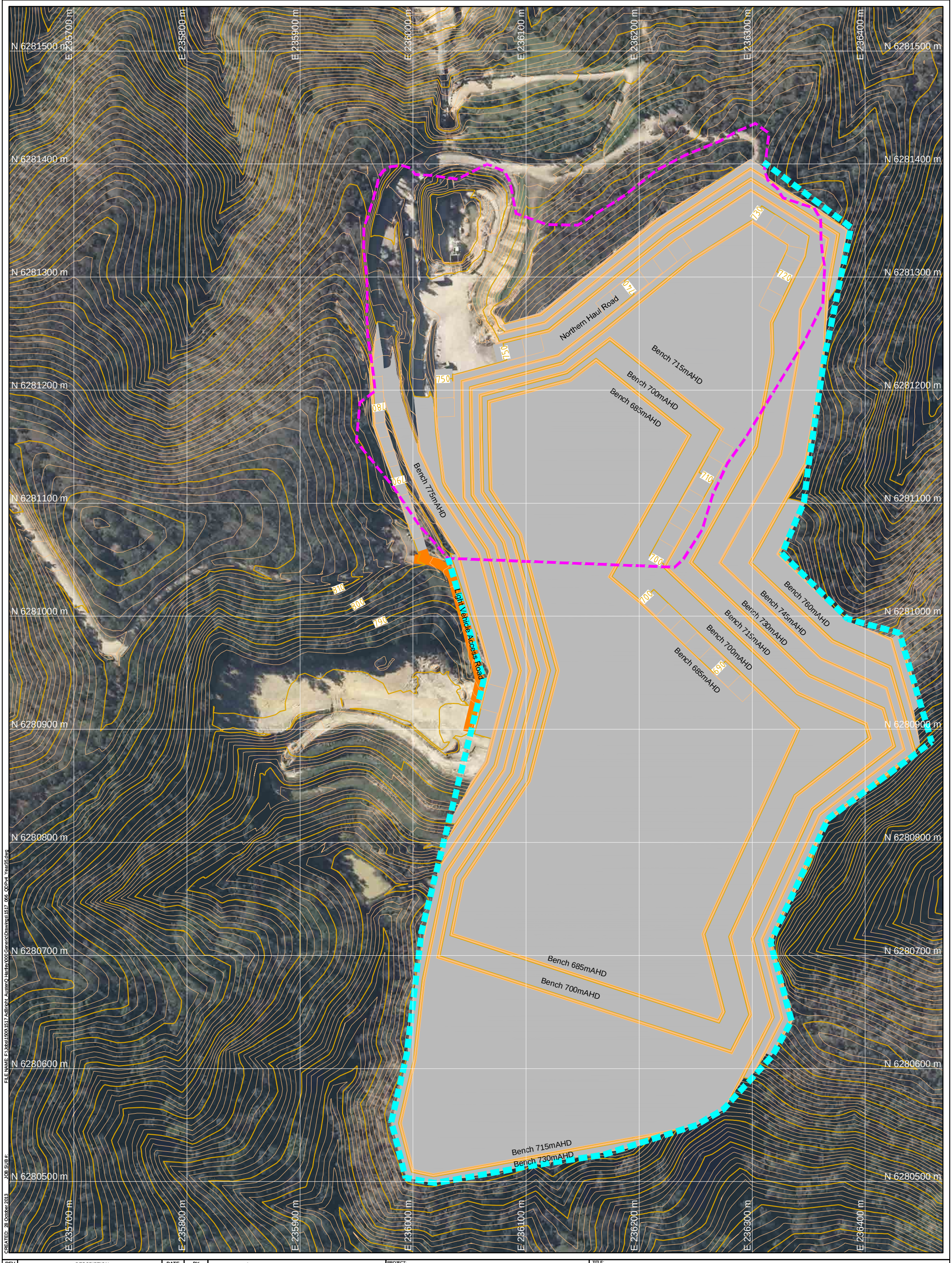

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Cadastre:
Ecosystem:
Other:

Legend:
- Approved Stage 1 Pit Boundary
- Proposed Stage 2 Pit Boundary

PROJECT: Austen Quarry

CLIENT: Hy-Tec Industries Pty Ltd

TITLE: Conceptual Pit Development v4 Stage G

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SCALE: 1:3,000 When Printed On A3 (0 – 60)
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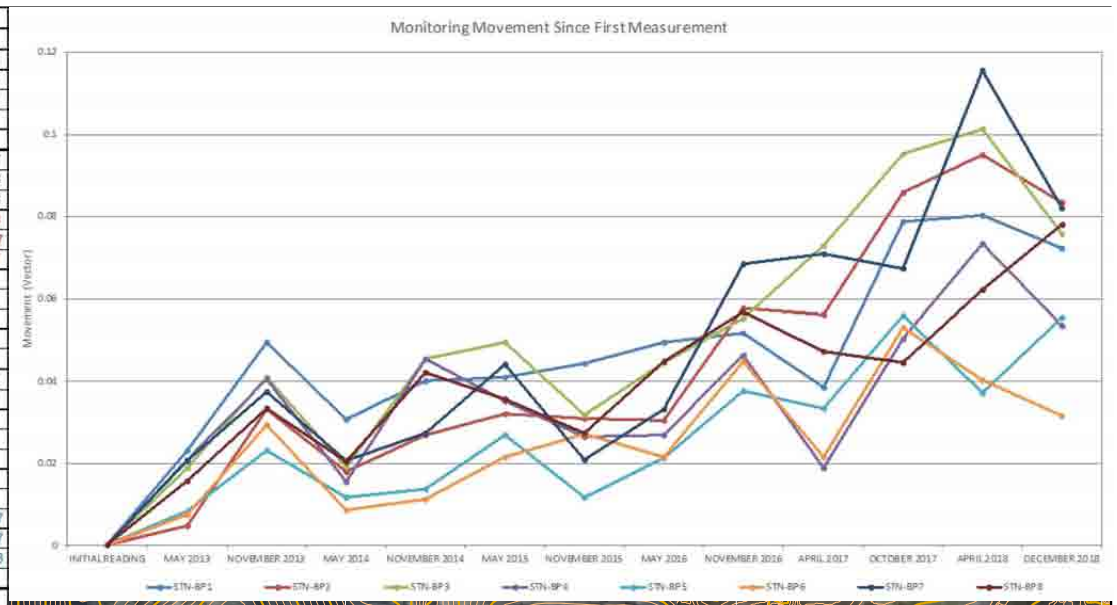
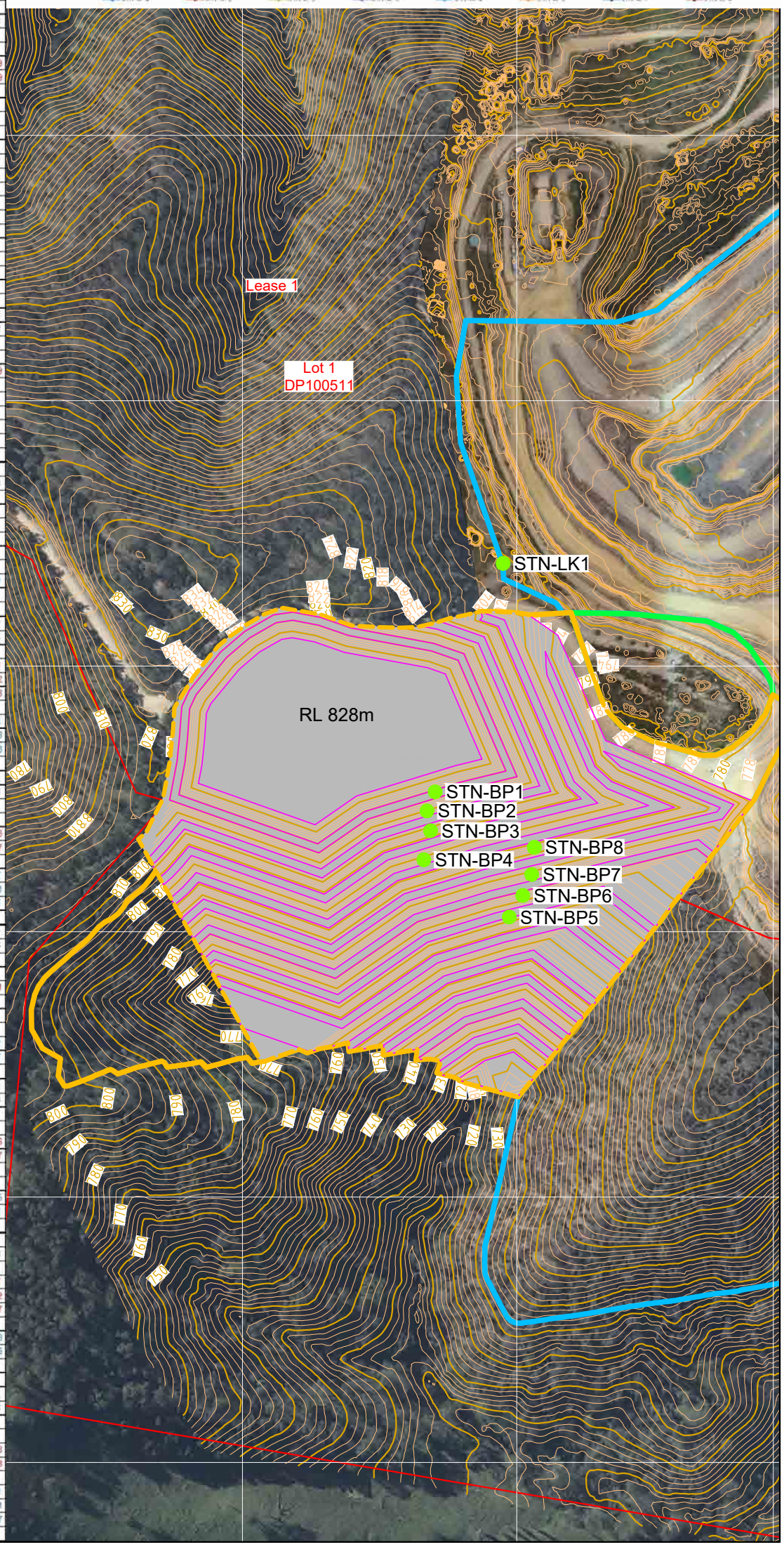
REVISION:
DATE: 18 November 2013
PRINTED: 19 November 2013
DRAWN: MH
CHECKED:
DATUM: HORIZONTAL / VERTICAL / ZONE MGA / AHD / 56

Attachment 2

Monitoring Movement Since First Measurement

Date		Target ID							
		STN-BP1	STN-BP2	STN-BP3	STN-BP4	STN-BP5	STN-BP6	STN-BP7	STN-BP8
INITIAL READING	Easting	235945.1115	235938.936	235941.6495	235936.637	236000.938	236011.161	236017.931	236019.833
	Northing	6280905.321	6280890.876	6280875.907	6280854.099	6280810.903	6280827.175	6280843.02	6280863.401
	RL	777.184	770.6815	764.2865	755.814	754.046	762.37	768.6755	778.457
	Vector Distance	0	0	0	0	0	0	0	0
MAY 2013	Easting	235945.1127	235938.939	235941.6493	235936.64	236000.9423	236011.165	236017.9357	236019.8317
	Northing	6280905.312	6280890.873	6280875.899	6280854.089	6280810.899	6280827.175	6280843.026	6280863.403
	RL	777.1626667	770.6843333	764.2693333	755.796	754.04	762.3636667	768.6563333	778.4413333
	Δ East Since FIRST Reading	-0.001166667	-0.003	0.000166667	-0.003	-0.004333333	-0.004	-0.004666667	0.001333333
	Δ North Since FIRST Reading	0.009000001	0.0025	0.007666667	0.010000001	0.003666668	0	-0.006	-0.001666667
	Δ Height Since FIRST Reading	0.021333333	-0.002833333	0.017166667	0.018	0.006	0.006333333	0.019166667	0.015666667
	Vector Distance	**0.0232**	**0.0048**	**0.0188**	**0.0208**	**0.0083**	**0.0075**	**0.0206**	**0.0158**
	Δ East Since LAST Reading								
	Δ North Since LAST Reading								
	Δ Height Since LAST Reading								
	Vector Distance								
NOVEMBER 2013	Easting	235945.106	235938.931	235941.644	235936.628	236000.920	236011.146	236017.927	236019.816
	Northing	6280905.318	6280890.871	6280875.909	6280854.088	6280810.900	6280827.178	6280843.009	6280863.391
	RL	777.135	770.649	764.246	755.776	754.032	762.345	768.640	778.430
	Δ East Since FIRST Reading	-0.0055	-0.005	-0.0065	-0.009	-0.018	-0.015	-0.004	-0.017
	Δ North Since FIRST Reading	-0.003	-0.0045	0.002	-0.010999999	-0.003	0.003	-0.011	-0.01
	Δ Height Since FIRST Reading	-0.049	-0.0325	-0.0405	-0.038	-0.014	-0.025	-0.0355	-0.027
	Vector Distance	**0.0494**	**0.0332**	**0.0409**	**0.0406**	**0.0230**	**0.0293**	**0.0374**	**0.0334**
	Δ East Since LAST Reading	-0.006666667	-0.008	-0.005333333	-0.012	-0.022333333	-0.019	-0.008666667	-0.015666667
	Δ North Since LAST Reading	0.006	-0.001999999	0.009666667	-0.000999998	0.000666668	0.003	-0.017	-0.011666667
	Δ Height Since LAST Reading	-0.027666667	-0.035333333	-0.023333333	-0.02	-0.008	-0.018666667	-0.016333333	-0.011333333
	Vector Distance	0.0291	0.0363	0.0268	0.0233	0.0237	0.0268	0.0251	0.0226
MAY 2014	Easting	235945.115	235938.939	235941.649	235936.640	236000.929	236011.157	236017.929	236019.824
	Northing	6280905.299	6280890.864	6280875.890	6280854.091	6280810.900	6280827.172	6280843.018	6280863.394
	RL	777.163	770.668	764.278	755.801	754.053	762.363	768.655	778.44
	Δ East Since FIRST Reading	0.0035	0.003	-0.0005	0.003	-0.009	-0.004	-0.002	-0.009
	Δ North Since FIRST Reading	-0.022000001	-0.0115	-0.017	-0.007999999	-0.003	-0.003	-0.001999999	-0.006999999
	Δ Height Since FIRST Reading	-0.032000001	-0.0215	-0.027	-0.017999999	-0.013	-0.013	-0.011999999	-0.016999999
	Vector Distance	**0.0306**	**0.0180**	**0.0190**	**0.0156**	**0.0118**	**0.0086**	**0.0207**	**0.0205**
	Δ East Since LAST Reading	-0.009	-0.008	-0.005	-0.012	-0.009	-0.011	-0.002	-0.006
	Δ North Since LAST Reading	0.009	-0.003	0.009	-0.013	-0.01	-0.004	-0.019000001	-0.013
	Δ Height Since LAST Reading	-0.028	-0.019	-0.032	-0.025	-0.021	-0.018	-0.015	-0.01
	Vector Distance	0.0350	0.0218	0.0375	0.0279	0.0228	0.0219	0.0176	0.0132
NOVEMBER 2014	Easting	235945.120	235938.940	235941.650	235936.630	236000.940	236011.160	236017.930	236019.830
	Northing	6280905.290	6280890.860	6280875.880	6280854.090	6280810.890	6280827.170	6280843.010	6280863.381
	RL	777.160	770.660	764.250	755.770	754.050	762.360	768.650	778.420
	Δ East Since FIRST Reading	0.0085	0.004	0.0005	-0.007	0.002	-0.001	-0.001	-0.003
	Δ North Since FIRST Reading	-0.031	-0.0155	-0.027	-0.009	-0.013000001	-0.005	-0.01	-0.02
	Δ Height Since FIRST Reading	-0.024	-0.0215	-0.0365	-0.044	0.004	-0.01	-0.0255	-0.037
	Vector Distance	**0.0401**	**0.0268**	**0.0454**	**0.0455**	**0.0137**	**0.0112**	**0.0274**	**0.0422**
	Δ East Since LAST Reading	0.005	0.001	0.001	-0.01	0.011	0.003	0.001	0.006
	Δ North Since LAST Reading	-0.009	-0.004	-0.01	-0.001	-0.010000001	-0.002	-0.008	-0.013
	Δ Height Since LAST Reading	-0.003	-0.008	-0.028	-0.031	-0.003	-0.003	-0.005	-0.02
	Vector Distance	0.0107	0.0090	0.0297	0.0326	0.0152	0.0047	0.0095	0.0246
MAY 2015	Easting	235945.099	235938.927	235941.650	235936.625	236000.926	236011.165	236017.927	236019.828
	Northing	6280905.287	6280890.845	6280875.860	6280854.066	6280810.879	6280827.154	6280842.979	6280863.372
	RL	777.165	770.678	764.271	755.812	754.048	762.373	768.660	778.437
	Δ East Since FIRST Reading	-0.0125	-0.009	0.0005	-0.012	-0.012	0.004	-0.004	-0.005
	Δ North Since FIRST Reading	-0.034000001	-0.0305	-0.046999999	-0.033	-0.024000001	-0.021	-0.040999999	-0.028999999
	Δ Height Since FIRST Reading	-0.019	-0.0035	-0.0155	-0.002	0.002	0.003	-0.0155	-0.02
	Vector Distance	**0.0409**	**0.0320**	**0.0495**	**0.0352**	**0.0269**	**0.0216**	**0.0440**	**0.0356**
	Δ East Since LAST Reading	-0.021	-0.013	0	-0.005	-0.014	0.005	-0.003	-0.002
	Δ North Since LAST Reading	-0.003	-0.015000001	-0.02	-0.024	-0.011	-0.016	-0.030999999	-0.009
	Δ Height Since LAST Reading	0.005	0.018	0.021	0.042	-0.002	0.013	0.01	0.017
	Vector Distance	0.0218	0.0268	0.0290	0.0486	0.0179	0.0212	0.0327	0.0193
NOVEMBER 2015	Easting	235945.115	235938.942	235941.646	235936.631	236000.931	236011.153	236017.920	236019.837
	Northing	6280905.277	6280890.847	6280875.878	6280854.093	6280810.900	6280827.175	6280843.005	6280863.380
	RL	777.179	770.671	764.274	755.789	754.037	762.344	768.666	778.440
	Δ East Since FIRST Reading	0.0035	0.008	-0.0035	-0.006	-0.007	-0.008	-0.011	0.004
	Δ North Since FIRST Reading	-0.044000001	-0.0285	-0.029	-0.005999999	-0.003	0	-0.015	-0.021
	Δ Height Since FIRST Reading	-0.005	-0.0105	-0.0125	-0.025	-0.009	-0.026	-0.0095	-0.017
	Vector Distance	**0.0444**	**0.0310**	**0.0318**	**0.0264**	**0.0118**	**0.0272**	**0.0209**	**0.0273**
	Δ East Since LAST Reading	0.016	0.015	-0.004	0.006	0.005	-0.012	-0.007	0.009
	Δ North Since LAST Reading	-0.01	0.002	0.017999999	0.027000001	0.021000001	0.021	0.026	-0.007999999
	Δ Height Since LAST Reading	0.014	-0.007	0.003	-0.023	-0.011	-0.029	0.006	0.003
	Vector Distance	0.0235	0.0167	0.0187	0.0360	0.0242	0.0378	0.0276	0.0124
MAY 2016	Easting	235945.103	235938.943	235941.650	235936.642	236000.921	236011.158	236017.917	236019.837
	Northing	6280905.273	6280890.846	6280875.863	6280854.078	6280810.890	6280827.155	6280842.990	6280863.374
	RL	777.178	770.680	764.279	755.797	754.042	762.363	768.673	778.422
	Δ East Since FIRST Reading	-0.008833333	0.007333333	0.000166667	0.004666667	-0.016666667	-0.003	-0.013666667	0.004333333
	Δ North Since FIRST Reading	-0.048333333	-0.0295	-0.043999999	-0.020666665	-0.012666667	-0.02	-0.029999999	-0.027333332
	Δ Height Since FIRST Reading	-0.006333333	-0.001833333	-0.007166667	-0.016666667	-0.004333333	-0.007333333	-0.002833333	-0.035333333
	Vector Distance	**0.0495**	**0.0305**	**0.0446**	**0.0270**	**0.0214**	**0.0215**	**0.0331**	**0.0449**
	Δ East Since LAST Reading	-0.012333333	0.001333333	0.003666667	0.010666667	-0.009666667	0.005	-0.002666667	0.000333333
	Δ North Since LAST Reading	-0.004333332	-0.001	-0.014999999	-0.014666666	-0.009666666	-0.02	-0.015	-0.006333333
	Δ Height Since LAST Reading	-0.001333333	0.008666667	0.005333333	0.008333333	0.004666667	0.018666667	0.006666667	-0.018333333
	Vector Distance								
NOVEMBER 2016	Easting	235945.109	235938.948	235941.660	235936.642	236000.931	236011.161	236017.927	236019.838
	Northing	6280905.280	6280890.819	6280875.853	6280854.069	6280810.867	6280827.148	6280842.967	6280863.353
	RL	777.153	770.684	764.278	755.779	754.037	762.334	768.633	778.427
	Δ East Since FIRST Reading	-0.002166667	0.012	0.010166667	0.005	-0.006666667	0	-0.003666667	0.005
	Δ North Since FIRST Reading	-0.041333334	-0.0565	-0.053666666	-0.029666665	-0.036	-0.026666665	-0.053333333	-0.048333333
	Δ Height Since FIRST Reading	-0.031	0.002166667	-0.008166667	-0.035333333	-0.009	-0.036	-0.042833333	-0.029666667
	Vector Distance	**0.0517**	**0.0578**	**0.0552**	**0.0464**	**0.0377**	**0.0448**	**0.0685**	**0.0569**
	Δ East Since LAST Reading	0.006666667	0.004666667	0.01	0.000333333	0.01	0.003	0.01	0.006666667
	Δ North Since LAST Reading	0.006999999	-0.027	-0.009666667	-0.009	-0.023333333	-0.006666666	-0.023333333	-0.021000001
	Δ Height Since LAST Reading	-0.024666667	0.004	-0.001	-0.018666667	-0.004666667	-0.028666667	-0.04	0.005666667
	Vector Distance	0.0265	0.0277	0.0139	0.0207	0.0258	0.0296	0.0474	0.0218
APRIL 2017	Easting	235945.099	235938.927	235941.650	235936.625	236000.926	236011.165	236017.927	236019.828
	Northing	6280905.283	6280890.820	6280875.834	6280854.087	6280810.870	6280827.155	6280842.951	6280863.366
	RL	777.187	770.683	764.288	755.800	754.042	762.365	768.678	778.426
	Δ East Since FIRST Reading	0.00075	0.00875	0.0005	0.00425	-0.00025	0.0055	-0.0135	0.0125
	Δ North Since FIRST Reading	-0.038500001	-0.0555	-0.073	-0.01175	-0.033000001	-0.020249999	-0.069499999	-0.034750001
	Δ Height Since FIRST Reading	0.00275	0.00125	0.00175	-0.014	-0.0045	-0.005	0.002	-0.0295
	Vector Distance	**0.0386**	**0.0562**	**0.0730**	**0.0188**	**0.0333**	**0.0216**	**0.0708**	**0.0473**
	Δ East Since LAST Reading	0.002916667	-0.00325	-0.009666667	-0.00075	0.006416667	0.0055	-0.009833333	0.0075
	Δ North Since LAST Reading	0.002833333	0.001	-0.019333334	0.017916665	0.003	0.006416666	-0.016166667	0.013583332
	Δ Height Since LAST Reading	0.03375	-0.008916667	0.009916667	0.021333333	0.0045	0.031	0.044833333	0.000166667
	Vector Distance	0.0340	0.0035	0.0238	0.0279	0.0084	0.0321	0.0487	0.0155
OCTOBER 2017	Easting	235945.099	235938.950	235941.659	235936.651	236000.925	236011.159	236017.938	236019.838
	Northing	6280905.249	6280890.791	6280875.818	6280854.053	6280810.849	6280827.128	6280842.953	6280863.360
	RL	777.154	770.681	764.255	755.799	754.045	762.346	768.668	778.439
	Δ East Since FIRST Reading	-0.0125	0.014	0.009166667	0.014	-0.013333333	-0.001666667	0.007	0.005
	Δ North Since FIRST Reading	-0.071666666	-0.084833332	-0.089333332	-0.045999999	-0.054333334	-0.047333332	-0.066666665	-0.040666666
	Δ Height Since FIRST Reading	-0.030333333	-0.0005	-0.031833333	-0.014666667	-0.001	-0.023666667	-0.0075	-0.017666667
	Vector Distance	**0.0788**	**0.0860**	**0.0953**	**0.0503**	**0.0560**	**0.0529**	**0.0675**	**0.0446**
	Δ East Since LAST Reading	-0.01325	0.00525	0.008666667	0.00975	-0.013083333	-0.007166667	0.0205	-0.0075
	Δ North Since LAST Reading	-0.033166666	-0.029333333	-0.016333332	-0.03425	-0.021333333	-0.027083333	0.002833334	-0.005916665
	Δ Height Since LAST Reading	-0.033083333	-0.00175	-0.033683333	-0.000666667	0.0035	-0.018666667	-0.0095	0.011833333
	Vector Distance	0.0487	0.0299	0.0383	0.0356	0.0253	0.0337	0.0228	0.0152
APRIL 2018	Easting	235945.101	235938.944	235941.662	235936.674	236000.917	236011.181	236017.928	236019.834
	Northing	6280905.242	6280890.781	6280875.807	6280854.036	6280810.881	6280827.140	6280842.909	6280863.340
	RL	777.176	770.688	764.283	755.803	754.067	762.365	768.708	778.446
	Δ East Since FIRST Reading	-0.010166667	0.008333333	0.012833333	0.036666667	-0.021333333	0.02	-0.002666667	0.000666667
	Δ North Since FIRST Reading	-0.079333333	-0.094499999	-0.100333332	-0.062666666	-0.022333333	-0.034666665	-0.110999999	-0.061333332
	Δ Height Since FIRST Reading	-0.007666667	0.006833333	-0.003166667	-0.011	0.020666667	-0.004666667	0.0325	-0.010666667
	Vector Distance	**0.0803**	**0.0951**	**0.1012**	**0.0734**	**0.0372**	**0.0403**	**0.1157**	**0.0623**
	Δ East Since LAST Reading	0.002333333	-0.005666667	0.003666667	0.022666667	-0.008	0.021666667	-0.009666667	-0.004333333
	Δ North Since LAST Reading	-0.007666667	-0.009666666	-0.011	-0.016666667	0.032000001	0.012666667	-0.044333333	-0.020666666
	Δ Height Since LAST Reading	0.022666667	0.007333333	0.028666667	0.003666667	0.021666667	0.019	0.04	0.007
	Vector Distance	0.0240	0.0134	0.0309	0.0284	0.0395	0.0315	0.0605	0.0222
DECEMBER 2018	Easting	235945.110	235938.951	235941.672	235936.658	236000.931	236011.176	236017.952	236019.863
	Northing	6280905.253	6280890.796	6280875.847	6280854.074	6280810.850	6280827.158	6280842.942	6280863.338
	RL	777.159	770.663	764.245	755.772	754.031	762.348	768.661	778.423
	Δ East Since FIRST Reading	-0.001833333	0.015333333	0.022166667	0.021333333	-0.007	0.014916667	0.021	0.03
	Δ North Since FIRST Reading	-0.068	-0.079833333	-0.059666665	-0.025333333	-0.053000001	-0.016916666	-0.078	-0.063333333
	Δ Height Since FIRST Reading	-0.024666667	-0.0185	-0.041166667	-0.042	-0.015	-0.022166667	-0.014833333	-0.034333333
	Vector Distance	**0.0724**	**0.0834**	**0.0758**	**0.0535**	**0.0555**	**0.0316**	**0.0821**	**0.0780**
	Δ East Since LAST Reading	0.008333333	0.007	0.009333333	-0.015333333	0.014333333	-0.005083333	0.023666667	0.029333333
	Δ North Since LAST Reading	0.011333333	0.014666665	0.040666667	0.037333333	-0.030666668	0.017749999	0.032999998	-0.002000001
	Δ Height Since LAST Reading	-0.017	-0.025333333	-0.038	-0.031	-0.035666667	-0.0175	-0.047333333	-0.023666667
	Vector Distance	0.0221	0.0301	0.0564	0.0509	0.0492	0.0254	0.0624	0.0377





REV	DESCRIPTION	DATE	BY

Data Sources:
Photography: UAV Survey, 2018-11-25
Topography: UAV Survey, 2018-11-25, UAV Survey, 2016-06-30
Cadastre:
Ecosystem:
Other:

PROJECT: Hartley Quarry

CLIENT: HY-TEC Industries NSW

TITLE: Overburden Structure Monitoring

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SCALE: 1:4,000 When Printed On A3 (0 — 80m)
DRAWING NUMBER: 1517.164
REVISION:
DATE: 28 May 2019
DRAWN: JHV
PRINTED: 28 May 2019
CHECKED: RH
DATUM: HORIZONTAL / VERTICAL / ZONE: MGA / AHD / 56

FILE NAME: F:\Jobs\1500\1517 AdBright - AustenQ Hartley\000 Generic\Drawings\1517 - 164 Overburden Structure Monitoring.dwg
JOB SUB #:
CREATED: 28 May 2019

Appendix 2

Review of Biodiversity Impacts and Offsetting Implications – Austen Quarry Modification 2

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Niche Environment and Heritage
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Excellence in your environment

30 May 2019

Nick Warren
Senior Environmental Consultant
RW Corkery & Co Pty Limited
PO Box 239
BROOKLYN NSW 2083

Via email: nick@rwcorkery.com

Dear Nick,

Re: Austen Quarry - Proposed Minor Modification to Development Consent SSD 6084 (Niche Ref #5002)

It is understood that Hy-Tec Industries Pty Ltd is proposing a second modification to Development Consent SSD 6084 (SSD 6084) for the Austen Quarry (the Quarry). The modification relates to improvements to geotechnical safety of the Quarry overburden area. The development, as modified, would remain substantially the same development as that approved under SSD 6084 (as originally granted).

An additional 1.0 hectare of vegetation disturbance is proposed beyond the north-west extent of the approved overburden emplacement. It was identified by RW Corkery & Co Pty Limited (RWC) that changes to vegetation impacts as a result of the additional disturbance would alter the biodiversity offsetting obligations of the Austen Quarry Stage 2 Project (the Project). So that the total area of vegetation to be cleared remains the same as under the existing SSD 6084, Hy-Tec has proposed to reduce the western extent of the overburden emplacement, where the same vegetation communities are located. The proposed modification would therefore add approximately 1.0 hectare of vegetation disturbance to the area of the approved overburden emplacement and remove 1.5 hectare of approved vegetation disturbance from the western extent of the same area (Figure 1). In order to keep this modification simple, Hy-Tec proposes that the offsetting obligations of the Project remain unchanged (even with an additional 0.5 hectare removed from impact on balance).

Niche Environment and Heritage Pty Ltd (Niche) have been commissioned to confirm that vegetation condition and characteristics in the 1.0 hectare to be added to the approved overburden emplacement footprint is similar to that in the 1.5 hectares to be removed from the approved overburden emplacement footprint.

The flora and fauna impacts and offsetting requirements of the Austen Quarry Stage 2 Extension Project were originally assessed by Niche in 2014 (Niche 2014). Changes to the impact area and offsetting obligations from a subsequent modification (Modification 1) were also assessed by Niche in 2018 (Niche 2018).

The approved boundary of the Stage 2 extraction area and overburden emplacement (approved boundary, as in Niche 2018) and the modified overburden emplacement (final boundary) are shown in Figure 1. Niche has calculated the vegetation clearing required based on the final boundary in Figure 1 (see Table 1).

Table 1 details a comparison of the vegetation clearing required for the approved boundary with the vegetation clearing required for the final boundary. The final boundary results in a reduced impact footprint in comparison to the approved boundary (Table 1):

- The approved boundary requires a total of 24.2 hectares of direct impacts on native vegetation and an additional 2.5 hectares of indirect impacts (based on a 10 metre buffer area) (Niche 2018), and
- The final boundary requires a total of 23.7 hectares of direct impacts on native vegetation and an additional 2.2 hectares of indirect impacts (based on a 10 metre buffer area).

Table 1 also illustrates that the impact of the proposed modification (final boundary) is either the same or less as that for the approved boundary for each plant community type and condition zone. Overall, the proposed modification would result in a 0.5 hectare reduction in direct impacts on native vegetation, compared with the approved boundary. Despite the reduced impact area for two of the plant community types for the proposed modification (final boundary), it is proposed that the offsetting obligation remain the same as that for the approved boundary, as discussed above.

In regards to impacts on the federally and state listed *Eucalyptus pulverulenta,* Figure 1 and Table 2 illustrate that the there is no change to the impact on this species caused by the proposed modification (final boundary), when compared with the approved boundary. No *Eucalyptus pulverulenta* occur within the 1.5 hectares of vegetation proposed to be removed from the approved overburden emplacement for the proposed modification, nor within 1.0 hectare of vegetation proposed to be added to the approved overburden emplacement area.

This letter confirms that no changes to biodiversity offsetting obligations result from the proposed modification. I trust that the information provided is suitably detailed, however, should you require any further information please do not hesitate to contact me.

Yours sincerely,

Sian Griffiths
Niche Environment and Heritage

Senior Botanist and Accredited BAM Assessor

sgriffiths@niche-eh.com

Mobile: 0409 483 727

References

Niche (2014), *Biodiversity Impact Assessment for Austen Quarry – Stage 2 Extension Project,* report for RW Corkery & Co.

Niche (2018), *Austen Quarry Stage 2 Extension Project Modification Application – Offsetting obligation,* report for RW Corkery & Co.

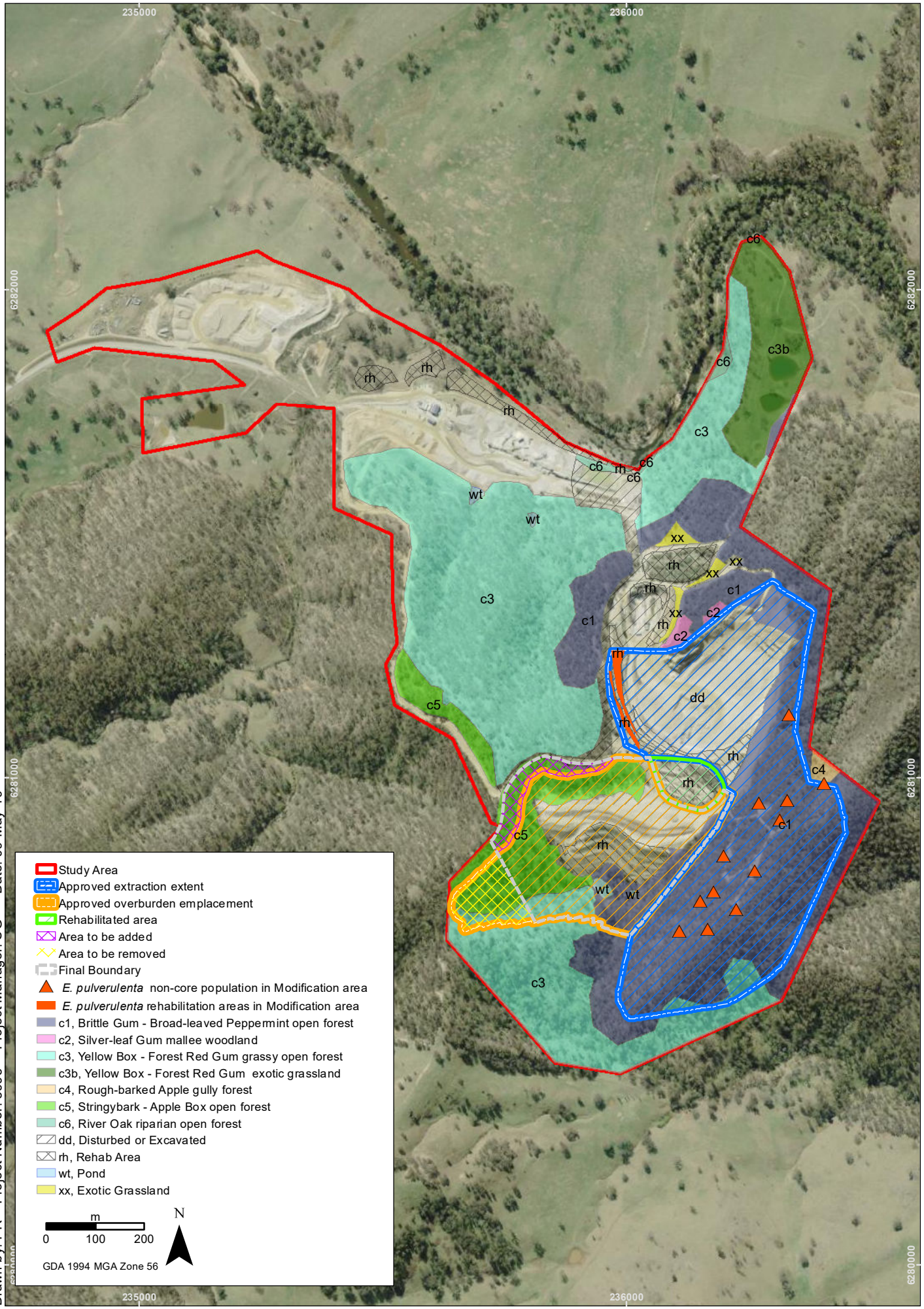
Table 1: Vegetation clearing required for Austen Quarry Stage 2 Extension Project Modification Application 2

Vegetation Community Unit (Niche)	Niche Type	Approved Boundary		Final Boundary		Change
		Direct impact (ha)	Indirect impact (ha)	Direct impact (ha)	Indirect impact (ha)	
c1	Brittle Gum – Broad-leaved Peppermint open forest	18.1	1.4	18.1	1.4	No change
c2	Silver-leaved Mountain Gum mallee woodland	-	-	-	-	No change
c3	Forest Red Gum grassy open forest	1.9	0.6	1.5	0.5	0.4 ha reduced direct impact
c3a	Forest Red Gum native grassland	-	-	-	-	No change
c3b	Forest Red Gum exotic grassland	-	-	-	-	No change
c4	Rough-barked Apple gully forest	-	-	-	-	No change
c5	Stringybark – Apple Box open forest	4.2	0.5	4.1	0.3	0.1 ha reduced direct impact
c6	River Oak riparian open forest	-	-	-	-	No change
Total		**24.2**	**2.5**	**23.7**	**2.2**	**0.5 ha reduced direct impact**

ha = hectare

Table 2: *Eucalyptus pulverulenta* impacts for Austen Quarry Modification Application 2

	***Eucalyptus pulverulenta* core population**	***Eucalyptus pulverulenta* non-core population**	**Planted *Eucalyptus pulverulenta***	**Total impact (# individuals)**
Approved boundary	0	90	611	701
Final boundary	0	90	611	701



Drawn by: PR Project Number: 3995 Project Manager: SG Date: 09-May-19

Native vegetation of Austen Quarry and the Modification Application

Austen Quarry Modification Application

niche Environment and Heritage

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FIGURE 1

Imagery (c) LPI 2013-09-03