Kings Quarry Ltd

EROSION AND SEDIMENT CONTROL REPORT

KINGS QUARRY STAGE 2

306 Pebble Brook Road, Wainui

Project Reference: 25050
March 31, 2025

DOCUMENT CONTROL

Version	Date	Comments
D	31/03/2025	Updated report issued for consent
C	17/11/2023	Updated report issued for consent
B	30/10/2023	Updated design issued for consent
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Version	Issued For	Prepared By	
D	Issued for Consent	 Helena Dubinko MEng(Civil), MEngNZ *Senior Civil Engineer*	

CONTENTS

EXECUTIVE SUMMARY

LDE Ltd was engaged by Kings Quarry Ltd to provide an erosion and sediment control plan in support of the Resource Consent process for the proposed expansion of Kings Quarry located at 306 Pebble Brook Road, Wainui, Auckland. This report summarises the proposed development and erosion and sediment controls to be put in place during earthworks and Stage 2 quarrying activities. These include the construction and operation of multiple sediment retention ponds at various locations over the course of Stage 2 quarry expansion, and corresponding diversion bunds. By following the recommendations provided in this report, alongside the relevant Council guidelines, any erosion, sediment discharge and sedimentation caused by land disturbing activities will be mitigated such that there are less than minor effects on the receiving environment.

Detailed design plans suitable for construction will be submitted to Council prior to commencement of physical works on site.

1 INTRODUCTION

LDE Ltd. was engaged by Kings Quarry Ltd to provide engineering services in support of the Resource Consent process for the Stage 2 expansion (Stage 2) of the Kings Quarry located at 306 Pebble Brook Road, Wainui (Site). The location of the Site is shown in **Figure 1** below.

This report has been prepared to provide recommendations for the erosion and sediment control measures that are required to be in place during the Stage 2 quarrying activities.

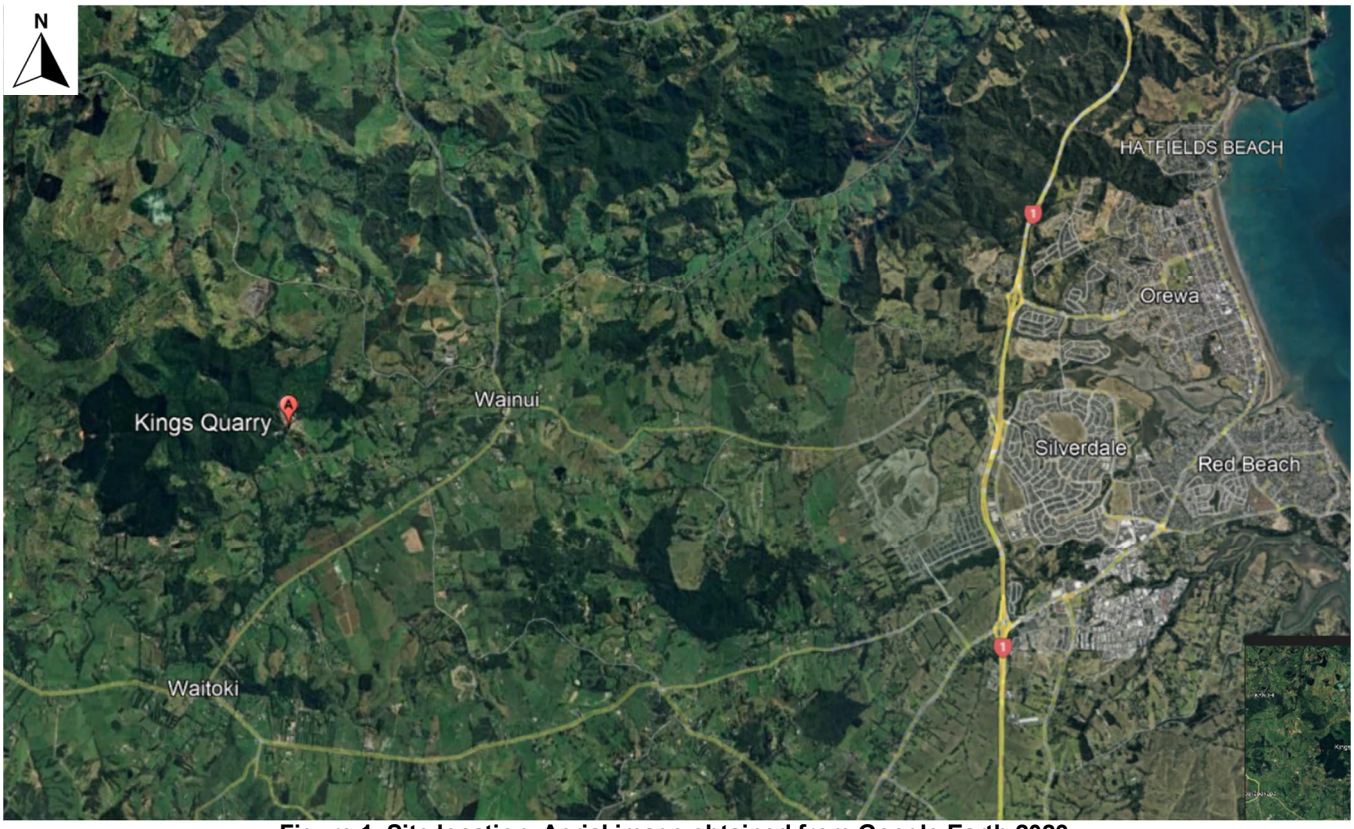


Figure 1. Site location. Aerial image obtained from Google Earth 2023.

2 SITE DESCRIPTION

The Site is located on the northern side of Pebble Brook Road, Wainui, some 2km northwest of the eastern end of Pebble Brook Road. The existing Kings Quarry (Stage 1) is located on the Site which has historically been used for quarrying of aggregate. Access to the quarry is via the road within an access lot located at 186 Pebble Brook Road (Lot 1 DP 414617). Since Kings Quarry Ltd's acquisition of the quarry in 2019, works have been ongoing for the re-establishment and expansion of the quarry.

The Site spans across multiple land parcels over an area of some 167ha and is within significant ecological areas as identified in the Auckland Unitary Plan Operative in Part (AUP). Except for the existing Stage 1 quarry facilities, the Site is currently covered in bush. The existing footprint of the quarry is within a steep south facing slope,

generally descending from north to south at slopes of some 35%, following the ridgeline along the western boundary of the parcel described as Allot 78 Psh of Kaukapakapa at approximately RL180m. **Figure 2** below shows and aerial of the Site and property boundaries.

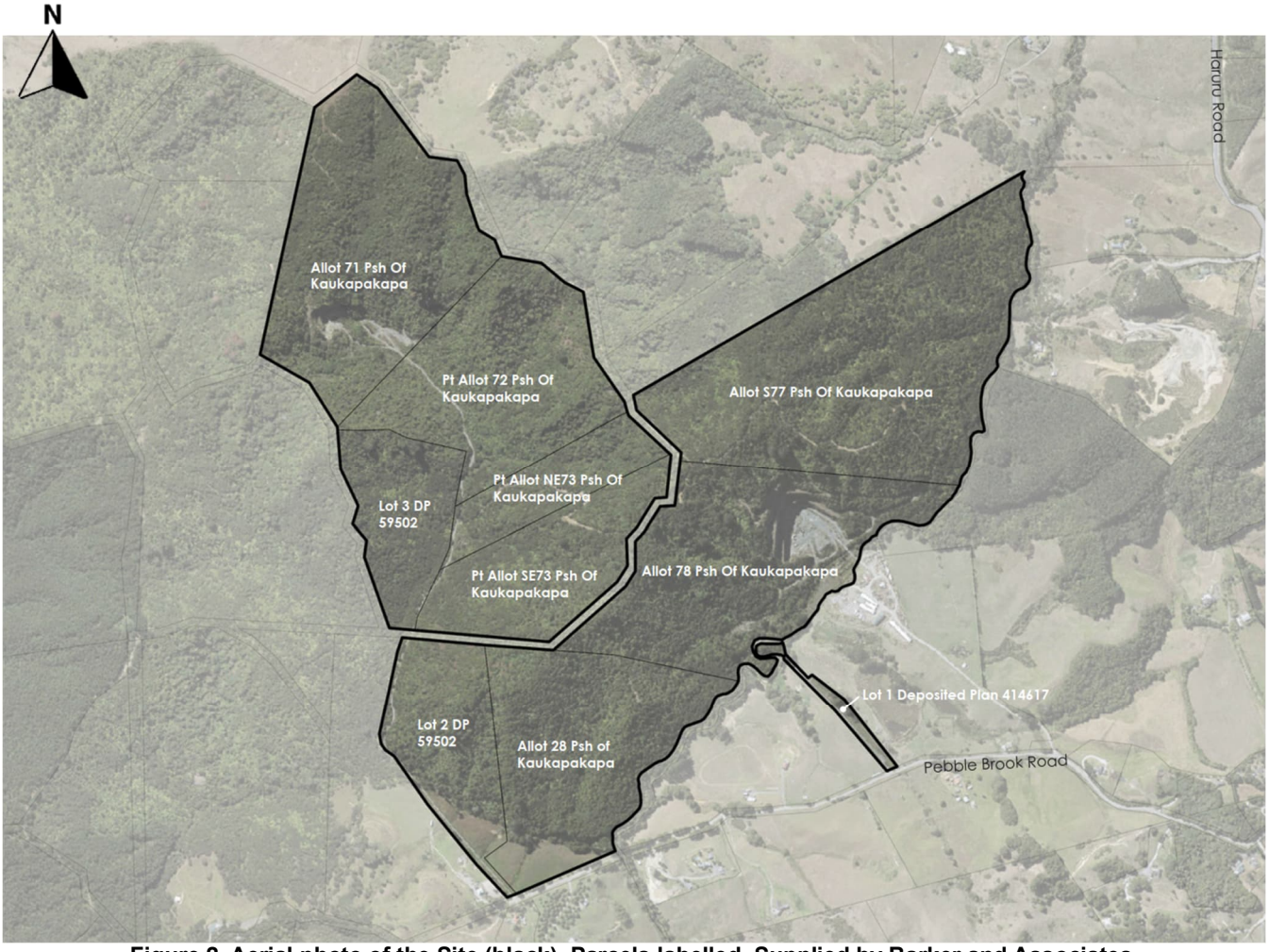


Figure 2. Aerial photo of the Site (black). Parcels labelled. Supplied by Barker and Associates.

3 PROPOSED DEVELOPMENT

It is proposed to expand the quarrying activities over the indicated area and approximately 45 years. Years 1-5 will involve the excavation of a pit which will be used to discard overburden material (the "**fill site**"). Years 6-45 will encompass the excavation to the main material and operation of the quarry ("**Stage 2 quarry**"). The following sections summarise the scope of erosion and sediment controls associated with the fill site and Stage 2 quarry. An overview of the proposed Stage 2 development is shown in Figure 3 below. The proposed stages for the quarry are included in **Appendix A** and **C**.

Detailed hydrological assessment of each contributing catchment and intermittent or permanent streams is addressed by WWLA.

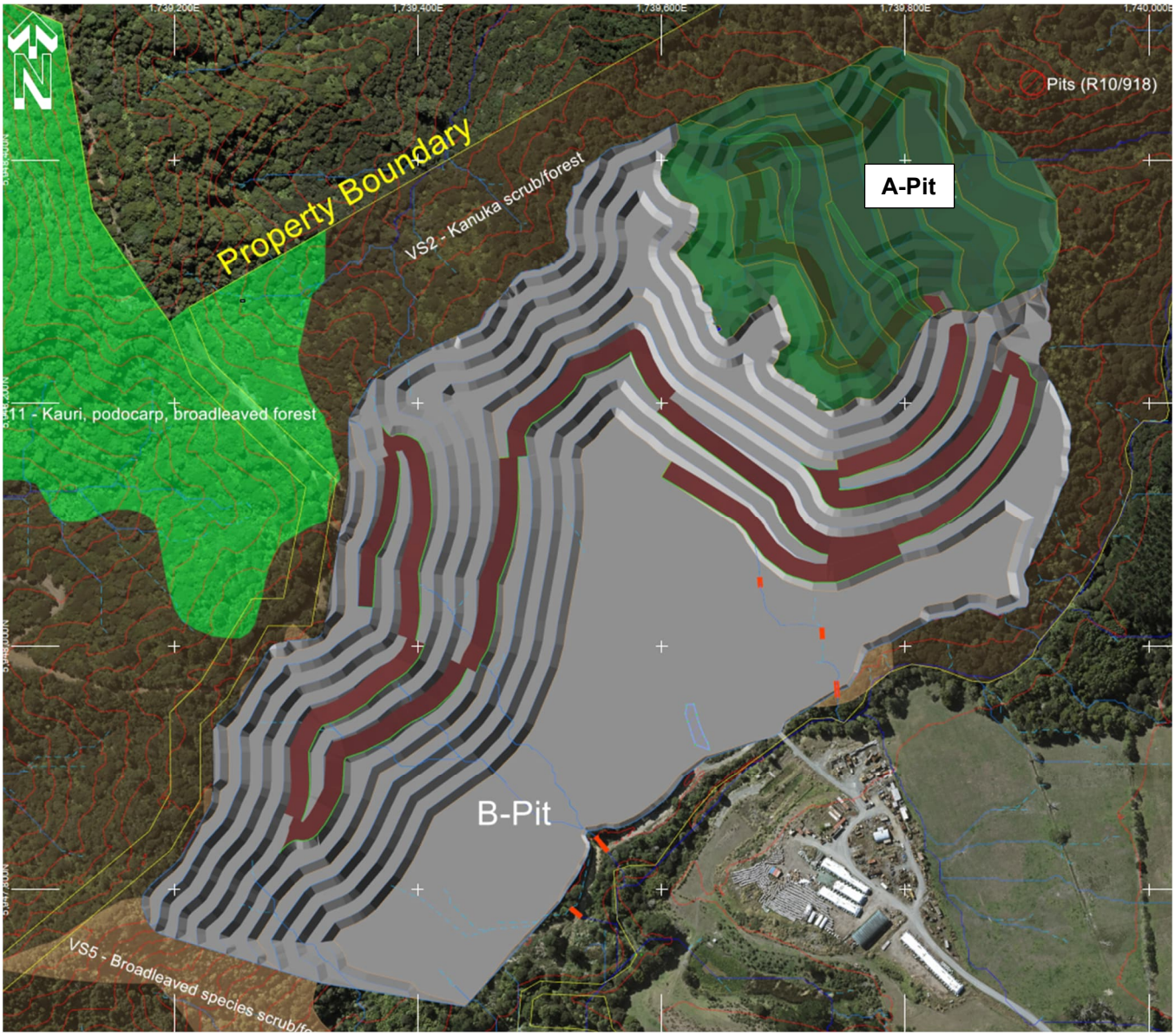


Figure 3: Overview of quarry expansion. Fill site labelled 'A-Pit', Stage 2 quarry labelled 'B-Pit'. Supplied by Aggretech Ltd.

3.1 Fill Site

The fill site is proposed to be located near the northeastern corner of Allot S77, labelled green 'A-pit' in the figure above. A pit proposed to be excavated over an area of 6.11ha. The excavation will produce approximately 306,000 Bank Cubic Meters (BCM) of overburden which is to be removed and backfilled in lower sections of the fill site as excavation progresses. If necessary, removed overburden will be deposited in Stage 1 overburden sites in the early stages of the fill site excavation. The remainder of the excavation of the fill site is estimated to produce 654,000 BCM of rock product. Per Aggretech design, the pit is to have 15m faces and an overall pit slope angle of approximately 43° at the steepest point.

A new access road from the quarry base to the fill site is to be constructed to enable access and hauling. This road is to be 12m wide and designed to be at 1V:8H grade.

All overburden stripped from the extent of Stage 2 quarry is to be deposited in the fill site as the work progresses. The pit is estimated to be filled over after 35 years with full volume. Once completed, it will have 15m faces at 20° gradient and 6m berms.

3.2 Stage 2 quarry

The Stage 2 quarry is to commence excavation following excavation of the fill site to design levels (year 6). The total area of the Stage 2 quarry is to span approximately 26.46ha. Excavation is proposed to begin from the ridgeline at the eastern border of Allot 78 and progress south-west down the existing slope to meet base of the existing Stage 1 quarry.

A 1.2 million BCM of overburden is expected to be removed across the Stage 2 quarry and deposited in the fill site. Approximately 8.0 million BCM of rock product is estimated to be extracted from the Stage 2 quarry over the following 45 years.

3.3 Operations

Topsoil from the earthworks area is to be removed, stockpiled to be reused for rehabilitated areas and respread as required. Exact stockpile location will be determined prior to commencement of physical works.

Overburden material is to be excavated progressively and deposited in the fill locations as above, in accordance with geotechnical recommendations.

Excavated rock product shall be transported via the haul roads to the fixed plant where it will be processed.

4 EROSION AND SEDIMENT CONTROL METHODOLOGY

Erosion and sediment controls are required for land disturbing activities throughout the construction and operation of the Stage 2 quarry. The proposed control measures will be undertaken generally in accordance with Auckland Council's *Erosion and Sediment Control Guide for Land Disturbing Activities in the Auckland Region* (Auckland Council GD05). Earthworks undertaken in accordance with these guidelines will minimise/mitigate any adverse environmental effects of sediment laden runoff. All generated sediment will be collected by stormwater runoff and will settle to the base of the sediment retention ponds while allowing clean water to raise to the top and discharge at the suitable location. The control measures shall be in place from the beginning of earthworks until the area has been suitably revegetated and/or stabilised. Progressive site stabilisation is considered impractical due to large catchments and multiple areas being quarried at the same time. Remediation and revegetation of the slopes will follow when appropriate.

The proposed erosion and sediment control devices are summarised in the sections below. Design plans and details for the proposed measured are included in Appendix C.

It is important to note that the methodology may be subject to change depending on the construction timeframe, standard operations of the quarry and proposed alternative staging.

Detailed design plans suitable for construction will be submitted to Council prior to commencement of physical works on site. Detailed calculations and flow allowances will allow for the governing rainfall event (5% AEP) including allowance for future climate change.
Deviations from the plans shall be discussed with Council's monitoring officer and/or the Engineer at the time of construction.

4.1 Stabilised Construction Access

A stabilised construction access shall be formed at the base of the existing Stage 1 quarry, at the beginning of the access road to the fill pit. An additional stabilised entrance is proposed at the base of the track to the top of the Stage 2 quarry.

The stabilised entrance shall be constructed of a 150mm thick layer of GAP65 aggregate underlain by a non-woven geotextile, as a minimum. The contractor will:

- Maintain the stabilised construction entrance in a condition to prevent sediment from leaving the construction site.
- If wheel washing is deemed necessary, ensure this is done in an area stabilised with aggregate which drains to an approved sediment retention facility.

4.2 Sediment Retention Pond

Sediment retention ponds (SRP) are proposed to collect sediment laden runoff from the earthworks areas. The main function of the SRPs is to control runoff during stripping of the overburden. Sediment-free water is discharged from the SRP via a stabilised outfall as shown in the Engineering Drawings (**Appendix C**). Catchment areas for SRPs are limited to 5ha in accordance with Auckland Council GD05.

Due to the large area of earthworks and contributing catchments, multiple SRPs are required to for the fill site and Stage 2 quarry. An additional SRP will be required during the construction of the access road to the fill site. The required SRP configurations are summarised in **Table 1** below. The proposed SRPs are detailed in the Engineering Drawings (**Appendix C**). Calculations for the sizing of SRPs are included in **Appendix B**.

Once the excavation in the Stage 2 quarry commences, it is anticipated for the exposed area to expand following the ridgeline, from east to west. Due to topography of the Stage 2 site, it is proposed to capture the runoff in the low point of the contributing catchment. Existing dense vegetation will be removed as the work progresses, however, in early years of the excavations, it is not proposed to bund between the catchments, as all runoff will follow the existing overland flow paths downhill.

It is intended to utilise the same SRP through multiple stages of work, where appropriate. Where catchment slightly exceeds 5Ha, an additional collection point (sump) will be provided to collect additional catchment and essentially provide pre-settlement for some of the runoff. The water will then be pumped or discharged to SRP at the controlled rate. Sumps will be sized appropriately prior to construction.

Table 1: Sediment retention pond summary.

Catchment	Earthworks Area [ha]	Pond Base Dimensions [m] (length x width x depth)	Pond Volume [m^3]	No. SRP Required
Fill site and access road	1.10	16x5x2	338	1
Fill site	6.11	35x10x2	1080	2
Stage 2 quarry	26.46	40x11.5x2	1355	5

The decant configuration and recommended flow rate for each catchment is summarised in **Table 2** below. Where multiple T-bar decants are required, the second decant shall be installed to operate in the upper 66% of live storage, and the third decant shall operate in the upper 33% of live storage. Refer to Engineering Drawings and Auckland Council GD05 section F1.1 for more information.

Vegetation will be slowly reinstated where possible as fill site and Stage 2 quarry excavation progresses. The SRP's have been sized to account for the maximum catchment size as runoff from reinstated areas will flow through exposed areas before reaching the SRP. Therefore, the sizing of the SRP devices has allowed for all runoff (clean and dirty water) from the subject catchment to be collected and treated by SRPs before discharge from the site as it is not practicable to separate these out on the subject site. It is important to note that once overburden is removed and the underlying rock is exposed, it is expected that the volume and generation of fine particles diverted to SRP will reduce.

Table 2: SRP decant summary.

Catchment	Recommended Decant Flow Rate [L/s]	No. Decants Required	Height of Primary Decant above pond base [m]
Fill site and access road	3.3	1	0.9
Fill site	10.5	3	0.8
Stage 2 quarry	13.5	3	0.8

Standard operations will include:

- Inspect SRP every day, before forecasted rainfall event, and after every rainfall event.
- Install and maintain perimeter bunding as required.
- Clean forebay after each major rainfall event.
- Clean out pond before volume of accumulated sediment reaches 20% of total pond volume.
- Clean out using sludge pumps or excavators to containment areas created using 500mm high mulch bunds. The sediment laden water will filter through the mulch bunds and be treated prior to returning to the DEB

via runoff channels. Following a suitable treatment period defined by Site Engineer, the remaining sediment laden water will be pumped back into the pond and the solids will be taken to an approved receiving facility.

- All sediment removed must be disposed of responsibly to an approved receiving facility.

A detailed maintenance plan shall be provided together with plans prior to construction.

At the time of writing of our report, detailed sediment loading calculation or laboratory testing of the overburden soil or mineral has not been undertaken to warrant explicit requirement of chemical treatment. Chemical treatment of SRP can enhance treatment outcomes dependant on the soil conditions in the subject catchment. If deemed required, Kings Quarry will implement chemical treatment to aid ESC treatment, to manage suspended sediments in runoff. Once the work commences, quality of water will be monitored, and appropriate Chemical Treatment Management Plan (CTMP) will be put into action if deemed required.

4.3 Diversion Bunds

Clean water diversion bunds shall be formed in the locations shown in the engineering plans, to divert uphill stormwater from entering the area of earthworks and to limit the stormwater runoff entering SRPs.

Dirty water diversion bunds shall be formed to convey sediment laden runoff into the appropriate SRP.

Bunds shall be sized appropriately prior to commencement of physical works on site.

Standard operations will include:

- Inspect channels and bunds regularly (weekly, unless otherwise specified in detailed design plans) and after each rainfall event to check for accumulated sediment which may cause overtopping or any signs of breaching.
- Check discharge points for signs of scouring and install further armouring or other stabilisation measures if scouring is evident.
- All removed sediment must be disposed of responsibly to an approved receiving facility.

4.4 Silt Fence

Silt fences shall be installed to capture sediment in flows and small catchments not captured by the diversion bunds or in areas where it is difficult to construct an effective SRP due to site topography. Proposed locations for silt fences are shown in the Engineering Drawings.

Standard operations will include:

- Inspect fences at least once a week and after each rainfall event to check for accumulated sediment.
- Make any necessary repair when bulges occur or when sediment accumulation reaches 20% up the fabric height.

- Remove sediment deposits as necessary, stockpile if in need of drying, dispose to an approved receiving facility.
- Any areas of ineffectiveness need to be removed and replaced so that they are effective.

4.5 Other controls

The erosion and sediment measures are not limited to the scope listed in previous sections. Other methods such as: Contour drains (cut-offs), Check dams, Pipe-drop structures and flumes, Surface roughening etc might be implemented prior or during the work to support SRP's and overall operation of works. This will be captured in the detailed plans that will be submitted to Council prior to construction together with maintenance and monitoring plan.

5 CONCLUSION

In summary, it is proposed to construct and operate sediment ponds for maximum catchment of 5Ha at various locations throughout the Stage 2 quarry expansion. There will be a maximum of 6 SRPs operating concurrently during quarrying activities. Where appropriate, some SRPs will be maintained through multiple stages of expansion, with corresponding adjustments in diversion bunds.

By following the recommendations provided in this report, alongside the relevant Council guidelines, we deem that any erosion, sediment discharge and sedimentation caused by land disturbing activities will be mitigated sufficiently such that the impact on the receiving environment is less than minor.

6 LIMITATIONS

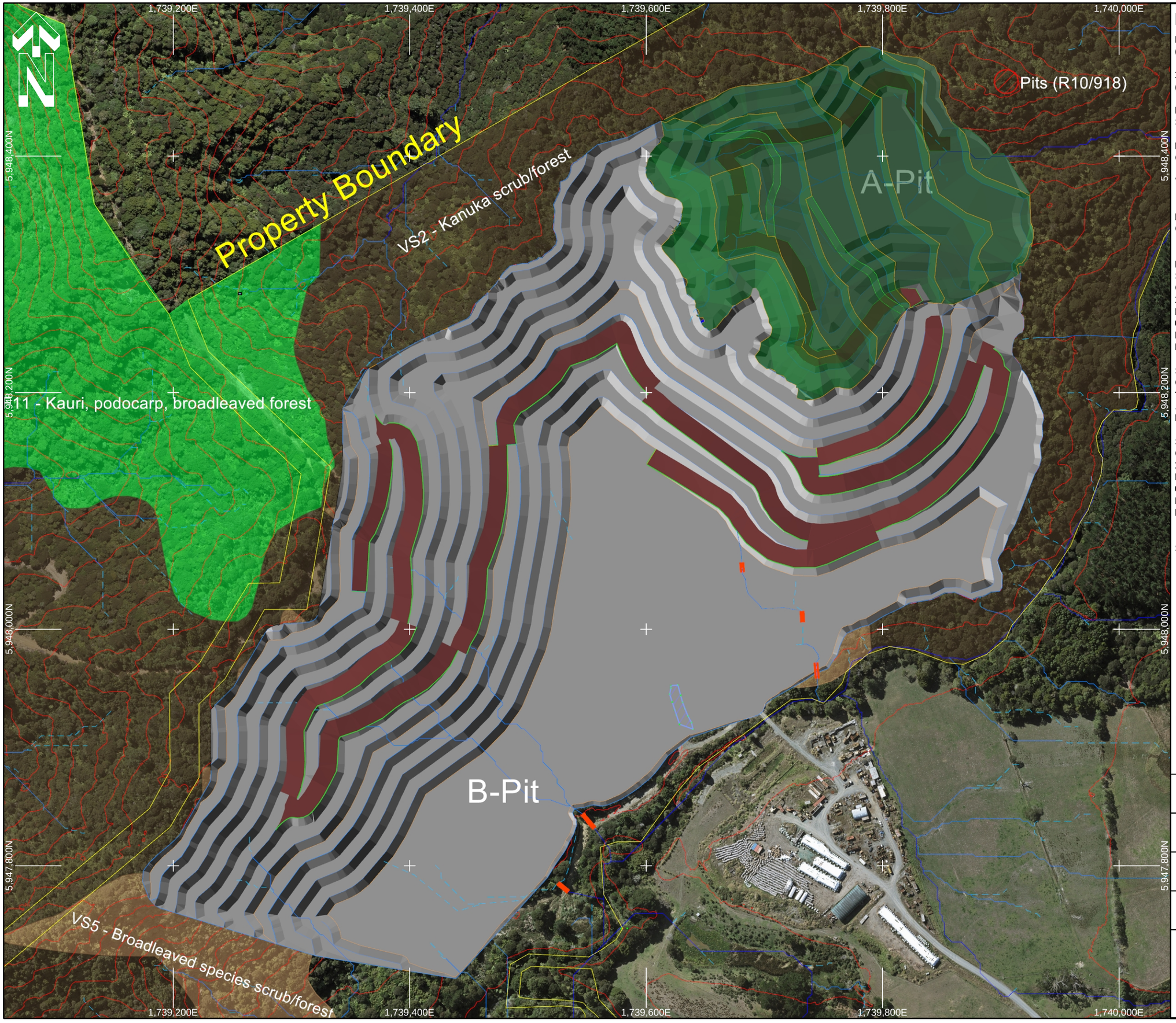
This report should be read and reproduced in its entirety including the limitations to understand the context of the opinions and recommendations given.

This report has been prepared exclusively for Kings Quarry Ltd in accordance with the brief given to us or the agreed scope and they will be deemed the exclusive owner on full and final payment of the invoice. Information, opinions, and recommendations contained within this report can only be used for the purposes with which it was intended. LDE accepts no liability or responsibility whatsoever for any use or reliance on the report by any party other than the owner or parties working for or on behalf of the owner, such as local authorities, and for purposes beyond those for which it was intended.

This report was prepared in general accordance with current standards, codes and best practice at the time of this report. These may be subject to change.

APPENDIX A

AGGRETECH DESIGN PLANS



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Property Boundaries: NZ Primary Parcels source: LINZ Data Service & C&R Surveyors Feb 2019

Water Paths are from Bioresearches (2020)

FINAL PIT, FILL AND ROAD DESIGNS ARE SUBJECT TO GEOTECHNICAL APPROVAL

DESIGN PARAMETERS:
Stage 2 Design 4 (A-Pit)
Outline = 6.11ha
15m faces at 2V:1H gradient, 8m berms
Haul Road: 12m wide, gradient = 8H:1V
Overall Pit Slope Angle ≈ 43° at steepest point
Estimated Rock Extraction = 654,000 BCM
Estimated Overburden Removal = 306,000 BCM

Stage 2 Design 4 (A-Fill)
Outline = 6.11ha
15m faces at 28° gradient, 6m berms
Access Tracks: 6m wide, gradient = 8H:1V
Estimated Overburden Capacity = 1.7 million BCM

Stage 2 Design 4 (B-Pit)
Outline = 26.46ha
15m faces at 2V:1H gradient, (generally) 10m berms
Haul Road: 15m wide, gradient = 10H:1V
Overall Pit Slope Angle ≈ 41° at steepest point (southern end)
Estimated Rock Extraction = 8.0 million BCM
Estimated Overburden Removal = 1.2 million BCM

SRP design - by others.

0 metres 50 100 150 200

Scale: 1:3000 @ A3

Projection: NZGD 2000 New Zealand Transverse Mercator

CLIENT
SEMENOFF GROUP

PROJECT
KING'S QUARRY - STAGE 2

TITLE
STAGE 2 OVERVIEW

Prepared By: MIKE CHILTON
Date Drawn: 4/09/2023 Revision: 4

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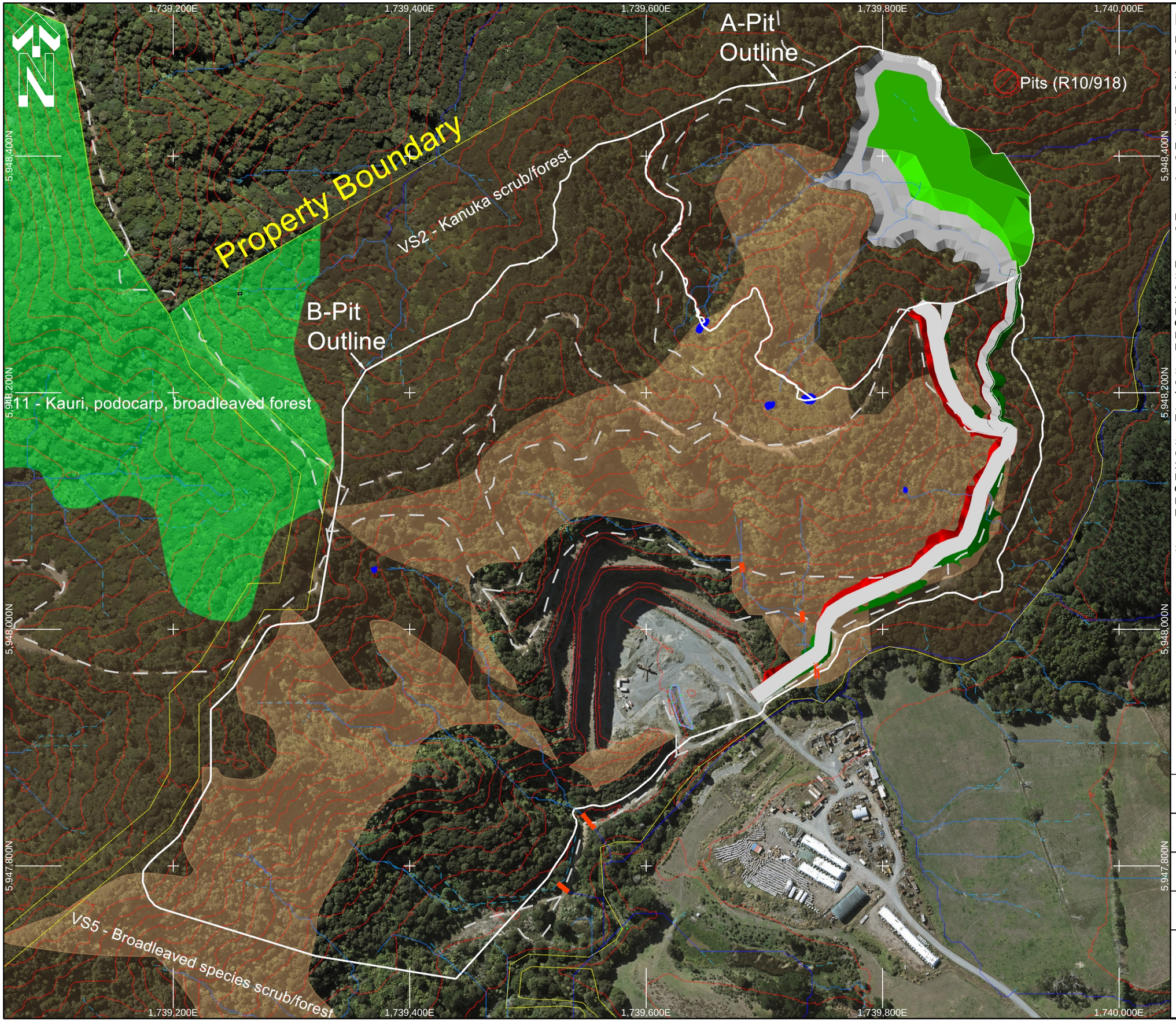

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PROJECT
KING'S QUARRY - STAGE 2

TITLE
STAGE 2 - YEAR 1

Prepared By: MIKE CHILTON

Date Drawn: 6/09/2023 Revision: 4

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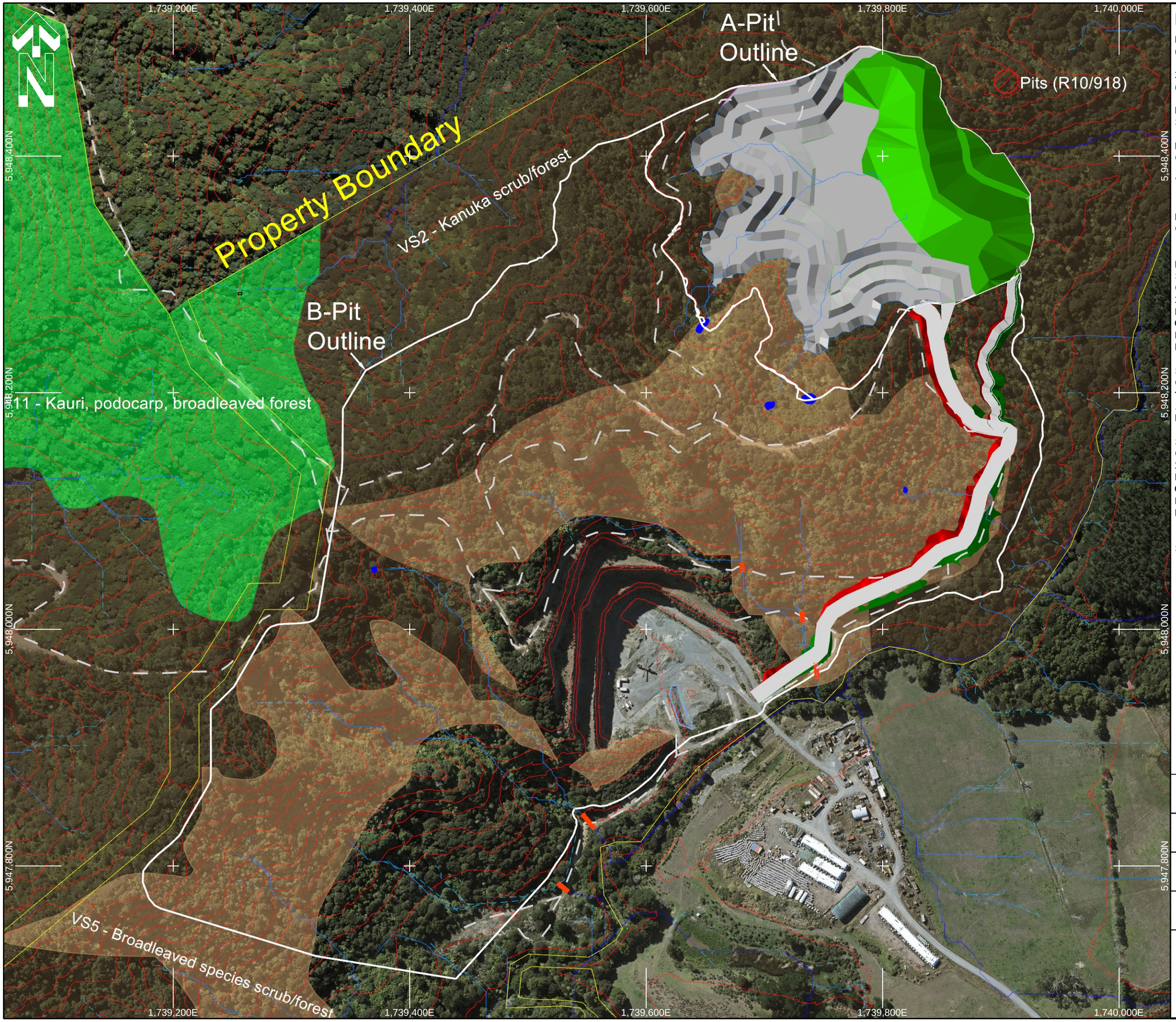

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PROJECT
KING'S QUARRY - STAGE 2

TITLE
STAGE 2 - YEAR 2

Prepared By: MIKE CHILTON

Date Drawn: 6/09/2023 Revision: 4

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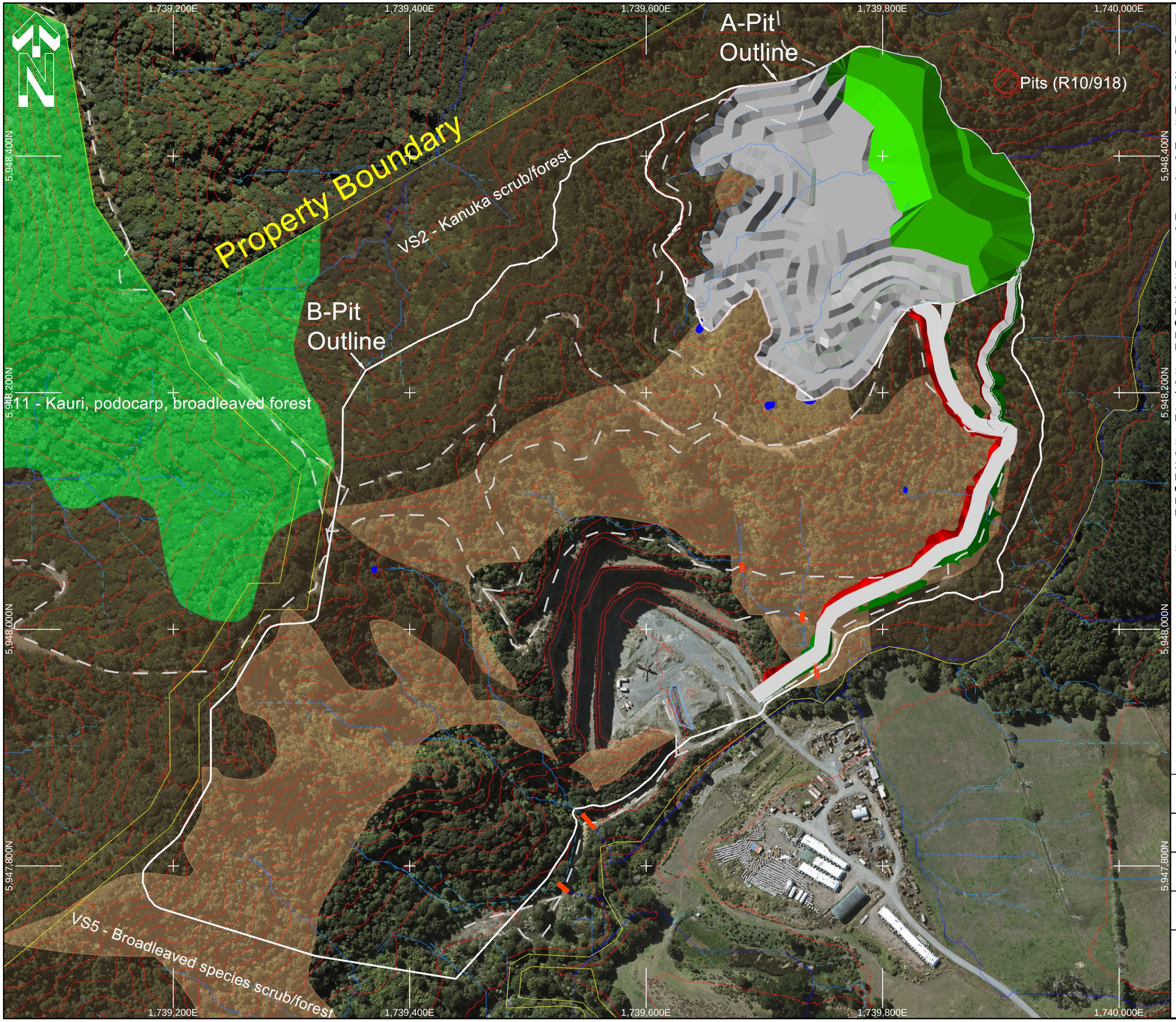

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SEMENOFF GROUP

PROJECT
KING'S QUARRY - STAGE 2

TITLE
STAGE 2 - YEARS 3-4

Prepared By: MIKE CHILTON

Date Drawn: 6/09/2023 Revision: 4

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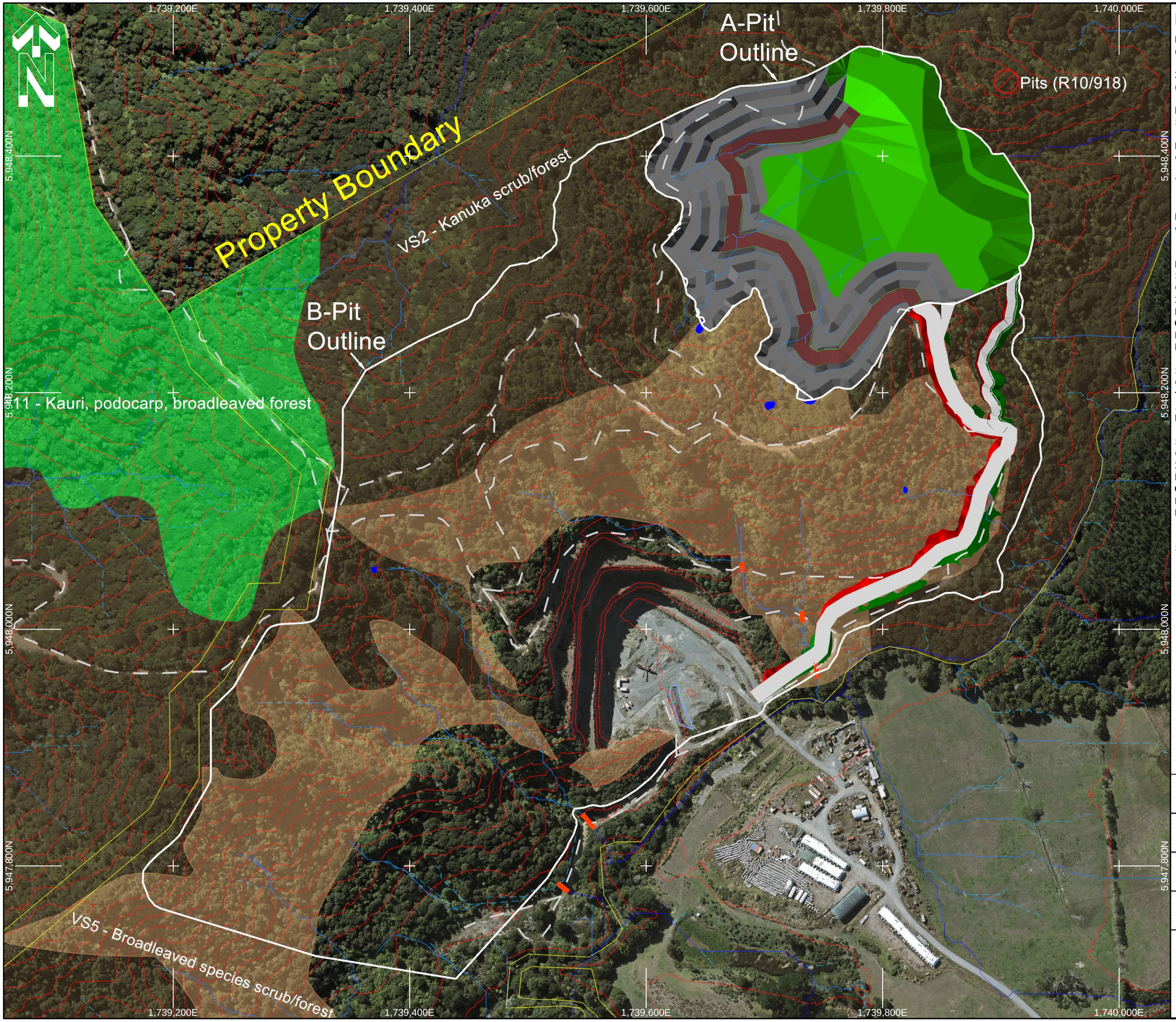

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PROJECT
KING'S QUARRY - STAGE 2

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STAGE 2 - YEAR 5

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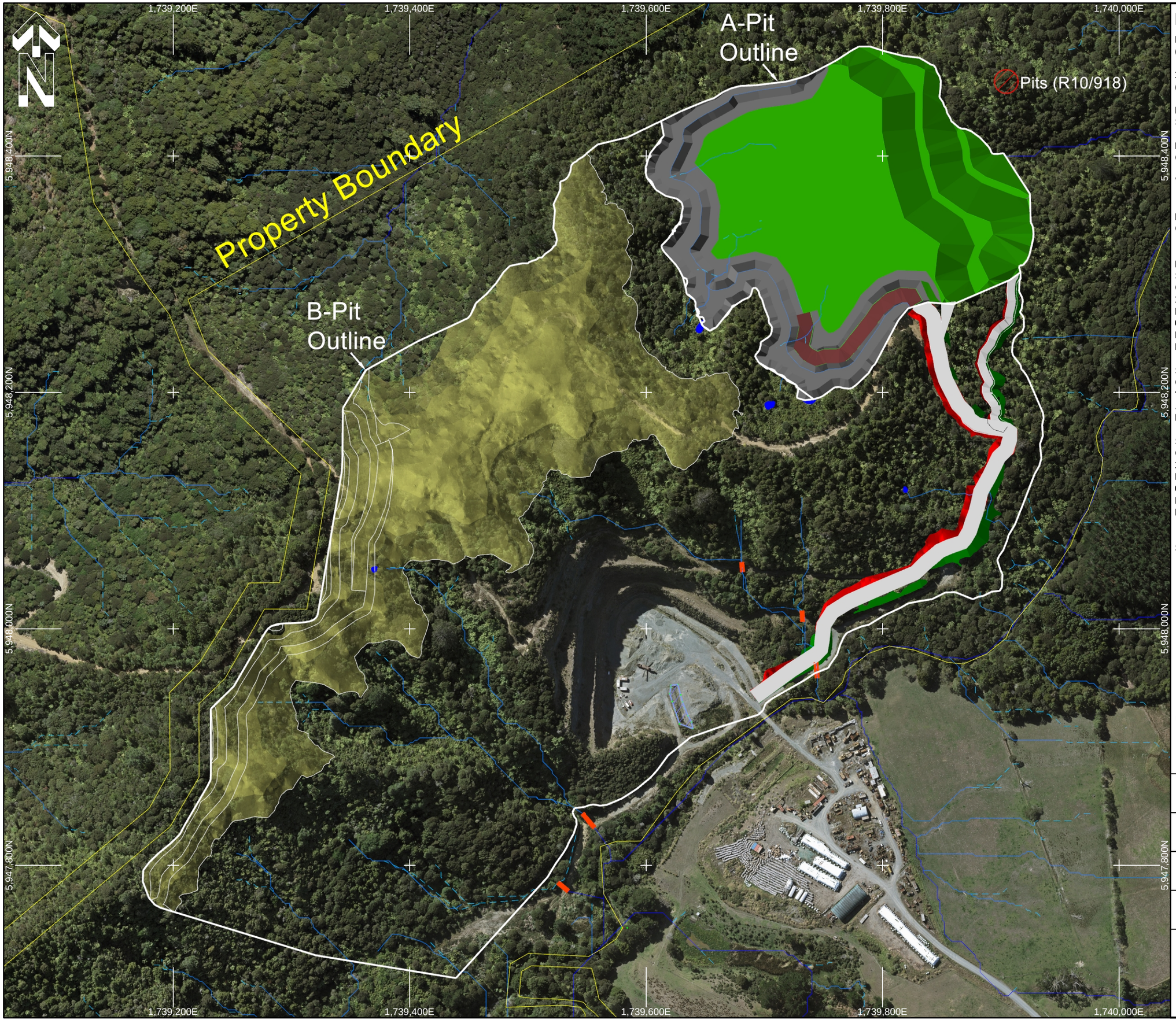

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15m faces at 2V:1H gradient, 8m berms
Haul Road: 12m wide, gradient = 8H:1V
Overall Pit Slope Angle ≈ 43° at steepest point
Estimated Rock Extraction = 654,000 BCM
Estimated Overburden Removal = 306,000 BCM

Stage 2 Design 4 (A-Fill)
Outline = 6.11ha
15m faces at 28° gradient, 6m berms
Access Tracks: 6m wide, gradient = 8H:1V
Estimated Overburden Capacity = 1.7 million BCM

Stage 2 Design 4 (B-Pit)
Outline = 26.46ha
15m faces at 2V:1H gradient, (generally) 10m berms
Haul Road: 15m wide, gradient = 10H:1V
Overall Pit Slope Angle ≈ 41° at steepest point (southern end)
Estimated Rock Extraction = 8.0 million BCM
Estimated Overburden Removal = 1.2 million BCM

SRP design - by others.

0 metres 50 100 150 200

Scale: 1:3000 @ A3

Projection: NZGD 2000 New Zealand Transverse Mercator

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PROJECT
KING'S QUARRY - STAGE 2

TITLE
STAGE 2: YEARS 6-10

Prepared By: MIKE CHILTON

Date Drawn: 6/09/2023 Revision: 4

CONSULTANT

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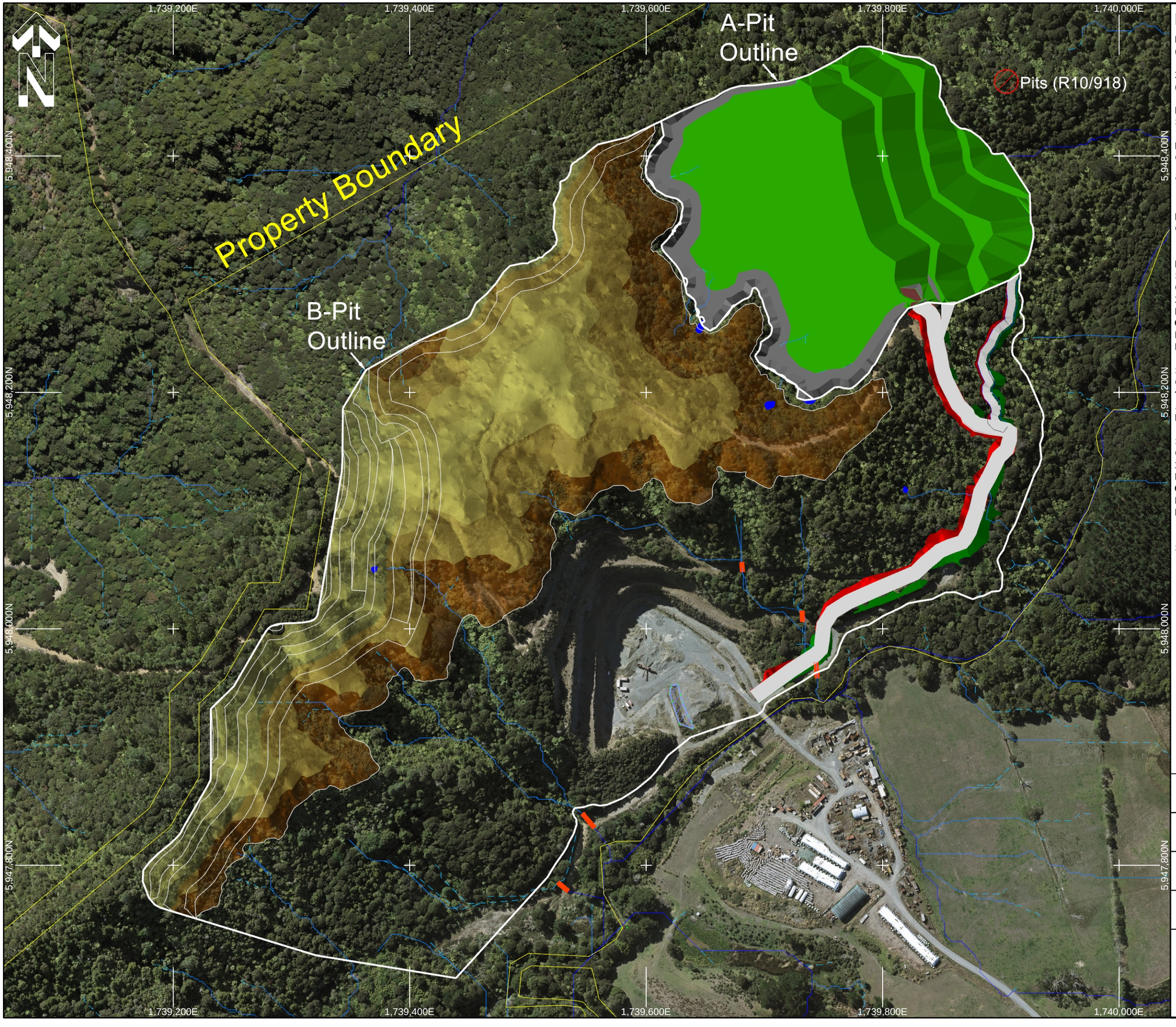

NOTES:

Background Image: Auckland 0.075m Rural Aerial Photos (2020), source: LINZ Data Service

10m Contours: Derived from Auckland North LiDAR 1m DEM (2016-2018), source: LINZ Data Service

Property Boundaries: NZ Primary Parcels source: LINZ Data Service & C&R Surveyors Feb 2019

Water Paths are from Bioresearches (2020)

FINAL PIT, FILL AND ROAD DESIGNS ARE SUBJECT TO GEOTECHNICAL APPROVAL

DESIGN PARAMETERS:
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SEMENOFF GROUP

PROJECT
KING'S QUARRY - STAGE 2

TITLE
STAGE 2: YEARS 11-15

Prepared By: MIKE CHILTON

Date Drawn: 6/09/2023 Revision: 4

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