APPENDIX K

Pattle Delamore Partners Soils Assessment

Soil Assessment for 668 Robinsons Road, Prebbleton

Prepared for

Winstone Aggregates

May 2024

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Limitations:

This report has been prepared by Pattle Delamore Partners Limited (PDP) on the basis of information provided by Winstone Aggregates and others not directly contracted by PDP for the work. PDP has not independently verified the provided information and has relied upon it being accurate and sufficient for use by PDP in preparing the report. PDP accepts no responsibility for errors or omissions in, or the currency or sufficiency of, the provided information.

This report has been prepared by PDP on the specific instructions of Winstone Aggregates for the limited purposes described in the report. PDP accepts no liability if the report is used for a different purpose or if it is used or relied on by any other person. Any such use or reliance will be solely at their own risk.

Executive Summary

Winstone Aggregates, a division of Fletcher Concrete and Infrastructure Limited, the applicants, are seeking approval for resource consent to extend an existing quarry site to their 4.17 ha site (Sullivans Block) on Lot 2 DP 80577 situated at 668 Robinsons Road, Rolleston. The applicant currently owns and manages the land, which is utilised for dryland drystock beef cattle grazing. The applicant has been the owner of this land since 2020.

The proposed quarry extension will be on Lot 2 DP 80577 which is 4.1720 ha including a narrow "pan handle" accessway from 668 Robinson Road to the proposed quarry site.

Winstone Aggregates propose to extend their existing quarry site at Robinson Road. The proposed activities include:

- removal and storage of topsoil and overburden,
- the formation and maintenance of bunds,
- the extraction of aggregates,
- the deposition of cleanfill for rehabilitation,
- the movement of vehicles associated with the above activities.

The site is currently used as a dryland lifestyle block and following the rehabilitation of the site it will be returned to a state where it can be used for agricultural production.

The soils on this site are Eyres soils that are between 250 and 500mm deep. They are shallow to very shallow soils over a very gravelly layer with moderate drought vulnerability.

The topsoils will be removed and stored in bunds. At the end of the quarry operation the topsoil will be combined with silt from the quarry operation, and imported topsoil to provide a soil that has at least the same depth as the original site.

The overall LUC of the site is 3s 33 and is described as moderately shallow and/or stoney soils on flat to undulating alluvial plains and terraces. The dominant limitations of the soil are shallowness, stoniness and low water holding capacity. This site is LUC 3, it is subject to the NHS-HPL which became operative on 17 October 2022. Consideration of NPS-HPL will be provided in a report prepared by AgriIntel for this application.

The restored site will have the same depth of topsoils as the existing site. There should be no long-term loss of soil quality and it will be suitable for agricultural production. There will be no long-term loss of highly productive land.

Based on this assessment it is considered that the soils on the property can be managed during and following the quarrying process so that once quarrying is

complete, the soils can be restored so that their capability to be used for agricultural purposes can continue. As such, the proposed development can achieve the desired outcomes of the various planning documents that aim to promote good soil management.

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Glossary of terms

Cultivation: to prepare the land for sowing pasture or crops

Field Capacity: The maximum amount of soil water held in the soil after excess water has drained away.

Gravel: weathered rock fragments deposited as a result of sedimentary and erosive geological processes.

Pea Gravel: gravel fragments less than 10 mm diameter

Permanent Wilting Point: the minimum amount of water in the soil that the plant requires not to wilt.

Profile Available Water: the measure of a soil's capacity to store water for plant growth. It is defined as the water held in the soil profile between field capacity and permanent wilting point in a defined depth of soil.

Sand: The coarsest of the three soil textural classes (sand, silt, and clay); a soil particle between 0.06 and 2.0 mm in diameter.

Silt: The intermediate soil textural class between sand and clay; a soil particle between 0.002 and 0.06 mm in diameter.

Suitably Qualified Rural Professional: a member of the New Zealand Institute of Primary Industry Management (NZIPIM) or a Certified Nutrient Management Advisor

Soil Wetness and 'Wet Soil': a generic term to denote water content at or above the soil's plastic limit.

Soil Plastic Limit: The water content at which soil material becomes plastic (mouldable) and prone to compression and smearing. Although the plastic limit is not manifest in sandy soils, they are prone to compression at high water contents.

Subsoil: The physio-chemically and biologically altered layers below the topsoil that are functioning parts of the soil profile.

Topsoil: The uppermost and most physically and biologically altered horizon, of undisturbed soil profiles.

1.0 Introduction

Pattle Delamore Partners Limited (PDP) has been commissioned by Winstone Aggregates to undertake a soil assessment for a proposed aggregate quarry extension to Wheatsheaf Quarry.

The purpose of this report is to provide:

- a summary of the soil and Land Use Capability units,
- a description of the soil management strategy to rehabilitate the soils for agricultural production following gravel extraction, and
- an assessment of effects relating to soil management and agricultural land use for the proposed activity, with particular reference to the Canterbury Regional Policy Statement, the Canterbury Land and Water Regional Plan, the National Policy for Highly Productive soils, and the National Environmental Standards for Freshwater.

As part of the soils assessment for the site, the approximate volume of overburden material covering the aggregate resource was estimated. The following available information has been reviewed as part of the geotechnical desktop study:

- Pattle Delamore Partners (PDP) report for Geotechnical Investigation into the Proposed Expansions Area of Wheatsheaf Quarry, Prebbleton - dated November 2019 (ref: C03942700R001).
- Images of farm pit/trench within the site boundary.
- LiDAR Elevation data of the site and surrounding area (sourced from LINZ, accessed April 2024).

2.0 Overview and Environmental Setting

A review of an adjacent site located at 692 Robinson Road was completed by PDP in 2019 as a part of the report “Geological Investigation into the Proposed Expansion Area of Wheatsheaf Quarry, Prebbleton” and we have used this report to provide some of the background information on the site.

2.1 Site description

The proposed quarry extension will be on Lot 2 DP 80577 which is 4.1720 ha including a narrow “pan handle” accessway from 668 Robinson Road to the proposed quarry site. The effective quarry extraction area will be 3.48ha, the “pan handle” will not be quarried.

The subject property is located on the north-eastern side of Robinsons Road, approximately in the middle between Rolleston (7.5 kilometres west), Prebbleton (6 kilometres east) and Lincoln (7 kilometres south) in the Selwyn District of Central Canterbury.

Land use in the surrounding area is a mix of lifestyle blocks, smaller farm holdings, quarrying operations and an indoor poultry business.

Within the site boundary, the ground is generally flat to gently sloping and covered by grass. Based on client conversations and a review of LiDAR elevation data, a mound area of higher elevation is present in the central/south-west section of the site. Elevation data indicates this mound is approximately 1.5 m (maximum) higher than the surrounding site area. A site plan is attached in Appendix C, showing the site boundary and relevant investigation and information locations that have been used to estimate the overburden extent on site.

2.2 Proposed activity

Winstone Aggregates propose to extend the existing quarry site at Robinson Road. The proposed activities include:

- removal and storage of topsoil and overburden,
- the formation and maintenance of bunds,
- the extraction of aggregates,
- the deposition of cleanfill for rehabilitation, and
- the movement of vehicles associated with the above activities.

The quarry will be rehabilitated so it can be used for agricultural purposes. The new level, following the completion of quarrying, will depend on the quantity of cleanfill available. The rehabilitated level will be at ground level in some areas and then will taper so the slope is not more than 1 in 3 and will be contoured to work in with the neighbouring properties including the existing quarry site.

2.3 Historical Use

A review of historical photographs was completed by PDP in 2019 as a part of the report “Geological Investigation into the Proposed Expansion Area of Wheatsheaf Quarry, Prebbleton.” These photographs covered the proposed site for this application. It showed that historically the site has been used for agricultural pastural uses.

The earliest available photograph is from 1942, when the site and the surrounding areas were mostly vacant paddocks with a few rural residential properties. A clear northwest – southeast orientation of the historical meanders

and channels are evident across the area. The only building on the site is a small barn that appears to have been built between 1994 and 2004.

The initiation of quarrying at the south-eastern corner of the currently active quarry is shown on the 1962 aerial photograph, while little change has occurred in the remainder of the current quarry area and the proposed expansion area.

The subsequent aerial photographs show the expansion of the quarry from the 1990s until it reaches its current extent.

2.4 Geology

The site is located on the Canterbury Plains which were formed by the reworking of moraine gravels deposited during glacial periods approximately 3 million years ago to 10,000 years ago.

The gravels were redeposited by fluvial processes of large, braided river systems, creating extensive plains some 70 km wide and 180 km long.

The wide meandering channels of the braided river systems have created a channel system through the site, generally orientated northwest – southeast, resulting in natural levees, meander scars, channel cut offs, point bars and abandoned channels.

The published geology (Forsyth 2008) of the site and surrounding area shows that the site is primarily underlain by “grey river alluvium beneath plains or low-level terraces (Q1a)”.

2.5 Hydrogeology

An Environment Canterbury (ECan) monitoring well (M36/20476, screened from 50.5 – 52.0 m deep) is located near the current quarry entrance approximately 400 m to the east of the nearest site boundary. The monitoring well provides ground water level information from the underlying Riccarton Gravel aquifer. The recorded groundwater level ranges from 11.49 m to 13.07 m below the measuring point (0.3 m above ground).

A review of historical aerial photographs was undertaken to gauge a better understanding of the geomorphological features, preferred orientation of meandering channels, gain a greater appreciation of the underlying geological regime and formulate a ground testing plan. The photographs are presented in Appendix D.

2.6 Groundwater levels beneath the site

A groundwater report is being prepared that provides an assessment of the highest groundwater levels beneath the site by LandWaterPeople (LWP). Quarrying will be managed to maintain at least 1 m separation between the base of the quarry excavations and the highest recorded groundwater levels.

3.0 Climate

The Canterbury climate is generally characterised by hot, dry summers and relatively cold winters. Rainfall ranges from approximately 400-500 mm per annum in the Rolleston/Prebbleton area of the Selwyn District.

The NIWA image below illustrates the Canterbury regions median annual rainfall between 1981 and 2010. The blue arrow illustrates the general location of the subject property.

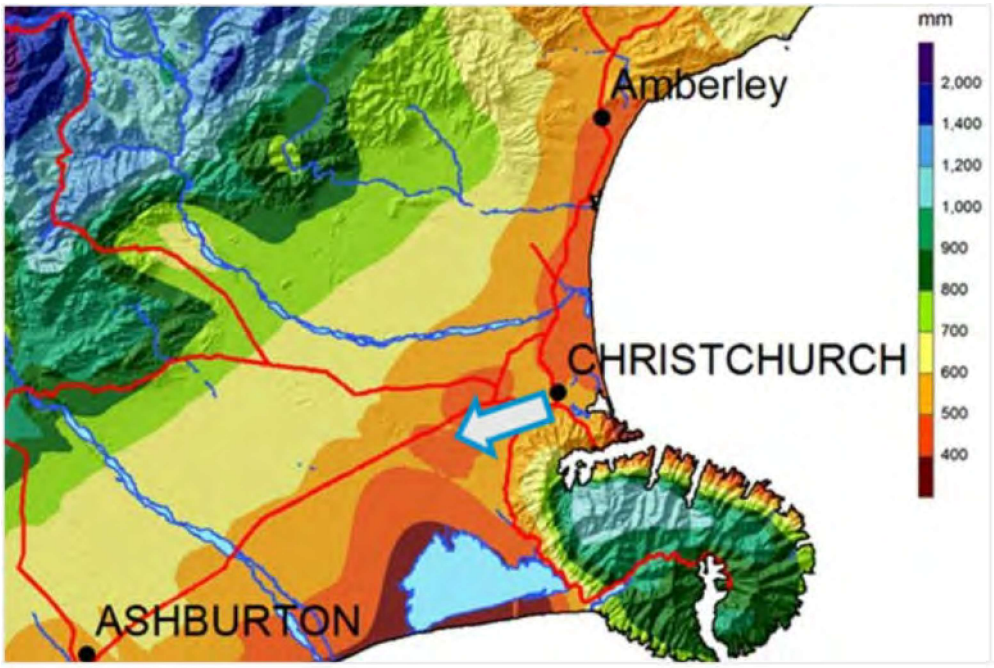

Figure 1: NIWA Median Annual Rainfall

4.0 Soils Description

A report for the site was obtained using S-Map (Manaaki Whenua Landcare Research). Table 1 shows the results of this report. The most prolific soil type is Eyre 4a.1 (60%), followed by Eyre 23a. 1 (30%) and Eyre 2a. 1 (10%). These are all recent soils. They are shallow to very shallow soils over a very gravelly layer with moderate drought vulnerability. The proportions of soils may vary across the land parcel as indicated by the different PAW values. The soils have a high nitrogen leaching vulnerability.

Profile Available Water (PAW) is a measure of a soil siblings' capacity to store water that is potentially available for plant growth. The soil siblings identified at the site in Tabe 1 have variable PAWs ranging from 49 to 99 mm. The most prolific soil sibling has a moderate to low PAW (86mm) at 100cm and moderate PAW at 0-60cm (68mm), making the site moderately suitable for growing pasture and other crops.

Table 1: Soil at the proposed quarry expansion site						
S-Map name	**% of soil**	**Depth class**	**Profile texture**	**% Stone at 400 mm**	**Drainage class**	**PAW at 60 cm (mm)**
Eyre_4a.1	60	Shallow	Loam	60 – 70 %	Well drained	61
Eyre_23a.1	30	Very Shallow	Loam	60 – 70 %	Well drained	49
Eyre_2a.1	10	Shallow	Loam	60 – 70 %	Well drained	99

5.0 Land Use Capability

An assessment of the site's Land Use Capability (LUC) was completed using information from the NZLRI LUC Classes 1 - 3 (Land Resource Inventory) in Canterbury Maps. The LUC classification is used to assess the long-term sustainable capability of land to support production for cropping, pastoral farming, forestry, and soil/water conservation. The classification also indicated the versatility of the land and its given limitations for use. As the LUC class increases, versatility of land use decreases and limitations of land use increases (Figure 1).

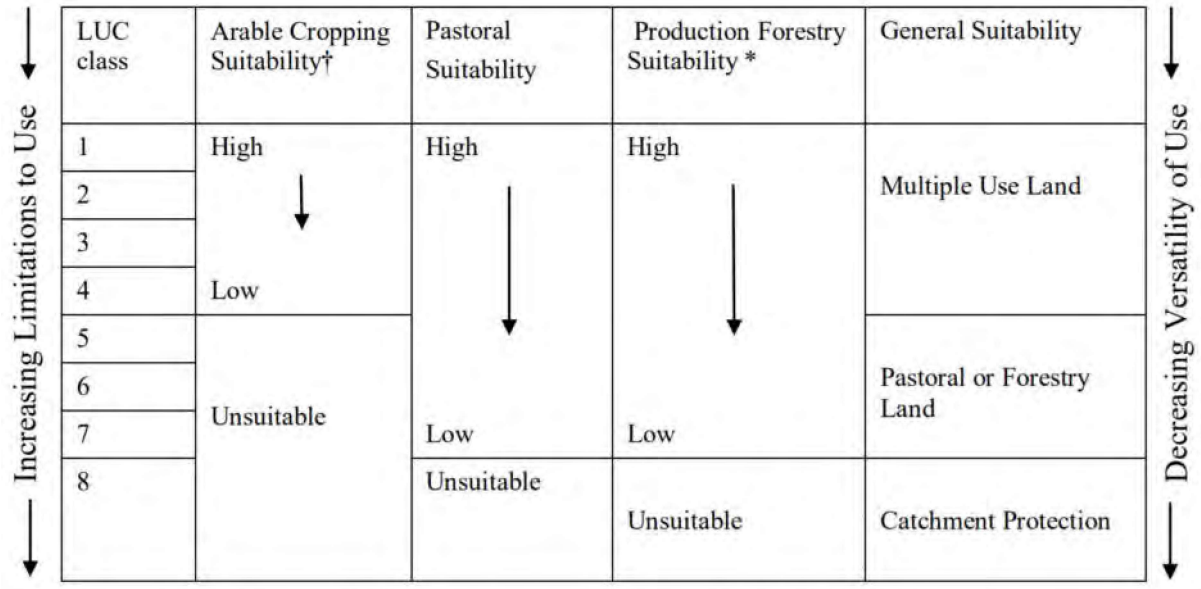

Figure 2: Relationship between LUC classes and versatility of use (from Lynn et al., 2009).

A detailed description of the system is provided in the Land Use Capability Survey Handbook, a 3rd edition of which was published in 2009 (Lynn et al., 2009). The LUC classification is based on five inventory factors including rock type, soil type, slope, erosion, and vegetation.

The LUC mapping unit is comprised of three parts:

- The LUC class

The LUC class is the broadest grouping in the classification, identifying the general degree of limitation to arable use. It comprises eight classes. Classes 1 to 4 are classified on their suitability for cultivation for cropping, with class 1 being the most versatile with few limitations to use, through to LUC class 4 which has limitations, so it is marginal for cultivation for cropping. Results from the LUC assessment show that the site is deemed to be on class 3 land (Appendix A Figure 2). This is likely due to the shallow topsoil and high stone percentage detailed in Table 1 limiting cultivation options.

- The LUC subclass

The LUC class is subdivided into one of four subclasses, depending on the major physical limitation to use. There are four limitations: erodibility (e), wetness (w), soil (s), and climate (c). They are denoted by the small letter e, w, s, or c after the LUC class number. This site is limited by the soil (s) type.

- The LUC unit

The third and most detailed level of classification is the LUC unit. The unit groups areas that require the same kind of management, the same kind and intensity of soil conservation treatment, and are suited to the same kinds of crops, pasture or forestry species which require specific conservation measures and management practices to achieve similar yields.

The overall LUC of the site is 3s 33 and is described as moderately shallow and/or stoney soils on flat to undulating alluvial plains and terraces. The dominant limitation is the physical and chemical properties of the soil such as shallowness, stoniness and low water holding capacity. These soils are often irrigated in summer to overcome moisture deficits. It should be noted that on Canterbury maps, this soil unit is also classed as 4s 7, likely due to its shallow and stoney nature.

6.0 Geotechnical Desktop Study

6.1 Information Review

6.1.1 Pattle Delamore Partners Geotechnical Investigation (2019)

Relevant test pits within 200 m of the site (TP6 to TP9) indicate 0.25 m to 0.5 m of overburden thickness, which is described as ‘organic silt’.

6.1.2 Farm Pit

An image of the farm pit located towards the southern extent of the site is shown in Figure 3. Visual interpretation shows a light brown silt (overburden) overlying the gravel/aggregate resource. The overburden thickness appears to be generally consistent with some undulation and is estimated to be no more than 0.5 m thick (based on comparison with test pit logs).

Figure 3. Cross sectional image of the farm pit present within the site boundary.

6.2 Overburden Quantification

Based on indicative overburden depths and the elevation data of the site sourced from LINZ (2024), an approximate range of overburden volume has been calculated. The volume estimates are presented in Table 1.

The minimum estimate assumes the overburden depth across the site is 0.25 m, as indicated by nearby test pits. The maximum estimate assumes the overburden depth across site is around 0.5 m and the mound feature is comprised of overburden material. These assumptions have been adopted to produce a conservative volume estimate, that ranges between 32,700 m^3 to 41,400m^3.

Table 2: Maximum and Minimum Estimated Overburden Volume

Part A – Overall Site Overburden	
Parameter	**Estimated Value**
Area[1]	34,800 m^2
Overburden Thickness[2]	0.25 to 0.5 m
Overburden Volume[3]	8,700 to 17,400 m^3
Part B – Mound Overburden	
Site Elevation[4]	30.7 to 32.3 m RL i.e. Mound height of ~ 1.5 m
Mound Area[1]	16,000 m^2
Mound Volume[3]	24,000 m^3
Part C – Total Overburden Estimate	
Total Volume[5]	32,700 m^3 to 41,400 m^3

Notes:

1. *Estimated area value presented based on measurements taken from aerial imagery, assuming around 89% of the 3.910 ha property will be quarried.*
2. *The values presented for overburden thickness have been based on the PDP test pits completed in 2019.*
3. *Volume has been calculated based on V = area x height.*
4. *Site elevation values based on LiDAR Elevation data sourced from LINZ (2024).*
5. *Total overburden volume range was calculated by adding the volume calculated in Part A (using an overburden thickness of 0.25 m and 0.5 m) to the mound volume calculated in Part B.*

7.0 Soil Management Plan

A draft Soil Management plan has been provided. This sets out the key concepts to inform a Soil Management Plan, including an explanation for why each action is required.

The purpose of the Soil Management Plan is to:

a) Ensure that the removal, management, and placement of soil avoids or minimises impacts on the soil properties prior to and following placement, and that the re-established soil retains the soil versatility of the original soil on the site; and

b) to ensure that soil management activities avoid potential adverse effects on the surrounding environment.

Key to the effective reestablishment of the soil on the gravel extraction site are careful pre-planning, adherence to the guidance provided in the Soil Management Plan, and the training of all staff involved.

The main on-ground factors that achieve successful land restoration and retain productive value of the land are preparation of the existing surface to ensure it has the appropriate contour, and careful removal and placement of the soil material and silt so they are not degraded or compacted.

Soil carbon is critical for soil health, it feeds the soil biology and helps retain soil moisture and nutrients. Average soil carbon stocks in New Zealand's agricultural soils are estimated at about 100 tonnes per hectare in the top 0.3m. It is important that the topsoil is retained and applied back onto the rehabilitated areas, particularly as the reinstated subsoil (washed silt, pea gravel and other products) will be very low in soil carbon.

The assessment of the site geology has indicated the following materials that could be involved in rehabilitation of the land following quarrying:

- The soil depth appears to be uniform across the site at a depth of approximately 0.25 m – 0.5 m and will contribute to the total post-rehabilitation depth;
- The samples show an average of 10% silt of the total extractable volume and most of this will used in the soil rehabilitation;
- There are likely to be minor additions to the rehabilitated quarry land from losses of products, sand and crushed fines and pea gravel. These are usually used in the bottom 0.5 m of the fill; and
- A consent to apply cleanfill is being applied for and they are proposing to restore the site back to a similar level as the existing site.

However, there are a number of factors which could mean less material is available:

- The availability of suitable cleanfill;
- The samples used may not be fully representative of all the material that is quarried;

- Some of the pea gravel is utilised to produce manufactured sand;
- At this stage, the expected average depth of the quarry is 8 m, and it will have clean fill added.
- The soil removed from the quarry site and stored in the bunds will be spread over site during the rehabilitation process.
- The soil profile depth with no significant barriers to plant roots.

Pasture is the best vegetation for preparing the soil for agricultural uses. The fine roots of pasture create soil structure and grow into the new subsoil to coat cracks and pores. Generally, after three years in pasture (post quarrying) and with careful stock management to avoid compaction, the soil will be suitable for a range of agricultural uses.

As the site is not irrigated, pastures will need to be established when soil moisture conditions and temperature are suitable for pasture establishment. The window for establishment is typically March to May or September and October. Winstone Aggregates will have water available via a water cart or similar delivery system if needed.

7.1 Soil Rehabilitation

7.1.1 Subsoil

The subsoil can be placed to within 200 mm of the final land surface and a minimum soil thickness (topsoil and subsoil) of 400 mm is required over the final quarry/ cleanfill surface. The final re-established subsoil profile should be predominantly fine matrix soil materials, free of stones over 150 mm in diameter and other coarse materials.

The following properties are required for the subsoil material:

- Silts either in slurry form or placed using dump trucks and earthworks machinery.
- May include topsoil if there has been mixing of topsoil with subsoil.
- The subsoil material can include up to 35% by volume of gravels (moderately gravelly) of 6-30 mm diameter (Milne 1995) with fine soil matrix materials.

It is unlikely that large stones would be disposed of into the land to be rehabilitated, as generally material over approximately 30 mm has good economic value. However, it is possible that a few larger stones could remain in the rehabilitated soil due to being present in the topsoil or from incidental incorporation into stockpiles.

7.1.2 Topsoil properties

The topsoil should occupy the as a minimum 200-400 mm of the final re-established soil profile. If suitable imported topsoil is available, the topsoil may be deeper. This is to ensure the final reestablished soil profile has a topsoil that has organic matter, nutrients, and fine matrix soil materials similar (or possibly better depending on the quality of the imported soils) than the original soil profile.

The following properties are recommended for the topsoil material:

- Topsoil removed from the extraction site and stockpiled.
- Cleanfill topsoil that is tested and confirmed to be free of contaminants.
- The topsoil may include organic material provided it is thoroughly mixed with the other soil material. When topsoil is stripped before quarrying it may contain material from the pasture.
- The topsoil material may have some stones and gravels present in the topsoil that was stockpiled/removed from the extraction site.

Coarse organic materials are not permitted in the topsoil (tree roots and other material from the removed trees/shelter belts).

7.2 Cleanfill

The cleanfill material will be from outside sources provided that material only includes virgin natural materials such as clay, soil and rock, or other similar materials such as concrete and bricks.

Furthermore, any cleanfill material from a HAIL site or site on the Listed Land Use Register will only be used if the soil has been shown to contain compounds at or below maximum values for human health listed under the scenario "Rural / lifestyle block 25% produce" Appendix B - "Soil Contaminant Standards" of the Ministry for the Environment Users Guide for the "National Environmental Standard for Assessing and Managing Contaminants in Soil to Protect Human Health" - April 2012.

All deposited cleanfill will be inspected by the Quarry Manager or his representative before being placed in its final position.

These management measures will aim to minimise the risk of adverse effects on the environment and enhance the future use of the quarry site.

There will be a layer of 0.5m of silt or clay placed at bottom of the quarry site before any clean fill is added. If any rocks, bricks or concrete are added as part of the cleanfill, there will be at least 1 m of soil deposited above the material.

7.3 Sequence of soil placement

Soil placement is the single most important operation in the restoration process. The soil must be placed under optimal conditions to specified depths on a platform graded to design levels.

The platform design determines the future landform and must consider materials available, groundwater levels, erosion hazard, slope criteria for restored land use, aspect, microclimate, aesthetics, and most importantly, drainage (Ramsay, 1986).

Once the shape of the existing land surface has been attained, the soil materials need to be placed using light track-driven machinery or lighter quarry machines or flotation tyred machinery. The topsoil material needs to be distributed in such a way as to achieve an approximately uniform stable thickness over the whole area.

Any exposed soil surfaces require protection from wind erosion. Light surface wetting of the soil topsoil via irrigation is an acceptable method. All areas that are not being actively quarried will be maintained in vegetation.

8.0 Assessment of Effects from Soil Management

8.1 Nitrogen loss from soils

The area of the site in which quarry activities are occurring will have a low nitrogen leaching rate, related to the nitrogen content in rainfall (2 kg N/ha/yr, as modelled in OverseerFM v 6.5.1).

Following rehabilitation, the thickness of the soils will be similar to the levels before quarrying. This is not expected to change the mass of nitrate leaching from the base of the soil profile. Following the rehabilitation of the quarried land, annual losses of nitrate to groundwater will be similar to the current losses if the current agricultural land use practices continue.

8.2 Phosphorus loss from soil

Phosphorus losses to water are usually from runoff to surface water. This site does not contain any surface waterways. This site has been utilised as a dryland small block mostly used for horse grazing and is unlikely to have had high levels of phosphate fertiliser added. Phosphorus leaching vulnerability for Eyre soils is not yet available.

Phosphorus leaching is most likely to occur following the application of phosphate fertiliser, therefore it is unlikely that there will be a high risk of phosphorus leaching during the quarry process and creation of storage bunds. As part of the rehabilitation programme phosphate fertiliser will be used to

establish the pasture and this will follow good management practices to match pasture uptake.

The proposed activity will have a less than minor effect on this nutrient loss it is expected the site will be returned to agricultural land uses that are similar to what has occurred in the past.

8.3 Nutrient loss to surface water

The nearest drains or rivers are over 4 km from the site, therefore, there is no overland flow from the quarry site or the farming operation to surface water.

8.4 Soil loss to water

Soil management for quarry activities typically requires measures to avoid the risk of soil loss to water. However, at this site there are no surface waterways on, or immediately adjacent to, the property. The quarry site and the rehabilitated site will mostly be below the surrounding ground level so overland flow to a waterway will not occur from these areas. The bunds created around the boundary of the property to screen the quarry will be vegetated with grass to reduce soil damage and loss caused by wind and rain.

The Eyre soils these are well drained soils with moderate permeability over gravels with rapid permeability. The depth of topsoil is not expected to change, therefore it is expected that rainwater will drain through the profile to the groundwater rather than pond. Areas of obviously impeded drainage, which show by way of surface ponding, will be examined to establish if any moisture restricting layer exists and appropriate ripping or subsurface aeration undertaken to shatter such compacted layers.

8.5 Soil Productivity

Following full establishment of the pasture vegetation, the soil should be capable of production similar to the land before quarrying. As the pasture establishes over the first year, soil properties will improve due to the positive impacts of the pasture cover. These will include development of soil aggregates and soil biological activity.

In general, soil properties are likely to change more rapidly in the first few years following re-establishment, and then slow as the soil settles towards longer term equilibrium conditions.

Under established land use, soil quality changes commonly occur over decades depending on the intensity of land use, at which point contemporary land management practices are likely to have a greater impact on the soil rather than the soil property changes associated with the reestablishment of the soil.

8.6 Effects of disturbance on soil properties and productivity

Any soil disturbance (as part of any activity) is likely to result in disruption to soil properties. Soil disturbance or disruption can occur with any land use practice (e.g., cultivation for cropping). Adherence to the Soil Management Plan (most importantly during the removal and placement of the subsoil and topsoil materials) will ensure the effects are minimised and are no more than the soil disturbance effects resulting from land use practices such as cultivation for cropping, forest harvesting and intensive pastoral use.

The effects on soil properties are likely to be predominantly soil physical effects related to soil compaction, loss of soil structure and degradation of soil aggregates during removal, transport and storage, and compaction of the soil material during placement. In turn, these can lead to impeded soil drainage (reducing air and water flow pathways in the soil), reduced soil water storage capacity, and reduced soil pores for biological activity if not managed properly. Soil fertility is not considered to be of primary concern as this can be remedied with the addition of fertiliser. If the steps set out in the Soil Management Plan area adhered to, then effects on soil properties following restoration will be minimised.

Re-vegetation to pasture should be undertaken as soon as practicable after topsoil placement. This will minimise possible deterioration of soil structure and development of erosion problems on bare cultivated soils.

Winstone Aggregates intends to return the land to a productive agricultural standard. Based on the guidance provided in the Soil Management Plan, the method of extraction has been designed to achieve this goal.

In the long term, the aim is that the land will be suitable for a range of uses. Following post extraction rehabilitation (including establishment of the pasture vegetation) the soil resource will be capable of supporting at least the same range of land uses as the current soil resource and the life supporting capacity of the soil will be retained.

9.0 Environmental and Potential Contamination Issues

The ECan Listed Land Use Register has been searched and the Regional Council does not hold any information about hazardous activities or industries having occurred on this property, see Appendix E for the HAIL report. The property has been used for rural lifestyle and pastoral purposes for many years. During these activities, chemicals in the form of fertilisers and sprays are likely to have been applied to the land. Aerial images from 1942 to 2019 (Appendix D) show the site has in pasture in all years photographed.

There is a small rubbish pit that appears to contain organic material, however the material lower down in the pit was not examined during the site visit and it appears to be between 8 and 20 years old (from the aerial photographs). A separate PSI maybe undertaken.

Asbestos products ceased to be used after 1986. It is noted that the barn was constructed between 1994 and 2004, however an inspection to determine whether it is constructed with materials containing asbestos has not been conducted. In addition, some rural properties have buried building materials from historical onsite dumping, however there are no known sites of dumps on this property.

The Soil Management Plan includes a process for the investigation and management of HAIL areas that might arise from further investigations.

10.0 Resource Management / Planning Control

10.1 National Policy Statement for Highly Productive Land (NPS-HPL)

The National Policy Statement for Highly Productive Land (NPS-HPL) identifies LUC 1, 2 or 3 land as highly productive. This site is LUC 3, as provided in Section 5 of this report, and is subject to the NHS-HPL which became operative on 17 October 2022. Consideration of NPS-HPL will be provided in a report prepared by Agriintel for this application.

The restored site will have the same depth of topsoil as the existing site and it will be suitable for agricultural production. There will be no long term loss of highly productive land.

10.1Canterbury Water Management Strategy

The Canterbury Water Management Strategy (CWMS) divides Canterbury into 10 water management zones (sub-regions) where issues specific to each area are managed. The site is located within the area managed by the Selwyn/ Te Waihora Zone Committee. The committee have generated a Zone Implementation Programme (ZIP) for this zone. ZIPs are non-statutory documents that are being completed by each of the Zone Committees within the Canterbury region. The Selwyn Te Waihora ZIP addresses critical issues in the sub-regional area such as setting limits for nutrients and the health of Te Waihora. Improving the health of the lake includes actions such as effective riparian management of lowland streams, grazing management, sediment removal, habitat enhancement and nutrient stripping via wetlands. Healthy lowland streams, best practice nutrient and water management, and the integration of kaitiakitanga into water management are all recognised as priority outcomes in the zone.

The issues regarding the quality of water include farm nutrient management in both irrigated and non-irrigated contexts, sedimentation problems e.g., gravel pits and stock water and lastly urban and rural water quality management issues i.e., the setting of nutrient load limits.

Using NCheck the estimated nitrogen loss is very low at 2 kg N/ha/yr for the farming operation and is not expected to increase when quarried, therefore this property can be considered to be meeting these requirements.

10.2 Canterbury Land and Water Regional Plan (LWRP)

The Canterbury Land and Water Regional Plan (LWRP) aims to provide clear direction on how land and water are to be managed in the region. Aspects of the plan that relate to soil use are discussed below.

The LWRP contains objectives, policies and rules as required under section 67(1) of the RMA. The objectives, policies and rules in this Plan manage land, water, and biodiversity within the region in conjunction with other non-statutory methods. They are consistent with the vision and principles in the CWMS.

This Plan operates at two levels. There is a region-wide section, which contains the objectives, policies and rules that apply across the region. There are also ten sub-region sections.

The sub-region sections contain policies and rules which are specific to the catchments covered by that section. The policies and rules in the sub-region sections implement the region-wide objectives in the Plan in the most appropriate way for the specific catchment or catchments covered by that section. As there are no policies relevant to this proposal in the Selwyn sub-region (Section 11) Region-wide policies apply.

Region-wide Policies 4.1 and 4.2 refer to water bodes meeting freshwater outcomes and consider cumulative effects. The nitrogen loss for the property is unlikely to increase which is consistent with these policies.

Policy 4.13 is focused on minimising the discharge of contaminants to surface water and groundwater. The proposal is generally consistent with this policy, in that the nutrient load will not increase.

The subject property is situated within the boundaries of the Canterbury Regional Council, ECan, and is subject to the Canterbury Land and Water Regional Plan (LWRP). The LWRP was made operative in part as of 1 September 2015. There were six additional plan changes to the LWRP that are now operative.

The subject property is located within the Selwyn - Te Waihora sub-region of the LWRP. Plan Change 1 Selwyn Waihora became operative on 1 February 2016. Rules that apply in the Selwyn - Te Waihora sub-region (section 11) apply in addition to or prevail over the region-wide rules (section 5) or are new.

The rules in the LWRP pertaining to nutrients consider the water quality within an area (nutrient allocation zone) and the amount of nutrients leached by a farming activity. the rules then aim to regulate nitrate leaching accordingly. The subject property is located within the Selwyn/Waihora nutrient allocation zone. The Selwyn/Waihora nutrient allocation zone is a red zone, meaning that water quality outcomes for the zone are not met and there is no capacity for the zone to absorb more nitrogen.

No part of the subject property is located within the Phosphorus & Sediment Risk Area or the Lake Area of the Cultural Landscape/Values Management Area (CLVMA) as shown on the Planning Maps.

Within the Selwyn - Te Waihora sub-region, small farms (less than 10 ha) leaching less than 15kgN/ha are a permitted activity. If farm nitrogen losses are greater than 15kgN/ha, a consent to farm is required even where a property is smaller than 10 ha.

A nutrient budget modelling report has not been provided by the applicant, however, using NCheck (estimated loss of 2 kg N/ha/yr) and given the low intensity pastural grazing land use and no cropping, it is considered that the subject property is likely to have a nitrogen leaching loss of less than 15 kg N/ha.

The Canterbury LWRP states quarry sites need to be “appropriately managed or rehabilitated once extraction ceases”. Rehabilitation will restore topsoil over areas already quarried to enable appropriate future uses.

Within the Selwyn District there are approximately 133,800 ha of land that are classified as LUC 1, 2 or 3 versatile land. The site will use approximately 4 ha which is 0.003% of this land and it will be rehabilitated so it can be used for primary production.

10.1District Plan

The site is located within the Rural (Inner Plains) zone under the Partially Operative Selwyn District Council District Plan (POSDP). The site was also found to not be located within the Waimakariri, Lower Plains or Lake Ellesmere Flood areas. It is not within the Lake Ellesmere Flood areas, nor was it found to be located in the Wāhi Taonga Management, Outstanding Landscapes or Outstanding Natural Features areas.

The current use of the subject property as a lifestyle block appears to comply with the District Plan and it is likely this site will be returned to this use following rehabilitation.

10.2 National Environmental Standard for Freshwater 2020 (NES-F)

The National Environmental Standards for Freshwater (NES-F) 2020 partially came into force on 3 September 2020. Parts of the standards have later enforcement dates.

The purpose of the NES-F is the 'regulation of activities that pose risks to the health of freshwater and freshwater ecosystems'. The NES-F sets out requirements that need to be complied with. These standards are set to:

a. Protect existing inland coastal wetlands;

b. Protect urban and rural streams from in-filling;

c. Ensure connectivity of fish habitat (fish passage);

d. Set minimum requirements for feedlots and other stockholding areas;

e. Improve poor practice intensive winter grazing of forage crops;

f. Restrict further agricultural intensification until the end of 2024; and

g. Limit the discharge of synthetic nitrogen fertiliser to land and require reporting of fertiliser use.

As the there are no waterways, the stock exclusion rules do not apply. The property is 4.2 ha and is therefore below the minimum thresholds for intensive winter grazing, dairy support, dairy land, and irrigation. In summary this farm is a Permitted activity under the NES-F.

11.0 Conclusion

Based on this assessment it is considered that the soils on the property can be managed during and following the quarrying process so that once quarrying is complete, the soils can be restored to a similar level of capability. As such, the proposed development can achieve the desired outcomes of the various planning documents that aim to promote good soil management.

12.0 References

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Appendix A: Soils Map

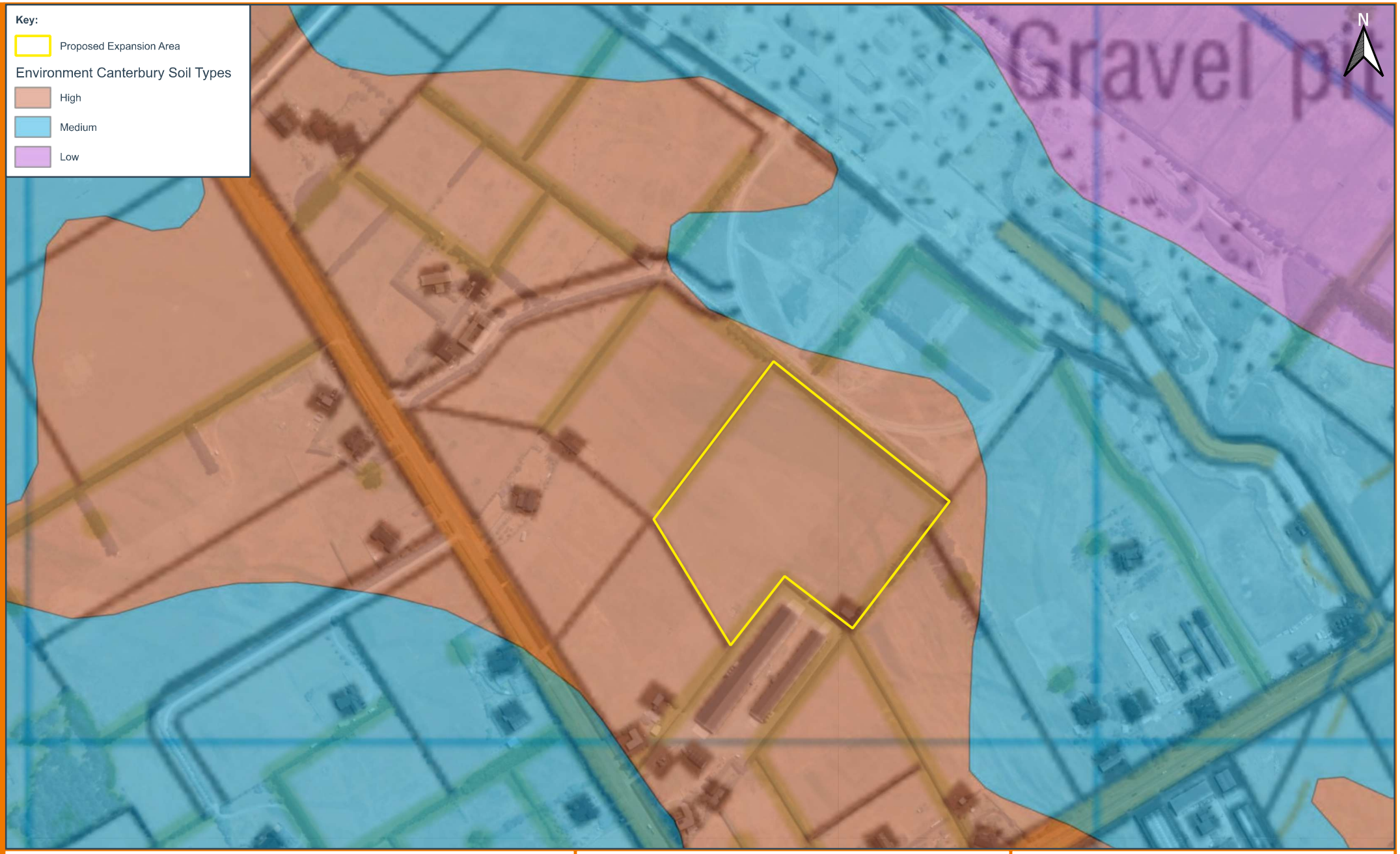

FIGURE 01:

FLETCHER CONCRETE AND INFRASTRUCTURE LIMITED

NOTES:
1. AERIAL IMAGERY SOURCED FROM THE LINZ DATA SERVICE [https://data.linz.govt.nz] AND LICENCED BY LINZ FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 INTERNATIONAL LICENCE.

0 100 200 m

METRES

SCALE : 1:4,600 (A4)

REVISION: 01 | DATE: APR 24 | BY: DM
CLIENT: FLETCHER CONCRETE AND INFRASTRUCTURE LIMITED

Appendix B: Land Use Capability Map

FIGURE 02: LAND USE CAPABILITY CLASSES

FLETCHER CONCRETE AND INFRASTRUCTURE LIMITED

NOTES:
1. AERIAL IMAGERY SOURCED FROM THE LINZ DATA SERVICE [https://data.linz.govt.nz] AND LICENCED BY LINZ FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 INTERNATIONAL LICENCE.

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METRES

SCALE : 1:4,600 (A4)

REVISION: 01 | DATE: APR 24 | BY: DM
CLIENT: FLETCHER CONCRETE AND INFRASTRUCTURE LIMITED

Appendix C: Site Map for Geotechnical Study

FIGURE 1: GEOTECHNICAL SITE LOCATION PLAN

706 ROBINSONS ROAD, SOILS ASSESSMENT

SOURCE:

1. AERIAL IMAGERY SOURCED FROM THE LINZ DATA SERVICE [https://data.linz.govt.nz] AND LICENCED BY LINZ FOR RE-USE UNDER THE CREATIVE COMMONS ATTRIBUTION 4.0 INTERNATIONAL LICENCE.
2. TEST PIT LOCATIONS BASED ON COORDINATES PRESENTED IN PDP GEOTECHNICAL REPORT (DATED NOV 2019).
3. MONITORING BORE LOCATIONS BASED ON COORDINATES PROVIDED IN PRO-DRILL BOREHOLE LOGS.
4. CONTOURS BASED ON LIDAR ELEVATION DATA SOURCED FROM LINZ (2024).

0 500 1,000 m

SCALE : 1:2,500 (A4)

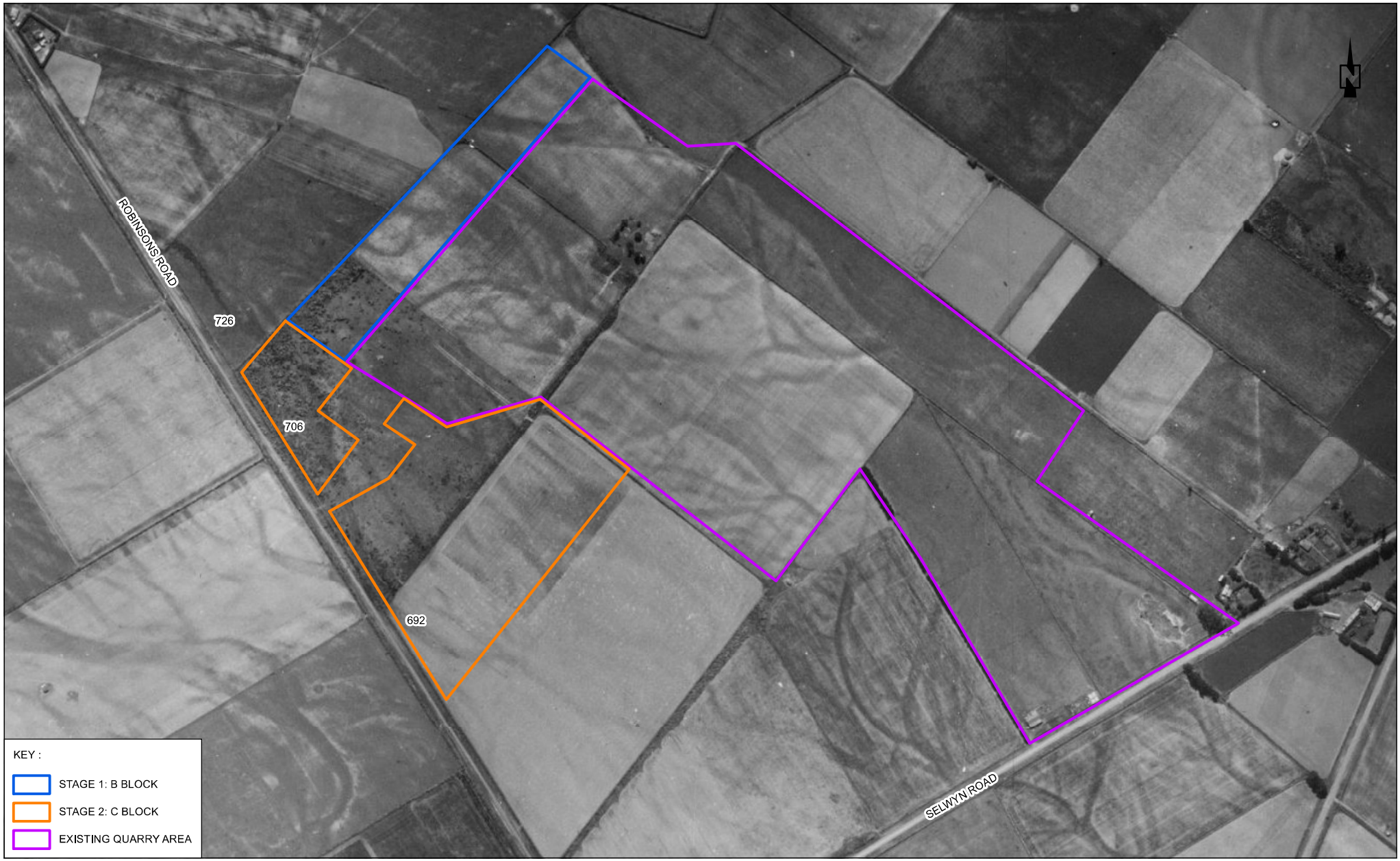
N

REVISION: 01 | DATE: APR 24 | BY: RS

CLIENT: FLETCHER CONCRETE AND INFRASTRUCTURE LIMITED (WINSTONE AGGREGATES)

C039420001

Appendix D: Historical Aerial Imagery



SOURCE:
1. AERIAL IMAGERY SOURCED FROM CANTERBURY MAP PARTNERS ADMINISTERED BY ENVIRONMENT CANTERBURY (MAY NOT BE SPATIALLY ACCURATE).

SCALE : 1:6,000 (A4)

0 50 100 200 300

METRES

1942 AERIAL PHOTOGRAPH

SOURCE:
1. AERIAL IMAGERY SOURCED FROM CANTERBURY MAP PARTNERS ADMINISTERED BY ENVIRONMENT CANTERBURY (MAY NOT BE SPATIALLY ACCURATE).

SCALE : 1:6,000 (A4)

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METRES

1962 AERIAL PHOTOGRAPH

SOURCE:
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SCALE : 1:6,000 (A4)

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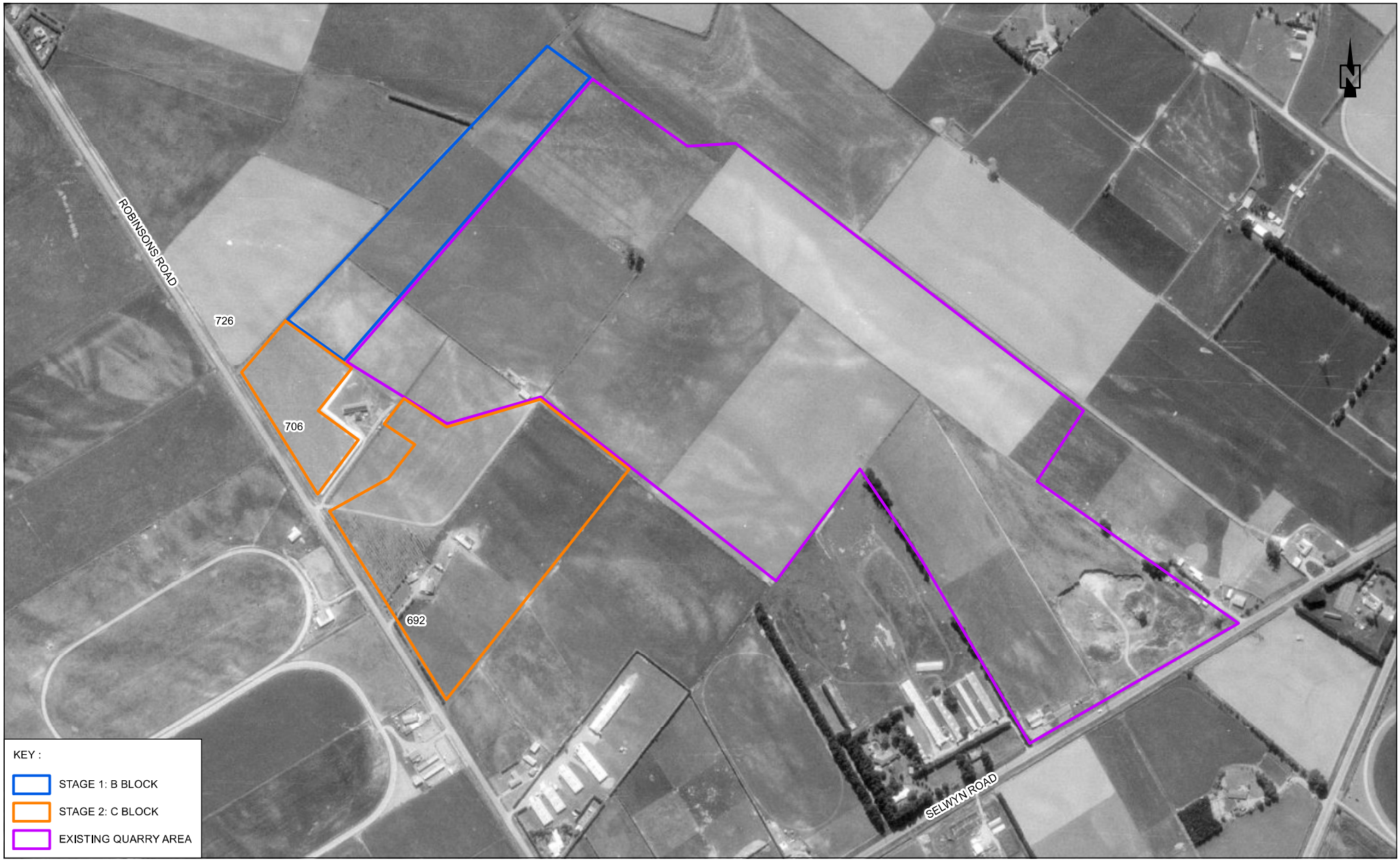
METRES

1974 AERIAL PHOTOGRAPH



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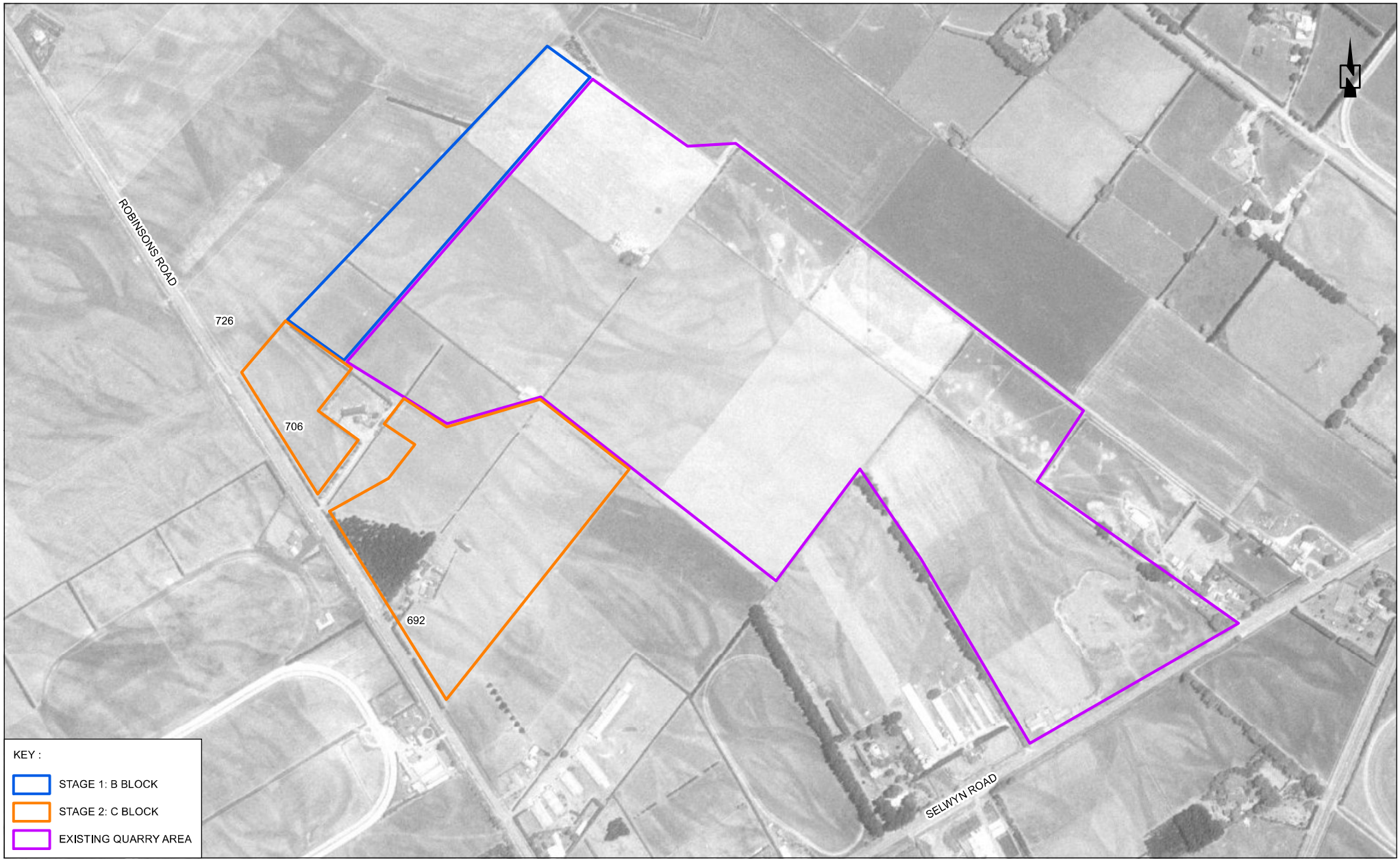
METRES

1984 AERIAL PHOTOGRAPH



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SCALE : 1:6,000 (A4)

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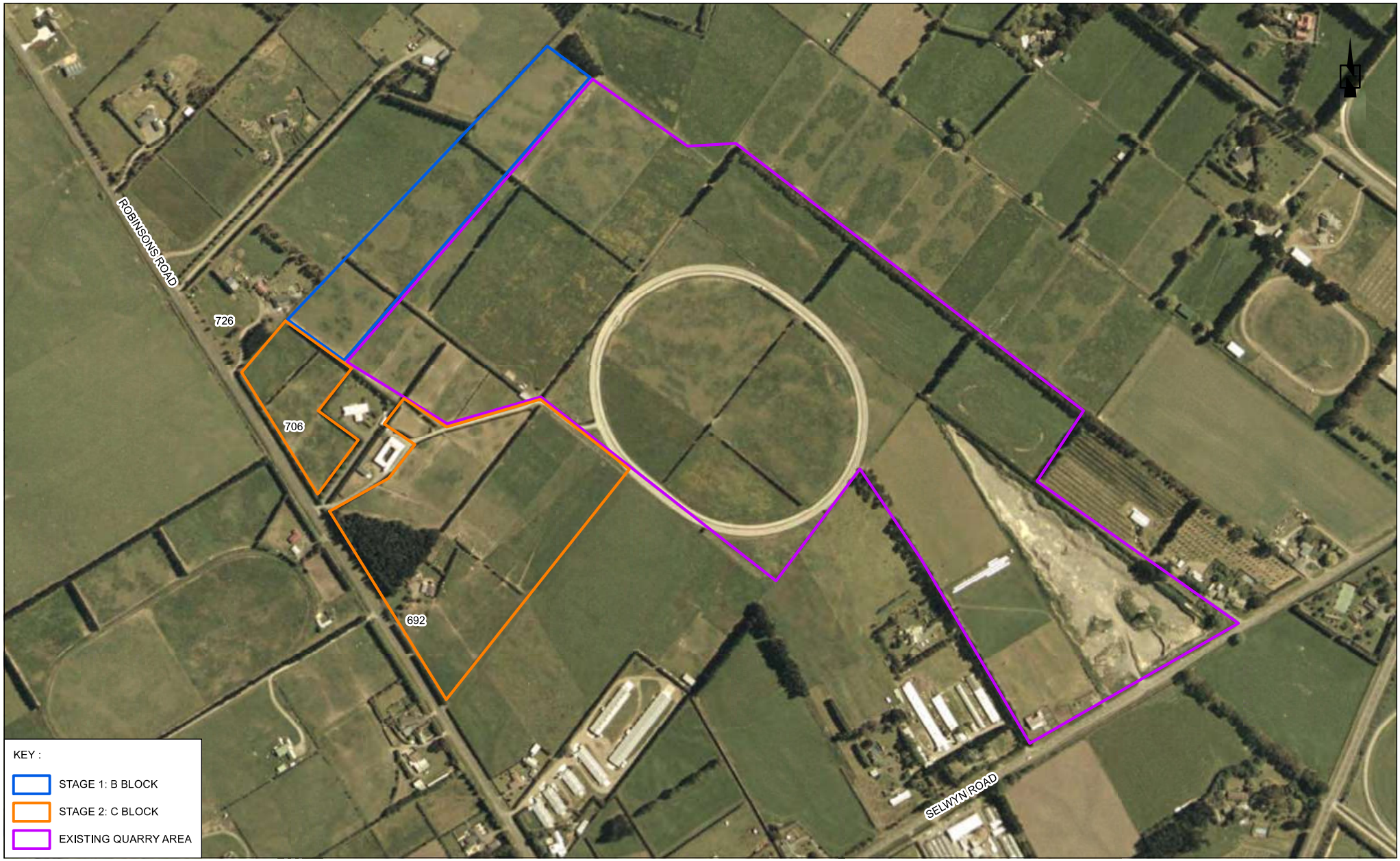
METRES

1994 AERIAL PHOTOGRAPH



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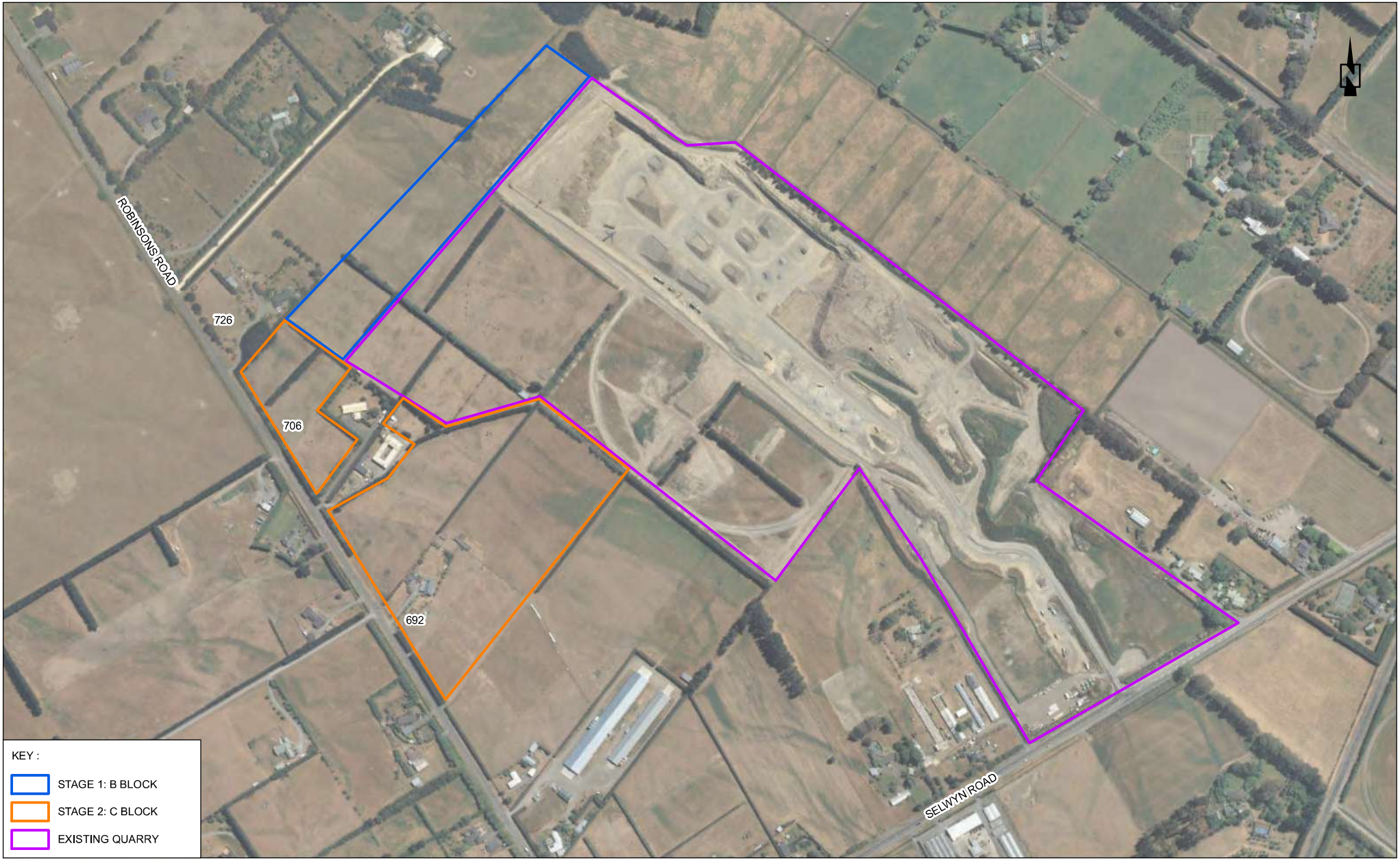
METRES

2004 AERIAL PHOTOGRAPH



SOURCE:
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2016 AERIAL PHOTOGRAPH

SCALE : 1:6,000 (A4)

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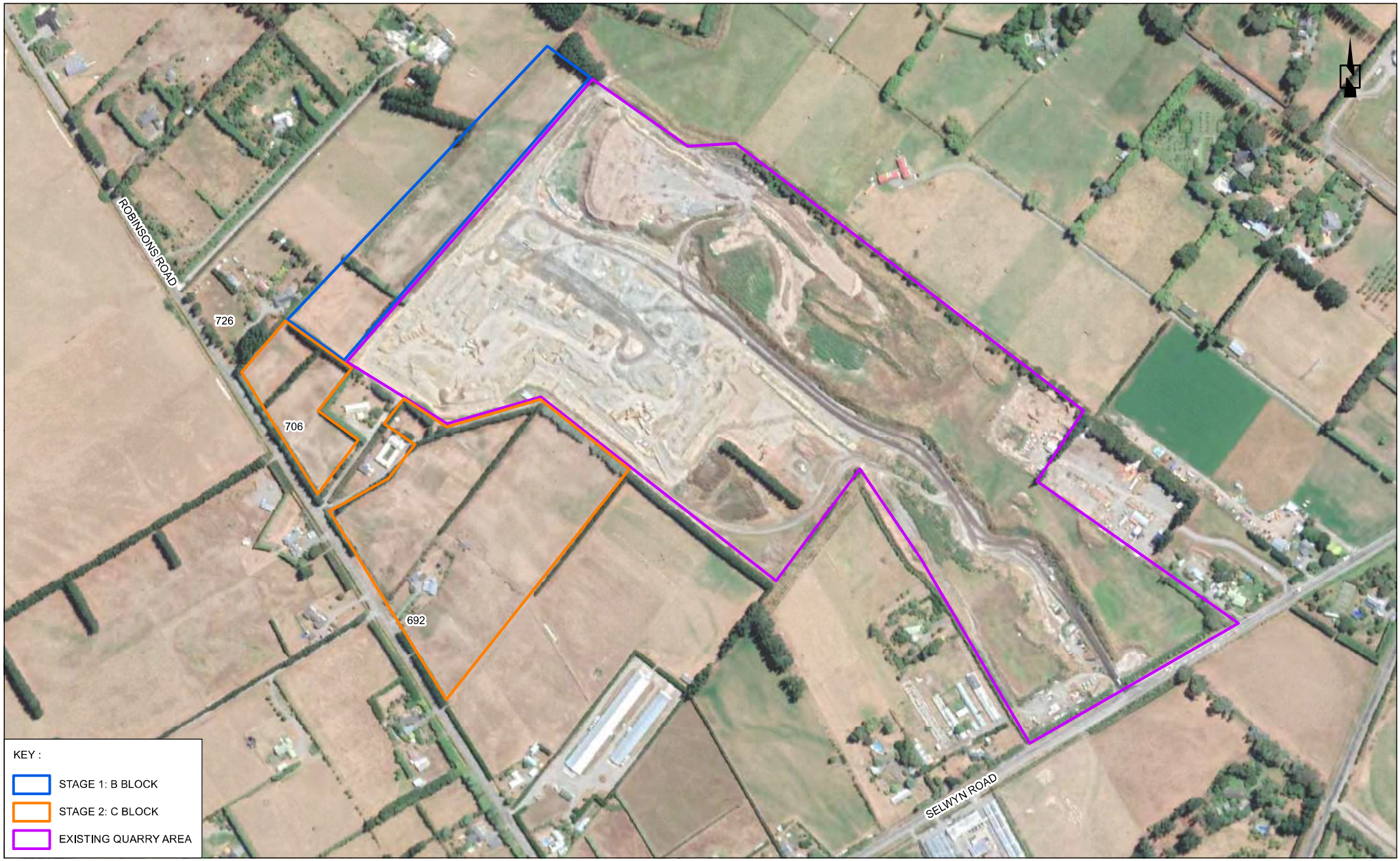

SOURCE:
1. SATELLITE IMAGERY SOURCED FROM GOOGLE EARTH PRO (MAY NOT BE SPATIALLY ACCURATE).

SCALE : 1:6,000 (A4)

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METRES

2019 AERIAL PHOTOGRAPH

C03942700_Z002_AERIAL_PHOTOGRAPH.mxd 26/09/2019 ISSUE 1

Appendix E: HAIL report

Property Statement from the Listed Land Use Register

Environment Canterbury Regional Council
Kaunihera Taiao ki Waitaha

Visit ecan.govt.nz/HAIL for more information or
contact Customer Services at ecan.govt.nz/contact/ and quote ENQ378519

Date generated: 09 May 2024
Land parcels: Lot 2 DP 80577

The information presented in this map is specific to the property you have selected. Information on nearby properties may not be shown on this map, even if the property is visible.

Sites at a glance

Sites within enquiry area

There are no sites associated with the area of enquiry.

More detail about the sites

There are no sites associated with the area of enquiry.

Disclaimer

The enclosed information is derived from Environment Canterbury's Listed Land Use Register and is made available to you under the Local Government Official Information and Meetings Act 1987.

The information contained in this report reflects the current records held by Environment Canterbury regarding the activities undertaken on the site, its possible contamination and based on that information, the categorisation of the site. Environment Canterbury has not verified the

Our Ref: ENQ378519
Produced by: LLUR Public 9/05/2024 5:49:13 AM

Page 1 of 2