Belmont Quarry Development – Part A

Substantive Application
Appendix A.8 – Aggregate Resource Assessment
Winstone Aggregates

16 August 2026

Belmont Quarry Development

Aggregate Resource Assessment

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Author

The author of this report is Paul Herbert, Senior Project Manager at Winstone Aggregates, a division of Fletcher Concrete and Infrastructure Limited. In this role, Mr Herbert is responsible for the planning, coordination, and delivery of major quarry infrastructure and staging works at Belmont Quarry.

Mr Herbert has over 20 years' experience across mining, quarrying, and civil infrastructure projects in New Zealand and Australia. He holds a Bachelor of Science and Technology (BSc(Tech)) from the University of Waikato and has multidisciplinary experience spanning geotechnical engineering, geology, engineering, and mine planning, including both project and operational roles in both the mining and quarrying industries.

In preparing this report, Mr Herbert has drawn together the independent geological, petrological and resource-modelling work undertaken for the quarry and coordinated its synthesis with the project's specialist assessments. This report has been prepared for the purpose of supporting an application under the Fast-track Approvals Act 2024. While not independent of Winstone Aggregates, the author confirms that he has read the Expert Witness Code of Conduct contained in the Environment Court's Practice Note 2023 and (to the extent possible, given his employment) has complied with it in providing this report. Except where explicit reliance is placed on advice from external specialists, the matters addressed are within the author's professional experience and responsibility. To the best of his knowledge, no material facts have been omitted that would materially alter the information presented.

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1 Executive Summary

1.1 Purpose of Report

This report presents an assessment of the greywacke aggregate resource at Belmont Quarry, prepared to support an application under the Fast-track Approvals Act 2024 for an engineered overburden disposal area (OBDA). It draws together the quarry's geological investigation history to establish the existence, quality, distribution and likely life of the resource, and to demonstrate why continued access to that resource requires the OBDA that forms the subject of the application.

The application authorises the OBDA and the associated land exchange; continued extraction occurs under the quarry's existing operational consents, which are not altered by this application. The resource case set out in this report establishes the need for, and the scale of, the OBDA.

Key conclusions that can be adopted or taken from this summary are provided in **bold** below.

1.2 Project Context

The Wellington region is structurally dependent on greywacke for its construction aggregate. In-situ greywacke, and greywacke-derived sands and gravels, is effectively the only viable aggregate resource available to the region; the geologically young volcanic sources that supply aggregate elsewhere in the North Island are absent. **Continuity of supply from established greywacke quarries such as Belmont is therefore a regional necessity rather than a matter of preference.** Aggregate and sand is listed on New Zealand's Critical Minerals List, and Belmont's proximity to the Hutt Valley and the wider Wellington market gives continuity of supply from this site particular value, because the delivered cost of aggregate is highly sensitive to haul distance.

1.3 Overview of Resource

The Belmont resource is dominantly greywacke sandstone of the Torlesse Composite Terrane (Rakaia Terrane), with low argillite content (less than approximately 5%) forming the principal aggregate-grade material. **Investigations confirm a substantial inventory of high-quality greywacke sandstone extending northeast behind the current faces and at depth. Application of geological, engineering and operational constraints identifies a substantial resource sufficient to support continued quarry operation over the assessment horizon.**

1.4 Resource Continuity and Confidence

Resource continuity has been established through successive drilling and mapping campaigns between 2004 and 2021, comprising twenty deep and shallow investigation bores, approximately 5.5 km of mapped faces, and dedicated aggregate-quality testing. These data have been incorporated into a three-dimensional geological and resource model. **Recent reconciliation of the model against exposed geology indicates that the model remains conservative, with aggregate-quality**

rock generally occurring at higher levels than predicted and lower quantities of overburden and low-grade material requiring removal than previously modelled. Confidence is highest adjacent to mapped quarry faces and within the previously investigated Cottle Ridge and Firth Ridge areas, where geological conditions have been confirmed by drilling, mapping and production exposure. Confidence decreases with distance from these areas as direct geological information becomes less abundant; however, the overall model is considered conservative and appropriate for long-term resource planning.

1.5 Aggregate Quality

Aggregate end-use at Belmont is governed primarily by weathering grade, with the less-weathered (slightly weathered to fresh) sandstone yielding the premium products. New Zealand greywacke is non-reactive in terms of Alkali Silica Reaction (ASR), consistent across the 2013 and 2021 assessments and as defined by industry guideline CCANZ TR3. **The deposit is capable of sustained production of specification aggregates, including high-PSV sealing chip and concrete aggregate, with quality-assurance considerations — principally vein-hosted laumontite near faults — managed through normal rock selection and testing.**

1.6 Resource Estimation and the OBDA Requirement

Belmont Quarry has a geological inventory of approximately 55 million tonnes (~20 mBCM) of greywacke. The geological inventory represents the total quantity of material identified within the deposit, whereas the resource represents the portion of that inventory currently considered suitable and available for extraction after applying geological, engineering, geotechnical and operational constraints. Based on the current long-term resource and scheduling model, the proposed OBDA makes approximately 33.7 million tonnes of resource accessible, [redacted] over an indicative 40-year quarry life schedule at current production rates of 0.72 to 0.85 million tonnes per annum. The current resource estimate is intentionally conservative and reflects present geological understanding, quarry design assumptions and operational constraints. As these factors evolve over time, the proportion of the geological inventory that can be recovered may also change.

The Fast Track referral documentation refers to approximately 20 million BCM of aggregate-bearing rock. The figures presented in this report distinguish between geological inventory, resource, saleable production and overburden material, and utilise reporting units appropriate to each material type. Geological inventory, resource and saleable production are reported primarily in tonnes, with volumes converted using an in-situ rock density of 2.6 t/m^3. Overburden, process fines and disposal volumes are reported in cubic metres (m^3 or BCM) due to the variable density and bulking characteristics of these materials. The apparent differences between reported quantities therefore reflect both density conversions and the distinction between total geological inventory, recoverable resource and saleable production.

Winning this resource requires removal of approximately 2.2 million cubic metres (in-situ) of overburden, low-grade rock and process fines that have little or no saleable value and therefore require placement within a managed disposal area. This requirement is the direct and unavoidable driver for the proposed OBDA. Key metrics are summarised in Table ES1.

Allowing for placement bulking, this material occupies approximately 2.87 million cubic metres, accommodated in full within the proposed OBDA (engineered capacity of approximately 2.73 million cubic metres across ten stages) together with the residual capacity of the existing Cottle disposal area (approximately 0.14 million cubic metres). **The OBDA is intrinsic and proportionate to the resource. Its volume and footprint are a direct function of the overburden inherent to the deposit, and the requirement is driven by the absolute volume of material requiring placement and the absence of early in-pit disposal capacity, rather than by a high strip ratio.**

Without new disposal capacity of the scale proposed, the quarry is estimated to reach a disposal constraint within approximately five to ten years (depending on market demand) and cease economic extraction well before the resource itself is exhausted (Section 9.7). Extraction would become progressively limited to areas where aggregate is already exposed and little or no overburden removal is required, leaving substantial portions of the resource inaccessible despite remaining in situ.

Metric	Value	Reference
Total geological inventory	~55 Mt	Section 6.1
Total resource	33.7 Mt	Section 6.3
[redacted]	[redacted]	Section [redacted]
Indicative quarry life	40 years	Section 6.3
Average production rate	0.72–0.85 Mtpa	Section 6.3
Material to disposal (in-situ)	2.20 Mm^3	Table 3
Placement bulking (swell) factor	1.30	Section 8.2
Material to disposal (placed)	2.87 Mm^3	Table 4
Regional OBDA capacity (10 stages)	2.73 Mm^3	Section 8.2
Cottle residual capacity	0.14 Mm^3	Section 8.2
Total available disposal capacity	2.87 Mm^3	Table 4

Table ES1: Key resource and disposal metrics (Mt = million tonnes; Mm^3 = million cubic metres).

1.7 OBDA Design Alternatives

The proposed OBDA is a permanent engineered landform developed through successive design iterations and staged construction. Its design integrates foundation preparation, drainage installed ahead of fill, controlled material placement, fines containment, catchment-based stormwater management and progressive rehabilitation. The preferred footprint was refined using updated 2025 LiDAR and ecological and geotechnical information, including pull-backs from the north-eastern wetland, higher-value ecological areas in the south-west (containing swamp maire) and areas of greater geotechnical uncertainty. Alternative locations and configurations, a smaller footprint, complete avoidance of streams and wetlands, off-site disposal and alternative quarry sequencing were all assessed as part of the project design. Complete avoidance or further footprint reduction would materially reduce capacity and compromise the integrated stability, drainage and safe sequencing of the landform, and reduced fill capacity would also mean this was not a long-term overburden solution for the quarry Gullies used to contain fill frequently have streams and wetland features present; it is not possible to both fill and avoid impact on these features. **The selected Exchange Land design provides the disposal capacity required to make 33.7 million tonnes of total resource accessible and enable [redacted] while maintaining short internal haul routes and progressively completing and revegetating the park-facing areas.**

1.8 Key Risks and Quality Assurance

The resource and aggregate-quality risks are well understood and operationally managed: irregular weathering boundaries; argillaceous and altered ("green") domains of variable hardness; and vein-hosted laumontite near faults. **These are managed through selective quarrying, blending, and established production testing.**

1.9 Overall Conclusion

The greywacke resource targeted by the Belmont Quarry Development is laterally and vertically continuous, capable of producing specification aggregates including high-PSV sealing chip, and suitable for long-term economic extraction. The proposed OBDA is operationally necessary to make approximately 33.7 million tonnes of resource accessible and enable the production of [redacted]. Its engineered, staged and progressively rehabilitated design provides the disposal capacity required to support extraction of the resource while appropriately balancing long-term stability, operational efficiency and environmental considerations. The volume and footprint of the OBDA are directly related to the overburden and non-saleable material inherent within the deposit and are proportionate to the resource being accessed. On this basis, the resource and proposed OBDA design provide a robust and technically sound foundation for the application under the Fast-track Approvals Act 2024.

2 Introduction

2.1 Background and Project Overview

Belmont Quarry, operated by Winstone Aggregates (a Division of Fletcher Concrete & Infrastructure Limited), is an established hard-rock aggregate quarry on the western side of the Hutt Valley, Wellington. It has supplied aggregate to the Wellington region for many years and remains an operating source of premium roading and concrete aggregates, hard fill and riprap. The quarry works a greywacke ridge system, with the active resource frontier having moved progressively into the Firth Block on the eastern side of the pit. Residential development adjoins the site to the south and east, including Hebden Crescent at approximately RL30m.

Extraction has been completed to the planned extent on the southwest side of the pit and has advanced east into the Firth Block. Much of the original Firth Ridge has been removed above the RL100m level, new faces have been established along the southwest side, and a box cut has been formed from the RL75m level into high-grade rock. As at the most recent (2021) mapping, the box cut had effectively targeted the best rock available in the Firth area and was becoming constrained by lower-grade rock to the north and east. The resource-driven development direction is a shift to more general northeast advancement of the northern faces, with scheduled removal of all rock units — the development that the OBDA is required to support.

The proposed OBDA is located adjacent to the operational area within Belmont Regional Park, on land to be obtained through a land exchange with the Department of Conservation (lodged December 2025). The OBDA, the land exchange, and the staged development of the disposal landform are described in the substantive application and supporting OBDA design documentation; this report establishes the resource basis on which the need for and scale of the OBDA rests. The site location and land-exchange context are shown in Figure 1.

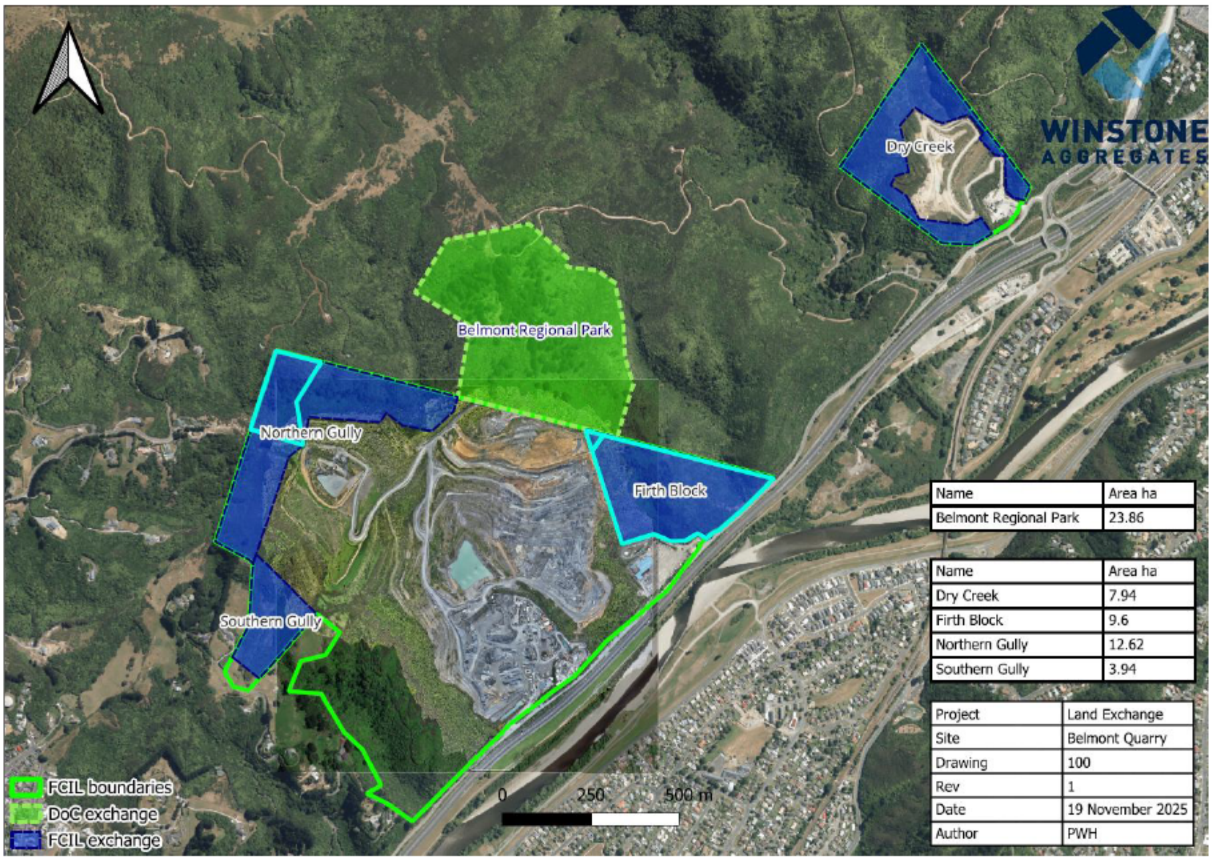

Figure 1: site location and land-exchange context.

2.2 Basis of Assessment

The assessment is a synthesis of independent technical work undertaken for Winstone Aggregates over almost two decades — principally by GF Industrial Geology / Industrial Geology Ltd (IGL), with petrographic input from Panda Geoscience Ltd and resource modelling by Terra Mining Consultants (TMC) — together with Winstone's current quarry production and OBDA staging schedule (8 July 2026). The principal sources are listed in the References (section 12). No new fieldwork has been undertaken for this report.

2.3 Scope of this Report

This report addresses the existence, quality, distribution, quantum and likely life of the greywacke resource, and the consequential overburden burden that drives the OBDA requirement. It does not address geotechnical stability design, ecological, hydrological, traffic, cultural or statutory-planning matters, which are dealt with in the relevant specialist assessments accompanying the application. Where relevant, this report provides the resource and end-use foundation on which those broader assessments rely.

2.4 Limitations

The resource described here is defined from a limited number of investigation bores and surface mapping, supplemented by exposures created during quarrying. As the source authors note, the geological model is necessarily a simplified and, in the authors' assessment, generally conservative representation of actual conditions. Confidence is highest close to mapped faces and lower in areas controlled only by sparse drilling. The resource estimate and model should be treated as requiring ongoing confirmation as extraction proceeds, consistent with the limitations recorded in the source reports.

3 Project Context and Strategic Significance

The Fast-track Approvals Act 2024 is directed at facilitating projects with significant regional or national benefits. The Belmont resource, and the continuity of supply that the OBDA enables, supports that test on several grounds set out below.

3.1 Aggregate use and the Wellington market

Rock aggregate is a core construction material and a fundamental component of concrete and asphalt, used across roading, building foundations, drainage, water and wastewater networks, and erosion protection. Aggregate demand is inherently high-volume, and as a low-value, high-volume commodity the delivered cost of aggregate is highly sensitive to haul distance. A producing quarry close to its market therefore has a value to the region that a more distant resource cannot replicate.

3.2 The sole-source nature of greywacke supply

In-situ greywacke is effectively the only aggregate resource available to the Wellington region. The geologically young volcanic materials that provide aggregate elsewhere in the North Island — including pumice and other rhyolitic and basaltic sources — are absent from the Wellington area. The region is therefore structurally dependent on greywacke quarries such as Belmont for its aggregate supply, and the continued functioning and progressive development of established quarries is a regional necessity. This locational constraint reflects the concept of functional need in national direction: aggregate extraction can only occur where a suitable geological resource exists and remains accessible.

3.3 Critical mineral status

Aggregate and sand is included on New Zealand's Critical Minerals List (finalised January 2025), in recognition of its economic importance and the regulatory constraints limiting new supply, together with the lack of cost-effective alternative sourcing arrangements. Quarrying projects have been expressly recognised under the fast-track regime as enabling infrastructure and housing delivery.

3.4 Proximity, premium products and continuity

Belmont sits adjacent to the Hutt Valley and the wider Wellington market. Because the delivered cost of aggregate is widely estimated to roughly double beyond the first 30 km of cartage, placing overburden locally also avoids unnecessary haulage emissions and the displacement of disposal demand onto other sites. The resource yields high-PSV sealing chip and concrete aggregate — specialised, quality-controlled products essential to safe roading and to construction, and not readily substitutable. Belmont is a long-established, consented operation with a well-characterised resource and a clear, geologically-driven development path; the application enables continuity of supply rather than greenfield establishment.

4 Geological Setting

4.1 Regional geological setting

The quarry works greywacke basement rocks of the Torlesse Composite Terrane (Rakaia Terrane), uplifted along the western side of the active Wellington Fault (orange dashed line below) and generally mantled by surficial soils including weathered colluvium, loess and ancient alluvium. The rock is dominantly greywacke sandstone with very steeply dipping interbeds of siltstone to argillite, weathered and/or altered to significant depths, variably fractured and veined, and crossed by several large faults. The detrital mineralogy indicates derivation from a largely granitic source area, with the rock subsequently metamorphosed to prehnite–pumpellyite grade. The regional geological setting is shown in Figure 2.

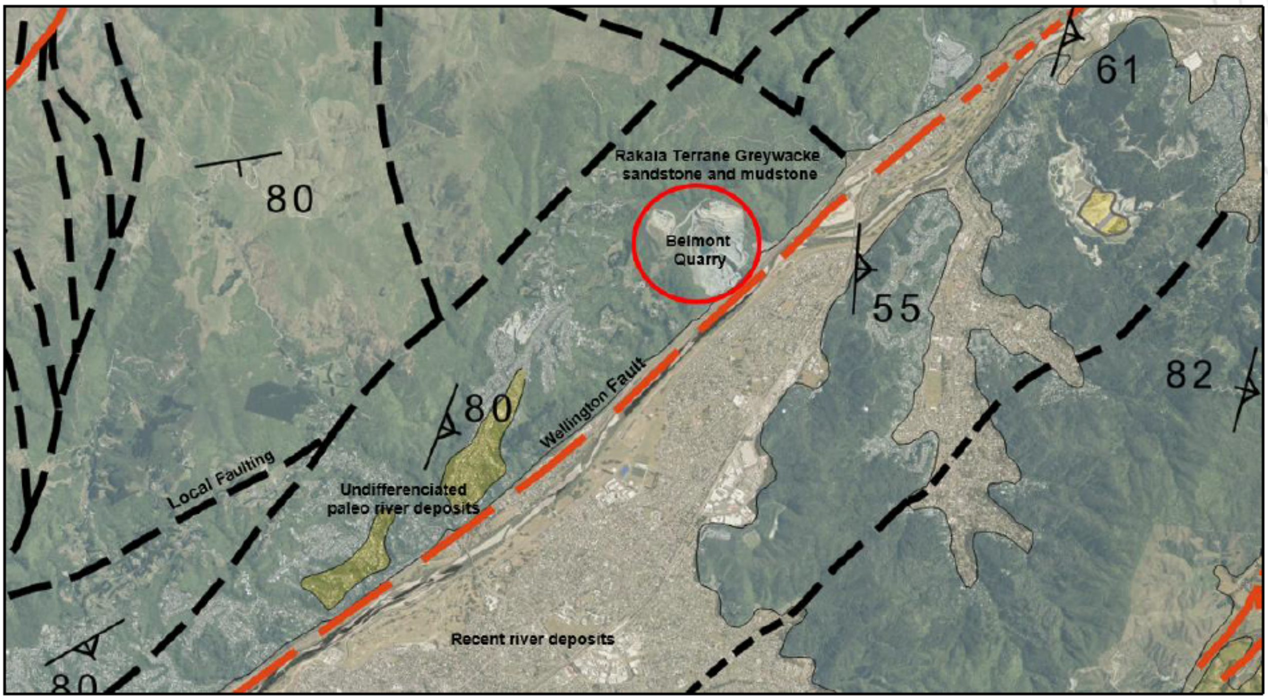

Figure 2: Belmont Quarry regional geological setting (QMAP).

4.2 Rock types

The resource is dominantly greywacke sandstone with low argillite content (less than approximately 5%), which forms the principal aggregate-grade material. Sandstone with intermediate (5–15%) and high (greater than 15%) argillite content occurs in discrete, broadly north-trending zones that have been delineated for rock-selection purposes. A central high-argillite unit, bounded on its eastern side by the main central fault, has narrowed in the mapped faces to typically 15–30 m wide. Argillite content generally increases with further eastward development in the Firth area. Argillaceous (clay-rich) rock is inferior for aggregate and is avoided by selective quarrying and/or removed during processing.

4.3 Weathering and Alteration

The greywacke is weathered to standard grades — residual soil / highly weathered ("rotten"), moderately weathered (brown), slightly weathered (blue-brown) and fresh (blue) — with weathering grade the primary control on aggregate end-use (Section 7.1). Weathering generally lowers from the northern faces southeast into the Firth area and rises beneath the ridge crests.

A distinctive feature of the eastern Firth area is a body of altered "greenish" rock that is equivalent to the standard weathering grades but lacks the usual brown oxidation colour. It is interpreted as relic deep weathering formed under low-oxygen conditions beneath the ancient alluvium that capped the quarry ridge, possibly with some geothermal alteration associated with the central fault at depth. The 2021 petrological work (Section 7.3) confirms the green colour is a thin surface stain of essentially aesthetic significance rather than a distinct or deleterious mineralogy. The operationally important point is that the associated weakening of the rock varies considerably and the altered rock can be visually indistinct, requiring close inspection and manual hardness assessment during selection. This variability is the basis for the conservative treatment of slightly weathered green rock in the resource classification (Section 6.2).

4.4 Geological structure

The dominant structural control is the main central fault, striking approximately 010–020° and near-vertical, with indications of a very steep eastward dip. It separates the central high-argillite unit from the sandstone-dominated resource and bounds the high-grade greenish rock to its east. Several further north to northeast-trending faults with steep dips occur along the eastern side of the pit in the Firth area but, owing to their complexity, could be traced only short distances. Rock is intensely veined and/or fractured near the significant faults; this fracturing and veining adversely affects both aggregate yield and quality, and concentrates the vein minerals discussed in Section 7.4.

4.5 Overburden

Overburden comprises assorted fill, weathered alluvium, loessal soil and highly weathered (rotten) greywacke. In the northern faces it is generally present down to about RL170m (locally to below RL153m at the western end). Most overburden has already been removed from the Firth area, where a maximum of about seven metres of loose colluvium to highly weathered greywacke remains below natural ground in places. Beneath the overburden, moderately weathered rock — typically 5–20 m thick and up to about 40 m adjacent to the central fault — ranges from soft material (effectively overburden) to slightly discoloured hard rock that is potentially saleable as hard fill. Substantial volumes of overburden plus low-grade moderately weathered rock must be removed to win the useable resource, exceeding 80 m in total thickness in places in the northeast. This is the central driver of the OBDA requirement. As discussed further in Section 8, opportunities to dispose of overburden on the existing quarry site have already been exhausted. The geology of the north-east area is shown in Figure 3.

[redacted]

5 Resource Investigation and Evaluation

The resource has been investigated through successive drilling, mapping, testing and resource evaluation campaigns, each building on the preceding work and contributing to the current geological and resource model. Twenty deep and shallow investigation bores inform the model, together with extensive face mapping, aggregate-quality testing, production reconciliation and long-term quarry planning studies. More recent investigations have focused on refining the resource model, validating geological interpretations against exposed quarry faces, optimising long-term extraction sequencing and quantifying the disposal requirements associated with future quarry development.

Campaign	Coverage	Principal outcomes
2004	Northern & southern areas (BEL04/1–9)	Nine RC bores; initial resource model built with TMC; deep weathering above ~RL125m confirmed, associated with unexposed faulting.

Campaign	Coverage	Principal outcomes
2011	Firth area angle bores (BEL11/6–9)	Four angled RC bores confirmed high-quality sandstone under the Firth Ridge; weathering rises sharply under the crest; artesian groundwater encountered.
2012	Firth ridge crest (BEL12/1–2)	Two vertical crest bores; resource surfaces close to modelled levels; confirmed economic depths beneath the ridge.
2013	PSV sourcing & ASR review	High-PSV source areas identified; petrographic review confirmed New Zealand greywacke as non-reactive (ASR).
2021	NE face mapping, modelling & petrology	~5.5 km of faces mapped; model rebuilt in current coordinates by TMC; petrological assessment of three trial aggregates (BEL21/A–C) by IGL and Panda Geoscience.
2025	Resource re-evaluation, optimisation and long-term planning	Comprehensive review and integration of historic drilling, mapping, petrological and production data into the current resource model. Resource classification criteria were reviewed and reconciled against production performance, geological mapping and aggregate quality information. Resource optimisation confirmed approximately 55 million tonnes (~20 mBCM) of geological inventory, of which approximately 33.7 million tonnes is currently classified as resource and accessible through the proposed quarry development.
2025	Long-term quarry design and scheduling	Development of an updated long-term quarry design, extraction sequence and life-of-quarry schedule. Optimisation of cutback sequencing, haulage arrangements, and overburden management confirmed the operational requirement for approximately 2.2 million m^3 (in-situ) of overburden, low-grade rock and process fines to be managed through the proposed OBDA. The work demonstrates the proposed OBDA provides the disposal capacity necessary to access the identified resource over an indicative 40-year quarry life operating horizon.

Campaign	Coverage	Principal outcomes
2025-2026	Proposed OBDA footprint, exposures and upper quarry batters adjacent to the OBDA	June/July 2025 engineering geological mapping of accessible exposures; four hand-auger/DCP Scala holes completed to refusal July 2025; July 2026 mapping of upper quarry batters. Highly to completely weathered greywacke was locally exposed, saturated alluvial gully floors and shallow refusal depths were identified, and historic quarry backfill/process pond fines were mapped in the upper quarry batters adjacent to the proposed OBDA.

5.1 Sampling, petrology and testing

Aggregate evaluation has combined production-scale and trial product sampling, representative drill core-derived materials, and targeted sampling of vein and joint materials. In April 2021, three trial concrete aggregates were produced from selected grades of rock in the Firth box cut and assessed by IGL using thin-section microscopy, with X-ray diffraction (XRD) by Panda Geoscience. The results are discussed in Section 7.3 (petrology and green colour) and Section 7.4 (ASR and laumontite).

5.2 Weathering grades and quarry-use framework

Aggregate end-use at Belmont follows the quarry's standard greywacke weathering classification, which links weathering grade to typical quarry use and provides the consistent basis for distinguishing overburden, hard fill and aggregate-suitable resource rock.

Grade	Quarry term	Potential use (subject to market)
Residual soil – highly weathered	Rotten	Overburden (clay & clean fill); hard overburden / race rock where weakly discoloured
Moderately weathered	Brown	Hard fill; from strong sandstone only, high-PSV aggregates & riprap
Slightly weathered	Blue-brown	Low-grade aggregates (GAP, asphalt, riprap) grading to basecourses & concrete aggregates
Fresh	Blue	High-grade aggregates including standard sealing chips & concrete aggregates

Table 1: Standard greywacke weathering grades.

5.3 Data quality and verification

Geological and analytical data have been validated through cross-checking between drilling, mapping and exposed faces, and through iterative reconciliation within the resource modelling workflow. Earlier assumptions of uniform thicknesses or simple correlations between weathering surfaces and topography have been recognised as unreliable, with greater reliance placed on surfaces constrained by drilling and verified exposures. Data limitations are primarily associated with structural complexity, irregular and locally reversed weathering profiles, and areas where bore spacing is wide or control on the depth to fresh rock is limited. Resource certainty is therefore treated as a function of investigation density and geological complexity (Section 6.4).

6 Geological Model, Resource Classification and Estimation

6.1 Geological model and reconciliation

Three-dimensional surfaces defining the main rock-unit boundaries and the roof levels of the moderately weathered, slightly weathered and fresh rock. The model incorporates conservative assumptions, including minimum overburden depths, defined fill areas, and assumed surface levels at bores abandoned in moderately weathered rock.

The geological model confirms the presence of approximately 55 million tonnes (~20 mBCM) of greywacke within the deposit. This geological inventory represents the total quantity of material identified by drilling, mapping and geological interpretation. It includes material that may be unsuitable for extraction due to quality, weathering, access, geotechnical, operational or other practical constraints.

The 2021 mapping reconciled the resource model against the geology exposed in the faces. The key findings are favourable to the resource position: moderately weathered and slightly weathered surfaces generally occur at higher levels than the model predicted (particularly immediately west of the central fault), implying less overburden and low-grade rock to remove than previously modelled. Fresh rock is somewhat below modelled levels in the northern faces but higher in the Firth area. The differences are attributed to conservative classification in the drilling relative to mapping, and to significant relief between sparse bores. On balance, the author considers the updated model to remain conservative. A representative south-west to north-east cross-section through the resource model is shown in Figure 4.

[redacted]

6.2 Resource and overburden classification

The geological inventory describes the total quantity of material identified within the deposit. The resource is the portion of that inventory considered suitable and potentially available for extraction after applying geological, engineering and operational criteria. Material that does not meet these criteria is classified as overburden or unsuitable material requiring disposal.

Resource and unsuitable material requiring disposal are distinguished by three independent geological controls applied within the resource model: weathering grade, argillite content, and the presence of green (relic-altered) rock. The governing logic, consistent with the classification adopted in the current model, is as follows:

- **Fresh greywacke is retained as resource across all sub-types — including significant- and high-argillite and green rock — on the basis that fresh rock retains sufficient hardness, with argillite managed by selective extraction and processing.**
- **Slightly weathered greywacke is retained as resource only where it is low-argillite and non-green. Slightly weathered rock that is significant- or high-argillite, or that is green (relic-altered), is classed as overburden.**
- **All moderately weathered greywacke, and all overburden, fill and slimes, are classed as overburden, regardless of argillite content.**

This classification is intentionally conservative and is designed to favour exclusion where geological or product quality uncertainty exists. Table 2 sets out the classification by material category.

Material category	Classification
Overburden — completely to highly weathered, fill, slimes	To disposal
Moderately weathered greywacke — low, significant and high argillite	To disposal
Slightly weathered greywacke — low argillite (non-green)	Resource

Material category	Classification
Slightly weathered greywacke — significant or high argillite	To disposal
Slightly weathered greywacke — green rock (low and high argillite)	To disposal
Fresh greywacke — low argillite	Resource
Fresh greywacke — significant and high argillite	Resource
Fresh greywacke — green rock (low argillite)	Resource

Table 2: Resource to disposal classification by material category.

The classification reconciles directly with the 2021 petrology report. The strongest green-rock trial aggregate, reported as “blue-green”, fresh, with approximately 92% of chippings scratching steel and comparable to completely fresh rock is retained as resource. The marginal trial aggregate reported as “green”, more discoloured, with over half the chippings variably weakened is representative of slightly weathered green rock and is classed as overburden. Because the weakening of green rock varies considerably and the altered rock can be visually indistinct at the face, classing slightly weathered green rock as overburden is a deliberate conservatism that keeps the model and the petrology consistent and minimises impact on product quality.

6.3 Resource estimation and saleable tonnage

Belmont Quarry contains an estimated geological inventory of approximately 55 million tonnes (~20 mBCM) of greywacke. Application of the classification criteria described in Section 6.2, together with geology, engineering, geotechnical and operational constraints, results in an estimated resource of approximately 33.7 million tonnes.

6.3.1 Reporting units and terminology

The Fast Track referral documentation refers to approximately 20 million BCM of aggregate-bearing rock. The figures presented in this report distinguish between geological inventory, resource, saleable production and overburden material, and utilise reporting units appropriate to each material type. Geological inventory, resource and saleable production are reported primarily in tonnes, with volumes converted using an in-situ rock density of 2.6 t/m^3. Overburden, process fines and disposal volumes are reported in cubic metres (m^3 or BCM) due to the variable density and bulking characteristics of these materials. The apparent differences between reported quantities therefore reflect both density conversions and the distinction between total geological inventory, recoverable resource and saleable production.

On the basis of the current resource and scheduling model, the proposed OBDA makes approximately 33.7 million tonnes of total resource accessible. This comprises slightly weathered low-argillite, non-green greywacke plus all fresh greywacke, in accordance with Table 2. [redacted]. Production is scheduled across six cutbacks over an indicative 40- year quarry life horizon at approximately 0.72 to 0.85 million tonnes per annum, consistent with 5-year average demand. A rock density of 2.6 t/m^3 has been adopted to convert modelled volumes to tonnage (Section 7.5).

6.4 Potential for future resource growth

The geological inventory represents the total quantity of material identified within the deposit, whereas the resource reflects the portion of that inventory currently considered suitable and available for extraction based on the geological, engineering, operational and market assumptions applied at the time of assessment.

As understanding of the deposit improves through ongoing drilling, mapping, production exposure and reconciliation, portions of the geological inventory that are currently excluded may be reclassified as resource. Similarly, changes to extraction methods, processing capability, product requirements, geotechnical design assumptions, infrastructure access, consented landforms or market conditions may alter the proportion of the inventory that can be economically recovered.

The current resource estimate should therefore be regarded as a snapshot based on present knowledge and project assumptions. Given the conservative classification methodology adopted, particularly in relation to weathered and altered rock units, there is potential for future growth in the resource as geological confidence increases and operational constraints are further refined.

6.5 Confidence

The updated resource model is assessed as generally conservative and is supported by ongoing production reconciliation, which demonstrates that product yields from lower-quality geological domains are generally higher than modelled. Accordingly, there is a high level of confidence in both the resource estimate and product yield assumptions in areas where geology is well defined, including locations adjacent to mapped quarry faces and the previously investigated Cottle Ridge to the southwest and Firth Ridge to the northeast. Resource quality has also been confirmed at depths of up to 100 m below the current quarry floor.

Confidence naturally decreases with increasing distance from exposed faces and areas of detailed investigation, reflecting the reduced availability of direct geological information. Notwithstanding this, the geological model remains conservative and provides an appropriate basis for long-term quarry planning and resource estimation.

7 Resource Quality and End Use

7.1 Weathering grade and product suitability

Aggregate end-use at Belmont is governed primarily by weathering grade, in accordance with the standard greywacke weathering classification set out in Table 1 (Section 5.2). The less-weathered (slightly weathered to fresh) sandstone yields the premium products, while the moderately weathered and rotten material above it is largely low-value or requiring disposal that must be moved to access the resource. This relationship underpins both the resource definition (Section 6.2) and the overburden burden that drives the OBDA (Section 8).

7.2 High-PSV aggregate

Belmont is a source of high Polished Stone Value (PSV) aggregate — the skid-resistant sealing chip required for road surfacing. High PSV is achieved in relatively coarse greywacke sandstone where slight weakening of the rock mass by weathering or alteration is present, but where that weakening is carefully controlled so other requirements are still met. This excludes both the more weathered upper-face materials and rock with significant argillite. High-PSV potential has been identified in the southern end of the quarry and, prospectively, in the Firth area. High-PSV sealing chip is a specialised and supply-constrained product, which adds to the strategic value of the resource (Section 3).

7.3 Petrological assessment

The three trial concrete aggregates assessed in 2021 (BEL21/A–C) are petrographically the same greywacke sandstone; the variation in colour is attributed to differing intensity of iron staining (and possibly trace metals such as copper) on fracture surfaces, of mainly aesthetic significance.

The practical conclusion is that hardness is sufficient for most products, but the proportion of weak rock and argillite varies significantly within the source rock, so rock selection and processing must be actively managed. As a working rule, low-grade slightly altered rock containing more than about a quarter moderately altered material is expected to have marginal hardness and may be unsuitable for high-grade products and important projects — the basis for classing slightly weathered green rock as requiring disposal while retaining fresh green rock as resource (Section 6.2).

7.4 Concrete suitability

New Zealand greywacke is generally regarded as non-reactive in terms of Alkali Silica Reaction (ASR). This is consistent across the sources: the 2013 petrographic review and the 2021 assessments both conclude the Belmont greywacke is non-reactive as defined by the industry guideline CCANZ TR3, with no surviving volcanic glass in the altered rock fragments and only trace strained quartz, all enclosed within the sandstone.

A risk to quality aggregate for concrete production is laumontite, a zeolite detected by XRD in all three 2021 samples, together with possible minor smectite interlayered with the chlorite. Laumontite can hydrate and dehydrate, potentially causing disintegration of chippings, volume change and pop-outs in concrete if present in sufficient amounts. It occurs mainly in veins, which are more prevalent near the large faults. This deleterious mineral exists in very small quantities in isolated areas that are readily identifiable. This is a routine quality-assurance matter for rock selection, managed through Winstone's production testing regime and the relevant CCANZ TR3 / NZS aggregate standards, not a constraint on the resource as a whole.

7.5 Density

A rock density of 2.6 t/m^3 has been adopted in the current schedule to convert modelled volumes to tonnage for resource and production estimates. No site-specific density testing has been undertaken; however this value is consistent with values determined regionally for the same rock type.

8 Overburden Characterisation and the OBDA Requirement

The resource at Belmont cannot be won without removing and placing substantial volumes of material that have little or no saleable value. This is the direct and unavoidable consequence of the quarry's geology, and it is what makes an engineered overburden disposal area essential to the continued operation.

8.1 Material to be disposed

The material to be managed comprises three streams: stripping overburden (fill, weathered alluvium, loessal soils, slimes and highly weathered "rotten" greywacke); low-grade moderately weathered rock that is not saleable as aggregate; and inferior rock removed during selective quarrying (material with excessive argillite, slightly weathered green rock, or intense veining and fracturing near faults that cannot be brought within product specifications). On the current schedule the in-situ volumes of these streams are approximately as set out in Table 3.

Disposal stream	In-situ volume (Mm^3)
Stripping overburden (incl. historic fines)	0.66
Mined low-grade rock	0.92
Process fines	0.61
Total material to disposal (in-situ)	2.20

Table 3: Life-of-schedule material to disposal, by stream (in-situ).

Advancing the northern faces northeast with scheduled removal of all rock units — the development direction indicated by the resource geology — necessarily generates these large, sustained volumes. Removal of the old slimes and previously disposed-rock fill behind the northern faces forms part of this task and will require geotechnical input.

8.2 OBDA capacity and staging

Disposal is provided through the residual capacity of the existing Cottle disposal area and the new regional OBDA. The regional OBDA is an engineered landform constructed across ten stages, with an in-place capacity of approximately 2.73 million cubic metres and a final landform level of approximately 230 m RL. The existing Cottle area accepts the balance of material required to fill and cap its void over the existing fines cell — approximately 0.14 million cubic metres, of the order of half process fines and half disposal rock and overburden — after which it is at end of life. The combined available disposal capacity is approximately 2.87 million cubic metres. The engineered design, staging and progressive rehabilitation of the regional OBDA are described in Section 9.

Converting the in-situ disposal volume to placed volume requires a bulking (swell) allowance. An overall placed-to-in-situ (swell) factor of approximately 1.30 has been adopted in the current schedule, reflecting the placement of a disposal stream that is roughly half blasted hard rock. On this basis the approximately 2.20 million cubic metres of in-situ material occupies approximately 2.87 million cubic metres when placed. This corresponds to the combined engineered capacity of the Cottle and regional OBDA facilities: the disposal task effectively fills the available capacity, leaving little residual headroom. Table 4 sets out the reconciliation.

Quantity	Volume (Mm^3)
Material to disposal (in-situ)	2.20
Placed volume at swell factor ~1.30	2.87
Regional OBDA engineered capacity (10 stages)	2.73
Cottle residual capacity (fill / cap balance)	0.14
Total available capacity	2.87

Table 4: OBDA volume reconciliation (placed basis).

The proposed new OBDA has a capacity of approximately 2.73 million cubic metres corresponds to the approximately 2.9 million cubic metres stated in the application for listing; the combined facilities provide approximately 2.87 million cubic metres. Filling occurs progressively over the approximately 35-year schedule in step with quarry production, with the regional OBDA receiving the first material once Cottle is committed to fill-and-cap. The staged development of the landform is shown in Figure 5.

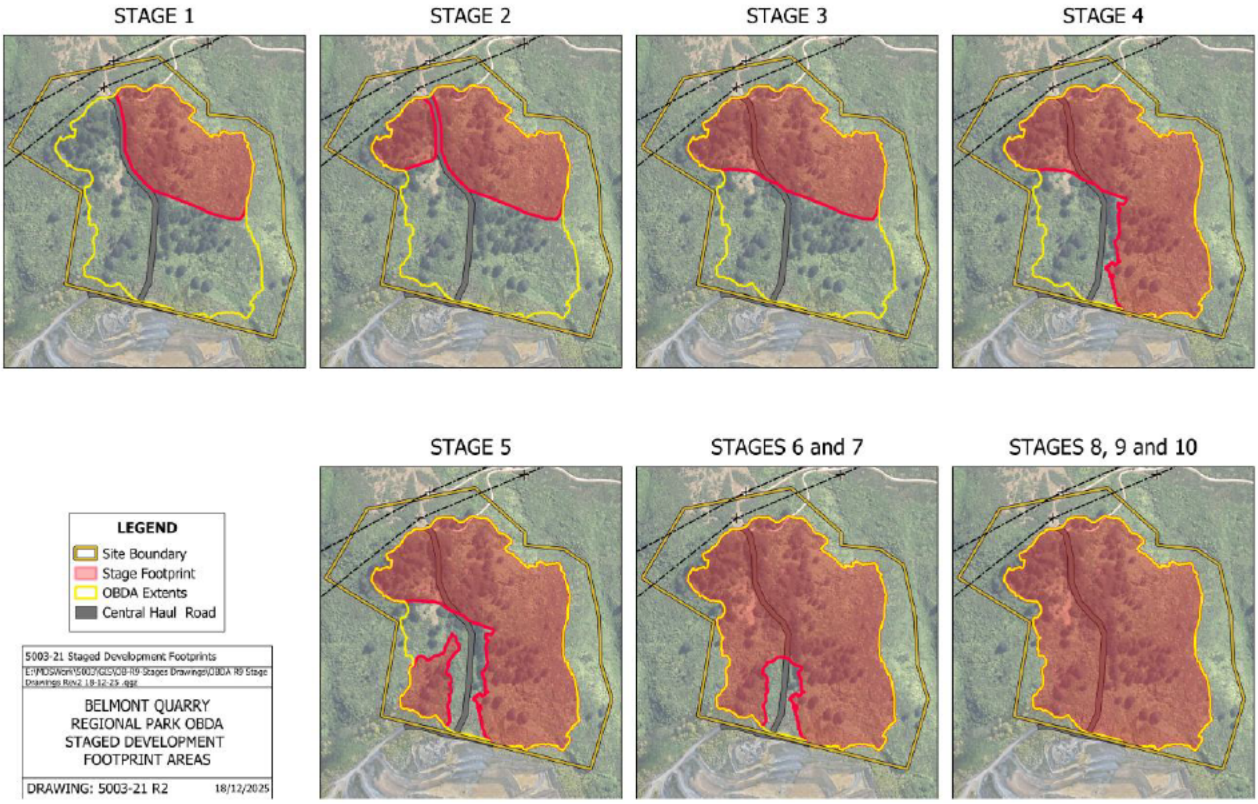

Figure 5: OBDA staged development design.

8.3 Why the OBDA is intrinsic and proportionate

The Quarry has an operational need for the OBDA to be located in close proximity to where extraction occurs. Being able to efficiently dispose of overburden is a prerequisite for accessing the rock below, as a regionally significant resource. The volume and footprint of the OBDA are a direct function of the overburden inherent to the deposit. Extraction cannot proceed without first removing the overburden. The requirement is driven by the absolute volume of material to be placed — approximately 2.87 million cubic metres over the life of the OBDA — rather than by a high strip ratio; the overall ratio of disposal material to resource rock is and favourable. The capacity of existing disposal facilities (Cottle OBDA) within the site is close to being exhausted and developing additional facilities within the site is not possible without sterilising future resource. The most practicable alternative is disposal of overburden on land immediately adjacent to the site. This is consistent with the proximity and aggregate-economics considerations set out in Section 3.4: as placing overburden locally avoids unnecessary haulage emissions, the displacement of disposal demand onto other sites, and effects on the transport network. The resource case set out in this report therefore directly establishes the need for, and the scale of, the OBDA.

9 OBDA Design Overview

9.1 Purpose and role

Aggregate extraction at Belmont Quarry requires the progressive removal and permanent placement of overburden — topsoil, subsoil, weathered and decomposed greywacke, and process fines and silts recovered from the settlement ponds — in order to expose the underlying rock resource. Overburden disposal is therefore not an ancillary activity but an integral part of the extraction sequence. The rate at which the quarry can access its resource is directly governed by the rate at which it can dispose of the material overlying that resource, and the resource life set out in this report is only realisable if disposal capacity remains continuously available ahead of production.

Overburden generated by quarry operations has historically been placed within the Cottle Block Overburden Disposal Area under existing consent WGN240139. Available capacity within the Cottle Block is now limited to the disposal of process fines and will be exhausted as continued extraction proceeds. Once the Cottle Block fines cell is filled and capped, and in the absence of an alternative disposal solution, the quarry would reach an operational constraint that would prevent further extraction irrespective of the extent of the rock resource remaining in the ground.

The proposed OBDA is the mechanism by which that constraint is resolved. It comprises an engineered landform occupying a design footprint of approximately 15.7 hectares located immediately north of the existing quarry, on land currently forming part of Belmont Regional Park and proposed to be acquired by Winstone Aggregates through the land exchange. Under that exchange, Winstone would provide 34 hectares of land to the conservation estate in return for 23.86 hectares of Crown-owned reserve land, within which the OBDA design footprint occupies approximately 15.7 hectares. The existing topography within the footprint comprises an eastern and a western gully, together with smaller sidling gullies in the north, all draining generally southward around the active quarry area, with the highest point of existing ground at approximately RL 210 metres. The proposed landform infills those gullies to a crest level of approximately RL 230 metres. Fill depth typically ranges from 10 to 15 metres, with a maximum depth of approximately 45 metres in the deepest part of the gully system. The OBDA has been designed to accommodate approximately 2.73 million cubic metres of overburden placed progressively over 35 years to accommodate the approximately 40-year operating life of the quarry, and to succeed the Cottle Block as the quarry's primary disposal facility, including through the establishment of a replacement fines containment cell within Stage 1.

9.2 Design philosophy

The OBDA has been designed as a permanent engineered landform rather than as a temporary spoil repository. That distinction governs the whole of the design. Stability is assessed against a design life measured in perpetuity rather than against the operating life of the quarry; drainage is treated as a permanent installed asset rather than a construction-phase control; the final surface is shaped to integrate with the surrounding park topography rather than to maximise volume; and rehabilitation is undertaken as an integral construction activity rather than as a closure obligation deferred to the end of the programme.

Four design principles follow from that philosophy and are applied consistently across all stages:

1. **Foundation integrity. Unsuitable material — soft or saturated alluvium, highly weathered rock, clay-rich soils, organic material, and remnants of historic fines disposal cells where encountered — is removed until competent foundation material is exposed that satisfies the material parameters adopted in the geotechnical design. Excavated unsuitable material is replaced with engineered fill placed and compacted to the geotechnical specification.**
2. **Drainage installed ahead of fill. Subsoil drainage, informal drainage blankets of weathered rock fill, and rockfill toe buttresses are installed as part of foundation preparation, before bulk placement commences, so that pore water pressures at the interface between natural ground and placed fill are controlled from the outset.**
3. **Material placement discipline. Overburden is placed in controlled lifts and compacted to specifications appropriate to the material type and its location within the landform. Coarser and more competent materials are preferentially directed to structural zones such as outer embankments and toe areas, while finer and moisture-sensitive materials are placed in contained zones with appropriate drainage and capping.**
4. **Staged, self-contained development. Each stage is designed to function as a discrete and stable module that integrates with adjacent stages as the landform is built up, and to operate as a self-contained stormwater catchment during its construction.**

Engineered features including rockfill toe buttresses, toe bunds, basal undercuts and shear keys are incorporated where required by ground conditions to achieve long-term stability, with the extent of foundation preparation and the subsoil drainage network confirmed and verified during foundation preparation for each construction stage. Detailed geotechnical design is confirmed prior to the commencement of each stage and documented through construction records and certification by a suitably qualified geotechnical professional.

9.3 Cottle OBDA precedent

The approach described above is not novel to this application. Overburden from Belmont Quarry has been placed in the Cottle Block OBDA since its construction, that facility having been designed for Winstone Aggregates by Tonkin + Taylor in 2007. The Cottle OBDA occupies a comparable footprint to the landform now proposed and was constructed to a greater maximum fill height — of the order of 50 to 60 metres, against a maximum fill depth of approximately 45 metres for the proposed OBDA. It has performed acceptably throughout its operating life and provides a directly relevant guide to the expected performance of a further landform constructed in a similar manner on the same rock type, using the same overburden materials, plant and operating practice.

The design of the proposed OBDA follows the general approach adopted for Cottle OBDA, but is more conservative in each of the respects that materially govern stability. More conservative material parameters have been adopted; more conservative porewater pressures have been assumed; a higher level of control is specified over the placement of overburden materials; the seismic design standards applicable have been revised since 2007 and impose higher seismic loads; and more robust guidance is now available on acceptable displacements in seismic events. The geotechnical assessment provided for the purpose of this application states that that these differences should result in a lower level of geotechnical risk for the proposed OBDA than for the existing facility.

It should be recognised that the Cottle OBDA has not yet been tested by a large magnitude earthquake, which is the critical design consideration for a landform of this type. Its performance to date is therefore corroborative rather than determinative, and the proposed design does not rely on it. The point is more limited but still material: the proposal is a further application of an established and demonstrated method of overburden disposal at this site, designed to a higher standard than the facility it succeeds, rather than an untested approach.

9.4 Progressive construction

Construction proceeds through preliminary works followed by ten sequenced stages. Preliminary works establish an access track along the alignment of the future central haul road, and construct the northern bund — a planted earth bund three to five metres high and approximately seven metres wide — which restricts public access to the working area and provides a visual and physical buffer between park users and OBDA activities.

Bulk placement then proceeds from north to south. The northern stages are constructed to their final landform first, so that the works adjoining Belmont Regional Park are completed and revegetated early in the programme and the majority of subsequent construction is screened from the park by the completed northern stages and the northern bund. The staging sequence is also aligned to discrete water catchments, particularly for Stages 1, 2, 4 and 5, so that each stage can be managed as a self-contained stormwater catchment during earthworks. Design levels rise progressively from approximately 210 m RL on completion of Stages 1 and 2, to 220 m RL in the northern section at Stage 3, with the central and western stages built to approximately 200 m RL and the northern face lifted to the final landform level of 230 m RL at Stage 7. Stages 8 to 10 comprise final shaping, drainage tie-in, capping of the fines containment cell, and rehabilitation and closure.

Fines management is integrated within the landform rather than provided for at separate discrete facilities. A fines containment cell is established and commissioned within Stage 1 to succeed the Cottle Block cell, and the cell then migrates within the OBDA footprint as the landform develops — initially westward during Stages 1 to 3 and subsequently southward — before being capped and incorporated into the final landform at closure. Earthworks are generally confined to the recognised earthworks season of approximately October to April, with out-of-season placement limited to no more than 50,000 cubic metres per calendar year.

Placement volumes vary across the programme in response to enabling works, overburden stripping and the quarry extraction sequence, with the largest volumes associated with major stripping campaigns. The indicative completion year and cumulative fill volume for each stage are set out in Table 1 of the Project Description.

9.5 Design objectives

The final OBDA design is the outcome of balancing a set of objectives that are, in part, in tension with one another. Increasing storage capacity generally increases footprint, height or slope angle; reducing footprint to avoid environmental features generally reduces capacity, steepens batters, or displaces fill into less favourable ground; and improving constructability can conflict with the shortest or most direct haul alignment. The objectives set out below were applied together, and the preferred design represents the point at which they are best reconciled rather than the point at which any one of them is optimised.

9.5.1 Geotechnical stability

The landform must perform acceptably under static and seismic loading for a design life extending beyond the operating life of the quarry. This objective drove the requirements for foundation preparation to competent material, sub-excavation and replacement of soft alluvium in the gully floors, subsoil drainage installed ahead of fill, controlled compaction, zoned material placement, and the provision of rockfill toe buttresses and basal undercuts where ground conditions require them. It also governed the treatment of the interface between the OBDA and the adjacent quarry batters, where the consequences of instability would be most significant.

Stability has been assessed by Baseline Geotechnical Limited (BGL) against criteria appropriate to a site of low importance that will not support development on completion. The proposed landform meets those criteria in the static and elevated groundwater cases and as is normal for engineered fill landforms under Wellington seismic loadings, satisfies the seismic case on a displacement basis. BGL identifies a small number of residual matters capable of being addressed through conditions of consent and accommodated within the consented landform geometry. The assessment is set out in full in the geotechnical report accompanying the application.

9.5.2 Operational safety

The design must allow overburden to be placed safely by heavy plant over a period of decades. This objective informed the width and gradient of the central haul road, the provision of maintenance access to the toe of the landform at each stage, the internalisation of all haulage within the quarry and land exchange area with no interaction with the public road network, and the construction of the northern bund, fencing and signage to exclude park users from active working areas.

9.5.3 Long-term landform stability

Beyond geotechnical stability in the engineering sense, the completed landform must resist erosion and remain stable once operations cease and active management is withdrawn. This objective drove the adoption of progressive rehabilitation as final levels are reached, the establishment of permanent surface water channels and drainage outlets, the shaping of outer faces to merge with existing topography, and the requirement for vegetation to be established and the surface certified stable before erosion and sediment controls are removed.

9.5.4 Available storage capacity

The OBDA must provide sufficient capacity to accommodate the overburden generated across the full extraction programme. Capacity is the constraint that links the OBDA design directly to the resource assessment in this report: a shortfall in disposal capacity translates directly into a reduction in accessible resource. This objective set the lower bound on footprint and final landform levels, and is the principal reason why footprint reductions beyond those already adopted are not available.

9.5.5 Constructability

The design must be capable of being built by conventional earthmoving plant, in seasonal campaigns, on steep and incised terrain, while the quarry continues to operate. This objective informed the ridge-following haul road alignment, which reduces earthworks and maintains workable gradients for heavy vehicles; the north-to-south sequencing, which allows each stage to be founded on completed work or on prepared ground; and the staging of enabling works so that foundation preparation for a stage can be completed within a single earthworks season where practicable.

9.5.6 Efficient quarry operations

The OBDA must be positioned and sequenced so that disposal capacity is available ahead of the production requirement at every point in the programme, and so that haul distances between the active extraction area and the placement face remain short. Its adjacency to the quarry allows a direct internal haul route, minimising transport distances, fuel use and emissions, and avoiding the land tenure and roading complexities associated with a more remote disposal location.

9.5.7 Environmental effects

The design must manage sediment, stormwater, groundwater, dust, noise and visual effects to acceptable levels throughout a multi-decade construction programme. This objective drove the catchment-based staging, the requirement for each stage to operate as a self-contained stormwater catchment during earthworks, the integration of fines containment within the landform rather than at multiple discrete pond locations, the north-to-south sequence that rehabilitates the park-facing slopes first, and the limitation of exposed surface area at any one time.

9.5.8 Minimisation of ecological impacts

The footprint must avoid or minimise effects on indigenous vegetation, watercourses, wetlands and habitat wherever engineering and operational constraints allow. This objective is the principal driver of the footprint refinements described in Section 9.5. Ecological values, effects and mitigation are assessed in the ecological assessments prepared for the application and are not addressed further in this report.

9.6 Design Evolution

The OBDA footprint presented in this application is not a first-pass design. It is the outcome of successive iterations undertaken over approximately a decade, in the course of which the footprint has been tested against alternative configurations and progressively refined in response to improved site information and identified environmental constraints.

9.6.1 Concept development and option testing

The design is based on an OBDA concept originally developed in 2016. As part of the design development process, that concept was reviewed alongside other OBDA options. Those options considered alternative locations both on-site and off-site, allowing for a range of footprint extents, landform configurations and development sequencing to be considered. The selected design was identified as the most appropriate option when assessed against, capacity, operational efficiency, geotechnical performance, environmental effects, and compatibility with the surrounding environment. The alternatives considered are discussed further in Section 9.7.

9.6.2 Design refinement

The proposed design footprint was further refined in 2025 using updated LiDAR topographic survey data and initial geotechnical and ecological investigations within the project area and consultation with Transpower. The availability of a high-resolution surface model allowed the footprint boundary, the toe alignment and the achievable landform levels to be tested against actual terrain rather than against the earlier and coarser topographic dataset and allowed the consequences of localised footprint reductions to be quantified. That refinement resulted in reduction of the overall footprint in several locations, specifically:

1. **to avoid a wetland area in the north-east of the site;**
2. **to avoid areas of higher ecological value in the south-west;**
3. **to avoid areas of increased geotechnical uncertainty, and**
4. **to ensure safe stand off from Transpower overhead HV transmission lines.**

In other locations the footprint was selectively extended to recover storage capacity while maintaining overall landform stability, targeting areas on benign slope, favourable geotechnical conditions and lower value ecology. The net effect of the 2025 refinement was therefore not a simple reduction in extent but a redistribution of the footprint away from areas of higher ecological and geotechnical sensitivity and towards areas where fill can be accommodated with lower effect and greater confidence and reduced the footprint to 15.7 ha.

9.6.2.1 Ecological impact

The 2025 refinement pulled the footprint back from the wetland area in the north-east of the site, within which swamp maire is present, and reduced the footprint in areas of higher ecological value in the south-west. Those reductions were accepted notwithstanding the storage capacity they cost, and were made wherever the engineering configuration of the landform could accommodate them. Vegetation clearance is also undertaken progressively, stage by stage, rather than across the whole footprint at the outset, which limits both the area exposed at any one time and the extent of habitat removed in advance of need.

Ecological values within and adjoining the footprint, the extent of residual effects, and the associated mitigation and offset measures are assessed in the ecological assessments prepared for the application. It is not possible to design the OBDA in a way that avoids these features. They are referred to here only so far as they explain the engineering and design decisions recorded in this chapter.

9.6.2.2 Infrastructure and third-party constraints

The final footprint has been designed to ensure that the OBDA does not encroach into the minimum separation distances from the overhead electricity transmission lines crossing the site, and complies with Transpower requirements and the mandatory provisions of NZECP 34. The primary Transpower utilities track running parallel to the northern boundary of the OBDA will be displaced by the footprint with an existing secondary track (Buchanan', which maintains Transpower’s operational access without interfering with overburden placement or site drainage infrastructure.

9.6.2.3 Outcome

The final footprint of 15.7 ha represents the outcome of balancing environmental, engineering and operational requirements across successive design iterations. Each of the reductions described above were adopted without significantly impacting total capacity by marginally extending the footprint in less sensitive locations rather than by steepening batters or raising final levels. The design that remains is the configuration that delivers the required disposal capacity with the least environmental effect that the engineering and operational constraints permit.

9.7 Alternatives assessment

9.7.1 Purpose and approach

This alternatives assessment considers the four principal options available for managing the overburden and other non-saleable material generated by the continued development of Belmont Quarry. The options are compared against the same core considerations: capacity and timing, environmental effects, engineering and operational practicality, haulage and traffic effects, and the ability to support continued access to the quarry resource.

The assessment focuses on the practical choice between no new overburden disposal area (OBDA), an OBDA in the Northern Gully, full off-site disposal, and the proposed OBDA on the Exchange Land within Belmont Regional Park. Detailed assessment of the proposed design and its effects is provided elsewhere in the application.

9.7.2 Material management requirement

The quarry schedule identifies approximately 2.20 million cubic metres of material requiring disposal on an in-situ basis. Applying the adopted swell factor produces approximately 2.87 million cubic metres of placed material. The existing Cottle Block has approximately 0.14 million cubic metres of remaining capacity, leaving a requirement for approximately 2.73 million cubic metres of new engineered disposal capacity.

That capacity must be available progressively and before the stripping campaigns that generate the material. If disposal capacity is unavailable, the overlying material cannot be removed and the underlying aggregate resource cannot be accessed, regardless of how much rock remains in the ground.

9.7.3 Options considered

9.7.3.1 1. No new OBDA

Under this option, the quarry would use the remaining Cottle Block capacity and continue operating for as long as that capacity allows. This would avoid the immediate physical effects of establishing a new OBDA.

The remaining capacity is not sufficient for the planned extraction programme. Once it is exhausted, stripping would need to be curtailed and the quarry would be unable to access the longer-term resource. Economically accessible resource is presently estimated to be exhausted within approximately five to ten years. A reduction in supply from Belmont would also increase reliance on aggregate transported from more distant sources.

Assessment: This option avoids a new footprint but does not meet the project requirement.

9.7.3.2 2. Northern Gully OBDA

The Northern Gully is within the existing quarry landholding and would allow material to be moved by internal haul routes. Its disposal footprint could also be smaller than the Belmont Regional Park option.

However, the Northern Gully provides materially less capacity than the approximately 2.73 million cubic metres required. It also contains waterways, riparian vegetation and mature or regenerating indigenous vegetation, and part of the area is subject to a QEII covenant. The option would therefore have significant ecological constraints while still leaving a disposal shortfall that would need to be met elsewhere.

Assessment: This option is not preferred because it does not provide the required capacity and has significant freshwater and terrestrial ecological constraints.

9.7.3.3 3. Full off-site disposal

Under this option, the full disposal volume would be transported to one or more third-party receiving sites. This would avoid the direct effects of constructing a new OBDA within Belmont Regional Park.

No receiving site, or combination of sites, has been identified with secure capacity for the required volume and duration. Disposal demand would also occur in substantial stripping campaigns, making the quarry programme dependent on third-party capacity being available at the right time.

All exported material would leave the quarry through Hebden Crescent and enter the public road network. Compared with internal haulage, this would materially increase heavy vehicle movements, fuel use, greenhouse gas emissions, road safety exposure and cost.

Assessment: This option avoids the Belmont Park footprint but is not sufficiently reliable or practicable as the primary disposal solution.

9.7.3.4 4. Proposed Belmont Park OBDA

The proposed OBDA occupies approximately 15.7 hectares of the Exchange Land within Belmont Regional Park. It would provide approximately 2.73 million cubic metres of engineered capacity which, together with the remaining Cottle Block capacity, meets the current life-of-schedule disposal requirement.

The location directly adjoins the quarry, allowing material to be moved by an internal haul route and the OBDA to be developed in stages coordinated with quarry stripping. The park-facing northern stages can be completed and rehabilitated early in the programme.

The proposed footprint has been refined using updated ecological, geotechnical and infrastructure information. It avoids the identified north-eastern wetland, reduces disturbance of higher-value ecological areas, avoids areas of greater geotechnical uncertainty and maintains the required separation and access for Transpower infrastructure.

The OBDA will still have environmental effects that require avoidance, minimisation, rehabilitation, mitigation, offsetting and ongoing management. However, it provides the required capacity and timing without transferring the full disposal task onto the public road network or relying on uncertain third-party receiving sites.

Assessment: This is the preferred option on balance because it meets the full capacity and timing requirement while retaining internal haulage and incorporating practicable measures to avoid and minimise effects.

9.7.4 Summary

Table 1: Summary of the four principal alternatives.

Option	Key assessment	Outcome
No new OBDA	Avoids a new development footprint, but the remaining Cottle Block capacity would not support the planned extraction programme.	**Does not meet requirement**
Northern Gully	Retains internal haulage, but has insufficient capacity and significant freshwater and terrestrial ecological constraints.	**Not preferred**
Full off-site disposal	Avoids a Belmont Park OBDA, but relies on unsecured third-party capacity and materially increases traffic, emissions, safety exposure and cost.	**Not sufficiently reliable**
Belmont Park OBDA	Provides the required capacity beside the quarry, retains internal haulage and incorporates practicable avoidance and design refinements.	**Preferred on balance**

9.7.5 Conclusion

The choice is not between an option with environmental effects and one without. No new OBDA would avoid an immediate new footprint but would prevent long-term access to the resource. The Northern Gully would not provide the required capacity and has significant ecological constraints. Full off-site disposal would avoid direct effects within Belmont Regional Park but would transfer effects to the public road network and rely on receiving capacity that has not been secured.

Of the four options assessed, the proposed Belmont Park OBDA provides the best overall balance. It supplies the required capacity when needed, is directly connected to the quarry, retains internal haulage and incorporates practicable changes to avoid and minimise effects. It is therefore the preferred option for supporting the continued development of Belmont Quarry.

9.8 Operational and Functional Need

Belmont Quarry is a principal source of aggregate for roading, housing and development throughout the Wellington region. The quarry holds a substantial remaining rock resource, sufficient at forecast production rates to support the indicative 40-year schedule assessed in this report. Access to that resource is, however, contingent on the continued availability of overburden disposal capacity. Existing capacity within the Cottle Block is now limited to process fines and will be exhausted as continued extraction proceeds.

Quarrying activities (including removal and placement of overburden) have an operational and functional need to occur where the resource is located. Access to that resource is, however, contingent on the continued availability of overburden disposal capacity. The OBDA is a structured fill site; the form and design of that structure and ability to place fill have a functional need to occur in that location because they are dependent upon utilising the topography of the fill site - there is a need for gullies and valleys to place fill in. The quarry gullies (needed to contain fill) frequently have biodiversity values, streams and wetland features present; it is not possible to both fill and avoid impact on these features. Complete avoidance or further footprint reduction would materially reduce capacity and compromise the integrated stability, drainage and safe sequencing of the landform, and reduced fill capacity would also mean this was not a long-term.

If the OBDA and the associated Exchange Land proposal were not approved, the consequences would follow in sequence. Overburden storage would become progressively constrained as the Cottle Block approaches capacity, and stripping campaigns would need to be curtailed to match the diminishing space available. Future quarry development would be significantly restricted, because overburden removal is a precondition to accessing rock in the areas identified for future extraction. Access to the long-term aggregate reserves described in this report would be correspondingly reduced, with the resource remaining in the ground but no longer economically or practicably recoverable. Quarry life would be materially shortened relative to the indicative 40-year horizon assessed in this report, and the shortening would occur not because the resource had been exhausted but because the means of reaching it had been. Without new OBDA capacity of the scale this project seeks to achieve the Belmont Quarry is estimated to run out of resource in between 5-10 years (depending on market demand)

The regional consequence is a reduction in aggregate supply from the Wellington region's principal source. Belmont's ability to continue supplying regional demand would be jeopardised, and that shortfall would need to be met from more distant sources at greater cost, with longer haul distances and higher transport emissions, in a region where alternative sources of hard rock aggregate of comparable quality and scale are limited. The OBDA is therefore not an adjunct to the quarry operation but a precondition of it, and the resource life presented in this report is realisable only if the disposal capacity described in this chapter is consented and constructed.

10 Integrated Assessment

The planned development at Belmont Quarry is supported by a body of geological, petrological and scheduling data that collectively demonstrates continuity of resource volume, consistency of aggregate-suitable rock quality, and a clear, quantified overburden burden that drives the OBDA requirement. The assessment shows a substantial geological inventory, a conservatively estimated resource, and a disposal requirement that is directly proportional to the volume of resource proposed to be accessed.

10.1 Continuity of resource and quality

The geological model is built from an integrated interpretation of drilling, mapping and face observations, and demonstrates that the greywacke resource is laterally and vertically continuous at quarry scale, with localised argillaceous panels and fault-influenced corridors treated as discrete geological domains rather than material discontinuities. Aggregate suitability is supported by trial production and laboratory testing demonstrating that slightly weathered to fresh, low-argillite sandstone produces high-quality concrete and roading aggregates, including high-PSV sealing chip, with deleterious minerals present only in small proportions and managed through selective extraction, blending and established quality assurance.

10.2 Resource estimate and the OBDA

The current schedule indicates that the proposed OBDA makes approximately 33.7 million tonnes of total resource accessible ([redacted]) from a geological inventory of approximately 55 million tonnes. This resource is associated with a disposal burden of approximately 2.20 million cubic metres in-situ, or approximately 2.87 million cubic metres when placed. This overburden is proposed to be accommodated within the residual Cottle capacity (approximately 0.14 million cubic metres) and the proposed ten-stage regional OBDA (approximately 2.73 million cubic metres), effectively filling the combined available capacity.

11 Conclusions

The investigation history at Belmont Quarry establishes a substantial resource of high-quality greywacke sandstone extending northeast behind the current faces and beneath Firth Ridge to significant depths suitable for long-term quarry development. The rock yields the full range of products including high-PSV sealing chip and concrete aggregate, is non-reactive in terms of ASR, and presents only routine quality management considerations—principally vein-hosted laumontite near faults—which are effectively managed through selective extraction, blending and testing. The 2021 reconciliation indicates the resource model is conservative, with useable rock generally occurring at higher levels than predicted.

The current resource and scheduling model indicates that the proposed OBDA makes approximately 33.7 million tonnes of resource accessible and [redacted] over an indicative 40-year horizon. Accessing this resource necessarily requires the removal and managed placement of approximately 2.87 million cubic metres (placed) of overburden, low-grade rock and process fines—the direct and unavoidable driver of the proposed OBDA. That burden is accommodated within the residual Cottle capacity and the ten-stage regional OBDA of approximately 2.73 million cubic metres, consistent with the substantive application.

The OBDA is therefore intrinsic and proportionate to the resource it enables. Its volume and footprint are a direct consequence of the overburden and non-saleable material inherent within the deposit, and the proposed capacity is aligned with the quantity of resource to be accessed. The resource is regionally significant: greywacke is effectively the Wellington region's primary source of quality aggregate, aggregate and sand are recognised critical minerals, and Belmont's proximity to the Wellington market makes continuity of supply from this site particularly important. On these grounds, the resource and proposed OBDA provide a sound technical basis for the application under the Fast-track Approvals Act 2024.

12 References

GF Industrial Geology (2004). Exploration Report for Belmont Quarry, November 2004.

GF Industrial Geology (2011). Drilling Report for Firth Area, Belmont Quarry, 16 December 2011 (bores BEL11/6–9).

GF Industrial Geology (2012). Additional Drilling Report for Firth Area, Belmont Quarry, 29 November 2012 (bores BEL12/1–2).

GF Industrial Geology (2013). Visits to Belmont & Waikanae Quarries, July 2013 (high-PSV aggregate sourcing).

Happy, A. (2013). Petrographic Characteristics of Belmont Greywacke — Implications for Alkali Silica Reactivity in Concrete, 6 June 2013.

Industrial Geology Ltd (2021). Geological Update for Northeast Development, Belmont Quarry 2021, June 2021 (Ref WAL21/5) — DRAFT.

Industrial Geology Ltd (2021). Petrological Assessment of Trial Aggregates from Belmont Quarry, June 2021 (Ref WAL21/5) — DRAFT.

Panda Geoscience Ltd (2021). Petrology of 3 samples from Belmont Quarry for Industrial Geology Ltd, P0196, June 2021.

Terra Mining Consultants (2021). Rock/Argillite Model Update — Section Lines & Resource Model (Drawings WBQ-157 / WBQ-158).

Winstone Aggregates (2026). Belmont Quarry Integrated Overburden Stripping and Production Schedule, 8 July 2026 (draft scheduling model, incorporating OBDA stage volumes OB-R9J).

Ministry of Business, Innovation and Employment (2025). A Critical Minerals List for New Zealand, January 2025.

Baseline Geotechnical Limited (2025). Geotechnical Appraisal Report — Land Exchange, Belmont Quarry Development Project, Wellington. Ref BGL000252 v1.0, 1 December 2025.

Baseline Geotechnical Limited (2026). Geotechnical Assessment Report — Belmont Quarry Overburden Disposal Area. Ref BGL000252 v2.0, 23 July 2026.

Terra Mining Consultants (2025). Belmont Quarry Regional Park OBDA — Staged Development Footprint and Stage Design Drawings, Series 5003-21 to 5003-38, Rev 2, 18 December 2025.

Tonkin + Taylor Limited (2007). Geotechnical Investigation and Design Advice for the Proposed Cottle Overburden Disposal Area, Belmont Quarry. Ref 83504.003 Rev B.

13 Appendix A — Borehole Summary

Roof levels (reduced level, RL m) of the moderately weathered (MW), slightly weathered (SW) and fresh (FW) rock, and end-of-hole (EOH) level, compiled from the source investigation reports. Values marked * are bores terminated within moderately weathered rock, where the source reports adopt conservative assumed levels for the deeper surfaces.

Bore	Year	Area	MW	SW	FW	EOH	Notes
BEL04/1	2004	North	118.9*	—	—	106.9	Terminated in MW; Sst, minor argillite
BEL04/2	2004	North	149.2	143.2	129.7	119.7	Sst grading to argillite at depth
BEL04/3	2004	North	137.5*	—	—	108.3	Terminated in MW; 2021 review raised MW to ~152.3
BEL04/4	2004	North	153.8	150.8	125.8	120.8	Sst; weathered alluvium base RL177.3
BEL04/9	2004	North	148.4*	—	—	106.7	Terminated in MW; deep weathering E of central fault
BEL04/5	2004	South	123.2	107.2	99.2	89.2	Sst, some argillite
BEL04/6	2004	South	128.5	102.9	86.4	76.4	Sst & argillite
BEL04/7	2004	South	119.8	113.5	85.5	76.0	Sst, minor argillite
BEL04/8	2004	South	116.3	112.3	84.3	~84.6	Sst; variably altered rock
BEL11/6	2011	Firth	39.7	38.9	37.7	-89.2	Fresh to EOH; fault ~RL-77.1; airlift flow
BEL11/7	2011	Firth	—	44.8	43.9	-56.0	Fresh near-surface; possible artesian
BEL11/8	2011	Firth	—	—	≈ surf	1.4	Artesian flow — slope-stability implication
BEL11/9	2011	Firth	—	—	≈ surf	-66.6	Artesian flow under pressure
BEL12/1	2012	Firth crest	99.9	75.9	69.9	50.9	Fault & quartz veining ~RL70; gw from RL74.9

Bore	Year	Area	MW	SW	FW	EOH	Notes
BEL12/2	2012	Firth crest	124.2	103.4	85.4	74.4	No obvious faults; gw from RL110.4
BEL88/8	old	SW margin	>147.5	147.5	147.5	145.5	Shallow geotechnical bore; mostly quarried away

Appendix A: Borehole weathering summary (roof levels, RL m).

14 Appendix B — Borehole Location Plan