Holcim - WCR, Inc.

Lyons Quarry

File #: M-1977-141

112c Reclamation Permit Operations
Technical Revision

Boulder County, Colorado

April 2025

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Contents

Attachments

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1 Introduction

1.1 Purpose and Objectives

The purpose of this document is to support the request to the Colorado Division of Reclamation Mining and Safety (DRMS) for a Technical Revision (TR) to the 112c Reclamation Permit Operations for Lyons Quarry (File number M-1977-141) held by Holcim – WCR, Inc (formerly Aggregate Industries and hereafter referenced as "Holcim"). The objectives of this document are to provide a narrative and updated Exhibits that explain the revisions to the approved Reclamation Plan based on changes from the ongoing reclamation at Lyons Quarry. Revised Exhibits include the following:

Exhibit E – Reclamation Plan

Exhibit F – Reclamation Plan Map

Exhibit L – Reclamation Costs

Rule 6.5 – Geotechnical Stability Exhibit

The purpose for executing this effort is to allow for revised slope configurations of the quarry highwall areas to be in compliance with the standards set forth in the DRMS Mineral Rules and Regulations for the Extraction of Construction Materials (July 15, 2019); Section 3.1.2 which states in part:

> *(3.1.2.1) Grading shall be carried on so as to create a final topography appropriate to the final land use selected in the Reclamation Plan.*
>
> *(3.1.2.3) All grading shall be done in a manner to control erosion and siltation of the affected lands, to protect areas outside the affected land from slides and other damage. If not eliminated, all highwalls shall be stabilized.*
>
> *(3.1.2.7) Maximum slopes and slope combinations shall be compatible with the configuration of surrounding conditions and selected land use* (OMLR, 2019).

Specifically, Holcim revised the grading plan and highwall stabilization to meet the slope stability and surrounding topography requirements. Through the process of reclamation and blasting of the sandstone overburden the dacite highwalls that were to remain in TR-05 have since been covered with materials accumulating on the highwall benches and at the toe of the slope at angle of repose. This revision removes the specified ground control, including rock reinforcement and highwall stabilization, which were included in TR-05. In place of the highwall stabilization, the buttressing ability of the accumulated blast material and the capacity of the large rockfall catchment basin will provide a necessary factor of safety for potential rockfall. The post-mining landowner, Boulder County Parks and Open Space (BCPOS) has viewed the current configuration of the highwall and supports, based on the analysis and findings in this TR, that the current state of the highwall allows for appropriately distanced and protected, public viewing of this unique geologic formation as well as providing suitable habitat for avian and bat nesting areas. Boulder County has expressed concerns

towards the use of rock bolting and mesh on the highwall due to the potential of high inspection and maintenance costs associated with this mitigation and the accessibility of the site.

In addition to the changes for the highwall stabilization this technical revision includes changes to the grading and restoration plans to capture areas of the site that were not accounted for in the previous TR-05 grading plan. Flat, or near flat operations areas adjacent to the highwall were re-graded to promote drainage towards South St. Vrain Creek and steep slopes along the base of the quarry and above the floodplain were re-graded to blend with surrounding topography. The final grading of Quarry 2 is also revised allowing for more stable and natural 4H:1V slopes instead of the original 2H:1V benched configuration. This required the invert elevation of the Quarry 2 drainage channel to be raised, but the overall slope of the channel remained the same from TR-05.

Other revisions to the approved reclamation plan include the following and are addressed in Sections 3-5.

- Revised area of full restoration including soil conditioning and seeding for areas where natural vegetation or important biological water features have established since the conclusion of mining. Following consultation with BCPOS, this TR requests for specific areas in Areas 1 and 2 to receive a revised restoration. Acreages listed in Table 3 indicate areas where revegetation has been removed as the area was not disturbed and has naturally revegetated, or areas where additional revegetation is required.
- Updates to the types and quantities of amendments used for revegetation. Following consultation with BCPOS in October 2023, the use of compost and crimped mulch on slopes steeper than 2H:1V was not likely to develop a successful vegetative cover. The seeding and mulching subcontractor, Powell Restoration Inc., provided alternatives to this plan that were accepted by BCPOS.
- Import of up to 8,000 Cubic Yards (CY) in 2025 from the adjacent Old St. Vrain Road Reach Restoration Project downstream of Lyons Quarry to the designated staging area at Lyons Quarry. This cobble material will be beneficially re-used by BCPOS for future watershed restoration work at Lyons Quarry by BCPOS.

1.2 Background

Aggregate Industries (now Holcim) operated the Lyons Quarry mine located 3 miles southwest of the town of Lyons, Colorado, in the South St. Vrain canyon area. Quartz monzonite was extracted from the mine between 1977 and 2008. While the mining permit for the quarry is still under active status with DRMS, the quarry is currently inactive and in the process of closure and reclamation in accordance the rules and regulations of DRMS. A timeline of the approved Mining Plan and Reclamation Plan for the project, as described in the Lyons Quarry Colorado DMG File M-1977-141 (2004), is provided in **Table 1** below.

Table 1 - Mine Permit Activity for Lyons Quarry

Year	Description
1977	Original Permit Application
1984	Revised Permit Application
2003	AM01 – Permit Amendment Approved
2008	Cessation of Mining Activity
2011	Hall Ranch Open Space, including Lyons Quarry, is sold to Boulder County
2016	TR01 – Technical Revision Approved for Weed Control Plan
2017	TR02 – Technical Revision Approved for Revised Reclamation Plan for Area 1 (Quarry)
2018	TR03 – Technical Revision Approved for Importing Fill to Quarry 2
2020	TR04 – Technical Revision Approved for Revised Reclamation Plan for Area 2 (Permitted Non-Mining Disturbance Area)
2021	TR05 - Technical Revision Approved for Revised Reclamation Plan for Area 1 (Quarry)

Changes in the mining operations at Lyons Quarry resulted in much less mining (removal of quartz monzonite) than was originally planned. The reduction in mining activities resulted in less removal and stockpiling of overburden materials than were originally planned to support reclamation. Without the available stockpiled overburden materials for placement and re-grading at the site, extensive excavation would be required in the overburden sedimentary rocks to achieve a balance of the cut and fill quantities to re-grade the mined areas.

In 2013, flooding of South St. Vrain Creek destroyed several structures on the site and displaced stockpiled materials within the floodplain area. Access to the site was restored via construction of a new bridge and road improvements in 2017. In 2018, the remains of the structures, equipment and miscellaneous surface debris were removed from the floodplain area by Aggregate Industries; however, several areas impacted by the displacement of stockpiled site materials remain.

In response to the 2013 flooding, Boulder County has initiated development of restoration plans for the 3.2 mile stretch of South St. Vrain Creek, from the US Forest Service boundary in the canyon to the Old Saint Vrain Bridge off Highway 7. These restoration plans are currently at the 30% Design phase and include the floodplain area located between South St. Vrain Creek and the mined high walls at Lyons Quarry. Reclamation of South St. Vrain Creek has been completed upstream (in 2022) and downstream (in 2017) of Lyons Quarry. Reclamation planning of the impacted floodplain area (Area 2) of Lyons Quarry was addressed in Technical Revision #4 which was approved by DRMS in December 2020.

Reclamation operations of Area 1 (Quarry) began in October 2021 following the end of bird nesting season which allowed for equipment operation and blasting in the highwall areas. At the Quarry

highwall the overburden Fountain Formation has been rough graded back to a slope of 2H:1V. Quarry 2 has been backfilled and has been graded into a swale for drainage. The catchment berms were constructed in June 2023 and final grading, including compost incorporation, as well as final mulching and seeding is dependent on avoiding cold winter and hot summer weather to complete. Reclamation of Area 2 (Floodplain) began in the Spring of 2022 with the approval of the Boulder County Floodplain Development Permit. Reclamation continued through the winter of 2022-2023 with the scour berm construction, removal of nuisance crusher fines, and re-grading of the area. Limited topsoil found in the floodplain or in the berm along the creek has been applied to most areas and final grading, including compost incorporation, was completed in December 2024. Restoration efforts began in late 2023 but were mostly completed in late fall 2024 as the restoration contractor worked around seasonal conditions for optimal planting times. All floodplain and quarry restoration work was evaluated to be substantially complete on December 3, 2024. As of March 2025, the Site is in the operation and maintenance period with stormwater erosion inspections occurring on a regular schedule with Boulder County.

2 Project Location and Description

2.1 Location

Lyons Quarry is located southwest of Lyons, Colorado in Boulder County. **Attachment A - Figure 1,** shows the Lyons Quarry site just south of South St. Vrain Creek, along Colorado State Highway 7 in Sections 25 and 26 of Township 3 North, Range 71 West of the 6th Principal Meridian.

2.2 Lyons Quarry

Lyons Quarry is located southwest of Lyons, Colorado approximately 10 miles north of Boulder, Colorado. According to records from the 2002 permit Technical Revision #1, the total reclamation area (Project) covers 71 acres (55 acres have been disturbed) of the approximately 266-acre property lease area. The area of disturbance extends from South St. Vrain Creek on the north, to the south approximately 1,500 feet. The limits of affected land make up the east and west perimeters of the site reclamation with the east boundary adjacent to the lease property line. A mining map is shown in **Attachment A - Figure 2**.

The site is further described as having a surface elevation (El.) of 5,508 feet near the northeastern entrance of the site to above El. 6,000 feet at the south end of the site. The existing natural slopes in sedimentary rock strata are as steep as 1.75H:1V, where the sedimentary strata are capped by the Lyons Sandstone. Where the sedimentary rocks are not capped by the Lyons Sandstone, slopes ranged from 2H:1V to 4H:1V. The mining plan splits the operation up into two quarries as shown in **Attachment A - Figure 3**. Quarry 1 is at the east end and at the base of the 300-foot-tall high wall. Quarry 1 is bounded on the south and west by the highwall protrusion and on the east and northeast by backfill material. A constructed swale allowed access into Quarry 1 between the backfill and an access road ramp that leads to Quarry 2 to the west. The horseshoe-shaped Quarry 2 is in the southwest corner of the operation and is bounded on the east, south and west by quarry highwalls. Quarry 2 was partially backfilled in 2017 but still had highwalls approximately 100 feet in height.

The flattest measured slopes were in areas mapped as landslides. Existing natural slopes in the dacite are nearly vertical where the dacite is exposed along the north side of South St. Vrain Creek. Where the dacite outcrops in the drainage along the west side of the site, the existing natural slopes range from 0.3H:1V to 2.2H:1V. This large range in the natural slope was measured along west-facing slopes over a span of approximately 300 feet.

Vegetation was generally absent in the leveled and mined areas. Vegetation over the remainder of the site consists of grasses, forbs, and shrubs/brush with various cottonwoods, willows, Virginia creeper and golden currant found along the drainages.

Surface water is present along the north edge of the site, in South St. Vrain Creek and observed as wet areas along the floodplain where the 2013 flood event scoured a channel. Plans to re-establish South St. Vrain Creek through the former floodplain operating areas are in process through BCPOS and will be discussed in a future Technical Revision. Groundwater is also anticipated to be perched above siltstone and shale layers in the Fountain Formation.

Under the current reclamation plan, the sedimentation pond previously located on the east end of the site was proposed for dust control, earthen fill moisture conditioning, and watering vegetation as needed. Due to an expiring water right permit through the Colorado Water Quality Control Division, the pond was backfilled at the beginning of construction in 2021 and blended with surrounding topography. Water for the proposed uses above has been and will continue to be trucked in from a metered hydrant tap located in the Town of Lyons as needed. The pond area now serves as a staging area for excess materials to be used for the future creek restoration project.

3 Exhibit E – Reclamation Plan

The post-mining use has changed from the original permit application with the purchase of the Hall Ranch II property by BCPOS in 2011. Original plans involved the land being reclaimed to cattle range and pastureland in the production, stockpile, and pit floor areas.

BCPOS plans to use the Hall Ranch II property for uses other than cattle range and pastureland. Per comments from a BCPOS review of this TR, BCPOS will conduct a public planning process for Hall II property at some point in the future following mine reclamation and, based on that process, may allow some appropriate public recreation on the property if it does not impair the site's significant natural resource values. During the adequacy review period for TR-02, it was the request of BCPOS that the revised plan's construction approach leave as much natural slope variability to the site as possible; therefore, keeping the dacite formation exposed for geologic interpretation. Holcim and their consultant, HDR Engineering, Inc., developed TR-04 and TR-05 to meet the following objectives:

- Meet the requests of BCPOS for slope variability and preserve a section of the exposed dacite walls for biological and geological interpretation purposes,
- Minimize risk to reclamation earthmoving contractors working at the top and base of the highwall area during earthwork operations,
- Minimize the amount of blasting and material handling required to backfill the northeast facing slope of the highwall,

- Keep the reclamation operations within the current footprint of the disturbed mining area.

A meeting was held on December 21, 2022, between DRMS, Holcim and their engineering consultant HDR to discuss the revised plan for the highwall stabilization and final configuration. It was anticipated in TR-05 that an amendment for the highwall stabilization may be needed since the final configuration and condition of the highwall would be assessed after the majority of earthwork grading was performed. At this meeting it was decided that the level of detail and scope of the proposed changes would require a formal technical revision to the reclamation plan.

A follow up meeting was held onsite with BCPOS on February 13, 2023, to review the areas in question for the Quarry 1 highwall. The conclusion from this meeting was that BCPOS would support a proposed revision to leave the accumulated material in place pending results from a high-definition drone survey of the remaining rock faces and rockfall analysis to evaluate if geotechnical stability requirements for factor of safety are achieved. In April 2023, Holcim and HDR met with DRMS to discuss how the technical revision should be developed during active reclamation activities. It was determined that all revisions to the reclamation plan deve7loped during the reclamation project shall be incorporated into TR-06 and approved by BCPOS, as the current and future landowner, prior to submittal to DRMS. Changes to the reclamation plan noted below continued through the Fall of 2024 when final restoration efforts (compost application, seeding and mulching) were completed.

The addition of the imported material to Lyons Quarry starting in February 2025 is also included in this TR-06 to document the change to the reclamation plan. Further information about this material import can be found in Section 3.x. The approval for this import material was cleared by DRMS in an email dated January 31, 2025, after a memo detailing the operation and the DRMS “Is It Mining?” form was submitted for review.

The following identifies the revisions to the reclamation plan for permit M-1977-141 specifically to the proposed plans in TR-04 and TR-05.

- Revisions to the highwall slope configuration for Quarry 1,
- Removal of scaling and rock reinforcement of the remaining exposed dacite,
- Revised grading for areas of mining disturbance where steep slopes will not support vegetation,
- Revised reclamation area and types for discreet areas of established vegetation
- Revised revegetation specifications for areas of steep slope
- Addition of rolling dips and a safety berm to the eastern access road
- Import and stockpiling of up to 8,000 CY of rock material at the site staging area

The Site Grading Plan, **Attachment B**, shows the proposed cut and fill slopes and final grading. Exhibit F – Reclamation Plan Map, **Attachment C**, shows the updated reclamation areas and the types of reclamation proposed in Area 1 and Area 2, based on a slope analysis of the final grading. Section 5.1 provides more detail of the proposed Reclamation Plan and Scope of Work developed for estimating the costs for Exhibit L – Reclamation Cost, **Attachment D**. Unless otherwise noted, unit costs for Attachment D are based on rates established in TR-04 and TR-05. Rule 6.5-Geotechnical Stability Exhibit, **Attachment E**, provides the basis for the Site Grading Plan based on analysis and recommendations from the Kleinfelder Summary Report of Engineering Stability Analysis (Attachment E-1) and the Colorado Rockfall Simulation Program (CRSP) Evaluation Report (Attachment E-2) from TR-05. This reclamation plan is based on the premise that the conditions

described in the geotechnical report for the analyses performed and the conclusions and recommendations presented still exist at the site and should remain valid for the duration of the planned reclamation. The Geotechnical Stability Amendment (**Attachment F**), sealed by a registered professional geotechnical engineer, verifies that the slopes and configurations shown on the Grading Plan meet or exceed the recommendations of the Geotechnical Stability Exhibit. The updated Final Design Technical Specifications and Drawing Plan Set with revision date June 2, 2023, are included as **Attachments G and H** respectively. The Lyons Quarry Catchment Basin Operations and Maintenance (O&M) Plan is included in **Attachment I**. A technical memorandum for the results of the Lyons Quarry Revegetation Study – Germination Bench Test in included in **Attachment J.** Documents pertaining to the import of the rock material from the Old St. Vrain Road Reach Restoration Project, including the memo to DRMS and determination letter, are included as **Attachment K**.

Table 2 shows the proposed reclamation schedule through completion with planned reclamation phases, sequence, and estimated durations.

Table 2 – Reclamation Schedule for Area 1 and 2

Phase	Timeframe
Revised Design and Construction Documents	September 2023
Earthwork, Final Grading, Drainage Features, Site Perimeter Fence	Fall 2023
Restoration, Substantial Completion of Reclamation Activity	Winter 2024
Operations, Monitoring, and Maintenance	Ongoing

3.1 Revised Highwall Slope Configuration

3.1.1 Background

Specific to the highwall areas in Quarry 1, TR-05 proposed leaving the dacite face of the highwall exposed providing that the reclamation is in accordance with the Kleinfelder Geotechnical Summary Analysis Report (**Attachment E**), or the geological engineer provides sufficient evidence that the highwall configuration provides a necessary factor of safety. Section 6.3.1 of the Kleinfelder report details the reasons for the stabilization requirements based on potential wedge failures. Section 7.1.2 of the report details the proposed Slope Template II (**Attachment A - Figure 4**) that was the basis of the design for TR-05. TR-05 also added large catchment basins formed by berms at the base of the highwalls to address rock-rollout potential from the remaining highwalls. Noted in Item 7.0 - Ground Control of TR-05 Section 5 is the following:

Rock Reinforcement may be needed for stabilization where large blocks are evident in the bedrock. Locations for Rock Reinforcement will be determined by the on-site Engineer after scaling operations are complete. Based on these field observations, the Engineer may increase, reduce, delete, or otherwise alter the Rock Reinforcement as necessary to address actual field conditions. This is anticipated to be addressed in an amendment to this Technical Revision (TR-05) once the

slope has been cleared and a formal design of the Rock Reinforcement alignment, placement and depth is determined.

3.1.2 Summary of Grading Activities

As blasting and excavation operations progressed on the sandstone overburden of the highwall very minimal blast material was accumulated on the benches, and it was anticipated that rock scaling and reinforcement following excavation would occur (see **Attachment A - Figure 5** for an aerial image from July 2022 showing site conditions five months after the start of blasting). In October 2022 most of the dacite was still visible (**Attachment A – Figure 6**) though some rock had accumulated. However, as blasting approached the lowest sections of the sandstone, large amounts of blast material, including soils, gravels, cobbles and boulders, began to accumulate on the lower dacite benches and at the base of the highwall. When the last blast events were performed in November 2022, the dacite benches at the base of the highwall were completely covered with blast material built up at angle of repose (**Attachment A - Figure 7**). The amount of exposed dacite has been significantly reduced and is now buttressed by the blast material.

To remove this material from the dacite highwall would require extensive scaling and earthwork operations using heavy equipment to build up access ramps and/or traverse the highwall slopes. This operation would not only be very dangerous for the operators and equipment working under a highwall, but also extremely cost and schedule intensive which was not considered in the original reclamation estimates. Alternatively, the accumulated material is now acting as a buttress against the lowest sections of the highwall in a similar configuration to the proposed fill slopes in TR-02 that were approved for reclamation. Section 7.1.1 of the Kleinfelder report recommends, “reinforcing potential wedge failures on the northeast facing slopes using rock anchors and shotcrete; or alternately constructing soil fills against the dacite on the northeast facing slopes”.

BCPOS viewed the current site conditions on February 13, 2023, and noted that, contrary to the original bench/highwall configuration of Quarry 1, the current slope configuration resembles the natural topography seen around many of Lyons Quarry’s surrounding areas. BCPOS agrees the current state of the highwall, and the proposed catchment basin allows for appropriately distanced and protected public viewing of this unique geologic formation as well as providing suitable habitat for avian nesting areas. Boulder County has expressed concerns towards the use of rock reinforcement such as bolting and mesh on the highwall due to the potential of high inspection and maintenance costs associated with this mitigation and the accessibility of the site. Based on the analysis and findings in this TR-06, BCPOS supports the option to leave the accumulated material in place in Quarry 1 with the assumption that the geotechnical stability requirements for factor of safety are achieved.

3.1.3 Geotechnical Stability Evaluation

HDR geotechnical engineers began developing a Geotechnical Stability Amendment in Spring of 2023 using drone and contractor’s interim survey data to evaluate the condition of the highwall and blast material as all blasting activities were completed.

A rockfall evaluation using a Colorado Rockfall Simulation Program (CRSP) model (Jones et al., 2000) was used in TR-05 to verify that the Quarry 1 catchment basin was adequate to catch 100% of the modeled potential rockfall from both the dacite and Fountain Formation sandstone with an

adequate factor of safety meeting or exceeding the MLRB Policy No.30 requirement of 1.5. For this TR-06, HDR used two separate methods, Kinematic Analysis and Rockfall Analysis, to evaluate the stability of the remaining dacite highwalls and the potential for rockfall to roll out past the catchment basins that were designed for TR-05.

A drone survey of the current conditions in Quarry 1 was performed by Chinook Landscape Architecture, LLC was performed in April 2023 to provide a high-definition photogrammetric assessment of the remaining exposed dacite faces. The survey also collected topographic data of the blast material on the northeast and northwest faces of Quarry 1 to confirm the slope height, runout area, and catchment berm dimensions are within the parameters of the TR-05 rockfall evaluation. The results of the drone survey and evaluation of the data corresponding to the Kinematic and Rockfall analysis are discussed in Geotechnical Stability Amendment **(Attachment F**). Recommendations noted in **Attachment F** from these analyses are noted below.

Kinematic Recommendations

Although wedge failure, as noted in the Kleinfelder report, appears to be most critical, it is the opinion of HDR that the fractured nature of the rock mass and the low persistence of the critical joint sets related to the wedge failures within the Lyons Quarry lend themselves to smaller-scale block and topple failures that are calculated to be retained by the proposed rockfall catchment measures. Additionally, the fractured and blocky nature of the exposed rock mass would likely be unreasonably challenging to retain by a bolting program. It is reasonable to assume that the rock bolting program is not necessary at this location. If an additional rockfall remediation program were to be suggested and evaluated in the future, a pinned mesh would likely be significantly more cost-effective and effective to remediate the Lyons Quarry highwalls.

Rockfall Recommendations

Based on the rockfall design discussed in **Section 2.2 of Attachment F**, the existing and proposed geometry of the benches at the Lyons Quarry is acceptable for rockfall so long as a detailed understanding of the regions where rockfall is expected to occur exists at the site. **Attachment F**, **Figure 9** indicates, in plan view, the outer limits that rocks reached within the RocFall2 models. From the start of each section at the tops of the highwalls until the locations marked, rockfall should be expected. Additionally, as rockfall modeling is an uncertain and statistical process performed on 2D representations of a 3D surface, this area of caution should be expanded by a nominal 50.0’ for each critical section. Of the 500 rock paths evaluated for existing and proposed critical sections 1, 2, and 3, none of the rocks reach the proposed catchment berms and frequently lose rollout energy well before reaching any form of the catchment.

Based on the recommendations above and inherent safety issues that limit safe access the highwall face to install ground controls, it is proposed that the Ground Controls included in TR-05 be removed from the reclamation plan. The rockfall catchment berms designed under TR-05 have been installed to specifications with only minor deviations in the placement of the northwest catchment berm based on slope configurations. The geotechnical engineers reviewed the as-built files for this catchment berm and included its placement into the modeling for the analyses.

3.2 Revised Grading of Select Areas

3.2.1 Former Mining Operations Areas

As reclamation progressed since October 2021, two areas of mining disturbance were identified by BCPOS that are not called out on the grading plans from TR-04 or TR-05. These areas were likely used during mining operations for staging equipment or stockpiling materials. The resulting grades in these areas do not blend with the surrounding topography and required re-grading. One area was relatively flat while the other was a slope that was steepened to an angle where vegetation is unlikely to grow and has evidence or stormwater erosion.

The East Stockpile Area is shown in Figure 3 and on the Grading Plan. This area is part of the catchment berm for Quarry 1 and is approximately 120 feet from east to west and 140 feet from north to south. BCPOS requested this flat area to be blended into the hillside to the southeast using the excess material from the hillside. It is estimated a wedge fill of up to 8 feet and down to 0 feet was applied across this area. An approximate total of 2,500 CY was needed to fill this area and blend into the surrounding topography. Fill was provided from re-grading of the east slope below the access road (Figure 3).

The West Stockpile Area is shown in Figure 3 and on the Grading Plan. This area lies above the scour berm and below the current access road to Quarry 2. It appears this area was widened out from the access road during mining operations to create a truck passing area or stockpile. The resulting downgradient slope has a gradient of greater than 1.5H1V. A 100-foot section of this slope does not support vegetation and has evidence of heavy erosion. Holcim added this area to the grading plan. To blend into the surrounding topography a slope 100 feet-long and 40 feet in height was re-contoured to a slope of at least 2H:1V. Additionally, 100 feet of slope to the east and west of this area was tapered to the blend in with the surrounding topography. To re-grade this 0.25-acre area required approximately 5,000 CY of cut material which was blended to re-grade the adjacent flat area near the Quarry 2 access road, used to construct the catchment berms, or placed in the excess material stockpile on the east end of the site as shown in the Grading Plan.

3.2.2 Quarry 2 Fill and Drainage Channel

As shown in Figure 9, the fill slopes of Quarry 2 were graded from the top down. Following placement of fill, the configuration of the Quarry 2 slopes was shallower and more stable than the TR-05 grading plan which calls for 2H:1V slopes and benches every 50 vertical feet. Because the material was placed in this area from the top down there exists an excess of fill. Slope configurations ranged between 2.7H:1V and 4.3H:1V as shown in Sheet 01C-02 of the grading plans.

Holcim proposed to BCPOS to revise the grading plan for the Quarry 2 Fill and raise the invert of the drainage channel in place of removing, hauling and replacing this material. The drainage channel through Quarry 2 remained at the same slope of approximately 20% as designed, but the invert elevation was raised roughly 15-20 feet and additional fill was placed at the north end of quarry to tie the drainage into downgradient slopes. The remaining excess material was pulled out and placed for the catchment berms on the northeast and northwest faces of the highwall.

BCPOS has approved this revision as the flatter slopes will reduce the likelihood of erosion and allow for maintenance equipment to traverse the majority of the slopes at the west end of the site.

The east area received final grading to blend with surrounding topography and was revegetated. The reclamation included soil conditioning and hydromulching consistent with the current reclamation plan.

3.2.3 Highwall Crest – Station 14+00 to 18+00

Areas of the northeast face of the Quarry 1 highwall have been excavated down to solid rock following the drilling and blasting that occurred in November 2022. Some areas did not fracture during blasting and an approximate 400-foot section of the highwall is roughly 5-20 feet above the specified grade for this area. To remove the material down to final grade would require either additional drilling and blasting or hydraulic hammering from heavy equipment. Further blasting was not feasible given the undulating terrain, shallow blast depths, and potential for more material to accumulate along the highwall toe (Section 3.1). Hammering of this much area would put the heavy equipment operators in precarious positions at the top of the sloped highwall.

Holcim proposed to BCPOS to grade out these areas to the extent possible but leave the final elevation to those described above. See the "Current Grading Based on Meridiam's March 2023 Survey" lines shown on **Attachment A - Figure 10** for current and proposed grades for the highwall crest area at Sta. 14+00, 16+00, and 18+00 of the Sheet 01C-02 grading plan. Holcim graded the area to 2H:1V to the extent practical, but some undulations may remain near the highwall crest. The soil riprap safety berm that existed along the highwall during excavation was pulled back into the hillside and the area received hydromulch application for restoration. The soil riprap that makes up the crest of the highwall will provide protection against erosion until the vegetation has established in this area.

3.2.4 Quarry 1 Drainage Basin

In reference to the outlet culvert from the catchment basin in Quarry 1, Section 3.5 of TR-05 states "The culvert outlet will tie into the drainage channel at the toe of the scour berm and direct flow to the east. The culvert is necessary to prevent the retention of water within the catchment basin. Holcim does not propose to impound water in the catchment basin and all areas will be graded to positively drain through the RCP outlet". Due to grading discrepancy between the survey files used for developing the TR-05 grading plan, a small depression below the elevation of the floodplain remains in Quarry 1. This area is at the toe of the rockfall above the highest portion of highwall and is not feasible for equipment to safely enter and perform earthwork. Monitoring over three years of construction, the basin has not shown any evidence of retaining stormwater as the fractured bedrock of the quarry likely allows for high hydraulic conductivity to shallow groundwater adjacent to South St. Vrain Creek. In discussion with BCPOS, the county supports leaving the 50-foot by 30-foot basin as-is since it does not appear to be impounding water, provides additional area to capture sediment coming down the channel from the Quarry 2 slope and rock off the Quarry 1 high wall, as well as providing potential habitat for wildlife. Further discussion on the operation and maintenance of the catchment basin and the culvert can be found in **Attachment J**.

3.3 Revised Areas of Restoration

3.3.1 Reduced Restoration Acreage

As specified in TR-05, slopes for the revised plan that are steeper than 2H:1V were revegetated either by using straw mulch and crimping or hydro mulching methods while also receiving an appropriate seed mix and necessary organic amendments (**Attachment C2**). Slopes steeper that mostly consist of rock faces that will not support vegetation; therefore, these slopes were not revegetated. The focus of revegetation was to establish native plant species, adapted to the area climate, which require no irrigation. Two native plant seed mixes were developed in consultation with BCPOS ecologists for upland and floodplain applications. Areas of revegetation will be maintained by the restoration contractor for up to one growing season to control weed infestation. Holcim will monitor and maintain the Site until the area is satisfactorily reclaimed per Specification 32 90 00 and the O&M Plan (**Attachment I**).

Now that the Area 1 reclamation activities, including mass excavation, are complete, Holcim proposes to revise the acreages of restoration for areas of established vegetation outside of disturbance zones. These areas were planned to receive full restoration including soil conditioning and seeding. The revised areas are on existing slopes where vegetation is important to prevent erosion issues and may take years to fully establish. This TR proposes for the specific areas in **Table 3** below that account for 4.1 acres to receive a revised restoration of hydroseed and hydromulch only to promote further germination of native species. Additional acreage was removed to account for the main access road and a staging area in the former sedimentation pond area, the Quarry 1 catchment basin, and undisturbed areas along South St. Vrain Creek. Additional areas where vegetation is established, or the floodplain will be restored in the near future, or where reclamation proved unsafe and not feasible are listed in Table 3 below and in **Attachment C2**.

3.3.2 Increased Restoration Acreage

The restoration section TR-05 states that 40.35 acres in the Quarry area (Area 1) will be restored and revegetated. This did not include the scour berm which was anticipated to be constructed solely of large riprap material. Because the scour berm design was changed to be soil filled as an amendment to TR-04 (dated 2/11/22) this area received revegetation consistent with the Quarry (upland) area along the slope of the berm. The top of the berm will serve as an access road along the floodplain for future O&M activities, per BCPOS direction. This adds 1.94 acres to the total area for Area 1 reclamation.

TR-04 revised acreage for restoration of the Area 2 floodplain. The total acreage for Area 2 was expected to cover 5.15 acres according to the reclamation costs estimated for TR-04. After performing the reclamation of the proposed areas, the floodplain area required 9.0 acres to be reclaimed. This is due to underestimating the acreage of disturbance of the floodplain and accounting for the areas between reclamation plots that were not connected which had to be disturbed during the excavation, stockpiling, and fill processes (see Area H in Table 3).

Table 3 Areas of Revised Restoration from TR-05 Reclamation Plan

Area ID	Description	Grading + Soil Cond. Acreage	Seeding Acreage
	Current Total Acreage from Area 1 (TR-05) and Area 2 (TR-04)	**45.50**	
A	West Stockpile Area Slope below (north) and west of Quarry 2 and above scour berm (Area 1)	-1.18	0
B	East Slope below East Access Road (Area 1)	-0.64	0
C	Main and East Access Roads and Staging Area (Area 1)	-2.84	-2.84
D	Scour Berm Riprap Channel and West Floodplain Channel - Undisturbed, vegetated area of floodplain (Area 2)	-3.10	-3.10
E	South bank of SSV Creek along Floodplain (Area 2)	-1.57	-1.57
F	Quarry 1 Catchment Basin and Northwest face of highwall between Quarry 1 and 2 (Area 1)	-5.88	-5.88
G	Scour Berm with Soil Fill (Area 1)	1.94	1.94
H	Additional Floodplain area to be reclaimed (Area 2)	2.16	2.16
	Total Acreage Reduced from Area 1 (TR-05) and Area 2 (TR-04)	**-11.11**	**-9.29**
	Total Reclamation Acreage Area 1 (TR-05)	**40.35**	
	Revised Reclamation Acreage Area 1 (TR-06)	**31.75**	**33.57**
	Total Reclamation Acreage Area 2 (TR-04)	**5.15**	
	Revised Reclamation Acreage Area 1 (TR-06)	**9.00**	

Removing 11.18 acres from the TR-05 total of 45.5 acres for Areas 1 and 2 (**Attachment D**) would result in a total of approximately **34.39 acres** to be reclaimed with final grading and soil conditioning. Including areas A and B in Table 3 for seeding and mulching, the total area for revegetation is **36.21 acres**.

3.4 Revised Restoration Amendments and Application Rates

Analytical and observation results from a revegetation bench test (**Attachment J**) using Lyons Quarry Fountain Formation soils were provided to BCPOS in May 2023. As noted in the Technical Memo from the Germination bench Test, the results of the bench test were mixed, but overall, the control tests without compost or fertilizer amendments showed the highest rate of germination. Follow up sampling of the quarry and floodplain soils after mass excavation was performed to verify soils results from 2019 and at the start of the bench test in October 2021 (**Attachment J, Table 3**). The results from testing confirmed that Organic Matter (OM) and Available Nutrients remained extremely low. It was decided at this time to continue with the specified application rate for compost

of 3 CY per 1000 square feet for areas where import compost material in the floodplain. Rates for areas in Area 1 that received the spray-on Sustane product discussed below were based on discussions between BCPOS, Holcim, and Holcim's subcontractors. In total, 1,688 bags weighing 50 lbs. each were used for soil conditioning of Area 1. This equates to 2,500 lbs./acre as specified in Section 5.

In consultation with the BCPOS ecologist over Summer 2023, Holcim worked with their revegetation subcontractor Powell Restoration to propose additional amendments to promote revegetation on steep, rocky topography with minimal nutrients and OM. These included the following:

- Humates and Mycorrhizae inoculant to promote initial growth from the relatively inert soils.
- Hydraulic wood mulch and psyllium tackifier in place of blown straw mulch.
- Sustane concentrated hydraulic compost/fertilizer for slopes steeper than 3H:1V which typical revegetation heavy equipment is unable to traverse for spreading compost and fertilizer efficiently.

The Sustane, Humate, and Mycorrhizae were approved by BCPOS in June 2023, and after further consultation, the hydraulic wood mulch was approved for use in select areas. In addition, BCPOS requested the use of Flexterra HP-FGM hydromulch on slopes steeper than 2:1 to assure the seed and mulch have a better resistance to erosion. Holcim agreed to this and the Flexterra is planned to be used on most of the slopes within Area 1 (Quarry) and above the scour berm.

All of these products were approved for use on steep slopes within the quarry and upper highwall area. The amendments specified for the floodplain remained unchanged. The floodplain restoration was completed in late November 2023. Winter conditions have delayed the completion of the quarry revegetation and are expected continue to do so until Spring 2024.

3.5 Boulder County 2025 Rock Import

In January 2025, Holcim provided the following information to DRMS for approval of importing rock fill material from an adjacent project to Lyons Quarry for stockpiling to be used on future watershed restoration work. The following is a description of the Old St. Vrain Road Reach Restoration project and the details of importing the rock fill material to the Site.

Inert fill material will be obtained from the Old St. Vrain Road Reach Restoration Project downstream of the Lyons Quarry. A full copy of the downstream project narrative is included in **Attachment K**. The overall goal of this project is to increase ecological and geomorphological resilience in a relatively unconfined river reach to maintain beneficial uses of waters and improve watershed resilience at a site located downstream of high severity fire and upstream of communities. Resilience will be attained through a process-based design approach that focuses on overall corridor function, particularly floodplain processes including more frequent inundation, infiltration, and expansion of riparian vegetation. The project will remove the excessive floodplain deposition that occurred during the 2013 flood, provide multiple elevational zones that support various riparian communities and activate during different flood events, and create additional complexity for improved habitat. An additional goal is to complete the project as efficiently and cost effectively as possible within the established timeframe. This material is assumed to be riverbed material excavated to increase the ability of the floodplain to handle flood events without causing damage to nearby properties.

The off-site material will be accepted in accordance with Holcim-WCR Inc. "Inert Material Acceptance Policy" a copy of which is enclosed as Attachment K. This material will be incorporated into the reclamation of the quarry but will be maintained and monitored by BCPOS. The project is being led by The Watershed Center (TWC) in coordination with BCPOS. Biohabitats, a subconsultant to TWC, engineered the downstream project and Left Hand Excavating will excavate, transport, and stockpile the material at Lyons Quarry staging area.

The volume of inert material to be imported and backfilled will be an assumed total of 8,000 cubic yards. This volume is within the 200,000 cubic yards of potential additional material that was referenced for future import in TR-03 (dated 6/28/2018) for Lyons Quarry in which 29,405 cubic yards of inert material were imported as backfill from restoration work downstream of the site (see **Attachment K**) into Quarry 2. No additional import was performed following this initial work.

Enclosed in **Attachment K** is the agreement (Exhibit 2) between Aggregate Industries and Boulder County including an affidavit certifying that the material imported was clean and inert, as defined in Rule 1.1 (20).

Importing of fill material is planned to start in February 2025 and may continue into June 2025. The imported material will be stockpiled in the dedicated staging area at the east end of the site where the sedimentation pond previously existed as shown in **Attachment B**. This coincides with TR-03 which stated that, “Future fill material, if any, will be placed in the East Fill Area of the quarry”. This area is also determined to be outside of the 100-year floodplain and is protected from South St. Vrain Creek by the large riprap scour berm that was placed during floodplain reclamation in 2023. Existing remnant stockpiles left in the staging area will be relocated within the area to accommodate the imported fill.

The material will be placed and stabilized in accordance with this revised reclamation plan. In general, material will be dumped and pushed against the southeast-facing slope of the designated staging area as temporary stockpile with a wheel loader or bulldozer. The coarse aggregate to cobble material will remain stockpiled until grading work within the floodplain area of Lyons Quarry begins which is assumed for calendar year 2026. No temporary restoration of this rock material stockpile is anticipated as the material will be contained within earthen berm and riprap channels and is not expected to create sediments.

As this work is proceeding outside of the work that Holcim has performed at the Lyons Quarry Site, Holcim has not included the scope of work and costs into the Exhibit L (Section 5) below. Boulder County will be responsible for overseeing the fill import, maintaining the stockpiles, and managing the staging area following the approval of this TR-06. The release of the acreage will be accounted for in future Technical Revision (TR-07) that will also discuss release of acreages in the floodplain that will be impacted by future creek restoration work.

4 Exhibit F – Reclamation Plan Map

The Reclamation Plan Map is provided as **Attachment C1** showing the reclamation plan approved under TR-05.

The revised Reclamation Plan for soil conditioning and restoration as described in Table 3 is provided in **Attachment C2**.

5 Exhibit L – Reclamation Costs

Estimated reclamation costs for each of the major work items described below are summarized and presented in Exhibit L – Reclamation Costs, **Attachment D**.

5.1 Revisions to Planned Reclamation Scope of Work

The following revisions are specific to the reclamation work to be performed in the Lyons Quarry reclamation project. For a full list of the itemized scope sections refer to Section 5 of TR-04 and TR-05.

Item 1.0 – Mobilization/Demobilization

No revisions are proposed.

Item 2.0 – Project Safety Plan and Implementation

No revisions are proposed.

Item 3.0 – Erosion, Sedimentation, and Dust Control Plan

No revisions are proposed.

Item 4.0 – Site Survey

No revisions are proposed.

Item 5.0 – Disposal of Excavated Materials

No revisions are proposed.

Item 6.0 – Earthwork

Item 6.1 – Excavation and Blasting

Consistent with Section 3.1 and 3.2 above, the estimated quantities for excavation are to be revised to the following:

- Under section 3.1 it is assumed that all blast material that has accumulated on the Quarry 1 benches and at the toe of the slope are included in the excavation quantities listed in **Table 4** below. A drone survey is expected to be performed for this area to estimate the volume of material that would be left in place in Quarry 1. It is assumed this quantity would reduce the 72,729 CY volume that was anticipated for placement on the east slope of the highwall as excess fill as shown in the Grading Plan.
- Under Section 3.2 an additional 2,500 CY would be excavated to be used as fill for the East Stockpile area and an additional 5,000 CY would be excavated from the slope below the West Stockpile area. An additional 7,500 CY was excavated under this task.

As shown in **Table 4** the estimated aggregate excavation volume to establish the final grading for the Quarry 1 area is approximately 252,580 CY. This number has increased by 7,500 CY from TR-05. Excavation and fill requirements for the floodplain (Area 2), which are covered in Technical Revision #4, are included for reference. Technical Specifications, including blasting requirements, for Excavation are included in Section 31 23 16 of **Attachment G**.

Table 4 – Estimated Excavate-Fill Quantities

Item	Excavate (CY)	Fill (CY)
Area 1 – Quarry Slope Grading[1]	245,080	125,300
Northeast Catchment Berm		14,278
Northwest Catchment Berm		21,133
Sedimentation Pond Fill		2,222
Scour Berm		19,033
Revised Grading of Select Areas	7,500	7,500
Total Area 1	**252,580**	**189,466**
Area 2 – Floodplain Soil Removal	23,300	13,685
Area 2 – Floodplain Soil Export	10,000	
Total Area 2	**33,300**	**13,685**
Total Project	**285,880**	**203,151**
Excavate-Fill Balance	**72,729**	

1. Area 1 quantities include Quarry 1 and Quarry 2

Item 6.2 – Fill

Consistent with Section 3.1 and 3.2 above, the estimated quantities for fill are to be revised to the following:

- Under section 3.1 it is assumed that all blast material that has accumulated on the Quarry 1 benches and at the toe of the slope are included in the fill quantities listed in **Table 4** above. It is assumed this quantity has reduced the 72,729 CY volume that was anticipated for placement on the east slope of the highwall as excess fill as shown in the Grading Plan.
- Under Section 3.2 an additional 2,500 CY would be excavated to be used as fill for the East Stockpile area and an additional 5,000 CY was be excavated from the slope below the West Stockpile area to be used as fill or placed as excess fill on the east slope of the highwall. Approximately an additional 7,500 CY was placed as fill under this task.

As discussed in Section 3.1, due to the location of the blast material that has accumulated on the benches and base of the Quarry 1 highwall, compaction of this material would not be achievable. The remaining highwall and risk of continued settlement of the blast material creates a significant safety hazard for equipment to operate within the rockfall runout area of the fill slopes. Select areas

of fill noted under Section 3.2 and in the revised grading plan received the same standard of compaction as other fill areas including Quarry 2. This involves the routing of heavy equipment to provide the necessary compaction. As specified, visual observations were performed to assess deflection of soil while material is being placed by a CAT D9 bulldozer or CAT 730 haul truck.

Additional Technical Specifications for Fill are included in Section 31 23 23 of **Attachment G**.

Item 6.3 - Riprap for Drainage Channels and Scour Berm

No revisions are proposed.

Item 6.4 – Final Grading

Final grading acreage amounts will not be affected by the revisions proposed in Sections 3.1 or 3.2. Section 3.1 proposes additional fill to be placed in Quarry 1, but as noted above this material will not receive final grading due to access and safety concerns. TR-05 did not propose final grading for any areas within the Quarry 1 catchment basin. The additional area affected under Section 3.2 is already considered in the total acreage proposed in TR-05.

Final Grading acreage is revised to account for the changes in Section 3.3 which include an 11.11-acre decrease in Area 1 and Area 2. The total acreage for final grading for both Area 1 and Area 2 is consistent with the soil conditioning acreage of 40.75 acres.

Final Grading of all fill slopes, benches, crest areas, and toe areas will ensure that water is not allowed to pond on or adjacent to the fill slopes. Grading will be performed to the proposed slope gradients shown in the Grading Plan (**Attachment B**). Final grades with organic material included will be developed using an excavator or tracked skid-steer to lightly spread out the material and prevent compaction.

Item 7.0 – Ground Control

As discussed in Section 3.1, it is proposed that this item be removed from the Scope of Work for Reclamation.

Item 9.0 – Restoration - Test Plots, Soil Conditioning and Revegetation

Reclamation areas have been revised according to areas of disturbance and maintaining undisturbed areas with existing vegetation, as shown on Exhibit F- Reclamation Plan Map, **Attachment C1 and Attachment C2**. Reclamation areas were restored depending on their proximity to the current channel alignments or catchment basins and the overall slope configuration.

Revegetation amendments and application rates have been revised as well per Section 3.4 above.

9.1 – Test Plots

No revisions are proposed.

9.2 – Soil Conditioning

Per 3.1.10(8)e - Planting required for reclamation may be delayed, through the period of use related to places of refuse disposal, haulage roads and road cuts. Normal stabilization of surfaces is

required. No planting is required on any affected land so long as the chemical and physical characteristics of the surface and immediately underlying material of such affected land are toxic, deficient in plant nutrients, or composed of sand, gravel, shale, or stone to such an extent as to seriously inhibit plant growth and such condition cannot feasibly be remedied by chemical treatment, fertilization, replacement of overburden, or like measures.

All reclamation areas within the floodplain were reclaimed in a manner that allows for post-mining land use. These areas were backfilled as described above, then covered with a layer of growth medium material. The growth medium material was developed from a blend of any available topsoil stockpiled on site and material available from the excavation and breakdown of the fine-grained sedimentary overburden rock, supplemented as needed by imported topsoil, biosolids, or compost, then blended, scarified, seeded and mulched.

The materials were transported using front end wheel loaders or articulating haul trucks. This material was then uniformly spread and mixed with conventional earthmoving equipment, such as dozer rippers or the teeth of an excavator bucket, into the top 12 inches of the subsoil. For the Area 1 reclamation it is anticipated that the soil conditioning area covers approximately 31.75 acres.

For purposes of estimating restoration costs for **Attachment D**, Holcim estimates that the top six inches (assumed at 6,808 CY) from the layer underlying colluvium and crusher fines in the floodplain; and the berm (assumed at 7,980 CY) near South St. Vrain Creek will provide an assumed 14,788 CY of topsoil. This will provide a 6-inch layer of topsoil for 8.44 acres of the 9 total Area 2 acreage, though rock content is expected to be high and will need to be screened out of this total. To provide 6 inches of topsoil cover for the remaining approximate Area 2 acreage and all of Area 1, Holcim received approval from BCPOS to apply a concentrated hydraulic compost with a slow-release fertilizer (Sustane) to Area 1. A total of 31.75 acres received Sustane 2-3-3 compost (2500 lbs./acre) mixed with hydroseed, AM 120 mycorrhizae (20 lbs./acre), and Menefee Humate (200 lbs./acre) to promote growth in the fine-grained soils of Lyons Quarry. Area 2 (floodplain) had compost trucked in and applied at a rate of 3 CY/1000 sf to cover 9 acres as previously approved. This equates to a total import of compost of 392 CY. This number is reduced from the amount assumed in Technical Revision #5 due to the reduced amount of fill areas in Quarry 1 that would require revegetation (i.e., catchment basin, remaining highwall, currently vegetated areas) and the ability to use the Sustane product on Area 1. The costs of utilizing topsoil sources onsite versus imported soil growth medium have been broken out as separate lines in the estimated costs table of **Attachment D**.

Imported soil amendments were from a local source of material. Caked or lumpy soil amendments were not accepted. Manure was confirmed not be so caked or lumpy that it could not be spread uniformly. Compost manure was stabilized through at least one heating cycle (120 to 140 F degrees), turned at least once, and windrowed for at least 45 days and stockpiled for a least 2 months. Biosolids or compost biosolids, containing municipal biosolids, were not used during reclamation. Soil amendments were confirmed to not contain pathogens or toxic materials harmful to human health or vegetation growth.

9.3 – Revegetation

The revegetation of Area 1 covers approximately 33.57 acres and Area 2 covers 9.00 acres. Revegetation of some areas were performed without soil conditioning per BCPOS approval. These

include steep slopes between the scour berm and Quarry 1 and 2 which have existing vegetation, but BCPOS requested additional native seeding and mulching for stabilization. Completely grading, conditioning and restoring these areas would be very difficult and the existing vegetation is already stabilizing the slope. The total area of seeding/mulching without soil conditioning is approximately 1.82 acres (**Attachment C2**). Seeding of the reclaimed areas assumes a native seed mix comprised of the species and mixtures recommended by BCPOS with updates provided in December 2019 by Senior Plant Ecologist David Hirt. A new seed mix was provided in Summer 2023 with Boulder County providing certain seed varieties cultivated nearby, revising the application rates, and adding Triticale as a cover crop. This seed mix incorporates species that have performed well on recent floodplain projects in the area. **Table 4** shows the native seed mix recommended for 5,500 to 7,000 feet elevation (reclaimed areas at the site range in elevation from 5,500 to 5,820 feet). The listed quantities and application rates are shown in pounds of pure live seed per acre (#PLS/Acre). Assumed application rates have been doubled to account for broadcast seeding. The seeding was completed Fall 2024.

Table 4 – Area 1 and Area 2 Seed Mixes – Lyons Quarry

Lyons Quarry Mix						
Area 1 - Slopes and Benches						**ACRES**
Common Name	***Latin name***	**Variety**	**% of mix**	**PLS#/Acre**	**Revised Rate PLS#/Acre**	**33.57**
Sideoats Grama	*Bouteloua curtipendula*	Vaughn	12	2.19	**3.29**	110.45
Canada Wildrye	*Elymus canadensis*	Mandan	10	3.03	**4.55**	152.74
Squirrel Tail	*Elymus elymoides*	BOCO Collection	10	1.82	**2.73**	91.65
Slender Wheatgrass	*Elymus trachycaulus*	San Luis or First S	8	1.75	**2.63**	88.29
Montana Wheatgrass	*Elymus albicans*	BOCO Collection	10	2.26	**3.39**	113.80
Indian Ricegrass	*Oryzopsis hymenoides*	Paloma	5	1.24	**1.86**	62.44
Sandberg Bluegrass	*Poa secunda*	BOCO Collection	5	0.19	**0.29**	9.74
Little Bluestem	*Schizachyrium scoparii*	Pastura or Cimarr	7	0.94	**1.41**	47.33
Needle and Thread Grass	*Stipa comata*	Native VNS	8	2.42	**3.63**	121.86
Green Needlegrass	*Stipa viridula*	Lodorm or Native	5	0.96	**1.44**	48.34
Fringed Sage	*Artemesia frigida*	VNS	5	0.04	**0.06**	2.01
Hairy Golden Aster	*Heterotheca villosa*	VNS	7	0.28	**0.42**	14.10
Mountain Mahogany	*Cercocarpus montana*	VNS	1	0.59	**0.89**	29.88
Rabbitbrush	*Ericameria nauseousus*	VNS	6	0.52	**0.78**	26.18
Blue Grama	*Bouteloua gracilis*	Native, Alma, Hachita	8	0.34	**0.51**	17.12
Totals			**107**	**18.57**	**27.86**	**935.26**
Quickguard (Sterile)	*Triticale*	Quickguard	3	8.04	**12.06**	**404.85**

Lyons Quarry Mix *Area 2 - Flat Meadow*						ACRES
Common Name	***Latin name***	**Variety**	**% of mix**	**PLS/Acre**	**Revised at 1.5 original rate**	**9**
Blue Grama	*Bouteloua gracilis*	Native, Alma, Hachita	17	0.72	**1.08**	9.72
Canada Wildrye	*Elymus canadensis*	Mandan	12	3.64	**5.46**	49.14
Squirrel Tail	*Elymus elymoides*	BOCO Collection	12	2.18	**3.27**	29.43
Montana Wheatgrass	*Elymus albicans*	BOCO Collection	10	2.26	**3.39**	30.51
Slender Wheatgrass	*Elymus trachycaulus*	San Luis or First S	10	2.19	**3.29**	29.61
Switchgrass	*Panicum virgatum*	BOCO Collection	9	0.81	**1.22**	10.98
Sandberg Bluegrass	*Poa secunda*	BOCO Collection	5	0.38	**0.57**	5.13
Green Needlegrass	*Stipa viridula*	Lodorm or Native	8	1.54	**2.31**	20.79
Fringed Sage	*Artemesia frigida*	VNS	4	0.03	**0.05**	0.45
Hairy Golden Aster	*Heterotheca villosa*	VNS	5	0.2	**0.3**	2.70
Rocky Mtn. Bee Plant	*Cleome serrulata*	VNS	4	2.12	**3.18**	28.62
Rabbitbrush	*Ericameria nauseousus*	VNS	4	0.35	**0.53**	4.77
Totals			**100**	**16.42**	**24.63**	**221.67**
Quickguard (Sterile)	*Triticale*	Quickguard	3	8.04	**12.06**	**108.54**

Fertilization assumes a minimum of 300 pounds (lbs.) of available nitrogen and 50 lbs. of available phosphorous per acre was supplied after seeding and not included with the seeding. A soil analysis was performed as part of the Test Plots to determine the fertilizer needs as results shared with BCPOS. Immediately following the seeding and fertilizing, the area was lightly scarified and mulched using various application processes, based on the final grade, soil conditions, and equipment access. These application processes included:

- Per BCPOS request for stabilization of steeper slopes, Flexterra HP-FGM flexible growth medium (4000 lbs./acre) and a tackifier emulsion (150 gal/acre) hydro mulch was used. It is assumed that hydro mulch be applied to slopes 2H:1V or steeper (unless prohibited by access or topography). Based on approval from BCPOS, all areas of restoration were covered with hydro mulch (40.75 acres).

10.0 – Perimeter Fencing

To further mitigate against unauthorized access into the high wall area, Holcim installed appropriate land use controls, such as fences and signage, around a buffer zone restricting public access to any areas of potential rockfall or fall hazards. Additionally, BCPOS requested the installation of intermittent hanging bird tabs to ensure the fencing is visible to flying birds. The tabs were installed in winter 2023-2024 covering the perimeter fence on the top and bottom of Quarry 1.

The alignment of this proposed fencing is shown in **Attachment B** and Perimeter Fence specifications for the land use controls have been developed using the Colorado Department of Transportation's M-607-4 Deer Fence specifications. The mesh fence was installed using 12-gauge zinc-coated steel fabric with 6-inch mesh spacing. The fence is a minimum of 8 feet in height and has 5-inch timber line posts spaced at 10-foot intervals with a tension line at the top. The line posts were set in concrete at terminal points and gates. All other posts were installed in compacted soil. As shown in **Attachment D**, Holcim assumed installation of approximately 3,366 linear feet of perimeter fence including gates.

Holcim installed three gates at access points along the fence line: one at the east end of the swale berm of Quarry 1 to allow maintenance equipment access in the catchment basin; another in the southwest corner to allow maintenance access to the former-Quarry 2 area, and another at the top of the access road along the east end of the site to allow maintenance access to the top of the highwall area (see **Attachments B and H**). The gates provide an access path of 12-feet in width and are able to swing 90 degrees in and out. The gates were secured with a brass padlock with keys provided to the appropriate agencies unless otherwise directed by the appropriate stakeholders. Costs for this line item were based off of a similar scope under a 2020 CDOT highway project which included over 6,000 linear feet of deer fence installation at approximately $23 per linear foot.

6 References

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A

Attachment A. Figures

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Figure 1 – Site Map and Location

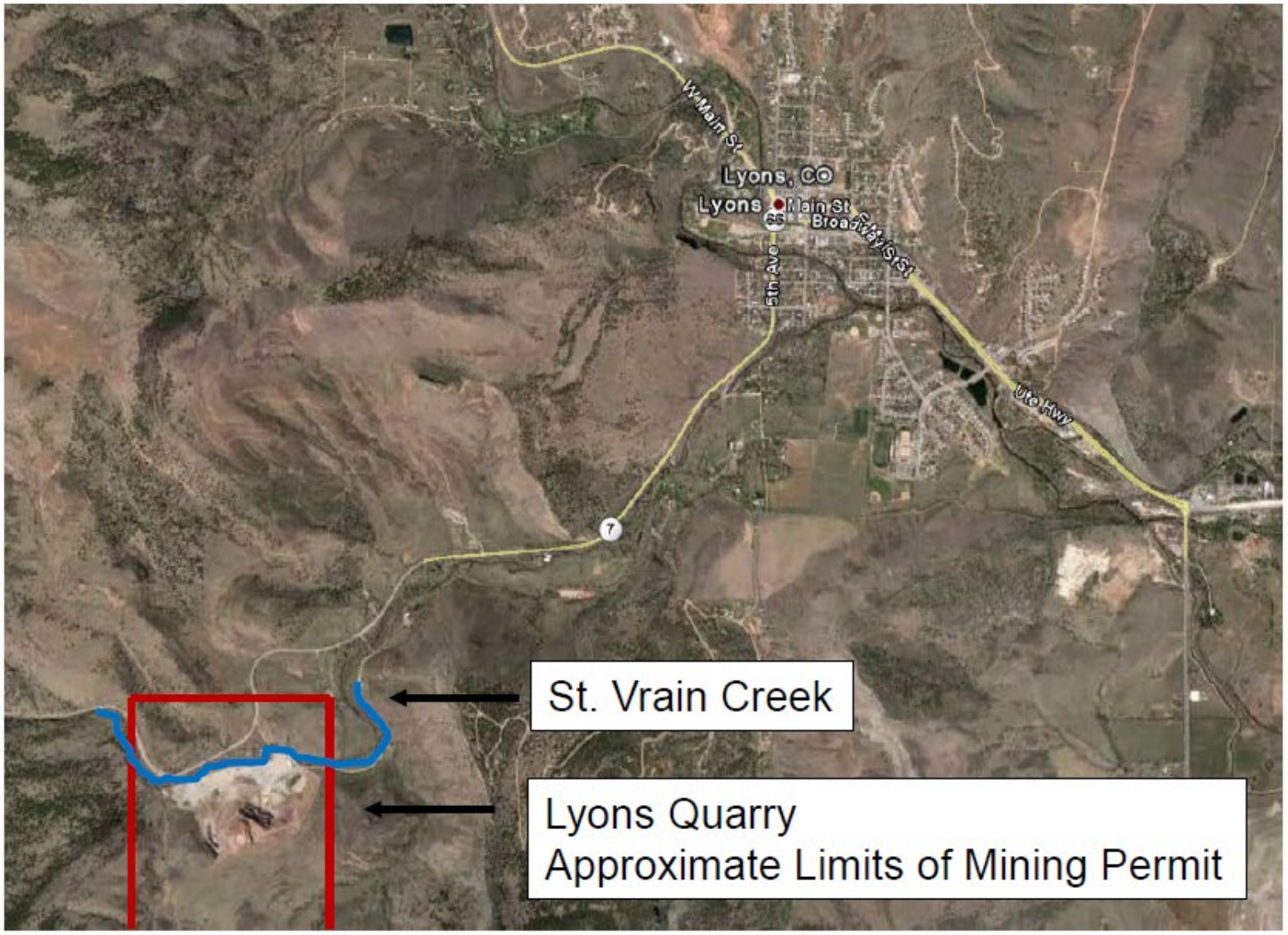


Figure 2 – Andesite Quarry Mining Map

Figure 3 – Lyons Quarry during mining activities looking south (pre-2009)

Figure 4 - Kleinfelder Report - Template I, Section D'-D', (Kleinfelder, 2008)

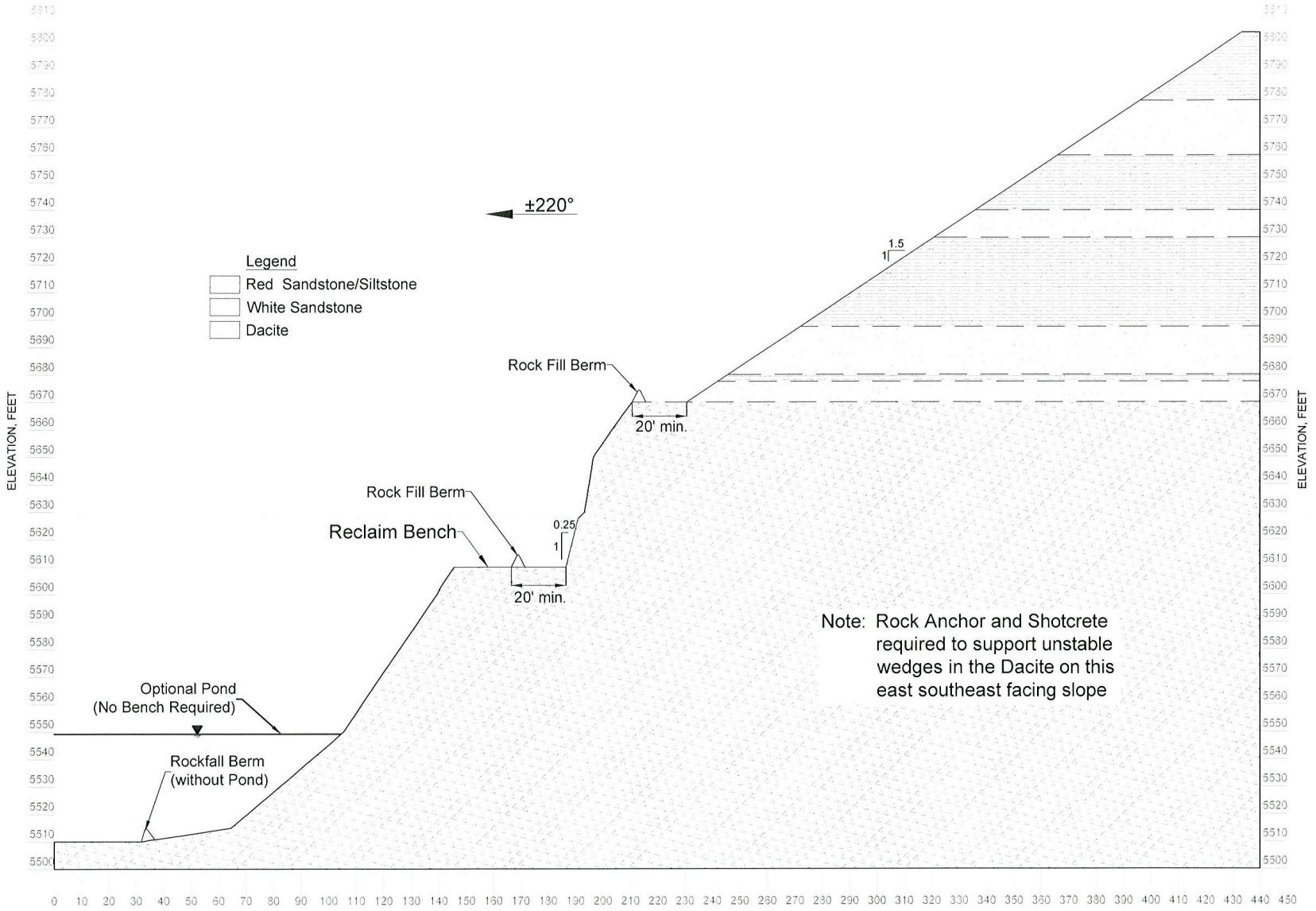


Figure 5 – Lyons Quarry Aerial April 2022

Northeast dacite face fully exposed prior to blasting of overburden

Figure 6 – Northeast Highwall October 2022

Dacite formation still exposed throughout most of highwall after majority of blasting was completed.

Figure 7 – Northeast Highwall December 2022

Dacite formation mostly covered by blast rock accumulation at toe and built up at angle of repose.

Figure 8 – Rockfall Catchment Basins and Berms, (Attachment E-2, Figure 1)

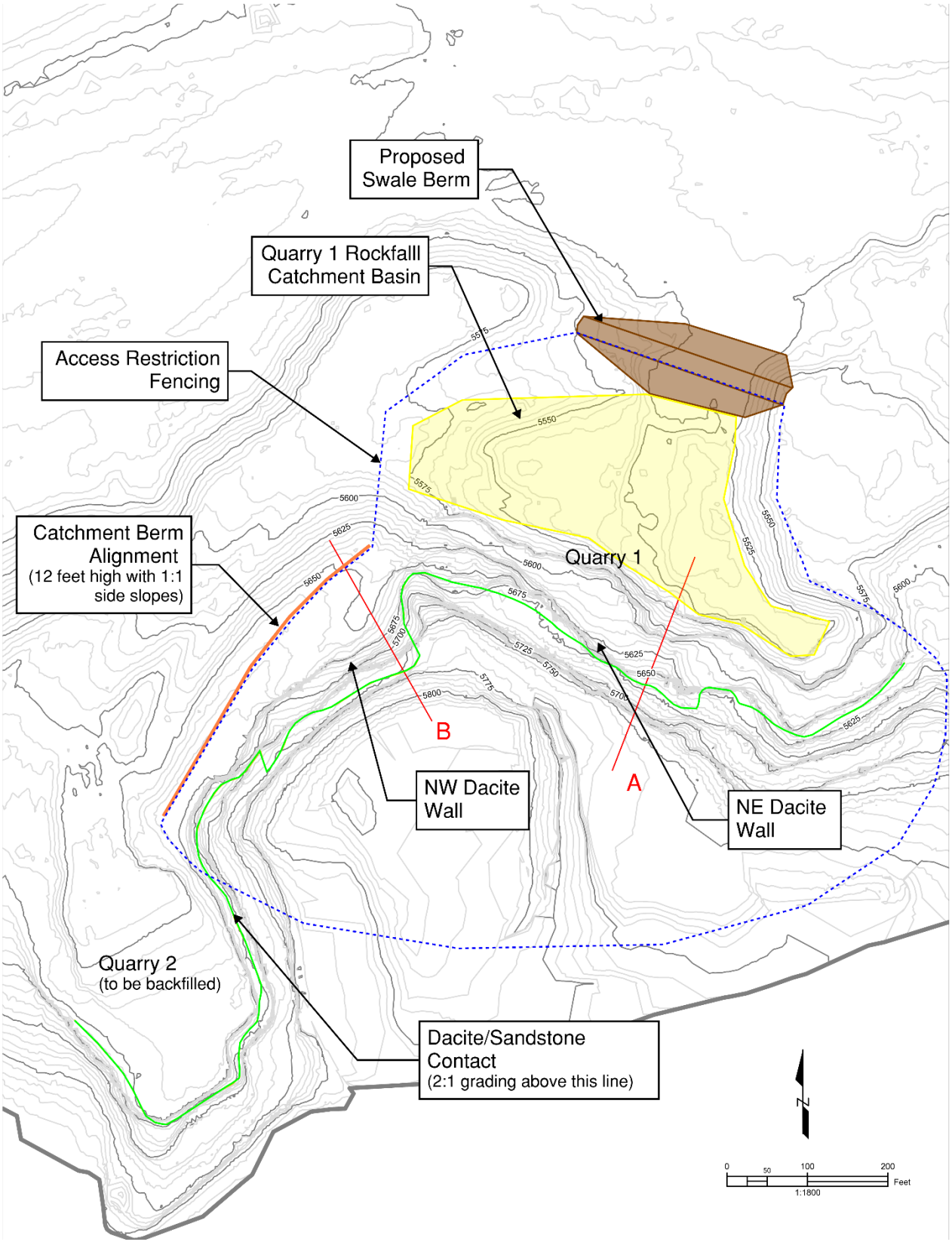
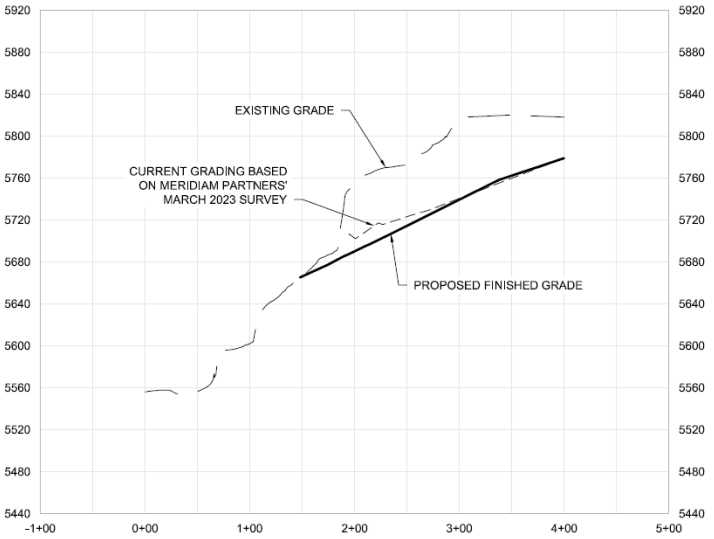
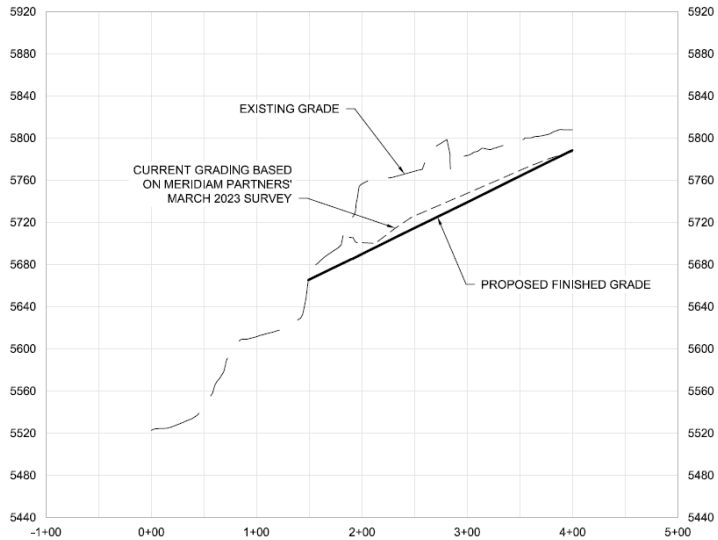


Figure 9 – Quarry 2 Fill Current Grading

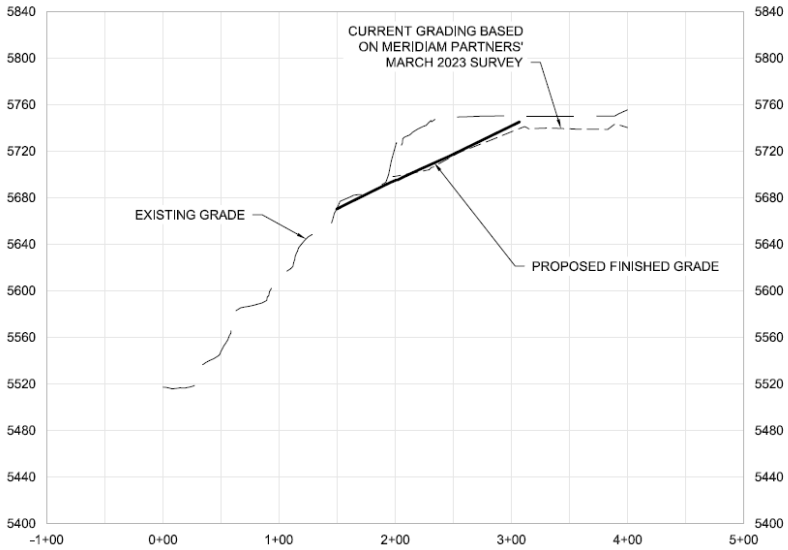
Figure 10 – Quarry 1 Highwall Sta. 14+00, 16+00, 18+00 Current Grading



STATION PROFILE @ STA 14+00



STATION PROFILE @ STA 16+00



STATION PROFILE @ STA 18+00

B

Attachment B.
Site Grading Plan

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C

Attachment C.
Exhibit F –

Reclamation Plan Maps

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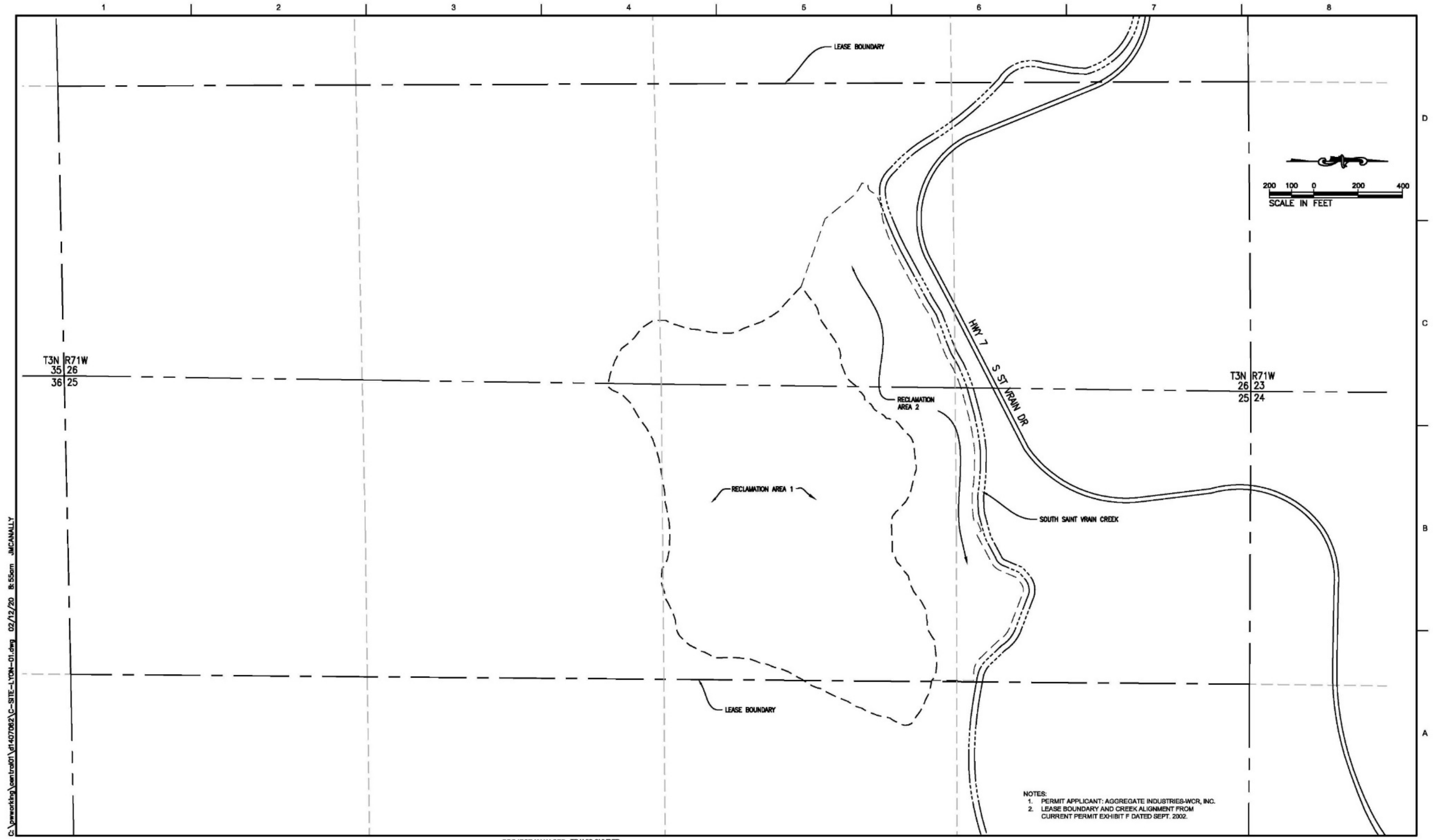
C-1 – Reclamation Plan Map (Area Boundaries) – Exhibit F



HDR

ISSUE	DATE	DESCRIPTION

PROJECT MANAGER TRAVIS SNYDER
DRAWN BY J. MCANALLY
PROJECT NUMBER 10191853

AGGREGATE INDUSTRIES
LYONS QUARRY
RECLAMATION PROJECT

EXHIBIT F
RECLAMATION PLAN

FILENAME EXH-F-SHEET-01.dwg
SCALE AS NOTED
SHEET **C0-03**

D

Attachment D.
Exhibit L –

Reclamation Costs

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Exhibit L – Reclamation Costs

Lyons Quarry Area 1 and 2 Reclamation Cost Estimate					
Item No.	**Description**	**Unit**	**Estimated Quantity**	**Unit Price**	**Total Cost**
1	Mobilization/Demobilization	Job	15% of Items 5-8	N/A	$571,198.03
2	Project Safety Plan	Job	2% of Items 5-8	N/A	$76,159.74
3	Erosion Control	Job	10% of Items 5-8	N/A	$380,798.69
4	Survey	Job	3% of Items 5-8	N/A	$114,239.61
5	Debris Removal (10 ton/load)	Load	10	$1,600.00	$16,000.00
6.1	Excavation & Blasting	CY	285,880	$5.35	$1,529,458.00
6.2	Fill and Compaction (refer to Table 4)	CY	203,151	$2.20	$446,932.20
6.3	Scour Berm/Drainage Riprap	CY	20,000	$28.00	$560,000.00
6.4	Final Grading	Acre	40.75	$1,000.00	$40,750.00
7.1	Rock Scaling	Hour	0	$500.00	$0.00
7.2	Rock Reinforcement	Each	0	$7,500.00	$0.00
8.1	Install Runoff Channels	LF	4,120	$33.00	$135,960.00
8.2	24” Class V RCP	LF	165	$550.00	$90,750.00
9.1	Soil Test Plots	Each	4	$14,901.00	$59,604.00
9.2	Soil Conditioning	Acre	40.75	$3,115.25	$126,946.40
	Scarify & Blend Amendments	Acre	40.75	$1,000.00	$40,750.00
	Utilize Onsite Topsoil Sources	CY	14,788	$5.00	$73,940.00
	Import Soil Growth Medium	CY	392	$13.00	$5,096.00
	Spray-on Compost Amendment	Tons	42	$170.00	$7,160.40
9.3	Re-vegetation	Acre	42.57	$6,935.52	$295,244.93
	Seeding*	#PLS	1670.3	$120.00	$200,438.93
	Fertilizing*	Lbs.	12,771	$3.00	$38,313.00
	Scarifying	Acre	40.75	$864.00	$35,208.00
	Mulching (Mulch and Crimp)	Acre	9	$500.00	$4,500.00
	Mulching (Hydromulch)*	Acre	33.57	$500.00	$16,785.00
10	Perimeter Fencing	LF	3,366	$25.00	$84,150.00
	Total of Items 1.0-10.0				**$4,528,191.58**

* Includes revegetation of undisturbed areas

E

Attachment E.
Rule 6.5 –

Geotechnical Stability Exhibit

Attachment E-1: Kleinfelder – Summary Report of Engineering Stability Analysis

Attachment E-2: HDR – Lyons Quarry CRSP Evaluation Report

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F

Attachment F.
Geotechnical Stability
Amendment

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G

Attachment G.

Lyons Quarry 100% Design – Technical Specifications

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H

Attachment H.

Lyons Quarry Reclamation Final Design – Drawing Set

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Attachment I.

Lyons Quarry – Catchment Basin O&M Plan (Draft)

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J

Attachment J.

Lyons Quarry Revegetation Study – Germination Bench Test

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K

Attachment K.

Boulder County Rock Import Memorandum and DRMS Determination Letter

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