Arcosa, Inc.
1112 E. Copeland Road, Suite 500
Arlington, TX 76011
T 817.635.8525

ARCOSA

February 28, 2020

Mr. Eric Scott
Environmental Specialist
Division of Reclamation Mining & Safety
1313 Sherman Street, Suite 215
Denver, Colorado

Re: Second Adequacy Review of Amendment Application Package AM03, Arcosa Lightweight - Boulder, Permit M1988-108 Response to Comments

Dear Mr. Scott,

Arcosa Materials Inc. (Arcosa) has received the Division of Reclamation, Mining, and Safety (DRMS) second adequacy review of its 112 Construction Materials reclamation permit amendment application for the Arcosa Lightweight Boulder facility. The application was deemed complete for review on April 8, 2019, and all comment and review periods began on April 8, 2019. A preliminary adequacy review of the application was received on May 16, 2019, and Arcosa submitted a response to comments letter on September 30, 2019. Arcosa received additional comments from DRMS on October 11, 2019. On October 29, 2019, Arcosa requested an extension to the decision date to December 18, 2019. DRMS approved that request in an email dated October 30, 2019. Arcosa requested a second extension to February 28, 2020, which was approved by DRMS in an email dated December 9, 2019.

We are providing responses to DRMS's comments (*in italics*) in the same order in which they were received. For ease of review we have restated DRMS's comments and provided Arcosa's response following each comment. Supporting documentation is provided in the attachments to this letter. A copy of the responses also has been placed on file with the Jefferson County Clerk and Recorders office along with a copy of the original application.

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EXHIBIT D - MINING PLAN (RULE 6.4.4):

DRMS Comment (italics):

The revised mining plan provided contains a description of how waste/off-spec materials will be placed in back into the pit. The method described is stated as:

1) Waste is staged by trucks along the contours of the side walls of the quarry, then;
2) Pushed by dozer over the edge of the quarry sidewall allowing the material to slope down the side of the quarry.

The Division is having difficulty understanding, based on the descriptions provided, how this method is substantially different from the previous waste disposal method of end dumping the waste directly over the edge of the pit to form angle-of-repose slopes along the pit walls. Could you please clarify the difference between these two waste placement methods? Perhaps a simple diagram or two illustrating the differences would be useful. Please elaborate/provide additional detail for the statement that "new material will be placed in lifts as originally planned."

Arcosa Response:

Exhibit D has been updated to further clarify the method for future placement of backfill to achieve reclamation grades. The updated Exhibit D is provided in Attachment 1. In summary:

1. Backfill will be end-dumped from the edge of the pit into the quarry.
2. End-dumped material will then be graded using a bulldozer or other equipment such that the material is spread across the area of active backfilling, track-walked to provide some degree of compaction, and graded to shape the final restoration slopes.

The statement "new material will be placed in lifts as originally planned" has been removed to avoid confusion. Individual lifts will not be placed and compacted; rather, as stated above, a bulldozer will re-work the end-dumped material by grading and track-compacting the materials to achieve the final reclamation slopes.

Furthermore, Arcosa has developed a mine plan figure to accompany the updated Exhibit D. The mine plan figure is presented as Exhibit C-4 and is also provided in Attachment 1 to this letter. The mine plan represents Arcosa's anticipated maximum extent of mining within the quarry area. The figure was also used to update bond calculations as required for Exhibit L, which is discussed later in this letter. Arcosa will adhere to the mine plan (Exhibit D) and the mining plan figure (Exhibit C-4) provided in Attachment 1. If a deviation(s) from these documents is proposed, Arcosa will submit a technical revision.

EXHIBIT E - RECLAMATION PLAN (RULE 6.4.5):

DRMS Comments (italics):

The approved/stated post-mining land use for this permit is primarily rangeland, with an industrial/commercial area of approximately 33 acres where the current processing facility is

located. DRMS will require that the permittee demonstrate that the water quality in the proposed 10 acre pond (area currently used for process water) meets the appropriate surface water standards for a livestock pond prior to final release. Please acknowledge.

Please specify what buildings will remain in the process area after reclamation and what buildings will be removed, and make this clear on the reclamation map. Stating that unnecessary industrial buildings and equipment will be removed does not provide sufficient detail for the calculation of that portion of the reclamation bond.

Arcosa Response:

Comment acknowledged. Arcosa will develop a plan to obtain one or more surface water samples from the 10-acre pond during final reclamation activities. The surface water sample results will be compared to applicable surface water quality and agricultural water quality standards.

See attached updated reclamation plan and updated reclamation maps in Attachment 2.

EXHIBIT F - RECLAMATION PLAN MAP (RULE 6.4.6):

DRMS Comment (italics):

Please show what buildings will remain at final reclamation within the processing area.

Arcosa's Response:

See attached updated reclamation plan and updated reclamation maps in Attachment 2. At this point, Arcosa assumes all existing buildings within the processing area will remain in place. This final configuration is consistent with the zoning plan for Jefferson County, as described in the Jefferson County Official Development Plan.

EXHIBIT G - WATER INFORMATION (RULE 6.4.7):

DRMS Comment (italics):

DRMS has reviewed the additional information provided in the adequacy response, and verified that SEO has not required a well permit or substitute water supply plan for this operation as they have determined that it does not expose groundwater. DRMS concurs that monitoring of groundwater quantity/quality outside of the pit is not warranted at this time. DRMS encourages the permittee to address the water rights issues identified in the adequacy response as soon as practically possible.

Arcosa Responses:

Comment acknowledged. Arcosa is in the process of working with a third-party water rights consultant to address the water rights that may be needed in future drought years.

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EXHIBIT L - RECLAMATION COSTS (RULE 6.4.12):

DRMS Comment (italics):

All information necessary to calculate the costs of reclamation must be submitted and broken down into the various major phases of reclamation. You must provide sufficient information to calculate the cost of reclamation that would be incurred by the state.
Please resubmit this exhibit - considerably more information and details will be required for this exhibit to meet the requirements of Exhibit L as listed above. It is sometimes useful to think of this exhibit as "what information would I need to provide to a third-party to get a complete bid to conduct all the work required". Costs should be broken down by task and acreage area, and preferably shown on the reclamation plan map or map dedicated to this exhibit. Details such as topsoil and overburden volumes, equipment to be used, push distances, specifics for demolition and disposal costs for removal of the "red-mix" plant area, etc. will need to be provided. As an example some information that will be required is listed below:

1) How many acres will be reseeded by drill seeder (pit floor, plant area, quarry perimeter) and how many acres will require broadcast/hydro-tack compound (pit slopes).
2) How many cubic yards of backfill material will need to be placed/moved to achieve 2.5:1 slopes on all the pit walls? You may use the current conditions for this estimate.
3) How many cubic yards will need to be moved to create re-slope the shoreline of the 10 acre pond to 3:1 as required? How much earthwork will be required to repair the existing erosion gully damage around the north end of the pit if the walls will not be re-sloped?
4) How many cubic yards of topsoil will be needed to replace 6-12" of topsoil over the pit slopes and floor?
5) How much earthwork is required to construct the proposed diversion berms in the processing area?
6) How many yards of material (decomposed shale?) will be needed to construct the dam between the 10 acre lake and vegetated pit floor area. What engineering work will be required (design, QA/QC, compaction testing)?
7) Specific construction information (dimensions, construction type, foundation/footer size and thickness, etc) will need to be provided for buildings that will be removed from the current processing area so that demolition and disposal costs can be calculated for those structures.
8) Mobilization/Demob costs for all equipment required to complete the specified reclamation (scraper, dozer, grader, track hoe, tractor and seeder, water truck, etc).

This is not intended to be a comprehensive list of information needed to calculate the reclamation bond, but should serve as a guide as to what kind of data is required for the state to accurately estimate the reclamation bond amount.

Arcosa's Response:

Reclamation costs and quantities in Exhibit L have been updated to address DRMS's questions, and the updated Exhibit L is provided in Attachment 3. As stated in Exhibit L:

1. Broadcast seeding is the preferred/selected method for seeding all areas.

2. The earthwork quantities provided in Exhibit L represents the total amount of material to be cut and the total amount of material to be filled (i.e., placed) to achieve the proposed

reclamation grades. This includes the minimum 2.5:1 slopes for the quarry area, and the 3:1 slopes around the 10-acre pond. As stated in the Reclamation Plan (Exhibit E) provided in Attachment 2 to this letter, backfill of the quarry area will be concurrent with mining operations.

3. Repair work for the existing erosion gully damage is included in the updated cost estimate.

4. Refer to the reclamation plan (Exhibit E) for details on topsoil placement. The reclamation cost estimate provided in Exhibit L (Attachment 3 to this letter) is updated to provide topsoil at the locations identified in the reclamation plan, as well as soil amendments, seeding, and prep (i.e., ripping/disking) for areas that will not receive topsoil.

5. The volume calculation for soil needed to construct the berms within the processing area is provided in Attachment 3 (Exhibit L).

6. No dam is proposed. See the updated reclamation plan maps (Exhibits F-1 and F-2) in Attachment 2.

7. The operational buildings in the processing area will remain (see responses to previous comments above). The demolition and disposal costs for the unused building foundation and associated portions of that structure located to the south of the main processing area buildings is provided in Exhibit L.

8. A list of equipment needed to perform the reclamation by a third party is provided in Exhibit L. Mobilization and demobilization cost estimates are provided in the cost estimate. Indirect costs are not included.

In addition to the numbered items above, backup documentation for the cost estimate is provided with Exhibit L, including (i) assumptions; (ii) figures with area/volume measurements; (iii) a list of anticipated construction equipment; and (iv) a list of borrow sources in the proximity of the mine site. A description of the assumptions and conditions, as well as the unit cost reference for each cost line item also is provided in Exhibit L, which may be found in Attachment 3.

ADDITIONAL INFORMATION:

DRMS Comment (italics):

Please provide the weed control plan submitted with the previously withdrawn TR01 as a separate appendix to AM03 through adequacy response so that it can be properly approved and incorporated into the permit.

Arcosa's Response:

A copy of the noxious weed control plan is appended to the updated Exhibit E, which is provided in Attachment 2 to this letter.

This concludes Arcosa's responses to DRMS's comments. Hard copies will be provided to DRMS and Jefferson County Clerk and Recorder, as required. If you have any questions regarding the above responses or the attachments, please contact me at Michael.Ragsdale@arcosa.com or at 817-635-8556.

Sincerely,

Michael Ragsdale,
Environmental Manager

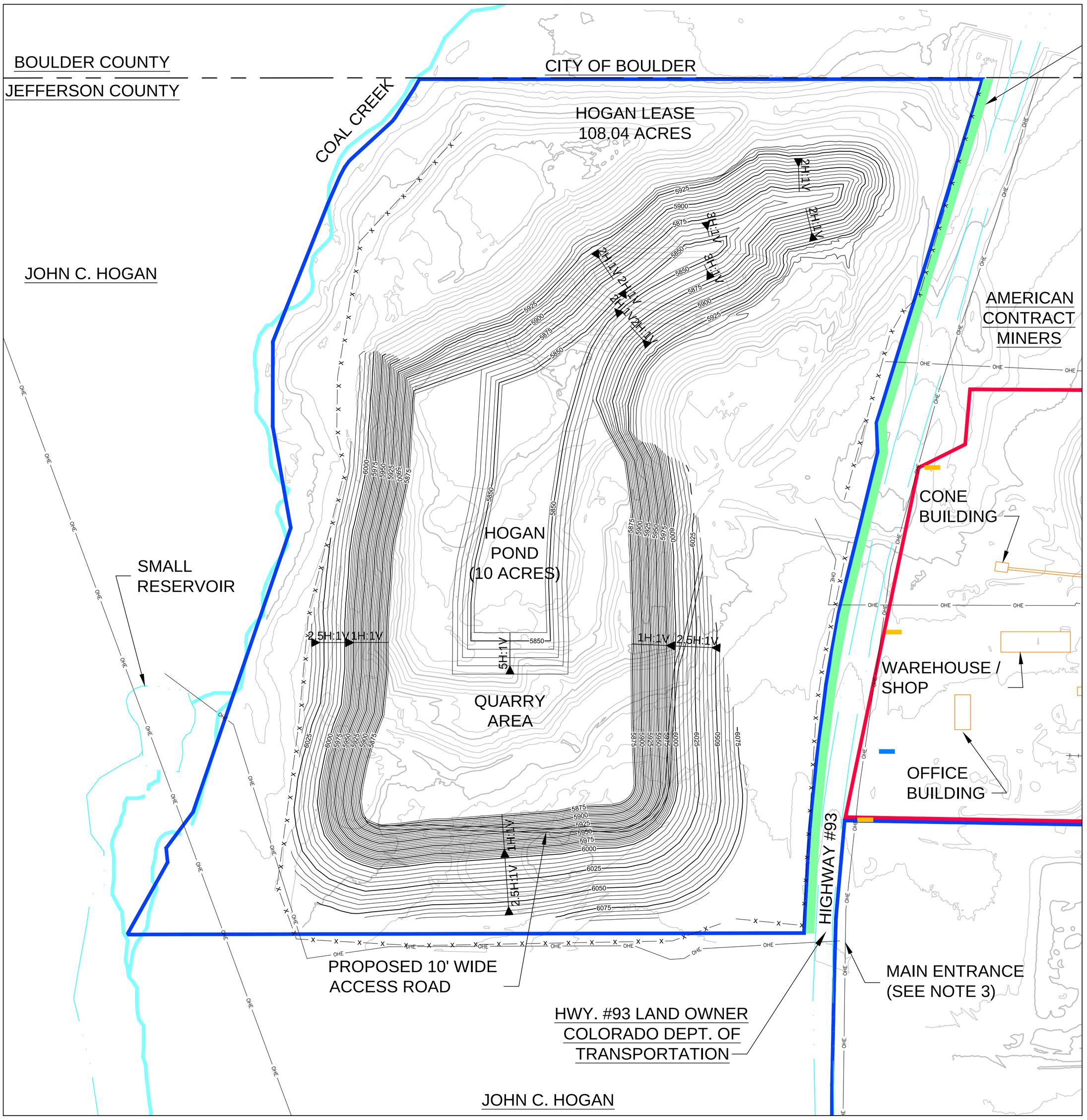
CC: Division of Reclamation, Mining & Safety - michael.cunningham@state.co.us
Jefferson County – Clerk and Recorder
Arcosa LWB - Stuart.McQueen@arcosa.com
Geosyntec – Electronic file

Attachments:

Attachment 1: Updated Exhibit D – Mining Plan, and New Exhibit C-4 – Mining Plan Figure
Attachment 2: Updated Exhibit E – Reclamation Plan, and Exhibit F – Reclamation Plan Maps
Attachment 3: Updated Exhibit L – Reclamation Costs and Attachments to Exhibit L

ATTACHMENT 1

EXHIBIT C-4



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SCALE IN FEET

NOTES:

1. TOPOGRAPHY INFORMATION WAS OBTAINED BY ARCOSA USING AN UNMANNED AERIAL DRONE SURVEY OF THE SITE IN JUNE 2019, AND PROVIDED TO GEOSYNTEC FOR MAPPING PURPOSES.
2. STRUCTURE OWNERS AND STRUCTURE DESCRIPTIONS ARE LISTED IN TABLE 1 OF EXHIBIT "S". EXCEL ENERGY AND CENTURY LINK OWN UTILITIES IN THE HIGHWAY 93 RIGHT OF WAY (ROW).
3. MAIN ENTRANCE IS LOCATED AT 39.9068779 LATITUDE, -105.2409362 LONGITUDE.
4. RECLAMATION IS TO OCCUR CONSISTENT WITH THIS PERMIT AND THE JEFFERSON COUNTY OFFICIAL DEVELOPMENT PLAN. AFFECTED LANDS SHOWN ON EXHIBIT C WILL BE CONVERTED TO THE POST-RECLAMATION LAND USE AREAS (E.G., RANGELAND, INDUSTRIAL) SHOWN HEREON BE THE RECLAMATION BOUNDARIES.

LEGEND:

- POST-RECLAMATION INDUSTRIAL USE
- RANGELAND
- HWY. #93 WALKING PATH ACREAGE REDUCTION (1.83 ACRES)
- BILLBOARD
- ABANDONED RAILROAD CAR
- FENCELINE
- OVERHEAD POWER LINE
- RAILROAD TRACKS
- OUTLINE OF VARIOUS STRUCTURES, SEE LIST OF STRUCTURES AND EXHIBIT "S"

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LIGHTWEIGHT BOULDER PLANT #1604

JEFFERSON COUNTY, COLORADO

MINE GRADING MAP

ARCOSA

EXHIBIT C-4

PERMIT M-1988-108 | FEBRUARY 2020

REV #	DESCRIPTION	DATE	BY	CHK	APP
0	ISSUE FOR PERMIT REVIEW	2/28/20	PS	JG	MR

R:\DE0374_ARCOSA MINE PERMIT SUPPORT\CAD\SHEET FILES\EXHIBIT C-4 - Last Saved By: SGallegos on 12/3/19

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EXHIBIT D

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Exhibit D – Mining Plan

This mining plan has been prepared to describe the mining activities conducted at the Arcosa Lightweight Boulder facility in Jefferson County, Colorado. This plan has been prepared in accordance with the Mineral Rules and Regulations of the Colorado Mined Land Reclamation Board for the Extraction of Construction Materials. Those rules and regulations are based on the records of the Division of Reclamation, Mining and Safety (DRMS). This plan includes a description of the geology, mining operations, processing operations, water management, and runoff controls. Facility features and layout information are shown in Exhibits C-1 and C-2. A soils and vegetation map is provided in Exhibit C-3 (detailed further in Exhibits I and J), and the mine plan figure is provided in Exhibit C-4.

Geology

The regional and site-specific geologic features include surficial geologic units and bedrock geologic units. Surficial geologic units are shown on Exhibit D-1, and bedrock units are shown on Exhibit D-2. These Exhibits were obtained from the *Engineering Design and Operations Report* prepared by Sergent, Hauskins & Beckwith in 1992 for the Western Aggregates, Inc (former owner) proposed Shale Mine Ash Backfill Project[1] and updated for this permit application. Material to be mined as feedstock for the lightweight aggregate processing plant is shale of Cretaceous Age contained in the Pierre Shale Formation, which is discussed below.

Surficial geologic units within the affected lands boundary shown on Exhibit D-1 include artificial fill placed by human operations, Slocum Alluvium and Verdos Alluvium. The vast majority of the surficial geology within the affected lands and mine quarry area is Slocum Alluvium which consists of 5 to 20 feet of silty, sandy and cobbly gravel that was deposited as a fluvial lag deposit during the middle Pleistocene (SHB, 1992).

As mentioned above, bedrock units within the affected lands consists of the Pierre Shale formation which is subdivided into four units. The quarry area is almost entirely within the upper shale unit, and the processing area and affected lands west of State Highway 93 lie within the upper transition member portion of the formation. The Pierre Shale formation is bedded and dips an average of 56 degrees toward the east at the quarry site and is interspersed with thin beds of limey sandstone and relatively small concretionary calcareous lenses. The Pierre Formation at this location is approximately 8,000 feet thick. As shown in Exhibit D-2, the quarry in cross section only penetrates a small fraction of the upper unit of the Pierre Shale formation. The shale is generally dark greenish grey to black in color, is well consolidated, quite soft and contains approximately 10% inherent moisture. Additionally, the material deteriorates rapidly when exposed to the natural elements, precluding any possibility of maintaining more than a few days' stockpile between mine and plant. Sufficient reserves of the shale are available within the affected lands area to sustain plant operations for approximately 18 years.

The Pierre Shale Formation is extremely impervious as evidenced by laboratory and field testing. Table D-1 was extracted from a report prepared for a proposed landfill located in Douglas County on the Pierre Shale Formation. As indicated, permeabilities were measured by two methods, a packer test and a recovery test. The results indicated show hydraulic conductivities ranging from 10^{-6} to 10^{-7} cm/sec. These

[1] The proposed Ash Backfill project was approved by the Colorado Department of Health in 1993; however, the project was dis-approved by Jefferson County. The comprehensive summary of regional and local geology, hydrogeology and other pertinent information, including Exhibits and exhibits, from the Sergent, Hauskins & Beckwith design report are discussed in this permit.

extremely low conductivities coupled with the vast thickness of remaining underlying Pierre shale make the quarry an ideal location for backfilling off-spec materials.

Additional tests were conducted on-site to confirm that site specific conditions are the same as in Douglas County. These tests, summarized in Table D-2, show the Pierre Shale Formation at the quarry site to be as impervious as it is in Douglas County. In addition, permeability tests were conducted for compacted shale fines and locally available clay materials to confirm their utility as impervious capping materials. Results of these tests also are presented in Table D-2.

Mine Operations

Mining occurs within the Quarry Area identified in Exhibit C. Mining progresses incrementally to the south. Each southward increment involves stripping overburden to expose additional reserves and placing this overburden on the side slope and bottom of the mined-out portion of the quarry. The newly exposed shale is mined to the ultimate quarry depth at 5,865 feet above mean seal level (a.m.s.l.), prior to stripping the next increment. An existing overburden stockpile located to the south of the quarry area will be reserved for use in reclaiming the final mined out sections of the quarry during reclamation activities performed concurrently with mining operations. Additional reclamation details are discussed in Exhibit E.

Shale is mined from the Pierre Shale formation using an excavator to rip the material from the quarry floor and load it directly into off-highway haul trucks of 35- to 50-ton capacity. No explosives are used during the mining process. The trucks haul the shale to a primary crusher (feeder-breaker) located at ground-level above the quarry along a haul road on the western side of State Highway 93 (HWY 93).

The rate of excavation is expected to be approximately 1,200 to 1,400 tons of shale per day. The quarry operates seven days per week, 24 hours per day. The mining and processing schedule may be modified depending on operational demand and the safety of operating conditions.

Crushing and Conveying

The mined shale is crushed by the primary crusher to a nominal minus 5-inch size. The primary crusher mechanically feeds crushed shale to a conveyor that traverses beneath HWY 93 from west to east to the processing plant for further size reduction and storage prior to processing.

Processing Operations

Crushed material is fed from the conveyor into a rotary kiln on the east side of HWY 93. The rotary kiln heats the crushed material to 2,000° F to produce lightweight aggregate. The finished product is stored in stockpiles prior to being hauled offsite.

The lightweight aggregate plant will produce at least 200,000 cubic yards of aggregate annually for up to 18 years, depending on market and operational conditions.

Products (i.e., primary and secondary commodities) produced at the processing plant include lightweight aggregate.

Based on facility records, site-specific experience, and operational considerations, approximately 25% of the raw materials processed at the facility become backfill material that will be used in reclamation.

Water Management and Runoff Control

A comprehensive description of the local and regional surface water hydrology and groundwater hydrology are presented in Exhibit G. Precipitation runoff and water that originates from seeps at the alluvial material and shale interface will be intercepted by a ditch (to be installed) and will be channeled around the quarry to the Hogan Pond (Hogan Reservoir) on the quarry floor. The ditch will be installed to prevent seepage down the sides of the quarry and the location of the ditch may be adjusted as necessary based on mining operational needs. The location of the pond on the quarry floor will be shifted from time to time to permit uniform deepening of the quarry floor or to accommodate reclamation plans. Up to approximately 30,000 gallons per day of water may be pumped from the quarry to the processing plant for various purposes including dust suppression and scrubber water. Water rights for the Hogan Reservoir are provided through formal lease agreement with the Hogan Family who owns the decreed water rights for the area. More information about water rights and water management may be found in Exhibit G.

Off-spec Materials Management and Disposal

Off-spec material is generated during the processing operations and includes three primary types of materials.

1) Shale fines
2) Baghouse dust
3) Lime scrubber sludge mixed with shale fines

These materials are stockpiled at the processing facility are in advance of being placed into the mined-out portions of the quarry or will be used for reclamation during backfilling of the quarry. The baghouse dust and shale fines are essentially comprised of native material that is too fine for use as a final product. This material is placed back into the quarry as backfill.

The lime flue gas scrubbing system generates a lime sludge that is mixed with shale fines and is generally composed of the following:

- 50% Raw Shale Fines
- 38% Gypsum (CaSO4.2H2O)
- 10% Fly ash
- 2% Unreacted Lime

The addition of lime to fine-grained soils (e.g., shale fines and clays) may provide lime fixation and stabilization benefits through chemical reactions with the mineral structure of the soil. Generally accepted engineering practices use the addition and mixing of lime to fine-grained soil to improve physical properties allowing for improved strength and stiffness, often renders unsuitable materials usable for bulk fill and other earthwork applications[2]. Generally, with time (i.e., curing of the mixed soil) the physical properties improve for fine-grained soil mixed with lime. Though the lime interaction with shale fines has not been specifically evaluated for this Site, the mixing of the lime sludge with soil is anticipated to have at least a marginally positive effect on soil physical properties.

The placement method for these off-spec materials is as follows:

[2] Boardman et al., (2001). *Development of stabilization and solidification in lime-clay mixes*. Geotechnique 50, No. 6, pp. 533-543.

Off-spec material is trucked from the plant site in a relatively dry state (i.e., 15% moisture) at an estimated rate of approximately 50 to 70 tons per day. The material is placed along the contours of the sidewalls of the portion of the quarry that is undergoing contemporaneous reclamation. The material is placed along the sidewall via dozer pushing the solid waste material over the edge of the quarry sidewall allowing the material to slope down the side of the quarry. The material is placed within the impervious Pierre Shale Formation, and therefore, potential leachates are expected be contained to within the quarry.

More recently, the placement of off-spec material into the quarry has been completed by end-dumping the materials into the mined-out portion of the quarry. This practice was added to the mine plan after the 2013 floods caused water to pool in the main quarry, which limited the ability for back-fill to be placed along the contours of the quarry walls. The practice of end-dumping off-spec materials directly into the quarry has ceased. Currently, the off-spec materials are being stockpiled at the processing facility until the quarry can be dewatered. Once dewatering is complete in an area to be backfilled, placement of the backfill material via end-dumping will recommence.. New backfill material will be placed by end dumping from the edge of the pit into the quarry. After being end-dumped into the quarry area, backfill material will be graded using a bulldozer or grader such that the material is spread and track-walked to achieve the 2.5:1 reclamation slopes. The material will be compacted during regrading as soil is tracked and traversed by the grading and backfilling equipment. Some portions of the already-reclaimed quarry will be recontoured, as necessary to achieve the reclamation grades. Backfilling and regrading will occur concurrently with mining operations. Additional details regarding reclamation activities are provided in Exhibit E.

To verify that leachate from the off-spec material (and in particular the lime scrubber sludge) will not impacted local groundwater conditions, the following considerations are made:

1. As summarized in the *Engineering Design and Operations Report* prepared by Sergent, Hauskins & Beckwith in 1992 for the Western Aggregates, Inc (former owner) proposed Shale Mine Ash Backfill Project; the Pierre Shale formation hydraulic conductivity ranges from approximately 10^{-6} cm/s to 10^{-7} cm/s. The results presented for hydraulic conductivity packer test and laboratory hydraulic conductivity of the Pierre Shale indicate the quarry area consists of very low-permeability material with low potential for migration of water through the formation.
    a. Table D-1 and Table D-2 present information on in situ and laboratory hydraulic conductivity testing performed on Pierre Shale and Pierre Shale fines.
2. Historic groundwater monitoring wells were used at the site. These groundwater monitoring wells were used previously by Western Aggregates Inc. in the *Engineering Design and Operations Report* discussed above; however, the wells have since been abandoned, decommissioned, or are no longer present or usable. From that report, groundwater was found to be isolated within a seam of sandstone within the Pierre Shale formation. This groundwater was at elevation 5,800 a.m.s.l., which is approximately 60 feet below the proposed bottom of quarry elevation. Furthermore, the sandstone lenses within the Pierre Shale formation are discontinuous and small and would not be a reliable source of groundwater.
3. As discussed above, the regional and site-specific geologic information suggest the Pierre Shale formation is approximately 8,000 feet thick in this area.
4. As discussed in Exhibit G, the regional groundwater hydrology indicates the nearest groundwater aquifer is likely contained in the Fox-Hills Formation. This formation has an outcrop close to the affected lands; however, the formation dips away from the Pierre Shale formation at the Site.

Given the hydraulic conductivity of the Pierre Shale formation, water quality impairment of the Fox Hills formation from the quarry ponds is unlikely.

5. The alluvial deposits overlaying the Pierre Shale within the quarry area are removed during mining operations. The mining operations are performed in the Pierre Shale formation at lower elevations than any exposed alluvial materials, thus, water quality impairment for waters in the alluvial materials is unlikely.
6. Most groundwater wells used by adjacent landowners are screened within the alluvial deposits and are closer to Coal Creek.
7. Alluvial deposits located at higher elevations than Coal Creek contain intermittent groundwater and generally drain quickly. Refer to Exhibit G for surface water and groundwater hydrology details.

Based on the considerations listed above, the permeability of the Pierre Shale formation, and the proximal distance of groundwater, the potential leaching of contaminants from post-processed soil materials used as backfill is extremely low.

Table D-1 – Hydraulic Conductivity Data, Douglas County, Colorado

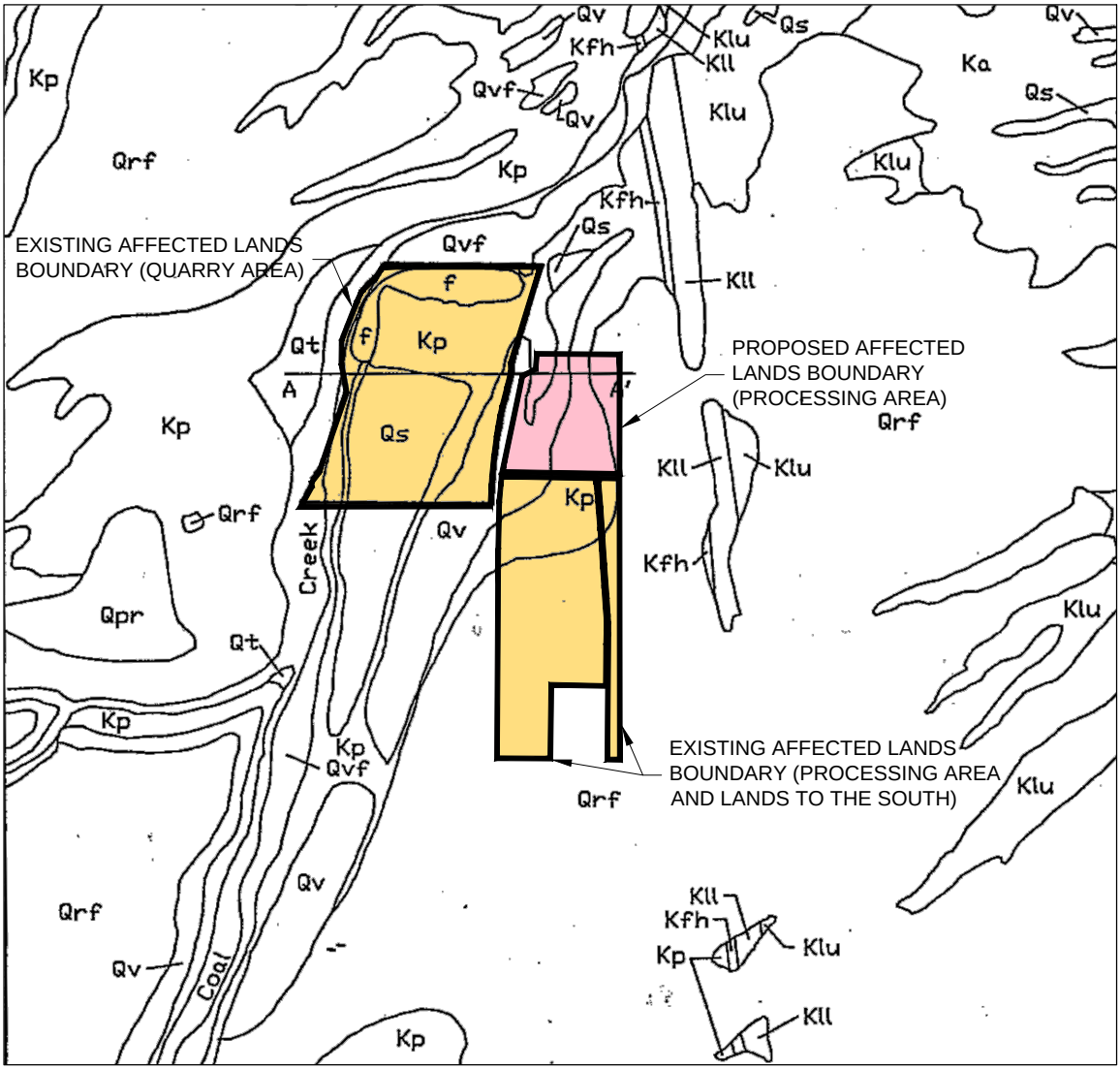
Material	Well	Test Interval (feet below ground)	Packer Test Hydraulic Conductivity Value (cm/sec)	Recovery Test Hydraulic Conductivity Value (cm/sec)	Geometric Mean (cm/sec)
Pierre	BH-1	26.5-32.4	7.6×10^{-6}		
Shale	BH-10	21.0-31.1	9.6×10^{-6}		
Weathered	BH-17	27.3-42.3		5.1×10^{-6}	
					7.2×10^{-6}
Pierre	BH-1	42.6-69.1	7.6×10^{-8}		
Shale	BH-1	51.1-69.1		4.9×10^{-7}	
Un-weathered	BH-8	34.3-40.0	1.8×10^{-7}		
	BH-4	61.2-73.3		1.8×10^{-6}	
					3.3×10^{-7}

Source: Hydrogeologic and Geotechnical Characterization of Proposed Foothills Landfill, Douglas County, Colorado, June 6, 1986, by Hydro-Search, Inc.

Table D-2 Summary of Permeability Test Data

Material	Permeability, cm/sec
Un-weathered Pierre Shale (Hogan Quarry)	10^{-6} to 10^{-7}
Compacted Shale Fines (Hogan Quarry)	2×10^{-8} @ 90% compaction
Compacted Clay (Spicer Quarry)	2×10^{-10} @ 90% compaction

Source: In-Situ, Inc., Lakewood, Colorado

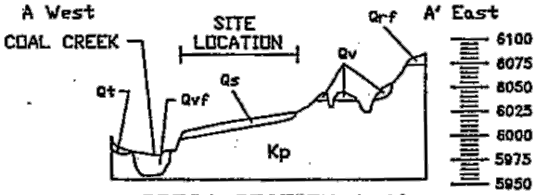


REFERENCE:

-THIS FIGURE WAS ADAPTED FROM ORIGINAL PROVIDED IN THE ENGINEERING DESIGN AND OPERATIONS REPORT, DATED 1992 AND DEVELOPED BY SERGENT, HAUSKINS & BECKWITH CONSULTING GEOTECHNICAL ENGINEERS FOR WESTERN AGGREGATES INC (A PREVIOUS OWNER), TITLED "SURFICIAL GEOLOGY IN VICINITY OF WAI SHALE MINE, MODIFIED FROM HURR, 1976", FIGURE 5.1.1-1 CERTIFICATE OF DESIGNATION.

LEGEND:

f: ARTIFICIAL FILL
Qvf: VALLEY FILL ALLUVIUM
Qt: TERRACE ALLUVIUM
Qs: SLOCUM ALLUVIUM
Qv: VERDOS ALLUVIUM
Qrf: ROCKY FLATS ALLUVIUM
Qpr: PRE-ROCKY FLATS ALLUVIUM
Ka: ARAPAHO FORMATION
Klu and Kll: UPPER AND LOWER MEMBERS OF THE LARAMIE FORMATION
Kp: PIERRE SHALE UNDIFFERENTIATED
——— WAI BOUNDARY



CROSS-SECTION A-A'
VERTICAL EXAGERATION 5X

SURFICIAL GEOLOGIC CROSS SECTION

NOTE: A DETAILED BEDROCK GEOLOGY CROSS SECTION PROVIDED ON FIGURE D.2.

0 2000
SCALE IN FEET

ARCOSA
LIGHTWEIGHT BOULDER PLANT #1604
JEFFERSON COUNTY, COLORADO

SURFICIAL GEOLOGY

REV #	DESCRIPTION	DATE	BY	CHK	APP
0	ISSUE FOR PERMIT REVIEW	10/01/19	JG	PS	MR

PERMIT M-1988-108 | OCTOBER 2019

EXHIBIT D-1

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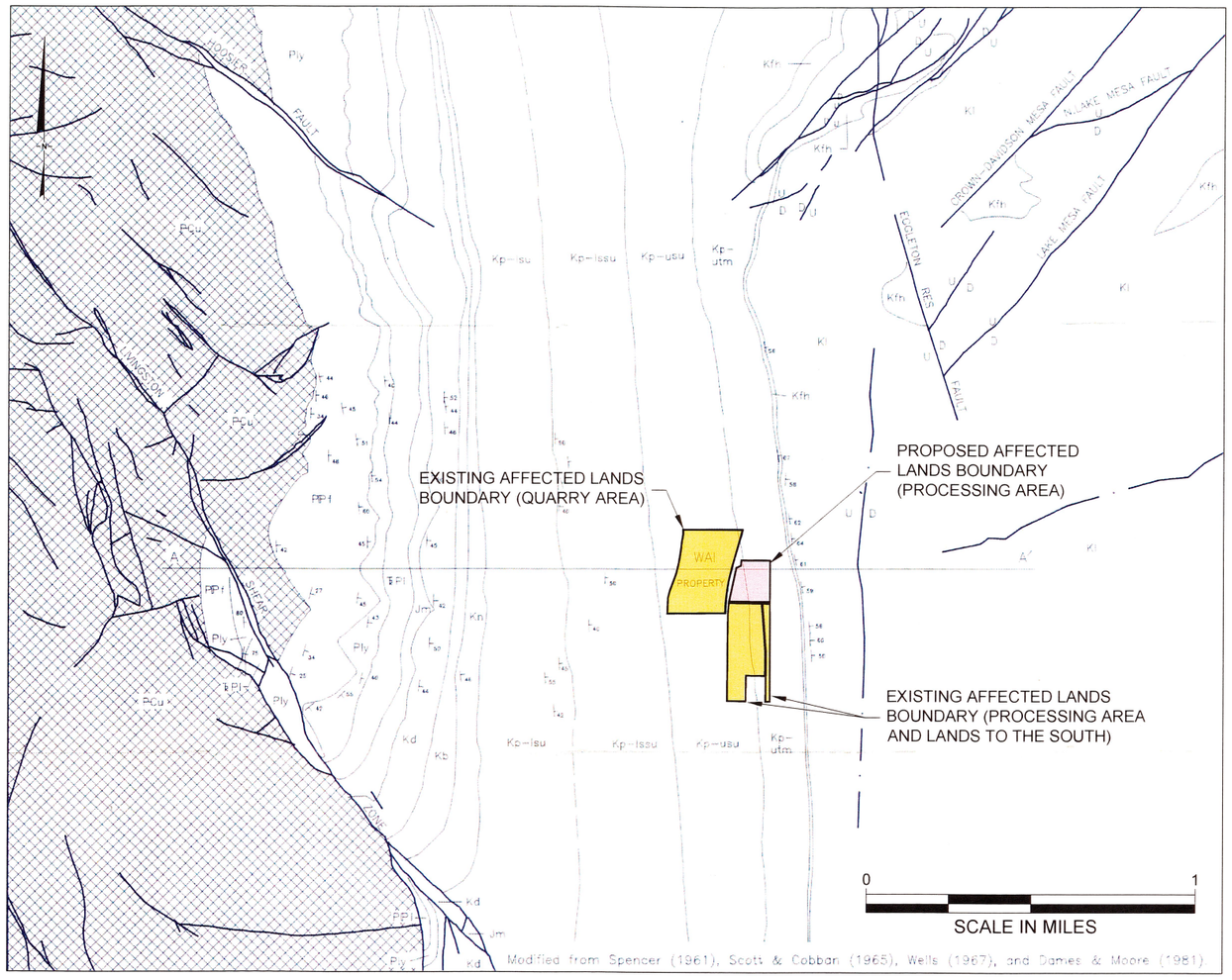

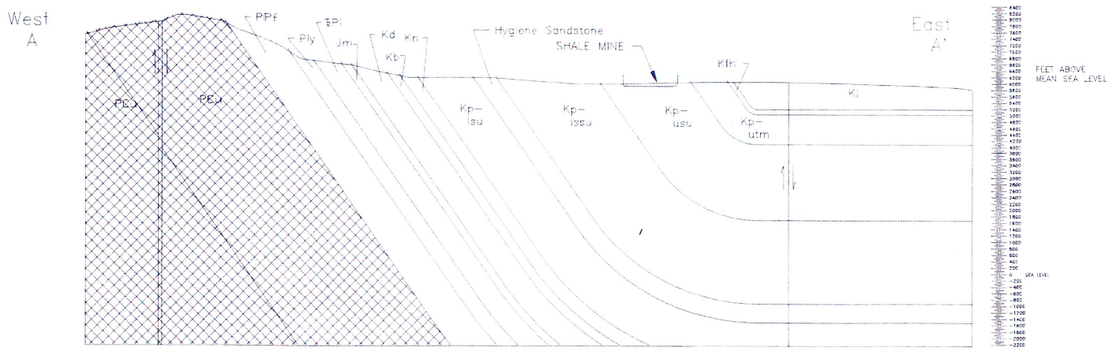

BEDROCK GEOLOGIC CROSS SECTION

NOTE: A DETAILED SURFICIAL GEOLOGY CROSS SECTION PROVIDED ON FIGURE D.1.

LEGEND:

Kl — LARAME FORMATION (CRETACEOUS, MESOZOIC ERA)

LOWER 100 FEET CONSISTS OF LIGHT- TO MEDIUM-GRAY QUARTZOSE SANDSTONE AND ARKOSIC SANDSTONE DIVISIBLE INTO BENCHES SEPARATED BY CLAY, FIRE CLAY, SHALE, OR COAL SEAMS. UPPER 600 FEET PREDOMINANTLY CLAYSTONE AND LIGNITE. INCLUDES ROCKS PREVIOUSLY CALLED ARAPAHOE FORMATION.

Kfh — FOX HILLS SANDSTONE

GREENISH-BUFF, FINE TO COARSE, CROSS-BEDDED QUARTZOSE SANDSTONE IN LOWER PART GRADING UPWARD INTO LIGHT-YELLOW AND WHITE FINE- TO MEDIUM-GRAINED SANDSTONE CONTAINING POLYGONAL WEATHERING PATTERNS. INCLUDES LAWNSTON'S "B" SANDSTONE UNIT OF THE LARAME FORMATION.

Kp — PIERRE SHALE

- Kp-utm
- Kp-usu
- Kp-lssu
- Kp-lsu

LOCALLY APPROX. 8200 FEET THICK; DOMINATED BY BLACK, THINLY-BEDDED FISSILE MARINE SHALE WITH THIN SILTSTONE AND SANDSTONE INTERBEDS.

SUBDIVIDED INTO THE FOLLOWING UNITS:

Kp-utm: UPPER TRANSITION MEMBER; APPROX. 1200 FEET THICK LOCALLY; COARSENS UPWARD TOWARD CONFORMABLE CONTACT WITH FOX HILLS FORMATION; LIMONITE NODULES AND CALCAREOUS SANDSTONE CONCRETIONS NEAR TOP.

Kp-usu: UPPER SHALE UNIT; APPROX. 2300 FEET THICK LOCALLY; BLACK TO DK-GRAY THINLY LAMINATED SHALE WITH THIN INTERBEDS OF BROWN TO GRAY, SILTSTONE, SANDSTONE AND SANDY LIMESTONE.

Kp-lssu: LOWER SANDSTONE UNIT; APPROX. 2600 FEET THICK LOCALLY; FIVE SANDSTONE UNITS SEPARATED BY SHALE AND SILTSTONE. LOWER 500 FEET CORRELATES WITH HYGIENE MEMBER (SCOTT & CABBAN, 1965).

Kp-lsu: LOWER SHALE UNIT; APPROX. 2100 FEET THICK LOCALLY; BLACK TO DK-GRAY THINLY LAMINATED CALCAREOUS SHALE WITH BENTONITIC STRINGERS, CALCAREOUS AND LIMONITIC CONCRETIONS; CONFORMABLE LOWER CONTACT WITH THE NIOBRARA FORMATION.

Kn — NIOBRARA FORMATION

INTERBEDDED GRAY LIMESTONE AND GRAY VERY THIN BEDDED CALCAREOUS SHALE ABOUT 250 FEET THICK.

Kb — BENTON SHALE

DARK- TO LIGHT-GRAY SHALE INTERBEDDED WITH DARK-GRAY EARTHLY TO CRYSTALLINE LIMESTONE; ABOUT 450 FEET THICK.

Kd — DAKOTA GROUP

UPPER PART IS GRAY TO TAN, WELL-SORTED, FINE- TO MEDIUM-GRAINED SANDSTONE INTERBEDDED WITH DARK-GRAY CARBONACEOUS SILTSTONE AND CLAYEY SHALE; LOWER PART GRAY TO TAN COURSE-GRAINED CONGLOMERATIC CROSSBEDDED SANDSTONE INTERBEDDED WITH VARICOLORED SHALE; 295-350 FEET THICK.

Jm — MORRISON FORMATION (JURASSIC, MESOZOIC ERA)

VERICOLORED CLAYEY CALCAREOUS SILTSTONE IN UPPER TWO-THIRDS; INTERBEDDED GRAY SANDSTONE, VERICOLORED CALCAREOUS CLAYEY SILTSTONE, AND LIGHT GRAY LIMESTONE IN LOWER ONE THIRD; 325-340 FEET THICK.

TRPl — LYKINS FORMATION (TRIASSIC, MESOZOIC ERA)

RED AND LIGHT GREEN CALCAREOUS SILTSTONE AND FINE-GRAINED SANDSTONE; 5-FOOT GRINKLY LIMESTONE 100 FEET ABOVE BASE; ABOUT 550 FEET THICK.

Ply — LYONS SANDSTONE (PALEOZOIC ERA)

RED AND PINK FINE TO VERY FINE GRAINED WELL-SORTED SANDSTONE; VERY COARSE GRAINS ALONG STEEL BEDDING PLANES; CROSS-BEDDED IN NORTHERN PART OF QUADRANGLE; 230-250 FEET THICK.

PPf — FOUNTAIN FORMATION (PALEOZOIC ERA)

RED AND MINOR GRAY COARSE-GRAINED CONGLOMERATIC ARKOSIC SANDSTONE CONTAINING LENSES AND LAYERS OF SILTSTONE AND FINE-GRAINED SANDSTONE; 800-1000 FEET THICK.

PCu — PRECAMBRIAN UNDIFFERENTIATED (PRECAMBRIAN)

IGNEOUS AND METAMORPHIC ROCKS OF THE FRONT RANGE.

- 45 — STRIKE AND DIP OF BEDDING PLANES.
- FORMATION CONTACT, UNITS OF PIERRE SHALE DASHED.
- U / D — FAULT, DASHED WHERE INFERRED.
- POSSIBLE FAULT INDICATED BY GEOPHYSICAL EXPLORATION.

105°07' 30" — 40°00'

ELDORADO SPRINGS QUADRANGLE	LOUISVILLE QUADRANGLE
SCOTT & COBBAN, 1965 WELLS, 1967	SPENCER, 1961 DAMES & MOORE, 1981

STUDY AREA

39°52' 30"

RECEIVED
MAR 2 0 1992
Mined Land Reclamation Div.

REV #	DESCRIPTION	DATE	BY	CHK	APP
0	ISSUE FOR PERMIT REVIEW	10/01/19	JG	JG	MR

REFERENCE:

-THIS FIGURE WAS ADAPTED FROM ORIGINAL PROVIDED IN THE ENGINEERING DESIGN AND OPERATIONS REPORT, DATED 1992 AND DEVELOPED BY SERGENT, HAUSKINS & BECKWITH CONSULTING GEOTECHNICAL ENGINEERS FOR WESTERN AGGREGATES INC (A PREVIOUS OWNER), TITLED "DETAILED REGIONAL GEOLOGIC MAP", FIGURE 5.2.1-1 CERTIFICATE OF DESIGNATION.

ARCOSA
LIGHTWEIGHT BOULDER PLANT #1604
JEFFERSON COUNTY, COLORADO

BEDROCK GEOLOGY

ARCOSA

EXHIBIT D-2

PERMIT M-1988-108 | OCTOBER 2019

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ATTACHMENT 2

EXHIBIT E

Arcosa, Inc.
1112 E. Copeland Road, Suite 500
Arlington, TX 76011
T 817.635.8525

ARCOSA

Exhibit E – Reclamation Plan

This Reclamation Plan (Exhibit E) presents the reclamation goals, provisions, and activities for the Arcosa Lightweight Boulder facility (Site) including the mining and processing areas.

Site Description

Great Western Aggregates was the original operator of the Site in the 1960's and early 1970's. Operations during this time pre-dated DRMS mining regulations, and little consideration was given to post-mining reclamation activities. The current understanding is that no reclamation work was performed at the time when operations ceased in 1975. Current site conditions are shown on Exhibit C-1 and Exhibit C-2. A soils and vegetation map is provided in Exhibit C-3 (detailed further in Exhibits I and J), and the mine plan figure is provided in Exhibit C-4.Reclamation activities have already begun, concurrent with mining operations, in the north of the quarry area where processed soil material has been placed and stabilized to establish soil slopes.

Mine Area

The mine area (quarry) currently constitutes approximately 41 acres of land located within the approximately 108-acre Hogan Lease property which is located west of Highway 93 and east of Coal Creek. The 108-acre Hogan Lease property is currently zoned for industrial use and is being developed under an Official Development Plan through the Jefferson County Planning Department. The current features of this area are depicted in Exhibit C. The geology and current mining operations for this area are described in Exhibit D. Wildlife use of the quarry area is low, at present, due to quarry location situated between Highway 93 and Coal Creek.

Processing Area

The processing area currently constitutes approximately 33 acres of land located east of Highway 93 and is zoned for industrial use under an Official Development Plan through the Jefferson County Planning Department. The Processing Area is owned entirely by Arcosa. Facility buildings and process equipment located in this area are shown on Exhibit C. The geology and current operations for this area are described in Exhibit D.

South of the 33-acre processing area is another approximately 75-acre Hogan Lease property. On the north part of this property are existing structures including concrete foundations and electrical hook-ups from a former ready-mix cement facility. The rest of the property is unused grassland. Structures are shown on Exhibit C-2, and the geology is described in Exhibit D.

Reclamation Goals

The reclamation goal of the Site is to restore affected lands according to the land uses described in the Jefferson County Official Development Plan: the mine area will be restored to rangeland and wildlife habitat, and the processing area will be restored for industrial use. There are several other reclamation goals for this site as described below:

1. Restore the affected lands according to the land uses described in the Jefferson County Official Development Plan (i.e., rangeland for Quarry Area, and industrial use for the Processing Area).

2. Perform reclamation activities (i.e., backfilling and grading the quarry area) contemporaneously with mining operations.
3. Use on-site sources of topsoil where available and mitigate the need for transportation and import of additional soil materials.
4. Restore the affected lands to a condition with a usable water resource at the request of the landowner (the Hogan Family) that complies with applicable Colorado water laws and regulations governing the existing water rights.

Reclamation Approach

Reclamation will occur to achieve the above-stated goals. The reclamation approach defines the proposed post-mining and reclamation use, the reclamation activities related to materials handling, groundwater protection and surface water protection, and the sequence for the reclamation activities. This reclamation approach takes into consideration the conditions resulting from the operational decisions of Great Western Aggregates and methodologies for reclamation that reasonably meet the performance requirements for site reclamation set forth by DRMS and the Regulations.

Quarry Area

Proposed post-reclamation land use for the quarry is rangeland consisting of mixed grasses, forbs, and shrubs. As discussed below, Arcosa will construct a small, approximately 10-acre, pond which is to be left for stock watering purposes and water storage. Portions of the 108-acre Hogan Lease that are disturbed due to mining operations, including the quarry, will be reclaimed to grades that are both suitable for grazing and similar to existing topography of the surrounding areas.

The proposed final slopes for the quarry will be graded, as necessary, to achieve the proposed final slope configuration shown on Exhibit F. For the south half of the quarry, slopes are not to exceed 2H:1V. This slope is consistent with DRMS's Construction Materials Rules and Regulations, is adequate for wildlife or stock grazing, and is generally less steep than the existing and naturally occurring slopes around Coal Creek and the surrounding area to the north and west where stock is currently grazed.

The landowner has previously requested that an access road to the quarry bottom be left in place for future use. The proposed access road is shown on the final reclamation map in Exhibit F. This road will also serve to facilitate access to the area for final reclamation maintenance and monitoring. The landowner has also requested that an existing surface water pond be part of the reclamation configuration in the quarry area, purposed for use in stock watering. To address this request, a permanent pond is shown on the final reclamation map in Exhibit F. This pond configuration includes 10 acres for the pond footprint and side slopes no steeper than 3H:1V from 5 feet in elevation above to 10 feet in elevation below the expected water level.

Arcosa's reclamation approach for the quarry area includes the contemporaneous establishment of reclamation grades (i.e., slopes and elevations) with mining activities. As such, for the purpose of this plan, the following activities (described below) will be performed during mining operations:

- Quarry backfill and interim grading; and
- Stabilization.

The following activities (described below) will be performed as part of final reclamation:

- Final grading and restoration; and
- Seeding and amendments.

Processing Area and Area to the South

The approximate 33-acre processing area will remain as industrial use when mining operations cease. The approximate 75 acres to the south of the processing area is mostly undisturbed and is vegetated with native grasses. Historically a portion of the processing plant operated as a cement plant with a ready mix facility as described above. The plant and processing area will be repurposed as another industrial use such as cement production, lime production, or another related activity at the end of mine life. The 75-acre area to the south will undergo reclamation. The foundations and some structures related to a former Ready Mix cement plant (Ready Mix Plant) are present south of the processing area. This former plant area will undergo reclamation and will be converted to rangeland. The rest of the 75-acre area to the south of the processing area will remain rangeland upon completion of final processing activities.

The processing area interim grading activities (described below) will be contemporaneous with mining operations and quarry area interim grading activities. The post-mining reclamation activities for the Processing area are described in the Final Grading and Restoration, and the Seeding and Amendments sections below.

Reclamation Activities

Quarry Backfill and Interim Grading

Upon achieving the target mining elevations as shown on Exhibit C-4, the Mine Plan Map, backfill material will be placed and graded to the reclamation grades shown in Exhibit F. As stated above, backfill and grading will occur contemporaneously with mining operations; therefore the reclamation activities described in this subsection will occur prior to final grading and restoration activities.

Backfill material is generated during the processing of mined materials and consists of either overburden soil material that was removed from mined areas of the site, or of processed soil material that is not sold as product. Backfill materials will either be staged and stockpiled adjacent to the top of the quarry slope (as described later in this subsection), or direct placed at the bottom of the quarry. An intermediate screening step may be employed to remove rock from the backfill materials. Rock screened from these materials may be sold as aggregate or used in the reclamation process.

Where reclamation has already begun in the north section of the quarry area, processed soil material has been end-dumped from the edge of the quarry and stabilized. These activities have occurred around the north walls of the quarry. The soil placed has been stabilized and will remain in place as final reclamation slopes. There are no plans to regrade the already vegetated slopes, except where shown on the updated reclamation plan (bold topographic contours), which includes the 3H:1V slopes around the perimeter of the 10-acre pond are required (i.e., within 5 feet above and 10 feet below the pond water line). Arcosa will grade and shape the 10-acre pond and the 3H:1V slope area around the 10-acre pond during mining operations as shown on Exhibit C-4 and Exhibit F.

For portions of the quarry that have not yet been reclaimed, the stockpiles of backfill materials at the top of the quarry slope will be pushed into the quarry using a bulldozer. Using this method, the side slope of the backfilled material may initially be steeper than the final slope configuration of 2.5H:1V proposed for final reclamation. Backfill materials will be graded and managed within the quarry and quarry bottom using a bulldozer to flatten slopes and track-compact the backfilled soils to achieve the proposed reclamation elevations, as shown in Exhibit F. As mentioned above, overburden materials recovered from active mining may be directly placed to achieve target reclamation elevations as mining of the quarry progresses south.

Arcosa will take care to ensure backfill materials are handled to prevent side slope sloughing, erosion, and to protect workers and the work area from slope failures. Arcosa will perform additional final grading activities, as described below, in preparation for final restoration and to achieve the final restoration grades shown in Exhibit F.

Processing Area Interim Grading

Stockpiles of raw, partially processed, or fully processed materials exist within the Processing Area at any given time during operations. As part of contemporaneous reclamation and upon completion of mining operations and the final processing of materials, stockpiles will be removed from the processing area and the area will be graded as necessary to an interim condition before final restoration. The actual interim grades will be based on the needs of the processing area and post-reclamation industrial use. During this time, erosion and sediment controls, specifically soil berms, will be used to manage stormwater runoff from the processing area. Stormwater from the processing area will be diverted toward the roadside ditches along HWY 93 and away from the quarry area using soil berms installed in the process area along the HWY 93 underpass. These soil berm locations are shown on Exhibit F-1. The soil berms will be compacted and shaped generally to be approximately 2 feet high and 2 feet wide with H3:1V side slopes..

The Processing Area will be initially graded after removal of soil stockpiles. The initial grading will conform to existing topography and provide for a relatively shallow slope for the majority of the process area. These initial grades may be slightly adjusted during final grading but will largely be the final grades for the reclamation condition to accommodate future industrial uses. These interim grades will mimic the surrounding topography to the extent practicable, while maintaining stormwater drainage away from the quarry area

Stabilization

After initial grading is performed in the Quarry Area and the Processing Area, and prior to Final Grading and Restoration activities, both areas will be stabilized using mulch. Seed and erosion control blankets may be used if necessary. Additional erosion control measures such as seeding, erosion control blankets, soil berms, or other means as necessary to prevent erosion of the affected lands, sloughing of slopes, and discharge of overland flow beyond the boundaries of the affected lands.

If seed is used, it shall conform to the requirements presented in Table E.1 – Revegetation Mix, or it shall be a seed mix obtained from an agricultural extension (Ag-extension) in the state of Colorado. The application method and rate shall be specified by the Ag-extension. The seed mix, application method, and application rate will be provided to DRMS for review and approval prior to use.

Mulch shall be either hay or straw mulch and be placed to a thickness of 1-inch on slopes steeper than 3H:1V. Aggregate and/or pavement may be utilized to achieve stabilization and provide additional space for vehicle traffic or access, if needed. The final configuration of erosion and sediment controls, access roads and paved areas, and other final restoration Site features will be established during the Restoration and Final Grading activities.

Final Grading and Restoration

After quarry backfill and interim grading activities are complete, and the reclamation grades have been achieved, Arcosa will perform final grading and prepare the affected lands for restoration. Final grading will include the placement of topsoil on slopes, of excess backfill material on the quarry bottom, mechanical preparation (i.e., harrowing, ripping or surface roughening) of areas to receive seed, soil amendments to promote vegetation growth, and seed placement.

The existing source of on-site topsoil overlies presently undisturbed areas south of the active mining area. To minimize the need for transporting additional materials to the Site, topsoil will not be placed on the bottom of the quarry during final restoration. However, topsoil may be imported to supplement the existing on-site source, if necessary. The on-site supply of topsoil, including topsoil currently stockpiled on site, and any imported topsoil will only be placed reclaimed side slopes of the quarry where rapid revegetation is most critical in stabilizing the slopes and minimizing erosion. Topsoil will be placed to a thickness of 6 to 12 inches.

Prior to seeding and the addition of soil amendments, the exposed shale remaining at the quarry bottom will be covered with excess backfill material from operations; spread to a thickness of 6 to 12 inches. The materials in the quarry bottom will be ripped and disked if necessary and to the extent possible given the stony nature of the in-place material. The soil will be amended as necessary, prior to seeding, to promote vegetation growth.

Seeding and Soil Amendments

Backfill materials, topsoil, and surface soils within the affected lands will be amended, if necessary, to promote vegetation growth and seed germination. The quarry area will receive phosphorus and nitrogen fertilizer or manure, or other recommended amendments if identified through soil testing. Soil testing may be performed for areas of the site where quickly establishing vegetation is critical. Amendments will likely be applied at higher rates for areas not receiving topsoil (i.e., the quarry floor) than for quarry side slopes. Final seed mix and soil amendment recommendations will be provided based on the results of soil testing. One or more samples of soil will be submitted to an Ag-extension for evaluation and amendment recommendation.

A seed mix will be applied to the affected lands where vegetation disturbance has occurred or where existing vegetation is insufficient. The seed mix will not be applied to certain areas within the Process Area that are expected to remain an active industrial area post-mining. The seed mix shown in Table E.1 will provide a vegetation mix that is suitable for cattle grazing and to a lesser degree, wildlife habitat. This mix is based on information on local soil types, climate, and current reclamation practices. The seeding rates shown in the table are rates that assume the use of a seed drill. In those areas where hydro seeding or broadcast seeding is required, the seeding rate will be increased by at least 50 percent for flat lying areas and 75 percent for slopes. Seeding in each case will occur between November 1 and April 30 when

the ground is not frozen. The seeded areas will be moisture-conditioned prior to seed placement, and moisture conditioned or irrigated post-placement if climate conditions warrant.

Efforts will be made to employ a grass land seed drill to seed the quarry bottom, however, the stony soil medium may somewhat hamper its use. If, after placing the overburden, it appears that use of a seed drill is inappropriate, alternative seeding procedures may be employed, such as hydro seeding/mulching, or broadcast seeding and increasing the seeding rate as appropriate.

A Noxious Weed Management Plan is provided as an attachment to this Exhibit E. This plan will be employed during mining and reclamation activities to ensure the establishment of noxious weeds will be prevented during those activities.

Reclamation Sequence and Schedule

Reclamation activities will be performed contemporaneously with mining activities as areas of the mine reach the target mine elevations. Under the current mine plan (Exhibit D) the existing quarry will be mined to the elevations shown on Exhbit C-4 and progressive mining southward will occur as process plant needs warrant. As stated above, backfill placement in the quarry will occur as areas of the quarry reach the target mining elevations. The backfilling and interim grading activities will occur over the course of the mining activities, as necessary, and through till final grading and restoration activities commence.

Reclamation of topsoil in areas currently scheduled to be mined will occur during mining, as described in Exhibit D. The topsoil salvaged from the mining operations will be stockpiled on site separate from other materials.

Table E.1 Revegetation Mix

SPECIES	VARIETY	% MIX	MINIMUM POUNDS PLS PER ACRE (DRILLED)
Western Wheatgrass (Pascopyrum smithii)	Arriba	40	6.4
green needlegrass (Stipa viridula)	Lodorm	15	1.5
sideoats grama (Bouteloua curtipendula)	Vaughn/Butte	15	1.4
blue gramma (Bouteloua gracilis)	Lovington	10	0.3
little bluestem (Schizachyrium scoparium)	Pastura	10	0.7
indian ricegrass (Oryzopsis hymendoides)	Paloma	10	1.3
		100%	

Notes:

1. Includes 0.5 lb. of pure live seed (PLS) of each of the following:
   “Rincon” form-wing saltbrush winterfat
   “Kaneb” purple prairie clover
2. If broadcast method is used, area must receive double the rate specified above.
3. It is anticipated that seed will be placed at a rate of 50-lb/acre minimum in a broadcast/hydroseed application.

Exhibit E Attachment

Noxious Weed Management Plan

Jefferson County - Noxious Weed Management Plan - Instructions

Noxious weeds are non-native plants that out-compete desirable agricultural and native plants. Colorado requires landowners to manage noxious weeds. In 2003 the Noxious Weed Act (C.R.S. 35-5.5 et.al.) was amended to include a prioritized list that requires specific levels of control for designated weeds.

1. Identify the noxious weeds on your property

2. Map the location of the weeds

3. Choose an appropriate control method. See Appendix A for control types and timing. Info Sheets for each weed are available at www.jeffco.us/jcism for specific treatment requirements and options.

4. Prevention – decide how you will prevent movement of contaminated materials and prevent weed infestation. Prevention of noxious weeds in very important, it can save landowners time and money and also allow the land to exist in a more natural state. Some ways to prevent noxious weeds from becoming established are to carefully monitor contaminated materials (vehicles, shoes, pets, etc.). Be aware of the plant species growing in and around your land, and facilitate the health of native or non-noxious plants already established.

5. Complete the Weed Management Plan Forms. Submit to the Invasive Species Management Coordinator who will review. If modifications are required, you will be notified and will have 5 days to make the required changes and resubmit your plan. Once the plan is approved, you will be notified.

6. The Invasive Species Management staff will periodically inspect the site after the plan is implemented to gauge noxious weed control.

Submit to:

Alicia Doran
Invasive Species Management Coordinator
700 Jefferson County Parkway, Suite 100
Golden, Colorado 80401

adoran@jeffco.us
303-271-5989
www.jeffco.us/jcism

Noxious Weed Management Plan - Jefferson County

Name: Trinity Industries
Email: chase.bracy@trin.net

Phone Home: 303-499-1010
Cell Phone:

Property Address: 11728 Hwy 93
City: Boulder
State: CO Zip: 80303

Mailing Address: 11728 Hwy 93
City: Boulder
State: CO Zip: 80303

I plan to start treatment on June 2018
I will be using a Professional Applicator

Company Name:
Contact Name:
Phone:
Email:

Signature: Date:

Basic Noxious Weed Management Plan - Jefferson County

Weed	Method of Control	Herbicide (include EPA Registration number)	Rate/Acre	Spring Start Date	Spring Completion Date	Fall Start Date	Fall Completion Date
Common Mullein (Verbascum thapsus)	Chemical	Aminopyralid (Milestone) w/ non-ionic surfactant EPA Reg # 62719-519	7oz/acre	May 1st	June 20th		
Diffuse Knapweed (Centaurea diffusa)	Chemical	Aminopyralid (Milestone) w/ non-ionic surfactant EPA Reg # 62719-519	7oz/acre	May 1st	June 20th		
Common Mullein (Verbascum thapsus)	Chemical	TBD EPA Reg #	TBD			Oct 1st	Nov 30th
Diffuse Knapweed (Centaurea diffusa)	Chemical	TBD EPA Reg #	TBD			Oct 1st	Nov 30th
		 EPA Reg #					
		 EPA Reg #					
		 EPA Reg #					
		 EPA Reg #					
		 EPA Reg #					
		 EPA Reg #					

Basic Noxious Weed Management Plan - Jefferson County

Prevention

Trinity will minimize the personnel/vehicle traffic in the potentially affected areas to prevent the spread of noxious weeds. In addition, none of the contaminated soils or weeds themselves will be removed from the property.

Weed infestation will be controlled via a ground broadcast application of chemicals. All areas outlined in red on the aerial map, included in this management plan, will be sprayed in the Spring and Fall Seasons. The chemicals that will be used are outlined in the above table. The chemicals used in the Fall will be determined with guidance from Jefferson County.

Basic Noxious Weed Management Plan - Jefferson County
Appendix A

Annual Weeds

☐ **Chamomile**

Task	Time of Year	Year 1	Year 2	Year 3	Ongoing
Spring Herbicide Application	April-June	X	X	X	as needed
Fall Herbicide Application	September-frost	X	X	as needed	as needed
Removal of rosettes	April-Oct.	X	X	X	X
Removal/ Bagging Flowers	April-Oct.	X	X	X	X

Biennial Weeds

☐ **Black henbane - eradication**
☐ **Bull thistle - eradication**
☐ **Dame's rocket**
X **Diffuse knapweed - eradication parts of Jeffco**
☐ **Houndstongue**
☐ **Musk thistle**
☐ **Plumeless thistle - eradication**
☐ **Scotch thistle**
☐ **Spotted knapweed - eradication**
☐ **Teasel**

Task	Time of Year	Year 1	Year 2	Year 3	Ongoing
Spring Herbicide Application	April-June	X	X	X	as needed
Fall Herbicide Application	September-frost	X	X	as needed	as needed
Removal of Rosettes	Anytime	X	X	as needed	as needed
Cutting and Bagging Flowers	June-August	as needed	as needed	as needed	as needed

Perennial Weeds

☐ **Bouncingbet**
☐ **Canada thistle**
☐ **Dalmatian toadflax**
☐ **Hairy willowherb - eradication**
☐ **Hoary cress**
☐ **Leafy spurge**
☐ **Orange hawkweed - eradication**
☐ **Oxeye daisy**
☐ **Perennial pepperweed**
☐ **Sulfur cinquefoil**
☐ **Yellow toadflax**

Task	Time of Year	Year 1	Year 2	Year 3	Ongoing
Spring Herbicide Application	April-June	X	X	X	as needed
Fall Herbicide Application	September-frost	X	X	as needed	as needed

Perennial Weeds - Continued

☐ **Chinese clematis - eradication** ☐ **Russian knapweed - eradication** ☐ **Salt cedar - eradication**

☐ **Purple loosestrife - eradication** ☐ **Russian olive - eradication parts of Jeffco**

Task	Time of Year	Year 1	Year 2	Year 3	Ongoing
Herbicide Application	April-frost	X	X	X	as needed

☐ **Cypress spurge - eradication** ☐ **Myrtle spurge - eradication**

Task	Time of Year	Year 1	Year 2	Year 3	Ongoing
Herbicide Application	April-frost	X	X	X	as needed
Removal and Bagging	Anytime	X	X	X	as needed
Caution - Sap may cause severe reactions to skin and eyes					

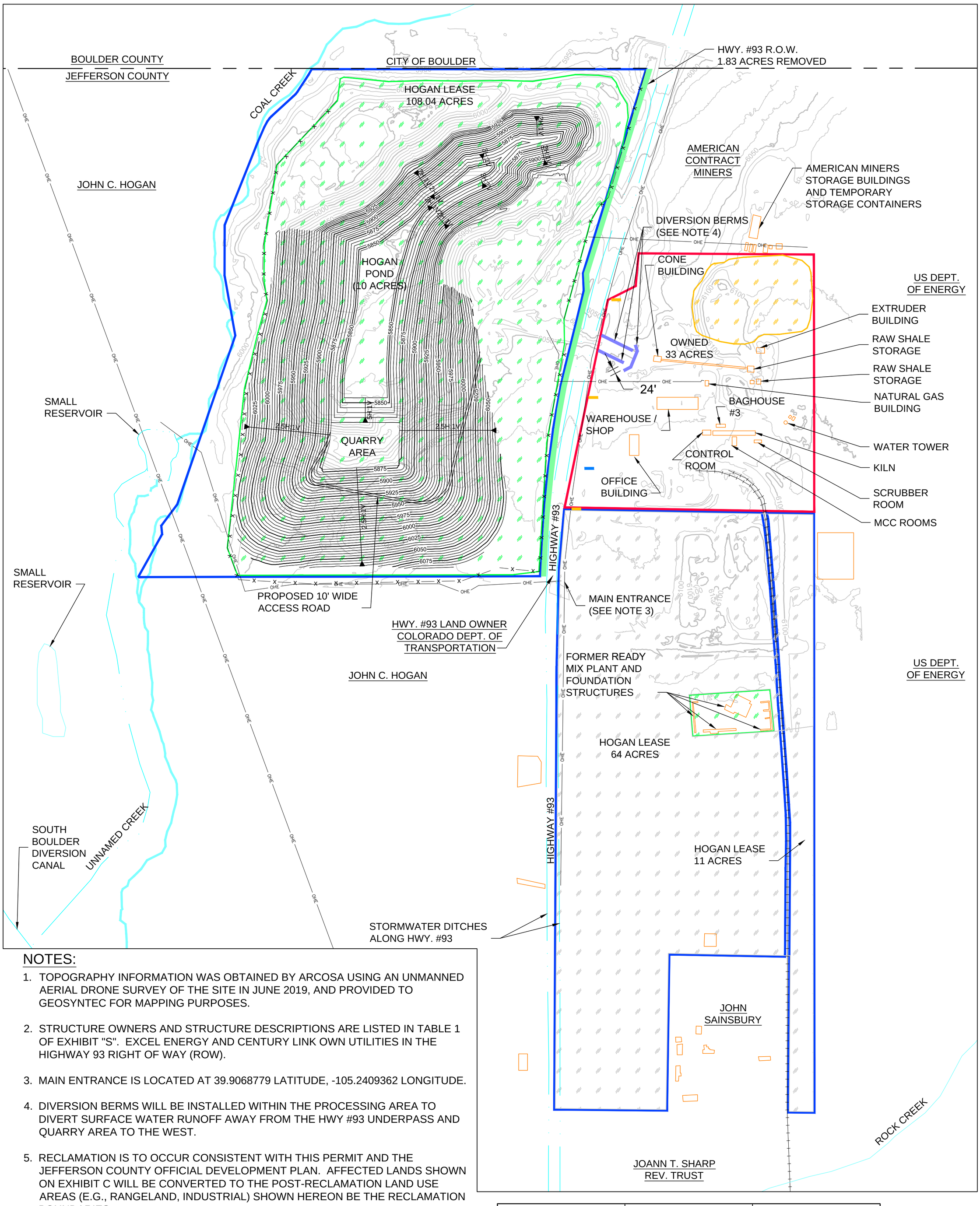
List C Noxious Weeds - Control Recommended

☐ **Cheat grass** **X** **Common mullein** ☐ **St Johnswort**

☐ **Chicory** ☐ **Field bindweed**

Task	Time of Year	Year 1	Year 2	Year 3	Ongoing
Spring Herbicide Application	March-June	X	X	X	as needed
Fall Herbicide Application	September-frost	X	X	as needed	as needed
Removal of Rosettes/Seedlings	Anytime	X	X	as needed	as needed
Cutting and Bagging Flowers (Common mullein)	May-August	as needed	as needed	as needed	as needed

EXHIBIT F-1



NOTES:

1. TOPOGRAPHY INFORMATION WAS OBTAINED BY ARCOSA USING AN UNMANNED AERIAL DRONE SURVEY OF THE SITE IN JUNE 2019, AND PROVIDED TO GEOSYNTEC FOR MAPPING PURPOSES.
2. STRUCTURE OWNERS AND STRUCTURE DESCRIPTIONS ARE LISTED IN TABLE 1 OF EXHIBIT "S". EXCEL ENERGY AND CENTURY LINK OWN UTILITIES IN THE HIGHWAY 93 RIGHT OF WAY (ROW).
3. MAIN ENTRANCE IS LOCATED AT 39.9068779 LATITUDE, -105.2409362 LONGITUDE.
4. DIVERSION BERMS WILL BE INSTALLED WITHIN THE PROCESSING AREA TO DIVERT SURFACE WATER RUNOFF AWAY FROM THE HWY #93 UNDERPASS AND QUARRY AREA TO THE WEST.
5. RECLAMATION IS TO OCCUR CONSISTENT WITH THIS PERMIT AND THE JEFFERSON COUNTY OFFICIAL DEVELOPMENT PLAN. AFFECTED LANDS SHOWN ON EXHIBIT C WILL BE CONVERTED TO THE POST-RECLAMATION LAND USE AREAS (E.G., RANGELAND, INDUSTRIAL) SHOWN HEREON BE THE RECLAMATION BOUNDARIES.

MANAGEMENT AREA	MEASURE	APPLICATION
FINAL RESTORATION AND VEGETATION	PERMANENT SEED MIX AND AMENDMENTS. SEED MIX AND AMENDMENTS WILL BE PER REQUIREMENTS IN EXHIBIT E, AND ACCORDING TO AG-EXTENSION RECOMMENDATIONS.	APPLY TO ALL DISTURBED AREAS THAT ARE TO BE RECLAIMED AS APPROPRIATE. APPLICATION REQUIREMENTS ARE DESCRIBED IN EXHIBIT E.
MULCH	MULCH WILL BE STRAW OR HAY AND OF AN ORIGIN AND CONSISTENCY CONSISTENT WITH THE INTENDED USE.	APPLY MULCH TO AREAS WITHIN THE PROCESSING AREA THAT WILL BE STABILIZED (UP TO 5 ACRES). THE PROCESSING AREA WILL REMAIN IN PLACE POST-RECLAMATION.
CURRENTLY VEGETATED AND STABLE	NO ADDITIONAL MEASURES ARE NEEDED FOR VEGETATED/STABILIZED AREAS OF THE SITE.	NONE

N

0 520

SCALE IN FEET

LEGEND:

- POST-RECLAMATION INDUSTRIAL USE
- RANGELAND
- HWY. #93 WALKING PATH ACREAGE REDUCTION (1.83 ACRES)
- BILLBOARD
- ABANDONED RAILROAD CAR
- FENCELINE
- OVERHEAD POWER LINE
- RAILROAD TRACKS
- OUTLINE OF VARIOUS STRUCTURES, SEE LIST OF STRUCTURES AND EXHIBIT "S"

ARCOSA

LIGHTWEIGHT BOULDER PLANT #1604

JEFFERSON COUNTY, COLORADO

RECLAMATION MAP

ARCOSA

EXHIBIT F-1

PERMIT M-1988-108 | FEBRUARY 2020

REV #	DESCRIPTION	DATE	BY	CHK	APP
0	ISSUE FOR PERMIT REVIEW	2/28/20	PS	JG	MR

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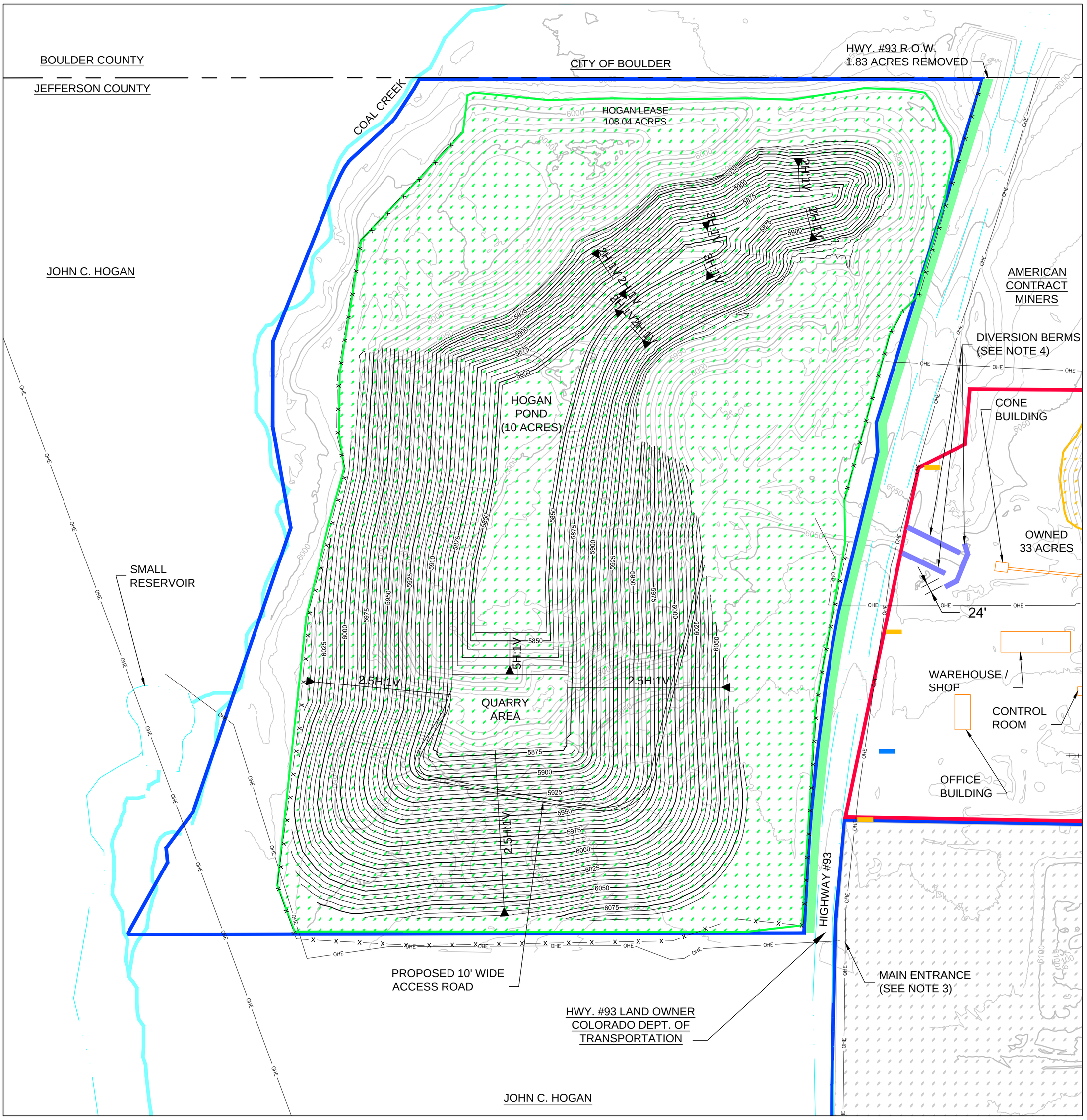
EXHIBIT F-2



MANAGEMENT AREA	MEASURE	APPLICATION
FINAL RESTORATION AND VEGETATION	PERMANENT SEED MIX AND AMENDMENTS. SEED MIX AND AMENDMENTS WILL BE PER REQUIREMENTS IN EXHIBIT E, AND ACCORDING TO AG-EXTENSION RECOMMENDATIONS.	APPLY TO ALL DISTURBED AREAS THAT ARE TO BE RECLAIMED AS APPROPRIATE. APPLICATION REQUIREMENTS ARE DESCRIBED IN EXHIBIT E.
MULCH	MULCH WILL BE STRAW OR HAY AND OF AN ORIGIN AND CONSISTENCY CONSISTENT WITH THE INTENDED USE.	APPLY MULCH TO AREAS WITHIN THE PROCESSING AREA THAT WILL BE STABILIZED (UP TO 5 ACRES). THE PROCESSING AREA WILL REMAIN IN PLACE POST-RECLAMATION.
CURRENTLY VEGETATED AND STABLE	NO ADDITIONAL MEASURES ARE NEEDED FOR VEGETATED/STABILIZED AREAS OF THE SITE.	NONE

NOTES:

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N

0 350

SCALE IN FEET

LEGEND:

- POST-RECLAMATION INDUSTRIAL USE
- RANGELAND
- HWY. #93 WALKING PATH ACREAGE REDUCTION (1.83 ACRES)
- BILLBOARD
- ABANDONED RAILROAD CAR
- FENCELINE
- OVERHEAD POWER LINE
- RAILROAD TRACKS
- OUTLINE OF VARIOUS STRUCTURES, SEE LIST OF STRUCTURES AND EXHIBIT "S"

ARCOSA

LIGHTWEIGHT BOULDER PLANT #1604

JEFFERSON COUNTY, COLORADO

QUARRY AREA RECLAMATION

ARCOSA

EXHIBIT F-2

PERMIT M-1988-108 | FEBRUARY 2020

REV #	DESCRIPTION	DATE	BY	CHK	APP
0	ISSUE FOR PERMIT REVIEW	2/28/20	PS	JG	MR

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ATTACHMENT 3

Arcosa, Inc.
1112 E. Copeland Road, Suite 500
Arlington, TX 76011
T 817.635.8525

ARCOSA

Exhibit L – Reclamation Costs

Reclamation Costs (Exhibit L) and the corresponding assumptions and supporting documentation for cost estimation are presented herein.

Reclamation Costs

Reclamation costs are presented in the attached reclamation cost spreadsheet. The costs represent direct costs (e.g., labor, materials, and equipment) associated with the activities described in the reclamation plan (Exhibit E). Indirect costs (e.g., engineering costs, DRMS oversight costs, construction management fees, etc.) are not included as they are typically calculated by DRMS for reclamation bonding purposes. The reclamation bond amount will be the approved direct costs plus the calculated indirect costs.

The following is a summary of the direct costs and the corresponding assumptions and supporting documentation for each item. Additional notes and details on specific cost items are provided in the attached reclamation cost spreadsheet. Unless otherwise stated, unit prices for each cost item listed in the cost spreadsheet are obtained from the 2019 RS Means online software. The unit prices from the online software represent unit prices released in the first quarter of 2020 and are specific to unit costs gathered for the Boulder, Colorado region. Unit prices include costs for labor, equipment, and materials indicated in the specific line-items on the cost spreadsheet. The unit prices do not include overhead and profit, which are assumed to be included in the indirect cost calculation performed by DRMS.

Mobilization/Demobilization

- Mobilization and demobilization costs are included in the attached reclamation cost spreadsheet and are based on the list of equipment anticipated for the reclamation work. The list of equipment is provided in the Attachments to Exhibit L.

Quarry Area

- Quarry backfilling is being performed concurrently with mining operations (reference Exhibit D and Exhibit E); however, the cost to place and spread backfill is included in the reclamation cost estimates which includes the following assumptions:
    - The volume of backfill to be placed is based on the surface comparison between the mine plan (Exhibit C-4) and the reclamation plan for the quarry area (Exhibit F-2) provided in Attachment 2.
    - The cost to purchase, load, and haul imported backfill is not included, because the backfill is generated during mining operations.
    - According to Arcosa's operational records and experience, 25% of the material mined for processing will be utilized as backfill material.
    - The mining plan has been optimized so as to generate enough backfill during operations to account for the quantity of backfill needed to reach the reclamation grades (reference Attachment 2).
    - Backfill generated from mining operations will be staged adjacent to the quarry area during operations. The average "hauling/pushing distance" is 300 feet from the quarry edge.
- Existing stockpiles surrounding the quarry area and located in the processing area are either (i) backfill material, or (ii) product for sale. As such, the existing stockpiles seen on site, including their

maintenance, removal and grading of the surface after removal, are part of Arcosa's mining operations and thus these activities are not included in the direct costs.

- Direct costs for rough-grading of the quarry area are included as part of the backfilling and interim grading activities. Costs for these activities are included in the estimate. Rough grading is for the entire area within the quarry that is yet to reach reclamation grades as shown in bold contours on Exhibit F-2. Grading includes establishment of:
    - 2.5H:1V quarry area side slopes (except the already-reclaimed side slopes in the north portion of the quarry area);
    - 3:1 side slopes in the pond area (area between 5 ft vertically above the water line to 10 feet vertically below the water line per the CO Mineral Rules and Regulations);
    - Reclamation slopes in the southern portion of the quarry area; and
    - The quarry area bottom.
- Repair of existing erosion rills on the north portion of the quarry area is included in the direct costs. These rills are on portions of the quarry side slopes that have been reclaimed, therefore their costs are included. The extent of these rills are shown on the photos in the Attachments to Exhibit L, and an average depth of the rill along the entire length is assumed. It is anticipated that this work will be performed during operations.
- Quarry area side slopes will be stabilized with mulch between interim and final grading activities to mitigate the potential for erosion.
- Final grading and restoration activities, described in Exhibit E, include placement of topsoil on quarry side slopes and placement of the majority of the remaining excess backfill on the quarry bottom.
    - It is assumed that topsoil for quarry area side slopes will be purchased at an off-site borrow location and hauled to the quarry. Borrow sources have been identified within 15 to 30 miles of the site, and are listed in the Attachments to Exhibit L.
    - Topsoil and excess backfill will be placed and graded to a thickness of 6 to 12 inches (refer to Exhibit E) within the quarry area.
    - A portion of the excess backfill will be used to reclaim the Ready mix plant area (see description below).
- Samples of topsoil and backfill will be tested at an agricultural extension to identify the appropriate amendments to support seed growth.
    - Unit pricing for soil testing is based on the costs provided by the Ag-Extension at Colorado State University for "routine soil and overburden" testing.
    - It is assumed that no additional amendments will be needed for topsoil and backfill other than fertilizer, which is included in the costs.
- Seed and fertilizer will be applied to the quarry area using broadcast/hydroseed methods.

Processing Area

- As stated above, existing Processing Area stockpiles will be removed as part of Arcosa's operations (as material to be sold or used as backfill material).
    - The stockpile area will be rough-graded and stabilized with mulch as part of restoration activities.
- Soil berms will be constructed within the processing area to control stormwater runoff towards the quarry area.

  - Berms will be approximately 2 feet high, 2 feet wide, with 3:1 side slopes.
  - Berms will be compacted, and the soil will be amended and seeded.
- All buildings within the processing area will remain as part of the property after mining operations, under the Jefferson County Official Development Plan zoning. The property (including buildings) may be sold, or re-used, or re-configured for industrial purposes based on the needs of the owner during reclamation; therefore, costs to remove or alter the buildings are not included.

Former ready mix plant Decommission and Restoration (Area south of Processing Area)

- The area to the south of the processing area constitutes approximately 75 acres. The area primarily consists of prairie/grassland and requires no reclamation since there no future plans to disturb the area. A former Ready Mix Plant foundation and associated electrical infrastructure do exist.
  - The Ready Mix Plant area is shown in the Attachments to Exhibit L and the remaining structure consists of various concrete footings and pads and miscellaneous electrical conduit/equipment.
  - Dimensions for the strip footings have been assumed, based on site reconnaissance, to be approximately 2 feet wide and 3 feet deep.
  - Dimensions for the concrete pad have been assumed, based on site reconnaissance, to be 6-inches thick by the pad area shown on the aerial images in the Attachments to Exhibit L. It is assumed that the pad contains steel rod reinforcing.
- The Ready Mix Plant area will be reclaimed using excess backfill material obtained from the processing operations. The excess backfill will be placed to a thickness of approximately 6 to 12 inches across the area.
- Soil testing will be performed on the excess backfill placed to identify possible amendments and fertilizer recommendations for seeding.
  - It is assumed that no additional soil amendments will be needed except for fertilizer.

List of Attachments to Exhibit L

L.1. Equipment List
L.2. Nearby Borrow Sources
L.3. Erosion Rill Repair Areas
L.4. Cut-Fill Summary for Quarry Area
L.5. Cut/Fill Map 1 – Existing Ground Surface Contours v. Mining Grading Map Contours
L.6. Cut/Fill Map 2 – Mining Grading Map Contours v. Reclamation Grading Map Contours
L.7. Area Measurements for Cost Analysis (1)
L.8. Area Measurements for Cost Analysis (2)

EXHIBIT L - RECLAMATION COSTS

Arcosa Lightweight Boulder
Permit M1988-108

Item No.	Item Description	Unit	Estimated Quantity	Estimated Unit Rate (USD)	Costs (USD)	Notes	2020 RS Means line number
I. MOBILIZATION/DEMOBILIZATION							
001	Mobilization/Demobilization - 50-ton capacity truck	Ea.	6	$ 1,620	$ 9,720	Assume 50-ton capacity truck to mob dozer, water truck, and excavator (see equipment list)	01 54 36 501600
002	Mobilization/Demobilization - 20-ton capacity truck	Ea.	8	$ 440	$ 3,520	Assume 20-ton capacity truck to mob dozer, grader, smooth-drum roller, and wheel loader (see equipment list)	01 54 36 501400
	MOBILIZATION/DEMOBILIZATON SUBTOTAL:				**$ 13,240**		
II. QUARRY AREA							
	Quarry Backfill and Interim Grading (This work will be performed during operations, however; a cost estimate is provided here regardless).						
003	Backfill - material generated from operations	CY	1,458,685	$ 1.43	$ 2,085,920	Backfill material is generated and stockpiled for reclamation during operations. 25% of mined material becomes backfill material (based on Arcosa operations experience and facility specific production rates). Backfill generated from mining operations will be placed within the quarry area, except for backfill used to reclaim the Ready Mix Plant area. Assumes backfill has been placed next to quarry area during operations, and a 300 HP dozer 300-ft hauls from stockpile to backfill location and track-compacts during backfill/grading.	31 23 23 145420
004	Grading - interim grading & shaping of reclamation slopes	SF	2,414,448	$ 0.04	$ 100,670	For entire mine area that is not currently reclaimed, west of HWY 93. Cost for rough grading for open sites, 75,100 - 100,000 SF, using ~30,000 lb-size grader. Includes ripping of quarry area bottom to prep for seeding. Assumes dozers, during backfill and grading operations, track-compacts slopes.	31 22 13 200280
005	Erosion Rill Repairs - Backfill, spread with dozer	CY	4,030	$ 3.20	$ 12,900	Erosion rill areas as shown (see attached Exhibit L). Assume soil is from onsite stockpile of backfill from process operations and dozer push is 300 ft. Dozer track-walks placed material to prep for seeding. Volume of material is assumed based on an average rill depth of 2 ft across entire rill area.	31 23 23 170190
006	Erosion Rill Repairs - Stabilization, Seeding, Fertilizing	SY	6,050	$ 0.37	$ 2,270	Assume area is to be hydroseeded with slope seed, fertilizer, and mulch for stabilization. Rate of application is approximately 6lb per 1000 SF (~260 lb/AC).	32 92 19 144600
	Stabilization						
007	Stabilization (mulch) - Quarry slopes	SF	1,884,620	$ 0.06	$ 107,010	Quarry Area side slopes steeper than 3:1 will be stabilized with straw mulch using a large power mulcher. Area shown on Exhibit F drawings.	32 91 13 160350
	Final Grading and Restoration						
008	Topsoil - Borrow and Loading	CY	34,910	$ 25.42	$ 887,420	Volume is equal to quarry area side slopes multiplied by 0.5 ft of topsoil thickness. Topsoil purchase and loading at a nearby borrow source area.	31 23 23 157080
009	Topsoil - Hauling	CY	34,910	$ 5.64	$ 196,900	Assumes 16.5 CY capacity truck, 50 MPH average speed, 30 mile round trip from borrow source, 15 minute wait/load/unload time	31 23 23 203110
010	Topsoil - Soil Placement and Final Grading	CY	34,910	$ 1.94	$ 67,730	Volume is equal to the quarry area side slopes multiplied by 0.5 ft of topsoil thickness. Assumes 105HP dozer backfilling, up to 300' haul from stockpile, track-compacted.	31 23 23 143310
	Seeding and Soil Amendments						
011	Soil Testing	AC	20	$ 35.00	$ 700	Assumes basic soil testing for Organic Content and pH. Recommendations for amendments by Lab. Price from Colorado State University soil testing lab for "Routine Soil and Overburden" testing suite. Quantity is 1 per 5 acres of quarry area (excluding already reclaimed areas)	pricing from CO State University lab
012	Fertilizer, and Seeding	SY	401,300	$ 0.37	$ 150,000	Area includes entire disturbed area within quarry area boundary, west of HWY 93. Ref Attachments to Exhibit L. Assumes seed, soil amendments/fertilizer included in hydroseed mix. All areas will by hydroseeded. Assumes no additional soil amendments will be necessary.	32 92 19 144600
	QUARRY AREA SUBTOTAL:				**$ 3,611,520**		
III. PROCESSING AREA							
	Interim Grading						
013	Rough-grading former stockpile area	SF	229,457	$ 0.04	$ 9,570	Assumes area within processing area will be graded prior to stabilization - refer to Attachments for Exhibit L. Area shown on Exhibit F-1.	31 22 13 200280
	Soil Berms						
014	Soil Berms - Backfill	CY	890	$ 0.66	$ 590	Assumes backfill from processing operations is already stockpiles. 300 HP dozer, 50-ft haul, common earth (backfill) placement in lifts (see compaction). Berms are 2 ft high, 2 ft wide, with 3H:1V slopes. Total berm lengths (as measured from Exhibit F - reclamation plan drawing) = 160+160+180 = 500 ft.	31 23 23 145020
015	Soil Berms - Compaction	CY	890	$ 0.27	$ 250	Assumes riding vibro-roller, 2 passes, 6-inch lifts for berm construction. Refer to equipment list.	31 23 23 235000
016	Soil Berms - Fertilizer and Seeding	SY	560	$ 0.37	$ 210	Surface area of berms: (4+2+4) x 500; seed mix, fertilizer included. Assumes no additional amendments will be necessary. Hydroseed method as above.	32 92 19 144600
	Stabilization						
017	Stabilization (mulch)	SF	229,457	$ 0.06	$ 13,030	Assumes 5-acre area within processing area will be stabilized with straw mulch using a large power mulcher. Area shown on Exhibit F drawings.	32 91 13 160350
	PROCESSING AREA SUBTOTAL:				**$ 23,650**		
IV. FORMER READY MIX PLANT DECOMMISSION/RESTORATION							
	Demolition of Structures						
018	Demolition - concrete pad	SF	8,640	$ 0.70	$ 6,050	Assume 6-inch thick, slab on grade, rod reinforcing	02 41 16 170440
019	Demolition - concrete footing	LF	1,010	$ 14.46	$ 14,610	Assume 2-ft thick, 3 ft wide strip footings, length as measures on Exhibit L Attachments.	02 41 16 171140
020	Demolition - electrical miscellaneous	LS	1	$ 3,300	$ 3,300	The extent and types of electrical fixtures remaining at the former Ready mix plant are not known; therefore, assume removal of 1 single-phase 75 kVA transformer, and up to 500 LF of underground electrical conduit (4-6 inch, galvanized steel conduit). Includes disposal costs.	26 05 05 101420 (transformer), and 100160
021	Disposal	Ton	40.0	$ 74	$ 2,960	Disposal of concrete at landfill. Assumes concrete unit weight is 145 lb/cyd.	02 41 19 200100
	Restoration						
022	Backfill - material generated from operations	CY	1,670	$ 1.43	$ 2,390	Volume calculated as 89,971 square foot Ready mix plant area (shown on Exhibit L attachments), Material will be backfill remaining after backfill is placed in quarry area to achieve reclamation grades. Assumes dozer backfilling, up to 300' haul from stockpile, track-compacted.	31 23 23 145420
023	Soil Testing	AC	2	$ 35.00	$ 70	Assumes basic soil testing for Organic Content and pH. Recommendations for amendments by Lab. Price from Colorado State University soil testing lab for "Routine Soil and Overburden" testing suite. Quantity is 1 per acre of Ready mix plant area to be reclaimed with backfill	pricing from CO State University lab
024	Fertilizer and Seeding	SY	230	$ 0.37	$ 90	Assumes hydroseed method, no amendments will be necessary. Cost for seed and fertilizer. Area based on topsoil area referenced above.	32 92 19 144600
	Ready mix PLANT DECOMISSION/RESTORATION SUBTOTAL:				**$ 29,470**		
	TOTAL ESTIMATED RECLAMATION COSTS:				**$3,677,880**		

Notes:

1. CY = cubic yards, SY = square yards, LF = linear feet, LS = Lump Sum, AC = acre.
2. "Unit Rate" and "Costs" column items are provided in United States dollar (USD).
3. Individual cost items are rounded up to the nearest ten (USD).
4. Costs listed above are estimated Direct Costs (RS Means Bare Costs), and do not include Indirect Costs (overhead and profit, DMRS oversight, construction management, etc). DRMS will assess Indirect Costs and notify Arcosa of those costs prior to bonding.

Exhibit L Attachments

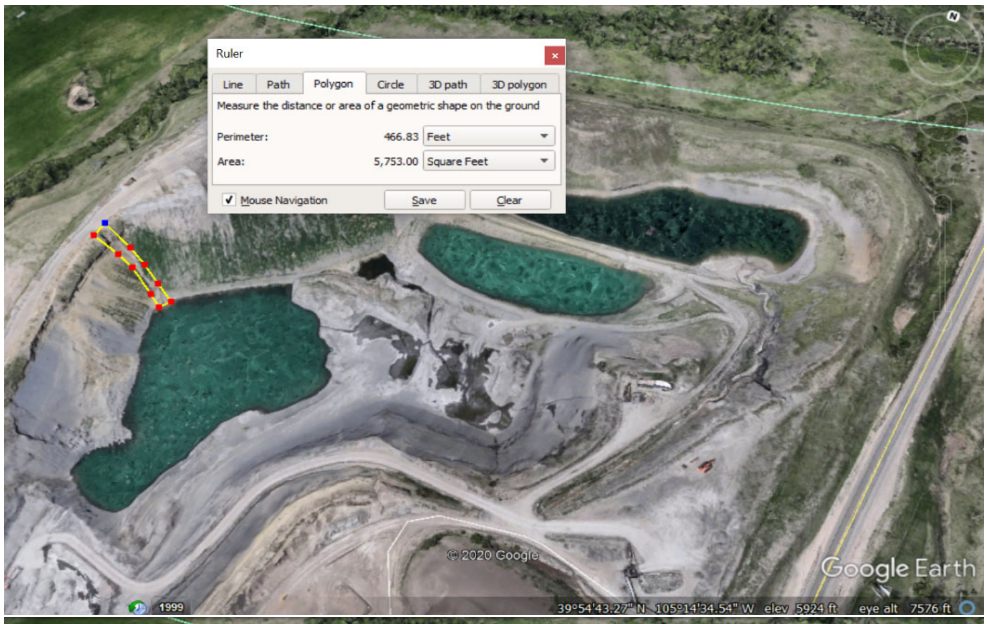
ATTACHMENT L.1 - EXHIBIT L
Equipment List for Reclamation Activities
Arcosa Lightweight Facility

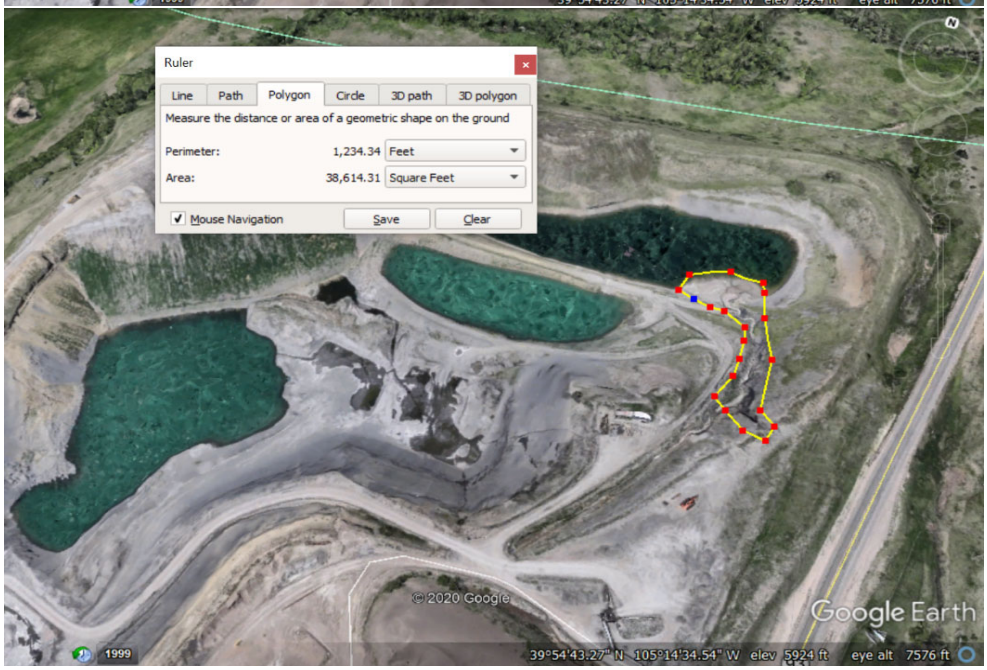
Equipment	Approximate Weight (tons)	Purpose	Reference
Caterpillar Dozer with ripper blades - D8R (305 hp)	41	Grading final reclamation slopes in Quarry Area, ripping bottom of quarry area for reseeding prep, spreading backfill and topsoil, grading/shaping process area diversion berms	Caterpillar performance handbook (2010)
Caterpillar Dozer - D6K (125 hp)	14	Grading final reclamation slopes in Quarry Area, ripping bottom of quarry area for reseeding prep, spreading backfill and topsoil, grading/shaping process area diversion berms	Caterpillar performance handbook (2010)
Caterpillar Motor Grader - 120M	16	Grading and fine-grading restoration slopes, ripping bottom of quarry area for seeding prep	Caterpillar performance handbook (2010)
Caterpillar Excavator 345C with Demo arrangement (assume 8000 ft-lb demo hammer)	56	Demolition of concrete pad	Caterpillar performance handbook (2010)
Caterpillar Wheel Loader 907H	7	Demolition and load-out of materials for disposal, stockpile management	Caterpillar performance handbook (2010)
Caterpillar smooth drum roller - CS423E	7	Berm construction/compaction	Caterpillar performance handbook (2010)
4. The backfill remaining after achieving reclamation gra	50 (assumed)	Dust mitigation	--

ATTACHMENT L.2 - EXHIBIT L
Nearby Borrow Sources
Arcosa Lightweight Facility

Company	Name	Material	Address	Distance from Arcosa
Burnco	Jeffco	Concrete and aggregate	10888 CO-93, Golden, CO 80403	#VALUE!
Martin Marietta	Aggregate Dispatch	Aggregates	1627 Cole Blvd Ste. 200 Lakewood, Colorado 80401	12 miles
Martin Marietta	Spec Agg Quarry	Aggregates	18401 West Colfax Ave Golden, Colorado 80401	13 miles
Martin Marietta	Gordon Yard	Aggregates	2000 W 64th Ave. Denver, Colorado 80221	13 miles
Colorado Landscaping Material	Quarry in Longmont, CO	Topsoil, Amended topsoil	1541 Boston Avenue, Longmont, CO 80501	21 miles
4. The backfill remaining after achi	Riverbend Sand & Gravel	Sand and gravel	12673 County Road 6 Brighton, Colorado 80603	23 miles
Boral Aggregates	Brighton Bromley Lakes Plant	Aggregates and more	14585 Brighton Rd. Brighton, CO 80601	35 miles
Pioneer	Fort Lupton Quarry	Sand/aggregate	9477 Co Rd 25, Fort Lupton, CO 80621	37 miles
Varra Companies	Platteville Pit #115	Sand and gravel	8490 Highway 66 Platteville, CO 80651	47 miles
Pioneer	Quincy Quarry	Sand/aggregate	Airline Rd, Bennett, CO 80102	63 miles
Varra Companies	Greeley Pit #120	Sand and gravel	1431 East 16th Street Greeley, CO 80631	64 miles

ATTACHMENT L.3 - EXHIBIT L
Erosion Rill Repair Areas
Arcosa Lightweight Facility





*Assume erosion rill average depth is 2 feet across entire rill area.
**Sediment in mine area will be removed during operations.

ATTACHMENT L.4 - EXHIBIT L
Cut-Fill Summary for Quarry Area
Arcosa Lightweight Facility

Figure References	Activity Description	Volume of Material To Be Mined (yd3)	Backfill Generated (yd3)	Total Available Backfill (yd3)	Backfill Required to Achieve Reclamation Grades (yd3)	Available Backfill Remaining After Reclamation (yd3)
Cut/Fill Map 1 - showing Exhibit C-1 (Existing ground surface topography) compared to Exhibit C-4 (Mine Grading Map)	**Operations Activity:** Mine quarry area from current conditions to current mining plan extents (Exhibit C-4).	5,841,322	1,460,330	1,460,330	4,184	-
Cut/Fill Map 2 - showing Exhibit C-4 compared to Exhibit F-2	**Reclamations Activity:** Once at mining plan extents, backfill quarry area to reclamation plan grades (Exhibit F-2).	101	25	1,460,356	1,453,326	7,029

Notes:

1. Cut/Fill maps are attached to Exhibit L as supplemental documents.

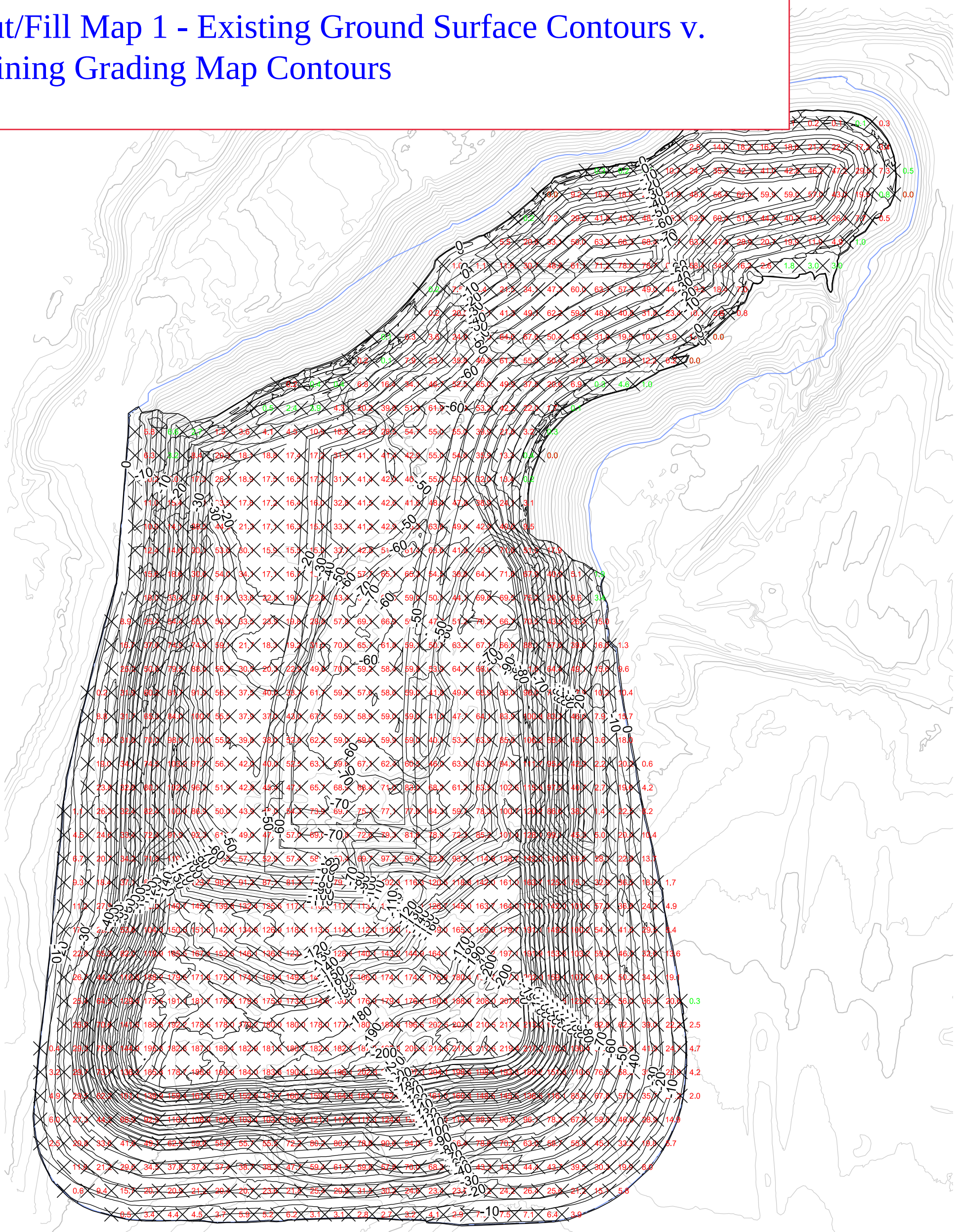
2. Volumes are obtained from a comparison of topographic contours for the representative exhibits using a computer aided drafting program (AutoCAD Civil 3D).

3. Backfill generated volume is calculated as 25% of the volume of material mined (i.e., cut) to achieve the target grades. This is based on Arcosa's operational requirements, processing needs and records, and facility-specific experience.

4. The backfill remaining after achieving reclamation grades will be (i) used in reclamation of the Ready Mix Plant area (spread across the Ready Mix Plant area between 0.5 and 1-ft thick, amended, and seeded); and (ii) the remaining will be spread across approximately 4.3 acres of the bottom of quarry and 10-acre pond to a thickness of 1-ft thick as needed. This material, per the Reclamation Plan, will be prepped, amended, and seeded for reclamation.

ATTACHMENT L.5 - EXHIBIT L

Cut/Fill Map 1 - Existing Ground Surface Contours v. Mining Grading Map Contours



Cut/Fill Summary

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill
Exist vs Mining 5999	1.000	1.000	2415252.42 Sq. Ft.	5841321.57 Cu. Yd.	4183.78 Cu. Yd.
Mning 5999 vs Reclam	1.000	1.000	2414447.82 Sq. Ft.	100.62 Cu. Yd.	1453326.20 Cu. Yd.
Totals				5841422.19 Cu. Yd.	1457509.98 Cu. Yd.

0 200

SCALE IN FEET

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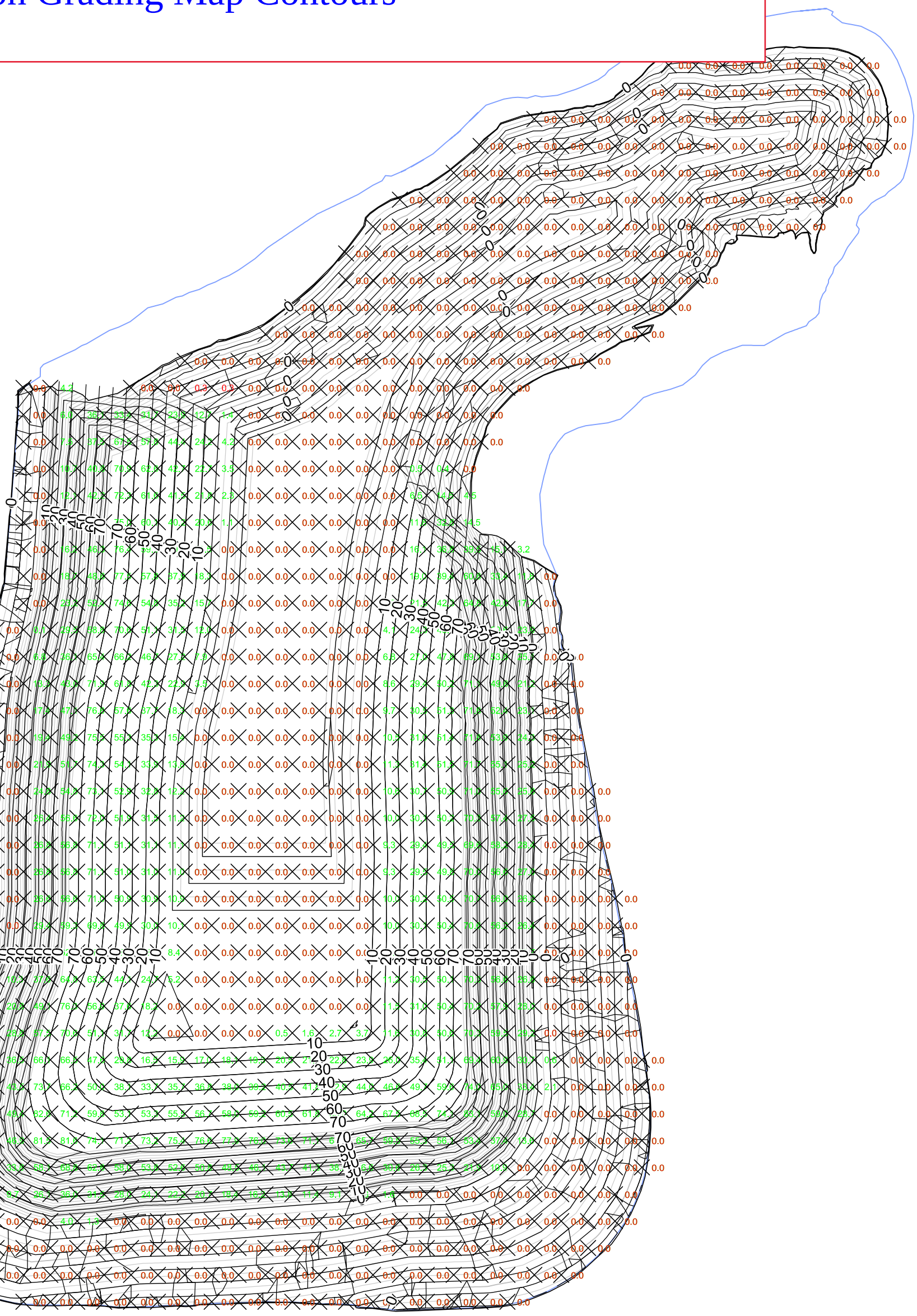
ATTACHMENT L.6 - EXHIBIT L

Cut/Fill Map 2 - Mining Grading Map Contours v. Reclamation Grading Map Contours



Cut/Fill Summary

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill
Exist vs Mining 5999	1.000	1.000	2415252.42 Sq. Ft.	5841321.57 Cu. Yd.	4183.78 Cu. Yd.
Mning 5999 vs Reclam	1.000	1.000	2414447.82 Sq. Ft.	100.62 Cu. Yd.	1453326.20 Cu. Yd.
Totals				5841422.19 Cu. Yd.	1457509.98 Cu. Yd.

N

0 200

SCALE IN FEET

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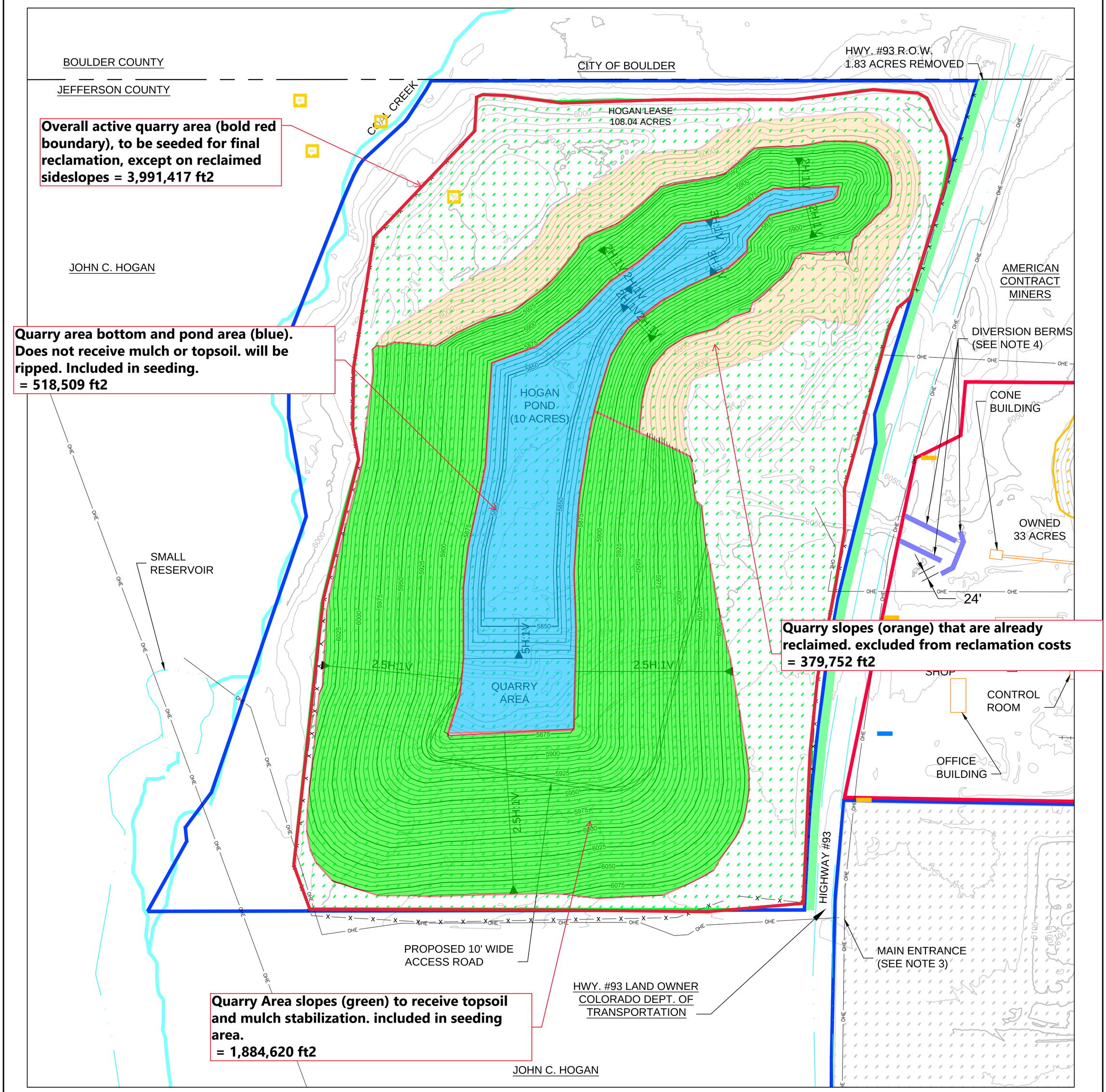
ATTACHMENT L.7 - EXHIBIT L

AREA MEASUREMENTS FOR COST ANALYSIS (1)

(This attachment is adapted from Exhibit F-2).



MANAGEMENT AREA	MEASURE	APPLICATION
FINAL RESTORATION AND VEGETATION	PERMANENT SEED MIX AND AMENDMENTS. SEED MIX AND AMENDMENTS WILL BE PER REQUIREMENTS IN EXHIBIT E, AND ACCORDING TO AG-EXTENSION RECOMMENDATIONS.	APPLY TO ALL DISTURBED AREAS THAT ARE TO BE RECLAIMED AS APPROPRIATE. APPLICATION REQUIREMENTS ARE DESCRIBED IN EXHIBIT E.
MULCH	MULCH WILL BE STRAW OR HAY AND OF AN ORIGIN AND CONSISTENCY CONSISTENT WITH THE INTENDED USE.	APPLY MULCH TO AREAS WITHIN THE PROCESSING AREA THAT WILL BE STABILIZED (UP TO 5 ACRES). THE PROCESSING AREA WILL REMAIN IN PLACE POST-RECLAMATION.
CURRENTLY VEGETATED AND STABLE	NO ADDITIONAL MEASURES ARE NEEDED FOR VEGETATED/STABILIZED AREAS OF THE SITE.	NONE

NOTES:

1. TOPOGRAPHY INFORMATION WAS OBTAINED BY ARCOSA USING AN UNMANNED AERIAL DRONE SURVEY OF THE SITE IN JUNE 2019, AND PROVIDED TO GEOSYNTEC FOR MAPPING PURPOSES.
2. STRUCTURE OWNERS AND STRUCTURE DESCRIPTIONS ARE LISTED IN TABLE 1 OF EXHIBIT "S". EXCEL ENERGY AND CENTURY LINK OWN UTILITIES IN THE HIGHWAY 93 RIGHT OF WAY (ROW).
3. MAIN ENTRANCE IS LOCATED AT 39.9068779 LATITUDE, -105.2409362 LONGITUDE.
4. DIVERSION BERMS WILL BE INSTALLED WITHIN THE PROCESSING AREA TO DIVERT SURFACE WATER RUNOFF AWAY FROM THE HWY #93 UNDERPASS AND QUARRY AREA TO THE WEST.
5. RECLAMATION IS TO OCCUR CONSISTENT WITH THIS PERMIT AND THE JEFFERSON COUNTY OFFICIAL DEVELOPMENT PLAN. AFFECTED LANDS SHOWN ON EXHIBIT C WILL BE CONVERTED TO THE POST-RECLAMATION LAND USE AREAS (E.G., RANGELAND, INDUSTRIAL) SHOWN HEREON BE THE RECLAMATION BOUNDARIES.

N

0 350

SCALE IN FEET

LEGEND:

- POST-RECLAMATION INDUSTRIAL USE
- RANGELAND
- HWY. #93 WALKING PATH ACREAGE REDUCTION (1.83 ACRES)
- BILLBOARD
- ABANDONED RAILROAD CAR
- FENCELINE
- OVERHEAD POWER LINE
- RAILROAD TRACKS
- OUTLINE OF VARIOUS STRUCTURES, SEE LIST OF STRUCTURES AND EXHIBIT "S"

ARCOSA

LIGHTWEIGHT BOULDER PLANT #1604

JEFFERSON COUNTY, COLORADO

QUARRY AREA RECLAMATION

ARCOSA

EXHIBIT F-2

PERMIT M-1988-108 | FEBRUARY 2020

REV #	DESCRIPTION	DATE	BY	CHK	APP
0	ISSUE FOR PERMIT REVIEW	2/28/20	PS	JG	MR

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ATTACHMENT L.8 - EXHIBIT L
AREA MEASUREMENTS FOR COST ANALYSIS (2)
(This attachment is adapted from Exhibit F-1).

BOULDER COUNTY
JEFFERSON COUNTY
CITY OF BOULDER
COAL CREEK
HOGAN LEASE
108.04 ACRES
HWY. #93 R.O.W.
1.83 ACRES REMOVED
JOHN C. HOGAN
HOGAN POND
(10 ACRES)
QUARRY AREA
2.5H:1V
5H:1V
Rough-grading former stockpile area, receives stabilization (mulch) = 229,457 ft2
AND TEMPORARY STORAGE CONTAINERS
DIVERSION BERMS (SEE NOTE 4)
CONE BUILDING
US DEPT. OF ENERGY
EXTRUDER BUILDING
OWNED 33 ACRES
RAW SHALE STORAGE
RAW SHALE STORAGE
NATURAL GAS BUILDING
24'
BAGHOUSE #3
WAREHOUSE / SHOP
WATER TOWER
CONTROL
Berm lengths = 150 + 175 + 160 = 485 (round to 500) ft
OFFICE BUILDING
SCRUBBER ROOM
MCC ROOMS
SMALL RESERVOIR
SMALL RESERVOIR
PROPOSED 10' WIDE ACCESS ROAD
HIGHWAY #93
MAIN ENTRANCE (SEE NOTE 3)
HWY. #93 LAND OWNER
COLORADO DEPT. OF TRANSPORTATION
JOHN C. HOGAN
FORMER READY MIX PLANT AND FOUNDATION STRUCTURES
US DEPT. OF ENERGY
HOGAN LEASE
64 ACRES
Ready Mix Plant area = 89,971 ft
Foundation lengths = 180 + 166 + 422 + 240 ft = 1010 ft
one foundation pad - area = 8,640 ft2
HIGHWAY #93
HOGAN LEASE
11 ACRES
SOUTH BOULDER DIVERSION CANAL
UNNAMED CREEK
STORMWATER DITCHES ALONG HWY. #93
JOHN SAINSBURY
ROCK CREEK
JOANN T. SHARP REV. TRUST

NOTES:

1. TOPOGRAPHY INFORMATION WAS OBTAINED BY ARCOSA USING AN UNMANNED AERIAL DRONE SURVEY OF THE SITE IN JUNE 2019, AND PROVIDED TO GEOSYNTEC FOR MAPPING PURPOSES.
2. STRUCTURE OWNERS AND STRUCTURE DESCRIPTIONS ARE LISTED IN TABLE 1 OF EXHIBIT "S". EXCEL ENERGY AND CENTURY LINK OWN UTILITIES IN THE HIGHWAY 93 RIGHT OF WAY (ROW).
3. MAIN ENTRANCE IS LOCATED AT 39.9068779 LATITUDE, -105.2409362 LONGITUDE.
4. DIVERSION BERMS WILL BE INSTALLED WITHIN THE PROCESSING AREA TO DIVERT SURFACE WATER RUNOFF AWAY FROM THE HWY #93 UNDERPASS AND QUARRY AREA TO THE WEST.
5. RECLAMATION IS TO OCCUR CONSISTENT WITH THIS PERMIT AND THE JEFFERSON COUNTY OFFICIAL DEVELOPMENT PLAN. AFFECTED LANDS SHOWN ON EXHIBIT C WILL BE CONVERTED TO THE POST-RECLAMATION LAND USE AREAS (E.G., RANGELAND, INDUSTRIAL) SHOWN HEREON BE THE RECLAMATION BOUNDARIES.

MANAGEMENT AREA	MEASURE	APPLICATION
FINAL RESTORATION AND VEGETATION	PERMANENT SEED MIX AND AMENDMENTS. SEED MIX AND AMENDMENTS WILL BE PER REQUIREMENTS IN EXHIBIT E, AND ACCORDING TO AG-EXTENSION RECOMMENDATIONS.	APPLY TO ALL DISTURBED AREAS THAT ARE TO BE RECLAIMED AS APPROPRIATE. APPLICATION REQUIREMENTS ARE DESCRIBED IN EXHIBIT E.
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CURRENTLY VEGETATED AND STABLE	NO ADDITIONAL MEASURES ARE NEEDED FOR VEGETATED/STABILIZED AREAS OF THE SITE.	NONE

N
0 520
SCALE IN FEET

LEGEND:
- POST-RECLAMATION INDUSTRIAL USE
- RANGELAND
- HWY. #93 WALKING PATH ACREAGE REDUCTION (1.83 ACRES)
- BILLBOARD
- ABANDONED RAILROAD CAR
- FENCELINE
- OVERHEAD POWER LINE
- RAILROAD TRACKS
- OUTLINE OF VARIOUS STRUCTURES, SEE LIST OF STRUCTURES AND EXHIBIT "S"

ARCOSA
LIGHTWEIGHT BOULDER PLANT #1604
JEFFERSON COUNTY, COLORADO

RECLAMATION MAP

ARCOSA

EXHIBIT F-1

PERMIT M-1988-108 | FEBRUARY 2020

REV #	DESCRIPTION	DATE	BY	CHK	APP
0	ISSUE FOR PERMIT REVIEW	2/28/20	PS	JG	MR

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