ADAMS
RESOURCE
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FINAL NORTH CKD AREA CLOSURE PLAN

AND

POSTCLOSURE MONITORING AND MAINTENANCE PLAN

RMC Pacific Materials, LLC
700 Highway 1
DAVENPORT, CALIFORNIA
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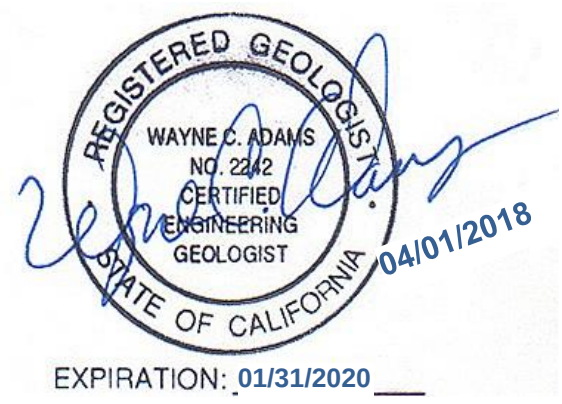
Prepared by:
Adams Resource Consultants Company



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EXECUTIVE SUMMARY

This document presents final modifications to the Closure Plan (design) and is an update of the Conceptual Final CKD Closure Plan, previously prepared by Adams Resource Consultants and dated April 13, 2017. The Closure Plan is for the project site Landfill commonly referred to as the North Cement Kiln Dust (CKD) Area located at the RMC Pacific Materials, LLC (referred to herein as CEMEX) Davenport Cement Plant (Plant) in Davenport, California. The southern portion of the project site is on property owned by CEMEX. As of the date of this Plan the northern portion of the project site is located on property leased from the Coast Dairies and Land Company (CDLC). Closure activities will extend beyond the CDLC lease lines in some locations. The site also contains identified habitat for the California red-legged frog, (*Rana aurora draytonii*) (CRLF), a federally-listed threatened species. Portions of this plan may be subject to landowner and agency approvals and negotiations.

The North CKD Area is subdivided into Areas 1 (northernmost extent of CKD), 2, and 3 (southernmost extent of CKD). The CKD Closure is planned to occur over two consecutive construction seasons with proper monitoring and interim erosion and sediment control measures in place to protect the site over the winter months.

Drainage improvements for the surface water run-on and runoff will be constructed including placement of a new 42-inch bypass pipe to direct run-on around the North CKD Area. Once the CKD project site has been filled and graded to reach final elevations, the perimeter ditches, French Drain and other ditches will receive final grading. The CKD Areas 1, 2 and 3 will receive a final low permeability cap and protective soil layer that extends below the perimeter drainage ditches. The low permeability cap will consist of welded sheets of textured 60 mil linear low-density polyethylene (LLDPE) liner overlain by a geo-composite drainage net that is in turn overlain by a compacted 18-inch protective cover soil (PCS) and an 8-inch vegetative soil layer. The surface of the perimeter ditches will consist of a rock-filled geocell lining. Where grades allow, a French Drain system will extend to depths equal to the perimeter ditches in order to intercept potential stormwater run-on and shallow ground water that could build-up against the outside edge of the lined perimeter ditches. The French drain will consist of an 8-inch diameter perforated polyvinyl chloride (PVC) pipe enclosed in drain rock and surrounded by filter fabric. Additional work efforts will include constructing a steel-reinforced soil nail wall and shotcrete cover on a lower steep slope at the southwest face of the North CKD Area and seeding/planting vegetation on the surface of the capped Landfill.

The construction of the final CKD closure for Areas 1, 2 and 3 will require a substantial amount of regrading to lower its overall height to an elevation and slope that approximates the adjacent topography. The construction will proceed by excavating and moving CKD to establish the

surface for placement of the synthetic liner (cap) system. With the exception of a lower steep southwest face in Area 3, final slopes for the vast majority of that CKD grading will be less than 13.3 percent (or less than about 7.6 degrees).

One exception to this graded slope design involves the steep area on the lower portion of the southwest face of Area 3. This area will be reinforced with soil nails for slope stability and covered with a 6-inch thick steel-reinforced permanent shotcrete wall for erosion control and to deter infiltration. Slope stability is not considered an issue for this area as described further below in main body of this report and covered in detail in the Final Geotechnical Design Report, Appendix C. Slope stability calculations indicate that stability considerations governed by the seismic (earthquake) condition and predicted maximum deflections under the Maximum Credible Earthquake (MCE) meet Title 27 requirements. Geotechnical subsurface investigations and the data and observations resulting from that effort were applied to the stability analysis in Appendix C.

Stormwater runoff from the North CKD Area is routed into a stormwater Retention Pond, which is located to the southwest of the North CKD Area and adjacent to the former coal unloading and stockpile area. As part of the North CKD Area Closure, residual coal on the ground surface in the vicinity of the Retention Pond and sediment deposited in the Retention Pond will be excavated as part of remedial activities in the area. Soil and sediment excavated from in and around the Retention Pond will be placed into the CKD Landfill prior to placement of the final cap.

Ongoing groundwater monitoring will continue during and after closure activities until determined by the agencies and CEMEX that monitoring is no longer necessary.

The following report, including associated documents, contains the details of the Closure Plan and is submitted in compliance with the WDRO (Appendix H) and Title 27.

The timing and execution for this project relies heavily on the involvement and approval of the various agencies and municipalities that are part of this Plan including but not limited to review and permitting.

1.0 INTRODUCTION AND PROJECT BACKGROUND

This document presents the Final Closure Plan for the North Cement Kiln Dust (CKD) Area located at the CEMEX Davenport Cement Plant (Plant) in Davenport, California. The Central Coast Regional Water Quality Control Board (WB) most recently provided comments on the April 13, 2017 Conceptual Final CKD Closure Plan in August 2017 and the new February 2018 Waste Discharge Requirements (WDR) Order No. R3-2018-0001 was issued with additional requirements for the Landfill closure. The WDR is included in Appendix H.

In particular, this document includes revisions to address the most recent review comments/suggestions from the WB. CEMEX has been working with Adams Resource Consultants Company (ARC), TRC Environmental Corporation (TRC) and EcoSystems West Consulting Group (ES) to address the CKD pile, adjacent land and various ponds at the project site. This Final Closure Plan has been prepared to reflect CEMEX's current understanding of relevant regulatory requirements and allow the WB to proceed with their review/permitting process for the execution of the closure at the project site.

During preparation of the Final Geotech Design Report, design assumptions were confirmed, when possible. Additional design information and plans, including a site specific geotechnical investigation and the specific details to complete the soil nailed wall, are included as Appendix C. The location details for the soil nail wall, bypass pipe and other excavations were of key importance during the geotechnical subsurface investigation. The data collected was used to complete stability calculations and provide necessary data for the bidding process, such as the conditions at the depth of excavation or anchoring and material characteristics near ditch and pipe locations. Stability calculations include the static and dynamic thresholds required to maintain reasonable limits of deflection in accordance with Title 27 of the California Code of Regulations.

The project site is located adjacent to Highway 1 (Hwy 1), along the California coast, north of Santa Cruz (as shown on Sheet 1 of the Plans). The Plant has two areas of associated deposits of CKD. The older closed CKD area is at the southeast portion of the Plant and is known as the "Lonestar Closed CKD Area." The North CKD Area is the subject of this Final Closure Plan and is the subject of this report wherever terms such as CKD, Closure Plan, design, and project site or project area are used.

The southern portion of the project site is on property owned by CEMEX. The northern portion of the project site is on property leased from Coast Dairies and Land Company (CDLC). Closure activities will extend beyond the lease lines in some locations. Titled land ownership is currently shown as either CEMEX or CDLC as indicated on Sheets G1 and G2. The project site also

contains identified habitat for the California red-legged frog (CRLF), a federally listed threatened species. Portions of this plan may require additional landowner and agency approvals before construction can proceed. CEMEX will continue to cooperate with various regulatory agencies and stakeholders, as needed, to obtain approval. Landowner and agency cooperation is essential but may require changes to the project schedule and Final Closure Plan.

CEMEX has been working with the WB for many years. The first conceptual Closure Plan for the North CKD Area was completed for CEMEX and submitted to the WB in 2002 by Pincock Allen & Holt (PAH) with the expectation that a revision to the Plans would be needed after CKD recycling was complete. Once the recycling program came to a close, Adams Resource Consultants (ARC) was selected by CEMEX to complete the update in response to the letter titled "Land Disposal Program: CEMEX Davenport Cement Plant, Santa Cruz County – Request for Report of Waste Discharge" by the WB, dated July 29, 2011.

The request letter from the WB describes the need to revise the WDR Order No. 99-23 (issued for the North CKD Area) and WDR Order No. 94-66 (covering the now closed Lonestar Closed CKD Area). The WB combined these two WDR Orders and required that CEMEX submit a Report of Waste Discharge (ROWD) application package for the North CKD Area.

CEMEX received an email from the WB dated August 12, 2016 titled "2012 Closure Plan Comments to Facilitate Revision of the WDRs and Closure." CEMEX, ARC and TRC immediately began working on addressing these comments and meeting with other appropriate entities (including the United States Fish and Wildlife Service) to determine the correct parameters for design.

CEMEX received a letter from the WB dated February 22, 2017 titled; "Land Disposal Program: CEMEX Davenport Cement Plant Inactive North CKD Area – Water Code 13267 Order for Final Closure Plan Requirements and Submittal Due Date," which outlined the required clarifications related to a design.

The February letter stated requirements that the engineered drainages meet the 1,000-year, 24-hour design storm event. Previous closure documents and meetings had outlined the use of the 100-year, 24-hour storm event to size such items as the perimeter ditches, drop structures and conveyance pipes with the rationalization that the CKD was a legacy site, with some portions inactive for more than 65 years and not meant for disposal. At the request of the WB, and as required by Title 27, this Final Closure Plan includes an evaluation of the effects of a 1,000-year, 24-hour design storm event on the stormwater conveyance system associated with the North CKD Area, as described in the hydraulic analysis report included in Appendix A. Furthermore,

the stormwater conveyance features to be constructed as part of the North CKD Area closure have now been designed to pass the 1,000-year, 24-hour design storm.

CEMEX received a thorough set of comments from the WB, regarding the April 13, 2017 Conceptual Final CKD Closure Plan, in an email titled "Informal Comments on the Conceptual Closure Plan", dated August 11, 2017" and letter titled: "Land Disposal Program: CEMEX Davenport Cement Plant Inactive North CKD Area – Conceptual Final Closure Plan and Post-Closure Monitoring and Maintenance Plan Conditional Approval," dated August 24, 2017. Revisions to address these comments were incorporated where ever possible and practical based on the latest revisions.

The WB issued a revised WDR titled; "Waste Discharge Requirements Order No. R3-2018-0001, Waste Discharge Identification No. 3 442004001, For CEMEX Davenport Cement Plant CKD Landfills" dated February 8, 2018. This WDR Order is an update that replaces previous WDR Order Nos. 99-23 and 94-66 and applies to both Landfills at the Plant.

Several key documents are referred to in this Final Closure Plan and will be relied on either in part or in full and considered part of our submitted design. These documents are listed in the Selected References section at the end of this report. With the exception of the report by CH2M Hill (1995), these documents are referenced with the previous submittals in 2002, 2012 and 2017.

1.1 General Description of North CKD Project Area

The project area contains valley fill composed mainly of CKD currently estimated to be approximately 848,000 cubic yards (cy) (see Table 1), much of it in a cemented, very dense "caked" condition. The CKD was placed within an existing canyon and has reached the elevation of the canyon rim such that the area of the pile is either flat or rises above the surrounding land elevation. Until the plant shutdown in 2010 the some of the upper CKD pile was recycled and hauled away. Based on the chemistry of the CKD and market demand, CEMEX has determined that no additional CKD can be feasibly recycled from the project area for soil amendments, road stabilization, soil amendment, or other uses. The North CKD Area has performed well under significant storm events since the first deposition and has shown no signs of significant degradation or erosion. It is important to note in considering existing stability conditions that the steepest portion of the CKD, at the west end, have shown no signs of seepage, sloughing or movement over time.

The North CKD Area is subdivided into three adjacent work areas, as shown on (Sheet C1) of the Plans. Area 1 (Farm CKD Area 1) is the farthest north, at the head of the backfilled canyon,

contains mainly CKD and the entire area was covered by approximately 18 inches of topsoil. Area 1 has remained largely undisturbed for over 65 years, returning to grassland about 10 years ago (see Figure 1). The focus of this Closure Plan includes Area 1 (Farm CKD Area 1), Area 2 (Plant "Old" CKD Area 2) and Area 3 (Plant CKD Pile Area 3).

1.2 Summary of Closure Actions

We anticipate that the CKD Closure will occur over two construction seasons based on the amount of work required, narrow access for construction equipment ingress/egress and reasonably anticipated weather restrictions associated with wind and rain. All necessary permits will be obtained with input from the Contractor where necessary, then the Contractor will submit the construction plan and schedule, setup operations, clear and grub the work areas and mobilize equipment and materials according to an approved plan and schedule. During clearing, the Contractor will prepare the area by removing materials that may be in the way of grading/construction, including but not limited to, trees, shrubs, topsoil to be stockpiled, cement blocks, tires and plastic sheeting. Deleterious material or excess fill not used to complete the CKD Closure work will be hauled off-site as part of the contract unless otherwise approved to remain on-site by CEMEX and appropriate regulatory agencies. Once the work area is prepared, some of the drainage improvements for the surface water run-on and runoff, including the North Pond Bypass, will be constructed. The Retention Pond sediments excavated during the first season will be moved to the Former Coal Storage Area for drying. The sediments and residual coal will be moved to the North CKD Area in the second season for moisture conditioning and mixing, along with any additional fill from trenching, sediments and soil from final fine grading of the Retention Basin. Details for the Retention Pond are provided in Appendix D.

If there is available fill volume under the final rough grade target elevations, some non-hazardous facility stockpiled materials may be mixed and blended with the CKD for incorporation into the final Landfill. Appropriate sediment control measures will be installed prior to any earthwork.

The Retention Pond sediments excavated during the first season will be moved to the Former Coal Storage Area for drying. The sediments and residual coal will be moved to the North CKD Area in the second season, along with any additional fill from trenching, sediments and soil from final fine grading of the Retention Basin.

Grading for drainage will not include filling the Seasonal Ponds alongside Area 2. The Seasonal Ponds will be part of a habitat enhancement effort, as shown on Sheet DR9, as advised by California Department of Fish and Wildlife in consideration of CRLF habitat. Once the CKD

project area has reached final elevations (see Sheets G1 and G2), the perimeter ditches along with adjacent French Drains will receive final grading according to the Plans and specifications, then the CKD area will receive the impervious liner/cap and cover soil as shown on the drawings. Pipes, drop structures and manholes will be placed according to the design. Final restoration work will include: a) planting the cover soil and hydroseeding disturbed the work areas and b) installing the rock-filled geocell to serve as a flexible erosion control layer in the ditches and swales.

The low permeability cap will consist of welded sheets of textured 60 mil linear low-density polyethylene (LLDPE). The LLDPE will form a continuous impervious layer overlain by a geocomposite drainage net layer and this synthetic system will be placed over the compacted CKD. The capped Landfill area will be overlain by a 26-inch thick soil cover to provide liner protection and support vegetative cover, see Section 4.3 below.

The closure work will include the major tasks listed below. Note that the order of construction activities may vary based on the schedule proposed by the selected contractor(s).

1.2.1 Construction Stormwater and Dust Management

Stormwater during construction will be managed in accordance with the Wet Weather Preparedness Plan in Appendix E. Prior to beginning construction, a stormwater pollution prevention plan (SWPPP) will be prepared and submitted to the State Water Resources Control Board with a Notice of Intent to comply with the State of California Construction Stormwater General Permit. Best management practices to prevent sediment and pollutants from discharging in stormwater will be implemented throughout the project, stormwater will be monitored, and reporting will be conducted in accordance with the Wet Weather Preparedness Plan and the SWPPP.

Throughout the construction activities, dust will be minimized to the extent feasible, monitored, and managed in accordance with the Dust Mitigation Plan in Appendix F.

1.2.2 Regrade and Complete Site Drainage Improvements

A) Survey property lines and relevant construction features. Staking shall include property lines, work areas, pipelines, utilities including utility locate, ditches, and preliminary grades.

B) Upgrade existing 30-inch corrugated metal pipe (CMP) bypass drain system by removing or abandoning the 30-inch CMP and placing a new 42-inch pipe (Bypass Pipe), which will convey flow from the North Pond to “No-name Creek.”

C) Excavate Retention Pond sediment. This pond will be drained, then the exposed sediment excavated, dried in windrows and the sufficiently dry sediment placed in the North CKD Area after site preparations are complete. Once drying has been completed volume estimates, that include shrink and swell factors for the placed and compacted volumes of transported material will be provided by the Contractor before movement. The soil material from the pond and adjacent coal storage area may require mixing and blending in the CKD area before final grading. Details are provided on Sheets DR5, DR6 and in Appendix G.

D) Begin site preparations related to and including mass grading in Areas 1, 2 and 3. These preparations will facilitate the creation of rough grades for such features as perimeter drainage ditches, perimeter French Drains, staking for excavation and/or filing as necessary to achieve finish foundation grades for placement of the liner system as shown on the Plans.

E) Subject to the approval of the appropriate agencies and landowners, clear vegetation and remove excess sediment from the North Pond where necessary to expose the existing pipe inlet(s) and outlet(s). Stockpile useable sediment for use in regrading (as topsoil). Modify North Pond for placement of Bypass Pipe to maintain CRLF habitat.

F) Replace and enlarge the drainage ditches in the lower "Shop" area of the plant. Remove existing pipes where applicable, existing loose plastic sheets used for ditch lining, and install the permanent ditch system. Lower sections of the ditches will use the rocked filled geocell or concrete lining as shown on the Plans. Excavate trench and construct perimeter French Drains to intercept stormwater run-on as shown on the Plans.

G) The drainage ditches will be excavated as shown on the Plans and will include a final configuration consisting of a 6-inch thick rock filled geocell covered with 2-inches of crushed rock, see Sheet D1. This armored ditch system is designed to be durable and flexible to minor earth movements and to prevent scour. Minimal long term maintenance was a key factor in providing this design.

H) Construct drop structure storm drain high density polyethylene (HDPE) pipes along the east and west sides of the south face of Area 3 as shown on Plans.

I) Connect drainage ditches to manholes, drop structures and lined conveyance channels downstream from CKD Area 3, as indicated on the Plans.

J) Subject to appropriate agency approval, install riprap splash-pads and spillway at outfall of the pipe outlets at the Retention Pond and "No-name Creek."

K) Enhance Seasonal Ponds. Finish inlet to perimeter French Drain at south end of Seasonal Ponds to serve as over-flow relief. Place synthetic LLDPE liner and fabric to provide a low permeability bottom in the two small ponds alongside and east of Area 2.

The liner will be covered with rock and soil as shown in Sheet DR9. The final configuration of the Seasonal Ponds is subject to agency and landowner approval in order to maintain sufficient water in the ponds to provide CRLF habitat.

1.2.3 Final Closure of Areas 1, 2 and 3

A) Clear, grub and remove all deleterious materials from the grading/shotcrete areas including but not limited to such items as trees, brush, concrete, tires and plastic sheeting. Stockpile topsoil for use in final soil cover. Stockpile deleterious materials for removal from the project site or other approved use.

B) Excavate, crush and regrade, as necessary, previously deposited CKD within the existing CKD Landfill footprint and work area to achieve design grades to accept the Foundation Layer for the liner (with the exception of the slope below the access road at the southwest end of Area 3.

C) Install and grout soil nails and construct a 6-inch thick steel-reinforced shotcrete cover with fabric drain strips over the slope area below the access road at the southwest end of Area 3, see Section 4.3 in this report.

D) Construct a minimum 2-foot-thick compacted foundation layer using regraded CKD, imported materials and, if necessary, general fill materials.

E) Install a 60 mil LLDPE liner/cap overlain by a geocomposite drainage layer to facilitate lateral drainage, thus providing an increase in liner/cap stability.

F) Complete shotcrete tie-in at the top of the soil nailed wall to cover the liner along the outboard edge of the South Ditch. Install 26-inch-thick soil cover layer over the liner system. This will consist of an 18-inch Protective Cover Soil (PCS) and an overlying 8-inch thick Vegetative Soil Layer with amendments such as compost or other organic materials added to promote vegetation as approved in advance by all parties, Sheet D1.

G) Maintenance and inspection tasks will be performed as outlined in Section 6.4.

H) Plant and/or hydroseed the Vegetative Soil Layer and other disturbed work areas at the completion of grading or other soil disturbance activities. Provide native vegetation in the area as per CEMEX's recommendations.

2.0 CKD SITE BACKGROUND AND DESIGN ASSUMPTIONS

2.1 Description of North CKD Area Project Site

The North CKD Area project site is divided into three separate work areas described below, the ownership boundaries are shown on Sheet C3. In general we assume the CKD will be relatively

easy to regrade, moisture condition and compact, though excavation may require significant effort and possible crushing.

2.1.1 Area 1 – Farm CKD Area

Area 1 is farthest north, at the head of the backfilled canyon. The area covers approximately 3.5 to 4 acres and a portion is currently leased from CDLC. Area 1 was filled starting in the 1950s, first with CKD to the approximate elevation of the canyon rim, and then with 10 to 12 feet of excavated earth and concrete rubble from plant construction activities (approximately 50,000 to 60,000 cy of material). No CKD has been placed in Area 1 for over 65 years. Topsoil was placed over Area 1 in a 24 to 30-inch loose layer, and compacted to a thickness of approximately 18-inches. Area 1 was then returned to its landowner. The combined estimate of CKD volume in Area 1 and 2 is shown in Table 1. In Area 1, there is no CKD above the canyon rim.

The North Pond is located at the north end of Area 1. The pond receives surface water from adjacent uplands and directs it into a 30-inch Bypass Pipe that conveys the water south through and around the CKD Landfill for a total distance of about 2,500 feet, ultimately discharging into a natural drainage feature located east of Area 3 (the “Farmer’s Pond”).

Both the North Drainage Pond and Farmer’s Pond have been identified as CRLF habitat.

2.1.2 Area 2 – Plant “Old” CKD Area

Area 2 covers about 3.2 acres and contains exposed CKD. It is relatively flat with scattered mounds of CKD. Similar to Area 1, it is on land leased from CDLC as part of Lease Area C-1. Table 1 shows the approximate volume of CKD in Area 2. There are approximately 94,000 cy of CKD above the canyon rim. The east side of Area 2 abuts a pair of Seasonal Ponds, which will be enhanced for CRLF habitat (based on agency approval) as previously described in Section 1.2.1.

2.1.3 Area 3 – Plant CKD Pile

Area 3 is about 9.0 acres and contains the majority of the CKD. It is on land fully owned by CEMEX. Approximately 21,700 cy of CKD remains above the canyon rim. The CKD in Area 3 rises significantly higher than the surrounding area. Much of CKD in Area 3 is presently covered by protective plastic sheeting weighted down with rubber tires. This Area contains a steep (approximately 45 degree) average slope, see Section 4.3.

2.2 Previous Cover System – Lonestar Closed CKD Area (1995)

In 1995, RMC Materials Pacific, Inc. closed the Lonestar CKD Area located south of the Farmer's Pond between the cement plant and the facility's eastern property line. This closure was designed and constructed to meet or exceed the requirements of Title 27 and Previous Waste Discharge Requirement Order (WDR) Order No. 94-66. A geosynthetic clay liner was used as the impermeable cover element, concrete-lined drainage ditches were installed along the perimeter and at some points across the constructed cover. The final design and construction observations were documented by CH2M Hill (1995).

2.3 Previous Original Conceptual Closure Design – North CKD Area (2002)

In 2002 the original Conceptual Closure Plan for the North CKD Area was prepared under the assumption that work would proceed in two phases. The two phases were necessary to accommodate the CKD recycling at that time, which lasted over a span of about 15 years. Many elements of the original Closure Plan, such as the soil nail supported shotcrete slope, were considered viable and appropriate for the current conditions. We reference those elements as part of this design.

3.0 SITE DRAINAGE IMPROVEMENTS

Collection and routing of surface water are key components of the Landfill design. Water will not be allowed to pool atop the liner/cap cover system. Regular inspection and maintenance will ensure that surface water continues to flow to a collection system that conveys it away from the Landfill, through the Retention Pond, and eventually to the Pacific Ocean. The stormwater drainage conveyance and retention features included in this Final Closure Plan were evaluated and designed to handle the 1,000-year, 24-hour prescriptive storm event required by Title 27 and the WDR. A summary of the hydraulic analysis and design of the drainage improvements is included below and the complete analysis in Appendix A.

3.1 Hydraulic Analyses and Design Storm Event

Farallon Consulting, L.L.C. conducted a comprehensive hydraulic analysis to evaluate the ability of the proposed drainage conveyance system to meet the prescriptive 1,000-year, 24-hour storm event, which corresponds to a 11.6-inch rain event. Based on the initial evaluation presented in the *Draft North CKD Waste Pile Closure Stormwater Hydraulic Analysis Report* (Draft Hydraulic Analysis Report), submitted to the WB on November 29, 2017, it was determined that the drainage system proposed in the Conceptual Final CKD Closure Plan could meet the prescriptive storm event with few improvements. This Final Closure Plan incorporates the improvements recommended by the Hydraulic Analysis Report and the drainage system has

been designed to handle the 1,000-year, 24-hour storm event. The final hydraulic analysis report is included in Appendix A.

3.2 Perimeter Drainage Ditches

Upon final closure, one crushed rock filled geocell perimeter ditch will remain in place on each side of the North CKD Area to collect runoff from the final Landfill surface. The perimeter ditches have been located to closely follow the edge of the CKD filled valley keeping earthwork to a minimum to achieve positive drainage down slope. The LLDPE liner will extend from the Landfill and under the perimeter ditches. The north invert (ends) of the perimeter ditches are located near the south edge of the North Pond in order to provide overflow relief if necessary in the unlikely situation that a extreme event exceeds the design storm or the bypass pipe is blocked. Water in these ditches will flow southward, and discharge into new geocell-lined drainage trenches south of CKD Area 3. Along the upper surface of the CKD, the ditch center-lines will be graded at slopes ranging from about 0.5 to 3.0 percent, depending on the existing topography. Details showing the design sections for the perimeter ditches are located on Sheet D1.

The perimeter ditches will direct stormwater runoff around the perimeter of the Landfill and into HDPE drop structure pipes that will also capture flows from French Drains constructed on the outside of the perimeter ditches. The drop structure pipes will convey water down the steep grades along the edges of the North CKD Area to the lower Shop Area stormwater conveyance system. Rock-covered geocell drainage channels and concrete filled geocell are included in the design instead of HDPE or fully lined concrete lined channels because of the increased resistance to UV radiation and flexibility to surface settlement caused by fill/waste consolidation or seismic movement. Drop inlet structures with trash-racks will be installed at each pipe inlet to minimize clogging potential. Stilling basins will be installed at the pipe outlets to dissipate energy and protect the outlet from erosion. Water from the pipe on the east side of the pile will discharge to a crushed rock-filled geocell reinforced ditch near the base of the soil nailed wall.

3.3 Perimeter French Drain

The intent of the perimeter French Drain system is to intercept shallow groundwater that has the potential to build up under or alongside the LLDPE-lined ditches and to intercept sheet flow-stormwater run-on. The French Drains will be constructed by excavating trenches, as shown on the Plans, on the “outboard“ side of the perimeter ditch. The trenches will be adjacent to the perimeter ditches where grades allow and reach to the invert depth of the perimeter ditches. The trenches will be, lined with filter fabric then backfilled with bedding gravel that encases an 8-inch diameter perforated PVC pipe. The PVC pipe will be surrounded by drain rock and then

enclosed with the overlapping wrap of the ends of the filter fabric. The PVC pipe will empty into the drop structures at the south end of Area 3. A perimeter French Drain detail is provided on Sheet D1. The French Drain system is replaced by the Bypass Pipe trench east of Area 1.

3.4 Improvements to North Drainage Pond and Pipeline

The North Drainage Pond and the Bypass Pipe system will continue (pending appropriate agency approval) to be used to convey stormwater so that surface water from up gradient areas continues to be routed around the North CKD Area and discharge into the Farmer's Pond drainage at No-Name Creek. An outfall and riprap splash pad will be built at the discharge end of the 42-inch diameter pipeline to prevent erosion of the ground surface. Refer to Sheets DR4 (Drainage Improvements) and PS4 (Bypass Pipe Profile) of the Plans. The Bypass Pipe trench backfill includes free-draining fill and the ground surface along the pipe alignment will be configured as a shallow less permeable swale facilitating capture of sheet flow and shallow subsurface flow that can be directed to catch basins that will direct water into the Bypass Pipe via several catch basins at the manholes. Even though indications of seasonal shallow groundwater was typically not observed in the Bypass Pipe exploration test pits (Appendix C), this shallow water interception feature reduces the volume of potential surface water reaching the East Perimeter ditch and Seasonal Ponds area. In addition, an inlet structure will be attached to the upstream end of the Bypass Pipe to maintain CRLF habitat in the North Drainage Pond (Sheet D1). The inlet structure will be placed such that a pond depth of at least 3 feet will be reached before water will discharge into the 42-inch diameter Bypass Pipe. The perimeter ditches and French Drains provide over flow relief of the North Pond in the highly unlikely event that brief extreme storm events fill the pond above the 42-inch diameter Bypass Pipe.

3.5 Improvements to Retention Pond

CKD and coal-impacted sediments and soil excavated from the Retention Pond disposed of at the North CKD Area Landfill and placed under the closure cap. CKD and coal-impacted sediments and soil excavated from the Retention Pond will be relocated to the North CKD Area for placement under the closure cap. As shown on Sheets DR5 and DR6 and described in Appendix G, prepared by TRC, approximately a minimum of 2 feet of sediments and soil will be removed from the Retention Pond. In order to facilitate transport of the material to the North CKD Area, the wet sediments and soil will be excavated and temporarily placed on the adjacent Former Coal Storage Area for drying. Once the drying process is complete, the sediment and residual coal at the Former Coal Storage Area will be transported to the North CKD Area for disposal under the closure cap.

The Retention Pond will receive collected water from the capped North CKD Area Landfill via a 54-inch diameter pipe. The 54-inch pipe will collect water from the southwest end of the Shop Area ditch and deposit this flow onto a rock splash apron at the side of the Retention Pond.

Drainage improvements to the Retention Pond to accommodate the 1,000-year, 24-hour storm event include building up the perimeter of the pond to an elevation of 106.5 ft with the construction of a concrete gravity wall and the installation of a check-valved orifice in the outlet riser structure. The orifice will allow the pond to drain water between storm events to take advantage of available storage. Details are shown on DR5 and DR6.

3.6 Improvements to the Seasonal Ponds

Since these ponds have been identified as CRLF habitat, the ponds will be required to maintain habitat and retain water through the hatch season (at least 4 feet deep) to serve as viable habitat. The ponds are anticipated to capture a significantly smaller volume of water compared to pre-closure conditions observed in the past. Sources of water flowing into the Seasonal Ponds are expected to be reduced considering the drainage improvements in the area, such as:

- abandonment of the damaged adjacent 30-inch CMP that currently serves as the North Pond Bypass Pipe,
- Placement of a larger capacity new Bypass Pipe,
- Construction of the Bypass Trench and swale along the new Bypass Pipe that will capture sheet flow and shallow groundwater up gradient from the Seasonal Pond area.

Water for habitat will be retained by placing an impervious liner in the Seasonal Ponds. Proposed construction will occur during the dry season, the pond sediment and topsoil will be excavated and stockpiled. The ponds will be lined with a low permeability liner to an elevation of about 259 feet. The liner will be covered with the stockpiled sediment and topsoil, provided the material contains no protrusions, sharp particles or fragments. The southern edge of the Seasonal Pond area will expose the end of a perimeter French Drain. The French Drain, as previously described, will direct captured water into the adjacent eastern perimeter ditch. This drain will serve as an over-flow outlet for the area if unexpected volumes fill the ponds. This layout is shown on Sheet DR9.

3.7 Improvements to the Detention Pond

Generally, runoff from the North CKD Area does not drain to the Detention Pond; however, the sediment and soil in the Detention Pond was recently evaluated and sampled and it was verified that no sediment will need to be removed from the pond. Details are provided in Appendix D.

The hydraulic analysis of the detention pond did not identify the need for any drainage capacity improvements to safely handle the stormwater captured during the 1,000-year, 24-hour storm event. The existing 6-inch diameter drain at the bottom of the Detention Pond will be connected to the Shop Ditch that discharges stormwater from the Shop Area to the Retention Pond.

3.8 Regulatory Coordination - Habitat Restoration/Maintenance

CEMEX, with the involvement of their biological consultant ES, and others as needed, will coordinate with the appropriate agencies that have permitting authority over the habitat restoration activities, such as the US Army Corp of Engineers, WB, and/or US Fish and Wildlife Service. CEMEX will obtain necessary permits for the project and co-ordinate with appropriate agencies.

4.0 FINAL CLOSURE OF CKD

4.1 General Closure Requirements

The design of the final CKD closure for Areas 1, 2 and 3 will require a substantial amount of regrading to lower its overall height as much as feasible. The CKD will be excavated and moved, as needed. Then all imported materials, such as the material excavated from the Retention Pond and stockpiles will be mixed and blended with the CKD to the graded surfaces shown on Sheets G1 and G2. With the exception of the south face of Area 3, final maximum slopes for the liner/cap cover system will be no greater than 13.3 percent (less than about 7.6 degrees).

Adjacent, disturbed slopes will be treated with soil stabilization erosion control best management practices and linear sediment control measures, such as biodegradable straw wattles or equivalent, will be installed at the bottom of disturbed slopes and at regular intervals along the slopes, as needed or as required by permit. Disturbed soil and work areas used for equipment staging and material storage will be seeded at the end of the construction unless they are paved or gravel-surfaced Plant areas that will not support vegetation. The steep area on the lower portion of the south face of Area 3 will be covered in a 6-inch thick reinforced shotcrete wall for erosion control and to deter infiltration. The shotcrete wall will be supported by soil nails to hold the shotcrete section in place. Slope stability is not considered an issue for this area as described in section 4.2.4 and the system will conform to requirements in Title 27. The shotcrete wall is shown on Sheets N1 through N5, the design calculations and analysis summary are provided in Appendix C.

4.2 Summary and Approach

As discussed in the letter from the WB (February 22, 2017) the Final Closure Plan must include the information necessary to comply with CCR Title 27 and the requirements outlined in that letter. CCR Title 27 requirements are incorporated into this Closure Plan and the specific features applicable to selected sections are addressed as follows:

4.2.1 Title 27 Section 21090

According to Section C.9 of the WDR, CEMEX shall construct closure and containment systems for the North CKD Area pursuant to Title 27, Section 21090 and a Water Board Executive Officer-approved Final Closure Plan, which meets either a or b below

a. Prescriptive Final Cover

i. Two-foot-thick minimum foundation layer.

ii. One-foot thick minimum of compacted soil with hydraulic conductivity of 1x 10^{-6} cm/sec or less.

iii. Erosion-Resistant Layer (Vegetative or Mechanical)

b. An engineered alternative design approved by the Executive Officer. Engineered alternative designs shall satisfy the criteria for an engineered alternative to the prescriptive design, as provided by Title 27. Performance of the alternative composite cover's components, in combination, shall equal or exceed the waste containment capability of the prescriptive design outlined in (a) above.

In accordance with the requirements of Title 27 Section 21090, the Final Closure Plan includes the following components (in order of placement from lowest to highest):

1) 2 feet of compacted CKD (or soil around the perimeter fill areas) as a foundation layer;
2) 60 mil LLDPE synthetic liner as a textured liner/cap to serve as a low permeability barrier exhibiting a 1 x 10^{-6} cm/sec or less hydraulic conductivity;
3) A geocomposite drainage net layer that provides lateral drainage and provides friction against sliding as a "Velcro effect," to add stability to the LLDPE liner/cap;
4) An 18-inch compacted general fill PCS; and
5) An 8-inch erosion-resistant vegetative soil layer.

This Closure Plan assures the engineering measures are in compliance with the requirements of Section 21090.

ARC has provided in Appendix C final design for liner stability. The final design is based on our investigations and the final design report is complete with signature and stamp to verify compliance with the statute.

Post-closure maintenance requirements of Title 27, Section 21090, are addressed in Section 6.0.

4.2.2 Title 27 Section 20365

The Landfill to be constructed will limit, to the greatest extent possible, ponding, infiltration, inundation, erosion, slope failure, washout, and overtopping caused by the 1,000-year, 24-hour design storm event. Ongoing post-closure maintenance will be performed, as necessary, to maintain drainage controls.

4.2.3 Title 27 Section 21400

As a former surface impoundment, the requirements for a mandatory clean-closure attempt in Section 21400 are addressed in Chapter 5 – Clean Closure Considerations. Based on our evaluation of the issues surrounding clean closure we have continued with the Closure Plan under the requirements in Title 27, 21090.

4.2.4 Title 27 Section 21750

Section 21750 is incorporated by reference. Ongoing supervision of the property and all reporting to the WB will continue, as necessary, through submittal of a report of waste discharge as specified by WDRs.

4.2.5 Title 27 Section 20080

Section 20080, General Requirements, defines the North CKD Area Landfill as an “existing” unit because it was in operation on or before November 27, 1984. The section clarifies that existing units shall be closed and maintained in accordance with Section 20950 and monitoring must be in compliance with monitoring program requirements of section 20380 et seq. The Landfill closure and monitoring requirements in the Final Closure Plan were prepared to meet relevant the Title 27 requirements.

4.3 Grading and Cover Design

The cover design will include, listed from lowest to top most; a Foundation Layer at the top of the CKD surface, overlain by a low permeability liner system consisting of a 60 mil textured LLDPE liner, overlain by a geocomposite drainage net layer, a PCS layer and a vegetative soil layer. The approximate earthwork areas and volumes are estimated from various sources and include the proposed Landfill cover area of 751,537 ft^2 (about 17.25 acres). The CAD-generated approximate volumes are not meant to imply a high level of precision. These computer generated volumes are summarized in Table A below;

Table A: Grading Balance under Liner/Cap cover grade

Cut Volume (yd^3)	Fill Volume Under Liner Surface (yd^3)	Net Fill Required for Balance (yd^3)	Import Cut from North Pond 42-inch Bypass (yd^3)	Import Cut from Retention Pond Remediation (yd^3)	Import Cut from Coal Storage Area (yd^3)	Import Cut from Shop Ditches /Pipe (yd^3)	Remaining Net Fill Required* (yd^3)
-90,683	110,643	19,960	-472	-4,680	-3,733	-1,000	10,075

* Remaining volume under liner/cap will be imported fill from other sources such as from over-excavation and stockpile materials, see quantities of materials in Appendix D as-required to match design grades.

The Foundation Layer is shown on the Plans as a minimum 2-foot thick layer that will be graded and compacted to provide the foundation for the low permeability liner system. The Foundation Layer will consist mainly of CKD as indicated in Table 1, or where needed, general backfill that meets the requirements in the specifications that may include existing fill in some areas. The Foundation Layer will be compacted as specified to meet a minimum requirement of 90 percent of the maximum dry density per ASTM D1557, similar to requirements for clay liners outlined in Title 27, Section 20330, obtainable at optimum moisture content and graded smooth as required in the specifications. Large fragments and protrusions will be removed from the final surface to create a smooth final grade before the overlying LLDPE and drainage net layers are placed.

The WB requires a low permeability layer with no greater than 1 x 10^{-6} cm/sec hydraulic conductivity (k) and as previously mentioned in Section 4.2.1 this requirement will be achieved with the application of the textured LLDPE synthetic liner/cap. A liner/cap system was chosen

that includes the LLDPE overlain by geo-composite drainage net in order to: a) eliminate potential changes in permeability from interaction with clay minerals; b) improve drainage; and c) increase stability.

LLDPE is a crystalline polyethylene product that has high chemical resistivity and ability to flex and stretch when stressed, and is widely used in landfill/waste pile, liner/cap cover applications. A textured version is proposed with a 10 mil aperture to increase interface friction between the liner and the underlying foundation. This will greatly increase the stability of the liner system.

The Drainage Net is intended to provide relief from excessive precipitation percolating through the 26-inch thick layer of soil. The 26-inch thick t soil is located above the geo-composite Drainage Net and is partly comprised of the PCS. The geocomposite layer is comprised of a HDPE drainage net encapsulated between two non-woven cover geotextile layers. The geotextile provides friction against sliding with the underlying textured LLDPE as well as with the overlying soil layer to provide effective interface shear strength. We include our analysis in Appendix C for the long-term stability of the cover and geosynthetic materials on the design grades and slopes.

The aforementioned 26 inches of soil cover will be installed above the liner system. The lowest 18-inches of PCS will be compacted to 90 percent of maximum dry density according to the specifications. The top 8-inches of vegetative soil layer will contain native materials void of noxious weeds or seeds and be comprised of either stockpiled topsoil or imported and potentially amended (such as compost) soil. This soil layer will remain uncompacted, and will be ripped and tilled if compacted during placement.

Placement of the vegetative soil layer will be completed no later than September 10 of the year of closure, so that revegetation can be completed before November 1 of the same year. The Landfill cover will be seeded and mulched, as detailed in the Closure Plan Specifications. Vegetation will be selected that has a root depth of less than 24 inches.

4.4 Final Geotechnical Design

This section describes the geotechnical evaluation related to subsurface conditions near the proposed 42-inch Bypass pipeline, the proposed soil nailed wall and the Landfill cover stability.

4.4.1 Bypass Pipeline

Our final design report describes the soil and groundwater conditions that we observed in test pits excavated along/near the Bypass pipe location shown on the Closure Plans. In summary we observed fill, construction debris, native sand and rock at test pit depths up to a maximum of 18.4 feet. The details of the soil and seepage conditions are provided in the text and test pit logs in Appendix C.

4.4.2 Soil-Nailed Wall

The southwesterly face of the current CKD rises approximately 150 feet from the surface of the existing canyon floor. This face forms the southwest boundary of Area 3. It rests at an average angle of about 45 degrees (approximate slopes of 1H:1V) with the lower slopes closer to 32 degrees. The upper portion of this slope (above the access road at the west end of the CKD that cuts across the steep face) will be regraded such that at the time of final closure it is sloped at a relatively shallow (at or less than 7.6 degree) angle and covered as described in this report and shown on the Plans.

The lower portion of the southerly slope is designed to remain at the existing slope grades below the elevation of the existing unimproved access road. This slope face consists of progressively older CKD berms with depth. As part of our current evaluation, we considered cutting back the slope angle proposed for soil nail and shotcrete cover. In order to lay this slope back to a safe liner/cap angle (less than about 14 degrees) the current liner/cap slopes through-out the rest of the Landfill would need to increase to accept the added CKD. This additional CKD would require steeper (over 14 degree) slopes to contain all of the over-excavated CKD. An additional complication would involve increased density of the older CKD deposits as work progresses lower. It is likely these deeper deposits will be much more difficult to excavate and require extensive crushing operations to process for hauling and placement. Considering the time for excavation, narrowing of the old Canyon side slopes, handling and volume increase (swell factor), the option to lay back these slopes is not feasible.

The steep southwestern slope has performed well over the years and exhibits no evidence of sloughing, erosion, seepage, movement or slides, which is likely a result of the cemented nature of the CKD cake that comprises the slope. It has remained in the same condition for decades with no evidence of movement or erosion. The performance of this slope and back-analyses indicates that it continues to remain above equilibrium conditions from a slope stability point of view. Based on data, observations and stability calculations it is highly unlikely that the southerly slope of Area 3 will pose a significant risk of movement or sliding in the future, see Appendix C. We have provided a design for a shotcrete cover in the form of a soil nailed wall. The main

consideration in placing a soil nailed wall at this location is to limit calculated deflections during a Maximum Credible Earthquake (MCE) event. Our analysis of the MCE for this site is included as an attachment to the report in Appendix C.

A site specific geotechnical investigation at the shotcrete and soil nailed wall site was completed in January 2018. This investigation provides the proper subsurface data for the slope stability assessment (soil nailing). In order to protect the slope from surface water infiltration or erosion, the placement of a 6-inch thick, steel-reinforced shotcrete 'battered' wall (FHWA 1998) with soil nails has been determined to be an appropriate option as originally presented in the 2002 plan. A shotcrete swale at the base (toe) will convey potential stormwater runoff, that may accumulate at the base of the shotcrete, to the concrete-lined Shop Ditch. This ditch will be constructed as part of the site drainage improvements described in this Final Closure Plan and will convey stormwater to the Retention Pond. The monitoring plan includes provisions to inspect the shotcrete for water in the unlikely event that subsurface drainage emits from the drain fabric or elsewhere behind the shotcrete wall.

The unimproved road that traverses the southwest face of the slope at the top of the soil nailed wall will contain an LLDPE lined ditch covered with the rock-filled geocell system, see Sheets PS1 and D3. The Soil-Nailed Wall will be in-place before the ditch rough grading begins. Once the ditch is lined a final application of shotcrete at the top of the Soil-Nailed Wall will cover the LLDPE liner outside edge. The existing road is located over multiple active public water lines that service the nearby Davenport community of Newtown and the county sewage treatment plant. Depending on final utility locations construction activities will avoid shut-down and relocation of these lines unless the utility location investigation requires relocation of these utilities as necessary for grading or anchor placement purposes. The physical location of the water lines and assessment of conflicts with construction will be required by the Contractor before beginning construction.

The Soil-Nailed Wall design is completed as a "performance specification" style set of documents that will be provided to a specialty shoring contractor as a stand-alone package. Thus the specifications are included in the Soil Nail drawings so that Sheets N1 through N5 can be provided separately. There is a place holder in the project specifications for Shotcrete that directs the Contractor to follow those sheets.

4.4.3 Summary of Stability Analysis for Cap and Cover System

Our stability analysis of the cap and cover system included an assessment of slope and cover stability under dynamic (seismic) conditions, as well as the maximum predicted deflection under a Maximum Credible Earthquake (MCE) event, as mandated by CCR Title 27. Appendix C

presents the various geotechnical stability analyses that were performed, which are summarized as follows:

- The large-scale stability of the southwesterly face of the CKD fill, inclined up to an angle of 45 degrees, was evaluated for potentially sliding below the maximum depth of the soil nails. Limit equilibrium analysis was conducted using the *Slide* computer program, and the stratigraphy and geotechnical properties of the CKD material were delineated based on field explorations (two boreholes near the southwest CKD face). Under long-term static conditions, the overall factor of safety was determined to be 1.6, an appropriate value for design.
- For dynamic analyses, a peak ground acceleration (PGA) and pseudo-static coefficient were determined for a MCE seismic event, per CCR Title 27. The PGA was estimated to be 0.566g, and the corresponding pseudostatic coefficient was half of that, for a value of 0.283g.
- The pseudostatic coefficient was used in the *Slide* model to determine the stability of the soil nail face in a seismic event. The factor of safety against sliding was estimated as 1.0, which is below the CCR mandated level of 1.5. Therefore, a more robust analysis was conducted to determine the overall amount of slope deflection that could be expected during the MCE. Empirical models and a Newmark analysis were used to estimate the total slope deflection as being no greater than 4 inches. This amount of deflection is expected to be manageable and readily reparable using shotcrete application at this site.
- The soil and geosynthetic cover layers were evaluated for the rest of the CKD area, which will be graded to a slope inclination of 13.3 percent, and were found to be sufficiently stable, with minimal (less than one inch) deflection predicted in an MCE seismic event.
- The cover soils and geosynthetic elements are anticipated to remain stable in the drainage side slopes, provided that construction is free of defects, and that excessive potential flows or debris do not damage the ditch sides.

4.5 Post Closure Use of CKD Areas

The final cover soil will be vegetated by native grasses devoid of invasive plants or seeds, and will blend into the surrounding land. No grassland activity requiring irrigation will be conducted on this area to reduce the potential for infiltration of water into the CKD. No additional development is planned for Areas 1, 2 and 3.

5.0 CLEAN CLOSURE CONSIDERATIONS

Clean closure generally means the removal of all impacted materials from a landfill site as described by the CalRecycle LEA Advisory #16 available at http://www.calrecycle.ca.gov/LEA/Advisories/16/. In accordance with this advisory clean closure is usually considered an option when certain factors are met. Unless there are other better uses for the site or there are threats to public health and safety of the environment, it is a consideration when the removal cost is less than the cost of long term maintenance and monitoring of the material if left on site.

Other factors to consider are the removal and transportation of the impacted soil to a landfill including waste transportation issues, waste disposal costs and the restoration of the site, requiring the importation and placement of rehabilitation material (to minimize erosion).

The following facts were important in considering an option for clean closure at the North CKD Area Landfill:

A) The estimated current volume of Cement Kiln Dust (CKD) is about 850,000 cy. However, for CKD Clean Closure design purposes a certain amount of over-excavation is considered, so a total volume of 1Mcy is a reasonable total estimate.

B) Disposal of CKD is considered as "Class II or designated waste", by the DTSC. Accordingly, CKD may be disposed of at landfills, which have a permit to accept Class II waste. There are no landfills near the Davenport site that could accept the material. The closest potential option is the Keller Canyon landfill in Pittsburg, CA, which is 103 miles away. Of the landfills that would potentially accept the material, there would likely be capacity limitations, considering the quantity of material.

C) The total waste (including all CKD, over-excavated soil/rock and other fill materials) to be disposed of in a "clean closure" scenario is estimated to have waste mass of about 2M tons considering that the CKD is essentially a relatively heavy silty material with likely high captured moisture content.

D) Typical dump trucks carry 10-20 cy of waste, accordingly depending on the truck capacity, and the number of truck trips is estimated to be on the order of 60,000 to 120,000 trips to the landfill. This results in an increase in traveled miles of about 200 miles roundtrip per truck trip to Keller Canyon for a total of between 12,000,000 and 25,000,000 total haul miles.

E) Disposal and transport cost (based on a 2008 project experience from a project site at Ft. Bragg to the Kettleman Hills Landfill) is equal to about $120 per ton, so for

Davenport this cost is estimated to be about (2M tons x $120/ton) $240M.

F) Replacement backfill would be required on site. One can assume a 30-40,000 cy backfill at a cost of about $15-20/cy.

Considering purchase, mobilization, placement and compaction, we would estimate an additional $2-3M for grade replacement costs. This quantity is based on an approved grading plan.

G) CKD on the site is "caked" and would require extensive excavation, crushing and breaking effort that can manifest itself in excess air emission, dust generation, noise, additional handing time or other nuisance issues.

H) Air emissions associated with extensive trucking would be significant. If this solution is selected it is recommended to perform a detailed air emission study, and subsequent human health and biological impact study as part of an overall Environmental Assessment.

I) Extensive highway travel on local narrow roads represents risks, such as truck accidents, that present public safety issues and/or cause release of waste and fuel necessitating extensive environmental cleanup.

J) Offsite disposal of waste can often lead to even more hazardous conditions particularly if it is mixed with other waste or dust emissions from handling and placing at the disposal site.

K) Hydraulically placed CKD is an inherently stable material much akin to limestone placed in slurry form.

This type of CKD underwent a pozzolanic reaction that resulted in the increase of strength and the reduction of permeability for this CKD pile. Therefore, the CKD is a relatively stable homogeneous deposit and represents a significant reduction of groundwater impact with minimal to no chemical interaction.

L) A properly graded/covered and revegetated CKD pile is considered a suitable foundation for park lands/sporting fields, wildlife and other recreational uses.

M) Land zoning at the Plant allows (upon closure) wildlife incursions on the closed CKD areas, essentially increasing grazing/wandering habitat.

Table B: Potential Local Landfills

Landfills potentially serving the Davenport site	**Classification, comments**	**Distance (one way and round trip)**	**Recommended**
Guadalupe Landfill – San Jose- 408-268-1670	Class III, extensive public opposition because of high truck traffic		Not acceptable, for expected public opposition
Kirby Landfill – San Jose 408-779-5194	Class III, phone is not in service – possibly closed		Not acceptable, potentially out of service
Newby Island, CA 408-262-1401	Class III		Not acceptable, no proper waste acceptance criteria
Kettleman Hills, CA Central CA: 714-771-5554	Class I inherently suitable for designated waste	190 miles one way, 380 miles roundtrip	YES, proper waste acceptance permit/volume
Keller Canyon Pittsburg, CA: 925-313-8900	Class II	103 miles one way, 206 miles roundtrip	YES: proper waste acceptance permit and volume are available
Sunshine Canyon	Class III		Not acceptable: no proper waste permit

Half Moon Bay	Class III		Not acceptable: no proper waste permit

Note: We have also contacted the local facilities of: Sana Cruz, Buena Vista and Watsonville Landfills. These facilities are not able to accept the Davenport Facility CKD waste based on a variety of combined reasons including no proper permit, no room or, in the case of the Watsonville Facility, are closed and no longer accepts waste.

Based on the above factors a "clean closure" option for the North CKD Area Landfill is not recommended because:

1) The total volume of CKD required to be moved is expected to be 1Mcy (1,000,000 cy) or more.

2) Extensive excavation and hauling for a significant distance causing:

- **a)** Extensive cost.
- **b)** Traffic impacts.
- **c)** Air emissions during excavation and waste transport, including significant impacts to greenhouse gas (truck and equipment exhaust).
- **d)** Possible releases impact wildlife and native vegetation
- **e)** Lengthy removal and handling, would likely add several years to the project, which would cause unnecessary long-term dust, storm water, and traffic issues to the neighboring community. Compared to an approximate two year construction period for a liner/cap and cover system, the prospect of extending public exposure to the above mentioned issues over many years is ill-advised and unwarranted.

Conversely, on-site closure has several benefits that include but are not limited to:

- Reducing overall earthwork and handling, thus efficiently controls cost and project execution timeframe
- Generating a capping scheme that is environmentally protective, and also supports overall habitat reclamation and improvement
- Reducing impacts (noise, nuisance, dust, traffic) to the public.

Successful clean closure examples by rail are: the Pier 64 and 16th Street soil remediation in San Francisco, California, and the Hudson River sediment remediation project in New York. In the current project however, the nearby rail line is not considered a viable near-term alternative haul system due to the dilapidated condition of the trestles. A full retrofit of the rail line is expected to take many years. The refurbishing of the rail line would require completion of such items as:

transportation planning, engineering studies, structural evaluation, permitting and demolition, to bring into modern compliance before considering as a useful haul method.

Based on the above discussion all CKD should be kept on site, properly graded, properly covered in accordance with CCR Title 27. Depending on future land use, the North CKD Area Landfill could be rehabilitated as habitat that readily connects to neighboring wildlife areas. Clean closure is infeasible based on the physical risks to the public generated by a comparatively lengthy (many years) clean-closure project.

6.0 POSTCLOSURE MONITORING AND MAINTENANCE PLAN

WDR R3-2018-0001 and monitoring and reporting program (MRP) No. R3-2018-0001, included in Appendix H, contain specific inspection, sampling, and reporting requirements as described below. Specific requirements are subject to change with the potential adoption of a new or revised WDR and MRP in the future.

6.1 Responsible Party

Company:	RMC Pacific Materials, LLC (CEMEX)
Contact Name:	Kori J. Andrews, Corporate Environmental Manager
Address:	15301 Dixie Highway, Louisville, Ky, 40372
Phone:	(502) 377-2973

6.2 Monitoring and Control Systems

The North CKD Area monitoring and control systems currently consist of: groundwater monitoring, stormwater monitoring including treatment. Installation of a surface water and gas monitoring network is not anticipated or necessary. Sampling stormwater data from the 1995 closure areas showed no detectable production of methane or carbon monoxide from the Lonestar Closed CKD Area. These results can be extrapolated to this site because the CKD areas are very similar.

6.2.1 Groundwater Monitoring System

Currently there are fifteen groundwater monitoring wells associated with the North CKD Area. Groundwater monitoring is conducted semiannually in accordance with WDR R3-2018-0001 and MRP No. R3-2018-0001. The WDR and MRP are provided in Appendix H.

6.2.2 Stormwater and Surface Water Monitoring and Treatment System

Stormwater samples are currently required to be collected from the Plant discharge at Point 001 on a monthly basis (when the Retention Pond is discharging) pursuant to MRP No. R3-20180-001 and four times per year in accordance with the State of California Industrial Stormwater General Permit (IGP). The stormwater monitoring parameters and frequency may vary over time as allowed by MRP No. R3-2018-0001, the IGP and future modified permits. After the North CKD Area Landfill is closed and the Plant is cleaned up to a level where no industrial materials remain, coverage under the IGP may be terminated. In addition, stormwater will be monitored during construction activities in accordance with the State of California Construction Stormwater General Permit (CGP).

Surface water in the Detention Pond and Retention Pond is required to be monitored annually as required by MRP.

A carbon dioxide gas injection system is currently used, when needed, to reduce elevated pH levels to meet water quality standards and stormwater action levels. Following closure of the North CKD Area, the pH treatment system may no longer be needed if acceptable pH levels can be consistently met without treatment. CEMEX may request approval from the Water Board to cease operation of the pH treatment system.

6.2.2 Leachate Monitoring

If a leachate seep is observed, the WB must be notified by telephone or email within 24 hours of discovering a leachate seep from a disposal area. Observed leachate seeps and affected surface waters will be sampled, maps of the seep must be created, photos must be taken, flow must be estimated, observations recorded, and corrective actions developed for a report to be submitted within 7 days in accordance with MRP No. R3-2018-0001.

6.3 Inspection

The following inspections will be performed for the North CKD Area. Site inspections described below are required as described in MRP No. R3-2018-0001.

Inspection of the Landfill must be conducted, per MRP No. R3-2018-0001, in accordance with the following schedule, and record (including photographs, when appropriate), at a minimum, the Standard Observations listed below.

6.3.1 Site Inspection Schedule

MRP No. R3-2018-0001 requires Wet Season inspections (October 1 through April 30) and Dry Season inspections (May 1 through September 30). The required frequency for inspections is included in MRP No. R3-2018-0001 in Appendix H.

6.3.2 Standard Observations

Standard observations must be conducted of the landfill, landfill perimeter and receiving waters in accordance with the wet season and dry season inspections as required by MRP No. R3-2018-0001 in Appendix H.

6.3.3 Drainage Systems Inspections

Drainage control systems shall be inspected as part of standard observations and following each runoff producing storm event as described by MRP No. R3-2018-0001 in Appendix H.

Specific stormwater facilities that should be inspected include the following:

- North Pond Bypass Pipe, inlet, outlet, catch basins, and intercepting swale;
- Landfill perimeter ditches and French Drains;
- Drop structures and stilling basins near the southwest end of the North CKD Area Landfill;
- Shop Area Ditch, downstream culvert, and outlet to Retention Pond;
- Detention Pond and outlet;
- Retention Pond and outlet structure, including outlet structure check valves; and
- Discharge 001 culvert outfall and stormwater pH treatment system.

Drainage tunnels downstream from the Retention Pond are over 20 feet below ground and are not readily accessible to be inspected per the schedule required by MRP No. 2018-0001. As described in the Hydraulic Analysis Report in Appendix A, the bedrock tunnels are in good condition as of the inspection conduced on February 1, 2018. Accessible portions of the drainage tunnels should be visually inspected approximately once every 10 years and after significant earthquakes.

6.3.4 Differential Settlement

A topographic ground survey of the North CKD Area Landfill will be performed at the conclusion of construction activities overlaid on the aerial photograph, at a scale and contour interval

sufficient to depict the as-closed topography, and to allow for the early identification of any differential settlement. The closed Landfill survey will be reported as part of the final Closure Construction Report. The topographic map of the Landfill will act as a baseline against which to measure the total settlement through time, of all portions of the final cover since the date of Landfill closure. CEMEX is not required to develop iso-settlement maps every five years as CKD is not expected to undergo significant differential settlement, but iso-settlement maps may be required if differential settlement is observed.

6.4 Maintenance

6.4.1 Landfill Cover

The vegetated areas on the Landfill cover will be regularly inspected as part of the standard observations previously described including deficient areas that will be corrected. The correction may involve seeding and replanting as necessary. Prior to vegetation establishment, temporary erosion control BMPs such as jute netting or straw mulch may be needed to reduce or prevent erosion. Native drought-tolerant species have been specified for the initial planting. CEMEX will prevent the growth or establishment of trees or other deep-rooted plants by mowing the vegetation and removing saplings from the new landfill cover as necessary. Digging of holes or burrowing by rodents or other animals must be controlled and repaired. Documentation of sufficient landfill cover vegetation or appropriate stabilization will be reported annually by October 1 to the WB as part of the Wet Weather Preparedness Report.

Eroded areas of the landfill soil cover should be filled in or regraded to match the surrounding grade and revegetated with erosion and sediment control BMPs installed, as described below. Areas of ponding or differential settlement may require regrading to provide free drainage.

If there is a breach in the landfill cover through the soil, drainage layer, and low-hydraulic conductivity LLDPE layer into the waste, the breach and other associated cover problems must be repaired with a CQA plan. During the wet weather season (October 1 through April 15 of each year), if repairs cannot be made promptly, damage that threatens waste containment, cover integrity, or percolation of water into waste, will be temporarily covered to avoid exposure to precipitation.

If cracks, settlement, unintended seepage (i.e. not through weep holes), or other failure of the soil-nailed wall is observed, the wall should be inspected by a qualified Professional Engineer or Engineering Geologist to determine the appropriate maintenance.

6.4.2 Erosion and Sediment Control BMPs

Erosion and sediment control measures, including, but not limited to erosion control blankets, silt fences, wattles, and drainage inlet protection devices, installed during or after construction of the North CKD Area landfill must be maintained and repaired, as needed, after deficiencies are identified. Erosion and/or sediment control BMPs should be implemented whenever inspections are conducted and erosion or potential erosion is observed. Erosion and sediment control BMPs will be inspected as described above in Section 6.3 and as part of other permit requirements, such as for the Industrial or Construction Stormwater General Permits, and maintained or replaced as needed. Documentation of appropriate erosion and sediment control BMPs will be reported annually by October 1 to the WB as part of the Wet Weather Preparedness Report.

6.4.3 Drainage System Maintenance

The drainage system is inspected as described in Section 6.3. In general, maintenance should be conducted when sediment or debris prevents stormwater runoff from being effectively routed into, through, or out of a stormwater conveyance system. Repairs should also be conducted whenever damage has been observed or indications of impending damage have been observed to a stormwater conveyance feature. Maintenance and/or repairs should be conducted prior to the next forecasted storm event or as soon as feasible. The key stormwater drainage system features and specific maintenance activities are described below:

- **North Pond Bypass Pipe, inlet, outlet, catch basins, and intercepting swale.** Remove accumulated sediment in the North Pond if it has reached the level of the Bypass Pipe inlet and remove sediment and debris that may block flow from freely entering the North Pond Bypass Pipe. Remove sediment and debris that blocks flows from the Bypass Pipe intercepting swale and catch basins. Repair visible erosion if observed in the North Pond, along the Bypass Pipe swale, or at the Bypass Pipe outlet and discharge area down to No-name Creek. Replace dislodged rip-rap at the Bypass Pipe outlet, if necessary to prevent erosion.
- **Landfill perimeter ditches and French Drains.** Remove accumulated sediment and debris that could clog the perimeter ditches or French drains. Remove matted vegetation from the surface of the French drains. Clean shrubs, trees, or large clumps of grasses from the perimeter ditches that can impede flow. Short grasses can remain in the ditches if they do not impede flow and sediment can fill the interstitial spaces within the rock-filled geocell ditch lining. Cut or remove thick, tall grasses. Replace rock in the geocell material if dislodged. If sheet flow from off-site is not intercepted by the French drain and flows into the perimeter ditch, clean the

surface of the French drain, further evaluate the French drain and replace drain rock and/or clean out the French drain pipe, if needed.

- **Drop structures and stilling basins near the southwest end of the North CKD Area Landfill**.
  Remove accumulated sediment and debris that could clog the entrance to the drop structure inlets or reduce the volume of the stilling basin.
- **Shop Area Ditch, downstream culvert, and outlet to Retention Pond.**
  Remove accumulated sediment and debris that could clog the Shop Area Ditch or downstream culvert inlet. Clean shrubs, trees, or large clumps of grasses from the ditch and culvert impede flow. Short grasses can remain in the ditches if they do not impede flow and sediment can fill the interstitial spaces within the rock-filled geocell ditch lining. Cut or remove thick, tall grasses. Replace rock in the geocell material if dislodged. Repair visible erosion if observed at the culvert outlet and replace dislodged rip-rap at the Bypass Pipe outlet, if necessary, to prevent erosion.
- **Retention Pond and outlet structure, including outlet structure check valves.**
  Remove accumulated sediment and debris that blocks water from flowing from the Retention Pond into the outlet structure and backflow prevention check valves. Repair visible erosion on the banks of the Retention Pond. Maintain check valves in accordance with manufacturer's specifications.
- **Detention Pond and outlet structure.**
  Remove accumulated sediment and debris that blocks water from flowing from the Detention Pond into the outlet structure. Repair visible erosion on the banks of the pond and maintain the outlet structure as needed or required.
- **Plant drainage tunnels.**
  Remove accumulated sediment and debris that compromises the capacity of the drainage tunnels. Repair the tunnels, as needed.
- **Highway 1 drain and Highway 1 culvert outlet.**
  Notify Caltrans if a blockage or damage is observed at the Highway 1 drain just north of the Plant entrance or at the outlet of the 30-inch culvert.
- **Stormwater pH treatment system.**
  Until stormwater treatment is deemed no longer necessary and approval from the WB is received to cease operation, clean the pH probes and calibrate the pH meter in accordance with manufacturer recommendations, and refill carbon dioxide tank, as needed. Remove debris and sediment in the stormwater/carbon dioxide mixing sump, as needed.

6.5 Reporting

WDR Order No. R3-2018-0001 and MRP Order No. 2018-0001 (Appendix H) contain various reporting requirements following the closure of the North CKD Area Landfill, as follows:

- Final Construction Closure Report;
- Semi-Annual Monitoring Reports;
- Annual Summary Monitoring Reports; and
- Wet Weather Preparedness Reports.

Various other notifications also have reporting requirements as described in WDR Order No. R3-2018-0001 and MRP Order No. 2018-0001 (Appendix H). Refer to the WDR and MRP for the specific requirements.

Stormwater monitoring data, annual reports, and other required information will be reported to the State Water Resources Control Board pursuant to the IGP and CGP, as applicable.

The Landfill closure construction may also require other local, State, and or Federal approvals or permits that will have additional reporting requirements.

7.0 COST AND SCHEDULE ESTIMATES

7.1 Cost Estimates

Tables 2 and 3 provide a summary of the engineering cost estimates for the closure and post-closure monitoring and maintenance. Costs are given in current dollars and are not adjusted for future inflation. Detailed cost worksheets, from which the cost summary tables were generated, are also included in Appendix B.

These engineering cost estimates are based on our experience with similar projects in this vicinity and others up to the time this report was written. In some cases, the expected costs were provided as preliminary estimates from local contractors. It is important to note that the costs presented herein may not be completely representative of actual costs for this work and this construction market, at the time the construction is performed. Based on our experience with similar projects we have added a 30 percent contingency factor to all costs to account for some of these uncertainties.

Volumes and quantities presented are reflective of the Closure Plan design that is presented in this report, its attachments and the Plans. Estimates will be re-evaluated if any elements of the design are modified.

7.2 Schedule Estimates

We list approximate completion dates for closure activities in Table 4. The timing and execution for this project relies heavily on the involvement and approval of the various appropriate agencies and municipalities that are part of this Plan including but not limited to review and permitting.

These are subject to appropriate agencies and landowner approval. Updates of the schedule will be provided if the schedule changes. A partial summary of tasks that may have significant impact on a final schedule after agency approval include but are not limited to: a) permit delays; b) final land ownership agreements; c) unknown subsurface conditions that require added effort such as trenching in rock; d) very dense CKD conditions requiring excessive crushing/handling; e) 30-inch pipe abandonment; and f) frequent or prolonged delays caused by weather such as wind and rainfall.

Two important issues that will affect this schedule include lease negotiations and habitat evaluation issues, as described below.

Previous attempts to negotiate the purchase of the North CKD Area land owned by the CDLC have been unsuccessful. CEMEX is currently in discussions with CDLC. The completion of closure activities on these lands will be subject to final negotiation and approval by the current owner.

The North Pond and the two Seasonal Ponds on the east side of Area 2 have been identified as habitat for the CRLF a federally listed, threatened species. The Final CKD Closure Plan includes some work in the North Pond area and Seasonal Ponds, including cleaning out the Seasonal Ponds for a liner and preparing the Bypass Pipe inlet for the North Pond. We consider these temporary modifications to the habitat. These areas will be improved beyond current pre-construction conditions.

Procedures for approvals of changes to the Closure and Postclosure Maintenance Plan and Closure Plan are addressed in Title 27, Section 21865 and 21890, respectively.

8.0 SELECTED REFERENCES

Adams Resource Consultants Company 2012. "Final CKD Closure Plan and Post Closure Monitoring and Maintenance Plan, North CKD Area, CEMEX Davenport Cement Plant," July 31, 2012.

CH2M-Hill, Inc. 1995. "Construction Quality Assurance Report, Inactive Landfill Closure, Davenport Cement Plant," October 1995.

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FHWA 1998. Manual for Design and Construction Monitoring of Soil Nailed Walls, Publication No. FHWA-SA-96-069R. Revised October 1998. (Not Available in Electronic Format,) also see: https://www.fhwa.dot.gov/engineering/geotech/pubs/nhi14007.pdf and https://www.fhwa.dot.gov/engineering/geotech/pubs/if99015.pdf

Figure 1: North Pond (Center) and Revegetated CKD Area 1 in Foreground. View Northward.

Project No.: J-045-051-15 Date: April 1, 2018

Project No.: J-045-051-16 Date: April 1, 2018

Figure 2: Artists Rendition of final vegetated cover at the North CKD Closure Area. View Northward.

TABLE 1 CKD INVENTORY

Description	North CKD Area	2000 Estimated Volume of CKD (cy)	2012 Estimated Volume of CKD (cy)
CKD Below Canyon Rim	Area 1 & 2	342,000	342,000
	Area 3	390,000	390,000
	Sub Total	732,000	732,000
CKD Above Canyon Rim	Area 1	None	None
	Area 2	91,000	93,915
	Area 3	115,000	21,728
	Sub Total	206,000	115,643
Total Estimated CKD Inventory (June 2012)		**938,000**	**847,643**

TABLE 2 SUMMARY OF CLOSURE COST ESTIMATE

All costs listed are approximate and level of precision reflects unit cost estimates as of April 2018 only, not exact "real" values.

Final Cover	$4,640,000
Revegetation and Erosion Control	$140,000
Landfill Gas Monitoring and Control	$0
Groundwater Monitoring/Remediation	$0
Drainage Improvements and Modifications	$1,159,000
Security Improvements	$0
Mobilization/Demobilization	$110,000
Other Closure Costs	$2,820,000
SUBTOTAL CLOSURE COST ESTIMATE	**$9,409,000**
Contingency 30 percent	$2,820,000
TOTAL CLOSURE COSTS (Rounded to nearest thousand)	**$12,229,000**

TABLE 3 SUMMARY OF POST CLOSURE COST ESTIMATE

All costs listed are approximate annual costs unless otherwise noted.

Revegetation	$19,800
Erosion Control	$13,000
Monitoring	$87,000
Remediation/Control	$44,000
Drainage Maintenance	$6,200
Other Post-closure Monitoring Costs	$32,000
SUBTOTAL POSTCLOSURE COST ESTIMATE	**$202,000**
Contingency 30%	$60,600
TOTAL POST CLOSURE COST ESTIMATE (Rounded to nearest thousand)	**$263,000**
TOTAL 30-YEAR POST CLOSURE COST ESTIMATE (Rounded to nearest thousand)	**$7,890,000**

Note: Rounded values, not adjusted for inflation or fluctuations in market value.

TABLE 4 ESTIMATED CLOSURE SCHEDULE (Subject to Appropriate Agency/Landowner Permits and/or Approval)

Item	Activity	Completion
1	Receive WB approval to proceed with Closure Plan	August 2017
2	Respond to Comments, Complete Geotech Investigation, Final Design Addendum & Prepare Final Closure Plan	February 2018
3	Submit Final North CKD Closure Plan	April 1, 2018
3	Receive WB approval of Final Closure Plan & Final Design and Begin Preparing “For Bid” Package	May 2018
4	Final Drawings and Specifications Issued for Bid	June 2018
5	Receive all approvals for CRLF mitigation site	August 2018
6	Acquire CDLC land or re-negotiate lease area	August 2018
7	Receive all applicable Planning/Grading or Other Permits	August 2018
8	Select Final Bidder and General Contractor	September 2018
9	Mobilize Equipment, Prep Work Areas	September 2018
10	Install Bypass Pipe, Excavate Retention & Seasonal Ponds Pond	April 2019
11	Abandon 30-inch CMP, Clear, Grub and Stockpile	April 2019
12	Move Retention Pond Sediment and Coal to CKD Area	April 2019
13	Layout and Rough Grade Some Drainage Improvements	April 2019
14	Set up Air Monitoring, Crushing Operation and Begin Regrading	April 2019
15	Finish/Complete Winterization of Exposed Areas, Start Site Monitoring	October 2019
16	Remove Winterization. Resume Air Monitoring, Crushing Operation and Regrading and Ditching	April 2020
17	Finished Grades, Liner/cap, Cover, Pipes and Ditches	September 2020
18	Re-vegetate CKD Areas; seeding and mulching	October 2020
19	Demobilize Equipment, Establishment period - vegetation	October 2020
20	Install rural-type fencing in closed area	November 2020
21	Commence Post-closure Monitoring Period of Landfill	November 2020