RUN-ON AND RUN-OFF CONTROL SYSTEM PLAN
SANDOW 5 GENERATING PLANT
AX LANDFILL CELLS 1, 2 AND 2A
ROCKDALE, TEXAS

October 2016

Prepared for:

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PBW Project No. 5196D

PROFESSIONAL CERTIFICATION

This document and all attachments were prepared by Pastor, Behling & Wheeler, LLC under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I hereby certify that the Run-on and Run-off Control System Plan has been prepared in accordance with the requirements of Section 257.81 of the CCR Rule.

STATE OF TEXAS
PATRICK J. BEHLING
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LICENSED
PROFESSIONAL ENGINEER

10/05/16
Patrick J. Behling, P.E.
Principal Engineer
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1.0 INTRODUCTION

Luminant Generation Company, LLC (Luminant) operates the Sandow 5 Generating Plant located approximately 7 miles southwest of Rockdale in Milam County, Texas (Figure 1). Unit No. 5 is an approximately 581-megawatt, lignite-fired electric generation unit that was placed into service in 2009. Coal Combustion Residuals (CCR) including fly ash and bed ash are generated as part of Unit No. 5 operation. CCR is currently managed in the AX Landfill located approximately 7,500 feet south of Unit No. 5.

The CCR Rule (40 CFR 257 Subpart D - *Standards for the Receipt of Coal Combustion Residuals in Landfills and Surface Impoundments*) has been promulgated by EPA to regulate the management and disposal of CCRs as solid waste under Resource Conservation and Recovery Act (RCRA) Subtitle D. The final CCR Rule was published in the Federal Register on April 17, 2015. The effective date of the CCR Rule was October 19, 2015.

The CCR Rule establishes national operating criteria for existing CCR surface impoundments and landfills, including development of a run-on and run-off control system plan (RRCSP) for all CCR landfills. Pastor, Behling & Wheeler, LLC (PBW) was retained by Luminant to develop this run-on and run-off control system plan for the AX Landfill.

1.1 CCR Landfill Run-on and Run-off Control System Plan Requirements

Section 257.81(c) of the CCR Rule specifies that a written run-on and run-off control system plan be prepared for each existing CCR landfill that describes the systems that have been designed and constructed to control run-on to and run-off from the landfill consistent with the requirements of the CCR Rule and recognized and generally accepted good engineering practices. The RRCSP must include, at a minimum, design, construction, operation, and maintenance information for the following:

- A run-on control system to prevent flow onto the active portion of the CCR unit during the peak discharge from a 24-hour, 25-year storm; and
- A run-off control system from the active portion of the CCR unit to collect and control at least the water volume resulting from a 24-hour, 25-year storm. Run-off from the active portion of the CCR unit must be managed in accordance with the requirements of 40 CFR 257.3–3 (prohibition against pollution of waters of the United States).

The RRCSP must be must be supported by appropriate engineering calculations and must be certified by a qualified professional engineer. The RRCSP must document how the run-on and run-off control system has been designed and constructed to comply with the requirements of section 257.81 of the CCR Rule.

In accordance with 257.81(c)(3) of the CCR Rule, the initial RRCSP for an existing CCR landfill must be completed and placed in the facility operating record no later than October 17, 2016. Periodic RRCSPs must be completed every five years from the completion date of the initial plan. In addition, the RRCSP must be amended whenever there is a change in conditions that would substantially affect the plan.

1.2 Sandow 5 Units Subject to Run-on and Run-off Control System Plan Requirements

The AX Landfill is the only waste management unit associated with Sandow 5 that meets the definition of a CCR landfill. AX Landfill Cells 1, 2 and 2A are collectively considered an "existing landfill" under 40 CFR 257.53.

This RRCSP was prepared for AX Landfill Cells 1, 2 and 2A. In accordance with 257.81(c)(3) of the CCR Rule, the RRCSP must be amended when future landfill cells are constructed at the AX Landfill.

1.3 Description of AX Landfill Cells 1, 2 and 2A

The AX Landfill consists of Cells 1, 2 and 2A and covers an area of approximately 148.9 acres. The AX Landfill is located approximately 7,500 feet south of Sandow 5 on reclaimed mine land that is leased by Luminant from Alcoa (Figure 2). A site plan for the AX Landfill is shown on Figure 3. The AX Landfill was registered with the TCEQ as a Class 2 Non-hazardous Waste Landfill in 2008, and the registration was updated in 2015 (PBW, 2008; PBW 2015). The landfill is used to manage fly ash and bed ash generated from Unit No. 5. Fly ash and bed ash are transported to the landfill in trucks and placed in the landfill as dry material.

AX Landfill Cells 1, 2 and 2A are lined landfill cells. Construction of Cell 1 was completed in July 2013 and construction of Cells 2 and 2A was initiated in May 2015. Cell 2 was completed in October 2015 and Cell 2A was completed in July 2016. Placement of Unit No. 5 CCR began in Cell 1 in May 2015 and Cell 2 in September 2016. As of the completion date of this plan, CCR has not been placed in Cell 2A.

The AX Landfill is constructed partially above and partially below grade and are surrounded by engineered earthen dikes that extend approximately 10 to 15 feet above surrounding grade. Smaller interior earthen dikes separate Cells 1, 2 and 2A from each other. A geosynthetic liner system, consisting of a 30 mil thick Geomembrane Supported Geosynthetic Clay Liner (GSGCL) installed on top of 2 feet of soil exhibiting a minimum hydraulic conductivity of 5 X 10-5 cm/sec, has been installed in the landfill cells. The liner system is installed across the bottom of each cell, extends across the interior dikes, and extends up the inside sides of the perimeter dikes. The liner system is covered with an approximately 18-inch thick layer of protective soil to prevent damage to the liner during landfill operations. The base of each landfill cell is sloped toward a collection area for runoff from active landfill areas at the downgradient edge of the cell.

CCR will be placed within the engineered earthen dikes that surround Cells 1, 2 and 2A. CCR levels at the embankment start approximately 2 feet below the top of the embankment and the material is sloped upward at approximately 4 (Horizontal) to 1 (Vertical) to an approximate height of 40 feet above the top of the embankment. The material then slopes upward from the top of the 4:1 sloped tier at 3 to 5 percent and reaches a peak elevation of approximately El. 586 near the center of the landfill.

2.0 RUN-ON AND RUN-OFF CONTROL SYSTEM PLAN

The RRCSP for AX Landfill Cells 1, 2 and 2A is described in this section. Placement of CCR began in Cell 1 in May 2015 and is anticipated to continue through 2016. Placement of CCR in Cells 2 and 2A will be initiated once the capacity of Cell 1 has been exhausted or as otherwise dictated by landfill operating conditions. In accordance with 257.81(c) of the CCR Rule, the RRCSP addresses run-on and run-off control for the active portion of the landfill. Run-on and runoff control systems for closed sections of AX Landfill Cells 1, 2 and 2A are described in the Closure Plan for the landfill.

2.1 Design Storm Conditions

In accordance with Sections 257.81(a)(1) and 257.81(a)(2) of the CCR Rule, the run-on and run-off control systems for the landfill must be designed to prevent run-on into the landfill and run-off from active portions of the landfill during the peak discharge from a 24-hour, 25-year storm. The 25-year, 24-hour storm for the AX Landfill was estimated to be 8.2 inches based on the 25-Year, 24-Hour Rainfall Graph from US Department of Commerce Technical Paper No. 40 (Hershfield, 1961). A copy of the 25-Year, 24-Hour Rainfall Graph from Technical Paper No. 40 is reproduced in Appendix B.

2.2 Run-on Control System

The CCR Rule defines run-on as “any rainwater, leachate, or other liquid that drains overland onto any part of a CCR landfill or lateral expansion of a CCR landfill.” The run-on control system for AX Landfill Cells 1, 2 and 2A is described below.

2.2.1 Design and Construction

AX Landfill Cells 1, 2 and 2A have been designed and constructed to eliminate entry of any storm water runoff (exclusive of direct rainfall from above) from areas outside the landfill. The landfill is surrounded by exterior earthen dikes that extend 10 to 15 feet or more above the surrounding grade. As shown on Figure 4, storm water runoff generated from areas outside the landfill is diverted away from the landfill by the dikes and associated drainage ditches, swales and other surface features. In accordance with Section 257.81(a)(1) of the CCR Rule, the height of the exterior landfill dikes relative to the surrounding topography indicate that run-on from a 25-year 24-hour storm will be diverted around the landfill and not flow onto any part of the landfill actively receiving CCR.

The landfill dikes and storm water drainage features are also designed and constructed to minimize soil erosion. The exterior of the dikes, drainage features and other earth structures are permanently vegetated to control erosion. Additional erosion protection (channel linings, rip rap, etc.) are used at locations with higher storm water flow velocities and increased erosion potential.

2.2.2 Operation and Maintenance

Storm water drainage features along the exterior of AX Landfill Cells 1, 2 and 2A will be operated and maintained to ensure that proper storm water run-on control is maintained throughout the life of the landfill. Storm water run-on operation and maintenance activities implemented at the landfill include:

- The landfill is visually inspected on a weekly basis by a qualified person in accordance 40 CFR 257.83(a) and annual by a professional engineer in accordance with 40 CFR 257.83 (b). The weekly and annual inspections address the exterior dikes around the landfill and storm water run-on control features along the dikes and include:
  - Verification that storm water generated from areas outside the CCR placement areas is diverted around the landfill by the dikes and associated drainage ditches, swales and other drainage features.
  - Verification that the drainage ditches, swales and other drainage features do not contain significant accumulated sediments or other flow obstructions;
  - Identification of areas of dike or drainage feature erosion/scouring that require repair.
- Accumulated sediment/debris are removed, as required, from the drainage features to maintain adequate storm water drainage. Areas of erosion/scour are repaired through backfilling, grading/reshaping, seeding and related activities. Drainage features may be redesigned/reconfigured if erosion/scouring are observed repeatedly in certain areas.
- Inspection and maintenance activities are documented in inspection and maintenance records.

2.3 Run-off Control System

The CCR Rule defines run-off as “any rainwater, leachate, or other liquid that drains overland from any part of a CCR landfill or lateral expansion of a CCR landfill.” For the purposes of this RRCSP, the term “run-off” has been further classified into run-off from active landfill areas and run-off from capped landfill areas. The run-off control system for AX Landfill Cells 1, 2 and 2A is described below.

2.3.1 Design and Construction

AX Landfill Cells 1, 2 and 2A have been designed and constructed to contain precipitation that falls directly on the active portions of Cells 1, 2 and 2A. The landfill is surrounded by earthen dikes that extend 10 to 15 feet or more above the surrounding grade, so precipitation that falls within the active areas of the landfill is contained and managed as run-off from active areas. The base of each landfill cell is sloped toward a collection area at the downgradient edge of the cell to assist in handling of rainfall accumulation. Run-off from active landfill areas that accumulates in the collection area is applied to the active landfill areas to control dust and/or is allowed to evaporate. Run-off from active landfill areas will not be discharged from the landfill unless authorized by appropriate regulatory agencies.

Luminant plans to place CCR in the AX Landfill sequentially, with CCR placed first in Cell 1, then Cell 2 and finally Cell 2A. Estimated sequential CCR placement plans for Cells 1, 2 and 2A are shown on the following figures:

- Figure 5 shows the design top of CCR contours for Cell 1;
- Figure 6 shows the design top of CCR contours for Cells 1 and 2; and
- Figure 7 shows the design top of CCR contours for Cells 1, 2 and 2A.

The collection area for run-off from active areas in each cell will be the last section of the cell that receives CCR so that the collection area is available for containment of run-off from active areas during cell operations.

Cells 1, 2 and 2A may be closed/capped once the cells have been filled with CCR to the design capacities/elevations. Luminant anticipates constructing the cap in phases over several years. While a landfill cell is active, all run-off from active landfill areas will be contained and managed. Once a cell or portion of a cell has been closed/capped (either with a permanent cap or with a temporary soil cover), precipitation that falls on the closed/capped area will be considered runoff from capped landfill areas and will be diverted away from the active areas of the landfill. Runoff from capped landfill areas will flow off of the closed/capped portions of the landfill and be diverted away from the landfill by the drainage ditches, swales and other surface features along the perimeter of the landfill.

Run-off Volume Calculation Procedures

In accordance with Section 257.81(a)(2) of the CCR Rule, Cells 1, 2 and 2A have been designed and constructed to contain the estimated volume of run-off from active landfill areas generated from a 25-year, 24-hour storm. Run-off volume estimates were generated for the following landfill operating scenarios:

- Scenario 1: Cell 1 Active - Storage in Empty Cell 2. Under this scenario, CCR is placed in Cell 1 and run-off from active areas is generated from precipitation that falls on Cell 1. The Cell 1 run-off collection area is available for some amount of run-off storage; however, due to the relatively short interior dikes separating Cell 1 from Cell 2, the Cell 1 collection area is conservatively assumed to provide negligible storage of run-off from active areas under this scenario. Cell 2 is not receiving CCR and the cell is available for storage of run-off from active areas in Cell 1; however, the total volume of water stored must also take into consideration precipitation on Cell 2.

- Scenario 2: Cell 2 Active, Cell 1 Full But Not Capped – Storage in Empty Cell 2A. Under this scenario, Cell 1 has been filled to capacity with CCR, but has not been closed/capped, and CCR is being placed in Cell 2. The Cell 2 run-off collection area is available for storage of run-off from active areas of Cells 1 and 2. Cell 2A is not receiving CCR and the cell is available for storage of run-off from active areas in Cells 1 and 2; however, the total volume of water stored must also take into consideration precipitation on Cell 2A.

- Scenario 3: Cell 2A Active, Cells 1 and 2 Full But Not Capped – Storage in Cell 2A Collection area. Under this scenario, Cells 1 and 2 have been filled to capacity with CCR, but have not been closed/capped and CCR is being placed in Cell 2A. The Cell 2A run-off collection area is available for storage of run-off from active areas in Cells 1, 2 and 2A.

- Scenario 4: Cell 2A Active, Cell 2 Full But Not Capped, Cell 1 Partially Closed/Capped – Storage in Cell 2A Collection area. Under this scenario, part of Cell 1 has been capped/closed, Cell 2 has been filled to capacity with CCR, but has not been closed/capped and CCR is being placed in Cell 2A. The Cell 2A run-off collection area is available for storage of run-off from active areas.

The run-off collection area in Cell 2A will be the last section of Cell 2A that receives CCR so that the collection area remains available for containment of run-off from active areas during cell operations. CCR will be placed in the Cell 2A run-off collection area once future landfill cells and/or alternative collection areas have been constructed.

Run-off volumes were estimated using the Curve Number (CN) method as described in the USDA publication *TR-55 - Urban Hydrology for Small Water Sheds* (USDA-NRCS, 1986). A key component of the TR-55 procedure is identifying the appropriate CN used in the evaluations. As a point of reference, a CN of 100 means 100 percent of the rainfall on an area runs off and none of the precipitation is retained by the exposed material through absorption, evaporation, localized ponding, infiltration and similar processes. Published CNs vary depending on material type, degree of saturation and other variables, ranging from 98 for impervious surfaces (concrete/asphalt pavement, etc.) to 50 or less for vegetated, well drained soils (USDA-NRCS, 1986).

The fly ash/bed ash placed in Cells 1, 2 and 2A is absorptive and is placed as an essentially dry material. As a result, is likely that the exposed fly ash/bed ash will absorb/retain a measureable volume of the precipitation that falls on the active landfill cells. The Hydrologic Evaluation of Landfill Performance (HELP) model was used to estimate a CN for the exposed CCR in the cells (Schroeder, et. al, 1994). HELP model results for the exposed CCR are shown in Appendix C. Based on the HELP model results, a CN of 94 was assumed for estimating run-off volumes generated from exposed fly ash/bed ash.

If necessary, the interior dikes between the cells may be overtopped so that run-off containment is provided by more than one cell. When multiple cells are used to provide run-off containment, precipitation on the empty containment cell from a 25-year, 24-hour storm is added to the volume of run-off from the active areas in the landfill cell, since precipitation on the empty cell itself must also be contained. The HELP model was also used to estimate a CN for the exposed protective soil in the empty cell (see Appendix C). Based on the HELP model results, a CN of 84 was assumed for estimating water volumes generated from exposed protective soil in the empty cell.

The surface areas of Cells 1, 2 and 2A used to calculate run-off volumes were determined using AutoCad Civil 3D. Outputs from the Civil 3D models showing the surface area of each cell are reproduced in Appendix D. The calculated surface areas of the landfill cells were as follows:

- Cell 1: 1,472,596 square feet (sf) or approximately 33.8 acres
- Cells 1 and 2: 2,770,574 sf or approximately 63.6 acres
- Cells 1, 2 and 2A: 6,483,918 sf or approximately 148.9 acres

Run-off Containment Capacities

Run-off containment capacities for Cells 2 and 2A were calculated using the terrain modelling capabilities of AutoCad Civil 3D. Outputs from the Civil 3D models showing the containment capacities of the landfill cells are reproduced in Appendix E. Run-off containment capacities were calculated for the conditions described below.

- Cell 2 Empty. Under this condition, no CCR has been placed in Cell 2. As a result, the containment capacity of Cell 2 extends beyond the run-off collection area to include other parts of the cell that can be inundated before the interior dike between Cell 2 and Cell 2A is overtopped. The minimum elevation of the top of the interior dike between Cell 2 and Cell 2A is El. 473 (It should be noted that the minimum elevation of the exterior dike of Cell 2 is El. 480 or approximately 7 feet higher than the interior dike). The volume of run-off in cubic feet (cf) that can be contained in the empty Cell 2 without overtopping the interior dike between Cells 2 and 2A is as follows:

  - Water surface elevation El. 471 (2 feet of freeboard on interior dike): 1,280,394 cf
  - Water surface elevation El. 472 (1 foot of freeboard on interior dike): 1,632,096 cf

- Cell 2 Run-off Collection Area. Under this condition, CCR is being placed in Cell 2. As a result, the containment capacity of Cell 2 is assumed to be limited to the run-off collection area in the cell. The minimum elevation of the top of the interior dike between Cell 2 and Cell 2A is El. 473 (As described above, the minimum elevation of the exterior dike of Cell 2 is El. 480 or approximately 7 feet higher than the interior dike). The volume of run-off that can be contained in the Cell 2 collection area without overtopping the interior dike between Cells 2 and 2A is as follows:

  - Water surface elevation El. 471 (2 feet of freeboard on interior dike): 706,806 cf
  - Water surface elevation El. 473 (0 feet of freeboard on interior dike): 904,230 cf

- Cell 2A Empty. Under this condition, no CCR has been placed in Cell 2A. As a result, the containment capacity of Cell 2A extends beyond the run-off collection area to include other parts of the cell that can be inundated while maintaining 2 feet of freeboard along the exterior Cell 2A dike. The minimum elevation of the top of the exterior Cell 2A dike is El. 479.9; therefore, the volume of run-off that can be contained in the empty Cell 2A was modelled using a maximum water surface elevation of El. 477.9 (2 feet of freeboard). The volume of run-off that can be contained in the empty Cell 2A at El. 477.9 is approximately 21,532,932 cf.

- Cell 2A Run-off Collection Area. Under this condition, CCR is being placed in Cell 2A. As a result, the containment capacity of Cell 2A is assumed to be limited to the run-off collection area. The minimum elevation of the top of the exterior Cell 2A dike is El. 479.9; therefore, the volume of run-off that can be contained in the Cell 2A run-off collection area without overtopping the exterior dike is as follows:

  - Water surface elevation El. 477.9 (2 feet of freeboard on exterior dike): 3,775,464 cf
  - Water surface elevation El. 478.9 (1 foot of freeboard on exterior dike): 4,071,843 cf

Run-off Evaluation

Run-off volume estimates for each of the landfill operating scenarios described above are shown in Appendix F. The estimated volumes of run-off were compared to the run-off containment capacities for the landfill cells shown in Appendix E to confirm that adequate run-off containment is provided for each scenario for the 25-year, 24-hour storm (8.2 inches). When multiple cells are used to provide run-off containment, precipitation on the containment cell from a 25-year, 24-hour storm is added to the run-off volume from the active landfill cell, since precipitation on the containment cell itself must also be contained.

The results of the run-off evaluation can be summarized as follows:

- Scenario 1: Cell 1 Active - Storage in Empty Cell 2. Under this scenario, the Cell 1 run-off collection area is conservatively assumed to provide negligible run-off storage and the empty Cell 2 is used for storage of run-off from active areas. The estimated volume of run-off generated from Cells 1 and 2 under this scenario is approximately 1,597,864 cf. The storage volume of the empty Cell 2 at El. 472 (1 foot of freeboard on interior dike) is 1,632,096 cf, which exceeds the estimated volume of run-off from active areas. As a result, adequate run-off storage for the 25-year, 24-hour storm is provided under this scenario.

- Scenario 2: Cell 2 Active, Cell 1 Full But Not Capped – Storage in Empty Cell 2A. Under this scenario, Cell 1 has been filled to capacity with CCR, but has not been closed/capped and CCR is being placed in Cell 2. Run-off containment is provided by Cell 2, however, the containment capacity of Cell 2 is assumed to be limited to the Cell 2 run-off collection area. Cell 2A is not receiving CCR and is also available for run-off storage as needed.

  The estimated volume of run-off generated from full Cell 1 and active Cell 2 under this scenario is approximately 1,727,180 cf. The storage volume of the Cell 2 run-off collection area at El. 473 (0 feet of freeboard on interior dike) is 904,230 cf, which is less than the estimated run-off volume. However, Cell 2A is empty and is available for additional overflow run-off storage from the Cell 2 run-off collection area.

  The estimated volume of run-off generated from full Cell 1, active Cell 2 and empty Cell 2A under this scenario is approximately 3,672,245 cf. The volume of run-off from active areas that can be contained in the empty Cell 2A at El. 477.9 (2 feet of freeboard on the exterior Cell 2A dike) is approximately 21,532,932 cf which significantly exceeds the additional volume of storage needed. As a result, adequate storage for run-off for the 25-year, 24-hour storm is provided under this scenario.

- Scenario 3: Cell 2A Active, Cells 1 and 2 Full But Not Capped – Storage in Cell 2A Collection area. Under this scenario, Cells 1 and 2 have been filled to capacity with CCR, but have not been closed/capped, and CCR is being placed in Cell 2A. Run-off containment is provided by Cell 2A, however, the containment capacity of Cell 2A is assumed to be limited to the Cell 2A run-off collection area.

  The estimated volume of run-off generated from full Cells 1 and 2 and active Cell 2A is approximately 4,042,083 cf. The storage volume of the Cell 2A run-off collection area at El. 478.9 (1 foot of freeboard on exterior dike) is approximately 4,071,843 cf, which exceeds the storage volume needed. As a result, adequate storage for run-off for the 25-year, 24-hour storm is provided under this scenario.

- Scenario 4: Cell 2A Active, Cell 2 Full But Not Capped, Cell 1 Partially Closed/Capped – Storage in Cell 2A Collection area. Under this scenario, approximately half of Cell 1 (16.9 acres) is assumed to have been capped/closed, the remainder of Cell 1 and Cell 2 are assumed to be full but not closed/capped, and CCR is being placed in Cell 2A. Run-off containment is provided by Cell 2A, however, the containment capacity of Cell 2A is assumed to be limited to the Cell 2A run-off collection area.

Approximately half of Cell 1 has been closed/capped under this scenario, so precipitation that falls on this part of Cell 1 is considered run-off from capped landfill areas and is diverted away from the active areas of the landfill. Therefore, run-off from active areas is generated only from the remainder of Cell 1, Cell 2 and Cell 2A under this scenario. The estimated volume of run-off generated from these areas is approximately 3,583,882 cf. The storage volume of the Cell 2A run-off collection area at El. 477.9 (2 feet of freeboard on exterior dike) is approximately 3,775,464 cf, which exceeds the storage volume needed. As a result, adequate storage for run-off for the 25-year, 24-hour storm is provided under this scenario.

2.3.2 Operation and Maintenance

The run-off containment features of AX Landfill Cells 1, 2 and 2A will be operated and maintained to ensure that proper run-off control is maintained throughout the life of the landfill. Run-off control operation and maintenance activities implemented at the landfill include:

- Run-off from active landfill areas is stored in the landfill cells for the shortest time practicable. Run-off accumulated in the collection area is applied to active areas of the landfill to control dust and/or is allowed to evaporate. Run-off from active landfill areas will not be discharged from the landfill unless authorized by appropriate regulatory agencies.
- The landfill is visually inspected on a weekly basis by a qualified person in accordance 40 CFR 257.83(a) and annually by a professional engineer in accordance with 40 CFR 257.83 (b). The weekly and annual inspections address the interior and exterior dikes at the landfill and include:
  - Verification that run-off from active areas is being contained in the landfill cells and a minimum of 2 feet of freeboard is maintained along the exterior dikes in areas where run-off is temporarily stored.
- Inspection and maintenance activities are is documented in inspection and maintenance records.

2.4 Updates to Run-on and Run-off Control System Plan

In accordance with 257.81(c)(3) of the CCR Rule, this initial RRCSP must be placed in the Sandow 5 facility operating record no later than October 17, 2016. Subsequent RRCSPs must be completed every five years from the completion date of this initial plan. In addition, the RRCSP must be amended whenever there is a change in conditions that would substantially affect the plan.

3.0 REFERENCES

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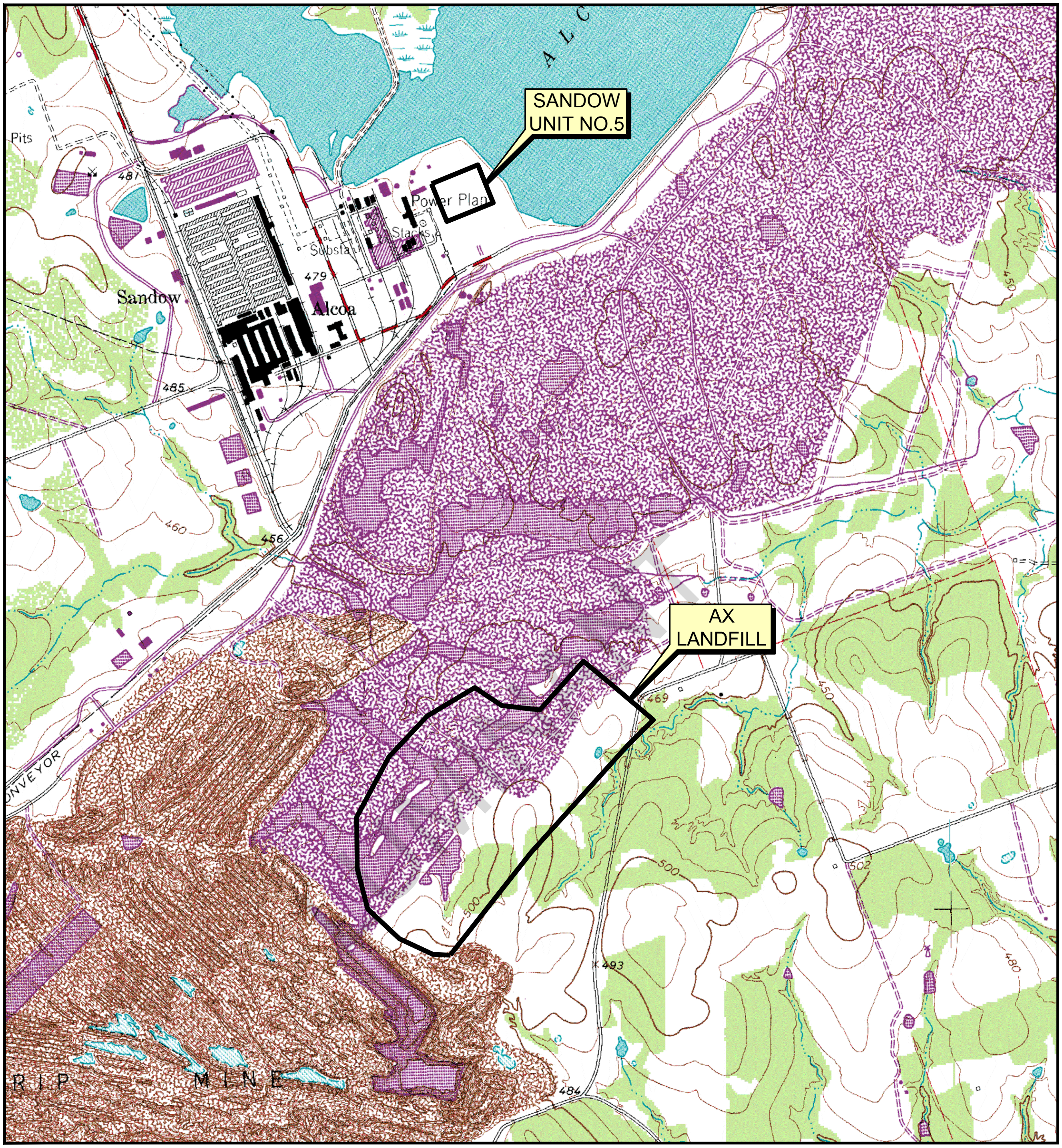
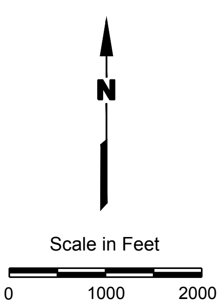
Figures





SOURCE:
Base map from www.tnris.gov, Alcoa Lake, TX 7.5 min. USGS quadrangle dated 1963, revised 1988.

LUMINANT GENERATION COMPANY, LLC
SANDOW UNIT NO.5

Figure 1

AX LANDFILL
LOCATION MAP

PROJECT: 5196D	BY: ADJ	REVISIONS
DATE: SEP., 2016	CHECKED: PJB	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

NOTE:
EXISTING GRADE CONTOURS OUTSIDE OF CELLS 1, 2 AND 2A ARE CIRCA 2006 AND ARE SHOWN FOR REFERENCE ONLY. CONTOURS DO NOT NECESSARILY REFLECT EXISTING CONDITIONS.

Scale in Feet
0 750 1500

LUMINANT GENERATION COMPANY, LLC
SANDOW UNIT NO.5

Figure 2
AX LANDFILL SITE VICINITY MAP

PROJECT: 5196D	BY: ADJ/GJM	REVISIONS
DATE: SEP., 2016	CHECKED: PJB	

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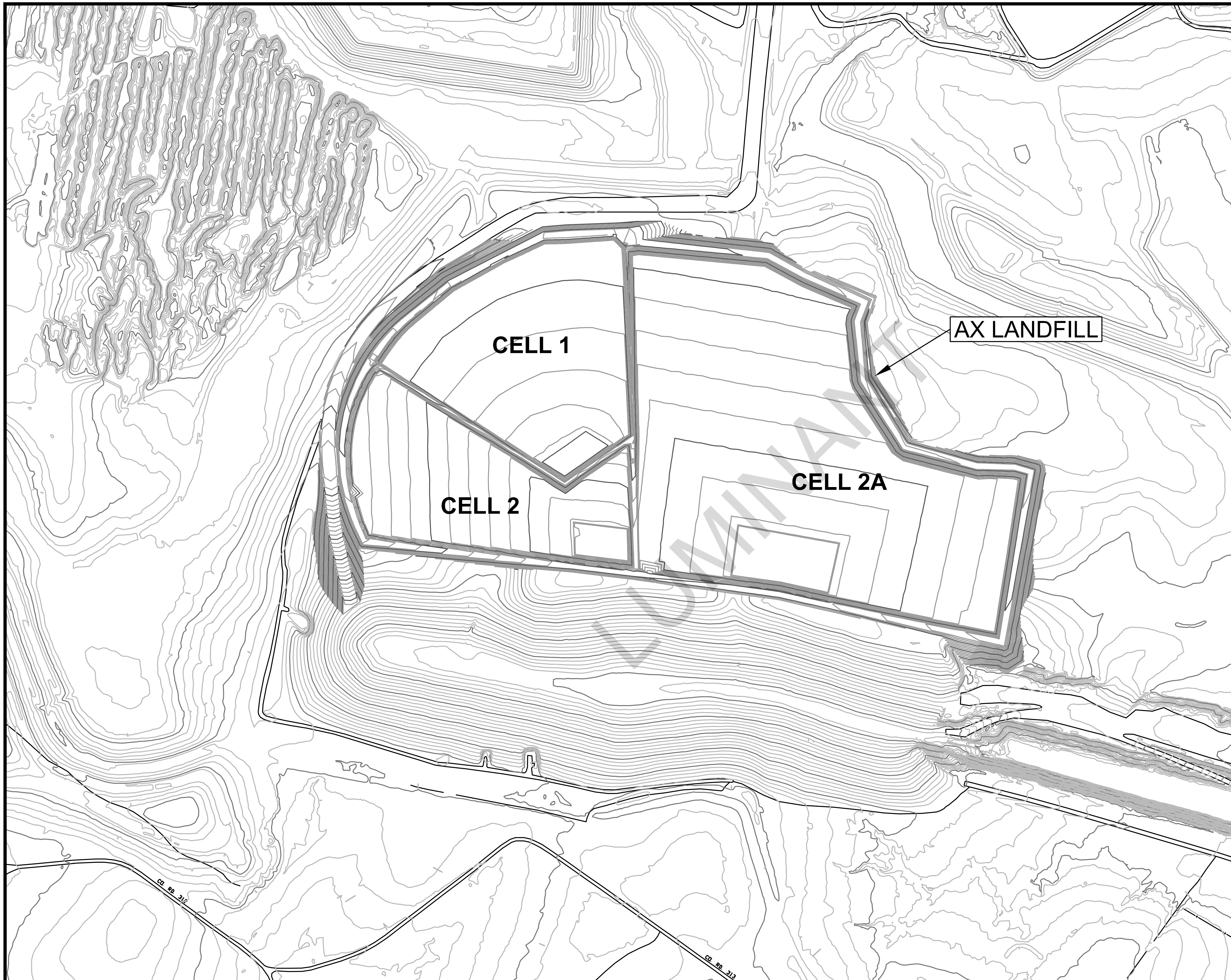
CONSULTING ENGINEERS AND SCIENTISTS



NOTE:
EXISTING GRADE CONTOURS OUTSIDE OF CELLS 1, 2 AND 2A ARE CIRCA 2006 AND ARE SHOWN FOR REFERENCE ONLY. CONTOURS DO NOT NECESSARILY REFLECT EXISTING CONDITIONS.

N

Scale in Feet

0 750 1500

LUMINANT GENERATION COMPANY, LLC
SANDOW UNIT NO.5

Figure 3
AX LANDFILL EXISTING SITE PLAN

PROJECT: 5196D	BY: ADJ	REVISIONS
DATE: SEP., 2016	CHECKED: PJB	

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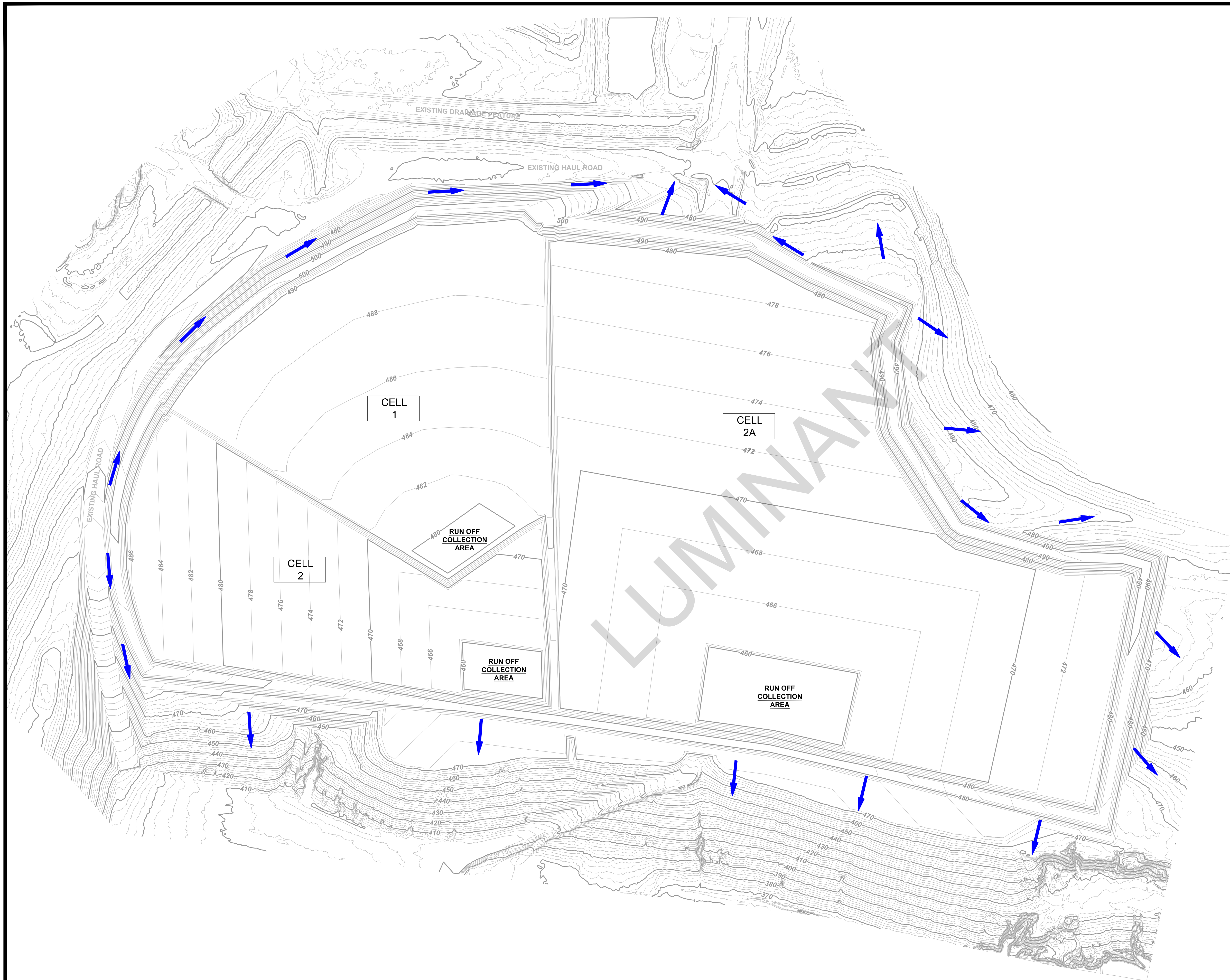


EXPLANATION

Grade Contour - 2 FT Interval

Grade Contour - 10 FT Interval

Stormwater Flow Direction

N

Scale in Feet

0 200 400

LUMINANT GENERATION COMPANY, LLC

SANDOW UNIT NO.5

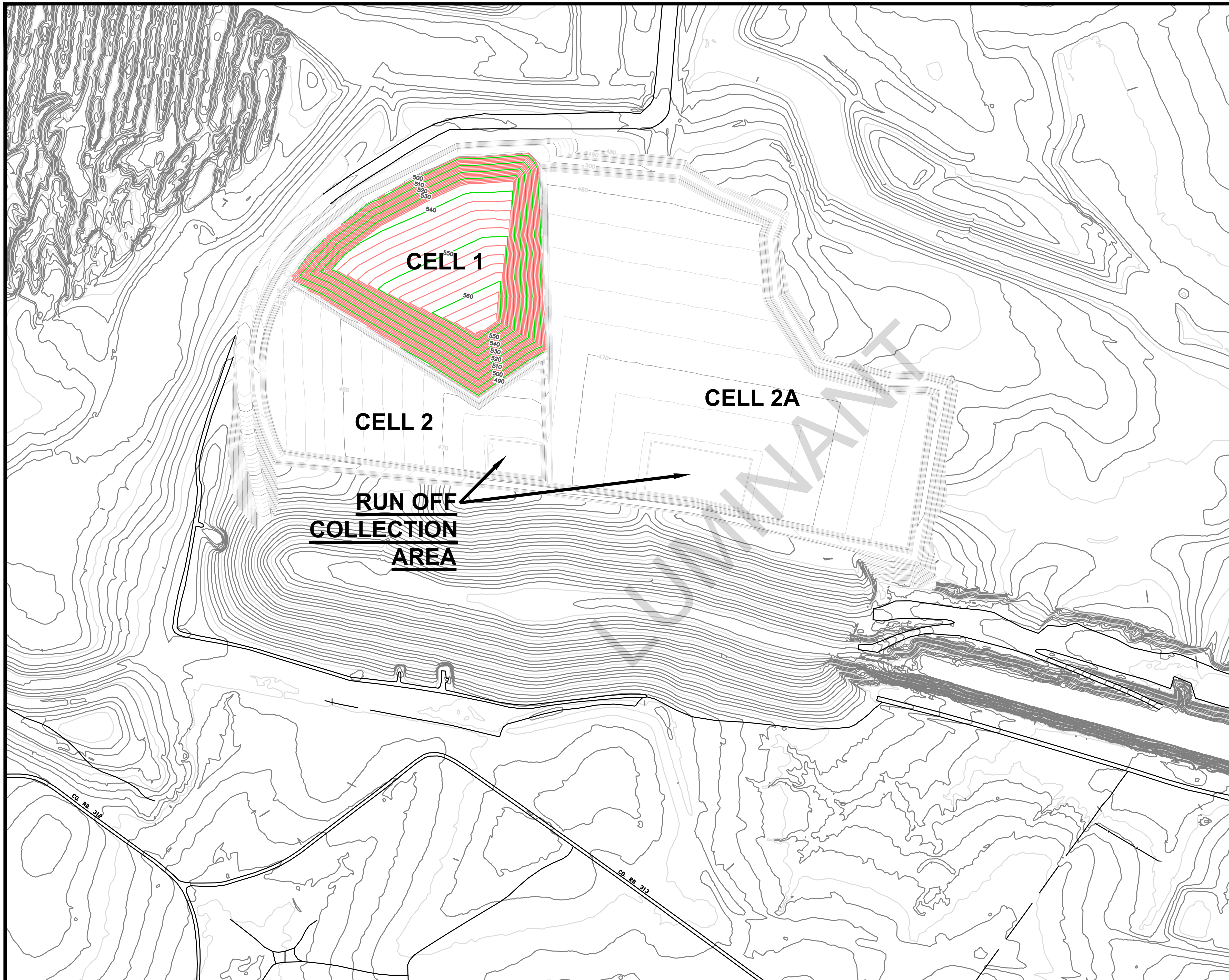
Figure 4

AX LANDFILL RUN-ON DIVERSION PLAN

PROJECT: 5196D	BY: ADJ	REVISIONS
DATE: SEP., 2016	CHECKED: PJB	

PASTOR, BEHLING & WHEELER, LLC

CONSULTING ENGINEERS AND SCIENTISTS



NOTE:
EXISTING GRADE CONTOURS OUTSIDE OF CELLS 1, 2 AND 2A ARE CIRCA 2006 AND ARE SHOWN FOR REFERENCE ONLY. CONTOURS DO NOT NECESSARILY REFLECT EXISTING CONDITIONS.

N

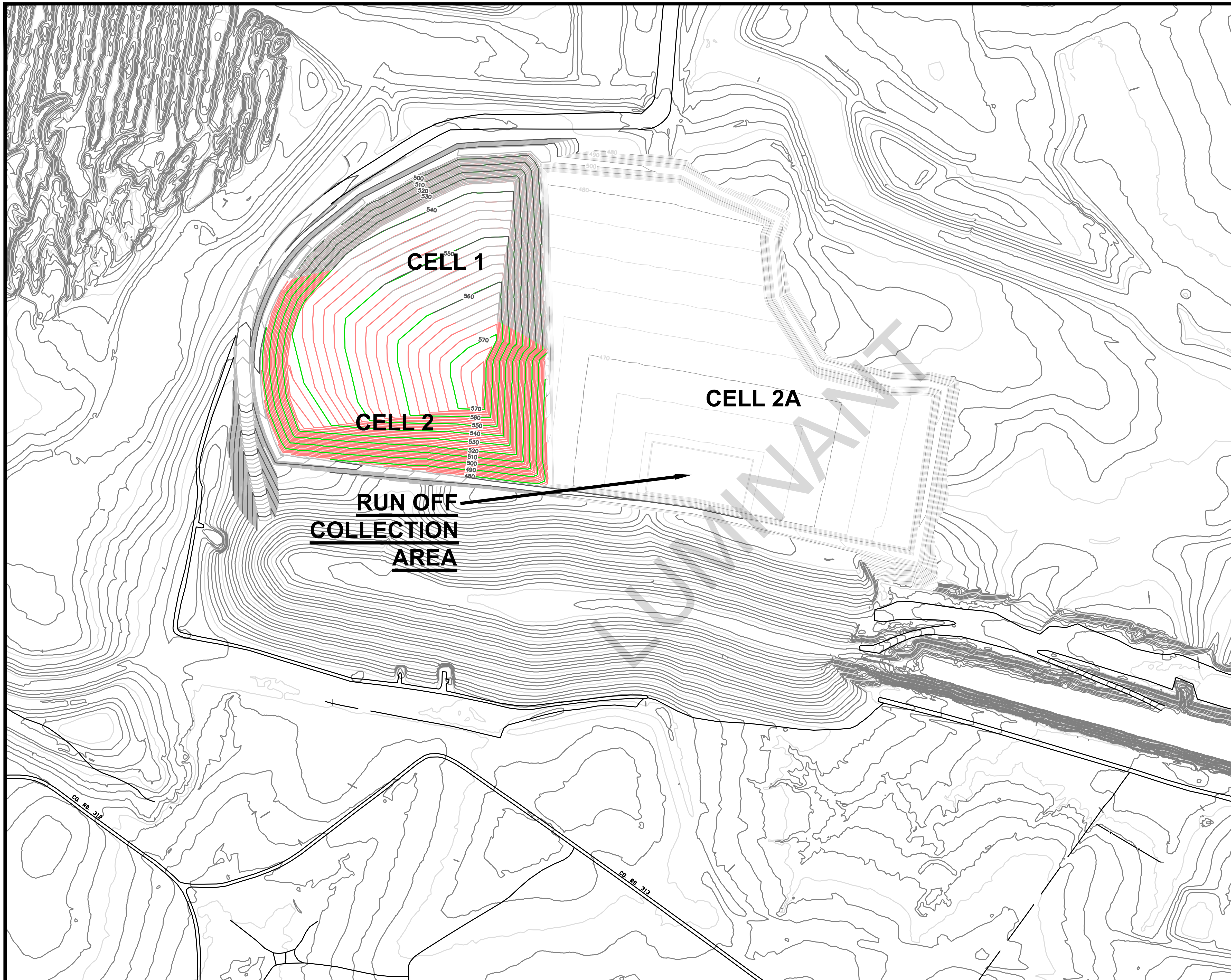
Scale in Feet
0 300 600

LUMINANT GENERATION COMPANY, LLC
SANDOW UNIT NO.5

Figure 5
AX LANDFILL
CELL 1 CCR PLACEMENT PLAN

PROJECT: 5196D	BY: ADJ	REVISIONS
DATE: SEP., 2016	CHECKED: PJB	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



NOTE:
EXISTING GRADE CONTOURS OUTSIDE OF CELLS 1, 2 AND 2A ARE CIRCA 2006 AND ARE SHOWN FOR REFERENCE ONLY. CONTOURS DO NOT NECESSARILY REFLECT EXISTING CONDITIONS.

N

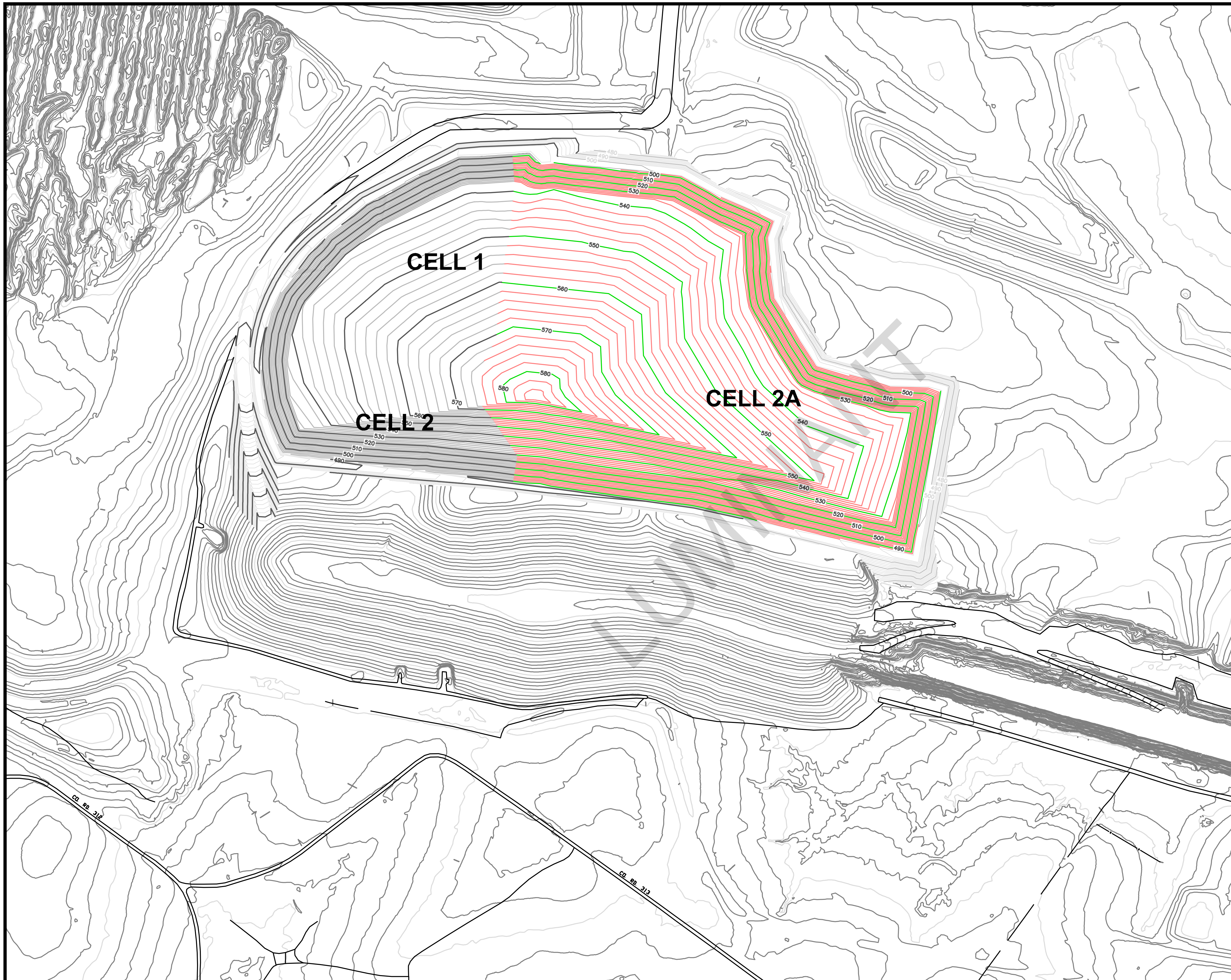
Scale in Feet
0 300 600

LUMINANT GENERATION COMPANY, LLC
SANDOW UNIT NO.5

Figure 6
AX LANDFILL CELLS 1 AND 2 CCR PLACEMENT PLAN

PROJECT: 5196D	BY: ADJ	REVISIONS
DATE: SEP., 2016	CHECKED: PJB	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS



NOTE:
EXISTING GRADE CONTOURS OUTSIDE OF CELLS 1, 2 AND 2A ARE CIRCA 2006 AND ARE SHOWN FOR REFERENCE ONLY. CONTOURS DO NOT NECESSARILY REFLECT EXISTING CONDITIONS.

N

Scale in Feet
0 300 600

LUMINANT GENERATION COMPANY, LLC
SANDOW UNIT NO.5

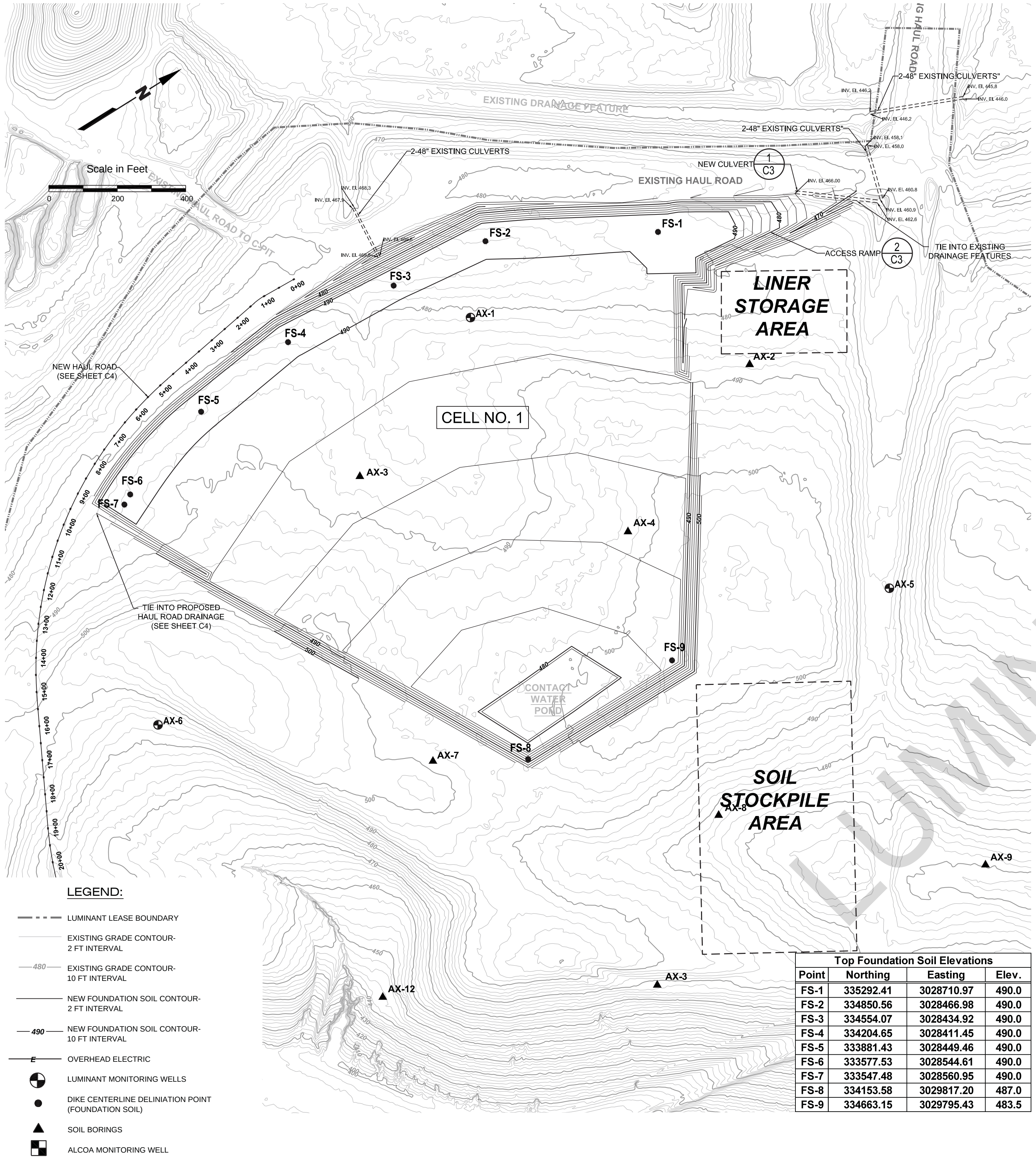
Figure 7
AX LANDFILL CELLS 1, 2 AND 2A CCR PLACEMENT PLAN

PROJECT: 5196D	BY: ADJ	REVISIONS
DATE: SEP., 2016	CHECKED: PJB	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

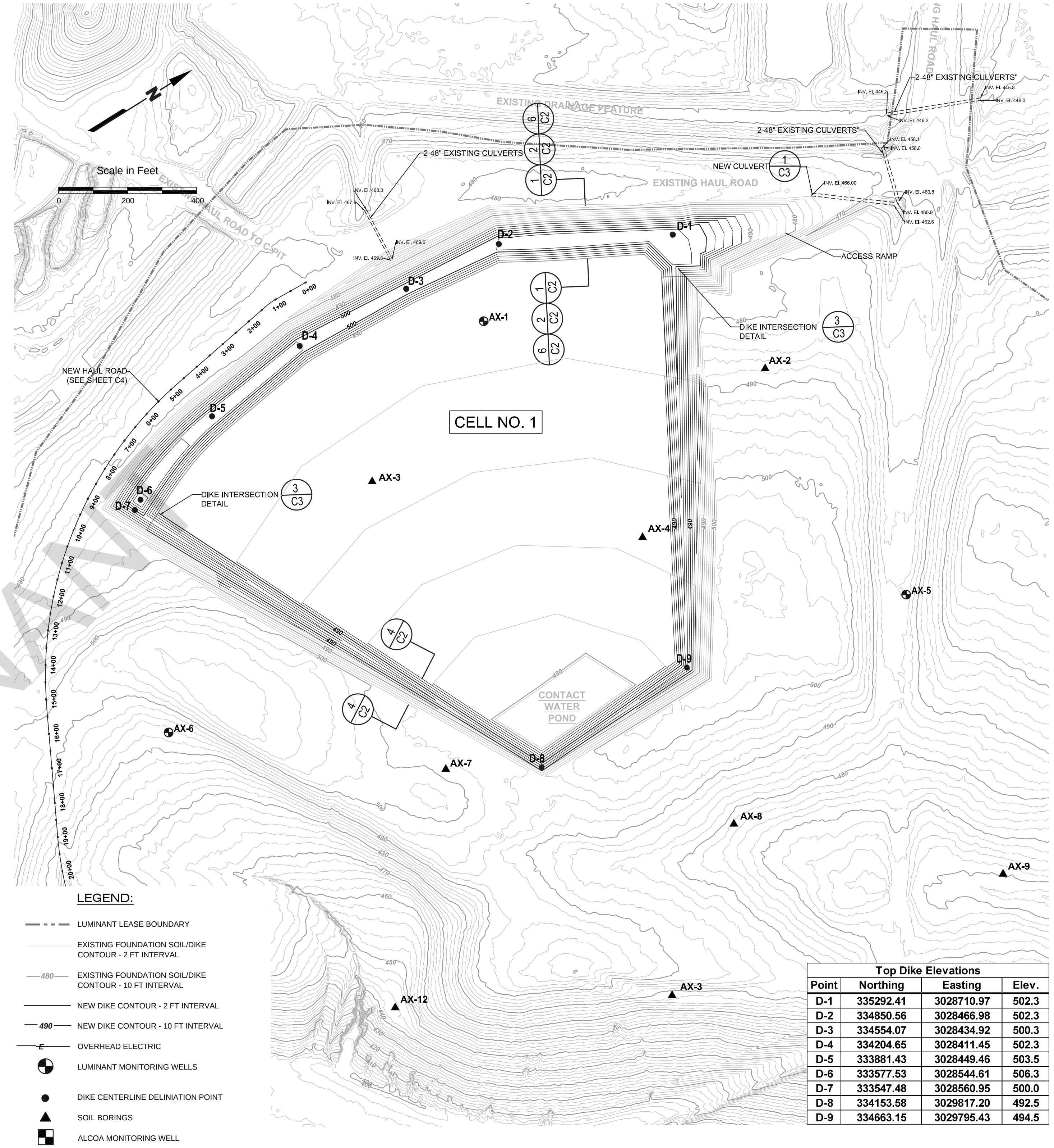
Appendix A

Engineering Site Plans – Cells 1, 2 and 2A



Top Foundation Soil Elevations			
Point	**Northing**	**Easting**	**Elev.**
FS-1	335292.41	3028710.97	490.0
FS-2	334850.56	3028466.98	490.0
FS-3	334554.07	3028434.92	490.0
FS-4	334204.65	3028411.45	490.0
FS-5	333881.43	3028449.46	490.0
FS-6	333577.53	3028544.61	490.0
FS-7	333547.48	3028560.95	490.0
FS-8	334153.58	3029817.20	487.0
FS-9	334663.15	3029795.43	483.5

CELL NO. 1 FOUNDATION SOIL PLAN



Top Dike Elevations			
Point	**Northing**	**Easting**	**Elev.**
D-1	335292.41	3028710.97	502.3
D-2	334850.56	3028466.98	502.3
D-3	334554.07	3028434.92	500.3
D-4	334204.65	3028411.45	502.3
D-5	333881.43	3028449.46	503.5
D-6	333577.53	3028544.61	506.3
D-7	333547.48	3028560.95	500.0
D-8	334153.58	3029817.20	492.5
D-9	334663.15	3029795.43	494.5

CELL NO. 1 DIKE PLAN

REFERENCE	NO.	REVISIONS	BY	DATE
	1	FOUNDATION SOIL CONTOURS MODIFIED.	PJB	10/22/12

STATE OF TEXAS
PATRICK J. BEHLING
79872
LICENSED PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY PATRICK J. BEHLING, P.E. NO. 79872 ON SEPTEMBER 17,2012

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS
TEXAS ENGINEERING FIRM NO. 4760

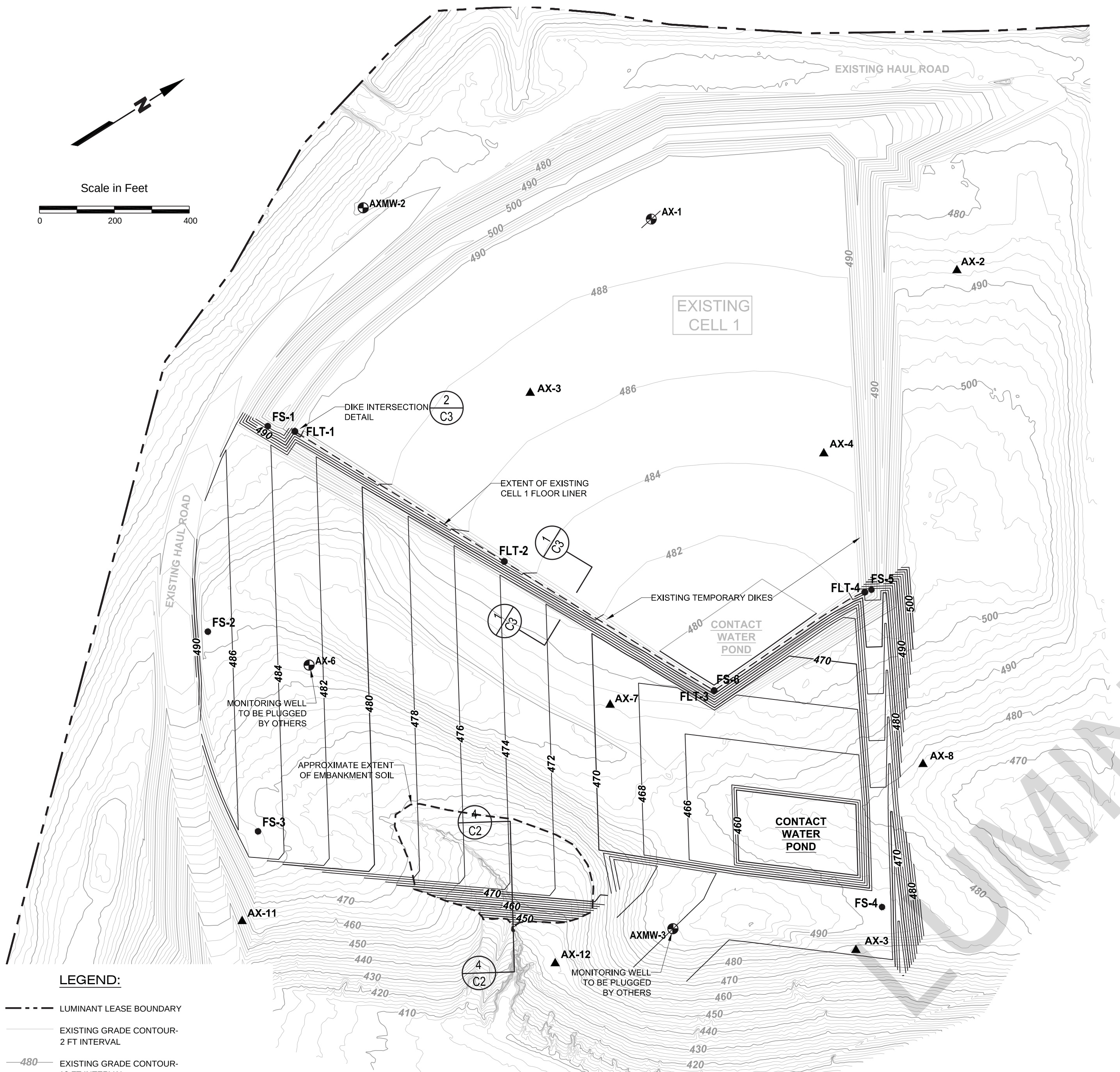
DESIGNED BY:	PJB
DRAWN BY:	MKS
CHECKED BY:	PJB
APPROVED BY:	PJB
FILE NAME:	1766_C1.DWG

LUMINANT POWER

AX AREA CELL NO. 1

CELL NO. 1 PLANS

DATE: SEPTEMBER 2012 | SHEET NO. C1 | SEQ NO. 1



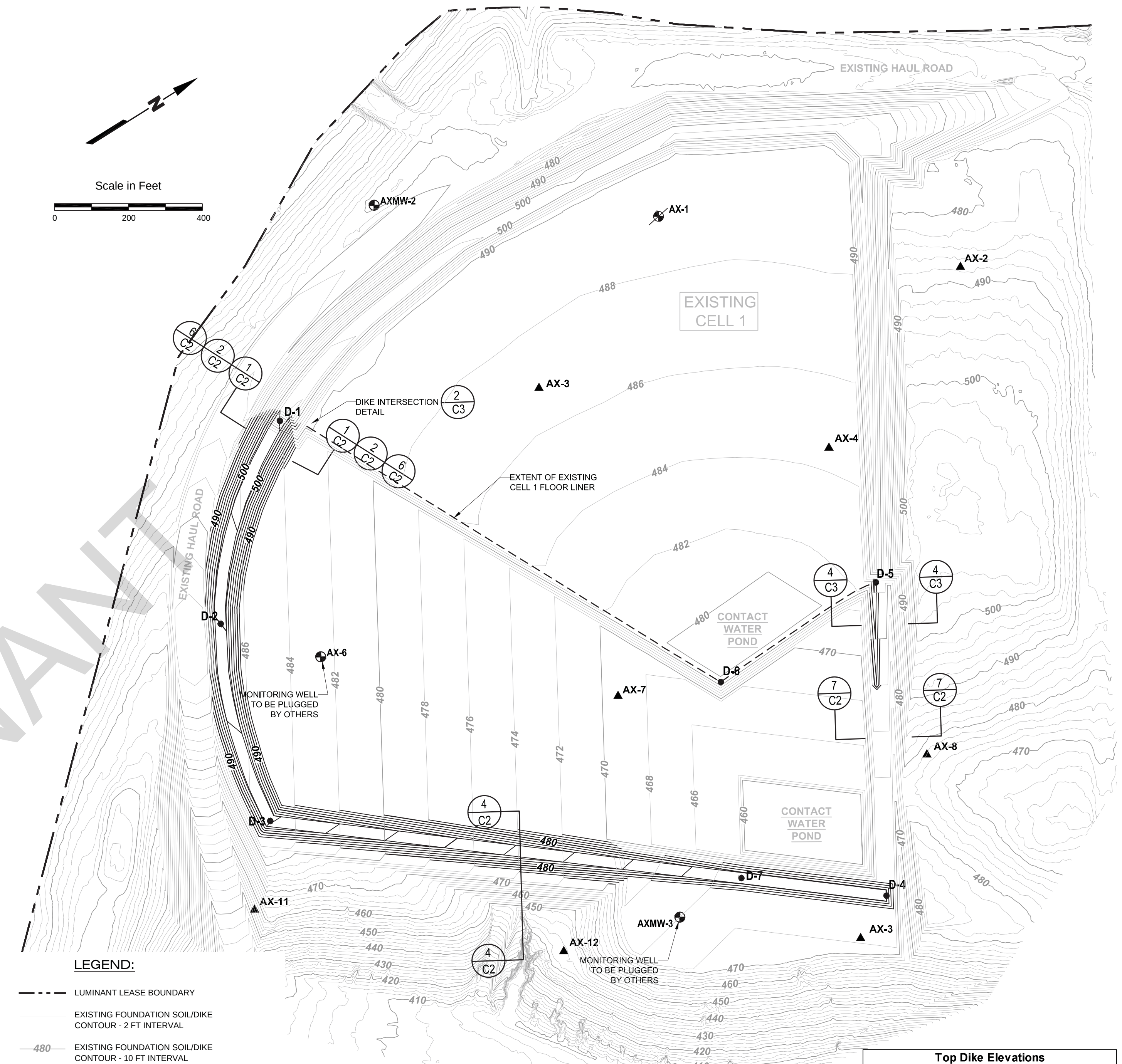
LEGEND:

- LUMINANT LEASE BOUNDARY
- EXISTING GRADE CONTOUR- 2 FT INTERVAL
- 480 EXISTING GRADE CONTOUR- 10 FT INTERVAL
- NEW FOUNDATION SOIL CONTOUR- 2 FT INTERVAL
- 490 NEW FOUNDATION SOIL CONTOUR- 10 FT INTERVAL
- LUMINANT MONITORING WELL
- PLUGGED LUMINANT MONITORING WELL
- DIKE CENTERLINE DELINEATION POINT (FOUNDATION SOIL)
- SOIL BORING

Cell 1 Floor Liner Termination Points			
Point	Northing	Easting	Elev.
FLT-1	333587.72	3028609.76	490.2
FLT-2	333877.60	3029200.53	484.5
FLT-3	334169.85	3029789.60	481.0
FLT-4	334650.41	3029779.85	482.3

Top Foundation Soil Elevations			
Point	Northing	Easting	Elev.
FS-1	333533.96	3028559.58	496.0
FS-2	333107.39	3028940.12	487.1
FS-3	332938.39	3029463.46	485.1
FS-4	334243.95	3030517.22	473.1
FS-5	334668.85	3029783.71	483.4
FS-6	334170.23	3029789.96	481.0

CELL NO. 2 FOUNDATION SOIL PLAN



LEGEND:

- LUMINANT LEASE BOUNDARY
- EXISTING FOUNDATION SOIL/DIKE CONTOUR - 2 FT INTERVAL
- 480 EXISTING FOUNDATION SOIL/DIKE CONTOUR - 10 FT INTERVAL
- NEW DIKE CONTOUR - 2 FT INTERVAL
- 490 NEW DIKE CONTOUR - 10 FT INTERVAL
- LUMINANT MONITORING WELL
- PLUGGED LUMINANT MONITORING WELL
- DIKE CENTERLINE DELINEATION POINT
- SOIL BORING

Top Dike Elevations			
Point	Northing	Easting	Elev.
D-1	333533.96	3028559.58	504.0
D-2	333107.39	3028940.12	500.0
D-3	332938.39	3029463.46	496.0
D-4	334243.95	3030517.22	480.0
D-5	334668.85	3029783.71	483.4
D-6	334170.23	3029789.96	481.0
D-7	333936.57	3030269.20	473.2

CELL NO. 2 DIKE PLAN

REFERENCE	NO.	REVISIONS	BY	DATE
	1	ISSUED FOR CONSTRUCTION	PJB	4/29/15

STATE OF TEXAS
PATRICK J. BEHLING
79872
LICENSED
PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY PATRICK J. BEHLING,P.E. NO. 79872 ON APRIL 29, 2015.

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS
TEXAS ENGINEERING FIRM NO. 4760

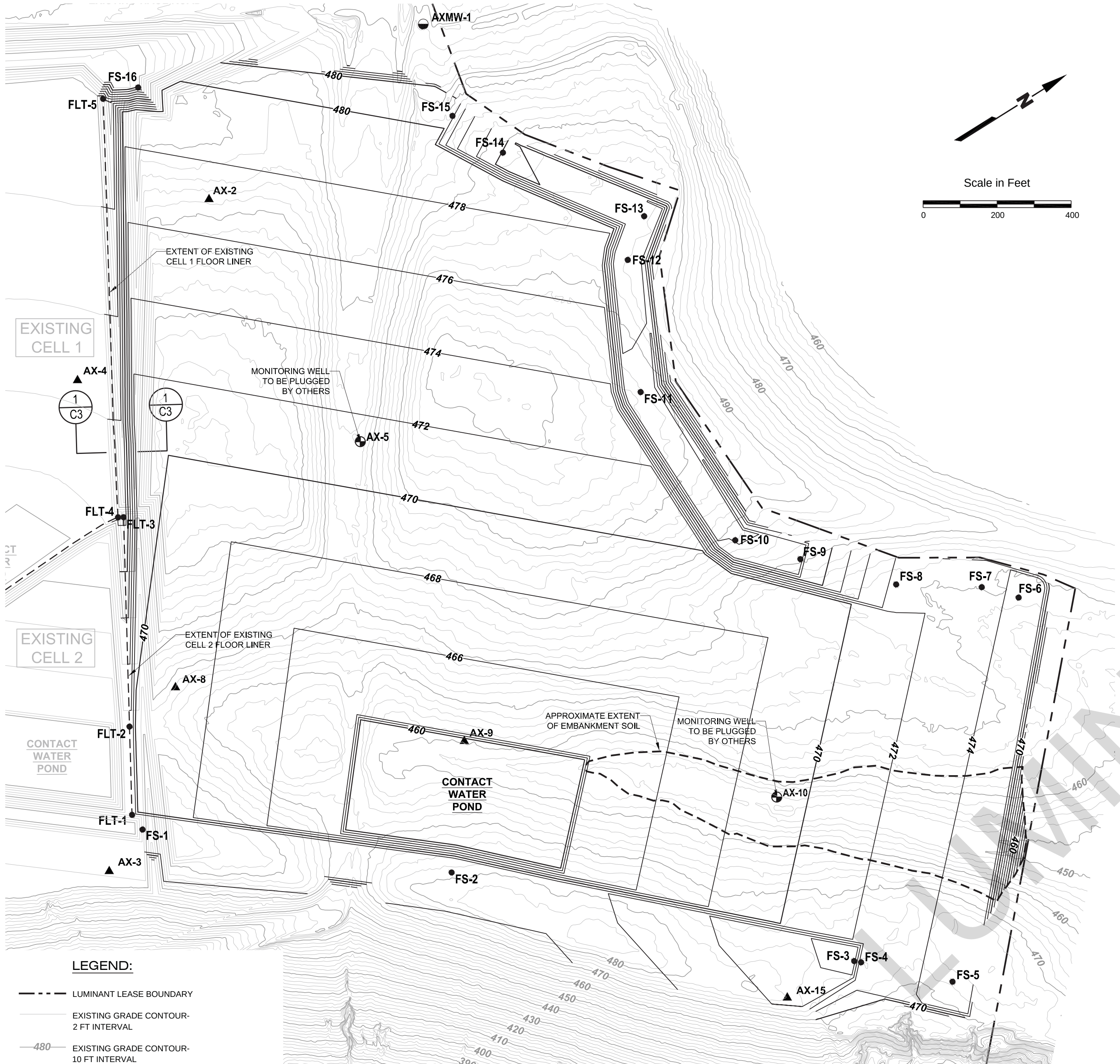
DESIGNED BY:	MKS
DRAWN BY:	MKS
CHECKED BY:	PJB
APPROVED BY:	PJB
DRAWING No:	25247-000-CG-0001-00014

LUMINANT POWER

AX AREA CELL NO. 2

CELL NO. 2 PLANS

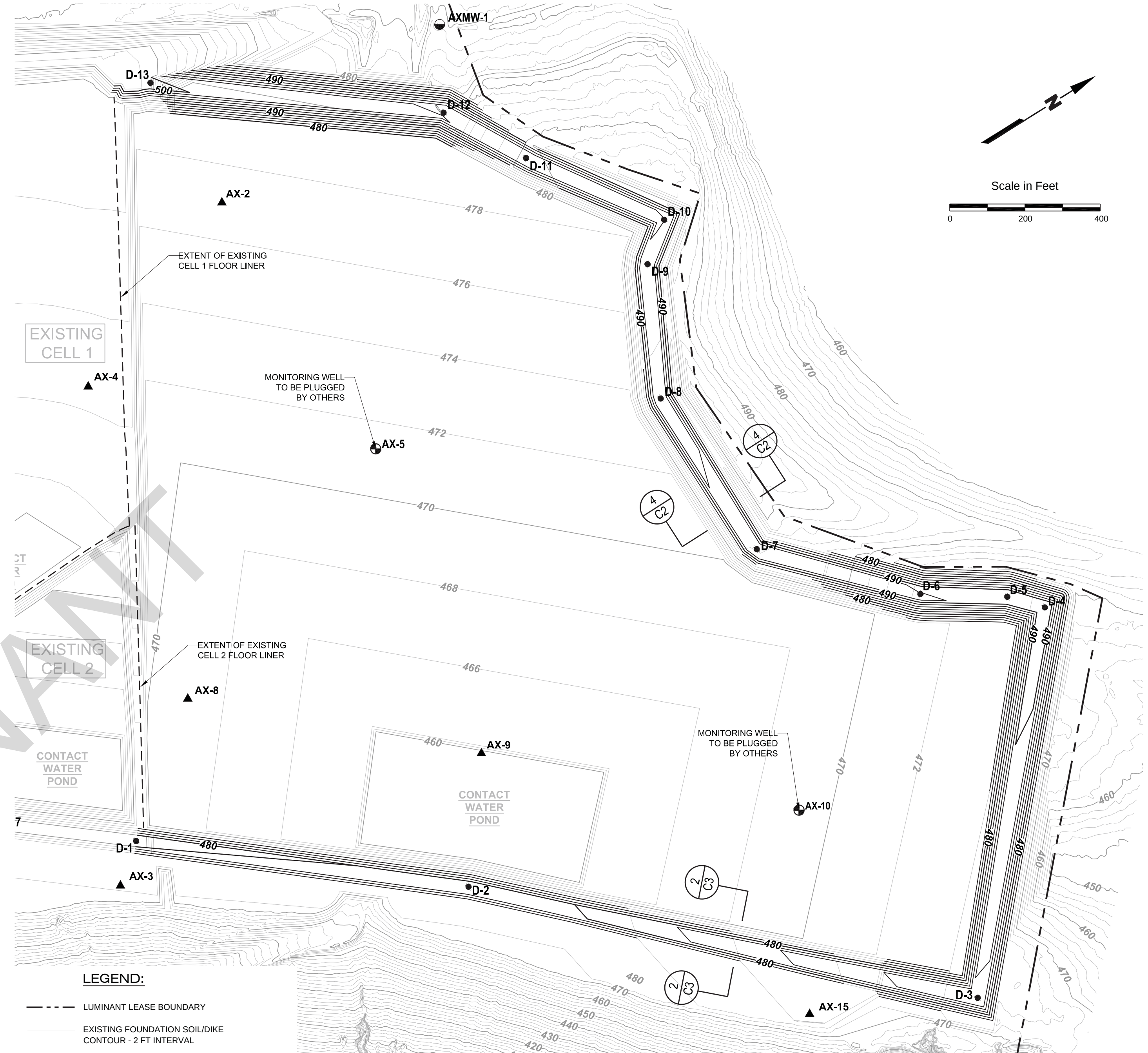
DATE: DECEMBER 2014 SHEET NO. C1 SEQ NO. 1



Cell 1 Floor Liner Termination Points			
Point	Northing	Easting	Elev.
FLT-1	334256.76	3030481.39	473.3
FLT-2	334377.38	3030275.52	473.3
FLT-3	334663.35	3029787.44	482.2
FLT-4	334650.41	3029779.85	482.3
FLT-5	335215.19	3028799.91	490.0

Top Foundation Soil Elevations			
Point	Northing	Easting	Elev.
FS-1	334259.74	3030530.06	473.2
FS-2	334906.50	3031070.72	472.9
FS-3	335701.93	3031849.93	478.8
FS-4	335715.83	3031862.64	472.4
FS-5	335897.72	3032038.14	474.9
FS-6	336598.83	3031252.85	474.4
FS-7	336529.22	3031176.05	473.3
FS-8	336337.12	3031047.44	473.6
FS-9	336153.95	3030852.40	485.8
FS-10	336031.64	3030715.72	486.0
FS-11	336027.10	3030241.09	487.5
FS-12	336186.70	3029919.88	488.5
FS-13	336286.74	3029843.30	489.0
FS-14	336054.21	3029495.27	490.2
FS-15	335991.25	3029339.02	481.0
FS-16	335311.91	3028823.92	500.0

CELL NO. 2A FOUNDATION SOIL PLAN



Top Dike Elevations			
Point	Northing	Easting	Elev.
D-1	334221.89	3030499.50	480.2
D-2	334906.50	3031070.72	479.9
D-3	335897.72	3032038.14	487.7
D-4	336598.83	3031252.85	491.0
D-5	336529.22	3031176.05	491.4
D-6	336337.12	3031047.44	492.0
D-7	336031.64	3030715.72	493.3
D-8	336027.10	3030241.09	494.6
D-9	336186.70	3029919.88	495.6
D-10	336286.74	3029843.30	496.0
D-11	336062.37	3029509.88	497.2
D-12	335940.23	3029291.31	497.9
D-13	335321.66	3028811.36	500.2

CELL NO. 2A DIKE PLAN

REFERENCE	NO.	REVISIONS	BY	DATE
	1	ISSUED FOR CONSTRUCTION	PJB	4/29/15

STATE OF TEXAS
PATRICK J. BEHLING
79872
LICENSED
PROFESSIONAL ENGINEER

THE SEAL APPEARING ON THIS DOCUMENT WAS AUTHORIZED BY PATRICK J. BEHLING,P.E. NO. 79872 ON APRIL 29, 2015.

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS
TEXAS ENGINEERING FIRM NO. 4760

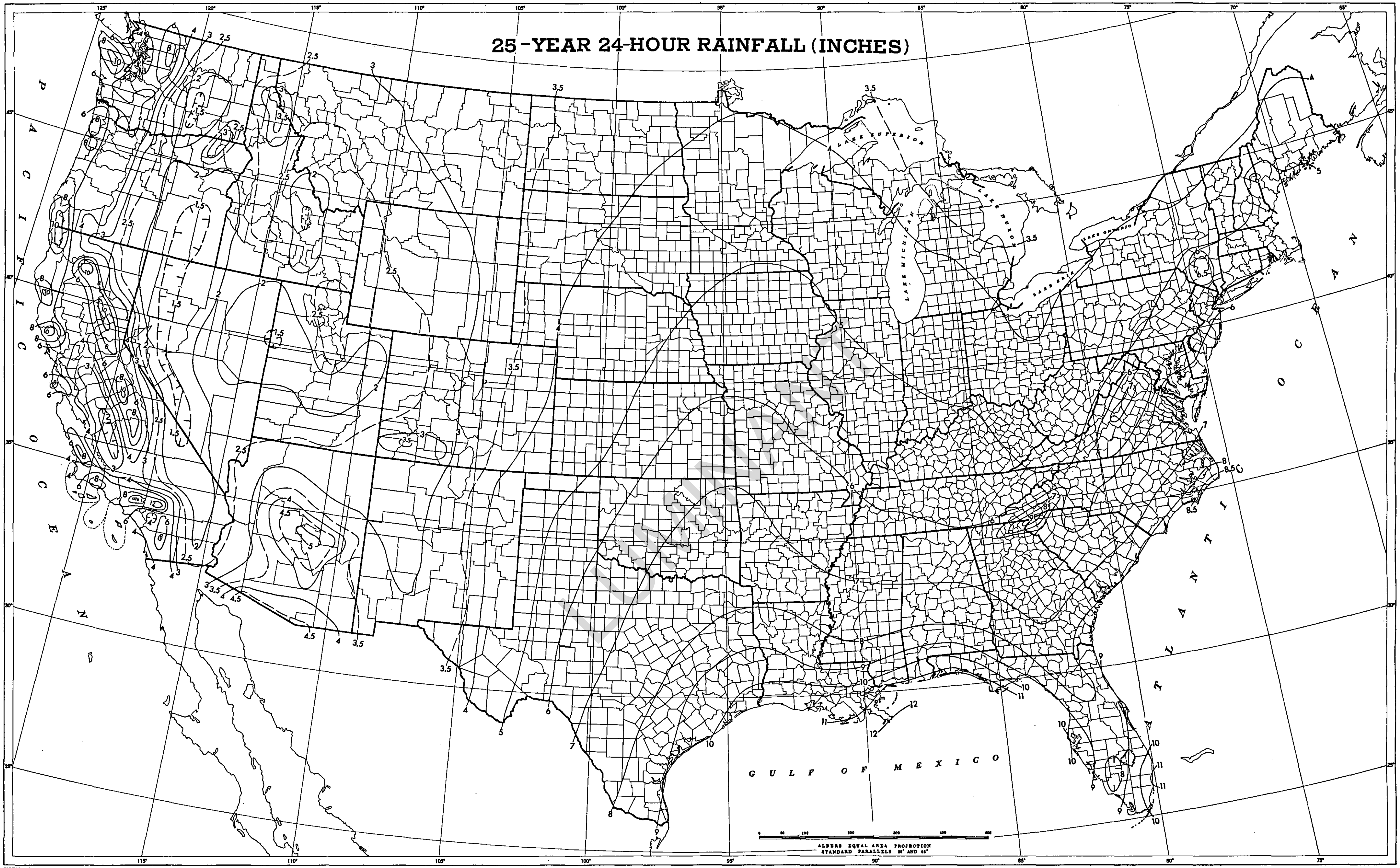
DESIGNED BY:	MKS
DRAWN BY:	MKS
CHECKED BY:	PJB
APPROVED BY:	PJB
DRAWING No:	25247-000-CG-AX-2A-00001

LUMINANT POWER
AX AREA CELL NO. 2A
CELL NO. 2A PLANS

DATE: JANUARY 2015 SHEET NO. C1 SEQ NO. 1

Appendix B

US Department of Commerce Technical Paper No. 40
25-Year, 24-Hour Rainfall Graph


25-YEAR 24-HOUR RAINFALL (INCHES)
PACIFIC OCEAN
ATLANTIC OCEAN
GULF OF MEXICO
LAKE SUPERIOR
LAKE MICHIGAN
LAKE HURON
LAKE ERIE
LAKE ONTARIO
ALBERS EQUAL AREA PROJECTION
STANDARD PARALLELS 29° AND 45°

Appendix C

HELP Model Results

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_
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*******************************************************************************
**                                                                           **
**                                                                           **
** HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE  **
**        HELP MODEL VERSION 3.07 (1 November 1997)          **
**       DEVELOPED BY ENVIRONMENTAL LABORATORY            **
**            USAE WATERWAYS EXPERIMENT STATION              **
**FOR USEPA RISK REDUCTION ENGINEERING LABORATORY**
**                                                                           **
**                                                                           **
*******************************************************************************
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```

PRECIPITATION DATA FILE: C:\WHI\VHELP22\data\P212.VHP_weather1.dat
TEMPERATURE DATA FILE: C:\WHI\VHELP22\data\P212.VHP_weather2.dat
SOLAR RADIATION DATA FILE: C:\WHI\VHELP22\data\P212.VHP_weather3.dat
EVAPOTRANSPIRATION DATA: C:\WHI\VHELP22\data\P212.VHP_weather4.dat
SOIL AND DESIGN DATA FILE: C:\WHI\VHELP22\data\P212.VHP\I_386690.inp
OUTPUT DATA FILE: C:\WHI\VHELP22\data\P212.VHP\O_386690.prt

TIME: 9:40 DATE: 5/17/2016

****

TITLE: Exposed Ash

****

NOTE: INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.

LAYER 1

TYPE 1 - VERTICAL PERCOLATION LAYER
MATERIAL TEXTURE NUMBER 30

THICKNESS	=	1524.00 CM
POROSITY	=	0.5410 VOL/VOL
FIELD CAPACITY	=	0.1870 VOL/VOL
WILTING POINT	=	0.0470 VOL/VOL
INITIAL SOIL WATER CONTENT	=	0.1878 VOL/VOL
EFFECTIVE SAT. HYD. COND.	=	0.500001120000E-04 CM/SEC

NOTE: SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY 5.00
FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.

GENERAL DESIGN AND EVAPORATIVE ZONE DATA

NOTE: SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
SOIL DATA BASE USING SOIL TEXTURE #30 WITH BARE
GROUND CONDITIONS, A SURFACE SLOPE OF 3.% AND
A SLOPE LENGTH OF 457. METERS.

SCS RUNOFF CURVE NUMBER	=	94.37
FRACTION OF AREA ALLOWING RUNOFF	=	100.0 PERCENT
AREA PROJECTED ON HORIZONTAL PLANE	=	64.7497 HECTARES
EVAPORATIVE ZONE DEPTH	=	25.4 CM
INITIAL WATER IN EVAPORATIVE ZONE	=	4.317 CM
UPPER LIMIT OF EVAPORATIVE STORAGE	=	13.741 CM
LOWER LIMIT OF EVAPORATIVE STORAGE	=	1.194 CM
INITIAL SNOW WATER	=	0.000 CM
INITIAL WATER IN LAYER MATERIALS	=	286.163 CM
TOTAL INITIAL WATER	=	286.163 CM
TOTAL SUBSURFACE INFLOW	=	0.00 MM/YR

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
Austin TX

STATION LATITUDE = 30.31 DEGREES
MAXIMUM LEAF AREA INDEX = 4.50
START OF GROWING SEASON (JULIAN DATE) = 44
END OF GROWING SEASON (JULIAN DATE) = 346
EVAPORATIVE ZONE DEPTH = 10.0 INCHES
AVERAGE ANNUAL WIND SPEED = 9.30 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 66.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 70.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 66.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 67.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR Austin TX

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	AY/NOV	JUN/DEC
1.60	2.49	1.68	3.11	4.19	3.06
1.89	2.24	3.60	3.38	2.20	2.06

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR Austin TX

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
49.10	53.20	60.50	68.70	74.90	81.60
84.70	84.50	79.20	69.80	58.70	52.10

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR Austin TX
AND STATION LATITUDE = 30.56 DEGREES

LEAK #1: PERCOLATION OR LEAKAGE THROUGH LAYER 1

****
****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	1.15	2.50	1.69	3.07	4.12	2.87
	2.10	2.84	3.09	2.84	2.07	2.03
STD. DEVIATIONS	0.76	1.44	0.99	1.85	2.16	2.46
	1.60	2.21	2.00	2.10	1.33	1.35
RUNOFF						
TOTALS	0.065	0.525	0.160	0.737	1.263	0.890
	0.528	0.704	0.787	0.759	0.409	0.352
STD. DEVIATIONS	0.099	0.530	0.182	0.842	1.035	1.193
	0.679	0.897	0.793	0.880	0.517	0.519
EVAPOTRANSPIRATION						
TOTALS	1.490	1.572	2.204	2.279	2.843	2.018
	1.753	2.051	2.144	1.746	1.064	1.122
STD. DEVIATIONS	0.439	0.554	0.912	0.955	1.207	1.320

1.116	1.255	1.097	0.878	0.371	0.319

PERCOLATION/LEAKAGE THROUGH LAYER 1

TOTALS	0.0428	0.0466	0.0502	0.0409	0.0342	0.0259
	0.0244	0.0240	0.0222	0.0239	0.0284	0.0345
STD. DEVIATIONS	0.0292	0.0259	0.0304	0.0257	0.0233	0.0195
	0.0209	0.0203	0.0228	0.0247	0.0272	0.0339

****

****

AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.38 (6.302)	17642770.7	100.00
RUNOFF	7.178 (2.7782)	4168898.08	23.629
EVAPOTRANSPIRATION	22.286 (3.2170)	12943634.34	73.365
PERCOLATION/LEAKAGE THROUGH LAYER 1	0.39822 (0.21093)	231281.071	1.31091
CHANGE IN WATER STORAGE	0.515 (1.1360)	298957.42	1.695

*** –
****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 30 and their dates (DDDYYYY)

	(INCHES)	(CU. FT.)	
PRECIPITATION	5.09	2956207.56546	1290008
RUNOFF	3.648	2118779.84362	1290008
PERCOLATION/LEAKAGE THROUGH LAYER 1	0.006337	3680.25651	3350029
SNOW WATER	1.95	1131571.6871	3430003
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3642		
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0470		

****

****

FINAL WATER STORAGE AT END OF YEAR 30

LAYER	(INCHES)	(VOL/VOL)
1	128.1050	0.2135

SNOW WATER 0.000

****
****

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******************************************************************************
******************************************************************************
**                                                                          **
**                                                                          **
**  HYDROLOGIC EVALUATION OF LANDFILL PERFORMANCE                           **
**        HELP MODEL VERSION 3.07  (1 November 1997)                        **
**        DEVELOPED BY ENVIRONMENTAL LABORATORY                             **
**            USAE WATERWAYS EXPERIMENT STATION                             **
**FOR USEPA RISK REDUCTION ENGINEERING LABORATORY                           **
**                                                                          **
**                                                                          **
******************************************************************************
******************************************************************************


PRECIPITATION DATA FILE:      C:\WHI\VHELP22\data\P212.VHP\_weather1.dat
TEMPERATURE DATA FILE:        C:\WHI\VHELP22\data\P212.VHP\_weather2.dat
SOLAR RADIATION DATA FILE:    C:\WHI\VHELP22\data\P212.VHP\_weather3.dat
EVAPOTRANSPIRATION DATA:      C:\WHI\VHELP22\data\P212.VHP\_weather4.dat
SOIL AND DESIGN DATA FILE:    C:\WHI\VHELP22\data\P212.VHP\I_386709.inp
OUTPUT DATA FILE:             C:\WHI\VHELP22\data\P212.VHP\O_386709.prt


TIME:   9:40      DATE:   5/17/2016


******************************************************************************

    TITLE:   Protective Soil

******************************************************************************


    NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER WERE
           COMPUTED AS NEARLY STEADY-STATE VALUES BY THE PROGRAM.


                                   LAYER  1
                                   --------

                        TYPE 1 - VERTICAL PERCOLATION LAYER
                          MATERIAL TEXTURE NUMBER   6
          THICKNESS                   =      45.72    CM
          POROSITY                    =      0.4530 VOL/VOL
          FIELD CAPACITY              =      0.1900 VOL/VOL
          WILTING POINT               =      0.0850 VOL/VOL
          INITIAL SOIL WATER CONTENT  =      0.1742 VOL/VOL
          EFFECTIVE SAT. HYD. COND.   =  0.720001612800E-03 CM/SEC
        NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY   5.00
               FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


                    GENERAL DESIGN AND EVAPORATIVE ZONE DATA
                    ----------------------------------------

        NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
               SOIL DATA BASE USING SOIL TEXTURE # 6 WITH BARE
               GROUND CONDITIONS, A SURFACE SLOPE OF   1.% AND
               A SLOPE LENGTH OF   457. METERS.

       SCS RUNOFF CURVE NUMBER             =     84.11
       FRACTION OF AREA ALLOWING RUNOFF    =    100.0    PERCENT
       AREA PROJECTED ON HORIZONTAL PLANE  =     64.7497 HECTARES
       EVAPORATIVE ZONE DEPTH              =     25.4    CM
       INITIAL WATER IN EVAPORATIVE ZONE   =      3.628  CM
       UPPER LIMIT OF EVAPORATIVE STORAGE  =     11.506  CM
       LOWER LIMIT OF EVAPORATIVE STORAGE  =      2.159  CM
       INITIAL SNOW WATER                  =      0.000  CM
       INITIAL WATER IN LAYER MATERIALS    =      7.963  CM
       TOTAL INITIAL WATER                 =      7.963  CM
       TOTAL SUBSURFACE INFLOW             =      0.00   MM/YR
```

EVAPOTRANSPIRATION AND WEATHER DATA

NOTE: EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
Austin TX

STATION LATITUDE = 30.31 DEGREES
MAXIMUM LEAF AREA INDEX = 4.50
START OF GROWING SEASON (JULIAN DATE) = 44
END OF GROWING SEASON (JULIAN DATE) = 346
EVAPORATIVE ZONE DEPTH = 10.0 INCHES
AVERAGE ANNUAL WIND SPEED = 9.30 MPH
AVERAGE 1ST QUARTER RELATIVE HUMIDITY = 66.00 %
AVERAGE 2ND QUARTER RELATIVE HUMIDITY = 70.00 %
AVERAGE 3RD QUARTER RELATIVE HUMIDITY = 66.00 %
AVERAGE 4TH QUARTER RELATIVE HUMIDITY = 67.00 %

NOTE: PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR Austin TX

NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
1.60	2.49	1.68	3.11	4.19	3.06
1.89	2.24	3.60	3.38	2.20	2.06

NOTE: TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR Austin TX

NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
49.10	53.20	60.50	68.70	74.90	81.60
84.70	84.50	79.20	69.80	58.70	52.10

NOTE: SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
COEFFICIENTS FOR Austin TX
AND STATION LATITUDE = 30.56 DEGREES

LEAK #1: PERCOLATION OR LEAKAGE THROUGH LAYER 1

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****

AVERAGE MONTHLY VALUES IN INCHES FOR YEARS 1 THROUGH 30

	JAN/JUL	FEB/AUG	MAR/SEP	APR/OCT	MAY/NOV	JUN/DEC
PRECIPITATION						
TOTALS	1.15	2.50	1.69	3.07	4.12	2.87
	2.10	2.84	3.09	2.84	2.07	2.03
STD. DEVIATIONS	0.76	1.44	0.99	1.85	2.16	2.46
	1.60	2.21	2.00	2.10	1.33	1.35
RUNOFF						
TOTALS	0.000	0.067	0.002	0.109	0.256	0.205
	0.096	0.111	0.103	0.142	0.056	0.039
STD. DEVIATIONS	0.000	0.119	0.006	0.199	0.391	0.423
	0.233	0.217	0.179	0.292	0.127	0.133
EVAPOTRANSPIRATION						
TOTALS	1.419	1.427	1.896	2.410	3.047	2.186
	1.893	2.321	2.306	1.785	1.115	1.248

STD. DEVIATIONS	0.522	0.626	0.855	1.022	1.275	1.417
	1.198	1.450	1.159	0.945	0.400	0.328

PERCOLATION/LEAKAGE THROUGH LAYER 1

TOTALS	0.2898	0.5031	0.3157	0.4682	0.7648	0.5736
	0.3523	0.3176	0.5315	0.7171	0.6325	0.6587
STD. DEVIATIONS	0.2657	0.6811	0.3477	0.6965	0.8823	0.6451
	0.4498	0.5516	0.7779	0.8813	0.7956	0.6460

****

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AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS 1 THROUGH 30

	INCHES	CU. FEET	PERCENT
PRECIPITATION	30.38 (6.302)	17642770.7	100.00
RUNOFF	1.184 (0.7832)	687692.42	3.898
EVAPOTRANSPIRATION	23.052 (3.3332)	13388374.17	75.886
PERCOLATION/LEAKAGE THROUGH LAYER 1	6.12519 (2.88664)	3557431.474	20.16368
CHANGE IN WATER STORAGE	0.016 (0.8539)	9272.86	0.053

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****

PEAK DAILY VALUES FOR YEARS 1 THROUGH 30 and their dates (DDDYYYY)

	(INCHES)	(CU. FT.)	
PRECIPITATION	5.09	2956207.56546	1290008
RUNOFF	1.869	1085263.83510	1290008
PERCOLATION/LEAKAGE THROUGH LAYER 1	1.347824	782799.02178	2790006
SNOW WATER	1.95	1131571.6871	3430003
MAXIMUM VEG. SOIL WATER (VOL/VOL)	0.3684		
MINIMUM VEG. SOIL WATER (VOL/VOL)	0.0850		

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FINAL WATER STORAGE AT END OF YEAR 30

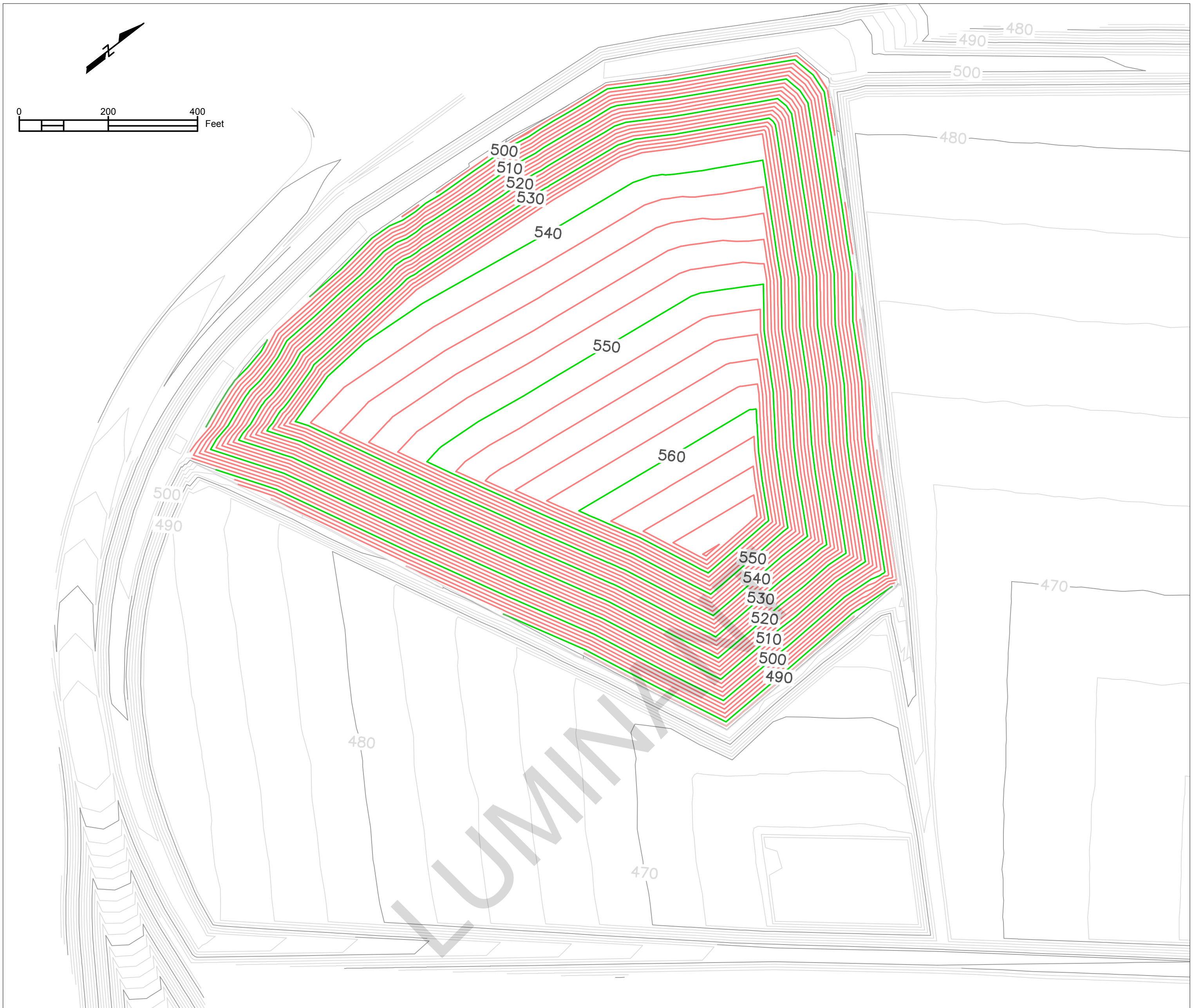
LAYER	(INCHES)	(VOL/VOL)
1	3.6139	0.2008

SNOW WATER 0.000

****
****

Appendix D

Cells 1, 2 and 2A Surface Areas

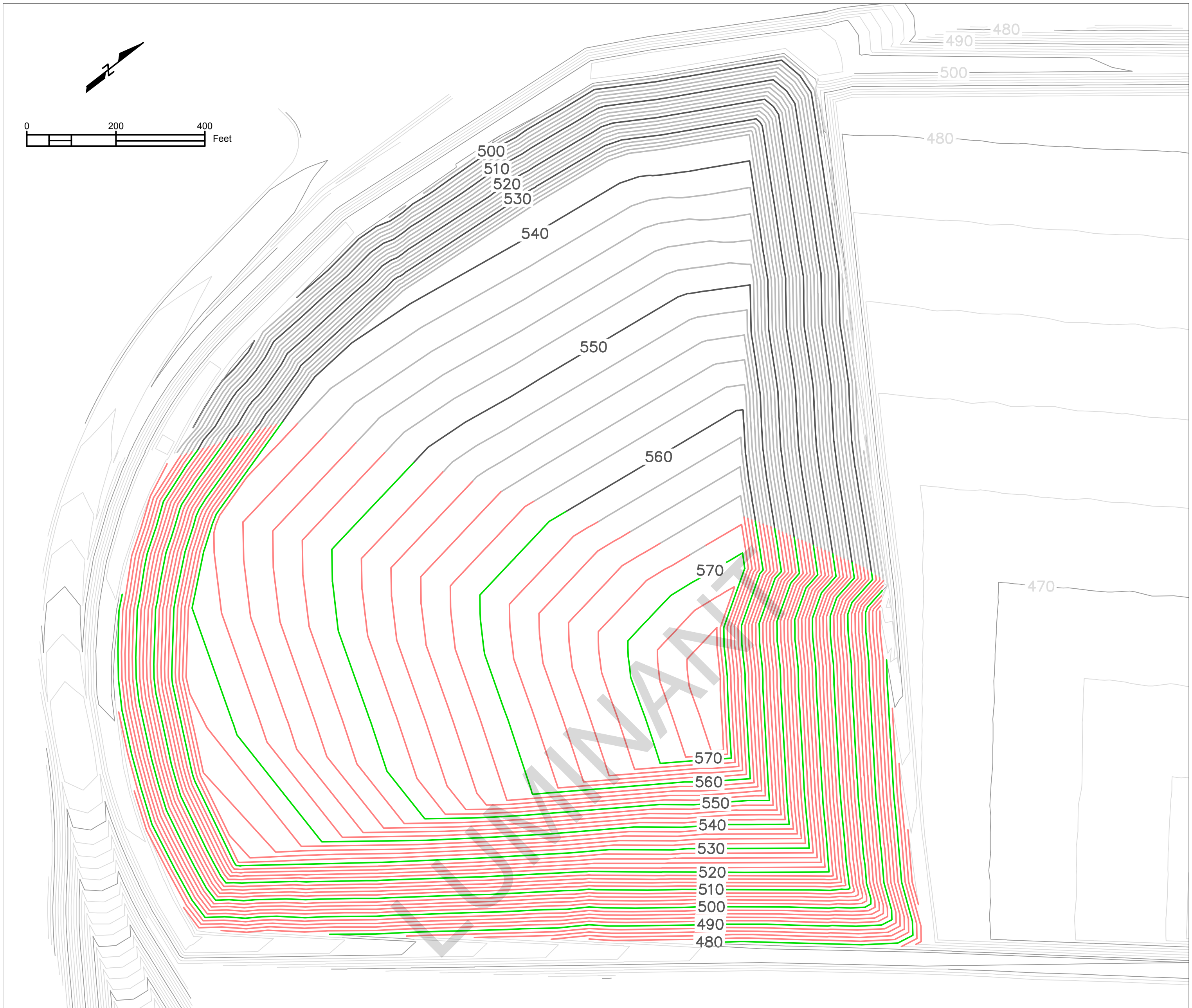


Explanation

	Existing Cell 2 and 2A Contour – 2 ft. interval
500.00	Existing Cell 2 and 2A Contour – 10 ft. interval
	Phase 1 Contour – 2 ft. interval
500.00	Phase 1 Contour – 10 ft. interval

Cut/Fill Summary

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
Phase 1 Ash Volume	**1.000**	**1.000**	1472596.92 Sq. Ft.	0.87 Cu. Yd.	2437982.60 Cu. Yd.	2437981.73 Cu. Yd.<Fill>
Totals			1472596.92 Sq. Ft.	0.87 Cu. Yd.	2437982.60 Cu. Yd.	2437981.73 Cu. Yd.<Fill>



Explanation

Existing Cell Contour – 2 ft. interval

500 Existing Cell Contour – 10 ft. interval

Phase 1 Contour – 2 ft. interval

500 Phase 1 Contour – 10 ft. interval

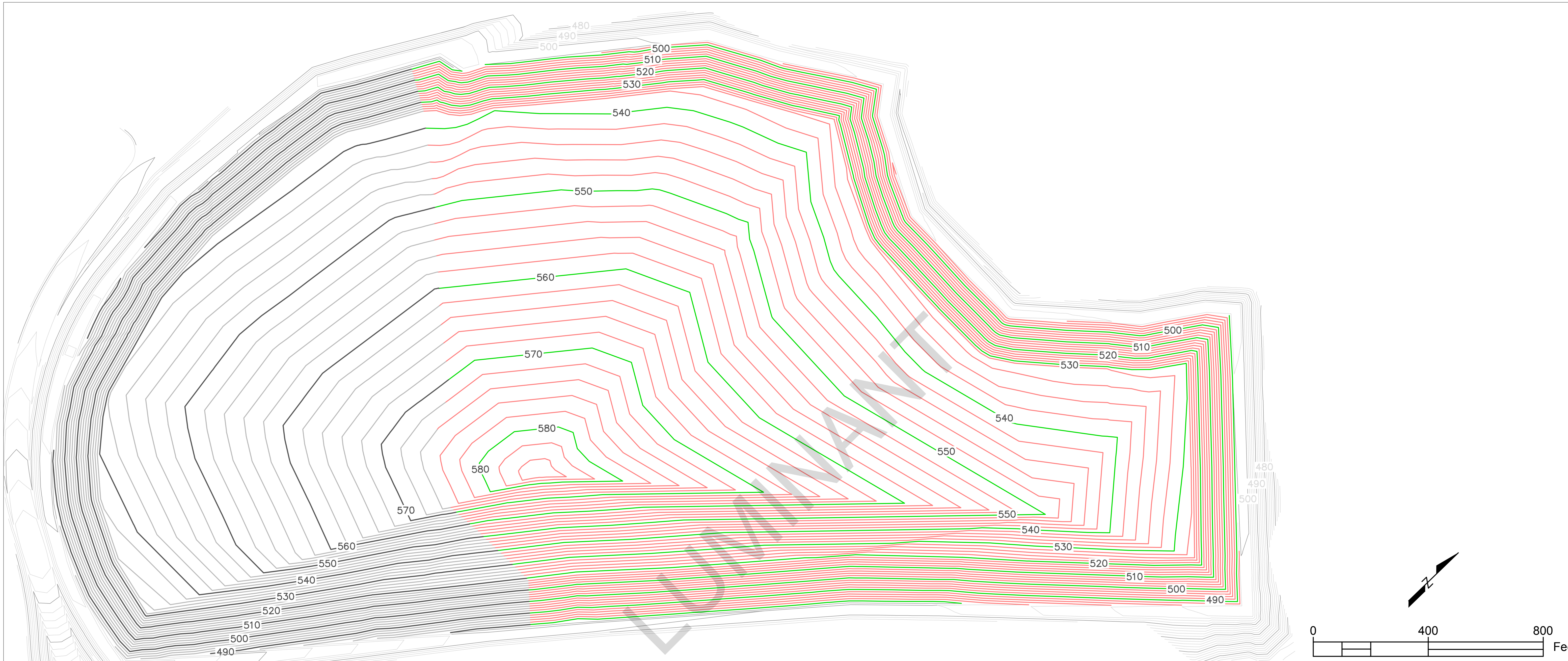
Phase 2 Contour – 2 ft. interval

500 Phase 2 Contour – 10 ft. interval

Phase 2 Ash Volume: 3,124,469 Cu. Yd.

Cut/Fill Summary

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
Phase 1 Ash Volume	**1.000**	**1.000**	1472596.92 Sq. Ft.	0.87 Cu. Yd.	2437982.60 Cu. Yd.	2437981.73 Cu. Yd.<Fill>
Phase 1 & 2 Ash Volume	**1.000**	**1.000**	2770574.84 Sq. Ft.	1.74 Cu. Yd.	5562451.93 Cu. Yd.	5562450.18 Cu. Yd.<Fill>



Explanation

Phase 3 Ash Volume: 9,730,523

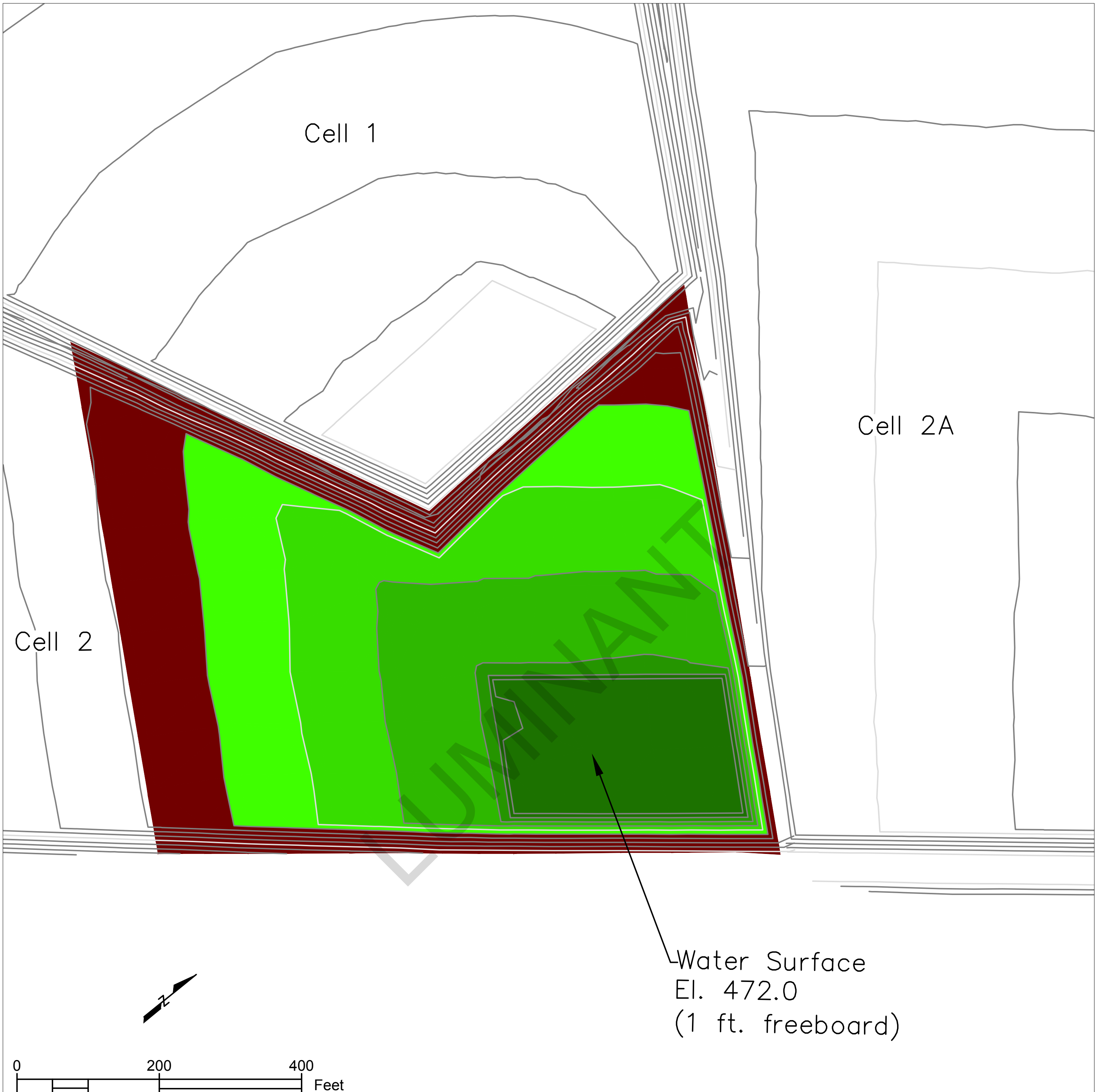
- Existing AX Area Contour – 2 ft. interval
- Existing AX Area Contour – 10 ft. interval (500)
- Phase 1 & 2 Ash Contour – 2 ft. interval
- Phase 1 & 2 Ash Contour – 10 ft. interval (500)
- Phase 3 Ash Contour – 2 ft. interval
- Phase 3 Ash Contour – 10 ft. interval (500)

Cut/Fill Summary

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
Phase 1 2 & 3 Ash Volume	1.000	1.000	6483918.27 Sq. Ft.	0.45 Cu. Yd.	15292975.05 Cu. Yd.	15292974.60 Cu. Yd.<Fill>
Phase 1 & 2 Ash Volume	1.000	1.000	2770574.84 Sq. Ft.	1.74 Cu. Yd.	5562451.93 Cu. Yd.	5562450.18 Cu. Yd.<Fill>
Phase 1 Ash Volume	1.000	1.000	1472596.92 Sq. Ft.	0.87 Cu. Yd.	2437982.60 Cu. Yd.	2437981.73 Cu. Yd.<Fill>

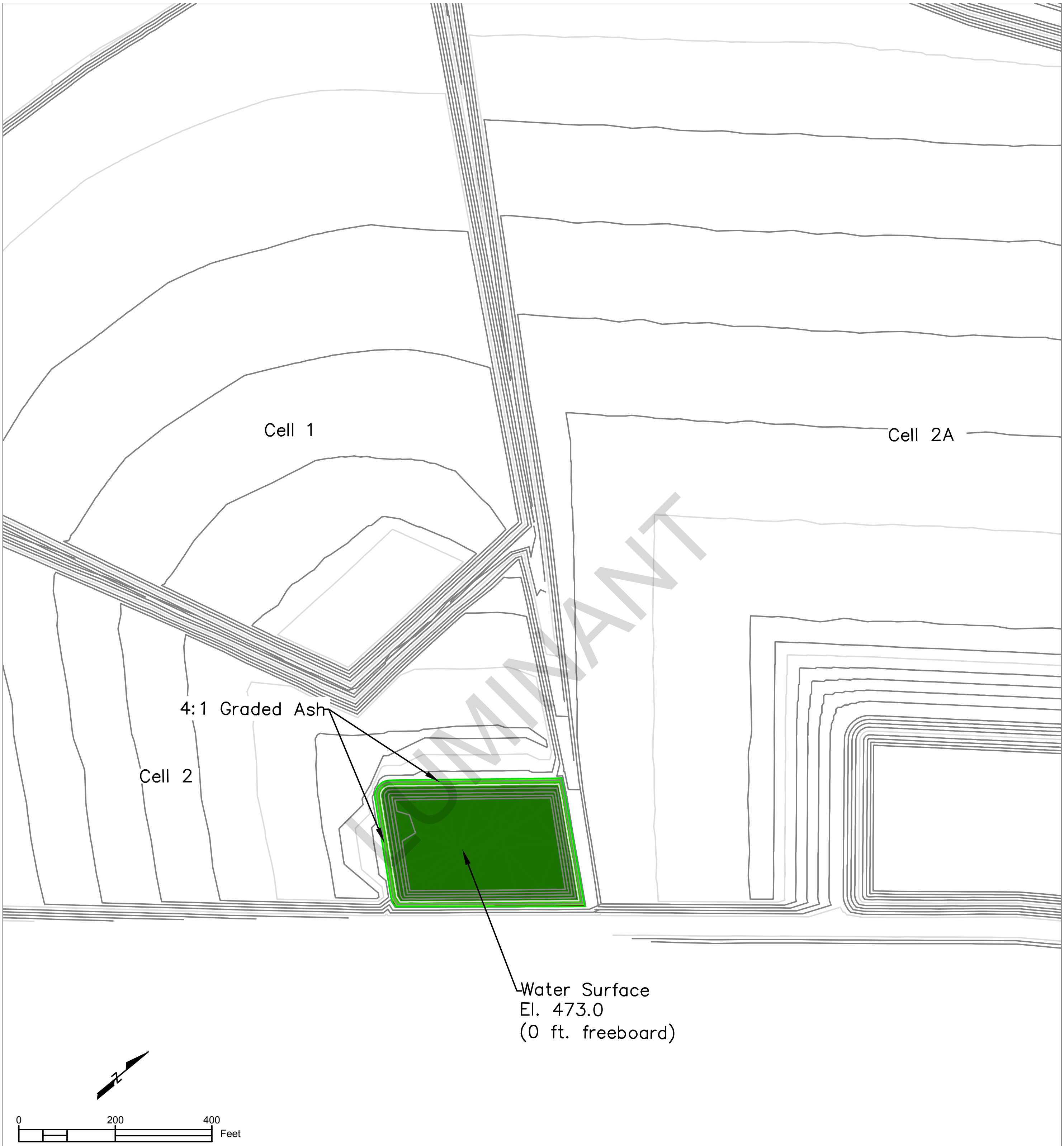
Appendix E

Run-off Containment Capacities



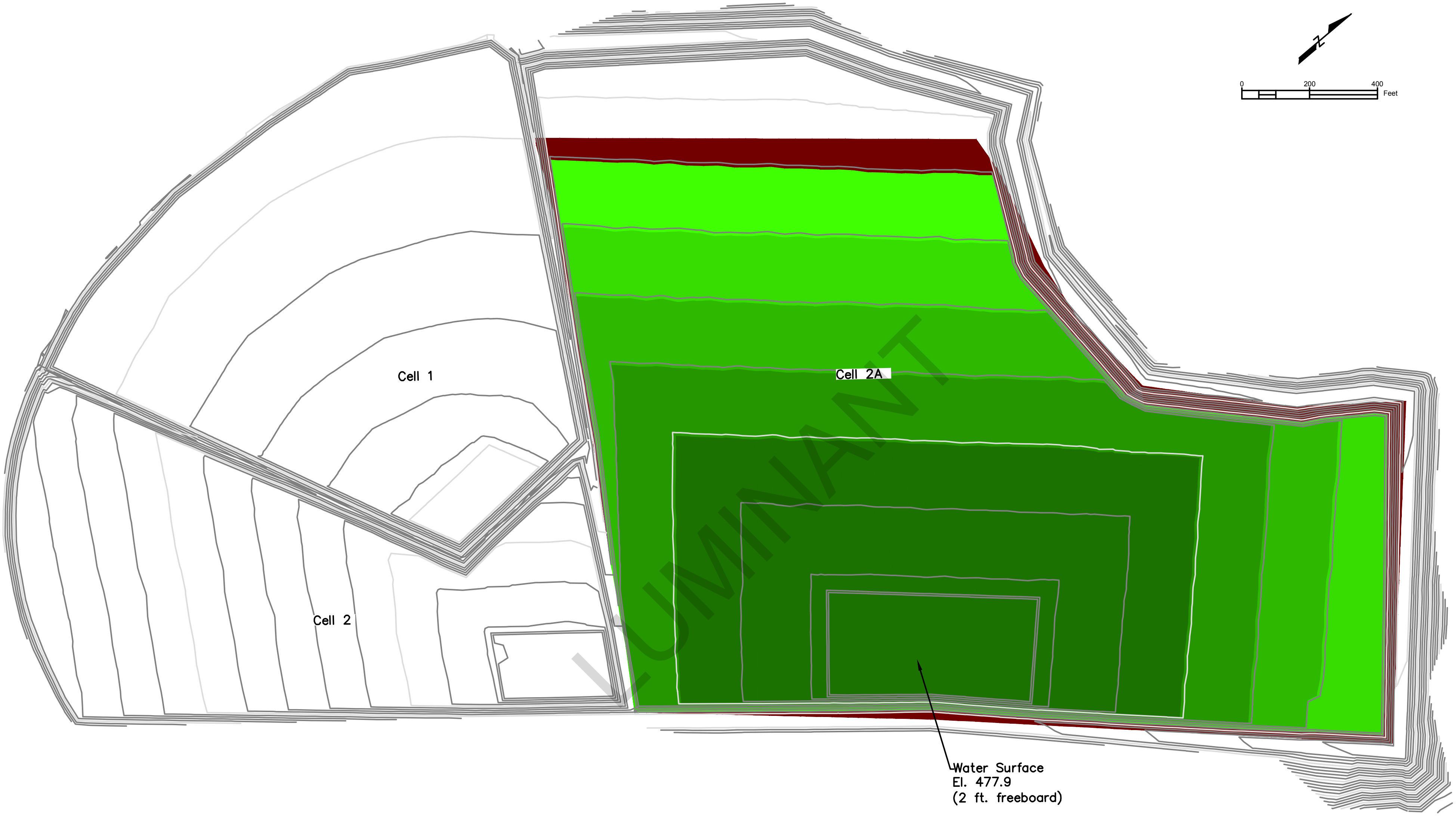
Cut/Fill Summary

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
Cell 2 Run-off Storage Volume	0.000	**1.000**	541251.07 Sq. Ft.	0.00 Cu. Yd.	60448.69 Cu. Yd.	60448.69 Cu. Yd.<Fill>
Totals			541251.07 Sq. Ft.	0.00 Cu. Yd.	60448.69 Cu. Yd.	60448.69 Cu. Yd.<Fill>



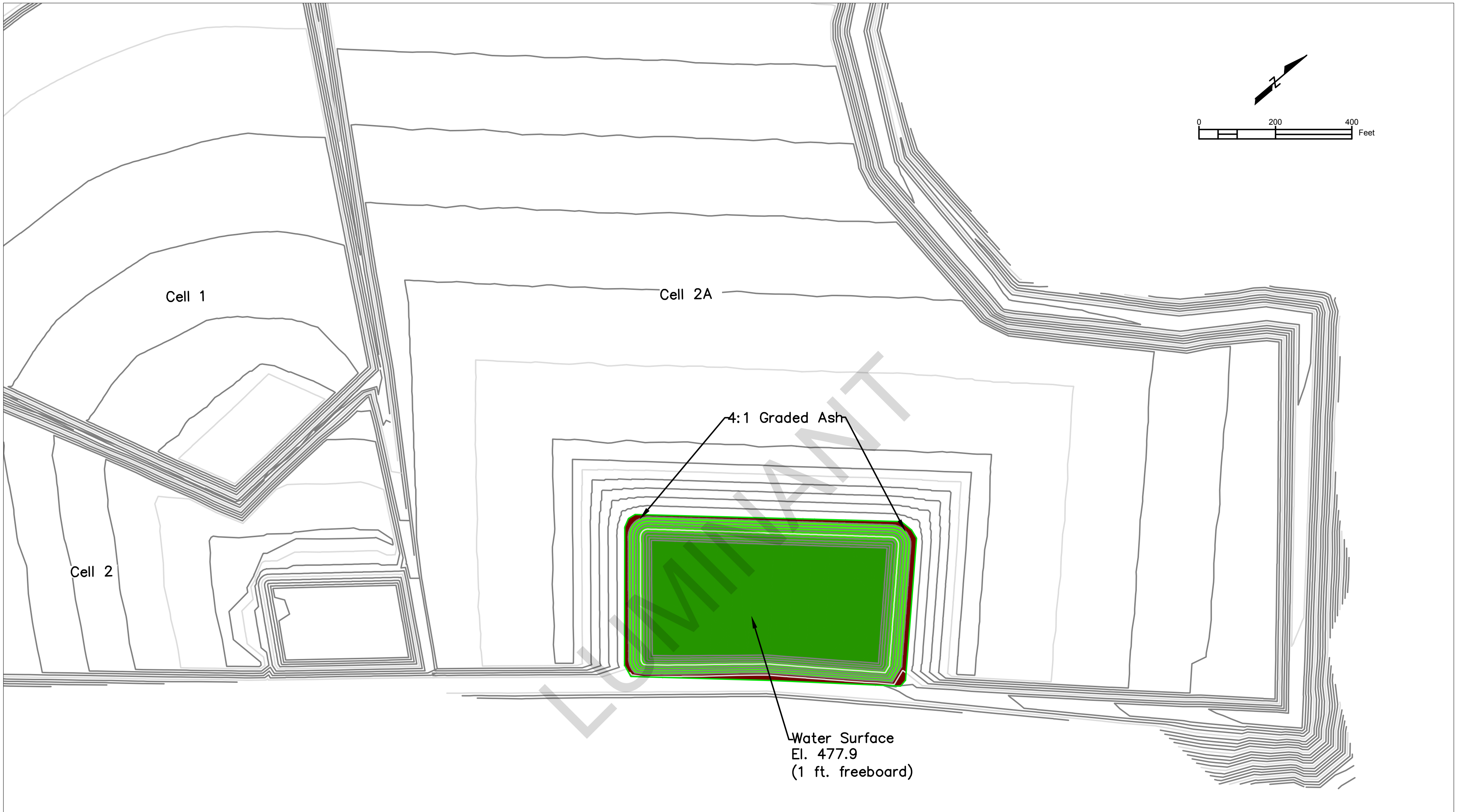
Cut/Fill Summary

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
Cell 2 Runoff Storage Volume With Ash	0.000	**1.000**	104191.15 Sq. Ft.	0.00 Cu. Yd.	33490.89 Cu. Yd.	33490.89 Cu. Yd.<Fill>
Totals			104191.15 Sq. Ft.	0.00 Cu. Yd.	33490.89 Cu. Yd.	33490.89 Cu. Yd.<Fill>



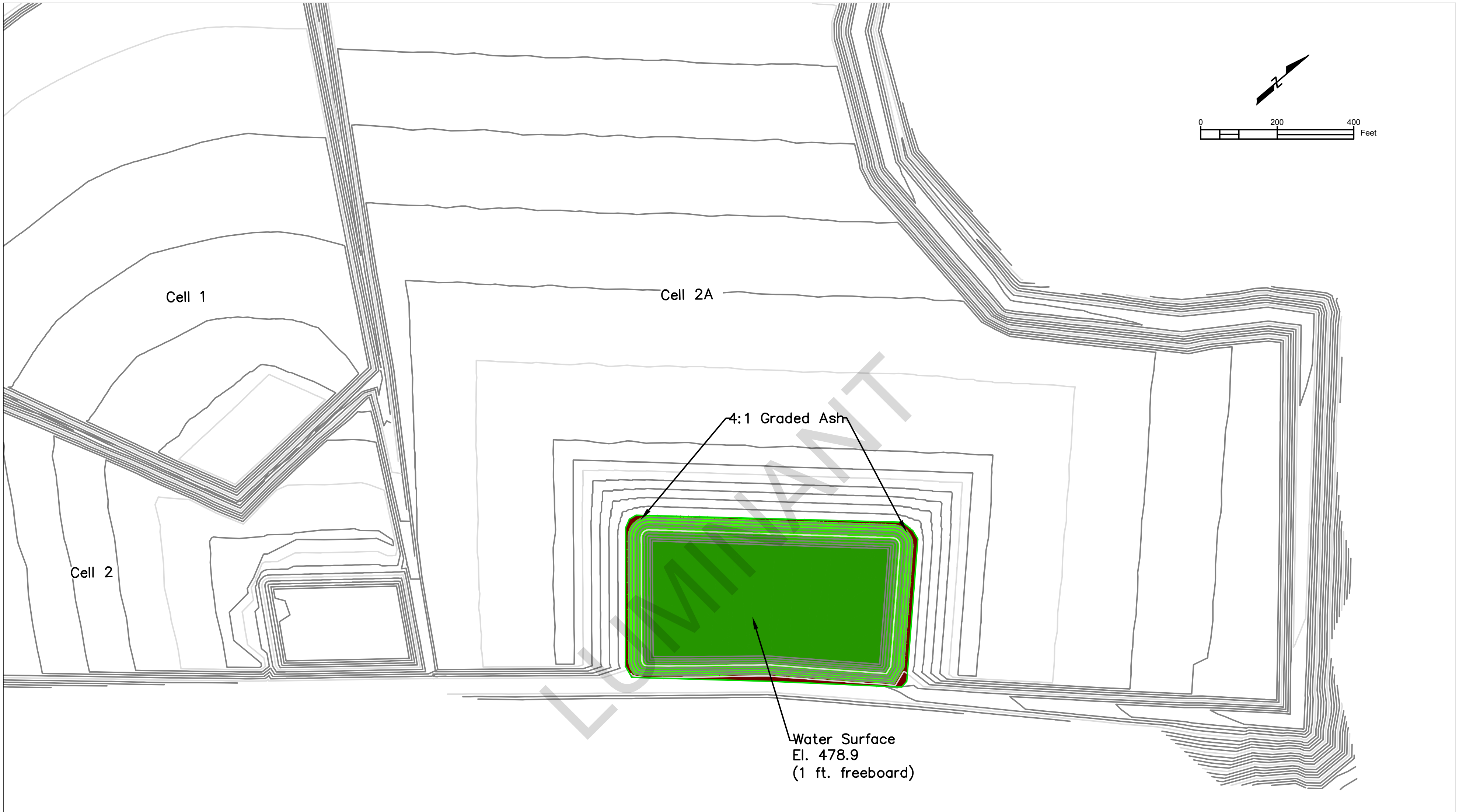
Cut/Fill Summary

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
Cell 2A Runoff Storage Volume	0.000	**1.000**	3350628.69 Sq. Ft.	0.00 Cu. Yd.	797516.09 Cu. Yd.	797516.09 Cu. Yd.<Fill>
Totals			3350628.69 Sq. Ft.	0.00 Cu. Yd.	797516.09 Cu. Yd.	797516.09 Cu. Yd.<Fill>



Cut/Fill Summary

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
Cell 2A Runoff Storage Volume With Ash	0.000	**1.000**	318262.22 Sq. Ft.	0.00 Cu. Yd.	139832.49 Cu. Yd.	139832.49 Cu. Yd.<Fill>
Totals			318262.22 Sq. Ft.	0.00 Cu. Yd.	139832.49 Cu. Yd.	139832.49 Cu. Yd.<Fill>



Cut/Fill Summary

Name	Cut Factor	Fill Factor	2d Area	Cut	Fill	Net
Cell 2A Runoff Storage Volume With Ash	0.000	**1.000**	318262.22 Sq. Ft.	0.00 Cu. Yd.	150809.92 Cu. Yd.	150809.92 Cu. Yd.<Fill>
Totals			318262.22 Sq. Ft.	0.00 Cu. Yd.	150809.92 Cu. Yd.	150809.92 Cu. Yd.<Fill>

Appendix F

Run-off Volume Calculations

APPENDIX F-1

LUMINANT GENERATING COMPANY, LLC
SANDOW UNIT 5
AX LANDFILL - CELL 1 ACTIVE AND CELL 2 EMPTY
RUN-OFF CALCULATIONS

Definitions

Run-off from active landfill areas:	storm water that comes into contact with waste
Run-off from capped landfill areas:	storm water that falls outside of an active waste management area and does not come into contact with waste

Assumptions

1) Cell 1 is active, Cell 2 is empty
2) Run-off is generated on Cell 1 area and blends with runoff from Cell 2 area
3) Run-off volume based on a 25-year, 24-hr storm
4) Assumed exposed fly and bed ash in Cell 1 and exposed protective soil in Cell 2
5) Storm water runoff volumes are estimated using the Curve Number method as described in USDA's Urban Hydrology for Small Water Sheds (TR-55)

Area that Generates Run-off

Cell 1 Surface Area:	1,472,596	sf
Cell 1 Surface Area:	33.8	acres
Cells 1 and 2 Surface Area:	2,770,575	sf
Cells 1 and 2 Surface Area:	63.6	acres

Design Rainfall

From TP No. 40, 25-Yr, 24-hr: 8.2 in/day

Curve Numbers

From TR-55, Table 2-2a:

- For exposed fly and bed ash, use CN =	94	(See HELP Model Results)
- For exposed protective soil, use CN =	84	(See HELP Model Results)

Calculate Weighted Curve Number for Site

Description	Area (acres)	CN	Area X CN
Exposed Fly and Bed Ash (Cell 1)	33.8	94	3,177.8
Exposed Protective Soil (Cell 2)	29.8	84	2,503.0
	63.6		5,680.8

Weighted Curve Number = (Sum of CN X A) /(Total Area)

Weighted Curve Number = 89.3

APPENDIX F-1

LUMINANT GENERATING COMPANY, LLC
SANDOW UNIT 5
AX LANDFILL - CELL 1 ACTIVE AND CELL 2 EMPTY
RUN-OFF CALCULATIONS

Calculate Run-Off Volume Using TR-55 Procedures

1) Calculate Potential Retention of Water (S). Assume this represents water adsorbed by ash and protective cover (non free water)

S = (1000/CNW)-10

where: S = Potential Retention of Water, inches
CN = Curve Number for Site

S = 1.20 inches

2) Calculate Depth of Runoff (Q)

Q = [(P-0.2S)^2]/[P-0.8S)]

where: Q = Depth of run-off generated, inches
S = Potential Retention of Water, inches
P = Design rainfall, inches

Q = 6.92 inches

3) Calculate Volume of Run-off

V = Q X A

where: Q = depth of run-off generated, ft
A = Total Area, sf

Q =	6.92	inches
Q =	0.58	feet
Area =	63.6	acres
Area =	2,770,575	sf

Total Run-off Volume:	**1,597,864**	**cf**

APPENDIX F-2

LUMINANT GENERATING COMPANY, LLC
SANDOW UNIT 5
AX LANDFILL - CELL 1 FULL AND CELL 2 ACTIVE
RUN-OFF CALCULATIONS

Definitions

Run-off from active landfill areas:	storm water that comes into contact with waste
Run-off from capped landfill areas:	storm water that falls outside of an active waste management area and does not come into contact with waste

Assumptions

1) Cell 1 is full of ash and not capped, Cell 2 is active
2) Run-off is generated on Cell 1 and Cell 2 areas
3) Run-off volume based on a 25-year, 24-hr storm
4) Assumed exposed fly and bed ash in Cells 1 and 2
5) Storm water runoff volumes are estimated using the Curve Number method as described in USDA's Urban Hydrology for Small Water Sheds (TR-55)

Area that Generates Run-off

Cell 1 Surface Area:	1,472,596	sf
Cell 1 Surface Area:	33.8	acres
Cells 1 and 2 Surface Area:	2,770,575	sf
Cells 1 and 2 Surface Area:	63.6	acres

Design Rainfall

From TP No. 40, 25-Yr, 24-hr: 8.2 in/day

Curve Numbers

From TR-55, Table 2-2a:

- For exposed fly and bed ash, use CN = 94 (See HELP Model Results)
- For exposed protective soil, use CN = 84 (See HELP Model Results)

Calculate Weighted Curve Number for Site

Description	Area (acres)	CN	Area X CN
Exposed Fly and Bed Ash (Cells 1 and 2)	63.6	94	5,978.7
Exposed Protective Soil (Cell 2)	0.0	84	0.0
	63.6		5,978.7

Weighted Curve Number = (Sum of CN X A) /(Total Area)

Weighted Curve Number = 94.0

APPENDIX F-2

LUMINANT GENERATING COMPANY, LLC
SANDOW UNIT 5
AX LANDFILL - CELL 1 FULL AND CELL 2 ACTIVE
RUN-OFF CALCULATIONS

<u>Calculate Run-Off Volume Using TR-55 Procedures</u>

1) Calculate Potential Retention of Water (S). Assume this represents water adsorbed by ash and protective cover (non free water)

$S = (1000/CNW)-10$

where: S = Potential Retention of Water, inches
CN = Curve Number for Site

S = 0.64 inches

2) Calculate Depth of Runoff (Q)

$Q = [(P-0.2S)^2]/[P-0.8S)]$

where: Q = Depth of run-off generated, inches
S = Potential Retention of Water, inches
P = Design rainfall, inches

Q = 7.48 inches

3) Calculate Volume of Run-off

$V = Q \times A$

where: Q = depth of run-off generated, ft
A = Total Area, sf

Q =	7.48	inches
Q =	0.62	feet
Area =	63.6	acres
Area =	2,770,575	sf

Total Run-off Volume:	**1,727,180**	**cf**

APPENDIX F-3

LUMINANT GENERATING COMPANY, LLC
SANDOW UNIT 5
AX LANDFILL - CELL 1 FULL, CELL 2 ACTIVE AND CELL 2 A EMPTY
RUN-OFF CALCULATIONS

Definitions

Run-off from active landfill areas:	storm water that comes into contact with waste
Run-off from capped landfill areas:	storm water that falls outside of an active waste management area and does not come into contact with waste

Assumptions

1) Cell 1 is full of ash and not capped, Cell 2 is active, Cell 2A is empty
2) Run-off is generated on Cells 1 and 2 area and blends with runoff from Cell 2A area
3) Run-off volume based on a 25-year, 24-hr storm
4) Assumed exposed fly and bed ash in Cells 1 and 2 and exposed protective soil in Cell 2A
5) Storm water runoff volumes are estimated using the Curve Number method as described in USDA's Urban Hydrology for Small Water Sheds (TR-55)

Area that Generates Run-off

Cell 1 Surface Area:	1,472,596	sf
Cell 1 Surface Area:	33.8	acres
Cells 1 and 2 Surface Area:	2,770,575	sf
Cells 1 and 2 Surface Area:	63.6	acres
Cells 1, 2 and 2A Surface Area:	6,483,918	sf
Cells 1, 2 and 2A Surface Area:	148.9	acres

Design Rainfall

From TP No. 40, 25-Yr, 24-hr: 8.2 in/day

Curve Numbers

From TR-55, Table 2-2a:

- For exposed fly and bed ash, use CN =	94	(See HELP Model Results)
- For exposed protective soil, use CN =	84	(See HELP Model Results)

Calculate Weighted Curve Number for Site

Description	Area (acres)	CN	Area X CN
Exposed Fly and Bed Ash (Cells 1 and 2)	63.6	94	5,978.7
Exposed Protective Soil (Cell 2A)	85.2	84	7,160.7
	148.9		13,139.5

Weighted Curve Number = (Sum of CN X A) /(Total Area)

Weighted Curve Number = 88.3

APPENDIX F-3

LUMINANT GENERATING COMPANY, LLC
SANDOW UNIT 5
AX LANDFILL - CELL 1 FULL, CELL 2 ACTIVE AND CELL 2 A EMPTY
RUN-OFF CALCULATIONS

<u>Calculate Run-Off Volume Using TR-55 Procedures</u>

1) Calculate Potential Retention of Water (S). Assume this represents water adsorbed by ash and protective cover (non free water)

S = (1000/CNW)-10

where: S = Potential Retention of Water, inches
CN = Curve Number for Site

S = 1.33 inches

2) Calculate Depth of Runoff (Q)

Q = [(P-0.2S)^2]/[P-0.8S)]

where: Q = Depth of run-off generated, inches
S = Potential Retention of Water, inches
P = Design rainfall, inches

Q = 6.80 inches

3) Calculate Volume of Run-off

V = Q X A

where: Q = depth of run-off generated, ft
A = Total Area, sf

Q =	6.80	inches
Q =	0.57	feet
Area =	148.9	acres
Area =	6,483,918	sf

Total Run-off Volume: 3,672,245 cf

APPENDIX F-4

LUMINANT GENERATING COMPANY, LLC
SANDOW UNIT 5
AX LANDFILL - CELLS 1 AND 2 FULL, CELL 2A ACTIVE
RUN-OFF CALCULATIONS

Definitions

Run-off from active landfill areas:	storm water that comes into contact with waste
Run-off from capped landfill areas:	storm water that falls outside of an active waste management area and does not come into contact with waste

Assumptions

1) Cells 1 and 2 area full of ash and not capped, Cell 2A is active
2) Run-off is generated on Cells 1, 2 and 2A
3) Run-off volume based on a 25-year, 24-hr storm
4) Assumed exposed fly and bed ash in Cells 1, 2 and 2A
5) Storm water runoff volumes are estimated using the Curve Number method as described in USDA's Urban Hydrology for Small Water Sheds (TR-55)

Area that Generates Run-off

Cell 1 Surface Area:	1,472,596	sf
Cell 1 Surface Area:	33.8	acres
Cells 1 and 2 Surface Area:	2,770,575	sf
Cells 1 and 2 Surface Area:	63.6	acres
Cells 1, 2 and 2A Surface Area:	6,483,918	sf
Cells 1, 2 and 2A Surface Area:	148.9	acres

Design Rainfall

From TP No. 40, 25-Yr, 24-hr: 8.2 in/day

Curve Numbers

From TR-55, Table 2-2a:
- For exposed fly and bed ash, use CN = 94
- For exposed protective soil, use CN = 84

Calculate Weighted Curve Number for Site

Description	Area (acres)	CN	Area X CN
Exposed Fly and Bed Ash (Cells 1, 2, 2A)	148.9	94	13,991.9
Exposed Protective Soil (None)	0.0	84	0.0
	148.9		13,991.9

Weighted Curve Number = (Sum of CN X A) /(Total Area)
Weighted Curve Number = 94.0

APPENDIX F-4

LUMINANT GENERATING COMPANY, LLC
SANDOW UNIT 5
AX LANDFILL - CELLS 1 AND 2 FULL, CELL 2A ACTIVE
RUN-OFF CALCULATIONS

Calculate Run-Off Volume Using TR-55 Procedures

1) Calculate Potential Retention of Water (S). Assume this represents water adsorbed by ash and protective cover (non free water)

S = (1000/CNW)-10

where: S = Potential Retention of Water, inches
CN = Curve Number for Site

S = 0.64 inches

2) Calculate Depth of Runoff (Q)

Q = [(P-0.2S)^2]/[P-0.8S)]

where: Q = Depth of run-off generated, inches
S = Potential Retention of Water, inches
P = Design rainfall, inches

Q = 7.48 inches

3) Calculate Volume of Run-off

V = Q X A

where: Q = depth of run-off generated, ft
A = Total Area, sf

Q =	7.48	inches
Q =	0.62	feet
Area =	148.9	acres
Area =	6,483,918	sf

Total Run-off Volume: 4,042,083 cf

APPENDIX F-5

LUMINANT GENERATING COMPANY, LLC
SANDOW UNIT 5
AX LANDFILL - CELL 1 CAPPED, CELL 2 FULL, CELL 2A ACTIVE
RUN-OFF CALCULATIONS

Definitions

Run-off from active landfill areas:	storm water that comes into contact with waste
Run-off from capped landfill areas:	storm water that falls outside of an active waste management area and does not come into contact with waste

Assumptions

1) Cell 1 is partially capped/closed. Cell 2 is full of ash and not capped, Cell 2A is active
2) Run-off is generated on Cells 2 and 2A. Clean runoff from capped Cell 1 diverted away from landfill
3) Run-off water volume based on a 25-year, 24-hr storm
4) Assumed exposed fly and bed ash in Cells 2 and 2A
5) Storm water runoff volumes are estimated using the Curve Number method as described in USDA's Urban Hydrology for Small Water Sheds (TR-55)

Area that Generates Run-off

Cell 1 Total Surface Area:	1,472,596	sf
Cell 1 Total Surface Area:	33.8	acres
Cell 1 Capped Surface Area:	735,000	sf
Cell 1 Capped Surface Area:	16.9	acres
Cell 2 Surface Area:	1,297,979	sf
Cell 2 Surface Area:	29.8	acres
Cells 2 and 2A Surface Area:	5,011,321	sf
Cells 2 and 2A Surface Area:	115.0	acres

Design Rainfall

From TP No. 40, 25-Yr, 24-hr: 8.2 in/day

Curve Numbers

From TR-55, Table 2-2a:
- For exposed fly and bed ash, use CN = 94
- For exposed protective soil, use CN = 84

Calculate Weighted Curve Number for Site

Description	Area (acres)	CN	Area X CN
Exposed Fly/Bed Ash (Cells 1 (Part), 2, 2A)	132.0	94	12,405.8
Exposed Protective Soil	0.0	84	0.0
	132.0		12,405.8

Weighted Curve Number = (Sum of CN X A) /(Total Area)

Weighted Curve Number = 94.0

APPENDIX F-5

LUMINANT GENERATING COMPANY, LLC
SANDOW UNIT 5
AX LANDFILL - CELL 1 CAPPED, CELL 2 FULL, CELL 2A ACTIVE
RUN-OFF CALCULATIONS

Calculate Run-Off Volume Using TR-55 Procedures

1) Calculate Potential Retention of Water (S). Assume this represents water adsorbed by ash and protective cover (non free water)

S = (1000/CNW)-10

where: S = Potential Retention of Water, inches
CN = Curve Number for Site

S = 0.64 inches

2) Calculate Depth of Runoff (Q)

Q = [(P-0.2S)^2]/[P-0.8S)]

where: Q = Depth of run-off generated, inches
S = Potential Retention of Water, inches
P = Design rainfall, inches

Q = 7.48 inches

3) Calculate Volume of Run-off

V = Q X A

where: Q = depth of run-off generated, ft
A = Total Area, sf

Q =	7.48	inches
Q =	0.62	feet
Area =	132.0	acres
Area =	5,748,917	sf

Total Run-off Volume:	**3,583,882**	**cf**