FINAL CLOSURE PLAN

EDWARDS POWER PLANT
ASH POND
(IEPA ID W1438050005-01)
Bartonville, Illinois

April 2022

PREPARED FOR:

Illinois Power Resources Generating, LLC
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Project Number: VST002-D22-001-01

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1.0 INTRODUCTION

Illinois Power Resources Generating, LLC is submitting this Final Closure Plan for Edwards Power Plant Ash Pond (IEPA ID. W1438050005-01) as part of the construction permit for closure required per the Illinois Administrative Code Title 35, Part 845, Standards for Disposal of Coal Combustion Residuals (CCR) in Surface Impoundments.

Edwards Power Plant is a coal-fired power plant and is located at 7800 South Cilco Lane in Bartonville, Peoria County, Illinois.

1.1 Proposed Selected Closure Method

Part 845, Subpart G: Closure and Post-Closure Care, Section 845.720 (b)(3): The final closure plan must identify the proposed selected closure method and must include the information required in subsection (a)(1) and the closure alternative analysis specified in Section 845.710.

A Closure Alternatives Analysis was performed by Gradient Corporation to evaluate the method of closure for the Edwards Power Plant Ash Pond. Closure-in place (CIP) (Section 845.750) was compared with closure by removal (CBR) (Section 845.740). The results indicate CIP was the most appropriate closure method. The Closure Alternative Analysis is included in Appendix A. A report of supplemental information, by IngenAE, LLC, for the Closure Alternative Analysis is also included in Appendix A.

2.0 FINAL CLOSURE PLAN

This Final Closure Plan for the Edwards Power Plant Ash Pond is required by Section 845.720. The following addresses the requirements in subsection (a)(1).

2.1 Narrative Description of Closure

Section 845.720(a)(1)(A): A narrative description of how the CCR surface impoundment will be closed in accordance with this Part.

The final cover system design for final closure is based on the closure-in place option of Section 845.710 and is detailed in the construction permit design drawings included in Appendix B.

Final closure of the CCR surface impoundment will include the following components:

1. site preparation,
2. removing free liquids,
3. relocation to the south sections of the pond of approximately 1,130,000 cubic yards (CY) of CCR from the high points and northwest sections of the ash pond and approximately 210,000 CY from the rail line embankment,
4. over-excavation of commingled ash and soils below the CCR relocation area,
5. construction of an earthen separation berm at the perimeter of the relocation area of the ash pond to contain the relocated ash,
6. removal of the existing rail loop, ballast, and ash embankments,
7. removal of onsite existing structures,
8. grading of the CCR subgrade,
9. installation of the designed final cover system,
10. backfill and grading the northwest relocation area to promote positive drainage,
11. installation of stormwater structures,
12. seeding and fertilization of the final protective soil layer and other disturbed areas.

The sequence of construction events for closure of the CCR surface impoundment are detailed below:

- Site Preparation

  The site will be prepared for closure by establishing perimeter stormwater Best Management Practices (BMPs), as and if needed, at the construction limits of disturbance.

- Removing free liquids

  Free liquids will be removed by solidifying waste, as needed, and removing liquid waste using a series of trenches, ditches, and sumps excavated into the CCR. The liquids will be pumped to a temporary storage system, such as a treatment pond, settling pond or tanks, prior to discharge to an NPDES-permitted outfall.

- Relocation of CCR

  As the phreatic surface is lowered to a safe level, heavy equipment will be mobilized to relocate approximately 1,130,000 CY of CCR from the high points and northwest sections of the surface impoundment to the south end and other low areas of the surface impoundment. Additionally, approximately 210,000 CY will be relocated from the rail loop embankment into the surface impoundment closure area. The ash will be relocated by loading the material with excavators into offroad articulated trucks which will haul the material to fill areas in the central and south sections of the surface impoundment. The relocated CCR will be used to attain design grades in these areas of the surface impoundment and will be placed in 1-foot-thick compacted lifts. A dust control plan will be followed during the relocation and placement of the CCR.

- Excavation of the CCR relocation area

  The CCR within the designated CCR relocation area located at the northwest portion of the impoundment shall be completely removed and relocated to the areas of the pond to receive final cover. After CCR and CCR residue is removed, up to 1 foot of soil will be removed beneath this area. The subsoils will be visually observed for signs of CCR staining. If subsoils with CCR staining are observed, they will be removed and disposed.

- Construction of an earthen berm

  An earthen berm will be constructed to contain and stabilize the remaining CCR in the north and middle sections of the surface impoundment. The earthen berm will be constructed with local silty clayey soils and compacted in 8-inch loose lifts from the bottom of the surface impoundment to the final design grade of the CCR subgrade. The compaction will be based on 95% of the soils Standard Proctor maximum dry density.

- Removal of existing rail loop

  The existing rail loop constructed on the perimeter berm of the surface impoundment will be removed as part of the final closure of the surface impoundment. The steel rails will be recycled after decontamination. The rail ties will be disposed of in a landfill or construction demolition site. Ballast and encountered ash (approximately 210,000 CY) used in the construction of the rail line berm will be loaded and hauled to the surface impoundment closure area.

- Removal of existing structures

  Structures within the surface impoundment will be removed or closed in place as part of the final closure of the surface impoundment. The structures include, but are not limited to, culverts, the surface impoundment spill way structure and outfall pipe, and a sewer forcemain. Removal of the structures will be documented by the CQA firm as part of the closure.

- Grading of the CCR to final cover design subgrade elevations

  Existing and relocated CCR will be graded to design final cover subgrade elevations. The CCR will be placed in areas requiring fill in 1-foot loose lifts and compacted with a roller or compactor of sufficient weight to create a surface that will support the low permeability layer and protective soil layer of the final cover system. Ballast from demolition of the rail loop and residual coal from the coal pile may be used as backfill material to achieve design final grades. The construction will be documented by the CQA firm.

- Installation of the final cover system

  The final cover system design for the CCR surface impoundment will encompass an area of approximately 69.1 acres of CCR closed in place and will include from bottom to top:

  > A low permeability layer consisting of a 40 mil LLDPE geomembrane to be placed and seamed on top of the prepared CCR subgrade. The geomembrane installation will be installed and documented in accordance with GRI-GM19a specifications by the CQA firm. The geomembrane material will be evaluated and required to meet GRI-GM17 specifications.
  >
  > A 200 mil geocomposite with 6 oz nonwoven HDPE geotextile fabric on both sides will be placed on top of the 40 mil LLDPE geomembrane to provide drainage from the top of the geomembrane.
  >
  > The final protective layer will consist of two feet of soil materials placed on top of the geocomposite drainage layer. The soil material will include six-inches of soils to support vegetative growth to reduce potential erosion.

- Backfill and grading the northwest relocation area

  Additional soil will be transported from the borrow area to the northwest relocation area and graded to promote positive drainage toward the proposed stormwater pond.

- Installation of stormwater structures

  Stormwater structures will be installed on the west side of the final cover system to direct stormwater to the existing drainage ditch on the west side of the CCR surface impoundment. The stormwater will discharge from the drainage ditch to the Illinois River per the Plant's NPDES permit.

- Seeding and fertilization of the final protective layer of the final cover system and other disturbed areas

  At the completion of the construction of the final cover system, the entire final protective layer will be seeded, fertilized, amended, and mulched as required to promote the establishment of vegetation that is sustainable in the local climate. The base seed mixture will be determined in consultation with local agronomists at the time of planting and shall consist primarily of turf grasses.

For select areas of the site, the vegetation shall include native pollinator plantings consistent with IDNR's "Solar Site Pollinator Scorecard" [1]. In the northwest reclamation area, outside of the capped area, the soils will be fertilized and planted with pollinator plants. If pollinators are proposed for the capped areas, the final grading plan shall be revised to increase the depth of the protective soil to accommodate the deeper roots of the pollinators. In accordance with the Pollinator Establishment Guidelines prepared by the Illinois Department of Natural Resources (IDNR), native prairie species will be planted approximately 1/8"-1/4" on bare firm ground free of weeds. A ratio of 25% Native Grasses to 75% wildflowers is preferred and on slopes 5% or less, the minimum seeding rate is 20 seeds/ft^2 Pure Live Seed (PLS). PLS is calculated by the following equation: PLS = % Purity X % Total Germination/100.

Long-term maintenance of the pollinators shall be performed in accordance with IDNR guidelines. The site should be checked for undesirable species such as woody plants or invasive species at least annually. During the first year, mowing at a height of 10" or greater 1-3 times during the growing season. Spot mowing and/or spot herbicide treatment will be performed to control noxious and undesirable weeds. After the first year, mowing will not take place during April 15th – October 1st.

2.2 CCR Removal and Decontamination of the CCR Surface Impoundment

Section 845.720(a)(1)(B): If closure of the CCR surface impoundment will be accomplished through removal of CCR from the CCR surface impoundment, a description of the procedures to remove the CCR and decontaminate the CCR surface impoundment in accordance with Section 845.740.

Based on the proposed design, CCR will be removed from the northwest area of the CCR surface impoundment and relocated on the south end as part of the subgrade design. The ash will be relocated by loading the material with excavators into offroad articulated trucks which will haul the material to fill areas in the central and south sections of the surface impoundment. The remaining base soils within the area of CCR removal will be observed for CCR staining and removed if encountered. Approximately 1 foot of material may be removed. The materials will be incorporated into the grading of the CCR to final cover design subgrade elevations.

2.3 Final Cover System Design

Section 845.720(a)(1)(C): If closure of the CCR surface impoundment will be accomplished by leaving CCR in place, a description of the final cover system, designed in accordance with Section 845.750, and the methods and procedures to be used to install the final cover. The closure plan must also discuss how the final cover system will achieve the performance standards specified in Section 845.750.

The final cover system is described in Sections 2.1 and 4.0 and detailed in the final cover construction permit drawings included in Appendix B of this final closure plan. The final cover system design is in accordance with the required installation methods and procedures of Section 845.750 and describes how the final cover system design will achieve the performance standards of Section 845.750.

2.4 Estimate of Maximum CCR Inventory

Section 845.720(a)(1)(D): An estimate of the maximum inventory of CCR ever on-site over the active life of the CCR surface impoundment.

The Ash Pond currently contains approximately 4,135,000 CY of CCR. This estimate is based on the comparison between the existing surface contours surveyed on December 1, 2020, and the bottom contours of the CCR. Edwards Power Plant is scheduled to close no later than December 31, 2022, and before closure, additional CCR will be placed in the surface impoundment. According to Section 2.4 of the 2021 USEPA CCR Rule Periodic Certification Report, dated October 11, 2021, by Geosyntec [2], 126,383 CY of CCR was placed in the Ash Pond between July 2015 and December 2020. This corresponds to approximately 23,000 CY per year. Therefore, for the two-year period between the survey conducted in December 2020 and the expected date of plant closure in December 2022, an additional 46,000 CY of CCR is expected to be placed in the Ash Pond. Furthermore, approximately 210,000 CY of ash is currently in the surface impoundment rail line embankments and will be placed inside the surface impoundment upon closure, resulting in a maximum CCR capacity of approximately 4,391,000 CY.

2.5 Estimate of Largest Area of CCR Surface Impoundment

Section 845.720(a)(1)(E): An estimate of the largest area of the CCR surface impoundment ever requiring a final cover (see Section 845.750), at any time during the CCR surface impoundment's active life.

The largest estimated area of the CCR surface impoundment ever requiring a final cover is 102.06 acres based on the CCR Facility Boundary Exhibit located in Attachment A of the Initial Operating Permit submittal by Burns & McDonnell dated October 25, 2021 [3]. The actual design acreage required for a final cover system based on this final closure plan is approximately 69.1 acres.

2.6 Final Closure Completion Schedule

Section 845.720(a)(1)(F): A schedule for completing all activities necessary to satisfy the closure criteria in this Section, including an estimate of the year in which all closure activities for the CCR surface impoundment will be completed. The schedule should provide sufficient information to describe the sequential steps that will be taken to close the CCR surface impoundment, including identification of major milestones such as coordinating with and obtaining necessary approvals and permits from other agencies, the dewatering and stabilization phases of CCR surface impoundment closure, or installation of the final cover system, and the estimated timeframes to complete each step or phase of CCR surface impoundment closure. When preparing the preliminary written closure plan, if the owner or operator of a CCR surface impoundment estimates that the time required to complete closure will exceed the timeframes specified in Section 845.760(a), the preliminary written closure plan must include the site-specific information, factors and considerations that would support any time extension sought under Section 845.760 (b).

The final closure completion schedule with major milestones is included below in Table 1 – Final Closure Completion Schedule.

TABLE 1 – FINAL CLOSURE COMPLETION SCHEDULE

Milestone	Timeframe
Final Closure Plan Submittal	August 1, 2022
Agency Coordination and Permit Approvals. • State permits for dewatering, land disturbance, stormwater discharge, and dam modifications.	6 to 12 months after the approval of the Final Closure and Construction Permit Application.
Dewater and Stabilize CCR. • Dewater surface impoundment. • Stabilize dewatered CCR.	18 to 24 months after approved permits.
Subgrade Stabilization • Relocate CCR from the northwest section, middle section and rail line embankment areas of the surface impoundment to the south end and place to final design elevations. • Remove existing structures. • Construct northwest berm. • Remove rail line.	18 to 24 months after the completion of the dewatering and stabilization of the ash subgrade. Can be completed in conjunction with stabilization of ash.
Installation of the Final Cover System. • Prepare the CCR subgrade for the placement of the final cover system. • Install geomembrane/geocomposite. • Install/place the final protective cover soil layer. • Backfill and grade the northwest relocation area. • Install stormwater structures.	8 to 12 months after subgrade stabilization. Can be completed in conjunction with subgrade stabilization.
Site Restoration. • Amend, Seed, fertilize, and mulch the final protective layer. • Fertilize and plant pollinator plants in the northwest relocation area. • Demobilization.	2 to 4 months after the completion of the final cover system construction. Can be completed in conjunction with final cover system construction.
Timeframe to Complete Closure	**Prior to October 2028**

3.0 REVISION OF THE FINAL CLOSURE PLAN

Section 845.720(B)(4): If a final written closure plan revision is necessary after closure activities have started for a CCR surface impoundment, the owner or operator must submit a request to modify the construction permit within 60 days following the triggering event.

If an event triggering a revision is necessary for the written closure plan, the owner will submit a request to modify the construction permit within 60 days of the triggering event.

4.0 CLOSURE WITH A FINAL COVER SYSTEM

This section addresses the closure performance standards when leaving CCR in place for the Edwards Power Plant Ash Pond as required by Section 845.750.

4.1 Control, Minimization or Elimination of Post-Closure Infiltration and Releases

Section 845.750(a): The owner or operator of a CCR surface impoundment must ensure that, at a minimum, the CCR surface impoundment is closed in a manner that will:

(1) Control, minimize or eliminate, to the maximum extent feasible, post-closure infiltration of liquids into the waste and releases of CCR, leachate, or contaminated run-off to the ground or surface waters or to the atmosphere.

The final cover system design will, to the maximum extent feasible, minimize infiltration of liquids into the retained CCR with the following design features and specifications:

- A 40 mil LLDPE geomembrane low permeability layer will be placed over the entirety of the CCR surface impoundment closure footprint, approximately 69 acres, to control and minimize infiltration into the waste. The geomembrane will be constructed on a subgrade that is free of sharp rocks and other debris.

- A 200 mil geocomposite with 6 oz nonwoven HDPE geotextile fabric on both sides will be placed on top of the 40 mil LLDPE geomembrane to protect and provide drainage from the top of the geomembrane.

- A two-foot-thick final protective layer of soil materials. The final protective layer will allow the establishment of vegetation on the top of the final cover system. The soil and vegetation will reduce the amount of infiltration to the geocomposite and geomembrane layers.

Surface stormwater will be routed off the top of the surface impoundment final cover, conveyed to drainage stormwater channels, and discharge into the west perimeter ditch and northeast stormwater pond. The stormwater management system will drain by gravity and preclude water impoundment on top of the final cover system, thereby minimizing post-closure infiltration into the CCR.

Releases of CCR leachate and/or contaminated run-off into the groundwater, surface water, and/or atmosphere will be minimized, to the maximum extent feasible, as:

- CCR leachate (e.g., pore water within the CCR) will be minimized via the installation of the final cover system, including a low-permeability geomembrane layer. The final cover system will minimize infiltration and therefore the amount of leachate within the CCR.

- Releases of CCR leachate via the existing outlet culverts will be prevented by removing or sealing existing penetrations into the ash pond. Sealing will include the capping of plastic culverts and the cleaning of concrete pipe culverts and filling with cement bentonite grout, thereby removing potential flow paths that could otherwise allow leachate to be released.

4.2 Preclusion of Future Impoundment of Water, Sediment or Slurry

Section 845.750(a): The owner or operator of a CCR surface impoundment must ensure that, at a minimum, the CCR surface impoundment is closed in a manner that will:

(2) Preclude the probability of future impoundment of water, sediment, or slurry.

The design of the final cover system will be sloped to ensure positive drainage of stormwater from the final cover system surface and directed to drainage structures of the final cover system. The drainage structures will convey the stormwater to the existing drainage ditch on the west side of the CCR surface impoundment and discharge into the existing perimeter west ditch in accordance with the terms of an NPDES permit. Stormwater calculations supporting the design of the final cover system to minimize releases are included in Appendix D.

4.3 Stability Measures for Prevention of Sloughing or Movement

Section 845.750(a): The owner or operator of a CCR surface impoundment must ensure that, at a minimum, the CCR surface impoundment is closed in a manner that will:

(3) Include measures that provide for major slope stability to prevent the sloughing or movement of the final cover system during the closure and post-closure period.

The existing perimeter berms around the ash pond are constructed using compacted soil materials. The proposed separation berm for the northwest section of the surface impoundment will also be constructed using compacted soil materials.

Sloughing and movement of the final cover system will be minimized by constructing the final cover system at relatively flat slopes, including 2.7% over most of the final cover and 3H:1V at the edges of the final cover, as necessary to tie into existing grades. The limited areas of 3H:1V slope are 20 feet or less in total slope height

Geotechnical calculations completed for the design of the final cover system and the stability of the existing and proposed berms show that the final cover system will be prevented from sloughing or movement during the closure and post-closure period. Slope stability calculations are included in Appendix E.

4.4 Minimize the Need for Further Maintenance

Section 845.750(a): The owner or operator of a CCR surface impoundment must ensure that, at a minimum, the CCR surface impoundment is closed in a manner that will:

(4) Minimize the need for further maintenance of the CCR surface impoundment.

The final cover system design of the surface impoundment is designed to promote stormwater run-off yet minimize erosion of the final protective layer. The majority of the final cover system is sloped at less than 3%. These relatively shallow slopes will help with the establishment of vegetation and minimize the need for further maintenance of the final cover system. Isolated steeper slopes, associated with the perimeter drainageway, were designed with short slope lengths to minimize erosion. Any further maintenance will be described in the Post-Closure Care Plan in accordance with Section 845.780.

The final cover system design includes stormwater controls systems that will reduce the possibility of major erosion by controlling the flow of stormwater away from the final cover system. Calculations for sizing the stormwater control systems are included in Appendix D.

4.5 Be Completed in the Shortest Amount of Time

Section 845.750(a): The owner or operator of a CCR surface impoundment must ensure that, at a minimum, the CCR surface impoundment is closed in a manner that will:

> *(5) Be completed in the shortest amount of time consistent with recognized and generally accepted engineering practices.*

Closure construction is expected to be completed within an amount of time that is consistent with recognized and generally accepted timeframes required to permit, design, bid, and construct a CCR impoundment final closure system, with a consideration of other permits form multiple agencies that are also required for the project. Where possible, construction tasks will occur concurrently to reduce project construction time. The estimated Final Closure Completion Schedule is included in Table 1 in Section 2.6 of this final closure plan. It should be noted that this schedule may change based on contractor, equipment, and material availability and actual weather conditions at the time at which closure occurs.

4.6 Drainage and Stabilization of CCR Surface Impoundments

Section 845.750(b): Drainage and Stabilization of CCR Surface Impoundments. The owner or operator of a CCR surface impoundment or any lateral expansion of a CCR surface impoundment must meet the requirements of this subsection (b) before installing the final cover system required by subsection (c).

> *(1) Free liquids must be eliminated by removing liquid wastes or solidifying the remaining wastes and waste residues.*
>
> *(2) Remaining wastes must be stabilized sufficiently to support the final cover system.*

Prior to installing the final cover system, free liquids will be eliminated by removing the liquid waste from the Ash Pond. Engineering measure necessary to remove liquid waste that is readily separable under ambient temperature and pressure are being evaluated.

The removal of free liquids will result in the stabilization of the remaining CCR and will therefore allow the final cover to be placed on stable subgrade.

4.7 Final Cover System

Section 845.750(c): Final Cover System. If a CCR surface impoundment is closed by leaving CCR in place, the owner or operator must install a final cover system that is designed to minimize infiltration and erosion, and, at a minimum, meets the requirements of this subsection (c). The final cover system must consist of a low permeability layer and a final protective layer. The design of the final cover system must be included in the preliminary and final written closure plans required by Section 845.720 and the construction permit application for closure submitted to the Agency.

The following sections define the low permeability layer and the final protective layer components of the proposed final cover system which is designed in accordance with Section 845.750.

4.7.1 Standards for the Low Permeability Layer

Section 845.750(c)(1): Standards for the Low Permeability Layer. The low permeability layer must have a permeability less than or equal to the permeability of any bottom liner system or natural subsoils present, or a hydraulic conductivity no greater than 1 x 10^{-7} cm/sec, whichever is less. The low permeability layer must be constructed in accordance with the standards in either subsection (c)(1)(A) or (c)(1)(B), unless the owner or operator demonstrates that another low permeability layer construction technique or material provides equivalent or superior performance to the requirements of either subsection (c)(1)(A) or (c)(1)(B) and is approved by the Agency.

(A) A compacted earth layer constructed in accordance with the following Standards:

i) The minimum allowable thickness must be 0.91 meters (three feet); and

ii) The layer must be compacted to achieve a hydraulic conductivity of 1 x 10^{-7} cm/sec or less and minimize void spaces.

(B) A geomembrane constructed in accordance with the following standards:

i) The geosynthetic membrane must have a minimum thickness of 40 mil (0.04 inches) and, in terms of hydraulic flux, must be equivalent or superior to a three-foot layer of soil with a hydraulic conductivity of 1 x 10^{-7} cm/sec;

ii) The geomembrane must have the strength to withstand the normal stresses imposed by the waste stabilization process; and

iii) The geomembrane must be placed over a prepared base free from sharp objects and other materials that may cause damage.

The proposed final cover system low permeability layer will be a 40 mil LLDPE geomembrane as shown on the construction permit drawings in Appendix B. The geomembrane will be tested to meet the requirements of the Geosynthetic Institute GRI-GM17. A 40 mil LLDPE geomembrane that conforms to these specifications is less permeable than three feet of compacted clay soil and able to withstand normal stresses imposed by waste stabilization.

The installation of the 40 mil LLDPE geomembrane will be completed per the Geosynthetic Institute GRI-GM19a specifications and will be installed on a prepared subgrade, after the underlying CCR has been stabilized. Therefore, additional normal stresses will not be imparted on the geomembrane due to the waste stabilization process. The prepared subgrade shall be free of sharp or protruding objects and other materials that may cause damage.

A 200 mil geocomposite will be placed on top of the 40 mil LLDPE geomembrane. The geocomposite will convey clean stormwater that infiltrates the protective and vegetative soil layer off the geomembrane.

4.7.2 Standards for the Final Protective Layer

Section 845.750(c)(2): Standards for the Final Protective Layer. The final protective layer must meet the following requirements, unless the owner or operator demonstrates that another final protective layer construction technique or material provides equivalent or superior performance to the requirements of this subsection (c)(2) and is approved by the Agency.

(A) Cover the entire low permeability layer;

(B) Be at least three feet thick, be sufficient to protect the low permeability layer from freezing, and minimize root penetration of the low permeability layer;

(C) Consist of soil material capable of supporting vegetation;

(D) Be placed as soon as possible after placement of the low permeability layer; and

(E) Be covered with vegetation to minimize wind and water erosion.

The proposed final cover system final protective layer consists of 2 feet of soil material, the top six-inches capable of supporting vegetation. Soil protective layer material will be placed on top of the geocomposite drainage layer as soon as possible. The sandy, silty clay soil material will be borrowed from local sources. The top 6 inches of soil material will be amended with fertilizers as needed to help establish vegetation. A demonstration shall be submitted to the IEPA for approval in accordance with Section 845.750(c)(2) demonstrating that the proposed design provides equivalent or superior performance to the requirements of Section 845.750(c)(2).

The entire final protective layer will be seeded, fertilized, amended, and mulched as required to promote the establishment of vegetation that is sustainable in the local climate. The base seed mixture will be determined in consultation with local agronomists at the time of planting and shall consist primarily of turf grasses. For select areas of the site, the vegetation shall include native pollinator plantings consistent with IDNR's "Solar Site Pollinator Scorecard" [1]. In the northwest reclamation area, outside of the capped area, the soils will be fertilized and planted with pollinator plants. If pollinators are proposed for the capped areas, the final grading plan shall be revised to increase the depth of the protective soil to accommodate the deeper roots of the pollinators. In accordance with the Pollinator Establishment Guidelines prepared by the Illinois Department of Natural Resources (IDNR), native prairie species will be planted approximately 1/8"-1/4" on bare firm ground free of weeds. A ratio of 25% Native Grasses to 75% wildflowers is preferred and on slopes 5% or less, the minimum seeding rate is 20 seeds/ft^2 Pure Live Seed (PLS). PLS is calculated by the following equation: PLS = % Purity X % Total Germination/100.

Long-term maintenance of the pollinators shall be performed in accordance with IDNR guidelines. The site should be checked for undesirable species such as woody plants or invasive species at least annually. During the first year, mowing at a height of 10" or greater 1-3 times during the growing season. Spot mowing and/or spot herbicide treatment will be performed to control noxious and undesirable weeds. After the first year, mowing will not take place during April 15th – October 1st.

4.8 Final Cover Settlement

Section 845.750(c)(3): The disruption of the integrity of the final cover system must be minimized through a design that accommodates settling and subsidence.

The final cover system design includes slopes that will accommodate final cover settlement and subsidence and still maintain positive stormwater flow off the final cover surface. Slope stability calculations showing the stability of the final cover system design are included in Appendix E.

4.9 Certification

Section 845.750(c)(4): The owner or operator of the CCR surface impoundment must obtain and submit with its construction permit application for closure a written certification from a qualified professional engineer that that the design of the final cover system meets the requirements of this Section.

As a registered professional engineer in good standing with the State of Illinois I hereby certify that the design of the final cover system meets the requirements of Section 845.750.

____
Printed Name

____
Signature Date

____
Registration Number Expiration Date

4.10 Use of CCR in Closure of Surface Impoundments

Section 845.750(d): This subsection specifies the allowable uses of CCR in the closure of CCR surface impoundments closing under Section 845.700. Notwithstanding the prohibition on further placement in Section 845.700, CCR may be placed in these surface impoundments, but only for purposes of grading and contouring in the design and construction of the final cover system, if:

(1) The CCR placed was generated at the facility and is located at the facility at the time closure was initiated;

(2) CCR is placed entirely above the elevation of CCR in the surface impoundment, following dewatering and stabilization (see subsection (b);

(3) The CCR is placed entirely within the perimeter berms of the CCR surface impoundment; and

(4) The final cover system is constructed with either:

A) A slope not steeper than 5% grade after allowance for settlement; or

B) At a steeper grade, if the Agency determines that the steeper slope is necessary, based on conditions at the site, to facilitate run-off and minimize erosion, and that side slopes are evaluated for erosion potential based on a stability analysis to evaluate possible erosion potential. The stability analysis, at a minimum, must evaluate the site geology; characterize soil shear strength; construct a slope stability model; establish groundwater and seepage conditions, if any; select loading conditions; locate critical failure surface; and iterate until minimum factor of safety is achieved.

Based on the final cover system design approximately 1,130,000 CY of CCR from the northwest and middle sections of the surface impoundment will be relocated to areas of the central and south sections of the surface impoundment. CCR encountered from excavation of the rail loop embankments will also be relocated. The relocated CCR will only be placed above the elevation of the existing CCR that will remain as subgrade within the footprint of the perimeter berms of the CCR surface impoundment. This reuse of CCR in the closure of the surface impoundment is in accordance with the requirements in Section 845.750(d).

Final cover slopes will typically consist of 2.7% cross-slopes and 1% stormwater flowline slopes within the limits of final cover, which are less than 5%. However, short lengths of 3(H):1(V) final cover slopes, up to 20 ft in height, will be used in limited areas near the perimeter of the final cover, as needed to tie the final cover into the existing grades, as shown in the drawings. The 3(H):1(V) slopes will be utilized to allow most of the final cover, in area, to drain towards the west perimeter ditch. This will reduce the volume of post-closure stormwater runoff that is routed to the east (towards the new northeast pond). The stability of final cover slopes has been evaluated, and these calculations are provided in Attachment F. Resulting factors of safety exceed typical minimum factors of safety.

4.11 Additional Information

Both the lateral migration of groundwater and vertical infiltration of liquids, and releases of CCR, and leachate, and contaminated run-off into and out of the Ash Pond will be controlled, minimized, or eliminated, to the maximum extent feasible, under post closure conditions.

- Closure of the Ash Pond will include constructing a final cover system, thereby encapsulating CCR within the Ash Pond on the top and sides, as discussed in Section 4.

- In the area immediately underlying the Ash Pond, a thick layer of low-permeability clays associated with the Upper Cahokia Formation has been observed, as stated in the 2021 Hydrogeologic Site Characterization Report [4]. This clay layer restricts the migration of groundwater from the saturated deposits underlying the Ash Pond into the surrounding areas.

- CCR within the northwest area of the Ash Pond will be re-located to the south end to provide a minimum separation of 5 feet above the uppermost aquifer. The lowest elevation of CCR withing the consolidated area of the Ash Pond is approximately El. 413.9 ft, as shown in the Draft Groundwater Modelling Report [5].

5.0 CERTIFICATION FROM A QUALIFIED PROFESSIONAL ENGINEER

Section 845.720(b)(5): The owner or operator of the CCR surface impoundment must obtain and submit with its construction permit application for closure a written certification from a qualified professional engineer that the final written closure plan meets the requirements of this Part.

I, Brian J. Horvath, being a Registered Professional Engineer in good standing in the State of Illinois, do hereby certify, to the best of my knowledge, information, and belief, that the information contained in this construction permit application has been prepared in accordance with the accepted practice of engineering and the requirements of Title 35, Subtitle G, Chapter I, Subchapter j, Section 845.720 of the Illinois Administrative Code.

____
Printed Name

____
Signature Date

____
Registration Number Expiration Date

6.0 REFERENCES

[1] Illinois Department of Natural Resources, “Solar Site Pollinator Scorecard,” December 2019. [Online].Available: https://www2.illinois.gov/dnr/conservation/PollinatorScoreCard/Pages/default.aspx.

[2] Geosyntec Consultants, “2021 USEPA CCR Rule Periodic Certification Report §257.73(a)(2),(c),(d),(e) and §257.82, Ash Pond, Edwards Power Plant, Edwards, Illinois,” Chesterfield, Missouri, October 11, 2021.

[3] Burns & McDonnell, “Initial Operating Permit Edwards Power Plant Ash Pond,” St. Louis, MO, October 25, 2021.

[4] Ramboll. 2021. "Hydrogeologic Site Characterization Report, Ash Pond, Edwards Power Plant, Bartonville, Illinois." Report to Illinois Power Resources Generating, LLC. 733p. October 25.

[5] Ramboll. 2022. "Groundwater Modeling Report, Ash Pond, Edwards Power Plant, Bartonville, Illinois (Final Draft)." Report to Illinois Power Resources Generating, LLC. 39p

Appendix A

Closure Alternative Analysis

Closure Alternatives Analysis and Preliminary Corrective Measures Assessment for the Ash Pond at the Edwards Power Plant Bartonville, Illinois

Draft – April 25, 2022

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Abbreviations

AACE	Association for the Advancement of Cost Engineering
BCU	Bedrock Confining Unit
BMP	Best Management Practice
CAA	Closure Alternatives Analysis
CAAA	Corrective Action Alternatives Analysis
CBR	Closure-by-Removal
CBR-Offsite	Closure-by-Removal with Off-Site CCR Disposal
CCR	Coal Combustion Residual
CIP	Closure-in-Place
CMA	Corrective Measures Assessment
CO	Carbon Monoxide
CO_2	Carbon Dioxide
CW	Cutoff Wall
CY	Cubic Yard
EJ	Environmental Justice
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
ft-amsl	Feet Above Mean Sea Level
GE	Groundwater Extraction
GHG	Greenhouse Gas
GWPS	Groundwater Protection Standard
HUC	Hydrologic Unit Code
IAC	Illinois Administrative Code
ID	Identification
IDNR	Illinois Department of Natural Resources
IEPA	Illinois Environmental Protection Agency
IPRG	Illinois Power Resources Generating, LLC
IT	Interceptor Trench
LCF	Lower Cahokia Formation
LLDPE	Linear Low-Density Polyethylene
MNA	Monitored Natural Attenuation
N_2O	Nitrous Oxide
NAVD88	North American Vertical Datum 1988
NID	National Inventory of Dams
NO_x	Nitrogen Oxides
NPDES	National Pollutant Discharge Elimination System
O&M	Operations and Maintenance
PM	Particulate Matter
PRB	Permeable Reactive Barrier
SFWA	State Fish and Wildlife Area
Source Control-CW	Source Control with Construction of a Cutoff Wall
Source Control-GE	Source Control with Groundwater Extraction
Source Control-IT	Source Control with Construction of an Interceptor Trench

Source Control-MNA	Source Control with Monitored Natural Attenuation
Source Control-PRB	Source Control with Construction of a Permeable Reactive Barrier
TDS	Total Dissolved Solids
UA	Uppermost Aquifer
UCF	Upper Cahokia Formation
US DOT	United States Department of Transportation
US EPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound
WPC Permit	Water Pollution Control Construction and Operating Permit

Summary of Findings

Title 35, Part 845 of the Illinois Administrative Code (IAC; IEPA, 2021a) requires the development of a Closure Alternatives Analysis (CAA) prior to undertaking closure activities at certain surface impoundments containing coal combustion residuals (CCRs) in the state of Illinois. Part 845 additionally requires that a Corrective Measures Assessment (CMA) be performed prior to undertaking corrective measures at certain CCR surface impoundments. Pursuant to requirements under IAC Section 845.710, this report presents a CAA for the Ash Pond located on Illinois Power Resources Generating, LLC's (IPRG) Edwards Power Plant property in Peoria County, Illinois. This report also presents a CMA for the Ash Pond pursuant to requirements under IAC Section 845.660 (IEPA, 2021a).

Closure Alternatives Analysis

The goal of a CAA is to holistically evaluate potential closure scenarios with respect to a wide range of factors, including the efficiency, reliability, and ease of implementation of the closure scenario; the scenario's potential positive and negative short- and long-term impacts on human health and the environment; and the scenario's ability to address concerns raised by residents (IAC Part 845; IEPA, 2021a). Gradient evaluated two specific closure scenarios for the Ash Pond: Closure-in-Place (CIP) with consolidation and Closure-by-Removal with Off-Site CCR Disposal (CBR-Offsite). The CIP scenario entails the relocation of CCR located in the northwestern portion of the Ash Pond to the southern portion of the Ash Pond, followed by capping with a new cover system consisting of, from bottom to top, a geomembrane layer, a geocomposite drainage layer, and 24 inches of vegetated soil. The CBR-Offsite scenario entails excavating all of the CCR from the Ash Pond and transporting it to an off-Site landfill for disposal. IPRG will also continue to evaluate potential opportunities for beneficial re-use of CCR excavated from the Ash Pond as an alternative to disposal.

IAC Section 845.710(c)(2) requires CAAs to "[i]dentify whether the facility has an onsite landfill with remaining capacity that can legally accept CCR, and, if not, whether constructing an onsite landfill is possible" (IEPA, 2021a). There is no existing on-Site landfill at the Edwards Power Plant Site, and the property is too small to accommodate the construction of a new on-Site landfill. Moreover, the owned property outside of the Ash Pond and the Edwards Power Plant lies within the 100-year flood zone for the Illinois River. For these reasons, neither expansion of an existing on-Site landfill nor construction of a new on-Site landfill is a viable alternative at this Site (Attachment B).

Table S.1 summarizes the expected impacts of the CIP and CBR-Offsite closure scenarios with regard to each of the factors specified under IAC Section 845.710 (IEPA, 2021a). Based on this evaluation and the additional details provided in Section 2 of this report, CIP has been identified as the most appropriate closure scenario for the Ash Pond. Key benefits of the CIP scenario relative to the CBR-Offsite scenario include the more rapid re-development of the Site for use in utility-scale battery energy storage and reduced impacts to workers, community members, and the environment during construction (*e.g.*, fewer constructed-related accidents, lower energy demands, less air pollution and greenhouse gas [GHG] emissions, less traffic-related impacts, and potentially lower impacts to environmental justice [EJ] communities). This conclusion is subject to change as additional data are collected and following the completion of an upcoming public meeting, which will be held in May 2022 pursuant to requirements under IAC Section 845.710(e). Following the public meeting, a final closure decision will be made based on the considerations identified in this report, the results of additional data that are collected, and any additional considerations that arise during the public meeting. The final closure recommendation will be provided in a Final Closure Plan, which will be submitted to the Illinois Environmental Protection Agency (IEPA; the "Agency") as described under IAC Section 845.720(b) (IEPA, 2021a).

Table S.1 Comparison of Proposed Closure Scenarios

Evaluation Factor (Report Section; IAC Part 845 Section)	Closure Scenario	
	CIP	**CBR-Offsite**
Closure Alternative Descriptions (Section 2.1, IAC Section 845.710(c))	All CCR would be consolidated in the southern section of the Ash Pond and then capped in place with a new cover system consisting of, from bottom to top, a geomembrane layer, a geocomposite drainage layer, and 24 inches of vegetated soil.	All CCR would be excavated from the Ash Pond and transported to an off-Site landfill for disposal. Expansion of the off-Site landfill may be necessary in order to accept all of the CCR from the Ash Pond.
Type and Degree of Long-Term Management, Including Monitoring, Operation, and Maintenance (Section 2.2.3, IAC Section 845.710(b)(1)(C))	Monitoring would be performed for 30 years post-closure or until GWPSs are achieved, whichever is longer. Additionally, the final cover system for the Ash Pond would undergo 30 years of annual inspections, mowing, and maintenance.	Monitoring would be performed for 3 years post-closure or until GWPSs are achieved, whichever is longer.
Magnitude of Reduction of Existing Risks (Section 2.2.1, IAC Sections 845.710(b)(1)(A) and 845.710(b)(1)(F))	There are no current unacceptable risks to any human or ecological receptors associated with the Ash Pond. Because there are no current risks, and dissolved constituent concentrations would be expected to decline post-closure, no risks to human or ecological receptors would be expected post-closure.	There are no current unacceptable risks to any human or ecological receptors associated with the Ash Pond. Because there are no current risks, and dissolved constituent concentrations would be expected to decline post-closure, no risks to human or ecological receptors would be expected post-closure.
Likelihood of Future Releases of CCR (Section 2.2.2, IAC Sections 845.710(b)(1)(B) and 845.710(b)(1)(F))	During closure, there would be minimal risk of dike failure occurring at the Ash Pond (due to, *e.g.*, flooding or seismic activity) and minimal risk of dike overtopping during flood conditions. Post-closure, the risks of overtopping and dike failure would be even smaller than they are currently, due to the installation of a protective soil cover and new stormwater control structures. Dikes, final cover, and stormwater control features have been designed to withstand earthquakes and storm events.	During closure, there would be minimal risk of dike failure occurring at the Ash Pond (due to, *e.g.*, flooding or seismic activity) and minimal risk of dike overtopping during flood conditions. Following excavation, there would be no risk of CCR releases due to dike failure.
Worker Risks (Section 2.2.4.1, IAC Sections 845.710(b)(1)(D) and 845.710(b)(1)(F))	An estimated 0.011 worker fatalities and 1.7 worker injuries would be expected to occur due to on-Site activities under this closure scenario. An additional 0.0012 worker fatalities and 0.051 worker injuries would be expected to occur off-Site due to vehicle accidents during off-Site hauling. In total, a minimum of 0.012 worker fatalities and 1.8 worker injuries would be expected under this closure scenario. Overall, risks to workers would likely be somewhat higher under the CBR-Offsite scenario than under the CIP scenario.	An estimated 0.0051 worker fatalities and 0.79 worker injuries would be expected to occur due to on-Site activities under this closure scenario. An additional 0.039 worker fatalities and 1.7 worker injuries would be expected to occur off-Site due to vehicle accidents during off-Site hauling. In total, a minimum of 0.044 worker fatalities and 2.5 worker injuries would be expected under this closure scenario. Overall, risks to workers would likely be somewhat higher under the CBR-Offsite scenario than under the CIP scenario.
Community Risks (Section 2.2.4.2, IAC Sections 845.710(b)(1)(D) and 845.710(b)(1)(F))		
▪ *Off-Site Impacts on Nearby Residents and EJ Communities*	Off-Site impacts on nearby residents (including accidents, traffic, noise, and air pollution) would likely be less under this closure scenario than under the CBR-Offsite scenario, because it would require less off-Site hauling than the CBR-Offsite scenario. In total, an estimated 0.0053 fatalities and 0.15 injuries would be expected to occur among community members due to off-Site hauling under this scenario. With regard to traffic impacts, a haul truck would be likely to pass a location near the Site every 3.2 to 4.5 minutes on average during working hours for the duration of hauling activities under this scenario.	Off-Site impacts on nearby residents would likely be greater under the CBR-Offsite closure scenario than under the CIP scenario, because it would require more off-Site hauling than the CIP scenario. In total, an estimated 0.18 fatalities and 5.0 injuries would be expected to occur among community members due to off-Site hauling under this scenario. With regard to traffic impacts, a haul truck would be likely to pass a location near the Site every 1.0 to 1.3 minutes on average during working hours for the duration of hauling activities under this scenario. In addition, transport of CCR to the off-Site landfill may require hauling CCR through the EJ community near Peoria/Bartonville.
▪ *Impacts on Scenic, Historical, and Recreational Value*	Due to (*e.g.*) noise and visual disturbances, construction activities may have short-term negative impacts on the recreational use of the Illinois River. Because the expected duration of construction activities is shorter under the CIP scenario than under the CBR-Offsite scenario, short-term impacts on the scenic and recreational value of natural areas near the Site would be less under this closure scenario than under the CBR-Offsite scenario. There are no historical sites within 1,000 meters of the impoundment. No impacts on historical sites would therefore be expected under either closure scenario.	Due to (*e.g.*) noise and visual disturbances, construction activities may have short-term negative impacts on the recreational use of the Illinois River. Because the expected duration of construction activities is longer under the CBR-Offsite scenario than under the CIP scenario, short-term impacts on the scenic and recreational value of natural areas near the Site would be greater under the CBR-Offsite scenario than under the CIP scenario. There are no historical sites within 1,000 meters of the impoundment. No impacts on historical sites would therefore be expected under either closure scenario.
Environmental Risks (Section 2.2.4.3, IAC Sections 845.710(b)(1)(D) and 845.710(b)(1)(F))		

Evaluation Factor (Report Section; IAC Part 845 Section)	Closure Scenario	
	CIP	**CBR-Offsite**
▪ *Impacts on Greenhouse Gas Emissions and Energy Consumption*	Total energy demands and GHG emissions would be smaller under this closure scenario than under the CBR-Offsite scenario, because the CIP scenario would have a shorter duration of construction activities and require less CCR dewatering and handling. The CIP scenario would have an additional, unquantified carbon footprint due to the need to manufacture geomembranes for use in the final cover system. Construction of a utility-scale battery storage facility at the Edwards Power Plant Site would help the state meet its goal of decarbonizing electricity generation and would improve the overall reliability of the electricity grid. Re-development of the Site for battery storage would occur more rapidly under the CIP scenario than under the CBR-Offsite scenario.	Total energy demands and GHG emissions would be greater under this closure scenario than under the CIP scenario, because the CBR-Offsite scenario would have a longer duration of construction activities and require more CCR dewatering and handling. If expansion of the off-Site landfill became necessary in order to accept all of the CCR from the Ash Pond, then the CBR-Offsite scenario would have an additional, unquantified carbon footprint due to the need to manufacture geomembranes for use in the expanded landfill liner. Construction of a utility-scale battery storage facility at the Edwards Power Plant Site would help the state meet its goal of decarbonizing electricity generation and would improve the overall reliability of the electricity grid. Re-development of the Site for battery storage would occur more rapidly under the CIP scenario than under the CBR-Offsite scenario.
▪ *Impacts on Natural Resources and Habitat*	Construction activities may have short-term negative impacts on some species located in the vicinity of the Ash Pond, the off-Site borrow soil location, and the off-Site landfill. Short-term impacts on natural resources and habitat would be smaller under the CIP scenario than under the CBR-Offsite scenario, because the overall duration of construction is shorter under the former scenario.	Construction activities may have short-term negative impacts on some species located in the vicinity of the Ash Pond, the off-Site borrow soil location, and the off-Site landfill. Short-term impacts on natural resources and habitat would be greater under the CBR-Offsite scenario than under the CIP scenario, because the overall duration of construction is longer under the former scenario.
Time Until Groundwater Protection Standards Are Achieved (Section 2.2.5, IAC Sections 845.710(b)(1)(E) and 845.710(d)(2 and 3))	Groundwater modeling was performed to evaluate future groundwater quality in the vicinity of the Ash Pond under each of the proposed closure alternatives (Ramboll, 2022). The model-predicted timeframe to achieve the GWPSs for both the CIP and CBR scenarios is on the order of hundreds of years for both scenarios. The model predicts minimal and insignificant differences between the time for which GWPSs are achieved under the CIP scenario and the CBR scenario. Furthermore, the predicted maximum plume extents in excess of GWPSs for both CIP and CBR remain in close proximity to the Ash Pond while receding over time, indicating that both closure scenarios perform equivalently with regard to achieving the GWPSs (Ramboll, 2022).	Groundwater modeling was performed to evaluate future groundwater quality in the vicinity of the Ash Pond under each of the proposed closure alternatives (Ramboll, 2022). The model-predicted timeframe to achieve the GWPSs for both the CIP and CBR scenarios is on the order of hundreds of years for both scenarios. The model predicts minimal and insignificant differences between the time for which GWPSs are achieved under the CIP scenario and the CBR scenario. Furthermore, the predicted maximum plume extents in excess of GWPSs for both CIP and CBR remain in close proximity to the Ash Pond while receding over time, indicating that both closure scenarios perform equivalently with regard to achieving the GWPSs (Ramboll, 2022).
Long-Term Reliability of the Engineering and Institutional Controls (Section 2.2.7; IAC Section 845.710(b)(1)(G))	CIP would be expected to be a reliable closure alternative over the long term.	CBR-Offsite would be expected to be a reliable closure alternative over the long term.
Potential Need for Future Corrective Action (Section 2.2.8; IAC Section 845.710(b)(1)(H))	Corrective action is expected at the Site. Section 3 of this report (Corrective Measures Assessment) presents and evaluates the corrective measures being considered at the Site, consistent with the requirements in IAC Section 845.660.	Corrective action is expected at the Site. Section 3 of this report (Corrective Measures Assessment) presents and evaluates the corrective measures being considered at the Site, consistent with the requirements in IAC Section 845.660.
Effectiveness of the Alternative in Controlling Future Releases (Section 2.3; IAC Section 845.710(b)(2)(A and B))	There are no current or future risks to any human or ecological receptors associated with the Ash Pond. During closure, there would be minimal risk of dike failure occurring and minimal risk of dike overtopping during flood conditions. Post-closure, the risks of overtopping and dike failure would be even smaller than they are currently, due to the installation of a protective soil cover and new stormwater control structures. Dikes, final cover, and stormwater control features have been designed to withstand earthquakes and storm events.	There are no current or future risks to any human or ecological receptors associated with the Ash Pond. During closure, there would be minimal risk of dike failure occurring and minimal risk of dike overtopping during flood conditions. Following excavation, there would be no risk of CCR releases due to dike failure.
Ease or Difficulty of Implementing the Alternative (Section 2.4, IAC Section 845.710(b)(3))		

Evaluation Factor (Report Section; IAC Part 845 Section)	Closure Scenario	
	CIP	**CBR-Offsite**
▪ *Degree of Difficulty Associated with Construction*	CIP is a reliable and standard method for managing and closing waste impoundments. Dewatering saturated CCR to construct a stabilized final cover system subgrade may present challenges during closure; however, these challenges are common to most CCR surface impoundment closures and are commonly addressed *via* surface water management and dewatering techniques.	Hauling will be more difficult to implement under the CBR-Offsite scenario than under the CIP scenario, due to significantly larger earthwork volumes and more haul traffic on public roadways required under this scenario. Off-Site hauling under the CIP scenario would entail the transport of approximately 1,030,000 CY of soil and would not require the transportation of any CCR over public roadways; off-Site hauling under the CBR-Offsite scenario, in contrast, would entail the transport of approximately 900,000 CY of soil and 4,390,000 CY of CCR over public roadways. As described in Section 2.2.4.2 (Community Impacts), off-Site hauling may also have detrimental impacts due to an increased incidence of vehicle accidents, traffic-related impacts, noise, and air pollution. Off-Site landfilling under the CBR-Offsite scenario would require the development of a disposal plan and could raise issues related to the co-disposal of CCR and other non-hazardous wastes. The off-Site landfill may also need to be expanded to receive all of the CCR generated during excavation.
▪ *Expected Operational Reliability*	Operational reliability would be expected under both closure scenarios.	Operational reliability would be expected under both closure scenarios.
▪ *Need for Permits and Approvals*	Permits required under both closure scenarios would include a modification to the existing NPDES permit; a construction permit from the IDNR Dam Safety Program to allow the embankment and spillways of the Ash Pond to be modified as part of closure; a construction stormwater permit through IEPA; and a joint water pollution control construction and operating permit (WPC permit).	Permits required under both closure scenarios would include a modification to the existing NPDES permit; a construction permit from the IDNR Dam Safety Program to allow the embankment and spillways of the Ash Pond to be modified as part of closure; a construction stormwater permit through IEPA; and a WPC permit. Additional permits and approvals may be required under this scenario if the off-Site landfill must be expanded to receive all of the CCR from the Ash Pond.
▪ *Availability of Equipment and Specialists*	CIP and CBR rely on common construction equipment and materials and typically do not require the use of specialists. However, global supply chains have been disrupted due to the COVID-19 pandemic, resulting in shortages in the availability of construction equipment and parts. There may be delays in construction under both scenarios if supply chain resilience does not improve by the time of construction. Due to smaller earthwork volumes and a lesser need for construction equipment under the CIP scenario than under the CBR-Offsite scenario, shortages may cause fewer challenges under the CIP scenario than under the CBR-Offsite scenario.	CIP and CBR rely on common construction equipment and materials and typically do not require the use of specialists. However, global supply chains have been disrupted due to the COVID-19 pandemic, resulting in shortages in the availability of construction equipment and parts. There may be delays in construction under both scenarios if supply chain resilience does not improve by the time of construction. Due to higher earthwork volumes and a greater need for construction equipment under the CBR-Offsite scenario than under the CIP scenario, shortages may cause greater challenges under the CBR-Offsite scenario than under the CIP scenario. The current shortage of truck drivers may be particularly impactful under the CBR-Offsite scenario, due to the large volumes of material to be hauled to and from the Site.
▪ *Available Capacity and Location of Treatment, Storage, and Disposal Services*	Under the CIP scenario, all of the CCR currently within the Ash Pond would be stored within the existing footprint of the impoundment. Treatment would consist of unwatering and dewatering the Ash Pond at the start of construction and managing stormwater inflow. Water from unwatering and dewatering of the Ash Pond would be discharged in accordance with the NPDES permit for the facility.	The capacity remaining at the preferred off-Site landfill (Indian Creek Landfill #2 in Hopedale, Illinois) would be sufficient to receive all of the CCR in the Ash Pond. However, due to the relatively short period over which CCR would be received at the landfill, vertical and/or lateral expansions may become necessary. Additionally, the landfill operators may need to develop a disposal plan to account for the increased volume of material that would be received and the unique CCR waste characteristics. If expansion of the chosen off-Site landfill were found to be impractical or infeasible, then an alternative landfill located farther from the Site would need to be identified. Likely alternatives to the Indian Creek Landfill #2 include the Envirofil of Illinois Inc. Landfill in Macomb, Illinois, and the Clinton Landfill #3 in Clinton, Illinois. Water from unwatering and dewatering of the Ash Pond would be discharged in accordance with the NPDES permit for the facility.
Impact of Alternative on Waters of the State (Section 2.5, IAC Section 845.710(d)(4))	No current or future exceedances of any screening benchmarks for surface water would be expected under either closure scenario.	No current or future exceedances of any screening benchmarks for surface water would be expected under either closure scenario.
Potential Modes of Transportation Associated with CBR (Section 2.1; IAC Section 845.710(c)(1)	This factor is not relevant for CIP.	IAC Section 845.710(c)(1) requires CBR alternatives to consider multiple methods for transporting CCR off-Site, including rail, barge, and trucks. IngenAE evaluated the feasibility of transporting CCR to the off-Site landfill *via* rail or barge and found that neither option is likely to be viable at this Site. Truck transport has been identified as the preferred option for transport of CCR to the off-Site landfill. The local availability and use of natural gas-powered trucks, or other low-polluting trucks, will be evaluated prior to the start of construction.

Evaluation Factor (Report Section; IAC Part 845 Section)	Closure Scenario	
	CIP	**CBR-Offsite**
Concerns of Residents Associated with Alternatives (Section 2.6, IAC Section 845.710(b)(4))	Despite the preference for CBR that has been expressed by nonprofits representing community interests near the Site, CIP would effectively address residents' concerns regarding potential impacts to groundwater and surface water quality at the Site. Relative to CBR-Offsite, CIP also presents less risks to nearby residents and potentially EJ communities in the form of accidents, traffic-related impacts, noise, and air pollution. Moreover, under the CIP scenario, the Site could be more rapidly re-developed for use in utility-scale battery energy storage.	Nonprofits representing community interests near the Site have expressed a preference for CBR over CIP. However, the CBR-Offsite scenario has several disadvantages with regard to potential community concerns. Relative to CIP, the CBR-Offsite scenario presents greater risks to nearby residents and potentially EJ communities in the form of accidents, traffic-related impacts, noise, and air pollution. Moreover, under the CBR-Offsite scenario, the Site could take longer to re-develop for use in utility-scale battery energy storage.
Class 4 Cost Estimate (Section 2.7, IAC Section 845.710(d)(1))	A Class 4 cost estimate will be prepared in the Final Closure Plan consistent with AACE classification standards.	A Class 4 cost estimate will be prepared in the Final Closure Plan consistent with AACE classification standards.

Notes:
AACE = Association for the Advancement of Cost Engineering; CBR-Offsite = Closure-by-Removal with Off-Site CCR Disposal; CCR = Coal Combustion Residual; CIP = Closure-in-Place; CY = Cubic Yards; EJ = Environmental Justice; GHG = Greenhouse Gas; GWPS = Groundwater Protection Standard; IAC = Illinois Administrative Code; IDNR = Illinois Department of Natural Resources; IEPA = Illinois Environmental Protection Agency; NPDES = National Pollutant Discharge Elimination System; WPC permit = Water Pollution Control Construction and Operating Permit.

Corrective Measures Assessment

The goal of performing a CMA is to holistically evaluate proposed corrective measures designed to remediate groundwater and achieve compliance with the groundwater protection standards (GWPSs) specified under IAC Section 845.600 (IEPA, 2021a). A CMA provides a screening-level analysis of potential corrective measures based on a wide range of factors, including their performance, reliability, ease of implementation, and potential impacts on human health and the environment (IEPA, 2021a). This analysis determines which corrective measures are potentially viable at a site and should be evaluated further in a Corrective Action Alternatives Analysis (CAAA). The CAAA for a given site must be submitted to the Agency within 1 year of submission of the CMA.

Many CCR sites are complex groundwater environments where remedial actions will inherently take many years to complete. While no formal definition of a complex groundwater environment exists, most would agree that there are a number of common characteristics at complex groundwater sites, including the following (National Research Council, 2013):

- Highly heterogeneous subsurface environments;
- Large source zones;
- Multiple, recalcitrant constituents; and
- Long timeframes over which releases occurred.

Each of these characteristics is common at CCR sites. Surface impoundments are often tens to hundreds of acres in size and many have operated for decades, leading to large source zones and prolonged releases. Furthermore, CCR impoundments are often located in alluvial geologic settings where sands are interbedded with silts and clays. This results in a heterogeneous environment where constituent mass may persist for many years in low-permeability deposits. Finally, the constituents that are most common at CCR sites include metals and inorganics that do not naturally biodegrade. The combination of these factors results in a complex groundwater environment where remediation, even under the best of circumstances, may take many years to achieve GWPSs. It is for these reasons that United States Environmental Protection Agency (US EPA) refused to specify what is a reasonable *vs.* an unreasonable timeframe for groundwater corrective actions at CCR sites, stating that "EPA was truly unable to establish an outer limit on the necessary timeframes—including even a presumptive outer bound" (US EPA, 2015a, p. 21419).

It is also important to note that source control, which at a CCR impoundment could include either capping or excavation, is generally considered to be one of the more effective remedial action approaches. Source control involves removing the hydraulic head from an impoundment (*i.e.*, unwatering and dewatering) in order to prevent the further downward migration of constituents. US EPA has found that "releases from surface impoundments [to groundwater] drop dramatically after closure" (US EPA, 2014a, pp. 5-18 to 5-19). As a result, the implementation of source control often has a more substantial and more immediate effect on groundwater quality improvements than other groundwater corrective measures. In this CMA, source control is paired with other additional groundwater remediation strategies.

Five potential corrective measures were selected for consideration in this CMA. Each corrective measure includes source control based on the CIP scenario (*i.e.*, Closure-in-Place with consolidation). Corrective measures considered in this CMA include Source Control with Monitored Natural Attenuation (Source Control-MNA), Source Control with Groundwater Extraction (Source Control-GE), Source Control with Construction of an Interceptor Trench (Source Control-IT), Source Control with Construction of a Cutoff Wall (Source Control-CW), and Source Control with Construction of a Permeable Reactive Barrier

(Source Control-PRB). Each of these corrective measures was evaluated in the CMA for its potential viability at the Site. Under the Source Control-MNA alternative, groundwater concentrations of dissolved constituents would attenuate *via* naturally occurring physical and chemical processes in areas downgradient of the Ash Pond; active monitoring would be performed to verify and document the remediation processes. Under the Source Control-GE alternative, a GE system comprised of groundwater pumping wells would be installed on-Site in order to extract potentially impacted groundwater from the aquifer, helping to contain the contaminant plume and prevent the lateral migration of constituents off-Site. Under the Source Control-IT alternative, an interceptor trench would be constructed on-Site in order to extract potentially impacted groundwater from the aquifer, helping to contain the contaminant plume and prevent the lateral migration of constituents off-Site. Under the Source Control-CW alternative, a trench would be installed on-Site and then filled with a soil-bentonite mixture, creating a low-permeability subsurface barrier to the lateral migration of constituents. Under the Source Control-PRB alternative, a subsurface barrier of reactive materials (*e.g.*, zerovalent iron) would be placed in the path of groundwater flow downgradient of the Ash Pond in order to promote the *in situ* transformation and/or immobilization of CCR-associated constituents.

Table S.2 evaluates the corrective measures included in this CMA with regard to each of the factors specified under IAC Section 845.660(c) (IEPA, 2021a). Boron, sulfate, and total dissolved solids (TDS) have been identified as potential constituents of concern at the site; consequently, groundwater corrective measures focus on these constituents. Based on this evaluation and the details provided in Section 3 of this report, four corrective measures have been identified as potentially viable technologies for further consideration in the CAAA pursuant to IAC Section 845.670: Source Control-MNA, Source Control-GE, Source Control-IT, and Source Control-CW. These technologies may be combined in different manners to potentially address different zones of groundwater impacts (*i.e.*, near-field *vs*. far-field) and different constituents. For example, MNA combined with one of the other remedies may be a more optimal approach than relying on just a single remedial technology. The fifth corrective measure evaluated in this CMA, Source Control-PRB, is not being retained for further evaluation in the CAAA because PRBs have not been proven effective for boron in groundwater, construction of the PRB would likely be difficult due to its required length and depth, and a PRB would have relatively large impacts on worker safety, air quality, and potentially surface water quality and sediment quality due to the substantial construction activities required.

Table S.2 Comparison of Proposed Corrective Measure Alternatives

Evaluation Factor (Report Section; Part 845 Section)	**Corrective Measure Alternative**				
	Source Control-MNA	**Source Control-GE**	**Source Control-IT**	**Source Control-CW**	**Source Control-PRB**
Corrective Measure Alternative Descriptions (Section 3.1)	Source Control-MNA would rely on naturally occurring physical and chemical processes to immobilize and attenuate concentrations of CCR-associated constituents in groundwater downgradient of the Ash Pond. Active groundwater monitoring would be performed to ensure that the remedy was working as intended.	Under Source Control-GE, groundwater pumping wells would be installed on-Site to extract potentially impacted groundwater and prevent the lateral migration of constituents off-Site. Groundwater captured by the GE system would be treated, if necessary, and discharged to the Illinois River *via* an existing NPDES-permitted outfall. Monitoring would be performed to ensure that the remedy was working as intended.	Under Source Control-IT, an interceptor trench would be installed on-Site to collect potentially impacted groundwater and prevent the lateral migration of constituents off-Site. Groundwater captured by the IT would be treated, if necessary, and discharged to the Illinois River *via* an existing NPDES-permitted outfall. Monitoring would be performed to ensure that the remedy was working as intended.	Under Source Control-CW, a trench would be constructed on-Site and then filled with a soil-bentonite mixture, creating a low-permeability subsurface barrier that would prevent the lateral migration of constituents. Hydraulic control wells would likely be required to prevent groundwater mounding from occurring behind the CW. Groundwater captured by the hydraulic control wells would be treated, if necessary, and discharged to the Illinois River *via* an existing NPDES-permitted outfall. Monitoring would be performed to ensure that the remedy was working as intended.	Under Source Control-PRB, a subsurface barrier of reactive materials would be placed in the path of groundwater flow in order to promote the *in situ* transformation and/or immobilization of CCR-associated constituents. Monitoring would be performed to ensure that the remedy was working as intended.
Performance – Controlling the Source (Section 3.2.1; IAC Section 845.660(c)(1))	As a result of closure, all of the alternatives would be equally protective with regard to primary source control. Under the Source Control-MNA alternative, the attenuation of dissolved constituent concentrations in the subsurface (secondary source control) would be achieved through natural processes. A detailed assessment of the performance of MNA as a potential groundwater remediation technology, relative to the specific groundwater constituents of concern for the Site, will be included in the CAAA.	As a result of closure, all of the alternatives would be equally protective with regard to primary source control. Source Control-GE would also likely be effective with regard to secondary source control, although GE system performance can vary from site to site.	As a result of closure, all of the alternatives would be equally protective with regard to primary source control. Source Control-IT would also likely be effective with regard to secondary source control, although IT performance can vary from site to site.	As a result of closure, all of the alternatives would be equally protective with regard to primary source control. Source Control-CW would also likely be effective with regard to secondary source control, if the hydraulic control system were designed and operated appropriately.	As a result of closure, all of the alternatives would be equally protective with regard to primary source control. Source Control-PRB would likely be effective with regard to secondary source control for some constituents. However, Source-Control PRB is unlikely to be an effective technology for boron.
Performance – Likelihood of Future Releases of CCR (Section 3.2.2; IAC Section 845.660(c)(1))	There would be minimal likelihood of CCR releases occurring under any of the corrective measure alternatives.	There would be minimal likelihood of CCR releases occurring under any of the corrective measure alternatives.	There would be minimal likelihood of CCR releases occurring under any of the corrective measure alternatives.	There would be minimal likelihood of CCR releases occurring under any of the corrective measure alternatives.	There would be minimal likelihood of CCR releases occurring under any of the corrective measure alternatives.
Performance – Long-Term Management (Section 3.2.3; IAC Section 845.660(c)(1))	Minimal long-term O&M efforts would be required under Source Control-MNA, because it would not require the installation, operation, or maintenance of any engineered systems or structures other than monitoring wells. Groundwater sampling would continue until GWPSs had been achieved.	Long-term O&M efforts required under Source Control-GE would include the monitoring and maintenance of the GE system and the management and discharge of extracted groundwater. Fouling and scaling of the well screens could reduce the efficiency of the GE system over time and potentially create a need for the replacement of individual wells. Treatment of extracted water may be required prior to discharge. Groundwater sampling would continue until GWPSs had been achieved.	Long-term O&M efforts required under Source Control-IT would include the monitoring and maintenance of the IT and the management and discharge of intercepted groundwater. Treatment of extracted water may be required prior to discharge. Groundwater sampling would continue until GWPSs had been achieved.	Long-term O&M efforts required under Source Control-CW would include the monitoring and maintenance of the CW and hydraulic gradient control system and the management and discharge of extracted groundwater. Fouling and scaling of the well screens could reduce the efficiency of the hydraulic gradient control system over time and potentially create a need for the replacement of individual wells. Treatment of extracted water may be required prior to discharge. Groundwater sampling would continue until GWPSs had been achieved.	Long-term O&M efforts required under Source Control-PRB would include the monitoring and maintenance of the PRB. Groundwater sampling would continue until GWPSs had been achieved. The PRB would also be monitored for treatment efficacy. If necessary, the PRB media may be amended or exchanged to extend the life of the PRB.

Evaluation Factor (Report Section; Part 845 Section)	Corrective Measure Alternative				
	Source Control-MNA	**Source Control-GE**	**Source Control-IT**	**Source Control-CW**	**Source Control-PRB**
Reliability - Engineering and Institutional Controls (Section 3.2.4; IAC Section 845.660(c)(1))	A detailed assessment of the performance of MNA as a potential groundwater remediation technology, relative to the specific groundwater constituents of concern for the Site, will be included in the CAAA. Long-term reliability would be expected for Source Control-MNA, as long as this demonstration determines that the technology is effective for site-related constituents.	Long-term reliability would be expected for Source Control-GE, as long as the system was designed and constructed for Site-specific conditions.	Long-term reliability would be expected for Source Control-IT, as long as the system was designed and constructed for Site-specific conditions.	Long-term reliability would be expected for Source Control-CW, as long as the system was designed and constructed for Site-specific conditions.	Source Control-PRB may not be reliable over the long term with respect to engineering and institutional controls, because PRBs generally have limited success at treating boron in groundwater. The effectiveness of the PRB would also decrease over time, resulting in a potential need for the eventual replacement of the remedy.
Reliability - Potential Need for Replacement of the Corrective Measure (Section 3.2.5; IAC Section 845.660(c)(1))	A detailed assessment of the performance of MNA as a potential groundwater remediation technology, relative to the specific groundwater constituents of concern for the Site, will be included in the CAAA. Potential replacement of the remedy would be unlikely for Source Control-MNA, as long as this demonstration determines that the technology is effective for site-related constituents.	Unless groundwater flow conditions changed significantly at the Site, replacement of the entire remedy would be unlikely under Source Control-GE. However, it may be necessary to replace individual wells and/or pumps over time, because fouling and scaling could occur and because groundwater hydraulic controls would need to be maintained on a long-term basis.	Unless groundwater flow conditions changed significantly at the Site, replacement of the entire remedy would be unlikely under Source Control-IT.	Unless groundwater flow conditions changed significantly at the Site, replacement of the entire remedy would be unlikely under Source Control-CW. Replacement of individual hydraulic control wells may be necessary, because fouling and scaling could occur and because groundwater hydraulic controls would need to be maintained on a long-term basis.	Given the low effectiveness of PRBs for treating boron in groundwater, replacement of the Source Control-PRB remedy would likely be necessary. Replacement of the remedy would also be necessary if the effectiveness of the PRB declined over time.
Ease of Implementation (Section 3.2.6; IAC Section 845.660(c)(1))	Construction under Source Control-MNA would be limited to the installation of monitoring wells. Source Control-MNA therefore would not pose any significant construction challenges.	Construction under Source Control-GE would be limited to the installation of extraction wells and monitoring wells. Additional testing would be required to estimate the number, spacing, screened intervals, and extraction rates of the GE system wells for the effective capture of impacted groundwater.	Construction under Source Control-IT would be limited to the installation of trenches and monitoring wells. Additional testing would be required to determine the optimal location and depth of the IT system.	Construction of the CW under Source Control-CW may be relatively difficult, due to the required length and depth of the CW.	Construction of the PRB under Source Control-PRB may be relatively difficult, due to the required length and depth of the PRB.
Potential Impacts – Risks to the Community or the Environment During Implementation of Remedy (Section 3.2.7; IAC Section 845.660(c)(1))	Minimal impacts to worker safety, air quality, and surface water and sediment quality would be expected under Source Control-MNA, due to the minimal nature of the construction activities required under this alternative.	Modest impacts to worker safety, air quality, and potentially surface water and sediment quality would be expected under Source Control-GE, due to the modest construction activities required for the installation of the GE system.	Relatively large impacts to worker safety, air quality, and potentially surface water and sediment quality could occur under Source Control-IT, due to the substantial construction activities that may be required for the installation of the IT.	Relatively large impacts to worker safety, air quality, and potentially surface water and sediment quality could occur under Source Control-CW, due to the substantial construction activities that may be required for the installation of the CW.	Relatively large impacts to worker safety, air quality, and potentially surface water and sediment quality could occur under Source Control-PRB, due to the substantial construction activities that may be required for the installation of the PRB.
The Time Required to Begin and Complete the Corrective Action Plan (Section 3.3; IAC Section 845.660(c)(2))	A Corrective Action Plan must be submitted to the Agency within 1 year of the submission of a CMA. We do not anticipate that any delays will occur in the completion of a Corrective Action Plan for this Site.	A Corrective Action Plan must be submitted to the Agency within 1 year of the submission of a CMA. We do not anticipate that any delays will occur in the completion of a Corrective Action Plan for this Site.	A Corrective Action Plan must be submitted to the Agency within 1 year of the submission of a CMA. We do not anticipate that any delays will occur in the completion of a Corrective Action Plan for this Site.	A Corrective Action Plan must be submitted to the Agency within 1 year of the submission of a CMA. We do not anticipate that any delays will occur in the completion of a Corrective Action Plan for this Site.	A Corrective Action Plan must be submitted to the Agency within 1 year of the submission of a CMA. We do not anticipate that any delays will occur in the completion of a Corrective Action Plan for this Site.

Evaluation Factor (Report Section; Part 845 Section)	Corrective Measure Alternative				
	Source Control-MNA	**Source Control-GE**	**Source Control-IT**	**Source Control-CW**	**Source Control-PRB**
State or Local Permit Requirements or Other Environmental or Public Health Requirements that May Substantially Affect Implementation of the Corrective Action Plan (Section 3.4; IAC Section 845.660(c)(3))	Source Control-MNA would require regulatory approval prior to implementation. The approval process would not be expected to substantially affect the implementation of the Corrective Action Plan.	Source Control-GE would require regulatory approval prior to implementation, and may require modifications to the Site's NPDES permit. The approval process and, if needed, NPDES permit modification would not be expected to substantially affect the implementation of the Corrective Action Plan.	Source Control-IT would require regulatory approval prior to implementation, and may require modifications to the Site's NPDES permit. The approval process and, if needed, NPDES permit modification would not be expected to substantially affect the implementation of the Corrective Action Plan.	Source Control-CW would require regulatory approval prior to implementation, and may require modifications to the Site's NPDES permit. The approval process and, if needed, NPDES permit modification would not be expected to substantially affect the implementation of the Corrective Action Plan.	Source Control-PRB would require regulatory approval prior to implementation. The approval process would not be expected to substantially affect the implementation of the Corrective Action Plan.

Notes:
Agency = Illinois Environmental Protection Agency; CCR = Coal Combustion Residual; CMA = Corrective Measures Assessment; CW = Cutoff Wall; GWPS = Groundwater Protection Standard; IAC = Illinois Administrative Code; NPDES = National Pollutant Discharge Elimination System; O&M = Operations and Maintenance; Source Control-CW = Source Control with Construction of a Cutoff Wall; Source Control-GE = Source Control with Groundwater Extraction; Source Control-IT = Source Control with Construction of an Interceptor Trench; Source Control-MNA = Source Control with Monitored Natural Attenuation; Source Control-PRB = Source Control with Construction of a Permeable Reactive Barrier.

1 Introduction

1.1 Site Description and History

1.1.1 Site Location and History

Illinois Power Resources Generating, LLC's (IPRG) Edwards Power Plant is an electric power generating facility with coal-fired units located along the Illinois River between Mapleton and Bartonville in Peoria County, Illinois (Ramboll, 2021). The facility began operating in 1960 and will be retired in 2022 (Ramboll, 2021; Vistra, 2021).

1.1.2 CCR Impoundment

The Edwards Power Plant produces and stores coal combustion residuals (CCRs) as a part of its operations. The Edwards Ash Pond (the "Ash Pond") (Vistra identification number [ID No.] CCR Unit 301, Illinois Environmental Protection Agency [IEPA] ID No. W1438050005-01, and National Inventory of Dams [NID] ID No. IL50710), which is the only CCR-containing impoundment at this Site, is the subject of this report.

The Ash Pond (Figure 1.1) is an approximately 91-acre unlined surface impoundment constructed in 1960 for the management of sluiced bottom ash, fly ash, and other non-CCR wastes generated historically by the facility (AECOM, 2016a; Ramboll, 2021). The Ash Pond has been in continuous operation since 1960 (Ramboll, 2021). After the Edwards Power Plant is retired in 2022, the Ash Pond will no longer receive sluiced ash.

There are three sub-basins within the Ash Pond: the Process Water Pond (the "North Cell"), the Fly Ash Pond, and the Clarification Pond (the "South Cell"; AECOM, 2016a; Figure 1.1). CCR and other waste streams from the facility are sluiced into the Process Water Pond and the Fly Ash Pond. Serpentine channels located within the Fly Ash Pond settle out the majority of the CCR prior to discharging decanted water into the Clarification Pond, which serves as the settling basin for the unit. The Clarification Pond discharges to the Illinois River *via* a National Pollutant Discharge Elimination System (NPDES)-permitted outfall (AECOM, 2016a; Ramboll, 2021).

In 2004, a rail loop was constructed immediately south of the Clarification Pond. The embankments for the rail loop were constructed with ash, as a permissible beneficial use. The footprint of the Ash Pond was reduced at that time, and the CCR material located south of the rail loop was capped with soil (AECOM, 2016a). The CCR used in the construction of the rail loop embankments is considered in the closure evaluations presented in this Closure Alternatives Analysis (CAA).

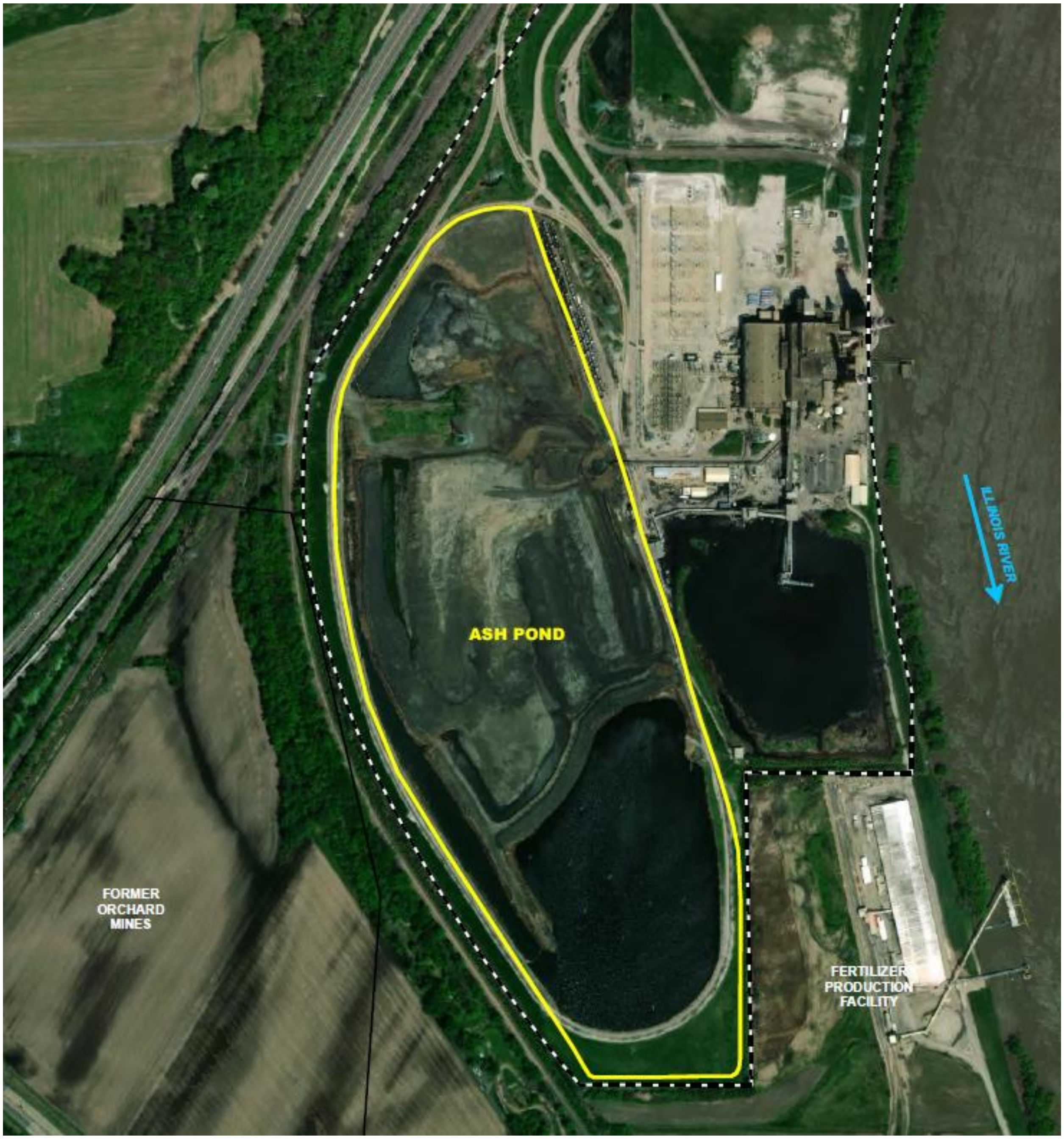

Figure 1.1 Site Location Map. Ramboll (2021).

1.1.3 Surface Water Hydrology

The Clarification Pond associated with the Ash Pond (Figure 1.1) discharges decanted water to the Illinois River *via* a NPDES-permitted outfall. The Illinois River is located more than 800 feet east of the outer perimeter of the Ash Pond within the Pekin Lake-Illinois River subwatershed (Hydrologic Unit Code [HUC] 071300030304; Ramboll, 2021). The segment of the Illinois River adjacent to the Site (Section IL_D-05) is listed on the 2018 Illinois Section 303(d) List as being impaired for fish consumption due to mercury and polychlorinated biphenyls (IEPA, 2016, 2019a). Two lakes, Pekin Lake and Worley Lake, are located approximately 0.5 miles east of the Ash Pond on the opposite side of the Illinois River (Ramboll, 2021).

1.1.4 Hydrogeology

The geology underlying the Site in the vicinity of the Ash Pond primarily consists of unlithified deposits of the Cahokia Formation underlain by a thick shale bedrock (Ramboll, 2021). The uppermost aquifer (UA) has been identified as the Lower Cahokia Formation (LCF) and saturated portions of the Upper Cahokia Formation (UCF) (Ramboll, 2021). The underlying shale has been identified as a bedrock confining unit (BCU) (Ramboll, 2021).

The UCF consists of low-permeability clays and silts, as well as discontinuous lenses of sand, sandy clay to clayey sand, and sandy silt. The saturated and unconfined sandy lenses within the UCF have been identified as Potential Migration Pathways. The thickness of the UCF ranges between 5 and 40 feet in the vicinity of the Ash Pond (Ramboll, 2021). The LCF consists of coarse materials of sand and gravel directly overlying the bedrock. The UA includes the LCF and, where saturated, portions of the UCF (Ramboll, 2021). The UA is primarily composed of moderately permeable sands and clayey gravels (Ramboll, 2021). The bottom of the UA (*i.e.*, LCF) overlies the shale BCU. This confining layer consists of very low-permeability shales and siltstones with interbedded sandstone.

The alluvial soils of the UA are limited to areas immediately adjacent to and underlying the Illinois River and are located in a north-south orientation parallel to the river (Ramboll, 2022). In the area immediately underlying the Ash Pond, a thick layer of low-permeability clays associated with the UCF has been observed (Ramboll, 2021). This clay layer restricts the migration of groundwater from the saturated deposits underlying the Ash Pond into the surrounding areas. West of the Ash Pond, the elevation of the ground surface increases, and correspondingly, the elevation of the shale BCU increases. Based on regional information, alluvial soils are not expected to occur in the areas west of the US Highway 24 (Ramboll, 2022).

Groundwater flow within the UA occurs in both a northward and southward direction along the orientation of the UA, parallel to the river. The Illinois River recharges groundwater (*i.e.*, surface water flows into groundwater) throughout much of the area surrounding the Edwards Power Plant Site. Due to the hydraulic influence of the Ash Pond, a groundwater mound (*i.e.*, piezometric maximum) is located underneath the Ash Pond. This mound facilitates groundwater flow in both a northward and southward direction. Moreover, the groundwater mound associated with the Ash Pond may have resulted in a localized area in which groundwater flows easterly, into the Illinois River. This easterly groundwater flow component and potential groundwater interaction with surface water in the Illinois River is expected to be eliminated after pond closure, when the hydraulic head in the Ash Pond is removed. Because the shale BCU is elevated in the areas west of the Ash Pond and alluvial soils are also not expected to occur west of the Ash Pond past US Highway 24, there is only a limited groundwater flow component from areas underlying the Ash Pond toward the west.

During groundwater interaction with surface water, CCR-related constituents may partition between sediments and the surface water column. It should be noted that many CCR-related constituents occur naturally in sediments and surface water (and can also arise from other industrial sources). As a result, their presence in the sediments and/or surface water of the Illinois River does not necessarily signify contributions from the Ash Pond.

The "Hydrogeologic Site Characterization Report" prepared by Ramboll as part of the operating permit for the Ash Pond includes an evaluation of groundwater data collected from Ash Pond monitoring wells between 2015 and 2021 (Ramboll, 2021).

1.1.5 Site Vicinity

The Edwards Power Plant Site is bordered by a salt processing facility to the north, a railroad right-of-way and Highway 42 to the west, agricultural fields to the south, and the Illinois River and a fertilizer production facility to the east (Ramboll, 2021; Figure 1.1). Coal mining operations occurred in the vicinity of the Site from 1890 until 1940. The mine located closest to the Ash Pond was the Orchard Mine (Mine ID #828), which operated from 1890 until 1909 and extended laterally (within uncertainty bounds) to the western edge of the Ash Pond. The Petri Mine (Mine ID #6673) operated from 1919 until 1933 and was located approximately 0.1 miles northwest of the Ash Pond. The Hollis Mine (Mine ID #3021) operated from 1933 until 1940 and was located approximately 0.6 miles north of the Ash Pond (Ramboll, 2021).

Although the area surrounding the Site is predominantly agricultural and industrial, there are a few scenic and recreational areas located within a few miles of the Site. These include the Illinois River, Worley Lake, the Pekin Lake State Fish and Wildlife Area (Pekin Lake SFWA), and the Powerton Lake State Fish and Wildlife Area (Powerton Lake SFWA). Pekin Lake SFWA is located east of the Site on the opposite bank of the Illinois River. Powerton Lake SFWA is located approximately 3 miles downstream of the Site on the opposite bank of the Illinois River. Based on a review of the Illinois Department of Natural Resources (IDNR) Historic Preservation Division database and the Illinois State Archaeological Survey database, there are no historic sites located within 1,000 meters of the Ash Pond (Ramboll, 2021).

1.2 IAC Part 845 Regulatory Review and Requirements

Title 35, Part 845 of the Illinois Administrative Code (IAC; IEPA, 2021a) requires the development of a CAA prior to undertaking closure activities at certain CCR-containing surface impoundments in the State of Illinois. Part 845 additionally requires that a Corrective Measures Assessment (CMA) be performed prior to undertaking any corrective measures at certain CCR-containing impoundments. Section 2 of this report presents a CAA for the Ash Pond pursuant to requirements under IAC Section 845.710. Section 3 presents a CMA for the Ash Pond pursuant to requirements under IAC Section 845.660. The goal of a CAA is to holistically evaluate each potential closure scenario with respect to a wide range of factors, including the efficiency, reliability, and ease of implementation of the closure scenario; each scenario's potential positive and negative short- and long-term impacts on human health and the environment; and each scenario's ability to address concerns raised by residents (IEPA, 2021a). The CMA similarly evaluates a range of factors for the various corrective measures being considered at an impoundment. A CAA and CMA are decision-making tools that are designed to aid in the selection of a closure alternative for the impoundment(s) at a site.

2 Closure Alternatives Analysis

2.1 Closure Alternative Descriptions (IAC Section 845.710(c))

This section of the report presents a CAA for the Edwards Ash Pond pursuant to requirements under IAC Section 845.710 (IEPA, 2021a). The two closure scenarios evaluated in this CAA are Closure-in-Place (CIP) with consolidation and Closure-by-Removal with Off-Site CCR Disposal (CBR-Off-Site). Under the CIP scenario, the CCR in the northwestern portion of the Ash Pond would be relocated to the southern portion of the Ash Pond and then capped with a new cover system. Under the CBR-Offsite scenario, all of the CCR would be excavated from the impoundment and hauled to an off-Site landfill for disposal. IPRG will also continue to evaluate potential opportunities for beneficial re-use of CCR excavated from the Ash Pond as an alternative to disposal.

IAC Section 845.710(c)(2) requires CAAs to "[i]dentify whether the facility has an onsite landfill with remaining capacity that can legally accept CCR, and, if not, whether constructing an onsite landfill is possible" (IEPA, 2021a). There is no existing on-Site landfill at the Edwards Power Plant Site, and the property is too small to accommodate the construction of a new on-Site landfill. Moreover, the owned property outside of the Ash Pond and the Edwards Power Plant lies within the 100-year flood zone for the Illinois River. For these reasons, neither expansion of an existing on-Site landfill nor construction of a new on-Site landfill is a viable alternative at this Site (Attachment B).

Sections 2.1.1 and 2.1.2 provide detailed descriptions of the CIP and CBR-Offsite closure scenarios. These scenarios are based on closure documents and analyses provided to Gradient by IngenAE, which are attached to this report as Attachment B.

2.1.1 Closure-in-Place

Under the CIP scenario, the CCR in the Ash Pond would be consolidated in the southern section of the Ash Pond and then capped with a final cover system. This scenario includes the following work elements (IngenAE LLC, 2022):

- Unwatering and dewatering to remove liquid wastes from the Ash Pond *via* pumping and the construction of dewatering ditches and sumps. Water would be managed in accordance with the NPDES permit for the facility.
- Relocation of CCR from the northwestern portion of the impoundment to an approximately 69-acre area in the southern portion of the impoundment. The relocated CCR would be used to attain design grades in these areas of the impoundment. All CCR and up to one foot of underlying soils would be removed from the designated CCR removal area.
- Construction of an earthen berm, which would divide the designated CCR removal area from the final closure area in the southern section of the impoundment.
- Removal of the rail loop located on the perimeter berm of the Ash Pond, followed by the removal of the ballast and embankment materials underlying the rail loop and the removal of structures located within the impoundment (*e.g.*, culverts, a spillway structure, an outfall pipe, and a sewer

force main). Any CCR-containing embankment material excavated from beneath the rail loop during this phase of closure would be relocated to the final closure area.

- Contouring and grading of the northwestern portion to manage stormwater.
- Construction of an alternative cover system over the consolidated ash consisting of a 40-mil linear low-density polyethylene (LLDPE) geomembrane layer, a geocomposite drainage layer, and 24 inches of protective soil cover suitable for supporting vegetative growth. An alternative cover performance demonstration will be submitted to IEPA for approval pursuant to Section 845.750(c)(2).
- Installation of stormwater control structures. Stormwater would be conveyed to the existing drainage ditch on the western side of the CCR surface impoundment, which discharges to the Illinois River per the Edwards Power Plant's NPDES permit.
- Long-term (post-closure) monitoring and maintenance, including at least 30 years of groundwater monitoring at the impoundment, or until such time as groundwater protection standards (GWPSs) are achieved. Additionally, 30 years of post-closure care would be undertaken for the final cover system, including annual cap inspections, mowing, and maintenance.

This CIP plan meets all closure requirements of IAC Part 845.750 (IEPA, 2021a). Key closure elements that address the Part 845 closure requirements are summarized below. Further details are provided in the Closure Plan (IngenAE LLC, 2022).

- An alternative cover system would be installed over the CCR that remains in the Ash Pond. The cover, consisting of a 40-mil LLDPE geomembrane low-permeability layer, a geocomposite drainage layer, and 24 inches of soil, would minimize vertical infiltration of precipitation into the basin [Part 845.750(a)(1)].
- The final cover system would be gently sloped to direct surface water away from the impoundment. Beyond the final cover system, channels would direct surface water away from the Ash Pond to existing site drainages [Part 845.750(a)(2)].
- Free liquids would be removed from the Ash Pond *via* unwatering and dewatering, as described above, and managed in accordance with the NPDES permit for the facility [845.750(b)(1) and 845.750(b)(2)].

In total, approximately 1,340,000 cubic yards (CY) of CCR would be relocated from the rail line embankment and the northwestern portion of the impoundment into the final closure area under the CIP scenario (an assumed average one-way travel distance of 1 mile; Attachment B). Construction of the northwest berm, the final cover system, and an access road would require an additional 977,000 CY of soil to be hauled to the Site from a nearby borrow area. It is expected that a suitable borrow location can be identified within 2 miles of the Site, resulting in a 4-mile round trip travel distance (Attachment B). In addition to the haul volumes listed above, approximately 53,300 CY of subsoil overexcavated from beneath the designated CCR removal area would be hauled to an off-Site landfill for disposal. The preferred off-Site landfill for the disposal of overexcavated soils is the Indian Creek Landfill #2 in Hopedale, Illinois (24501 McMullen Road), which is located approximately 24 miles (one-way) from the Site (Attachment B). Soil would be hauled to and from the Site using haul trucks with an assumed capacity of 16.5 CY (Attachment B). CCR would be hauled around the Site using haul trucks with an assumed capacity of 34 CY (Attachment B).

Under the CIP scenario, the overall expected duration of closure activities (excluding agency coordination and permit approvals) is approximately 3.8-5.3 years (46-64 months; IngenAE LLC, 2022). Key parameters for the CIP scenario are shown in Table 2.1.

Table 2.1 Key Parameters for the Closure-in-Place Scenario

Parameter	
Surface Area of Ash Pond	102 acres
Surface Area of Final Cover System	69 acres
Volume of CCR to be Relocated	1,340,000 CY
Average Travel Distance for Relocation of CCR	1 mile
Required Volume of Borrow Soil	977,000 CY
Distance to Borrow Site	2 miles
Volume of Subsoil Overexcavation	53,300 CY
Distance to Off-Site Landfill	24 miles
Total On-Site Labor Hours	148,000 hours
Total Off-Site Labor Hours	31,700 hours
On-Site Haul Truck Miles	79,000 miles
Off-Site Haul Truck Miles	398,000 miles
Duration of Construction Activities	3.8-5.3 years

Notes:
CCR = Coal Combustion Residual; CY = Cubic Yard.
Source: IngenAE LLC (2022); Attachment B.

2.1.2 Closure-by-Removal with Off-Site CCR Disposal

Under the CBR-Offsite scenario, all CCR would be excavated from the Ash Pond and transported to an off-Site landfill for disposal. The preferred landfill for disposal of the CCR is the Indian Creek Landfill #2 in Hopedale, Illinois (24501 McMullen Road), which is located approximately 24 miles from the Site (Attachment B). CCR would be hauled to the off-Site landfill using haul trucks with a capacity of 16.5 CY. As is described below in Section 2.4.5, it is possible that the Indian Creek Landfill #2 would have to be expanded in order to accept all of the material excavated from the Ash Pond.

IAC Section 845.710(c)(1) requires CBR alternatives to consider multiple methods for transporting CCR off-Site, including rail, barges, and trucks. IngenAE evaluated the feasibility of transporting CCR to the off-Site landfill *via* rail or barges and found that neither option is likely to be viable at this Site (Attachment B). Although there is a rail loop encircling the Ash Pond, it is expected to be demolished during closure of the Ash Pond. Moreover, none of the three off-Site landfills located nearest to the Site have an established rail terminal. The construction of a new rail terminal at the off-Site landfill would require coordination with the railroad and additional design and permitting, which could negatively impact the project schedule. Trucks would still be needed to haul CCR to and from the terminals, and additional CCR exposures could occur during the loading and unloading of CCR into trucks and rail cars. Finally, there is no direct rail route from the Site to the three nearest off-Site landfills. In order to haul CCR from the Site to the off-Site landfill, it would therefore be necessary to haul the CCR on tracks owned by multiple rail lines and to transfer the CCR from line to line.

Barge transport would require the construction of a new barge loadout facility along the Illinois River, which would necessitate additional permitting and could negatively impact the project schedule. The Peoria Barge Terminal is located approximately 6 miles north of the Site by road; however, this terminal does not belong to IPRG. Use of this terminal would therefore require negotiating agreements with the terminal owner and/or operator. Finally, none of the three off-Site landfills located nearest to the Site are located along the Illinois River or near an existing barge loadout facility. As with rail terminals, trucks would still be needed to haul CCR to and from the loading and unloading terminals, and additional CCR exposures could occur during the loading and unloading of CCR into trucks and onto barges. For these reasons, truck transport has been identified as the preferred option for transport of CCR to the off-Site landfill. Transport *via* truck would not require the construction of additional loading or unloading infrastructure and would not result in project delays due to permitting and coordination with other parties. The existing travel routes from the Site to the preferred off-Site landfill are suitable for CCR transport *via* truck (Attachment B). The local availability and use of natural gas-powered trucks, or other low-polluting trucks, will be evaluated prior to the start of construction.

This scenario includes the following work elements (Attachment B):

- Unwatering and dewatering to remove liquid wastes from the Ash Pond *via* pumping and the construction of dewatering ditches and sumps. Water would be managed in accordance with the NPDES permit for the facility.
- Excavation of CCR from the Ash Pond and the existing rail line embankment, followed by excavation of approximately one foot of underlying soil from these areas and the transport of these materials to the off-Site landfill.
- Removal of the rail line and existing structures.
- Backfilling of the former impoundment with clean soil to a minimum elevation of approximately 432 feet above mean sea level (ft-amsl), followed by grading of the surface at a 0.25% slope in order to route stormwater towards the existing west ditch.
- The top six inches of imported soil shall be capable of supporting vegetation. Disturbed surfaces shall be revegetated with native grasses or pollinators.
- Monitoring for 3 years post-closure or until such time as GWPSs are achieved, whichever is longer.

Under this scenario, approximately 4,390,000 CY of CCR would be excavated from the Ash Pond and the rail line embankment and hauled off-Site for disposal. Backfilling of the impoundment and site restoration would require an additional 900,000 CY of soil to be hauled to the Site from a nearby borrow area. As with the CIP scenario, a suitable borrow location is assumed to be located within 2 miles of the Site. A haul truck capacity of 16.5 CY is assumed for the off-Site transport of borrow soil and CCR (Attachment B).

The overall duration of closure activities under this closure scenario (excluding agency coordination and permit approvals) is approximately 5.3-6.7 years (63-80 months; Attachment B). Key parameters for the CBR-Offsite scenario are shown in Table 2.2.

Table 2.2 Key Parameters for the Closure-by-Removal with Off-Site CCR Disposal Scenario

Parameter	Value
Surface Area of Ash Pond	102 acres
Volume of CCR to be Hauled to the Off-Site Landfill	4,390,000 CY
Distance to Off-Site Landfill	24 miles
Required Volume of Borrow Soil	900,000 CY
Distance to Borrow Site	2 miles
Total On-Site Labor Hours	68,400 hours
Total Off-Site Labor Hours	446,000 hours
On-Site Haul Truck Miles	0 miles
Off-Site Haul Truck Miles	13,500,000 miles
Duration of Construction Activities	5.3-6.7 years

Notes:
CCR = Coal Combustion Residual; CY = Cubic Yard.
Source: Attachment B.

2.2 Long- and Short-Term Effectiveness of the Closure Alternative (IAC Section 845.710(b)(1))

2.2.1 Magnitude of Reduction of Existing Risks (IAC Section 845.710(b)(1)(A))

This section of the report addresses the potential risks to human and ecological receptors due to exposure to CCR-associated constituents in groundwater or surface water. Gradient has performed a Human Health and Ecological Risk Assessment for the Site (Attachment A of this report), which provides a detailed evaluation of the magnitude of existing risks to human and ecological receptors associated with the Ash Pond. This report concluded that there are no current unacceptable risks to any human or ecological receptors associated with the Ash Pond. Because there are no current risks to any human or ecological receptors, and dissolved constituent concentrations would be expected to decline post-closure, no post-closure risks would be expected under either closure scenario. Thus, there would be no current risk or future risk under either closure scenario, and the magnitude of reduction of existing risks would be the same under every closure scenario.

2.2.2 Likelihood of Future Releases of CCR (IAC Section 845.710(b)(1)(B))

This section of the report quantifies the risk of future releases of CCR that may occur during dike failure and storm-related events.

Storm-Related Releases and Dike Failure During Flood Conditions

The effective Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for the Site indicates that the Ash Pond was constructed within the 100-year flood zone for the Illinois River (FEMA, 1983). However, the Ash Pond is located behind a United States Army Corps of Engineers levee, the Pekin Lamarsh Levee, which is three feet higher in elevation than the 100-year flood elevation of the river (AECOM, 2016b; FEMA, 1983; Geosyntec Consultants, 2021). Additionally, due to the presence of the Ash Pond embankments, the area within the footprint of the Ash Pond is designated Zone C on the FEMA FIRM, or an area of "minimal flooding" (FEMA, 1983). Engineering analyses show that the Ash Pond dikes are expected to remain stable under static, seismic, and flood conditions (AECOM, 2016c; Geosyntec Consultants, 2021). Engineering analyses also show that the risk of overtopping occurring during flood conditions is minimal under current conditions. Specifically, AECOM (2016d) and Geosyntec Consultants (2021) evaluated the risk of flood overtopping occurring at the Ash Pond and found that the impoundment can adequately manage flow during peak discharge from a calculated probable maximum flood event. Prior to closure (*i.e.*, under current conditions), the risk of overtopping or dike failure occurring during floods or other storm-related events is therefore minimal. Post-closure, risks would be even smaller than they are currently. Under the CIP scenario, a new cover system would be installed, which would include 24 inches of soil and a geomembrane liner, as well as new stormwater control structures. Relative to current conditions, this cover system would provide increased protection against berm and surface erosion, groundwater infiltration, and other adverse effects that could potentially trigger a dike slope failure event (IngenAE LLC, 2022). Under the CBR-Offsite scenario, all of the CCR in the Ash Pond would be excavated and relocated, eliminating the risk of a CCR release occurring post-closure. In summary, there is minimal current or future risk of sudden CCR releases occurring under either closure scenario either during or following closure.

Dike Failure Due to Seismicity

Sites in Illinois may be subject to seismic risks arising from the Wabash Valley Seismic Zone and the New Madrid Seismic Zone (IEMA, 2020). However, the Edwards Power Plant property does not lie within a Seismic Impact Zone, defined in the Federal CCR Rule (40 CFR Part 257 Subpart D; US EPA, 2015a) as "an area having a 2% or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10 g in 50 years" (Burns & McDonnell, 2021a). The nearest known faults are four unnamed faults associated with the Troy Grove Dome, which are located about 63 miles northeast of the Ash Pond. The Ash Pond does not lie within 200 feet of an active fault or fault damage zone at which displacement has occurred within the current geological epoch (*i.e.*, within the last ~11,650 years; Burns & McDonnell, 2021b). Thus, the risk of dike failure occurring during or following closure activities due to seismic activity is exceedingly low at the Ash Pond.

2.2.3 Type and Degree of Long-Term Management, Including Monitoring, Operation, and Maintenance (IAC Section 845.710(b)(1)(C))

The long-term operation and management plans for the Ash Pond under each closure scenario are described in Section 2.1 (Closure Alternatives Descriptions). In summary, under the CIP scenario, the Ash Pond would undergo monitoring for 30 years post-closure, or until such time as GWPSs are achieved. Under the CBR-Offsite scenario, the Ash Pond would undergo monitoring for 3 years post-closure, or until such time as GWPSs are achieved. The post-closure care plan for the CIP scenario would additionally include annual inspections, mowing, and maintenance of the final cover system.

2.2.4 Short-Term Risks to the Community or the Environment During Implementation of Closure (IAC Section 845.710(b)(1)(D))

2.2.4.1 Worker Risks

Best practices would be employed during construction in order to ensure worker safety and comply with all relevant regulations, permit requirements, and safety plans. However, it is impossible to completely eliminate the risk of accidents occurring during construction activities, both on- and off-Site. On-Site accidents include injuries and deaths arising from the use of heavy equipment and/or earthmoving operations during construction activities. Off-Site accidents include injuries and deaths due to vehicle accidents during labor and equipment mobilization/demobilization, material deliveries, and the hauling of borrow soil and CCR.

As shown in Tables 2.1 and 2.2, IngenAE estimates that the CIP scenario would require 148,000 on-Site labor hours and the CBR-Offsite scenario would require approximately 68,400 on-Site labor hours (Attachment B). The US Bureau of Labor Statistics (US DOL, 2020a,b) provides an estimate of the hourly fatality and injury rates for construction workers. Based on the accident rates reported by US Bureau of Labor Statistics and the on-Site labor hours reported in Attachment B, we estimate that approximately 1.7 worker injuries and 0.011 worker fatalities would occur on-Site under the CIP scenario and approximately 0.79 worker injuries and 0.0051 worker fatalities would occur on-Site under the CBR-Offsite scenario (Table 2.3).

Table 2.3 Expected Number of On-Site Worker Accidents Under Each Closure Scenario

Closure Scenario	Injuries	Fatalities
CIP	1.7	0.011
CBR-Offsite	0.79	0.0051

Notes:
CBR-Offsite = Closure-by-Removal with Off-Site CCR Disposal; CCR = Coal Combustion Residual; CIP = Closure-in-Place.

Off-Site, a far greater number of haul truck miles would be required under the CBR-Offsite scenario than would be required under the CIP scenario (Tables 2.1 and 2.2). Under the CBR-Offsite scenario, 13,500,000 off-Site haul truck miles would be required to haul CCR and borrow soil to and from the Site. Under the CIP scenario, only 398,000 off-Site haul truck miles would be required (Attachment B). The United States Department of Transportation (US DOT, 2020) provides estimates of the expected number of fatalities and injuries "per vehicle mile driven" for drivers and passengers of large trucks and passenger vehicles. Table 2.4 shows the expected number of off-Site accidents under each closure scenario due to off-Site hauling. Based on US DOT's accident statistics and the mileage estimates in Attachment B, an estimated 0.051 worker injuries and 0.0012 worker fatalities would be expected to occur due to off-Site hauling under the CIP scenario. Under the CBR-Offsite scenario, an estimated 1.7 worker injuries and 0.039 worker fatalities would be expected to occur due to off-Site hauling.

Table 2.4 Expected Number of Off-Site Worker Accidents Due to Hauling Under Each Closure Scenario

Closure Scenario	Injuries	Fatalities
CIP	0.051	0.0012
CBR-Offsite	1.7	0.039

Notes:
CBR-Offsite = Closure-by-Removal with Off-Site CCR Disposal; CCR = Coal Combustion Residual; CIP = Closure-in-Place.

Overall, taking into account accidents occurring both on- and off-Site, a minimum of 1.8 worker injuries and 0.012 worker fatalities would be expected under the CIP scenario and 2.5 worker injuries and 0.044 worker fatalities would be expected under the CBR-Offsite scenario. In summary, overall risks to workers due to on-Site and off-Site accidents would likely be somewhat greater under the CBR-Offsite scenario than under the CIP scenario. These estimates reflect the minimum number of worker accidents that are likely to occur under each scenario, because they do not account for the additional off-Site vehicle accidents that may occur during non-hauling activities such as labor mobilization and demobilization, equipment mobilization and demobilization, and material deliveries. The vehicle mileages associated with these off-Site activities are not known.

2.2.4.2 Community Risks

Accidents

Vehicle accidents that occur off-Site can result in injuries or fatalities among community members, as well as workers. Based on the accident statistics reported by US DOT (2020) and the off-Site haul truck mileages reported in Attachment B, off-Site hauling could result in an estimated 0.15 injuries and 0.0053 fatalities among community members (*i.e.*, people involved in haul truck accidents that are neither haul truck drivers nor passengers, including pedestrians, drivers of other vehicles, *etc.*) under the CIP scenario (Table 2.5). Under the CBR-Offsite scenario, off-Site hauling could result in an estimated 5.0 community injuries and 0.18 community fatalities.

Table 2.5 Expected Number of Community Accidents Due to Hauling Under Each Closure Scenario

Closure Scenario	Injuries	Fatalities
CIP	0.15	0.0053
CBR-Offsite	5.0	0.18

Notes:
CBR-Offsite = Closure-by-Removal with Off-Site CCR Disposal; CCR = Coal Combustion Residual; CIP = Closure-in-Place.

In addition to impacts due to off-Site hauling, all scenarios may have off-Site impacts due to labor mobilization and demobilization, equipment and vehicle mobilization and demobilization, and material deliveries. The vehicle mileages associated with these off-Site activities are not known.

Traffic

Haul routes would be expected to use major arterial roads and highways wherever possible, which would reduce the incidence of traffic. However, the heavy use of local roads for construction operations may result in traffic near the Site, the borrow site, and the off-Site landfill. Traffic could potentially cause travel delays on local roads and also cause damage to local roadways. It could also cause delays in the re-development of the Site for use in utility-scale battery energy storage.

Traffic may increase temporarily around the Site under both closure scenarios due to the daily arrival and departure of the workforce, equipment mobilization/demobilization, and material deliveries. However, these impacts would be expected to largely occur at the beginning or end of each workday (for the arrival/departure of the workforce), at the beginning or end of the construction period (for equipment mobilization/demobilization), and at specific times throughout the construction period (for material deliveries). These impacts would therefore likely be less disruptive to community members than the constant and steady movement of haul trucks to and from the Site due to CCR hauling and borrow soil hauling. Under the CBR-Offsite scenario, hauling-related construction activities would be expected to take approximately 3.6-4.3 years (43-52 months) and require approximately 321,000 truckloads of CCR and soil; Attachment B). Assuming 26 working days per month and 10-hour working days, a haul truck would need to pass a given location near the Site once every 1.0-1.3 minutes on average for the duration of hauling-related activities under this closure scenario. The CIP scenario requires approximately 62,400 truckloads to transport soil to and from the Site, which corresponds with a haul truck passing a given location near the Site once every 3.2-4.5 minutes on average for the duration of hauling-related construction activities. Thus, the CIP scenario is likely to have a smaller influence on traffic near the Site than the CBR-Offsite scenario.

Noise

Construction generates a great deal of noise, both in the vicinity of the Site and along haul routes. In a closure impact analysis performed by the Tennessee Valley Authority (TVA, 2015), the authors found that "[T]ypical noise levels from construction equipment used for closure are expected to be 85 dBA or less when measured at 50 ft. These types of noise levels would diminish with distance…at a rate of approximately 6 dBA per each doubling of distance and therefore would be expected to attenuate to the recommended EPA noise guideline of 55 dBA at 1,500 ft." As identified in aerials and Google Street View (Google LLC, 2022), there are a small number of residences located within 1,500 feet of the Ash Pond to the west of the Site. Additionally, the fertilizer production facility located east of the Site lies within 1,500 feet of the Ash Pond. These residences and businesses may be adversely impacted by noise pollution under every closure scenario. Recreator and wildlife areas along the Illinois River, which also lie within 1,500 feet of the Ash Pond, could also be temporarily impacted by construction noise under both scenarios. The duration of noise impacts in the vicinity of the Ash Pond would be greater under the CBR-Offsite scenario than under the CIP scenario, because the expected duration of construction is longer under the former scenario (3.8-5.3 years under the CIP scenario *vs.* 5.3-6.7 years under the CBR-Offsite scenario).

In addition to impacts in the immediate vicinity of on-Site construction areas, local roads near the Site, the off-Site landfill (CBR-Offsite scenario only), and the off-Site borrow site (both scenarios) may also experience noise pollution due to high volumes of truck traffic. As described above (Traffic), the construction schedule for the CBR-Offsite scenario requires haul trucks to pass by a given location every 1.0-1.3 minutes on average for 10 hours each day for the duration of hauling-related activities at the Site (approximately 3.6-4.3 years). The construction schedule for the CIP scenario requires haul trucks to pass a given location every 3.2-4.5 minutes on average for 10 hours each day for the duration of hauling-related activities (approximately 2.2-3.0 years). Dump trucks generate significant noise pollution, with noise levels of approximately 88 decibels or higher expected within a 50-foot radius of the truck (Exponent, 2018). This noise level is similar to the noise level of a gas-powered lawnmower or leaf blower (CDC, 2019). Decibel levels above 80 can damage hearing after 2 hours of exposure (CDC, 2019).

In addition to haul truck impacts, noise pollution may also arise from the daily arrival and departure of the workforce, equipment mobilization/demobilization, and material deliveries. These impacts would be expected to largely occur at the beginning or end of each workday (for the arrival/departure of the workforce), at the beginning or end of the construction period (for equipment mobilization/demobilization), and at specific times throughout the construction period (for material deliveries). These impacts would therefore likely be less disruptive to community members than the constant and steady movement of haul trucks to and from the Site. In summary, noise impacts are likely to be greatest under the CBR-Offsite scenario and least under the CIP scenario.

Air Quality

Construction can adversely impact air quality. Air pollution can occur both on-Site and off-Site (*e.g.*, along haul routes), potentially impacting workers as well as community members. With regard to construction activities, two categories of air pollution are of particular concern: equipment emissions and fugitive dust. The equipment emissions of greatest concern are those found in diesel exhaust. Most construction equipment is diesel-powered, including the dump trucks that would be used to haul material to and from the Site. Diesel exhaust contains numerous air pollutants, including nitrogen oxides (NO_x), particulate matter (PM), carbon monoxide (CO), and volatile organic compounds (VOCs; Hesterberg *et al*., 2009; Mauderly and Garshick, 2009). Fugitive dust, another major air pollutant at construction sites, is generated by earthmoving operations and other soil- and CCR-handling activities. Along haul routes, an additional source of fugitive dust is road dust along unpaved dirt roads. Careful planning and the use of Best Management Practices (BMPs) such as wet suppression are used to minimize and control fugitive dust during construction activities; however, it is not possible to prevent dust generation entirely.

The air pollutant mass released under a given closure scenario will be proportional to the expected duration and intensity of construction activities under that scenario. The CIP scenario is the closure scenario with the shortest expected duration of construction activities, the smallest required volumes of CCR dewatering and handling, the least amount of total on-Site and off-Site labor hours, and the least amount of required on-Site and off-Site hauling. This scenario is therefore likely to result in fewer overall air emissions than the CBR-Offsite scenario.

Environmental Justice

The State of Illinois defines environmental justice (EJ) communities to be those communities with a minority population above twice the state average and/or a total population below twice the state poverty rate (IEPA, 2019b). As shown in a map of EJ communities throughout the state (EJ Start; IEPA, 2019b), the outer perimeter of the 1-mile buffer zone for the nearest EJ community lies approximately 2.5 miles northeast of the Site near Peoria/Bartonville (Figure 2.1). As described above (Noise), significant noise impacts due to construction are expected to be limited to potential receptors located within 1,500 feet (0.28 miles) of the Site. Similarly, the air quality impacts of construction are expected to be limited to potential receptors located within 1,000 feet (0.19 miles) of the Site (CARB, 2005; BAAQMD, 2017). Along heavily trafficked roadways, air quality impacts are expected to be limited to potential receptors located within 600 feet of the roadway (0.11 miles; US EPA, 2014b). The EJ community near Peoria/Bartonville is therefore unlikely to be directly impacted by on-Site air emissions, noise pollution, or other negative impacts arising at the Site. However, this community could nonetheless be affected by off-Site impacts, including CCR hauling (CBR-Offsite scenario only), borrow soil hauling (both scenarios), labor and equipment mobilization/demobilization, and material deliveries. Off-Site impacts due to labor and equipment mobilization/demobilization and material deliveries would be expected to be diffuse (*i.e.*, to span a wide range of transport routes originating over a wide area). Additionally, these impacts would be expected to largely occur at the beginning or end of each workday (for the arrival/departure of the workforce), at the beginning or end of the construction period (for equipment mobilization/demobilization), and at specific times throughout the construction period (for material deliveries). Hauling, in contrast, would rely on a single transport route that would be in continual use throughout the entire excavation period. Off-Site hauling is therefore more likely to have a significant impact on EJ communities than other types of off-Site vehicle use.

Two types of off-Site hauling are evaluated in this report: CCR hauling and borrow soil hauling. Overall, haul truck impacts on EJ communities due to borrow soil hauling are expected to be small, because borrow soil would be sourced from within 2 miles of the Site. The EJ community near Peoria/Bartonville lies within 4 miles of the Site, and it was assumed that a suitable borrow soil location could be found outside of this community. Under the CBR-Offsite scenario, however, EJ communities located along the haul route to the off-Site landfill or near the off-Site landfill may be negatively impacted throughout the excavation period by the air pollution, noise, traffic, and accidents generated by CCR-hauling activities. A review of the Illinois map of EJ communities reveals that the preferred off-Site landfill (the Indian Creek Landfill #2 in Hopedale, Illinois) is not located within the 1-mile buffer zone of an EJ community. However, one of the three major haul routes suggested by Google Maps (Google LLC, 2022) would require hauling CCR through the 1-mile buffer zone of the EJ community near Peoria/Bartonville (Figure 2.1).

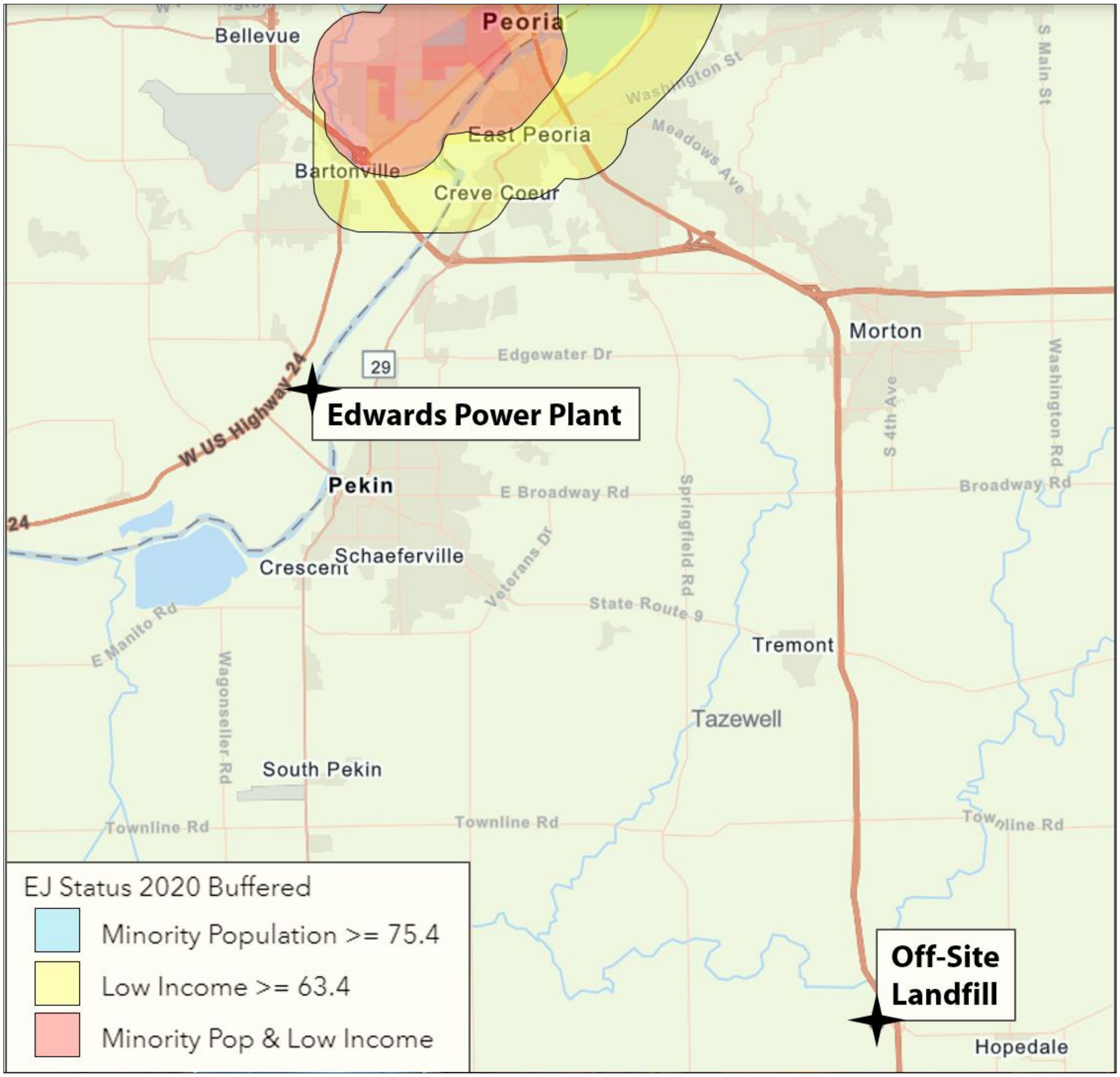

Figure 2.1 Environmental Justice Communities in the Vicinity of the Site and the Off-Site Landfill. EJ = Environmental Justice. Adapted from IEPA (2019b).

Scenic, Historical, and Recreational Value

During construction activities, negative impacts on scenic and recreational value may occur along the Illinois River, which lies within 1,500 feet of the Ash Pond. Noise impacts were described above. In addition, construction activities at the Ash Pond may be visible to recreators using the Illinois River, potentially interfering with enjoyment of the view. Negative impacts would not necessarily be expected to occur within any scenic or recreational areas located further away from the Site, including Worley Lake, the Pekin Lake SFWA, and the Powerton Lake SFWA. The expected duration of construction activities is longer under the CBR-Offsite scenario than under the CIP scenario (3.8-5.3 years under the CIP scenario *vs*. 5.3-6.7 years under the CBR-Offsite scenario). It is therefore anticipated that short-term impacts on the scenic and recreational value of the Illinois River would be greater under the CBR-Offsite scenario than under the CIP scenario.

Based on a review of the IDNR Historic Preservation Division database and the Illinois State Archaeological Survey database, there are no historic sites located within 1,000 meters of the Ash Pond (Ramboll, 2021).

2.2.4.3 Environmental Risks

Greenhouse Gas Emissions

In addition to the air pollutants listed above in Section 2.2.4.2, construction equipment emits greenhouse gases (GHGs), including carbon dioxide (CO_2) and possibly nitrous oxide (N_2O). The potential impact of each closure scenario on GHG emissions is proportional to the potential impact of each closure scenario on other emissions from construction vehicles and equipment, as described above in Section 2.2.4.2. The CIP scenario has the shortest expected duration of construction activities, the smallest required volumes of CCR dewatering and handling, the least amount of total on-Site and off-Site labor hours, and the least amount of required on-Site and off-Site hauling; this scenario is therefore likely to have the lowest amount of predicted GHG emissions across closure scenarios.

We did not quantify the carbon footprint of the approximately 69 acres of 40-mil LLDPE geomembrane liner required for the final Ash Pond cover system under the CIP scenario. The carbon footprint of this geomembrane (*i.e.*, the fossil fuel emissions required to manufacture it) is an additional source of GHG emissions at the Site under the CIP scenario. The potential expansion of the off-Site landfill under the CBR-Offsite scenario would have an additional, unquantified carbon footprint due to the manufacture of geomembranes used in the expanded landfill liners.

Energy Consumption

Energy consumption at a construction site is synonymous with fossil fuel consumption, because the energy to power construction vehicles and equipment comes from the burning of fossil fuels. Fossil fuel demands considered in this analysis include the burning of diesel fuel during construction activities and the carbon footprint of manufacturing geomembrane textiles. Because GHG emission impacts and energy consumption impacts both arise from the same sources at construction sites, the trends discussed above with respect to GHG emissions also apply to the evaluation of energy demands. In summary, the energy requirements of construction are expected to be smallest under the CIP scenario and largest under the CBR-Offsite scenario. We did not quantify the energy demands of the geomembranes required for the construction of the final cover system under the CIP scenario, or, potentially, the geomembranes required for expansion of the off-Site landfill under the CBR-Offsite scenario.

The Edwards Power Plant Site is slated for re-development as a utility-scale battery energy storage facility. The proposed battery storage facility at the Edwards Power Plant Site would help the state meet its goal of decarbonizing electricity generation and would improve the overall reliability of the electricity grid. In the short-term, closure activities at the Site may delay and obstruct these re-development efforts. The magnitude of expected delays will scale with the expected duration and intensity of construction activities during closure. Because the CIP scenario requires less overall construction activity than the CBR-Offsite scenario and would be completed over a shorter time period, the CIP scenario would be expected to result in fewer delays to re-development – and, hence, the more rapid realization of grid-scale energy benefits – than the CBR-Offsite scenario.

Natural Resources and Habitat

During closure, major construction activities such as the excavation of the impoundment, the excavation of the borrow area, and, potentially, the expansion of the off-Site landfill may require the destruction of some existing habitat atop portions of these construction areas, resulting in direct negative impacts to natural resources and habitat within the footprint of these areas. Construction may also have indirect negative impacts on the natural resources and habitat in the immediate vicinity of these locations by causing alarm and escape behavior in nearby wildlife (*e.g.*, due to noise disturbances). The duration of time over which various short-term negative habitat impacts might occur due to construction would be longer under the CBR-Offsite scenario than under the CIP scenario, due to the longer expected duration of construction activities under the former scenario (3.8-5.3 years for CIP *vs.* 5.3-6.7 years for CBR-Offsite). Thus, negative short-term impacts to natural resources and habitat due to closure activities would likely be greater under the CBR-Offsite scenario than under the CIP scenario.

The Ash Pond is separated spatially from the Illinois River by the Edwards Power Plant, the coal pile for the facility, and an off-Site fertilizer production facility (a buffer distance of at least 800 feet; Figure 1.1). For this reason, construction activities at the Ash Pond are unlikely to have a significant negative impact on aquatic species found in the Illinois River (due to, *e.g.*, erosion and sediment runoff). However, there are some small, discontiguous wetland areas in the immediate vicinity of the Ash Pond (Figure 2.2; US FWS, 2021). Wetland species in these areas could potentially be subjected to temporary, minor disturbances as a result of closure activities. Terrestrial species located near the Ash Pond could also potentially be temporarily impacted by closure. According to the IDNR Natural Heritage Database, there are 9 endangered species and 15 threatened species within Peoria County (Ramboll, 2021). To our knowledge, however, no threatened or endangered species have been identified at the Site. Based on the information that is currently available, we do not expect construction activities to have negative impacts on any threatened or endangered species.

In addition to the short-term habitat impacts described above, closure may also result in long-term shifts in the habitat types overlying the major construction locations associated with closure (the Ash Pond, the borrow area, and the off-Site landfill). This assessment does not make any value judgments regarding the relative value of the habitat types currently overlying these locations and the habitat types that could potentially overlie these locations post-closure under the various closure scenarios. For example, we did not attempt to determine whether the conversion of open water to grassland within the footprint of the Ash Pond would constitute a positive or negative long-term change with regard to factors such as biodiversity, ecosystem services, or the preferences of recreators/sightseers.

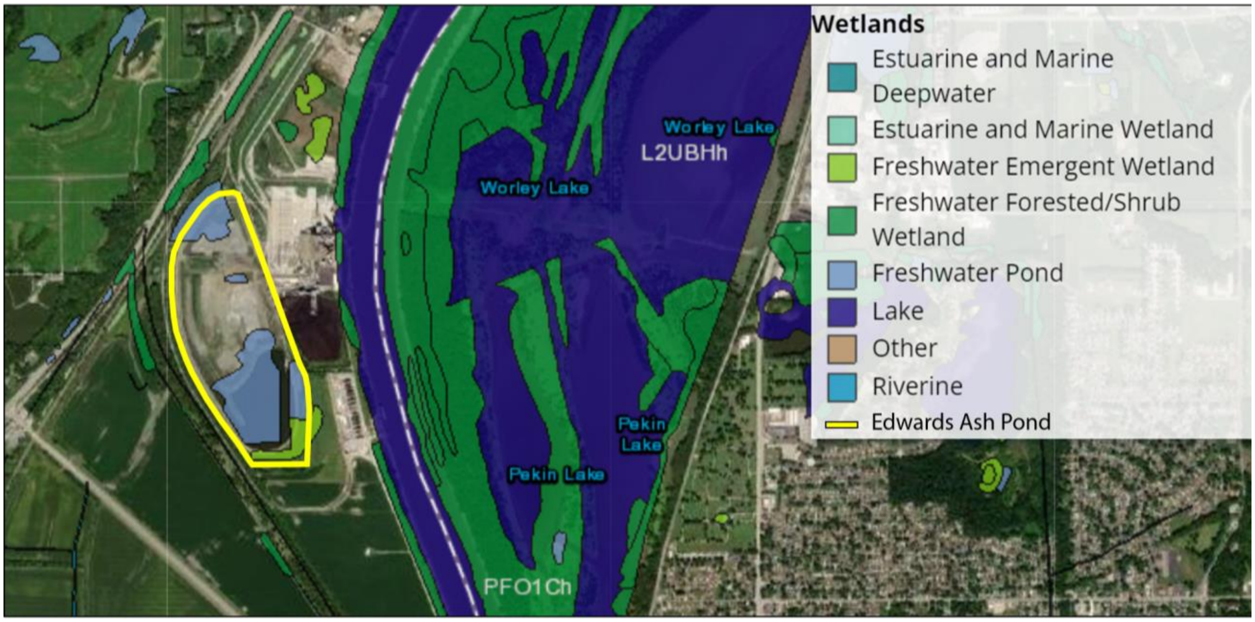

Figure 2.2 Wetlands and Surface Water Bodies in the Vicinity of the Edwards Ash Pond. Adapted from US FWS (2021).

2.2.5 Time Until Groundwater Protection Standards Are Achieved (IAC Sections 845.710(b)(1)(E) and 845.710(d)(2 and 3))

The time horizon over which GWPSs would be exceeded at the Site is immaterial from a risk perspective because there is no unacceptable risk associated with exceedances of a GWPS at the Site (see Section 2.2.1). Nonetheless, pursuant to requirements under IAC Section 845.710, this section of the text describes the time required to achieve GWPSs at the Site.

As described above in Section 1.1.4 (Hydrogeology), the UA is a moderately permeable sand and gravel zone that is oriented parallel to the Illinois River (Ramboll, 2021). The Illinois River recharges groundwater (*i.e.*, surface water flows into groundwater) throughout much of the area surrounding the Site. Groundwater in the UA flows in both a northward and southward direction along the orientation of the UA, parallel to the river. In the area immediately underlying the Ash Pond, a thick layer of low-permeability clays associated with the UCF has been observed. This clay layer restricts the migration of groundwater from the saturated deposits underlying the Ash Pond into the surrounding areas. A groundwater mound associated with the operation of Ash Pond may have resulted in a localized zone in which groundwater flows easterly, into the Illinois River. This easterly groundwater flow component and potential groundwater interaction with surface water in the Illinois River is expected to be eliminated after pond closure when the hydraulic head in the Ash Pond is removed. There is only a limited groundwater flow component from areas underlying the Ash Pond toward the west. Vertical groundwater migration from the UA into the underlying bedrock is significantly restricted due to the presence of low-permeability shale (Ramboll, 2021).

CCR-related constituents from the Ash Pond may migrate vertically downward and into groundwater. Once in groundwater, these constituents may migrate northward and southward consistent with the primary groundwater flow directions in the UA. Based on groundwater modeling and groundwater monitoring conducted at the Site, no CCR-related constituents from the Ash Pond have migrated off of the property to either the north or the south in excess of GWPSs. There is limited off-site migration of

CCR-related constituents in excess of GWPSs into farmland areas west of the Ash Pond resulting from the groundwater mound associated with the operation of Ash Pond. Because the shale BCU is elevated in the areas west of the Ash Pond and alluvial soils are not expected to occur west of the Ash Pond past US Highway 24, further off-site migration to the west is not anticipated. Some CCR-constituents may have migrated eastward into the Illinois River, as a result of the groundwater mound caused by the Ash Pond. Due to groundwater interaction with surface water, dissolved constituents in the groundwater may partition between surface water and river sediments.

Seasonal variation in groundwater levels generally results in groundwater elevation fluctuations of less than five feet at the Edwards Power Plant Site. Groundwater flow directions at the Site generally do not vary in response to groundwater elevation changes or the elevation of the Illinois River (Ramboll, 2021).

Groundwater modeling was performed to evaluate the future groundwater quality in the vicinity of the Ash Pond under each of the proposed closure alternatives (Ramboll, 2022). The model-predicted timeframe to achieve the GWPSs for both the CIP and CBR scenarios is approximately 750 years (Ramboll, 2022). The long model-predicted timeframes are the result of the low permeability materials adjacent to and underlying the Ash Pond, and low groundwater flow velocities observed within the water-bearing units of the Site, which results in reduced transport and slow physical attenuation (*i.e.*, dilution and dispersion). From a modeling perspective, the minimal difference between the time for which GWPSs are achieved under the CIP scenario and the CBR scenario (approximately 19 years) is not significant. Furthermore, the predicted maximum extents of the boron plume above the GWPSs for both CIP and CBR remain in close proximity to the Ash Pond while receding over time, indicating that both closure scenarios perform equivalently with regard to achieving the GWPSs (Ramboll, 2022).

2.2.6 Potential for Exposure of Humans and Environmental Receptors to Remaining Wastes, Considering the Potential Threat to Human Health and the Environment Associated with Excavation, Transportation, Re-disposal, Containment, or Changes in Groundwater Flow (IAC Section 845.710(b)(1)(F))

Section 2.2.1 evaluates potential risks to human and ecological receptors arising from the leaching of CCR-associated constituents into groundwater during closure activities and following closure of the Ash Pond. Section 2.2.2 evaluates the potential for CCR releases to occur due to dike failure or overtopping during floods or other storm-related events. In summary, there is no current or future risk to any human or ecological receptors associated with the Ash Pond. Additionally, there is minimal current or future risk of overtopping occurring at the embankments due to flood conditions at the Site. Dike failure due to, *e.g.*, seismic activity and storm-related events is also exceedingly unlikely.

Section 2.2.4 evaluates several potential risks to human health and the environment during closure activities, including risks of accidents occurring among workers; risks to nearby residents and EJ communities related to accidents, traffic-related impacts, noise, and air pollution; and risks to natural resources and wildlife. The findings from this section of the text are summarized in Table S.1 (Summary of Findings).

2.2.7 Long-Term Reliability of the Engineering and Institutional Controls (IAC Section 845.710(b)(1)(G))

Post-closure, there is minimal risk of engineering or institutional failures leading to sudden releases of CCR from the impoundment under the CIP scenario. There is no post-closure risk of engineering or institutional failures under the CBR-Offsite scenario (see Section 2.2.2 above). Additionally, there are no current or future unacceptable risks to any human or ecological receptors under either closure scenario (see Section 2.2.1 above). Moreover, reliable engineering and institutional controls (*e.g.*, a bottom liner, a leachate management system, and groundwater monitoring) would be implemented at the off-Site landfill under the CBR-Offsite scenario. All of the evaluated closure scenarios are therefore reliable with respect to long-term engineering and institutional controls.

2.2.8 Potential Need for Future Corrective Action Associated with the Closure (IAC Section 845.710(b)(1)(H))

Corrective action is expected at the Site. Section 3 of this report (Corrective Measures Assessment) evaluates the corrective measures being considered at the Site consistent with the requirements in IAC Section 845.660.

2.3 Effectiveness of the Closure Alternative in Controlling Future Releases (IAC Section 845.710(b)(2))

2.3.1 Extent to Which Containment Practices Will Reduce Further Releases (IAC Section 845.710(b)(2)(A))

The CCR in the Ash Pond currently poses no unacceptable risks to human health or the environment (Section 2.2.1). Because current conditions do not present a risk to human health or the environment, and dissolved constituent concentrations would be expected to decline post-closure, there would also be no unacceptable risks to human health or the environment following closure, regardless of the closure scenario.

Section 2.2.2 discussed the potential for dike failure or overtopping to occur during or following closure activities, resulting in a sudden release of CCR. That analysis showed that there is minimal risk of sudden CCR releases occurring during or following closure under either closure scenario.

2.3.2 Extent to Which Treatment Technologies May Be Used (IAC Section 845.710(b)(2)(B))

Under both closure scenarios, water generated during the dewatering and unwatering of the impoundment would be treated if necessary prior to disposal. Following treatment, water from unwatering and dewatering would be discharged to the Illinois River in accordance with the NPDES permit for the facility.

2.4 Ease or Difficulty of Implementing Closure Alternative (IAC Section 845.710(b)(3))

2.4.1 Degree of Difficulty Associated with Constructing the Closure Alternative

CIP using a final cover system is a reliable and standard method for managing and closing impoundments that relies on common construction activities. Dewatering saturated CCR to construct a stabilized final cover system subgrade can present challenges during closure; however, these challenges are common to most CCR surface impoundment closures and are commonly addressed *via* surface water management and dewatering techniques.

Excavation and landfilling of CCR is also a reliable and standard method for closing impoundments. However, relative to CIP, CBR-Offsite poses additional implementation difficulties due to higher earthwork volumes and longer construction schedules. For example, off-Site hauling under the CIP scenario would only entail the transport of approximately 1,030,000 CY of soil and would not require the transportation of any CCR over public roadways. In contrast, off-Site hauling under the CBR-Offsite scenario would entail the transport of approximately 900,000 CY of soil and 4,390,000 CY of CCR over public roadways. As described in Section 2.2.4.2 (Community Impacts), off-Site hauling may also have detrimental impacts due to an increased incidence of vehicle accidents, truck traffic, noise, and air pollution.

In addition to off-Site hauling, off-Site landfilling under the CBR-Offsite scenario may pose particular challenges. A disposal plan would need to be developed between IPRG and the owner/operator of the third-party landfill in order to outline acceptable waste conditions upon delivery, daily waste production rates, and the expected duration of the project. Off-Site landfilling may additionally raise issues related to the co-disposal of CCR and other non-hazardous wastes. Finally, the construction schedule for excavation may be negatively impacted if, during the course of closure, it is determined that the off-Site landfill must be expanded in order to receive all of the materials excavated from the Ash Pond.

2.4.2 Expected Operational Reliability of the Closure Alternative

There is no post-closure risk of operational failures leading to sudden releases of CCR from the impoundment under the CBR-Offsite scenario. There is minimal post-closure risk of sudden CCR releases occurring under the CIP scenario, because: (i) the final cover system will be constructed and maintained in accordance with all relevant state and federal safety regulations, and (ii) the dikes, final cover, and stormwater control features have all been designed to withstand earthquakes and storm events (see Section 2.2.2 above). Moreover, appropriate operational controls are expected to be implemented at the off-Site landfill under the CBR-Offsite scenario. As such, operational reliability would be expected under both closure scenarios.

2.4.3 Need to Coordinate with and Obtain Necessary Approvals and Permits from Other Agencies

Permits and approvals would be needed under both closure scenarios. Components of both closure scenarios that would be expected to require a permit include:

- A modification to the existing NPDES permit through IEPA to allow the disposal of water generated from unwatering and dewatering operations to the Illinois River *via* the existing NPDES-permitted outfall for the Site;
- A construction permit from the IDNR, Office of Water Resources, Dam Safety Program to allow the embankment and spillways of the Ash Pond to be modified as part of closure;
- A construction stormwater permit through IEPA, including construction stormwater controls and other BMPs such as silt fences and other measures; and
- A joint water pollution control construction and operating permit (WPC permit).

As discussed below in Section 2.4.5, the off-Site landfill may require expansion under the CBR-Offsite scenario in order to accommodate all of the material excavated from the Ash Pond. Additional permitting may be required under this scenario for transport of the CCR and to expand the off-Site landfill. It may also be necessary to modify the operating plan for the off-Site landfill in order to accommodate the increased rate of filling of the landfill and the likely need for additional equipment and personnel to manage the receipt and disposal of the CCR.

2.4.4 Availability of Necessary Equipment and Specialists

CIP and CBR-Offsite are reliable and standard methods for managing waste that rely on common construction equipment and materials and typically do not require the use of specialists, outside of typical construction labor and equipment operators. However, global supply chains have been disrupted due to the COVID-19 pandemic, resulting in shortages in the availability of construction equipment and parts. There may be some shortages in construction equipment under both scenarios, if supply chain resilience does not improve by the time of construction. Alternatively, extended downtime may be required for equipment repairs and maintenance. A national shortage of truck drivers has also developed during the COVID-19 pandemic. Due to higher earthwork volumes and a longer construction schedule under the CBR-Offsite scenario than under the CIP scenario, shortages in construction equipment may cause greater challenges under this scenario than under the CIP scenario. The current shortage of truck drivers may be particularly impactful under the CBR-Offsite scenario, due to the large volume of CCR to be hauled from the Site. If sufficient trucks and truck drivers are not available, the construction schedule at the impoundment may lengthen based on hauling-related delays.

The availability of critical materials such as metal, wood, and electronic chips has also been impacted by the COVID-19 pandemic. However, soil materials and geomembrane liner materials have generally been available during 2021 and early 2022 for landfill development and closure projects.

2.4.5 Available Capacity and Location of Needed Treatment, Storage, and Disposal Services

Under the CIP scenario, all of the CCR currently within the Ash Pond would be stored within the existing footprint of the impoundment. Treatment would consist of unwatering and dewatering the Ash Pond at the start of construction and managing stormwater inflow. Water from unwatering and dewatering of the Ash Pond would be discharged in accordance with the NPDES permit for the facility. Under the CBR-Offsite scenario, water treatment would similarly consist of unwatering and dewatering the Ash Pond at the start of construction and discharging water from unwatering/dewatering in accordance with the NPDES permit for the facility.

Under the CBR-Offsite scenario, approximately 4,390,000 CY of CCR would be excavated from the Ash Pond and the rail line embankment. According to the IEPA "Landfill Disposal Capacity Report" for 2020 (IEPA, 2021b), the closest nearby third-party landfill with the ability to receive and dispose of CCR from the Site is the Indian Creek Landfill #2 in Hopedale, Illinois. This facility has 12,500,000 CY of remaining capacity in its current permitted footprint. It receives 399,000 CY of waste annually, and is located approximately 24 miles from the Site by road. The Indian Creek Landfill #2 therefore has sufficient capacity to receive CCR from the Ash Pond. However, closure of the Ash Pond would increase the annual waste receipt rate at the off-Site landfill. Due to the short timeframe over which CCR would be received at the landfill, vertical and/or lateral expansions may become necessary. Additionally, the landfill operators may need to develop a disposal plan to account for the increased volume of material that would be received and the unique CCR waste characteristics. Elements of this disposal plan might include increasing daily operational capacity and procedures, expediting planned airspace construction, and potentially expediting landfill expansion.

If expansion of the Indian Creek Landfill #2 is impractical or infeasible, then an alternative landfill located farther from the Site would need to be identified. Likely alternatives to the Indian Creek Landfill #2 include the Envirofil of Illinois Inc. Landfill in Macomb, Illinois, and the Clinton Landfill #3 in Clinton, Illinois. The Envirofil of Illinois Inc. Landfill has 7,690,000 CY of remaining capacity in its current permitted footprint, receives 97,300 CY of waste annually, and is located approximately 60 miles from the Site. The Clinton Landfill #3 has 25,700,000 CY of remaining capacity in its current permitted footprint, receives 559,000 CY of waste annually, and is located approximately 71 miles from the Site.(IEPA, 2021b).

2.5 Impact of Closure Alternative on Waters of the State (IAC Section 845.710(d)(4))

As demonstrated in Gradient's Human Health and Ecological Risk Assessment (Attachment A), both modeled and measured surface water concentrations in the Illinois River are below relevant human health and ecological screening benchmarks. Thus, there is no current impact from the Ash Pond to the Illinois River.

Under normal, regional conditions, surface water from the Illinois River recharges groundwater (*i.e.*, surface water flows into groundwater as opposed to groundwater flowing into surface water). The eastward groundwater flow component from the Ash Pond toward the Illinois River is only a result of the groundwater mound that has formed under the Ash Pond as a result of Ash Pond operation. For both closure alternatives, the free-standing water in the Ash Pond will be removed; consequently, the groundwater mound underlying the Ash Pond will decline. Ultimately, the declining groundwater mound will eliminate the eastward groundwater flow component toward the Illinois River, and the groundwater system will return to its normal, regional conditions. Thus, surface water concentrations of CCR-associated constituents are expected to decline over time under both closure scenarios, and there is no expected impact to the Illinois River as a result of either closure alternative.

The lined landfill that would receive the CCR excavated from the impoundment under the CBR-Offsite scenario would be managed to ensure that no surface water impacts would occur in the vicinity of the landfill. In summary, no impacts on any waters of the state would be expected under either closure scenario.

2.6 Concerns of Residents Associated with Closure Alternatives (IAC Section 845.710(b)(4))

Several nonprofits representing community interests near the Site have raised concerns regarding the potential impacts of the Edwards Ash Pond on groundwater and surface water quality, including Earthjustice, the Prairie Rivers Network, the League of Women Voters, and the Sierra Club (Earthjustice *et al*., 2018; LWVGP, 2021; Sierra Club, 2014; Sierra Club and CIHCA, 2014; UCS, 2018). These parties generally prefer CBR to CIP, citing fears that allowing CCR to remain in place "allows the widespread groundwater contamination to continue indefinitely" (Earthjustice *et al*., 2018, p. 24). However, it is not the case that closing the Ash Pond *via* CIP rather than CBR would result in undue risks to groundwater and surface water post-closure. As described in Sections 2.2.1 and 2.2.2, no current or future unacceptable risks to human or ecological receptors are associated with the Ash Pond under either scenario. There is also minimal risk of future CCR releases occurring under either scenario. Furthermore, groundwater modeling conducted at the Site demonstrated that both closure scenarios perform equivalently with regard to achieving the GWPSs (Ramboll, 2022). Both closure scenarios are therefore responsive to residents' concerns regarding impacts to groundwater and surface water quality.

The CIP scenario has several advantages over the CBR-Offsite scenario with regards to likely community concerns. Notably, the CIP scenario presents fewer risks to workers, nearby residents, and potentially EJ communities during construction in the form of accidents, traffic-related impacts, noise, and air pollution (Section 2.2.4 above). Closure would also be achieved more rapidly under the CIP scenario than under the CBR-Offsite scenario, due to the shorter duration of construction activities. Finally, the Site could be more rapidly re-developed for use in utility-scale battery energy storage under the CIP scenario than under the CBR-Offsite scenario. Re-development of the Site for use in energy storage would bring new jobs to the community and help the state meet its goal of decarbonizing electricity generation.

2.7 Class 4 Cost Estimate (IAC Section 845.710(d)(1))

A Class 4 cost estimate will be prepared in the Final Closure Plan consistent with the Advancement of Cost Engineering (AACE) Classification Standard (or a comparable classification practice as provided in the AACE Classification Standard), as required by IAC Section 845.710 (IEPA, 2021a).

2.8 Summary

Table S.1 (Summary of Findings) summarizes the expected impacts of the CIP and CBR-Offsite closure scenarios with regard to each of the factors specified under IAC Section 845.710 (IEPA, 2021a). Based on this evaluation and the details provided in Section 2 above, CIP has been identified as the most appropriate closure scenario for the Ash Pond. Key benefits of the CIP scenario relative to the CBR-Offsite scenario include the more rapid re-development of the Site for use in utility-scale battery energy storage and greatly reduced impacts to workers, community members, and the environment due to construction activities (*e.g.*, fewer constructed-related accidents, lower energy demands, less air pollution and GHG emissions, less traffic-related impacts, and potentially lower impacts to EJ communities). These conclusions are subject to change as additional data are collected and following the completion of an upcoming public meeting, which will be held in May 2022 pursuant to requirements under IAC Section 845.710(e). Following the public meeting, a final closure decision will be made based on the considerations identified in this report, the results of additional data that are collected, and any additional considerations that arise during the public meeting. The final closure recommendation will be provided in a Final Closure Plan, which will be submitted to IEPA as described under IAC Section 845.720(b) (IEPA, 2021a).

3 Corrective Measures Assessment

This section of the report presents a CMA pursuant to requirements under IAC Section 845.660 (IEPA, 2021a). The goal of performing a CMA is to holistically evaluate proposed corrective measures designed to remediate groundwater and achieve compliance with the GWPSs specified under IAC Section 845.600 (IEPA, 2021a). A CMA provides a screening-level analysis of potential corrective measures based on a wide range of factors, including their performance, reliability, ease of implementation, and potential impacts on human health and the environment (IEPA, 2021a). This analysis determines which corrective measures are potentially viable at a site and should be evaluated further in a Corrective Action Alternatives Analysis (CAAA). The CAAA for a given site must be submitted to the Agency within 1 year of submission of the CMA.

Many CCR sites are complex groundwater environments where remedial actions will inherently take many years to complete. While no formal definition of a complex groundwater environment exists, most would agree that there a number of common characteristics at complex groundwater sites, including the following (National Research Council, 2013):

- Highly heterogeneous subsurface environments;
- Large source zones;
- Multiple, recalcitrant constituents; and
- Long timeframes over which releases occurred.

Each of these characteristics is common at CCR sites. Surface impoundments are often tens to hundreds of acres in size and many have operated for decades, leading to large source zones and prolonged releases. Furthermore, CCR impoundments are often located in alluvial geologic settings where sands are interbedded with silts and clays. This results in a heterogeneous environment where constituent mass may persist for many years in low-permeability deposits. Finally, the constituents that are most common at CCR sites include metals and inorganics that do not naturally biodegrade. The combination of these factors results in a complex groundwater environment where remediation, even under the best of circumstances, may take many years to achieve GWPSs. It is for these reasons that US EPA refused to specify what is a reasonable *vs.* an unreasonable timeframe for groundwater corrective actions at CCR sites, stating that "EPA was truly unable to establish an outer limit on the necessary time frames—including even a presumptive outer bound" (US EPA, 2015a, p. 21419).

It is also important to note that source control, which at a CCR impoundment could include either capping or excavation, is generally considered to be one of the more effective remedial action approaches. Source control involves removing the hydraulic head from an impoundment (*i.e.*, unwatering and dewatering) in order to prevent the further downward migration of constituents. US EPA has found that "releases from surface impoundments [to groundwater] drop dramatically after closure" (US EPA, 2014a, pp. 5-18 to 5-19). As a result, the implementation of source control often has a more substantial and more immediate effect on groundwater quality improvements than other groundwater corrective measures. In this CMA, source control is paired with other additional groundwater remediation strategies.

It is also important to note that after additional data are collected and the groundwater plume is further delineated, evaluations of interim remedies may be conducted and implemented prior to pond closure.

Interim remedies that are considered may include, but are not limited to, groundwater extraction and other remedial technologies described in this CMA.

3.1 Corrective Measure Alternative Descriptions

Five potential corrective measures were selected for consideration in this CMA. Each corrective measure includes source control based on the CIP scenario (*i.e.*, Closure-in-Place with consolidation). Corrective measures considered in this CMA include Source Control with Monitored Natural Attenuation (Source Control-MNA), Source Control with Groundwater Extraction (Source Control-GE), Source Control with Construction of an Interceptor Trench (Source Control-IT), Source Control with Construction of a Cutoff Wall (Source Control-CW), and Source Control with Construction of a Permeable Reactive Barrier (Source Control-PRB). Each of these corrective measures was evaluated in the CMA for its potential viability at the Site. Under the Source Control-MNA alternative, groundwater concentrations of dissolved constituents would attenuate *via* naturally occurring physical and chemical processes in areas downgradient of the Ash Pond; active monitoring would be performed to verify and document the remediation processes. Under the Source Control-GE alternative, a GE system comprised of groundwater pumping wells would be installed on-Site in order to extract potentially impacted groundwater from the aquifer, helping to contain the contaminant plume and prevent the lateral migration of constituents off-Site. Under the Source Control-IT alternative, an interceptor trench would be constructed on-Site in order to extract potentially impacted groundwater from the aquifer, helping to contain the contaminant plume and prevent the lateral migration of constituents off-Site. Under the Source Control-CW alternative, a trench would be installed on-Site and then filled with a soil-bentonite mixture, creating a low-permeability subsurface barrier to the lateral migration of constituents. Under the Source Control-PRB alternative, a subsurface barrier of reactive materials (*e.g.*, zerovalent iron) would be placed in the path of groundwater flow downgradient of the Ash Pond in order to promote the *in situ* transformation and/or immobilization of CCR-associated constituents.

The performance of each of these corrective measures would necessarily be influenced by the closure activities described in Section 2 (the CAA). However, because the impacts of closure on human health and the environment, engineering reliability, and other factors were already evaluated in Section 2, they were not re-evaluated in this section. Additionally, because the same source control measures would be undertaken at the Site under all of the corrective measure alternatives, the impacts of source control would be the same under all of the alternatives. We have therefore omitted discussion of the impacts of closure-related activities from this section of the report.

This report evaluates the potential performance, reliability, and impacts of various corrective measures at the Edwards Power Plant Site. However, it does not make any judgments regarding the need for these corrective measures at the Site.

Boron, sulfate, and TDS have been identified as potential constituents of concern at the Site; consequently, groundwater corrective measures focus on these constituents.

3.1.1 Source Control with Monitored Natural Attenuation

The United States Environmental Protection Agency (US EPA, 1999) defines MNA as "[t]he reliance on natural attenuation processes (within the context of a carefully controlled and monitored site cleanup approach) to achieve site-specific remediation objectives within a timeframe that is reasonable compared to that offered by other more active methods." MNA relies on naturally occurring physical and chemical processes to immobilize potentially problematic constituents in groundwater and attenuate dissolved concentrations of those constituents. Chemical processes that naturally promote the attenuation of dissolved inorganic constituent concentrations in groundwater include sorption, precipitation, and redox reactions. Physical processes that promote attenuation include dispersion and dilution (US EPA, 2015b). US EPA has determined that MNA can be a viable alternative at sites impacted by inorganic constituents such as metals and metalloids, especially when implemented alongside source control measures (US EPA, 1999, 2015b).

Because MNA relies on natural processes, implementation of the Source Control-MNA alternative would not require the installation, operation, or maintenance of any engineered systems or structures at the Site other than the monitoring well network. Long-term management associated with groundwater monitoring would be undertaken to ensure that attenuation was occurring as planned. Groundwater monitoring would continue until GWPSs were achieved. Following the completion of source control measures, the Source Control-MNA remedy would require 1-2 years to design, construct, and implement. This includes any additional investigations required to characterize Site conditions and additional work related to the design and installation of the groundwater monitoring system.

3.1.2 Source Control with Groundwater Extraction

Under the Source Control-GE alternative, a GE system comprised of groundwater pumping wells would be installed downgradient of the Ash Pond to extract potentially impacted groundwater from the aquifer. Extraction would help contain the contaminant plume and prevent the lateral migration of constituents off-Site. If groundwater monitoring revealed a need for the treatment of extracted groundwater prior to discharge, then a treatment system would also be designed and implemented at the Site. Under this scenario, groundwater captured by the GE system would be discharged to the Illinois River *via* an existing NPDES-permitted outfall.

Site investigations and engineering analyses must be conducted prior to designing a GE system. Additional testing would be required to estimate the number, spacing, screened intervals, and extraction rates for the extraction wells in order to effectively capture impacted groundwater. In total, following the completion of source control measures, the Source Control-GE remedy would require 2-3 years to design and construct. Long-term management of the GE system would include periodic inspections and routine maintenance, including the replacement of worn or damaged parts. Monitoring would also be undertaken to ensure that the GE system was working as intended. Monitoring would continue until GWPSs were achieved.

3.1.3 Source Control with Construction of an Interceptor Trench

Under the Source Control-IT alternative, an interceptor trench would be installed downgradient of the Ash Pond to extract potentially impacted groundwater from the aquifer. Extraction would help contain the contaminant plume and prevent the lateral migration of constituents off-Site. If groundwater monitoring revealed a need for the treatment of intercepted groundwater prior to discharge, then a treatment system would be designed and implemented at the Site. Under this scenario, groundwater captured by the IT would be discharged to the Illinois River *via* an existing NPDES-permitted outfall.

Site investigations and engineering analyses must be conducted prior to designing an IT system. In total, following the completion of source control measures, the Source Control-IT remedy would require 2-3 years to design and construct. Long-term management of the IT system would include periodic inspections and routine maintenance. Monitoring would also be undertaken to ensure that the IT was working as intended. Monitoring would continue until GWPSs were achieved.

3.1.4 Source Control with Construction of a Cutoff Wall

Under the Source Control-CW alternative, a trench would be constructed downgradient of the Ash Pond and filled with a soil-bentonite mixture. This process would create a low-permeability subsurface barrier to the lateral migration of constituents off-Site. The cutoff wall (CW) would extend all the way down to the underlying bedrock, creating a barrier to constituent transport both immediately beneath the impoundment and at depth.

In the absence of additional hydraulic controls, CWs can unintentionally function as subsurface dams, routing groundwater around the wall rather than preventing its lateral migration. In order to ensure that this would not occur at the Edwards Power Plant Site, a series of hydraulic control wells would need to be installed in the vicinity of the CW. These wells would serve as a "hydraulic gradient control system," ensuring that groundwater flowed inward through the wall, rather than flowing outward (thus containing any potentially impacted groundwater behind the wall). If groundwater monitoring revealed a need for the treatment of extracted groundwater prior to discharge, then a treatment system would be designed and implemented at the Site. Under this scenario, groundwater captured by the hydraulic gradient control system would be discharged to the Illinois River *via* an existing NPDES-permitted outfall.

Site investigations and engineering analyses must be conducted prior to designing a CW system. In total, following the completion of source control measures, the Source Control-CW remedy would require 2-3 years to design, construct, and implement. Long-term management under the Source Control-CW alternative would include periodic inspections and routine maintenance of the CW and the hydraulic gradient control system. Monitoring would also be undertaken to ensure that the corrective measure was working as intended. Monitoring would continue until GWPSs were achieved.

3.1.5 Source Control with Construction of a Permeable Reactive Barrier

Under the Source Control-PRB alternative, a subsurface barrier of reactive materials would be placed in the path of groundwater flow in order to promote the *in situ* transformation and/or immobilization of CCR-associated constituents. A permeable barrier would be used so that the barrier would not hinder groundwater flow. At the Edwards Power Plant Site, the PRB would extend all the way down to the underlying bedrock.

One potential reactive material that can effectively immobilize many CCR-associated constituents is zerovalent iron. However, zerovalent iron has not been proven effective for boron (EPRI, 2006).

Site investigations and engineering analyses must be conducted prior to designing a PRB. In total, following the completion of source control measures, the Source Control-PRB remedy would require 2-3 years to design, construct, and implement. Long-term management under the Source Control-PRB alternative would include periodic maintenance and possibly replacement of the reactive media in order to extend the life of the PRB. Monitoring would also be undertaken to ensure that the corrective measure was working as intended. Monitoring would continue until GWPSs were achieved.

3.2 Performance, Reliability, Ease of Implementation, and Potential Impacts of the Corrective Measure Alternative (IAC Section 845.660(c)(1))

3.2.1 Performance of the Corrective Measure Alternative – Controlling the Source (IAC Section 845.660(c)(1))

"Primary source control" refers to means of preventing CCR-associated constituents from leaching from an impoundment into underlying groundwater. Source control would be undertaken at the Site prior to the implementation of any corrective measures, as described in Section 2 (the CAA). Thus, all of the corrective measure alternatives would be equally protective with regard to primary source control, and the infiltration of CCR-associated constituents into groundwater would be greatly reduced following closure. However, impacted soils underlying the impoundments could potentially act as a secondary source of CCR-associated impacts even after closure had occurred. The effectiveness of the various corrective measure alternatives with respect to secondary source control is summarized as follows:

- Under the Source Control-MNA alternative, the attenuation of dissolved constituent concentrations in the subsurface would be achieved through natural processes. MNA relies on a combination of natural physical, chemical, biological, and related processes to mitigate groundwater contaminant migration and achieve groundwater remediation objectives. The groundwater constituents of concern identified for the Site (boron, sulfate, and TDS) are affected by these natural processes in multiple ways and to varying degrees. A detailed assessment of the performance of MNA as a potential groundwater remediation technology for the Site will be included in the CAAA.
- Under the Source Control-GE alternative, extraction wells would be used to capture dissolved constituent concentrations emanating from secondary source areas and prevent the lateral migration of constituents off-Site. GE is a widely used corrective measure. However, its performance can vary from site to site. Although good performance would generally be expected for this alternative, additional Site investigations and engineering analyses may be required to design the GE system.
- Under the Source Control-IT alternative, an interceptor trench would be used to capture dissolved constituent concentrations emanating from secondary source areas and prevent the lateral migration of constituents off-Site. Although good performance would generally be expected for this alternative, performance can vary from site to site. Additional Site investigations and engineering analyses may be required to design the IT.
- Under the Source Control-CW alternative, a low-permeability subsurface barrier would prevent the lateral migration of constituents off-Site. This barrier, which would extend all the way down to the bedrock, would likely be highly effective at preventing lateral constituent migration. Source Control-CW would likely be effective with regard to secondary source control, if the hydraulic control system were designed and operated appropriately. Additional Site investigations and engineering analyses may be required to design the CW and the associated hydraulic control system.
- Under the Source Control-PRB alternative, a PRB would be placed into the path of groundwater flow in order to promote the transformation and immobilization of constituents. The ability of this barrier to prevent the lateral migration of constituents would depend on Site-specific factors, such as Site hydrogeology and geochemical conditions. Moreover, the effectiveness of the barrier would vary by constituent. PRBs generally have limited success at treating boron in

groundwater, for example, which could limit the effectiveness of a PRB at this Site. Additional Site investigations and engineering analyses may be required to design the PRB.

3.2.2 Performance of the Corrective Measure Alternative – Likelihood of Future Releases of CCR (IAC Section 845.660(c)(1))

All of the corrective measures evaluated in this report present the same risks with respect to future releases of CCR, because all of them are assumed to employ the same source control method (Closure-in-Place with consolidation). Section 2.2.2 of the CAA discussed the potential for a sudden release of CCR to occur during or following closure activities at the Ash Pond. That analysis showed that there is minimal risk of sudden CCR releases occurring at the Ash Pond during or following the implementation of Closure-in-Place.

3.2.3 Performance of the Corrective Measure Alternative – Long-Term Management (IAC Section 845.660(c)(1))

The type and degree of long-term management required under each corrective measure is summarized as follows:

- The Source Control-MNA alternative would not require the installation, operation, or maintenance of any engineered systems or structures other than the monitoring well network. Long-term management associated with groundwater sampling would continue until GWPSs had been achieved or until it was determined that the measure was not meeting the requirements of IAC Section 845.670(d).
- Operations and maintenance (O&M) under the Source Control-GE scenario would include routine groundwater sampling and hydraulic gradient monitoring to ensure that the GE system was working as intended. O&M would continue until GWPSs had been achieved or until it was determined that the measure was not meeting the requirements of IAC Section 845.670(d). The GE would need to be regularly inspected and maintained to prevent the fouling and scaling of well screens from impacting the effectiveness of the remedy. Over time, fouling and scaling could potentially create a need for the replacement of individual extraction wells. The Source Control-GE alternative would additionally require the management and discharge of extracted groundwater. Treatment of extracted groundwater may be required prior to discharge.
- O&M under the Source Control-IT scenario would include routine groundwater sampling and hydraulic gradient monitoring to ensure that the IT was working as intended. O&M would continue until GWPSs had been achieved or until it was determined that the measure was not meeting the requirements of IAC Section 845.670(d). The Source Control-IT alternative would additionally require the management and discharge of intercepted groundwater. Treatment of intercepted groundwater may be required prior to discharge.
- O&M under the Source Control-CW scenario would include routine groundwater sampling and periodic maintenance of the CW and the hydraulic gradient control system, including the replacement of worn or damaged parts. The hydraulic gradient control system would need to be regularly inspected and maintained to prevent the fouling and scaling of well screens from impacting the effectiveness of the remedy. Over time, fouling and scaling could potentially create a need for the replacement of individual hydraulic gradient control wells. O&M would continue until GWPSs had been achieved or until it was determined that the measure was not meeting the requirements of IAC Section 845.670(d). The Source Control-CW alternative would

additionally require the management and discharge of groundwater extracted by the hydraulic gradient control system. Treatment of extracted groundwater may be required prior to discharge.

- O&M under the Source Control-PRB scenario would include routine groundwater sampling downgradient of the PRB until GWPSs had been achieved or until it was determined that the measure was not meeting the requirements of IAC Section 845.670(d). The PRB would also be monitored for treatment efficacy. If necessary, the PRB media may need to be amended or exchanged to extend the life of the PRB.

3.2.4 Reliability of the Corrective Measure Alternative – Engineering and Institutional Controls (IAC Section 845.660(c)(1))

The long-term reliability of the corrective measure alternatives is summarized as follows:

- A detailed assessment of the performance of MNA as a potential groundwater remediation technology, relative to the specific groundwater constituents of concern for the Site, will be included in the CAAA. Long-term reliability would be expected for Source Control-MNA, as long as this demonstration determines that the technology is effective for site-related constituents.
- The Source Control-GE alternative would be expected to be reliable over the long term at this Site, as long as the system were designed and constructed for Site-specific conditions. The long-term reliability of this alternative would depend on the management and maintenance of the GE system and (if necessary) the treatment system for extracted groundwater. However, maintenance of these systems would most likely be relatively straightforward to implement and therefore would be unlikely to have a negative impact on the reliability of this alternative.
- The Source Control-IT alternative would be expected to be reliable over the long term at this Site, as long as the system were designed and constructed for Site-specific conditions. The long-term reliability of this alternative would depend on the management and maintenance of the IT and (if necessary) the treatment system for intercepted groundwater. However, maintenance of these systems would most likely be relatively straightforward to implement and therefore would be unlikely to have a negative impact on the reliability of this alternative.
- The Source Control-CW alternative would be expected to be reliable over the long term at this Site, as long as the system were designed and constructed for Site-specific conditions. The long-term reliability of this alternative would depend on the management and maintenance of the hydraulic gradient control system wells and (if necessary) the treatment system for extracted groundwater. However, maintenance of these systems would be expected to be relatively straightforward to implement and therefore would be unlikely to have a negative impact on the reliability of this alternative.
- The Source Control-PRB alternative may not be reliable over the long term at this Site. The reliability of this alternative would depend on Site-specific groundwater hydraulics and geochemical conditions, including the behavior of the constituents of concern. PRBs generally have limited success at treating boron in groundwater. The effectiveness of the PRB would also decrease over time, resulting in a potential need for the eventual replacement of the remedy.

3.2.5 Reliability of the Corrective Measure Alternative - Potential Need for Replacement of the Corrective Measure (IAC Section 845.660(c)(1))

The potential need for the eventual replacement of each corrective measure alternative is summarized as follows:

- A detailed assessment of the performance of MNA as a potential groundwater remediation technology, relative to the specific groundwater constituents of concern for the Site, will be included in the CAAA. Replacement of the remedy would be unlikely for Source Control-MNA, as long as this demonstration determines that the technology is effective for site-related constituents.
- For the Source Control-GE alternative, implementation of the GE system would rely on physical management of the groundwater flow path. Fouling and scaling could reduce the effectiveness of the GE system over time and potentially create a need for the replacement of individual extraction wells. Pump replacement may also be required under this alternative, because groundwater hydraulic controls would need to be maintained on a long-term basis. However, it is unlikely that the entire remedy would need to be replaced. Complete replacement of the remedy would only be necessary if groundwater flow conditions changed significantly at the Site.
- For the Source Control-IT alternative, implementation of the IT would rely on physical management of the groundwater flow path. It is unlikely that this remedy would need to be replaced. Complete replacement of the remedy would only be necessary if groundwater flow conditions changed significantly at the Site.
- For the Source Control-CW alternative, implementation of the CW would rely on physical management of the groundwater flow path. Fouling and scaling could reduce the effectiveness of the hydraulic gradient control system over time and potentially create a need for the replacement of individual hydraulic gradient control wells. Pump replacement may also be required under this alternative, because groundwater hydraulic controls would need to be maintained on a long-term basis. However, it is unlikely that the entire remedy would need to be replaced. Complete replacement of the remedy would only be necessary if groundwater flow conditions changed significantly at the Site.
- PRBs would rely on the chemical treatment of groundwater along the flow path. Given the low effectiveness of PRBs for boron, replacement of the PRB remedy would likely be necessary at this site. Replacement of this remedy would also be necessary if the effectiveness of the PRB declined over time, or if groundwater flow conditions changed at the Site.

3.2.6 Ease of Implementation (IAC Section 845.660(c)(1))

The expected degree of difficulty associated with implementing each corrective measure is summarized as follows:

- The Source Control-MNA alternative would rely entirely on natural processes and therefore should not pose any significant construction challenges. This alternative would only require the installation of monitoring wells.
- Construction under the Source Control-GE alternative would be limited to the installation of extraction wells and monitoring wells. Additional testing would be required to estimate the number, spacing, screened intervals, and extraction rates of the GE system wells for the effective capture of impacted groundwater.

- Construction under the Source Control-IT alternative would be limited to the installation of the IT and monitoring wells. Additional testing would be required to determine the optimal location and depth of the IT system. Specialized trenching equipment may be required.
- Construction of a CW under the Source Control-CW scenario would likely be difficult due to the required length and depth of the CW. Construction of the CW, which would be on the order of 30-50 feet deep, would entail excavating into the low-permeability bedrock unit at the Site and then backfilling the excavated trench. Specialized equipment may be required. Design of the hydraulic gradient control system would require a good understanding of groundwater flow conditions at the Site, including an evaluation of the ability of the system to contain groundwater effectively.
- Construction of the PRB under the Source Control-PRB alternative would likely be difficult due to the required length and depth of the PRB. The PRB would need to be extended down to the low-permeability bedrock unit at the Site, which is approximately 30-50 feet below ground surface.

3.2.7 Potential Impacts – Risks to the Community or the Environment During Implementation of Remedy (IAC Section 845.660(c)(1))

Safety Impacts

Best practices will be employed during construction in order to ensure worker safety and comply with all relevant regulations, permit requirements, and safety plans. However, it is impossible to completely eliminate risks to workers during construction activities. For example, injuries and fatalities can occur due to truck accidents or equipment malfunctions. Truck accidents that occur off-Site can also result in injuries or fatalities to community members. The safety impacts of construction under each corrective measure alternative are summarized as follows:

- The Source Control-MNA alternative would not require the construction of any engineered systems or structures other than monitoring wells. Construction would not be expected to result in any significant negative safety impacts under this alternative.
- A moderate level of construction activity would be required under the Source Control-GE alternative, including the construction of extraction wells and monitoring wells. The construction-related safety impacts of this alternative would likely be modest. Impacts would largely be limited to workers, rather than community members, because construction activities would largely be limited to the Site.
- The construction requirements of the Source Control-IT alternative could be considerable due to the planned extent of construction activities. The Source Control-IT alternative could therefore pose relatively significant construction-related safety risks to workers. Impacts would largely be limited to workers, rather than community members, because construction activities would largely be limited to the Site.
- The construction requirements of the Source Control-CW alternative could be considerable due to the planned extent of construction activities (*i.e.*, excavation and backfilling of an approximately 30 to 50-foot-deep trench). The Source Control-CW alternative could therefore pose relatively significant construction-related safety risks to workers. Impacts would largely be limited to workers, rather than community members, because construction activities would largely be limited to the Site.

- The construction requirements of the Source Control-PRB alternative could be considerable due to the planned extent of construction activities (*i.e.*, excavation of an approximately 30 to 50-foot-deep trench). The Source Control-PRB alternative could therefore pose relatively significant construction-related safety risks to workers. Impacts would largely be limited to workers, rather than community members, because construction activities would largely be limited to the Site.

Cross-Media Impacts to Air

Diesel emissions are a major source of air pollutants and GHG emissions at construction sites. Corrective measures that require a high level of construction activity relative to alternatives will result in relatively large air impacts in the form of diesel emissions. The Source Control-MNA alternative would be expected to have minimal air impacts, because it would not require the construction of any engineered systems or structures other than monitoring wells. The Source Control-GE alternative would be expected to have moderate air impacts, because it would have modest construction requirements. The Source Control-IT, Source Control-CW, and Source Control-PRB alternatives would be expected to have the most considerable air impacts across all evaluated corrective measures, because these alternatives are associated with the most significant construction requirements.

Cross-Media Impacts to Surface Water and Sediments

Due to erosion and runoff, construction can have short-term negative impacts on the surface water and sediment quality immediately adjacent to a site. Minimal surface water or sediment impacts due to erosion and runoff would be expected during construction under the Source Control-MNA alternative, because it would not require the construction of any engineered systems or structures other than monitoring wells. In contrast, the Source Control-GE, Source Control-IT, Source Control-CW, and Source Control-PRB alternatives could have short-term negative impacts on the Illinois River due to erosion and sediment runoff during construction. These impacts would likely be greater under the Source-Control-IT, Source Control-CW, and Source Control-PRB alternatives than under the Source Control-GE alternative, due to the greater extent and duration of construction activities required for the former alternatives relative to the latter alternative.

Under the Source Control-GE, Source Control-IT, and Source Control-CW alternatives, extracted and/or intercepted groundwater would be discharged to the Illinois River *via* an existing NPDES-permitted outfall. If necessary, extracted and/or intercepted groundwater would be treated prior to discharge in order to ensure compliance with water quality standards. Thus, no surface water or sediment impacts would be expected under any of the corrective measure alternatives due to the permitted discharge of extracted and/or intercepted groundwater into the Illinois River.

Control of Exposure to Any Residual Contamination During Implementation of the Remedy

Under all evaluated corrective measures, risks to workers arising from potential contact with CCR, impacted soils, or impacted groundwater during construction, operation, and maintenance activities would be managed through the use of rigorous safety protocols and personal protective equipment.

Other Identified Impacts

In addition to safety impacts, cross-media impacts, and the potential for workers to be exposed to residual contamination, construction activities can also have significant energy demands and cause nuisance impacts such as traffic and noise. Moreover, construction can have temporary negative impacts on the scenic, historical, and recreational value of areas near the Site, as well as nearby natural resources and habitat. There are no historical sites in the immediate vicinity of the Ash Pond; thus, no impacts to historical areas are expected under any of the evaluated corrective measures. However, the Illinois River has scenic and recreational value, and also provides habitat for many species. For each corrective measure alternative, the potential magnitude of the construction-related impacts described above is likely to be proportional to the expected duration and intensity of the construction activities that are required under that corrective measure alternative. Because the Source Control-MNA alternative would not require any significant construction activity, the construction-related impacts listed above would not be a concern under this alternative. In contrast, modest construction-related impacts would be expected under the Source Control-GE alternative. The most significant construction-related impacts would likely to occur under the Source Control-CW and Source Control-PRB alternatives, both of which potentially require the construction of an approximately 30 to 50-foot-deep earthen trench.

3.3 The Time Required to Begin and Complete the Corrective Action Plan (IAC Section 845.660(c)(2))

IAC Section 845.670 states that a Corrective Action Plan must be submitted to the Agency within 1 year of submission of a CMA. We do not anticipate that any delays will occur in the completion of a Corrective Action Plan for this Site. Work will begin on the Corrective Action Plan following the completion of a public meeting, which will be held in May 2022.

3.4 State or Local Permit Requirements or Other Environmental or Public Health Requirements that May Substantially Affect Implementation of the Corrective Action Plan (IAC Section 845.660(c)(3))

All of the evaluated corrective measures would require regulatory approvals prior to implementation. The Source Control-GE, Source Control-IT, and Source Control-CW alternatives may also require modifications to the Site's existing NPDES permit in order to manage groundwater extracted by the GE system (Source Control-GE alternative), intercepted by the IT (Source-Control-IT alternative), or extracted by the hydraulic gradient control system (Source Control-CW alternative). However, these requirements would not be expected to substantially affect the implementation of the Corrective Action Plan.

3.5 Summary

Table S.2 evaluates the corrective measures included in this CMA with regards to each of the factors specified under IAC Section 845.660(c) (IEPA, 2021a). Based on this evaluation and the details provided in Section 3 of this report, four corrective measures have been identified as potentially viable technologies for further consideration in the CAAA pursuant to IAC Section 845.670: Source Control-MNA, Source Control-GE, Source Control-IT, and Source Control-CW. These technologies may be combined in different manners to potentially address different zones of groundwater impacts (*i.e.*, near-field *vs*. far-field) and different constituents. For example, MNA combined with one of the other remedies may be a more optimal approach than relying on just a single remedial technology. The fifth corrective measure evaluated in this CMA, Source Control-PRB, is not being retained for further evaluation in the CAAA because PRBs have not been proven effective for or boron in groundwater, construction of the PRB would likely be difficult due to its required length and depth, and a PRB would have relatively large impacts on worker safety, air quality, and potentially surface water quality and sediment quality due to the substantial construction activities required.

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Attachment A

Human Health and Ecological Risk Assessment

Draft

Human Health and Ecological Risk Assessment
Ash Pond
Edwards Power Plant
Bartonville, Illinois

April 25, 2022

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Abbreviations

ADI	Acceptable Daily Intake
AP	Ash Pond
BCF	Bioconcentration Factor
BCG	Biota Concentration Guide
BCU	Bedrock Confining Unit
CAA	Closure Alternatives Assessment
CCR	Coal Combustion Residual
CEM	Conceptual Exposure Model
COI	Constituent of Interest
COPC	Constituent of Potential Concern
CSF	Cancer Slope Factor
CSM	Conceptual Site Model
EPP	Edwards Power Plant
ESV	Ecological Screening Value
GWPS	Groundwater Protection Standard
GWQS	Groundwater Quality Standards
HTC	Human Threshold Criteria
IAC	Illinois Administrative Code
IEPA	Illinois Environmental Protection Agency
ILWATER	Illinois Water and Related Wells
IPRG	Illinois Power Resources Generating, LLC
ISGS	Illinois State Geological Survey
MCL	Maximum Contaminant Level
NOEC	No Observed Effect Concentration
NPDES	National Pollutant Discharge Elimination System
NRWQC	National Recommended Water Quality Criteria
ORNL RAIS	Oak Ridge National Laboratory's Risk Assessment Information System
PMP	Potential Migration Pathway
PRG	Preliminary Remediation Goal
RfD	Reference Dose
RME	Reasonable Maximum Exposure
RSL	Regional Screening Level
SWQS	Surface Water Quality Standards
TEC	Threshold Effect Concentration
UA	Uppermost Aquifer
UCF	Upper Cahokia Formation
US DOE	United States Department of Energy
US EPA	United States Environmental Protection Agency
USGS	United States Geological Survey

1 Introduction

The Edwards Power Plant (EPP or "the Site") is an electric power-generating facility with coal-fired units located in Peoria County, Illinois, between Mapleton and Bartonville. The facility is owned by Illinois Power Resources Generating, LLC (IPRG), and began operations in 1960. The EPP has one surface impoundment for storage of coal combustion residuals (CCR) known as the Ash Pond (AP), which covers approximately 91 acres (Ramboll, 2021). The EPP Ash Pond (Illinois Environmental Protection Agency [IEPA] ID No. W1438050005-01) is planned to commence closure by the end of 2022 and is the subject of this report.

This report presents the results of an evaluation that characterizes potential risk to human and ecological receptors that may be exposed to CCR constituents in environmental media potentially impacted by the AP. This risk evaluation was performed to support the Closure Alternatives Assessment (CAA) for the AP in accordance with requirements in Title 35 Part 845 of the Illinois Administrative Code (IAC) (IEPA, 2021a). Human and ecological risks were evaluated for Site-specific constituents of interest (COIs). The conceptual site model (CSM) assumed that Site-related COIs in groundwater may migrate to the Illinois River and affect surface water and sediment in the vicinity of the Site.

Consistent with United States Environmental Protection Agency (US EPA) guidance (US EPA, 1989), this report used a tiered approach to evaluate potential risks, which included the following steps:

1. Identify complete exposure pathways and develop a conceptual exposure model (CEM).
2. Identify Site-related COIs: Constituents detected in groundwater were considered COIs if their maximum detected concentration over the period from 2015 to 2021 exceeded a groundwater protection standard (GWPS), identified in Part 845.600 (IEPA, 2021a), or relevant surface water quality standards (SWQS) (IEPA, 2019; US EPA Region IV, 2018).
3. Perform screening-level risk analysis: Compare maximum measured or modeled COI concentrations in surface water and sediment to conservative, health-protective benchmarks to determine constituents of potential concern (COPCs).
4. Perform refined risk analysis: If COPCs are identified, perform a refined analysis to evaluate potential risks associated with the COPCs.
5. Formulate risk conclusions and discuss any associated uncertainties.

This assessment relies on a conservative (*i.e.*, health-protective) approach and is consistent with the risk approaches outlined in US EPA guidance. Specifically, Gradient considered evaluation criteria detailed in IEPA guidance documents (*e.g.*, IEPA, 2013, 2019), incorporating principles and assumptions consistent with the Federal CCR Rule (US EPA, 2015a) and US EPA's "Human and Ecological Risk Assessment of Coal Combustion Residuals" (US EPA, 2014).

Based on the evaluation presented in this report, no unacceptable risks to human and ecological receptors resulting from CCR exposures associated with the AP were identified. Specific risk assessment results include the following:

- No completed exposure pathways were identified for any groundwater receptors; consequently, no risks were identified relating to the use of groundwater.
- No unacceptable risks were identified for recreators swimming or boating in the Illinois River adjacent to the Site.
- No unacceptable risks were identified for recreators exposed to sediment in the Illinois River adjacent to the Site.
- No unacceptable risks were identified for anglers consuming locally caught fish.
- No unacceptable risks were identified for ecological receptors exposed to surface water or sediment.
- No bioaccumulative ecological risks were identified.

It should be noted that this evaluation incorporates a number of conservative assumptions that tend to overestimate exposure and risk. Moreover, it should be noted that because current conditions do not present a risk to human health or the environment, there will also be no unacceptable risk to human health or the environment for future conditions when the AP is closed. For all future closure scenarios, potential releases of CCR-related constituents will decline over time and, consequently, potential exposures to CCR-related constituents in the environment will also decline.

2 Site Overview

2.1 Site Description

The EPP is located in Peoria County, Illinois, between Mapleton and Bartonville, in a predominantly agricultural area. The EPP is bordered by a salt processing facility to the north, railroad right-of-way and former Orchard Mines to the west, the Illinois River and fertilizer production facility to the east, and agricultural land to the south (Figure 2.1) (Ramboll, 2021). The Illinois River flows adjacent to the facility from north to south (Figure 2.1). The AP discharges to the Illinois River under a National Pollutant Discharge Elimination System (NPDES) permit (Ramboll, 2021).

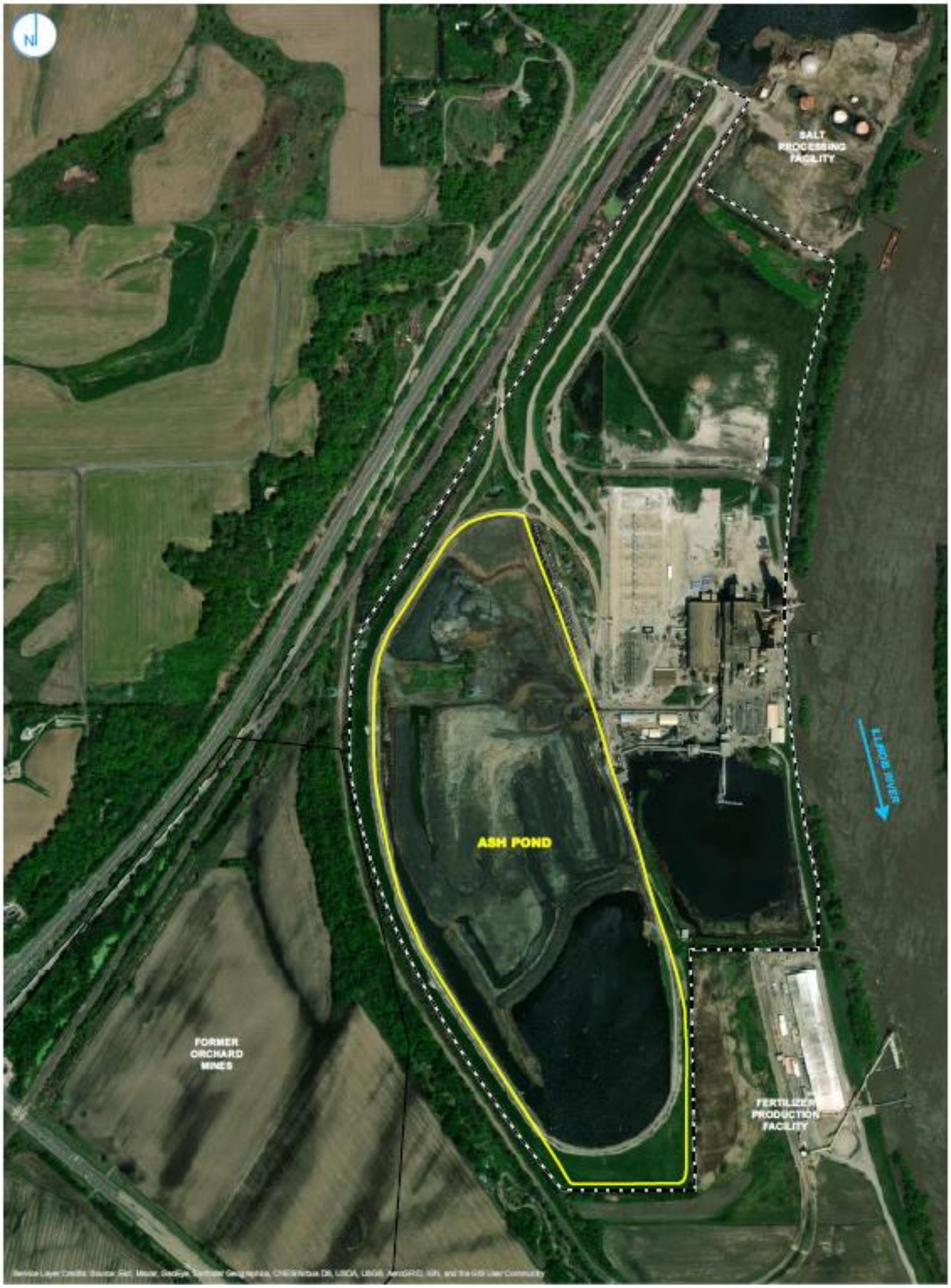

Figure 2.1 Site Location Map. Source: Ramboll (2021).

2.2 Geology/Hydrogeology

The geology underlying the Site in the vicinity of the AP primarily consists of unlithified deposits of the Cahokia Formation, underlain by a thick shale bedrock (Ramboll, 2021). The uppermost aquifer (UA) has been identified as the Lower Cahokia Formation (LCF) and saturated portions of the Upper Cahokia Formation (UCF) (Ramboll, 2021). The underlying shale has been identified as a bedrock confining unit (BCU) (Ramboll, 2021).

The UCF consists of low-permeability clays and silts, as well as discontinuous lenses of sand, sandy clay to clayey sand, and sandy silt. The saturated and unconfined sandy lenses within the UCF have been identified as Potential Migration Pathways. The thickness of the UCF ranges between 5 and 40 feet (ft) in the vicinity of the AP (Ramboll, 2021). The LCF consists of coarse materials of sand and gravel directly overlying the bedrock. The UA includes the LCF and, where saturated, portions of the UCF (Ramboll, 2021). The UA is primarily composed of moderately permeable sands and clayey gravels with a geometric mean horizontal hydraulic conductivity of 1.6×10^{-4} centimeters per second (cm/s) (Ramboll, 2021). Horizontal hydraulic gradients calculated for the UA range from 0.001 to 0.004 ft/ft (Ramboll, 2021). The bottom of the UA (*i.e.*, LCF) overlies the shale BCU. This confining layer consists of very low-permeability shales and siltstones with interbedded sandstone. The BCU has a geometric mean horizontal hydraulic conductivity of 3.2×10^{-6} cm/s (Ramboll, 2021), approximately two orders of magnitude lower than the overlying UA.

The alluvial soils of the UA are limited to areas immediately adjacent to and underlying the Illinois River and are located in north-south orientation parallel to the river (Ramboll, 2022a). In the area immediately underlying the AP, a thick layer of low-permeability clays associated with the UCF has been observed (Ramboll, 2022a). This clay layer restricts the migration of groundwater from the saturated deposits underlying the AP into the surrounding areas. West of the AP, the elevation of the ground surface increases and, correspondingly, the elevation of the shale BCU also increases. Based on regional information, alluvial soils are not expected to occur in the areas west of US Highway 24 (Ramboll, 2022).

Groundwater flow within the UA occurs in both a northward and southward direction along the orientation of the UA, parallel to the river (Figure 2.2). The Illinois River recharges groundwater (*i.e.*, surface water flows into groundwater) throughout much of the area surrounding the EPP. Due to the hydraulic influence of the AP, a groundwater mound (*i.e.*, piezometric maximum) is located underneath the AP. This mound facilitates groundwater flow in both a northward and southward direction (Figure 2.2). Moreover, the groundwater mound associated with the AP may have resulted in a localized area in which groundwater flows in an easterly direction to the Illinois River. This easterly groundwater flow component and potential groundwater interaction with surface water in the Illinois River is expected to be eliminated after pond closure when the hydraulic head in the AP is removed. Because the shale BCU is elevated in the areas west of the AP and alluvial soils are not expected to occur west of the AP past US Highway 24, there is expected to be only a limited groundwater flow component from areas underlying the AP toward the west.

Figure 2.2 Groundwater Elevation in Uppermost Aquifer - February 2021. Source: Ramboll (2021).

2.3 Conceptual Site Model

A CSM describes sources of contamination, the hydrogeological units, and the physical processes that control the transport of water and solutes. In this case, the CSM describes how groundwater underlying the AP migrates and potentially interacts with surface water and sediment in the adjacent Illinois River. The CSM was developed using available hydrogeologic data specific to the AP (Ramboll, 2021), including information on groundwater flow and surface water characteristics.

CCR-related constituents from the AP may migrate vertically downward and into groundwater. Once in groundwater, these constituents may migrate northward and southward consistent with the primary groundwater flow directions. Based on groundwater modeling and groundwater monitoring conducted at the Site, and because of the low-permeability clays underlying the AP, no CCR-related constituents from the AP have migrated off of the EPP property to the north or the south in excess of their GWPS (Figure 2.3). Some CCR-constituents may migrate eastward to the Illinois River, as a result of the groundwater mound caused by the AP. As a result, dissolved constituents in groundwater may partition between river sediments and Illinois River surface water.

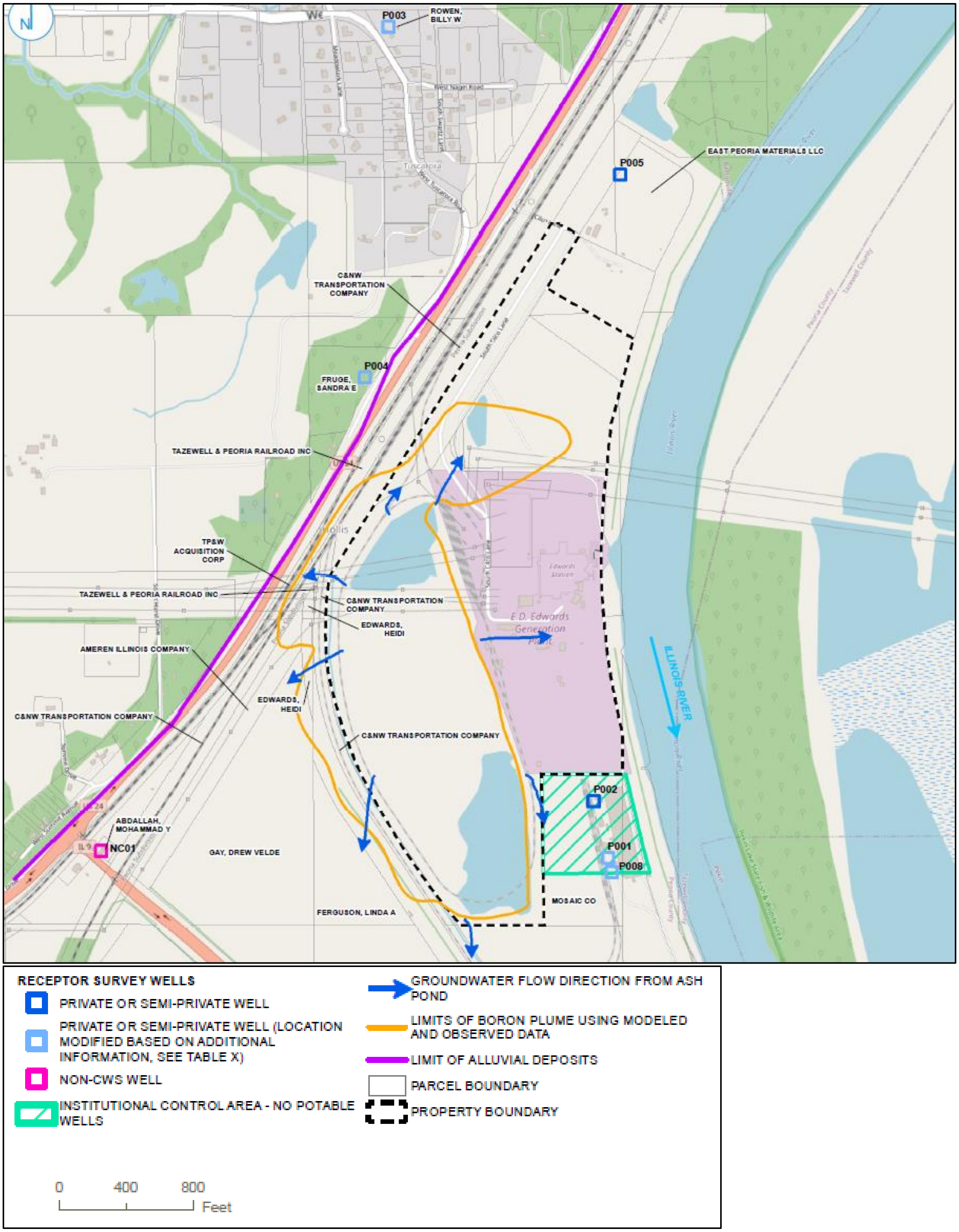

Figure 2.3 Modeled and Observed Extent of Boron in Groundwater and Water Wells Identified in Receptor Survey. Source: Ramboll (2022b).

2.4 Groundwater Monitoring

A total of 28 wells have been used to monitor the groundwater quality near and downgradient of the AP. Of these, 18 wells are screened in the UA, 8 are screened in the UCF, and 3 are screened in the BCU (Table 2.1) (Ramboll, 2021). The analyses presented in this report relied on all available data from the 28 wells collected between 2015 and 2021, which is the period subsequent to the promulgation of the Federal CCR Rule. Groundwater samples were analyzed for a suite of total metals, specified in Illinois CCR Rule Part 845.600 (IEPA, 2021a).[1] A summary of the groundwater data used in this risk evaluation is presented in Table 2.2. The AP well locations are shown in Figure 2.4. Note that there are additional wells located within the boundary of the AP and screened in pore water, that were not used in this risk analysis because they are not reflective of groundwater. The use of groundwater data in this risk evaluation does not imply that any detected constituents are associated with the AP or that they have been identified as potential groundwater exceedances.

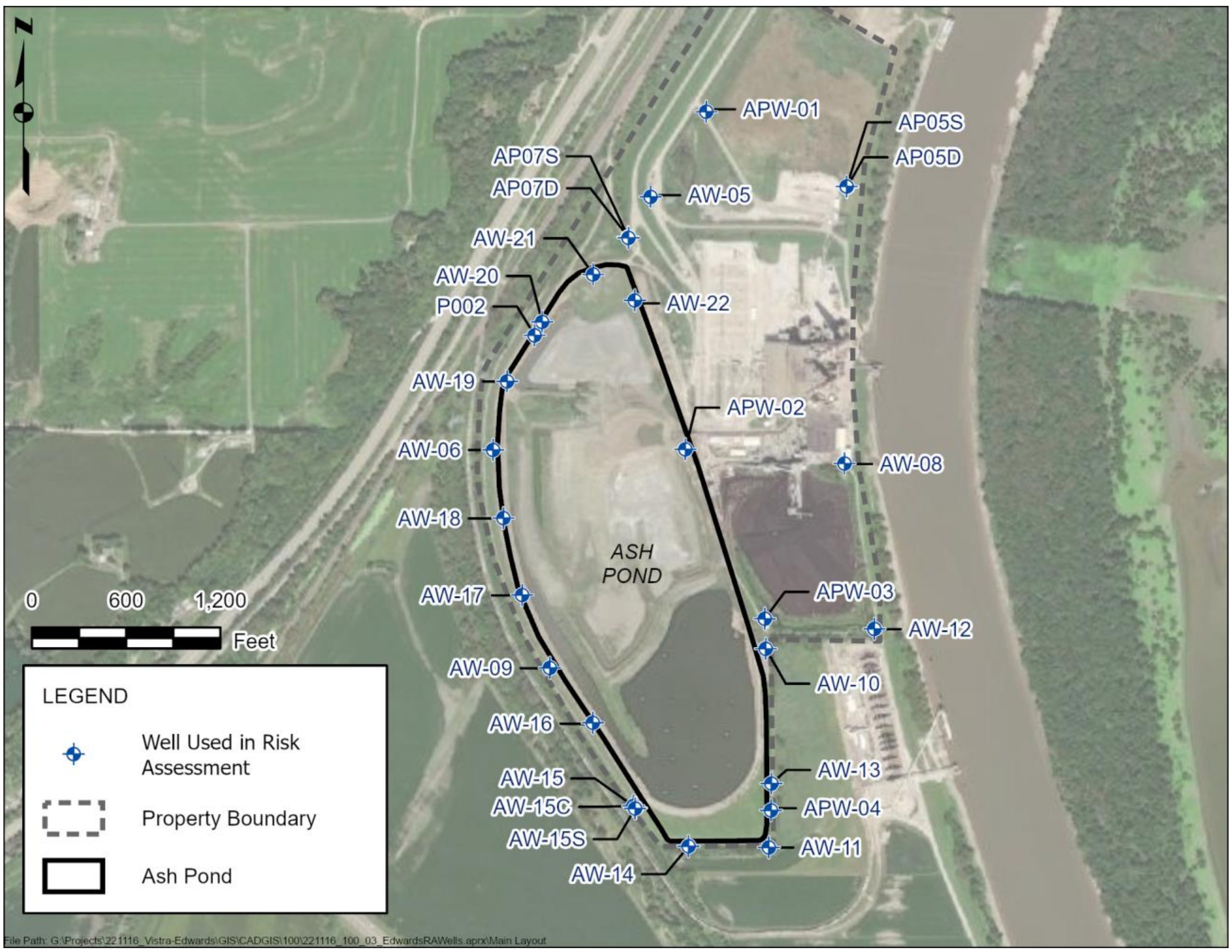

Figure 2.4 Monitoring Well Locations. Source: Ramboll (2021).

[1] Samples were analyzed for a longer list of inorganic constituents and general water quality parameters (chloride, fluoride, sulfate, and total dissolved solids), but these constituents were not evaluated in the risk evaluation.

Table 2.1 Groundwater Monitoring Wells Related to Edwards Ash Pond

Well	Hydrogeologic Unit	Date Constructed	Screen Top Depth (ft bgs)	Screen Bottom Depth (ft bgs)	Well Depth (ft bgs)
AP05S	UA	11/29/2016	32.87	37.64	38.06
AP05D	BCU	12/05/2016	47.09	56.69	57.17
AP06[a]	UCF	11/30/2016	19.93	24.72	25.00
AP07S	UCF	12/02/2016	29.95	34.74	35.00
AP07D	BCU	12/08/2016	55.01	64.59	65.00
APW-01	UCF	07/27/2010	7.60	18.00	18.00
APW-02	UCF	07/20/2010	39.60	50.00	50.00
APW-03	UCF	07/19/2010	19.60	30.00	30.00
APW-04	UCF	07/27/2010	9.60	20.00	20.00
AW-05	UA	07/22/2015	15.87	20.47	21.10
AW-06	UA	08/03/2015	36.60	41.09	41.69
AW-08	UA	07/21/2015	47.55	57.19	57.70
AW-09	UA	08/03/2015	47.14	51.62	52.23
AW-10	UA	07/23/2015	27.62	32.23	32.74
AW-11	UA	07/28/2015	24.21	28.81	29.31
AW-12	UA	01/07/2021	26.00	31.00	31.00
AW-13	UA	01/09/2021	25.00	30.00	30.00
AW-14	UA	01/08/2021	24.00	29.00	29.00
AW-15	UA	01/08/2021	33.00	38.00	38.00
AW-15C	BCU	01/08/2021	43.00	48.00	48.00
AW-15S	UCF	01/08/2021	8.00	18.00	18.00
AW-16	UA	01/08/2021	55.00	60.00	60.00
AW-17	UA	01/08/2021	51.00	56.00	56.00
AW-18	UA	01/09/2021	46.00	51.00	51.00
AW-19	UA	01/09/2021	35.00	40.00	40.00
AW-20	UA	01/10/2021	36.50	41.50	41.50
AW-21	UA	01/10/2021	32.00	37.00	37.00
AW-22	UA	01/08/2021	44.00	49.00	49.00
P002	UCF	--	30.60	35.60	35.90

Notes:
Source: Ramboll (2021).
-- = Data Unavailable; BCU = Bedrock Confining Unit; bgs = Below Ground Surface; ft = Feet; UA = Uppermost Aquifer; UCF = Upper Cahokia Formation.

Table 2.2 Groundwater Data Summary

Constituent	Samples with Constituent Detected	Samples Analyzed	Minimum Detected Value	Maximum Detected Value	Maximum Detection Limit
Total Metals (mg/L)					
Antimony	4	229	0.003	0.0045	0.003
Arsenic	228	253	0.001	0.097	0.02
Barium	253	253	0.062	8.6	0.02
Beryllium	29	253	0.00085	0.017	0.001
Boron	260	260	0.047	12	0.4
Cadmium	14	229	0.0011	0.004	0.001
Chromium	93	253	0.004	0.59	0.004
Cobalt	141	253	0.002	0.29	0.002
Lead	109	253	0.001	0.27	0.001
Lithium	179	253	0.011	0.85	0.02
Mercury	8	229	0.00021	0.0018	0.0002
Molybdenum	211	253	0.001	0.046	0.002
Selenium	57	253	0.001	0.019	0.004
Thallium	5	229	0.0012	0.0026	0.001
Radionuclides (pCi/L)					
Radium-226+228	252	252	0	23	1.93
Other (mg/L)					
Chloride	260	260	5.2	830	250
Fluoride	128	260	0.25	10.2	2.5
Sulfate	181	260	1	570	250
Total Dissolved Solids	260	260	390	2,600	34

Note:
Source: Ramboll (2021).
pCi/L = PicoCuries Per Liter.

2.5 Surface Water Sampling

One surface water sample was collected from the Illinois River in 2017, as part of the Antidegradation Alternatives Analysis (Foth Infrastructure & Environment, LLC, 2017). The sample was collected from the "River Inlet," located approximately 1,000 feet north (upstream) of the AP outfall to the river (Figure 2.5, Table 2.3) (Foth Infrastructure & Environment, LLC, 2017). It should be noted that although this sample location is due east of the northern end of the AP, it was not collected specifically to examine the potential impact of the AP on the Illinois River. Data from this sample are included in this report for completeness; however, due to the lack of upstream and downstream samples, results from this sample are insufficient to evaluate the potential impact of the AP on the surface water quality conditions in the Illinois River. Instead, the potential impact of groundwater flowing from the UA to the Illinois River was modeled to predict potential surface water effects resulting from the AP (Section 3.3.3). These model-predicted surface water concentrations were used in this evaluation to assess potential risk to surface water receptors.

Figure 2.5 Surface Water Sampling Location. Source: Foth Infrastructure & Environment, LLC (2017, Figure 1).

Table 2.3 Surface Water Data Summary

Constituent	Detected Concentration (mg/L)
Total Metals	
Arsenic	0.0025
Barium	0.080
Boron	0.097
Cadmium	0.00023
Chromium	0.0073
Copper	0.0063
Iron	4.2
Lead	0.0049
Manganese	0.11
Mercury	0.000015
Nickel	0.0060
Selenium	0.0012
Silver	0.000028
Zinc	0.033
Other	
Chloride	100
Fluoride	0.23
Sulfate	65
Total Dissolved Solids	534

Notes:
Source: Foth Infrastructure & Environment, LLC (2017).
Sample collected from the River Inlet location on February 13, 2017.

3 Risk Evaluation

3.1 Risk Evaluation Process

A risk evaluation was conducted to determine whether constituents present in groundwater underlying and downgradient of the AP have the potential to pose adverse health effects to human and ecological receptors. The risk evaluation is consistent with the principles of risk assessment established by US EPA and has considered evaluation criteria detailed in Illinois guidance documents (*e.g.*, IEPA, 2013, 2019).

The general risk evaluation approach is summarized in Figure 3.1 and discussed below.

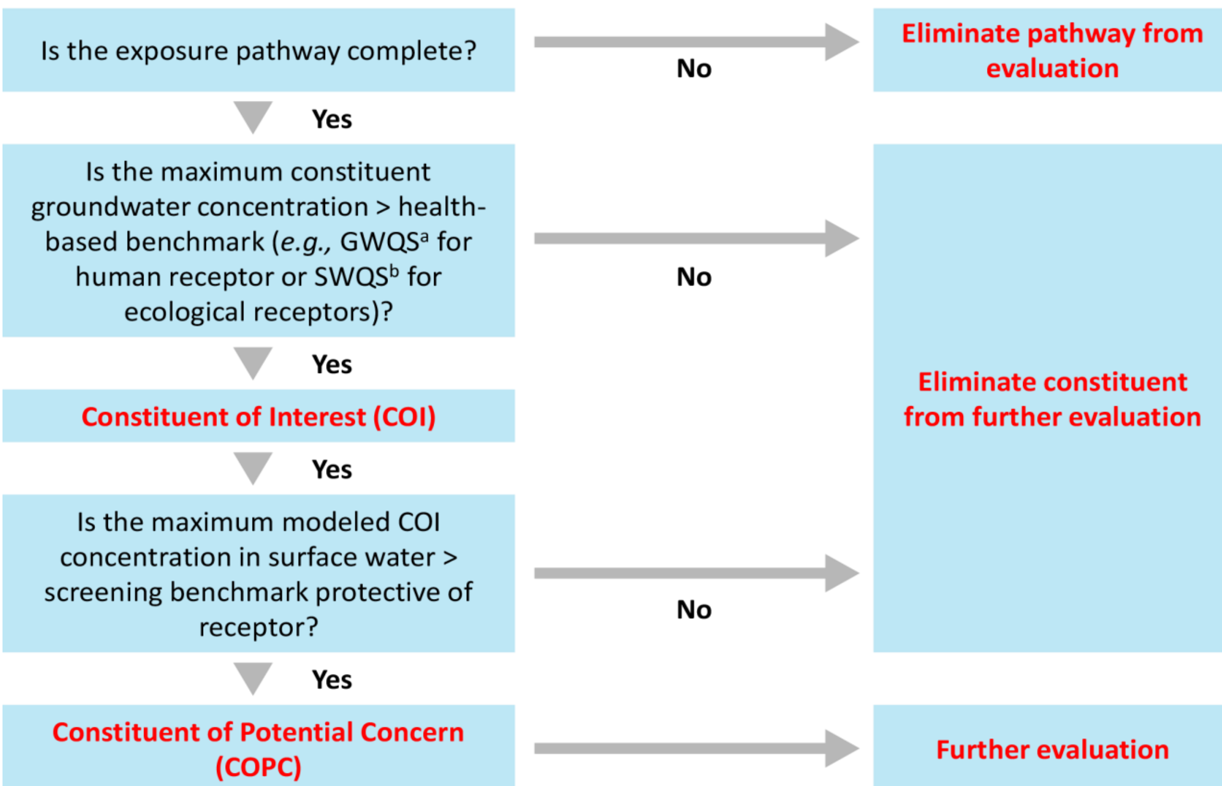

Figure 3.1 Overview of Risk Evaluation Methodology. GWQS = Groundwater Quality Standard; IEPA = Illinois Environmental Protection Agency; SWQS = Surface Water Quality Standard.
(a) The IEPA Part 845 GWPS were used to identify COIs.
(b) IEPA SWQS protective of chronic exposures to aquatic organisms were used to identify ecological COIs. In the absence of SWQS, US EPA Region IV Ecological Screening Values (ESV) were used.

The first step in the risk evaluation was to develop the CEMs and identify complete exposure pathways. All potential receptors and exposure pathways based on groundwater use and surface water use in the vicinity of the Site were considered. Exposure pathways that are incomplete were excluded from the evaluation.

Groundwater data were used to identify COIs. COIs were identified as constituents with maximum concentrations in groundwater in excess of groundwater quality standards (GWQS)[2] for human receptors and SWQS for ecological receptors. Based on the CSM (Section 2.2), groundwater flows in both a northward and southward direction along the orientation of the LCF/UA, parallel to the river. In the area immediately underlying the AP, a thick layer of low-permeability clays associated with the UCF has been observed (Ramboll, 2022a). This clay layer restricts groundwater migration from the saturated deposits underlying the AP to the surrounding areas. A groundwater mound associated with operation of the AP may cause a localized zone where groundwater flows in an easterly direction into the Illinois River. This easterly groundwater flow component and potential groundwater interaction with surface water in the Illinois River is expected to be eliminated after pond closure when the hydraulic head in the AP is removed. There is expected to be only a limited groundwater flow component from areas underlying the AP toward the west.

One surface water sample was collected from the Illinois River adjacent to the Site; however, sediment samples have not been collected from the river. Gradient modeled the potential migration of COIs from groundwater to surface water and sediment to evaluate potential risks to receptors (see Section 3.3.3).

Gradient modeled the COI concentrations in surface water and sediment based on the groundwater data from the AP-related wells. The measured and modeled COI concentrations in surface water and sediment were compared to conservative, generic risk-based screening benchmarks for human health and ecological receptors. These generic screening benchmarks rely on default assumptions with limited consideration of site-specific characteristics. Human health benchmarks are receptor-specific values calculated for each pathway and environmental medium that are designed to be protective of human health. Ecological benchmarks are medium-specific values designed to be protective of all potential ecological receptors exposed to surface water. Ecological and human health screening benchmarks are inherently conservative because they are intended to screen out chemicals that are of no concern with a high level of confidence. Therefore, a measured or modeled COI concentration exceeding a screening benchmark does not indicate an unacceptable risk; it only indicates that further risk evaluation is warranted. COIs with maximum concentrations exceeding a conservative screening benchmark are identified as COPCs requiring further evaluation.

As described in more detail below, this evaluation relied on the screening assessment to demonstrate that constituents present in groundwater underlying the AP do not pose an unacceptable human health or ecological risk. That is, after the screening step, no COPCs were identified and further assessment was not warranted.

3.2 Human and Ecological Conceptual Exposure Models

A CEM provides an overview of the receptors and exposure pathways requiring risk evaluation. The CEM describes the source of the contamination, the mechanism that may lead to a release of contamination, the environmental media to which a receptor may be exposed, the route of exposure (exposure pathway), and the types of receptors that may be exposed to these environmental media.

[2] As discussed further in Section 3.3.2, groundwater quality standards are protective of human health and not necessarily of ecological receptors. While ecological receptors are not exposed to groundwater, groundwater can potentially enter into the adjacent surface water and impact ecological receptors. Therefore, two sets of COIs were identified: one for humans and another for ecological receptors.

3.2.1 Human Conceptual Exposure Model

The human CEM for the Site depicts the relationships between the off-site environmental media potentially impacted by constituents in groundwater and the human receptors that could be exposed to these media. Figure 3.2 presents a human CEM for the Site. It considers a human receptor who could be exposed to COIs hypothetically released from the AP into groundwater, surface water, sediment, and fish. The following human receptors and exposure pathways were evaluated for inclusion in the Site-specific CEM:

- Residents – exposure to groundwater/surface water as drinking water
- Residents – exposure to groundwater/surface water used for irrigation
- Recreators in the river near the Site:
  - Boaters – exposure to surface water and sediment while boating
  - Swimmers – exposure to surface water and sediment while swimming
  - Anglers – exposure to surface water and sediment and consumption of locally caught fish

All of these exposure pathways were considered to be complete except for residential exposure to groundwater or surface water used for drinking water or irrigation. Section 3.2.1.1 explains why the residential drinking water and irrigation pathways are incomplete, and Section 3.2.1.2 provides additional description of the recreational exposures.

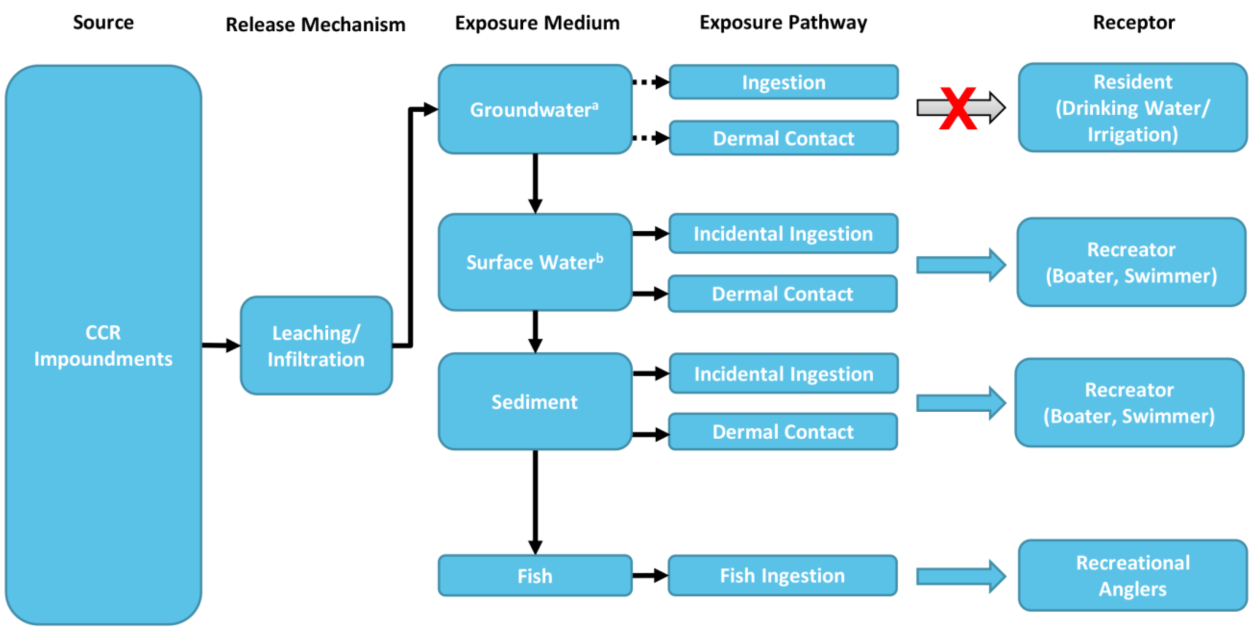

Figure 3.2 Human Conceptual Exposure Model. CCR = Coal Combustion Residual. Dashed line/Red X = Incomplete or Insignificant Exposure Pathway.
(a) Groundwater in the vicinity of the Site is not used as a drinking water or irrigation source.
(b) Surface water is not used as a drinking water source.

3.2.1.1 Groundwater or Surface Water as a Drinking Water/Irrigation Source

Groundwater as a source of drinking water and/or irrigation water is not a complete exposure pathway for CCR-related constituents originating from the AP. Based on groundwater modeling and groundwater monitoring conducted at the Site, and because of the low-permeability clays underlying the AP, no CCR-related constituents from the AP have migrated off of the EPP property to the north or the south in excess of their GWPS (Figure 2.3). Additionally, a summary of the evidence, presented below, supports the conclusion that there are no residential uses of groundwater that could be impacted as a result of the AP. Furthermore, Illinois River surface water is not used as a source of drinking water in the area.

- **There are no groundwater users near the EPP in areas where groundwater could be impacted due to the AP.** Relying on federal and state databases, Ramboll completed a potable water well survey in 2021 (Ramboll, 2021). A total of 7 wells were identified proximate to the EPP during a comprehensive search of the Illinois State Geological Survey's (ISGS) Illinois Water and Related Wells (ILWATER) Map (ISGS, 2020; Ramboll, 2021) (Figure 2.3). All of these wells are either in areas where groundwater is not expected to be impacted by the AP or are industrial wells that are not used for domestic purposes (Ramboll, 2021). Specific information pertaining to each well identified in the receptor survey is provided below.
  - Well P004: This is a residential well located on the bluff above the Illinois River, north of the AP. The well is 65 feet deep and screened in the shale bedrock (ISGS, 1978). The shale bedrock is a hydrostratigraphic unit that has a limited hydraulic connection to the UCF and LCF soil deposits located on the EPP property. Based on topographic maps, the ground surface elevation at the well is approximately 480 ft msl (based on NAVD88)[3] (USGS, 2017). Thus, the bottom of P004 is located at an elevation of approximately 415 ft msl (570 ft minus 65 ft). The well log indicates that the bedrock was encountered at a depth of 30 feet (ISGS, 1978), which is at an elevation of 450 ft msl (480 ft minus 30 ft). Additionally, the well log indicates that groundwater was encountered at a depth of 37 feet below the top casing (which is 36 feet below ground surface [ft bgs]; ISGS, 1978). Thus, the groundwater elevation at P004 is 444 ft msl (480 ft minus 36 ft). Because the groundwater elevation is below the depth of the bedrock, the unlithified soils at P004 are unsaturated (*i.e.*, there is no alluvial aquifer at P004). Additionally, the measured groundwater elevation at P004 (444 ft msl) is higher than the measured groundwater elevations at AW-05 and APW-01 (approximately 435 ft msl; Figure 2.2), which are the closest monitoring wells to P004, and are screened in unlithified soils of the UCF and LCF. Thus, it is impossible for any groundwater impacts associated with the AP to impact groundwater quality at well P004.
  - Well P003: This is a residential well located to the north of the EPP. The well is 43 feet deep and screened in clay (ISGS, 1969). Based on topographic maps, the ground surface elevation at the well is approximately 570 ft msl (based on NAVD88) (USGS, 2017); thus, the bottom of P003 is located at an elevation of approximately 527 ft msl (570 ft minus 43 ft). Because groundwater underlying the AP is located at an elevation of approximately 430 to 440 ft msl (Figure 2.2; *i.e.*, 87 to 97 ft lower than P003), it is impossible for any groundwater impacts associated with the AP to impact groundwater quality at P003.
  - Well P005: This is a well located on an industrial property, owned by East Peoria Materials LLC, north of the EPP. The well was installed to a depth of 60 ft bgs into bedrock (ISGS, 1987). After the well was drilled, the driller's notes indicated that it did not yield sufficient

[3] NAVD88 is the North American Vertical Datum of 1988.

water ("no water"; ISGS, 1987); thus, Gradient believes this well is not likely to be active, if it even still exists.

- Well P001: This is an industrial well located on the Mosaic Company property, formerly owned by Cargill Marine and Terminal and Cargo Carriers. The well was installed to a depth of 20 ft bgs into clay (ISGS, 2001). As a result of prior recognized environmental conditions on the property, land-use restrictions have been implemented that prevent anyone from installing, operating, or maintaining a potable water supply well (Eastep, 2003). Thus, it is not expected that this well is used for domestic purposes.
- Well P002: This is an industrial well located on the Mosaic Company property, formerly owned by Cargill Marine and Terminal and Cargo Carriers. The well was installed to a depth of 30 ft bgs into clay (ISGS, 1968). As a result of prior recognized environmental conditions on the property, land-use restrictions have been implemented that prevent anyone from installing, operating, or maintaining a potable water supply well (Eastep, 2003). Thus, it is not expected that this well is used for domestic purposes.
- Well P008: This is an industrial well located on the Mosaic Company property, formerly owned by Cargill Marine and Terminal and Cargo Carriers. The well was installed to a depth of 300 ft bgs into shale bedrock (ISGS, 2017). As a result of prior recognized environmental conditions on the property, land-use restrictions have been implemented that prevent anyone from installing, operating, or maintaining a potable water supply well (Eastep, 2003). Thus, it is not expected that this well is used for domestic purposes.
- NC-01: This is a non-community water source well associated with the Freedom Gas Station (Hahn, 2020). Peoria County Health Department indicated that the well is not a potable well (Hahn, 2020). Moreover, the well is side-gradient from the AP and unlikely to be affected by any AP-related impacts.

- **The Illinois River is not used as a public water supply adjacent to the Site.** The Illinois River is classified as a "General Use Water." IEPA supports the use of the Illinois River for aquatic life and primary contact recreation, but it is not designated for public and food processing water supplies (IEPA, 2018). The Illinois River is used as a public water supply in the city of Peoria, IL; however, this location is approximately 9 miles upstream of the Site (ISWS, 2022). The segment of the Illinois River adjacent to the Site (Assessment Unit ID: IL D-05) is listed on the 2018 Illinois Section 303(d) List as being impaired for fish consumption, due to mercury and polychlorinated biphenyls (US EPA, 2018; IEPA, 2021b). Therefore, surface water adjacent to the Site is not used as a source of drinking water, and this exposure pathway was not evaluated further.
- **The AP has a limited hydraulic connection to underlying bedrock groundwater resources**. The shale bedrock aquitard underlying the UA forms a hydraulic barrier between the AP and deeper groundwater resources. Due to very low hydraulic conductivity of the shale bedrock aquitard, downward migration of shallow groundwater to the underlying aquifers is expected to be limited. Therefore, the likelihood of AP-related impacts to the deep groundwater resources is minimal.

3.2.1.2 Recreational Exposures

The Illinois River flows from north to south past the Site. Recreational exposure to surface water and sediment may occur during activities such as swimming, boating, or fishing in the river. Exposure estimates for swimmers provide a health-protective means to evaluate exposure during other recreational activities. Recreational anglers may also consume locally caught fish from the Illinois River.

3.2.2 Ecological Conceptual Exposure Model

The ecological CEM for the Site depicts the relationships between off-site environmental media (surface water and sediment) potentially impacted by COIs in groundwater and ecological receptors that may be exposed to these media. The ecological risk evaluation considered both direct toxicity as well as secondary toxicity *via* bioaccumulation. Figure 3.3 presents the ecological CEM for the Site. The following ecological receptor groups and exposure pathways were considered:

- **Ecological Receptors Exposed to Surface Water:**

  Aquatic plants, amphibians, reptiles, and fish

- **Ecological Receptors Exposed to Sediment:**

  Benthic invertebrates (*e.g.*, insects, crayfish, mussels)

- **Ecological Receptors Exposed to Bioaccumulative COIs:**

  Higher trophic-level wildlife (avian and mammalian) *via* direct exposures (surface water and sediment exposure) and secondary exposures through the consumption of prey (*e.g.*, plants, invertebrates, small mammals, fish)

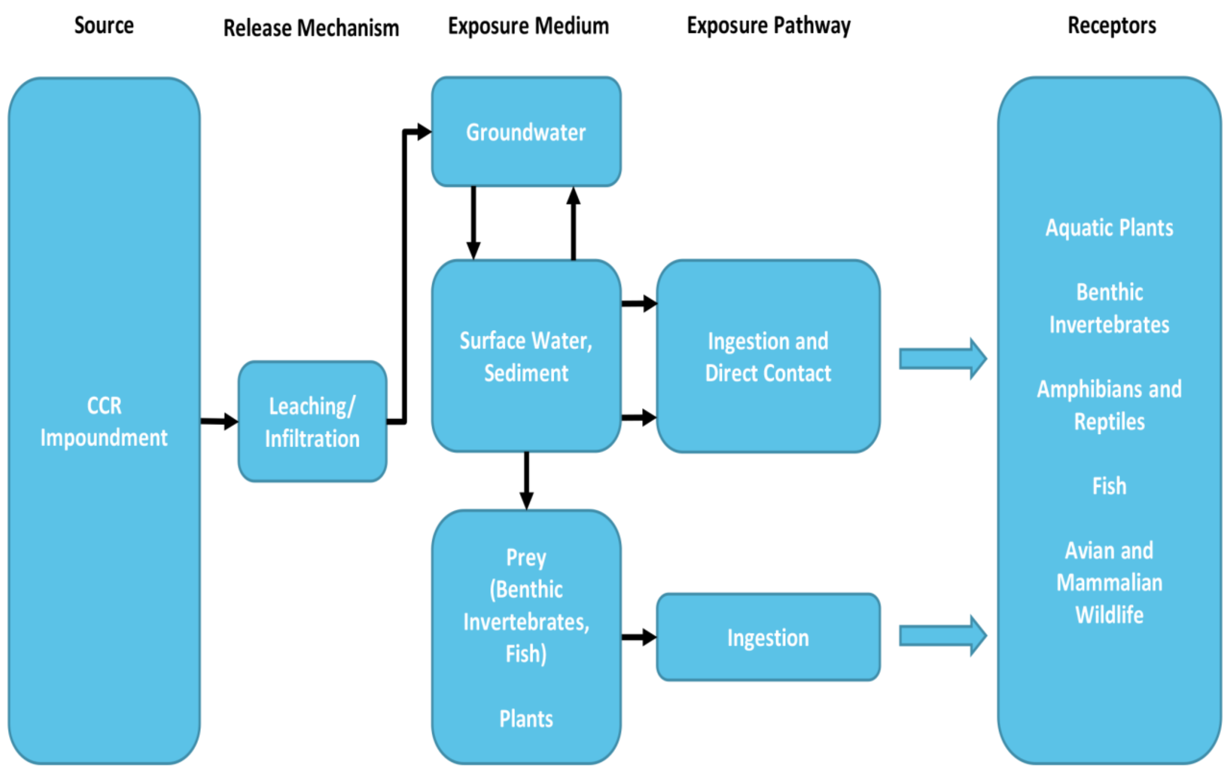

Figure 3.3 Ecological Conceptual Exposure Model. CCR = Coal Combustion Residual.

3.3 Identification of Constituents of Interest

Risks were evaluated for COIs. A constituent was considered a COI if the maximum detected constituent concentration in groundwater exceeded a health-based benchmark. According to US EPA risk assessment guidance (US EPA, 1989), this screening step is designed to reduce the number of constituents carried through the risk evaluation that are anticipated to have a minimal contribution to the overall risk. Identified COIs are the constituents that are most likely to pose a risk concern in the surface water adjacent to the Site.

3.3.1 Human Health Constituents of Interest

For the human health risk evaluation, COIs were conservatively identified as constituents with maximum concentrations in groundwater above the GWPS listed in the Illinois CCR Rule Part 845.600 (IEPA, 2021a). Gradient used the maximum detected concentrations from groundwater samples collected from all of the AP-associated wells, regardless of hydrostratigraphic unit. The use of groundwater data in this risk evaluation does not imply that detected constituents are associated with the AP or that they have been identified as potential groundwater exceedances. Using this approach, 11 COIs (arsenic, barium, beryllium, boron, chromium, cobalt, lead, lithium, thallium, radium-226+228, and fluoride) were identified for the human health risk evaluation *via* the surface water pathway (Table 3.1).

The water quality parameters that exceeded the GWPS included chloride, sulfate, and total dissolved solids; however, these constituents were not included in the risk evaluation because the GWPS are based on aesthetic quality. The US EPA secondary maximum contaminant levels (MCLs) for chloride, sulfate, and total dissolved solids are based on aesthetic quality. The secondary MCLs for chloride and sulfate (250 mg/L) are based on salty taste (US EPA, 2021a). The secondary MCL for total dissolved solids (500 mg/L) is based on hardness, deposits, colored water, staining, and salty taste (US EPA, 2021a). Given that these parameters are not likely to pose a human health risk concern in the event of exposure, they were not considered to be human health COIs.

Table 3.1 Human Health Constituents of Interest

Constituent[a]	Maximum Concentration	GWPS[b]	Human Health COI[c]
Total Metals (mg/L)			
Antimony	0.0045	0.006	No
Arsenic	0.097	0.01	Yes
Barium	8.6	2	Yes
Beryllium	0.017	0.004	Yes
Boron	12	2	Yes
Cadmium	0.004	0.005	No
Chromium	0.59	0.1	Yes
Cobalt	0.29	0.006	Yes
Lead	0.27	0.0075	Yes
Lithium	0.85	0.04	Yes
Mercury	0.0018	0.002	No
Molybdenum	0.046	0.1	No
Selenium	0.019	0.05	No
Thallium	0.0026	0.002	Yes
Radionuclides (pCi/L)			
Radium-226+228	23	5	Yes
Other (mg/L, unless otherwise noted)			
Chloride	830	200	No[d]
Fluoride	10.2	4	Yes
Sulfate	570	400	No[d]
Total Dissolved Solids	2,600	1,200	No[e]

Notes:
COI = Constituent of Interest; GWPS = Groundwater Protection Standard; MCL = Maximum Contaminant Level; pCi/L = PicoCuries Per Liter.
Shaded = Compound identified as a COI.
(a) The constituents are those listed in the IL Part 845.600 GWPS (IEPA, 2021a).
(b) The IL Part 845.600 GWPS (IEPA, 2021a) were used to identify COIs.
(c) COIs are constituents for which the maximum concentration exceeds the groundwater standard.
(d) This constituent is not likely to pose a human health risk concern due to the absence of studies regarding toxicity to human health. Therefore, this constituent is not considered a COI.
(e) Total dissolved solids are not considered a COI because the MCL is based on aesthetic quality.

3.3.2 Ecological Constituents of Interest

The Illinois GWPS, as defined in IEPA's guidance, were developed to protect human health but not necessarily ecological receptors. While ecological receptors are not exposed to groundwater, groundwater can potentially migrate into the adjacent surface water and impact ecological receptors. Therefore, to identify ecological COIs, the maximum concentrations of constituents detected in groundwater were compared to ecological surface water benchmarks protective of aquatic life.

The surface water screening benchmarks for freshwater organisms were obtained from the following hierarchy of sources:

- IEPA (2019) SWQS. IEPA SWQS are health-protective benchmarks for aquatic life exposed to surface water on a long-term basis (*i.e.*, chronic exposure). The SWQS for several metals are hardness dependent (cadmium, chromium, copper, lead, manganese, nickel, and zinc). Screening benchmarks for these constituents were calculated assuming US EPA's default hardness of 100 mg/L (US EPA, 2022).[4]
- US EPA Region IV (2018) surface water Ecological Screening Values (ESVs) for hazardous waste sites.

Benchmarks from a United States Department of Energy (US DOE) guidance document ("A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota") were used for radium (US DOE, 2019). US DOE presents benchmarks for radium-226 and radium-228 (4 and 3 picoCuries per liter [pCi/L], respectively). Given that radium concentrations are expressed as total radium (radium-226+228, *i.e.*, the sum of radium-226 and radium-228), Gradient used the lower of the two benchmarks (3 pCi/L for radium-228) to evaluate total radium concentrations.

Consistent with the human health risk evaluation, Gradient used the maximum detected concentrations from groundwater samples collected from all of the AP-associated wells, (regardless of hydrostratigraphic unit) without considering spatial or temporal representativeness for ecological receptor exposures. The use of the maximum constituent concentrations in this evaluation is designed to conservatively identify COIs that warrant further investigation. Barium, boron, cadmium, chromium, cobalt, lead, lithium, mercury, radium-226+228, chloride, and fluoride were identified as COIs for ecological receptors (Table 3.2).

[4] Hardness data are not available for the Illinois River adjacent to the Site; therefore, the US EPA (2022) default hardness of 100 mg/L was used. Use of a higher hardness value would result in less stringent screening values, thus, use of the US EPA default hardness is conservative.

Table 3.2 Ecological Constituents of Interest

Constituent[a]	Maximum Groundwater Concentration	Ecological Benchmark[b]	Basis	Ecological COI[c]
Total Metals (mg/L)				
Antimony	0.0045	0.19	US EPA R4 ESV	No
Arsenic	0.097	0.19	IEPA SWQC	No
Barium	8.6	5	IEPA SWQC	Yes
Beryllium	0.017	0.064	US EPA R4 ESV	No
Boron	12	7.6	IEPA SWQC	Yes
Cadmium	0.004	0.0011	IEPA SWQC	Yes
Chromium	0.59	0.21	IEPA SWQC	Yes
Cobalt	0.29	0.019	US EPA R4 ESV	Yes
Lead	0.27	0.020	IEPA SWQC	Yes
Lithium	0.85	0.44	US EPA R4 ESV	Yes
Mercury	0.0018	0.0011	IEPA SWQC	Yes
Molybdenum	0.046	7.2	US EPA R4 ESV	No
Selenium	0.019	1	IEPA SWQC	No
Thallium	0.0026	0.006	US EPA R4 ESV	No
Radionuclides (pCi/L)				
Radium-226+228	23	3	US DOE	Yes
Other (mg/L, unless otherwise noted)				
Chloride	830	500	IEPA SWQC	Yes
Fluoride	10.2	4	IEPA SWQC	Yes
Sulfate	570	NA	NA	No
Total Dissolved Solids	2,600	NA	NA	No

Notes:

AP = Ash Pond; COI = Constituent of Interest; ESV = Ecological Screening Value; GWPS = Groundwater Protection Standard; IEPA = Illinois Environmental Protection Agency; NA = Not Available; pCi/L = PicoCuries Per Liter; SWQC = Surface Water Quality Criteria; US DOE = United States Department of Energy; US EPA R4 = US Environmental Protection Agency Region IV.

Shaded = Compound identified as a COI.

(a) The constituents are those listed in the IL Part 845.600 GWPS (IEPA, 2021a) that were detected in at least one groundwater sample from the 28 wells related to the Edwards AP.

(b) Ecological benchmarks are from the hierarchy of sources discussed in Section 3.3.2: IEPA SWQC (IEPA, 2019); US EPA R4 "Ecological Risk Assessment Supplemental Guidance" (US EPA Region IV, 2018); and US DOE's guidance document "A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota" (US DOE, 2019).

(c) Constituents with maximum detected concentrations exceeding a benchmark protective of surface water exposure are considered ecological COIs.

3.3.3 Surface Water and Sediment Modeling

One surface water sample was collected from the Illinois River adjacent to the Site; however, as discussed in Section 2.5, this sample is insufficient to evaluate the potential impact of the AP on the Illinois River. Therefore, to estimate the potential contribution to surface water (and sediment) from groundwater specifically associated with the AP, Gradient modeled concentrations in the Illinois River surface water and sediment from groundwater that may flow to the Illinois River for the detected human and ecological COIs (arsenic, barium, beryllium, boron, cadmium, chromium, cobalt, lead, lithium, mercury, thallium, radium-226+228, chloride, and fluoride). The constituents detected in groundwater above a ecological or health-based benchmark are most likely to pose a risk concern in the adjacent surface water. Gradient modeled human health and ecological COI concentrations in the surface water and sediment using a mass balance calculation based on the surface water and groundwater mixing. The model assumes a well-mixed groundwater-surface water location.

The maximum detected concentrations in groundwater (regardless of well location) from 2015 to 2021 were conservatively used to model COI concentrations in surface water and sediment. The groundwater data were measured as total metals. Use of the total metal concentration for these COIs may overestimate surface water concentrations because dissolved concentrations, which are lower than total concentrations, represent the mobile fractions of constituents that could likely flow to and mix with surface water.

The modeling approach does not account for geochemical transformations that may occur during groundwater mixing with surface water. Gradient assumed that predicted surface water concentrations were influenced only by the physical mixing of groundwater as it enters the surface water and were not further influenced by the geochemical reactions in the water and sediment, such as precipitation. In addition, the model only predicts surface water and sediment concentrations as a result of the potential migration of COI concentrations in AP-related groundwater and does not account for background concentrations in surface water or sediment.

For this evaluation, Gradient adapted a simplified and conservative form of US EPA's indirect exposure assessment methodology (US EPA, 1998) that was used in US EPA's coal combustion waste risk assessment (US EPA, 2014). The model is a mass-balance calculation based on surface water and groundwater mixing and the concept that the dissolved and sorbed concentrations can be related through an equilibrium partition coefficient (K_d). The model assumes a well-mixed groundwater-surface water location, with partitioning among total suspended solids, dissolved water column, sediment pore water, and solid sediments.

Sorption to soil and sediment is highly dependent on the surrounding geochemical conditions. To be conservative, Gradient ignored the natural attenuation capacity of soil and sediment and estimated the surface water concentration based only on the physical mixing of groundwater and surface water (*i.e.*, dilution).

The aquifer and surface water properties used to estimate the volume of groundwater flowing to the Illinois River and surface water concentrations are presented in Table 3.3. The COI concentrations in sediment were modeled using the COI-specific sediment-to-water partitioning coefficients and the sediment properties presented in Table 3.4. In the absence of Site-specific information for the Illinois River, Gradient used default assumptions (*e.g.*, depth of the upper benthic layer and bed sediment porosity) to model sediment concentrations. The modeled surface water and sediment concentrations are presented in Table 3.5. These modeled concentrations reflect conservative contributions from groundwater. A description of the modeling and the detailed results are presented in Appendix A.

Table 3.3 Groundwater and Surface Water Properties Used in Modeling

Parameter	Unit	Value	Notes/Source
Groundwater			
COI Concentration	mg/L	Constituent specific	Maximum detected concentration in groundwater.
Cross Section Area for the UA[a]	m^2	1,277	The length of the groundwater discharge zone was assumed to be equal to the length of the AP (*i.e.*, approximately 1,047 m). The thickness of the discharge zone was assumed to be equal to the maximum thickness of the UA (1.22 m) (Ramboll, 2021).
Hydraulic Gradient	m/m	0.004	Maximum average horizontal hydraulic gradient determined for the UA (Ramboll, 2021).
Hydraulic Conductivity of the UA	cm/s	0.00017	Geometric mean horizontal hydraulic conductivity for all UA wells (Ramboll, 2021).
Surface Water			
Surface Water Flow Rate	L/yr	5.3×10^{12}	Representative low flow (10th percentile) discharge rate for the Illinois River at USGS Kingston Mines, Illinois, gauging station (USGS 05568500) (USGS, 2022).
Total Suspended Solids (TSS)	mg/L	6	Representative average river concentration (Hanson Professional Services, Inc., 2019).
Depth of the Water Column	m	2.74	Illinois River bathymetry data (Bist LLC, 2022).
Suspended Sediment to Water Partition Coefficient	mg/L	Constituent specific	Values based on US EPA (2014).

Notes:
AP = Ash Pond; COI = Constituent of Interest; L/yr = Liter Per Year; UA = Uppermost Aquifer; US EPA = United States Environmental Protection Agency; USGS = United States Geological Survey.
(a) The cross-sectional area represents the area through which groundwater flows from the UA to the Illinois River.

Table 3.4 Sediment Properties Used in Modeling

Parameter	Unit	Value	Notes/Source
Sediment			
Depth of Upper Benthic Layer	m	0.03	Default (US EPA, 2014).
Depth of Water Body	m	2.77	Depth of water column (2.74 m, as indicated by Illinois River bathymetry data (Bist LLC, 2022) plus depth of upper benthic layer (0.03 m) (US EPA, 2014).
Bed Sediment Particle Concentration	g/cm^3	1	Default (US EPA, 2014).
Bed Sediment Porosity	-	0.6	Default (US EPA, 2014).
TSS Mass per Unit Area	kg/m^2	0.016	Depth of water column × TSS × conversion factors (10^{-6} kg/mg and 1,000 L/m^3).
Sediment Mass per Unit Area	kg/m^2	30	Depth of upper benthic layer × bed sediment particulate concentration × conversion factors (0.001 kg/g, 10^6 cm^3/m^3).
Sediment to Water Partitioning Coefficients	mg/L	Constituent specific	Values based on US EPA (2014).

Notes:
TSS = Total Suspended Solids; US EPA = United States Environmental Protection Agency.

Table 3.5 Surface Water and Sediment Modeling Results

COI	Groundwater Concentration (mg/L or pCi/L)	Mass Discharge Rate (mg/year or pCi/year)	Total Water Column Concentration (mg/L or pCi/L)	Concentration Sorbed to Bottom Sediments (mg/kg or pCi/kg)
Total Metals				
Arsenic	0.097	2.7E+04	5.1E-09	1.2E-06
Barium	8.6	2.4E+06	4.5E-07	1.3E-04
Beryllium	0.017	4.7E+03	8.9E-10	5.1E-07
Boron	12	3.3E+06	6.3E-07	3.8E-06
Cadmium	0.0040	1.1E+03	2.1E-10	2.8E-07
Chromium	0.59	1.6E+05	3.1E-08	1.4E-03
Cobalt	0.29	7.9E+04	1.5E-08	1.4E-05
Lead	0.27	7.4E+04	1.4E-08	1.4E-04
Lithium	0.85	2.3E+05	4.4E-08	(a)
Mercury	0.0018	4.9E+02	9.4E-11	3.4E-06
Thallium	0.0026	7.1E+02	1.4E-10	2.5E-09
Radionuclides				
Radium-226+228	23	6.3E+06	1.2E-06	8.5E-03
Other				
Chloride	830	2.3E+08	4.3E-05	(a)
Fluoride	10.2	2.8E+06	5.3E-07	8.4E-05
Sulfate	570	1.6E+08	3.0E-05	(a)

Notes:
COI = Constituent of Concern; K_d = Equilibrium Partition Coefficient; pCi/L = PicoCuries Per Liter; pCi/kg = PicoCuries Per Kilogram.
(a) Lithium, chloride, and sulfate do not readily sorb to soil or sediment particles; a K_d value of 0 was used for the modeling.

3.4 Human Health Risk Evaluation

The section below presents the results of the human health risk evaluation for recreators (boaters, swimmers and anglers) along the Illinois River adjacent to the Site. Risks were assessed using the maximum measured or modeled COIs in surface water.

3.4.1 Recreators Exposed to Surface Water

Screening Exposures: Recreators could be exposed to surface water *via* incidental ingestion and dermal contact while swimming or boating. In addition, anglers could consume fish caught in the Illinois River. The maximum measured or modeled COI concentrations in surface water were used as conservative upper-end estimates of the COI concentrations to which a recreator might be exposed directly (incidental ingestion of COIs in surface water while swimming) and indirectly (consumption of locally caught fish exposed to COIs in surface water).

Screening Benchmarks: Illinois surface water criteria (IEPA, 2019), known as human threshold criteria (HTC), are based on incidental exposure through contact or ingestion of small volumes of water while swimming or during other recreational activities, as well as the consumption of fish. The HTC values were calculated from the following equation (IEPA, 2019):

$$\mathrm{HTC} = \frac{\mathrm{ADI}}{\mathrm{W} + (\mathrm{F} \times \mathrm{BCF})}$$

where:

HTC = Human health protection criterion in milligrams per liter (mg/L)
ADI = Acceptable daily intake (mg/day)
W = Water consumption rate (L/day)
F = Fish consumption rate (kg/day)
BCF = Bioconcentration factor (L/kg-tissue)

Illinois defines the acceptable daily intake (ADI) as the "maximum amount of a substance which, if ingested daily for a lifetime, results in no adverse effects to humans" (IEPA, 2019). US EPA defines its chronic reference dose (RfD) as an "estimate (with uncertainty spanning perhaps an order of magnitude) of a daily oral exposure for a chronic duration (up to a lifetime) to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime" (US EPA, 2011a). Illinois lists methods to derive an ADI from the primary literature (IEPA, 2019). In accordance with Illinois guidance, Gradient derived an ADI by multiplying the MCL by the default water ingestion rate of 2 L/day (IEPA, 2019). In the absence of an MCL, Gradient applied the RfD used by US EPA to derive its Regional Screening Levels (RSLs) (US EPA, 2021c) as a conservative estimate of the ADI. The RfDs are given in mg/kg-day, while the ADIs are given in mg/day; thus, Gradient multiplied the RfD by a standard body weight of 70 kg to obtain the ADI in mg/day. The calculation of the HTC values is shown in Appendix B, Table B.1.

Gradient used bioconcentration factors (BCFs) from a hierarchy of sources. The primary BCFs were those that US EPA used to calculate the National Recommended Water Quality Criteria (NRWQC) for human health (US EPA, 2002). Other sources included BCFs used in the US EPA coal combustion ash risk assessment (US EPA, 2014) and BCFs reported by Oak Ridge National Laboratory's Risk Assessment

Information System (ORNL RAIS) (ORNL, 2020).[5] Lithium did not have a BCF value available from any authoritative source; therefore, the water quality criterion for lithium was calculated assuming a BCF of 1. This is a conservative assumption, as lithium does not readily bioaccumulate in the aquatic environment (ECHA, 2020a,b; ATSDR, 2010).

Illinois recommends a fish consumption rate of 0.020 kg/day (20 g/day) for an adult weighing 70 kg (IEPA, 2019). Illinois recommends a water consumption rate of 0.01 L/day for "incidental exposure through contact or ingestion of small volumes of water while swimming or during other recreational activities" (IEPA, 2019). Appendix B, Table B.1 presents the calculated HTC for fish and water and for fish consumption only.

The HTC for fish consumption for radium-226+228 was calculated as follows:

$$\text{HTC} = \frac{\text{TCR}}{(\text{SF} \times \text{BAF} \times \text{F})}$$

where:

HTC = Human health protection criterion in picoCuries per liter (pCi/L)
TCR = Target cancer risk ($1\text{x}10^{-5}$)
SF = Food ingestion slope factor (risk/pCi)
BAF = Bioaccumulation factor (L/kg-tissue)
F = Fish consumption rate (kg/day)

The food ingestion slope factor (lifetime excess total cancer risk per unit exposure, in risk/pCi) used to calculate the HTC was the highest value of those for radium-226 (Ra-226), radium-228 (Ra-228), and "Ra-228+D" (US EPA, 2001). According to US EPA (2001), "+D" indicates that "the risks from associated short-lived radioactive decay products (*i.e.*, those decay products with radioactive half-lives less than or equal to 6 months) are also included."

Screening Risk Evaluation: The maximum modeled and measured COI concentrations in surface water were compared to the calculated Illinois HTC values (Table 3.6). All surface water concentrations were below their respective benchmarks. The HTC values are protective of recreational exposure *via* water and/or fish ingestion and do not account for dermal exposures to COIs in surface water while swimming. However, given that the measured and modeled COI surface water concentrations are orders of magnitude below HTC protective of water and/or fish ingestion, dermal exposures to COIs are not expected to be a risk concern. Moreover, the dermal uptake of metals is considered to be minimal and only a small proportion of ingestion exposures. Thus, none of the COIs evaluated would be expected to pose an unacceptable risk to recreators exposed to surface water while swimming and anglers consuming fish caught in the Illinois River.

[5] Although recommended by US EPA (2015c), US EPA EpiSuite 4.1 (US EPA, 2019) was not used as a source of BCFs because inorganic compounds are outside the estimation domain of the program.

Table 3.6 Risk Evaluation for Recreators Exposed to Surface Water

COI	Maximum Surface Water Concentration		HTC for Water and Fish	HTC for Water Only	HTC for Fish Only	COPC	
	Modeled	Measured[a]				Based on Modeled Concentrations	Based on Measured Concentrations
Total Metals (mg/L)							
Arsenic	5.1E-09	2.5E-03	0.022	2.0	0.023	No	No
Barium	4.5E-07	8.0E-02	1.5	400	1.5	No	No
Beryllium	8.9E-10	NR	0.021	0.80	0.021	No	NA
Boron	6.3E-07	9.7E-02	467	1,400	700	No	No
Cadmium	2.1E-10	2.3E-04	0.0018	1.0	0.0019	No	No
Chromium	3.1E-08	7.3E-03	0.61	20	0.63	No	No
Cobalt	1.5E-08	NR	0.0035	2.1	0.0035	No	NA
Lead	1.4E-08	4.9E-03	0.015	0.015	0.015	No	No
Lithium	4.4E-08	NR	4.7	14	7.0	No	NA
Mercury	9.4E-11	1.5E-05	0.000053	0.40	0.000053	No	No
Thallium	1.4E-10	NR	0.0017	0.40	0.0017	No	NA
Radionuclides (pCi/L)							
Radium-226+228	1.2E-06	NR	1,000	1,000	87,413	No	NA
Other (mg/L)							
Chloride	4.3E-05	1.0E+02	NA	NA	NA	NA	NA
Fluoride	5.3E-07	2.3E-01	143	800	174	No	No
Sulfate	3.0E-05	6.5E+01	NA	NA	NA	NA	NA

Notes:
COI = Constituent of Interest; COPC = Constituent of Potential Concern; HTC = Human Threshold Criteria; NA = Not Analyzed or Not Applicable; NR = Not Reported; pCi/L = PicoCuries Per Liter.
(a) Measured concentrations are shown only for COIs. Measured surface water concentrations may be different from modeled concentrations because measured data include the effects of background and other industrial sources. Modeled concentrations only represent the potential effect on surface water quality resulting from the measured groundwater concentrations.

3.4.2 Recreators Exposed to Sediment

Recreational exposure to sediment may occur during boating and swimming activity along the Illinois River; exposure to sediment may occur through incidental ingestion and dermal contact.

Screening Exposures: COIs in impacted groundwater flowing into the river can sorb to sediments. In the absence of sediment data, sediment concentrations were modeled using maximum detected groundwater concentrations.

Screening Benchmarks: There are no established recreator RSLs that are protective of recreational exposures to sediment (US EPA, 2021b). Therefore, benchmarks that are protective of recreational exposures to sediment *via* incidental ingestion and dermal contact were calculated using US EPA's RSL guidance (US EPA, 2021b). These benchmarks were calculated using the recommended assumptions (*i.e.*, oral bioavailability, body weights, averaging time) and toxicity reference values (*i.e.*, RfD and cancer slope factor [CSF]), with the following changes: Recreators were assumed to be exposed to sediment while recreating 60 days a year (or two weekend days per week for 30 weeks a year, from April to October). The exposure duration was assumed for a child 6 years of age and an adult 20 years of age, per US EPA guidance (Stalcup, 2014). The daily recommended residential soil ingestion rates of 200 mg/day for a child and 100 mg/day for an adult are based on an all-day exposure to residential soils (Stalcup, 2014; US EPA, 2011b). Since recreational exposures to sediment are assumed to occur for less than four hours per day, one-third of the daily residential soil ingestion (67 mg/day for a child and 33 mg/day for an adult) was used as a conservative assumption. For dermal exposures, recreators were assumed to be exposed to sediment on their lower legs and feet (1,026 cm^2 for the child and 3,026 cm^2 for the adult, based on the age-weighted surface areas reported in US EPA, 2011b). While other body parts may be exposed to sediment, the contact time will likely be very short, as the sediment would wash off in the surface water. Gradient used US EPA's recommended adherence factor of 0.2 mg/cm^2 based on child exposure to wet soil (US EPA, 2004; Stalcup, 2014), which was used in the US EPA RSL User's Guide for a child recreator exposed to soil or sediment (US EPA, 2021b). The sediment screening benchmarks were calculated based on a target hazard quotient of 1, or a target cancer risk of $1x10^{-5}$. Appendix B, Table B.2 presents the calculation of screening benchmarks protective of recreational exposures to sediment. A recreator sediment screening benchmark for radium-226+228 was based on soil Preliminary Remediation Goals (PRGs) calculated for radium-226 and radium-228 using US EPA's PRG calculator (US EPA, 2020). The lower of the two values was used as the recreator sediment screening benchmark for radium-226+228 (Appendix B, Table B.3).

Screening Risk Evaluation: The modeled sediment concentrations were well below the recreational sediment screening benchmarks (Table 3.7). Therefore, exposure to sediment is not expected to pose an unacceptable risk to recreators while swimming or boating.

Table 3.7 Risk Evaluation for Recreators Exposed to Sediment

COI[a]	Modeled Sediment Concentration (mg/kg)	Recreator Sediment Screening Benchmark (mg/kg)	COPC
Total Metals (mg/kg)			
Arsenic	1.2E-06	6.8E+01	No
Barium	1.3E-04	2.7E+05	No
Beryllium	5.1E-07	2.7E+03	No
Boron	3.8E-06	2.7E+05	No
Chromium	1.4E-03	2.1E+06	No
Cobalt	1.4E-05	4.1E+02	No
Lead	1.4E-04	4.0E+02	No
Lithium	(a)	2.7E+03	NA
Thallium	2.5E-09	1.4E+01	No
Radionuclides (pCi/kg)			
Radium-226+228	8.5E-03	7.9E+03	No
Other (mg/kg)			
Fluoride	8.4E-05	5.5E+04	No

Notes:
COI = Constituent of Interest; COPC = Constituent of Potential Concern; K_d = Equilibrium Partition Coefficient; NA = Not Applicable; pCi/kg = PicoCuries Per Kilogram.
(a) Lithium does not readily sorb to soil or sediment particles; a K_d value of 0 was used for the modeling.

3.5 Ecological Risk Evaluation

Based on the ecological CEM (Figure 3.3), ecological receptors could be exposed to surface water and dietary items (*i.e.*, prey and plants) potentially impacted by identified COIs (barium, boron, cadmium, chromium, cobalt, lead, lithium, mercury, radium-226+228, chloride, and fluoride).

3.5.1 Ecological Receptors Exposed to Surface Water

Screening Exposures: The ecological evaluation considered aquatic communities in the Illinois River potentially impacted by identified ecological COIs. Measured and modeled surface water concentrations were compared to risk-based ecological screening benchmarks.

Screening Benchmarks: Surface water screening benchmarks protective of aquatic life were obtained from the following hierarchy of sources:

- IEPA SWQS (IEPA, 2019), regulatory standards that are intended to protect aquatic life exposed to surface water on a long-term basis (*i.e.*, chronic exposure). For cadmium, the surface water benchmark is hardness dependent and calculated using a default hardness of 100 mg/L (US EPA, 2022).[6]
- US EPA Region IV (2018) surface water ESVs for hazardous waste sites.
- US DOE benchmarks from the guidance document, "A Graded Approach for Evaluating Radiation Doses to Aquatic and Terrestrial Biota" (US DOE, 2019).

Risk Evaluation: The maximum measured or modeled COI concentrations in surface water were compared to the benchmarks protective of aquatic life (Table 3.8). The modeled surface water concentrations were below their respective benchmarks. In the measured data, iron, nickel, and zinc were slightly above their respective benchmarks (Table 3.8); however, they were not retained as COPCs. The measured concentrations for these three constituents are likely reflective of background concentrations in the Illinois River, as opposed to the AP, because they are all naturally occurring constituents that are not commonly associated with CCR (*i.e.*, none of the three constituents are listed in Appendix IV of the Federal CCR Rule [US EPA, 2015a]). Furthermore, the exceedance ratios (measured concentration divided by the benchmark) were very low for nickel (1.2) and zinc (1.03), thus, they are not expected to present an ecological risk. Iron was detected at 4.2 mg/L, *versus* an ecological benchmark of 1 mg/L; however, iron is ubiquitous in the environment and is not characteristic of impacts from CCR impoundments. Thus, none of the COIs evaluated are expected to pose an unacceptable risk to aquatic life in the Illinois River.

[6] Conservatisms associated with using a default hardness value are discussed in Section 3.6.

Table 3.8 Risk Evaluation of Ecological Receptors Exposed to Surface Water

COI	Maximum Surface Water Concentration		Ecological Freshwater Benchmark	Basis	COPC	
	Modeled	Measured			Based on Modeled Concentrations	Based on Measured Concentrations
Total Metals (mg/L)						
Barium	4.5E-07	8.0E-02	5.0	IEPA (2019)	No	No
Boron	6.3E-07	9.7E-02	7.6	IEPA (2019)	No	No
Cadmium	2.1E-10	2.3E-04	0.00093	IEPA (2019)	No	No
Chromium	3.1E-08	7.3E-03	0.18	IEPA (2019)	No	No
Cobalt	1.5E-08	NA	0.019	US EPA R4 (2018)	No	NA
Lead	1.4E-08	4.9E-03	0.016	IEPA (2019)	No	No
Lithium	4.4E-08	NA	0.44	US EPA R4 (2018)	No	NA
Mercury	9.4E-11	1.5E-05	0.0011	IEPA (2019)	No	No
Thallium	1.4E-10	NA	0.0060	US EPA R4 (2018)	No	NA
Radionuclides (pCi/L)						
Radium-226+228	1.2E-06	NA	3.4	US DOE (2019)	No	NA
Other (mg/L)						
Chloride	4.3E-05	1.0E+02	230	US EPA R4 (2018)	No	No
Fluoride	5.3E-07	2.3E-01	2.7	US EPA R4 (2018)	No	No

Notes:
COI = Constituent of Interest; COPC = Constituent of Potential Concern; IEPA = Illinois Environmental Protection Agency; NA =Not Analyzed or Not Applicable; pCi/L = PicoCuries Per Liter; US DOE = United States Department of Energy; US EPA R4 = United States Environmental Protection Agency Region IV.

3.5.2 Ecological Receptors Exposed to Sediment

Screening Exposures: COIs in impacted groundwater flowing to the Illinois River can sorb to sediments *via* chemical partitioning. In the absence of sediment data, sediment concentrations were modeled using maximum detected groundwater concentrations. Therefore, the modeled COI sediment concentrations reflect the potential maximum Site-related sediment concentration from groundwater.

Screening Benchmarks: Sediment screening benchmarks were obtained from US EPA Region IV (2018). The majority of the sediment ESVs are based on threshold effect concentrations (TECs) from MacDonald *et al.* (2000), which provide consensus values that identify concentrations below which harmful effects on sediment-dwelling organisms are unlikely to be observed. In the absence of an ESV for radium-226+228, a sediment screening value of 90,000 pCi/kg was used, based on the biota concentration guide (BCG) for radium-228 (US DOE, 2019).[7] The no observed effect concentration (NOEC) of 38 mg/kg was used as a conservative benchmark for boron in the absence of an ESV (ECHA, 2019). Lithium, chloride, and fluoride are not expected to sorb to sediment; therefore, risk to ecological receptors exposed to sediment was not evaluated for these constituents. The benchmarks used in this evaluation are listed in Table 3.9.

Screening Risk Results: The maximum modeled COI sediment concentrations were below their respective sediment screening benchmarks (Table 3.9). The modeled sediment concentrations attributed to potential contributions from Site groundwater for all COIs were less than 1% of the sediment screening benchmark. Therefore, the modeled sediment concentrations attributed to potential contributions from Site groundwater are not expected to significantly contribute to ecological exposures in the Illinois River adjacent to the Site.

[7] The biota concentration guide (BCG) for sediment is 90 pCi/g for Ra-228 and 100 pCi/g for Ra-226; the lower of the two values was used for Ra-226+228 and converted to pCi/kg (US DOE, 2019).

Table 3.9 Risk Evaluation of Ecological Receptors Exposed to Sediment

COI	Modeled Sediment Concentration	ESV[a]	COPC	% of Benchmark
Total Metals (mg/kg)				
Barium	1.3E-04	20	No	0.00067%
Boron	3.8E-06	38[b]	No	0.000010%
Cadmium	2.8E-07	0.99	No	0.000028%
Chromium	1.4E-03	43	No	0.0032%
Cobalt	1.4E-05	50	No	0.000028%
Lead	1.4E-04	35.8	No	0.00039%
Lithium	-	-	-	-
Mercury	3.4E-06	0.18	No	0.0019%
Radionuclides (pCi/kg)				
Radium-226+228	8.5E-03	90,000[c]	No	0.0000094%
Other (mg/kg)				
Chloride	-	-	-	-
Fluoride	8.4E-05	NA	No	-

Notes:
COI = Constituent of Interest; COPC = Constituent of Potential Concern; ESV = Ecological Screening Value; NA = Not Available; NOEC = No Observed Effect Concentration; pCi/kg = PicoCuries Per Kilogram; US DOE = United States Department of Energy; US EPA = United States Environmental Protection Agency.
(a) ESV from US EPA Region IV (2018).
(b) NOEC of 38 mg/kg was used as a conservative benchmark for boron in the absence of an ESV (ECHA, 2019).
(c) ESV from US DOE (2019); value converted from 90 pCi/g to 90,000 pCi/kg.

3.5.3 Ecological Receptors Exposed to Bioaccumulative Constituents of Interest

Screening Exposures: COIs with bioaccumulative properties can impact higher-trophic-level wildlife exposed to these COIs *via* direct exposures (surface water and sediment exposure) and secondary exposures through the consumption of dietary items (*e.g.*, plants, invertebrates, small mammals, and fish).

Screening Benchmark: US EPA Region IV (2018) guidance and IEPA's SWQS (IEPA, 2019) guidance were used to identify constituents with potential bioaccumulative effects.

Risk Evaluation: With the exception of mercury, the ecological COIs (barium, boron, cadmium, chromium, cobalt, lead, lithium, radium-226+228, chloride, and fluoride) were not identified as having potential bioaccumulative effects. Therefore, these COIs are not considered to pose an ecological risk *via* bioaccumulation. IEPA (2019) identifies mercury as the only metal with bioaccumulative properties. US EPA Region IV (2018) also identifies mercury (including methyl mercury) as having potential bioaccumulative effects.[8]

The modeled mercury concentration in surface water (2.8×10^{-10} mg/L) was below the mercury surface water ESV for wildlife (1.3×10^{-6} mg/L), and the modeled mercury concentration in sediment (1×10^{-5} mg/kg) was below the sediment ESV for wildlife (0.18 mg/kg) (US EPA Region IV, 2018). Both the modeled surface water and sediment concentrations were below benchmarks protective of receptors

[8] US EPA Region IV (2018) identifies selenium as having potential bioaccumulative effects. Although selenium was detected in groundwater, it was not considered an ecological COI.

accounting for bioaccumulative properties. Therefore, in addition to not posing an ecological risk from direct toxicity, mercury does not pose a risk from bioaccumulation exposures.

3.6 Uncertainties and Conservatisms

A number of uncertainties and their potential impact on the risk evaluation are discussed below. Wherever possible, conservative assumptions were used in an effort to minimize uncertainties and overestimate rather than underestimate risks.

Exposure Estimates:

- The risk evaluation included the IL Part 845.600 constituents detected in groundwater samples collected from wells associated with the AP. However, it is possible that not all of the detected constituents are related specifically to the AP.
- The human health and ecological risk characterizations were based on the maximum measured or modeled COI concentrations, rather than on averages. Thus, the variability in exposure concentrations was not considered. Assuming continuous exposure to the maximum concentration overestimates human and ecological exposures, given that receptors are mobile and concentrations change over time. For example, US EPA guidance states that risks should be estimated using average exposure concentrations as represented by the 95% upper confidence limit on the mean (US EPA, 1992). Given that exposure estimates based on the maximum concentrations did not exceed risk benchmarks, Gradient has greater confidence that there is no risk concern.
- Only constituents detected in groundwater were used to identify COIs and model COI concentrations in surface water and sediment. For the constituents that were not detected in the AP groundwater, the detection limits were below the IL Part 845.600 GWPS and, thus, do not require further evaluation.
- COI concentrations in surface water were modeled using the maximum detected total COI concentrations in groundwater. Modeling surface water concentrations using total metal concentrations may overestimate surface water concentrations because dissolved concentrations, which are lower than total concentrations, represent the mobile fractions of constituents that could likely flow to and mix with surface water.
- The COIs identified in this evaluation also occur naturally in the environment. Contributions to exposure from natural or other non-AP-related sources were not considered in the evaluation of modeled concentrations; only exposure contributions potentially attributable to Site groundwater mixing with surface water were evaluated. While not quantified, exposures from potential AP-related groundwater contributions are likely to represent only a small fraction of the overall human and ecological exposure to COIs that also have natural or non-AP-related sources.
- Screening benchmarks for human health were developed using exposure inputs based on US EPA's recommended values for reasonable maximum exposure (RME) assessments (Stalcup, 2014). RME is defined as "the highest exposure that is reasonably expected to occur at a site but that is still within the range of possible exposures" (US EPA, 2004). US EPA states the "intent of the RME is to estimate a conservative exposure case (*i.e.*, well above the average case) that is still within the range of possible exposures" (US EPA, 1989). US EPA also notes that this high-end exposure "is the highest dose estimated to be experienced by some individuals, commonly stated as approximately equal to the 90^{th} percentile exposure category for individuals" (US EPA, 2015b). Thus, most individuals will have lower exposures than those presented in this risk assessment.

Toxicity Benchmarks:

- Screening-level ecological benchmarks were compiled from IEPA and US EPA guidance and designed to be protective of the majority of Site conditions, leaving the option for Site-specific refinement. In some cases, these benchmarks may not be representative of the Site-specific conditions or receptors found at the Site, or may not accurately reflect concentration-response relationships encountered at the Site. For example, the ecological benchmark for cadmium is hardness dependent. Gradient relied on US EPA's default hardness of 100 mg/L due to the lack of hardness data from the Illinois River adjacent to the Site. However, United States Geological Survey (USGS) data from Hennepin, Illinois, (approximately 55 miles upstream of the Site) reported hardness ranging from 200 to 370 mg/L, with a mean of 288 mg/L, based on samples collected in 1980-1997 (USGS, 2021). Increasing the hardness from 100 to 288 mg/L would increase the cadmium SWQS because benchmarks increase (become less stringent) with higher levels of hardness. Regardless of the hardness, the maximum modeled cadmium concentration is orders of magnitude below the SWQS.
- In addition, for the ecological evaluation, Gradient conservatively assumed all constituents to be 100% bioavailable. Modeled COI concentrations in surface water are considered total COI concentrations. US EPA recommends using dissolved metals as a measure of exposure to ecological receptors because it represents the bioavailable fraction of metal in water (US EPA, 1993). Therefore, the modeled surface water COI concentrations may be an overestimation of exposure concentrations to ecological receptors.
- In general, it is important to appreciate that the human health toxicity factors used in this risk evaluation are developed to account for uncertainties, such that safe exposure levels used as benchmarks are often many times lower (even orders of magnitude lower) than the levels that cause effects that have been observed in human or animal studies. For example, toxicity factors incorporate a 10-fold safety factor to protect sensitive subpopulations. This means that a risk exceedance does not necessarily equate to actual harm.

4 Summary and Conclusions

A screening-level risk evaluation was performed for Site-related constituents in groundwater at the EPP in Peoria County, Illinois, between Mapleton and Bartonville. The CSM developed for the Site indicates that groundwater beneath the AP flows into the Illinois River adjacent to the Site and may potentially impact surface water and sediment.

CEMs were developed for human and ecological receptors. The complete exposure pathways for humans include recreators in the Illinois River who are exposed to surface water and sediment (boaters and swimmers) and anglers who consume locally caught fish. Based on the local hydrogeology, residential exposure to groundwater used for drinking water or irrigation is not a complete pathway and was not evaluated. The complete exposure pathways for ecological receptors include aquatic life (including aquatic and marsh plants, amphibians, reptiles, and fish) exposed to surface water; benthic invertebrates exposed to sediment; and avian and mammalian wildlife exposed to bioaccumulative COIs in surface water, sediment, and dietary items.

Groundwater data collected from 2015 to 2021 were used to estimate exposures, and data from the one available surface water sample was also evaluated. For groundwater constituents retained as COIs, surface water and sediment concentrations were modeled using the maximum detected groundwater concentration. Surface water and sediment exposure estimates were screened against benchmarks protective of human health and ecological receptors for this risk evaluation.

For recreators (boaters and swimmers) exposed to surface water, all COIs were below the conservative risk-based screening benchmarks. Therefore, none of the COIs evaluated in surface water are expected to pose an unacceptable risk to recreators boating or swimming in the Illinois River adjacent to the Site.

For recreators exposed to sediment *via* incidental ingestion and dermal contact, the modeled sediment concentrations were below health-protective sediment benchmarks. Therefore, the modeled sediment concentration are not expected to pose an unacceptable risk to recreators exposed to sediment in the Illinois River adjacent to the Site.

For anglers consuming locally caught fish, the modeled concentrations of all COIs in surface water (as well as the measured data) were below conservative benchmarks protective of fish consumption. Therefore, none of the COIs evaluated are expected to pose an unacceptable risk to recreators consuming fish caught in the Illinois River.

Ecological receptors exposed to surface water include aquatic and marsh plants, amphibians, reptiles, and fish. The risk evaluation showed that none of the modeled or measured COIs in surface water exceeded protective screening benchmarks. Ecological receptors exposed to sediment include benthic invertebrates. The modeled sediment COIs did not exceed the conservative screening benchmarks; therefore, none of the COIs evaluated in sediment are expected to pose an unacceptable risk to ecological receptors.

Ecological receptors were also evaluated for exposure to bioaccumulative COIs. This evaluation considered higher-trophic-level wildlife with direct exposure to surface water and sediment and secondary exposure through the consumption of dietary items (*e.g.*, plants, invertebrates, small mammals, fish). Mercury was the only ecological COI identified as having potential bioaccumulative effects. However, the modeled concentrations did not exceed benchmarks protective of bioaccumulative effects. Therefore, mercury is not considered to pose an ecological risk *via* bioaccumulation. Overall, this evaluation demonstrated that none of the COIs evaluated are expected to pose an unacceptable risk to ecological receptors.

It should be noted that this evaluation incorporates a number of conservative assumptions that tend to overestimate exposure and risk. The risk evaluation was based on the maximum detected COI concentration; however, US EPA guidance states that risks should be based on a representative average concentration such as the 95% upper confidence limit on the mean; thus, using the maximum concentration tends to overestimate exposure. Although the COIs identified in this evaluation also occur naturally in the environment, the contributions to exposure from natural background sources and nearby industry were not considered; thus, CCR-related exposures were likely overestimated. Exposure estimates assumed 100% metal bioavailability, which likely results in overestimates of exposure and risks. Exposure estimates were based on inputs to evaluate the "reasonable maximum exposure"; thus, most individuals will have lower exposures than those estimated in this risk assessment.

Finally, it should be noted that because current conditions do not present a risk to human health or the environment, there will also be no unacceptable risk to human health or the environment for future conditions when the AP is closed. For all future closure scenarios, potential releases of CCR-related constituents will decline over time and, consequently, potential exposures to CCR-related constituents in the environment will also decline.

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Appendix A

Surface Water and Sediment Modeling

Gradient modeled concentrations in river surface water and sediment based on available groundwater data. First, we estimated the flow rate of constituents of interest (COIs) discharged to the Illinois River *via* groundwater. Then, we adapted United States Environmental Protection Agency (US EPA) indirect exposure assessment methodology (US EPA, 1998) in order to model surface water and sediment water concentrations in the Illinois River.

Model Overview

The groundwater flow to the river is represented by a one-dimensional, steady-state model. In this model, the groundwater plume migrates horizontally in the Uppermost Aquifer (UA) prior to flowing to the Illinois River. The groundwater flow entering the river is the flow going through a cross-sectional area that has a length equal to the Edwards Ash Pond (AP) and a width equal to the maximum saturated thickness of the UA. It was assumed that all the groundwater flowing through the UA would ultimately discharge to the Illinois River. The length of groundwater discharge zone was estimated using Google Earth Pro (Google, LLC, 2022).

The groundwater flow to the Illinois River mixes with the surface water in the river. The COIs entering the river *via* groundwater can dissolve into the water column, sorb to suspended sediments, or sorb to benthic sediments. Using US EPA's indirect exposure assessment methodology (US EPA, 1998), the model evaluates the surface water and sediment concentrations at a location downstream of the groundwater discharge, assuming a well-mixed water column.

Groundwater Discharge Rate

The groundwater discharge rate was evaluated using conservative assumptions. Gradient conservatively assumed that the groundwater concentrations were uniformly equal to the maximum detected concentration for each individual COI. Further, Gradient ignored adsorption by subsurface soil and assumed that all the groundwater flowing through the UA was discharged into the river.

For each groundwater unit, the groundwater flow rate into the river was derived using Darcy's Law:

$$Q = K \times i \times A$$

where:

Q = Groundwater flow rate (m^3/s)
K = Hydraulic conductivity (m/s)
i = Hydraulic gradient (m/m)
A = Cross-sectional area (m^2)

For each COI, the mass discharge rate into the river was then calculated by:

$$m_c = C_c \times Q \times CF$$

where:

m_c = Mass discharge rate of the COI (mg/year)
C_c = Maximum groundwater concentration of the COI in milligrams per liter (mg/L)
Q = Groundwater flow rate (m^3/s)
CF = Conversion factors: 1,000 L/m^3; 31,557,600 s/year

The values of the aquifer parameters used for these calculations are provided in Table A.1. The calculated mass discharge rates were then used as inputs for the surface water and sediment partitioning model.

The cross-sectional area for the UA was 1,277 m^2. The length of the discharge zone was estimated to be equal to the length of the AP (*i.e.*, approximately 1,047 m). The height of the discharge zone was assumed to be the maximum thickness of the UA (1.22 m) (Burns McDonnell, 2021). The hydraulic gradient was 0.004 m/m, based on the maximum average horizontal hydraulic gradient determined for the UA (Burns McDonnell, 2021). The hydraulic conductivity of the UA was 0.00017 cm/s, based on the geometric mean horizontal hydraulic conductivity for all UA wells (Burns McDonnell, 2021).

Surface Water and Sediment Concentration

Groundwater discharged into the river will be diluted in the surface water flow. Constituents transported by groundwater into the surface water migrate into the water column and the bed sediments. The surface water model we used to estimate the surface water and sediment concentrations is a steady-state model described in US EPA's indirect exposure assessment methodology (US EPA, 1998) and also used in US EPA's "Human and Ecological Risk Assessment of Coal Combustion Residuals [CCR]" (US EPA, 2014). This model describes the partitioning of constituents between surface water, suspended sediments, and benthic sediments based on equilibrium partition coefficients (K_d). It estimates the concentrations of constituents in surface water, suspended sediments, and benthic sediments at steady-state equilibrium at a theoretical location downstream of the discharge point after complete mixing of the water column. In our analysis, Gradient used the partitioning coefficients given in Table J-1 of the US EPA CCR Risk Assessment for all COIs (US EPA, 2014). These coefficients are presented in Table A.2.

To be conservative, Gradient assumed that the constituents were not affected by dissipation or degradation once they entered the water body. The total water body concentration of the COI was calculated as (US EPA, 1998):

$$C_{wtot} = \frac{m_c}{V_f \times f_{water}}$$

where:

C_{wtot}	=	Total water body concentration of the constituent (mg/L)
m_c	=	Mass discharge rate of the COI (mg/year)
V_f	=	Water body annual flow (L/year)
f_{water}	=	Fraction of COI in the water column (unitless)

For the Illinois River annual flow rate, Gradient conservatively used the low flow (10^{th} percentile) discharge rate of about 5,946 cubic feet per second (cfs) or 5.3 x 10^{12} L/yr based on the daily mean discharge rates measured at United States Geological Survey (USGS) station at Kingston Mines, IL (USGS 05568500) between 2017 and 2021 (USGS, 2022). The surface water parameters are presented in Table A.3.

The fraction of COIs in the water column was calculated for each COI using the sediment/water and suspended solids/water partition coefficients (US EPA, 2014, Table J-1). The fraction of COIs in the water column is defined as (US EPA, 2014):

$$f_{water} = \frac{(1 + [K_{dsw} \times TSS \times 0.000001]) \times \frac{d_w}{d_z}}{\left([1 + (K_{dsw} \times TSS \times 0.000001)] \times \frac{d_w}{d_z}\right) + ([bsp + K_{dbs} \times bsc] \times \frac{d_b}{d_z})}$$

where:

K_{dsw}	=	Suspended sediment-water partition coefficient (mL/g)
K_{dbs}	=	Sediment-water partition coefficient (mL/g)
TSS	=	Total suspended solids in the surface water body (mg/L), set equal to the representative average river concentration of 6 mg/L (Hanson Professional Services, Inc., 2019)
0.000001	=	Units conversion factor
d_w	=	Depth of the water column (m). The depth of the water column was estimated as 2.74 m, based on bathymetry data for the Illinois River (Bist LLC, 2022).
d_b	=	Depth of the upper benthic layer (m), set equal to 0.03 m (US EPA, 2014)
$d_z = d_w + d_b$	=	Depth of the water body (m)
bsp	=	Bed sediment porosity (unitless), set equal to 0.6 (US EPA, 2014)
bsc	=	Bed sediment particle concentration (g/cm^3), set equal to 1.0 g/cm^3 (US EPA, 2014)

The fraction of COIs dissolved in the water column (f_d) is calculated as (US EPA 2014):

$$f_d = \frac{1}{1 + K_{dsw} \times TSS \times 0.000001}$$

The values of the fraction of COIs in the water column and other calculated parameters are presented in Table A.4.

The total water column concentration (C_{wcTot}) of the COIs, comprising both the dissolved and suspended sediment phases, is then calculated as (US EPA, 2014):

$$C_{wcTot} = C_{wtot} \times f_{water} \times \frac{d_z}{d_w}$$

Finally, the dissolved water column concentration (C_{dw}) for the COIs is calculated as (US EPA, 2014):

$$C_{dw} = f_d \times C_{wcTot}$$

The dissolved water column concentration was then used to calculate the concentration of COIs sorbed to suspended solids in the water column (US EPA, 1998):

$$C_{sw} = C_{dw} \times K_{dsw}$$

where:

C_{sw}	=	Concentration sorbed to suspended solids (mg/kg)
C_{dw}	=	Concentration dissolved in the water column (mg/L)
K_{dsw}	=	Suspended solids/water partition coefficient (mL/g)

In the same way, using the total water body concentration and the fraction of COIs in the benthic sediments, the model derives the total concentration in benthic sediments (US EPA, 2014, Table J-1-12):

$$C_{bstot} = f_{benth} \times C_{wtot} \times \frac{d_z}{d_b}$$

where:

C_{bstot}	=	Total concentration in bed sediment (mg/L or g/m^3)
C_{wtot}	=	Total water body concentration of the constituent (mg/L)
f_{benth}	=	Fraction of contaminant in benthic sediments (unitless)
d_b	=	Depth of the upper benthic layer (m)
$d_z = d_w + d_b$	=	Depth of the water body (m)

This value can be used to calculate dry weight sediment concentration as follows:

$$C_{sed-dw} = \frac{C_{bstot}}{bsc}$$

where:

C_{sed-dw}	=	Dry weight sediment concentration (mg/kg)
C_{bstot}	=	Total sediment concentration (mg/L)
bsc	=	Bed sediment bulk density (used the default value of 1 g/cm^3 from US EPA, 2014)

The total sediment concentration is composed of the concentration dissolved in the bed sediment pore water (equal to the concentration dissolved in the water column) and the concentration sorbed to benthic sediments (US EPA, 1998).

The concentration sorbed to benthic sediments was calculated from (US EPA, 1998):

$$C_{sb} = C_{dbs} \times K_{dbs}$$

where:

C_{sb}	=	Concentration sorbed to bottom sediments (mg/kg)
C_{dbs}	=	Concentration dissolved in the sediment pore water (mg/L)
K_{dbs}	=	Sediments/water partition coefficient (mL/kg)

For each COI, the modeled total water column concentration, the modeled dry weight sediment concentration, and the modeled concentration sorbed to sediment are presented in Table A.5.

Table A.1 Parameters Used to Estimate Groundwater Discharge to Surface Water

Groundwater Unit	Parameter	Name	Value	Unit
UA	A	Cross-Sectional Area	1,277	m^2
UA	i	Hydraulic Gradient	0.004	m/m
UA	K	Hydraulic Conductivity	0.00017	cm/s

Notes:
Source: Hydraulic gradient and hydraulic conductivity values from Burns McDonnell (2021).
Cross-sectional area was estimated from Burns McDonnell (2021).
UA = Uppermost Aquifer.

Table A.2 Partition Coefficients

Constituent	Sediment-Water, Mean, K_{dbs}		Suspended Sediment-Water, Mean, K_{dsw}	
	Value (log_{10}) (mL/g)	Value (mL/g)	Value (log_{10}) (mL/g)	Value (mL/g)
Metals				
Arsenic	2.4	2.51E+02	3.9	7.94E+03
Barium	2.5	3.16E+02	4	1.00E+04
Beryllium	2.8	6.31E+02	4.2	1.58E+04
Boron	0.8	6.31E+00	3.9	7.94E+03
Cadmium	3.3	2.00E+03	4.9	7.94E+04
Chromium	4.9	7.94E+04	5.1	1.26E+05
Cobalt	3.1	1.26E+03	4.8	6.31E+04
Lead	4.6	3.98E+04	5.7	5.01E+05
Lithium	-	-	-	-
Mercury	4.9	7.94E+04	5.3	2.00E+05
Thallium	1.3	2.00E+01	4.1	1.26E+04
Radionuclides				
Radium-226+228	-	7.40E+03	-	7.40E+03
Other				
Chloride	-	-	-	-
Fluoride	2.2	1.58E+02	2.2	1.58E+02
Sulfate	-	-	-	-

Notes:
Source: US EPA (2014).
Lithium, chloride, and sulfate do not readily sorb to soils and sediments. Consequently, sediment concentrations were not modeled for these constituents (K_d was assumed to be 0).

Table A.3 Surface Water Parameters

Parameter	Name	Value	Unit
TSS	Total Suspended Solids	6	mg/L
V_{fx}	Surface Water Flow Rate	5.3 x 10^{12}	L/yr
d_b	Depth of Upper Benthic Layer (default)	0.03	m
d_w	Depth of Water Column	2.74	m
d_z	Depth of Water Body	2.77	m
bsc	Bed Sediment Bulk Density (default)	1	g/cm^3
bsp	Bed Sediment Porosity (default)	0.6	-
M_{TSS}	TSS Mass per Unit Area[a]	0.0165	kg/m^2
M_S	Sediment Mass per Unit Area[b]	30	kg/m^2

Notes:
Source of default values: US EPA (2014).
(a) Determined by multiplying total suspended solids, TSS, by the depth of water column, d_w.
(b) Determined by multiplying depth of upper benthic layer, d_b, by the sediment bed particle concentration of 1 g/cm^3.

Table A.4 Calculated Parameters

COI	Fraction of Constituent in the Water Column f_{water}	Fraction of Constituent in the Benthic Sediments $f_{benthic}$	Fraction of Constituent Dissolved in the Water Column $f_{dissolved}$
Arsenic	0.276	0.724	0.955
Barium	0.234	0.766	0.943
Beryllium	0.137	0.863	0.913
Boron	0.933	0.067	0.955
Cadmium	0.063	0.937	0.677
Chromium	0.002	0.998	0.570
Cobalt	0.091	0.909	0.725
Lead	0.009	0.991	0.250
Lithium	0.993	0.007	
Mercury	0.003	0.997	0.455
Thallium	0.827	0.173	0.930
Radionuclides			
Radium-226+228	0.013	0.987	0.957
Other			
Fluoride	0.365	0.635	0.999

Notes:
COI = Constituent of Concern.

Table A.5 Surface Water and Sediment Modeling Results

COI	Groundwater Concentration (mg/L or pCi/L)	Mass Discharge Rate (mg/year or pCi/year)	Total Water Column Concentration (mg/L or pCi/L)	Concentration Sorbed to Bottom Sediments (mg/kg or pCi/kg)
Total Metals				
Arsenic	0.097	2.7E+04	5.1E-09	1.2E-06
Barium	8.6	2.4E+06	4.5E-07	1.3E-04
Beryllium	0.017	4.7E+03	8.9E-10	5.1E-07
Boron	12	3.3E+06	6.3E-07	3.8E-06
Cadmium	0.0040	1.1E+03	2.1E-10	2.8E-07
Chromium	0.59	1.6E+05	3.1E-08	1.4E-03
Cobalt	0.29	7.9E+04	1.5E-08	1.4E-05
Lead	0.27	7.4E+04	1.4E-08	1.4E-04
Lithium	0.85	2.3E+05	4.4E-08	(a)
Mercury	0.0018	4.9E+02	9.4E-11	3.4E-06
Thallium	0.0026	7.1E+02	1.4E-10	2.5E-09
Radionuclides				
Radium-226+228	23	6.3E+06	1.2E-06	8.5E-03
Other				
Chloride	830	2.3E+08	4.3E-05	(a)
Fluoride	10.2	2.8E+06	5.3E-07	8.4E-05
Sulfate	570	1.6E+08	3.0E-05	(a)

Notes:
COI = Constituent of Concern; pCi/kg = PicoCuries Per Kilogram; pCi/L = PicoCuries Per Liter.
(a) Lithium, chloride, and sulfate do not readily sorb to soil or sediment particles; a K_d value of 0 was used for the modeling.

Appendix B

Screening Benchmarks

Table B.1 Calculated Water Quality Standards Protective of Incidental Ingestion and Fish Consumption

Human Health COI	BCF[a] (L/kg-tissue)	Basis	MCL (mg/L)	RfD (mg/kg-day)	ADI[b] (mg/day)	Human Threshold Criteria Water & Fish (mg/L)	Water Only (mg/L)	Fish Only (mg/L)
Arsenic	44	NRWQC (2002)	0.010	0.00030	0.020	0.022	2.0	0.023
Barium	130	US EPA (2014)	2.0	0.20	4.0	1.5	400	1.5
Beryllium	19	NRWQC (2002)	0.0040	0.0020	0.0080	0.021	0.80	0.021
Boron	1	(c)	NC	0.20	14	467	1,400	700
Chromium	16	NRWQC (2002)	0.10	1.5	0.20	0.61	20	0.63
Cobalt	300	ORNL (2018)	NC	0.00030	0.021	0.0035	2.1	0.0035
Fluoride	2.3	US EPA (2014)	4.0	0.040	8.0	143	800	174
Lead	46	US EPA (2014)	0.015	NC	0.030	0.015	0.015	0.015
Lithium	1	(c)	NC	0.002	0.14	4.7	14	7.0
Thallium	116	NRWQC (2002)	0.0020	0.000010	0.0040	0.0017	0.40	0.0017
Human Health COI	**BAF (L/kg-tissue) SW-Fish**	**Basis**	**MCL (pCi/L)**	**ADI (pCi/day)**	**Food Ingestion Slope Factor[d] (risk/pCi)**	**Human Threshold Criteria Water & Fish (pCi/L)**	**Water Only (pCi/L)**	**Fish Only (pCi/L)**
Radium-226+228	4.0	ORNL (2018)	5	10	1.43E-09	1,000	1,000	87,413

Notes:

ADI = Acceptable Daily Intake; BAF = Bioaccumulation Factor; BCF = Bioconcentration Factor; MCL = Maximum Contaminant Level; NC = No Criterion Available; NRWQC = National Recommended Water Quality Criteria; ORNL = Oak Ridge National Laboratory; pCi = PicoCurie; Ra = Radium; RAIS = Risk Assessment Information System; RfD = Reference Dose; US EPA = United States Environmental Protection Agency.

(a) BCFs from the following hierarchy of sources:

NRWQC (US EPA, 2002). National Recommended Water Quality Criteria: 2002. Human Health Criteria Calculation Matrix.

US EPA (2014). Human and Ecological Risk Assessment of Coal Combustion Residuals.

ORNL RAIS (ORNL, 2018). Risk Assessment Information System (RAIS) Toxicity Values and Chemical Parameters.

(b) ADI based on the MCL is calculated as the MCL (mg/L) multiplied by a water ingestion rate of 2 L/day. In the absence of an MCL, the ADI was calculated as the RfD (mg/kg-day) multiplied by the body weight (70 kg).

(c) BCF of 1 was used as a conservative assumption, due to lack of published BCF.

(d) Food ingestion slope factors for Ra-226+D and Ra-228+D were compared and the higher factor (Ra-228+D) was selected. The "+D" indicates that the risks from "associated short-lived radioactive decay products are also included" (US EPA, 2001).

Equations from IEPA (2019):

Consumption of Water and Fish

$$HTC = \frac{ADI}{W + (F \times BCF)}$$

Incidental Consumption of Water Only

$$HTC = \frac{ADI}{W}$$

Consumption of Fish Only

$$HTC = \frac{ADI}{F \times BCF}$$

Where:

Human Threshold Criteria (HTC)	Chemical-specific	mg/L
Acceptable Daily Intake (ADI)	Chemical-specific	mg/day
Fish Consumption Rate (F)	0.02	kg/day
Bioconcentration Factor (BCF)/ Bioaccumulation Factor (BAF)	Chemical-specific	L/kg-tissue
Water Consumption Rate (W)	0.01	L/day
Body Weight	70	kg
Target Cancer Risk (TCR)	1.0E-05	

Radium-226+228

$$HTC = \frac{TCR}{(SF \times BAF \times F)}$$

Table B.2 Recreator Exposure to Sediment

COI	Relative Bioavailability (unitless)	Dermal Absorption Fraction (unitless)	Cancer				Cancer SL (mg/kg)	Non-Cancer								Recreator RSL Sediment (mg/kg)	Basis[a]
			TRV		Child + Adult			TRV		Child		Adult		Child	Adult		
			CSF (mg/kg-day)$^{-1}$	Dermal CSF (mg/kg-day)$^{-1}$	Incidental Ingestion SL (mg/kg)	Dermal Contact SL (mg/kg)		RfD (mg/kg-day)	Dermal RfD (mg/kg-day)	Incidental Ingestion SL (mg/kg)	Dermal Contact SL (mg/kg)	Incidental Ingestion SL (mg/kg)	Dermal Contact SL (mg/kg)	Non-Cancer SL (mg/kg)			
Total Metals																	
Arsenic	1	3.0E-02	1.5E+00	1.5E+00	8.1E+01	4.1E+02	6.8E+01	3.0E-04	3.0E-04	4.1E+02	4.4E+03	4.4E+03	8.0E+03	3.8E+02	2.8E+03	6.8E+01	c
Barium	1	NA	NC	NC	NC	NC	NC	2.0E-01	1.4E-02	2.7E+05	NA	2.9E+06	NA	2.7E+05	2.9E+06	2.7E+05	nc
Beryllium	1	NA	NC	NC	NC	NC	NC	2.0E-03	1.4E-05	2.7E+03	NA	2.9E+04	NA	2.7E+03	2.9E+04	2.7E+03	nc
Boron	1	NA	NC	NC	NC	NC	NC	2.0E-01	2.0E-01	2.7E+05	NA	2.9E+06	NA	2.7E+05	2.9E+06	2.7E+05	nc
Chromium	1	NA	NC	NC	NC	NC	NC	1.5E+00	2.0E-02	2.1E+06	NA	2.2E+07	NA	2.1E+06	2.2E+07	2.1E+06	nc
Cobalt	1	NA	NC	NC	NC	NC	NC	3.0E-04	3.0E-04	4.1E+02	NA	4.4E+03	NA	4.1E+02	4.4E+03	4.1E+02	nc
Lead	1	NA	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	NC	4.0E+02	L
Lithium	1	NA	NC	NC	NC	NC	NC	2.0E-03	2.0E-03	2.7E+03	NA	2.9E+04	NA	2.7E+03	2.9E+04	2.7E+03	nc
Thallium	1	NA	NC	NC	NC	NC	NC	1.0E-05	1.0E-05	1.4E+01	NA	1.5E+02	NA	1.4E+01	1.5E+02	1.4E+01	nc
Other																	
Fluoride	1	NA	NC	NC	NC	NC	NC	4.0E-02	4.0E-02	5.5E+04	NA	5.8E+05	NA	5.5E+04	5.8E+05	5.48E+04	nc
Radionuclides																**Total Soil PRG (pCi/kg)**	
Radium-226+228																7.9E+03	

Notes:

ABS = Dermal Absorption Fraction; COI = Constituent of Interest; CSF = Cancer Slope Factor; NC = No Criterion Available; pCi = PicoCurie; PRG = Preliminary Remediation Goal; RfD = Reference Dose; RSL = Regional Screening Level; SL = Screening Level; TRV = Toxicity Reference Value; US EPA = United States Environmental Protection Agency.

(a) Screening benchmark defined as the lower of the Screening Levels for cancer and non-cancer. The basis of the benchmark presented as c = based on cancer endpoint, nc = based on non-cancer endpoint, or L = based on blood lead levels.

Equations for Screening Benchmark and Screening Levels:

$$\text{Screening Benchmark} = \frac{1}{\frac{1}{SL_{ing}} + \frac{1}{SL_{derm}}}$$

$$\text{Non-cancer } SL_{ing} = \frac{THQ * RfD}{Intake} \qquad \text{Cancer } SL_{ing} = \frac{TR}{Intake * CSF}$$

$$\text{Non-cancer } SL_{derm} = \frac{THQ * RfD}{Intake * ABS} \qquad \text{Cancer } SL_{derm} = \frac{TR}{Intake * ABS * CSF}$$

Where:

Target Risk (TR)	1E-05	
Target Hazard Quotient (THQ)	1	
Reference Dose (RfD)	Chemical-specific	mg/kg-day
Dermal Absorption Fraction (ABS)	Chemical-specific	
Cancer Slope Factor (CSF)	Chemical-specific	mg/kg
Incidental Ingestions Screening Level (SL_{ing})	Chemical-specific	mg/kg
Dermal Contact Screening Level (SL_{derm})	Chemical-specific	mg/kg

Sediment – Ingestion (Chemical)

Intake Factor (IF) = $\frac{IR \times EF \times ED \times CF}{BW \times AT}$ =		Non-Cancer		Cancer		Basis
		7.3E-07	6.8E-08	6.3E-08	2.0E-08	
		Child	Adult	Child	Adult	
IR	Ingestion Rate (mg/day)	67	33	67	33	One-third of US EPA residential soil ingestion rate (Professional Judgment)
EF	Sediment Exposure Frequency (days/year)	60	60	60	60	2 days/week between April and October when air temperature > 70°F (Professional Judgment)
ED	Exposure Duration (years)	6	20	6	20	Default value for Resident (US EPA, 2021b)
CF	Conversion Factor (kg/mg)	0.000001	0.000001	0.000001	0.000001	
BW	Body Weight (kg)	15	80	15	80	Default value for Resident (US EPA, 2021b)
AT	Averaging Time (days)	2,190	7,300	25,550	25,550	Default value for Resident (US EPA, 2021b)

Sediment – Dermal Contact (Chemical)

Intake Factor (IF) = $\frac{SA \times AF \times EF \times ED \times CF}{BW \times AT}$ =		Non-Cancer		Cancer		Basis
		2.2E-06	1.2E-06	1.9E-07	3.6E-07	
		Child	Adult	Child	Adult	
SA	Surface Area Exposed to Sediment (cm²/day)	1,026	3,026	1,026	3,026	Age weighted SA for lower legs and feet (US EPA, 2011b)
AF	Sediment Skin Adherence Factor (mg/cm²)	0.2	0.2	0.2	0.2	Age weighted AF for children exposed to sediment (US EPA, 2011b)
EF	Sediment Exposure Frequency (days/year)	60	60	60	60	2 days/week between April and October when air temperature > 70°F (Professional Judgment)
ED	Exposure Duration (years)	6	20	6	20	Default value for Resident (US EPA, 2021b)
CF	Conversion Factor (kg/mg)	0.000001	0.000001	0.000001	0.000001	
BW	Body Weight (kg)	15	80	15	80	Default value for Resident (US EPA, 2021b)
AT	Averaging Time (days)	2,190	7,300	25,550	25,550	Default value for Resident (US EPA, 2021b)

Table B.3.1 Recreator PRGs for Soil, input values

Variable	Recreator Soil Default Value	Form-input Value
A (PEF Dispersion Constant)	16.2302	16.8653
B (PEF Dispersion Constant)	18.7762	18.7848
City (Climate Zone)	Default	Chicago, IL (7)
C (PEF Dispersion Constant)	216.108	215.0624
Cover layer thickness for GSF (gamma shielding factor) cm	0 cm	0 cm
$CF_{rec\text{-}fowl}$ (fowl contaminated fraction) unitless	1	1
$CF_{rec\text{-}game}$ (game contaminated fraction) unitless	1	1
ED_{rec} (exposure duration - recreator) yr		26
EF_{rec} (exposure frequency - recreator) day/yr		60
$f_{p\text{-}fowl}$ (fowl on-site fraction) unitless	1	1
$f_{p\text{-}game}$ (land game on-site fraction) unitless	1	1
$f_{s\text{-}fowl}$ (fraction of year fowl is on site) unitless	1	1
$f_{s\text{-}game}$ (fraction of year land game is on site) unitless	1	1
$MLF_{pasture}$ (pasture plant mass loading factor) unitless	0.25	0.25
t_{rec} (time - recreator) yr		26
TR (target risk) unitless	0.000001	0.000001
F(x) (function dependent on U_m/U_t) unitless	0.194	0.182
PEF (particulate emission factor) m^3/kg	1,359,344,438	1,560,521,177
Q/C_{wind} (g/m^2-s per kg/m^3)	93.77	98.431
A_s (acres)	0.5	0.5
Site area for ACF (area correction factor) m^2	1,000,000 m^2	1,000 m^2
ED_{rec} (exposure duration - recreator) yr		26
$ED_{rec\text{-}a}$ (exposure duration - recreator adult) yr		20
$ED_{resc\text{-}c}$ (exposure duration - recreator child) yr		6
EF_{rec} (exposure frequency - recreator) day/yr		60
$EF_{rec\text{-}a}$ (exposure frequency - recreator adult) day/yr		60
$EF_{rec\text{-}c}$ (exposure frequency - recreator child) day/yr		60
ET_{rec} (exposure time - recreator) hr/day		8
$ET_{rec\text{-}a}$ (exposure time - recreator) hr/day		8
$ET_{rec\text{-}c}$ (exposure time - recreator) hr/day		8
$IFA_{rec\text{-}adj}$ (age-adjusted inhalation rate - recreator) m^3		9,200
$IFS_{rec\text{-}adj}$ (age-adjusted soil intake rate - recreator) mg		63,720
$IRA_{rec\text{-}a}$ (inhalation rate - recreator adult) m^3/day	20	20
$IRA_{rec\text{-}c}$ (inhalation rate - recreator child) m^3/day	10	10
$IRS_{rec\text{-}a}$ (soil intake rate - recreator adult) mg/day	100	33
$IRS_{rec\text{-}c}$ (soil intake rate - recreator child) mg/day	200	67
t_{rec} (time - recreator) yr		26
TR (target risk) unitless	0.000001	0.000001
U_m (mean annual wind speed) m/s	4.69	4.65
U_t (equivalent threshold value)	11.32	11.32
V (fraction of vegetative cover) unitless	0.5	0.5

Notes:
IL = Illinois; PRG = Preliminary Remediation Goal; yr = Year.

Table B.3.2 Recreator PRGs for Soil, Ra-226

Isotope	ICRP Lung Absorption Type	Soil Ingestion Slope Factor (risk/pCi)	Inhalation Slope Factor (risk/pCi)	External Exposure Slope Factor (risk/yr per pCi/g)	Food Ingestion Slope Factor (risk/pCi)	Lambda (1/yr)	Half-life (yr)	1,000 m^2 Soil Volume Area Correction Factor	0 cm Soil Volume Gamma Shielding Factor	Particulate Emission Factor (m^3/kg)	Dry Soil-to-plant transfer factor (pCi/g-fresh plant per pCi/g-dry soil)	Beef Transfer Factor (pCi/kg per pCi/d)	Poultry Transfer Factor (pCi/kg per pCi/d)	Ingestion PRG TR=1.0E-06 (pCi/g)	Inhalation PRG TR=1.0E-06 (pCi/g)	External Exposure PRG TR=1.0E-06 (pCi/g)	Total PRG TR=1.0E-06 (pCi/g)	Total PRG TR=1.0E-06 (mg/kg)	Total PRG TR=1.0E-06 (pCi/kg)
Ra-226	S	6.77E-10	2.82E-08	2.50E-08	5.14E-10	4.33E-04	1.60E+03	6.85E-01	1.00E+00	1.56E+09	1.95E-02	1.70E-03	-	2.32E+01	6.02E+03	4.10E+01	1.48E+01	1.50E-05	1.48E+04

Notes:

d = Day; ICRP = International Commission on Radiological Protection; Ra = Radium; S = Slow; pCi = PicoCurie; PRG = Preliminary Remediation Goal; TR = Target Risk; yr = Year.

Table B.3.3 Recreator PRGs for Soil, Ra-228

Isotope	ICRP Lung Absorption Type	Soil Ingestion Slope Factor (risk/pCi)	Inhalation Slope Factor (risk/pCi)	External Exposure Slope Factor (risk/yr per pCi/g)	Food Ingestion Slope Factor (risk/pCi)	Lambda (1/yr)	Half-life (yr)	1,000 m^2 Soil Volume Area Correction Factor	0 cm Soil Volume Gamma Shielding Factor	Particulate Emission Factor (m^3/kg)	Dry Soil-to-plant transfer factor (pCi/g-fresh plant per pCi/g-dry soil)	Beef Transfer Factor (pCi/kg per pCi/d)	Poultry Transfer Factor (pCi/kg per pCi/d)	Ingestion PRG TR=1.0E-06 (pCi/g)	Inhalation PRG TR=1.0E-06 (pCi/g)	External Exposure PRG TR=1.0E-06 (pCi/g)	Total PRG TR=1.0E-06 (pCi/g)	Total PRG TR=1.0E-06 (mg/kg)	Total PRG TR=1.0E-06 (pCi/kg)
Ra-228	S	1.98E-09	4.37E-08	3.43E-11	1.42E-09	1.21E-01	5.75E+00	1.00E+00	1.00E+00	1.56E+09	1.95E-02	1.70E-03	-	7.93E+00	3.89E+03	2.04E+04	7.91E+00	2.90E-08	7.91E+03

Notes:

d = Day; ICRP = International Commission on Radiological Protection; Ra= Radium; S = Slow; pCi = PicoCurie; PRG = Preliminary Remediation Goal; TR = Target Risk; yr = Year.

Attachment B

Supporting Information for the Closure Alternatives Analysis – Ash Pond at the Edwards Power Plant

CLOSURE ALTERNATIVES ANALYSIS SUPPORTING INFORMATION REPORT

EDWARDS POWER PLANT
ASH POND
(IEPA ID W1438050005-01)
Bartonville, Illinois

April 2022

PREPARED FOR:

Illinois Power Resources Generating, LLC
1500 Eastport Plaza Drive
Collinsville, Illinois 62234

PREPARED BY:

IngenAE, LLC
502 Earth City Expressway, Suite 120
Earth City, MO 63045

Project Number: VST002-D22-001-01

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TABLES

1. INTRODUCTION AND BACKGROUND

Illinois Power Resources Generating, LLC (IPRG) is the owner of the coal-fired Edwards Power Plant (EPP), also referred to as Edwards Power Station, located at 7800 South Cilco Lane in Bartonville, Peoria County, Illinois. EPP is currently active but expected to cease operations no later than December 31, 2022. IPRG intends to complete closure of the Ash Pond at Edwards Power Plant (IEPA ID No. W1438050005-01, CCR Unit ID 301, and National Inventory of Dams Number IL50710). Closure of the Ash Pond will be performed under the relevant Illinois Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments (Part 845) [1] and the United States Environmental Protection Agency (USEPA) CCR Rule [2].

Part 845, Section 854.710, requires a Closure Alternatives Analysis (CAA) to be completed to support the Closure Plan prepared pursuant to Section 845.720. The CAA for the Ash Pond at the Edwards Power Plant will be performed by Gradient Corporation (Gradient). IngenAE, LLC (IngenAE) has prepared this Closure Alternatives Analysis Supporting Information Report (Report) to provide information requested by Gradient to support their preparation of the CAA.

1.1. Report Contents

The following information is contained within this report:

- **Section 1** Introduction and Background
- **Section 2** Information related to closure-by-removal (CBR) including:
  - A feasibility evaluation of CBR using an on-site landfill (CBR-Onsite)
  - An evaluation of potential off-site landfill to receive the CCR for CBR-Offsite
  - A feasibility evaluation of CCR transportation for CBR-Offsite using over-the-road trucks, rail, and barging.
- **Section 3** An overview of the planned construction for both CIP and CBR-Offsite
- **Section 4** Project schedule for both CIP and CBR-Offsite
- **Section 5** Estimates for construction material quantities, cost, labor, vehicle miles, and equipment miles, for both CIP and CBR-Offsite.

2. CLOSURE-BY-REMOVAL INFORMATION

Section 845.710(c)(1) requires the evaluation of complete removal of CCR (e.g., CBR), and Section 845.710(c)(2) requires the CAA to identify if the Power Plant has a landfill that can accept CCR, or if construction of an on-site landfill is feasible. Additionally, Section 845.710(c)(1) requires the evaluation of multiple modes of transportation of CCR, including rail, barge, and truck. This section includes evaluation of on-site landfill options, potential off-site landfills, and potential methods for transporting CCR to off-site landfills.

2.1. Evaluation of On-site Landfill Options

2.1.1. Feasibility of New On-site Landfill Construction

The EPP property boundary was evaluated to consider if constructing a new on-site landfill was feasible. The entire property owned by IPRG, including Edwards Power Plant, the Ash Pond, and the Coal Yard is approximately 216 acres. The Ash Pond is approximately 102 acres, and the Edwards Power Plant and Coal Yard are approximately 60 acres of the total 216. Combined, these three areas encompass 162 acres of the 216, which leaves less than 60 acres available for potential development of a landfill. This is not enough space for the landfill, buffers, stormwater ponds, and other infrastructure that would be required. Furthermore, the owned property outside of the Ash Pond and Edwards Power Plant is within the 100-year floodplain of the Illinois River. Therefore, there is no feasible area for constructing a landfill within the existing EPP property boundary. The property boundary is shown in **Figure 1**.

2.2. Potential CBR-Offsite Receiving Landfills

Potential off-site landfills suitable for disposing of approximately 4,391,000 CY of CCR within the Ash Pond were evaluated using IEPA's online Illinois Disposal Capacity report [3]. The closest landfills to the site, by road miles, were determined to be Indian Creek Landfill #2 in Hopedale, Illinois, Envirofil of Illinois Inc. in Macomb, Illinois, and Clinton Landfill #3 in Clinton, Illinois.

The Indian Creek Landfill #2 is the preferred landfill due to its location being the closest to EPP (24 miles vs. 60 and 71 one-way miles, respectively), thereby resulting in reduced hauling mileage. All three landfills have sufficient remaining permitted capacity to receive the approximate 4,391,000 CY of CCR, although the landfills have not yet been contacted, as of the date of this report, to confirm that they would be willing to accept the CCR. Information on all landfills is provided in **Table 1** and the location of each landfill relative to the EPP is provided in **Figure 2**.

2.3. Potential CBR-Offsite Transportation Methods

Section 845.710(c)(1) required CBR to consider multiple methods for transporting removed CCR, including using rail, barge, and trucks. An evaluation of each method is included within this section.

2.3.1. Transportation by Rail

Edwards Power Plant does have an established coal rail line encircling the Ash Pond, however, the rail loop is proposed to be demolished to complete closure of the Ash Pond. Additionally, the potential off-site landfills do not have established rail terminals on-site. New rail terminals would need to be constructed, which would increase the project schedule due to the need to coordinate with the railroads, complete design and permitting, and construct the terminal. CCR would still need to be hauled by truck from the new off-site unloading terminal to the landfill, resulting in additional CCR handling and exposure to the surrounding environment.

Furthermore, a direct rail route from the Edwards Power Plant to the off-site landfills does not exist. Hauling CCR to Indian Creek Landfill would involve hauling by rail on tracks owned by three separate rail lines (Union Pacific Railroad, Illinois and Midland Railroad Inc., and Canadian National Rys.). Hauling CCR to Envirofil of Illinois Inc. would involve hauling over two separately owned rail lines (Keokuk Junction Ry. and BNSF Ry. Co.) and hauling CCR to Clinton Landfill would involve hauling over three separate rail lines (Union Pacific Railroad, Illinois and Midland Railroad Inc., and Canadian National Rys.). All these rail routes are shown on **Figure 2.** The ability of CCR to be hauled over multiple lines and transferred from line to line is currently unknown. Therefore, transporting CCR by rail is unlikely to be a viable option for the EPP Ash Pond, due to the need to design, permit, and construct additional unloading infrastructure, which would result in corresponding project schedule delays, and the number of rail lines which the CCR would need to be transported over.

2.3.2. Transportation by Barge

Edwards Power Plant is located along the Illinois River but does not currently have a barge loadout facility on-site. The Peoria Barge Terminal is located approximately 6 miles north of EPP by road, but this would require additional CCR handling and exposure to the surrounding environment. Additionally, none of the potential off-site landfills are located along the Illinois River or near a barge loadout facility. Therefore, transporting CCR by barge is unlikely to be a viable option for the EPP Ash Pond.

2.3.3. Transportation by Truck

Transporting CCR by truck will not require the construction of additional loading or unloading infrastructure at either the receiving landfills or the EPP. CCR would be loaded into trucks using heavy equipment at the Ash Pond. CCR will then be unloaded at the receiving landfill by the trucks directly. Since no construction is required, project delays related to coordination with other entities, design, and permitting are unlikely to be required. Therefore, transporting CCR by truck is a viable option for the EPP Ash Pond. Potential travel routes between the EPP and the potential off-site landfills are shown on **Figure 2**, although actual travel routes may vary.

3. CLOSURE DESCRIPTION NARRATIVES

Section 845.720(a)(1)(A) requires narrative description of CCR impoundment closures to be prepared. Narrative descriptions have been prepared for both CIP and CBR-Offsite and are included within this section.

3.1. CIP

The CIP scenario entails relocating approximately 1,130,000 cubic yards of CCR from the high points, the northwest section of the Ash Pond, and the rail line embankment to the south end of the existing impoundment to achieve proposed final grades. The remaining 69 acres of the impoundment will then be capped with a final cover system. The new cover system will consist of, from bottom to top, a 40-mil LLDPE geomembrane, a geocomposite drainage layer, and 24 inches of soil including 6 inches of soil to support vegetative growth.

The CIP final grading plan can be found in **Figure 4**. The major components of construction are described below:

- Free liquids will be removed from the Ash Pond by pumping free surface water and discharged at the existing NPDES Outfall. A temporary water management system will be constructed within the Ash Pond, including ditches and sumps. Collected liquids will be pumped to temporary storage locations for ultimate discharge in accordance with an NPDES permit.
- As the phreatic surface is lowered to a safe level, heavy equipment will be mobilized to relocate CCR from the high points and northwest sections of the surface impoundment to the south end and other low areas of the surface impoundment to achieve the proposed grading plan.
- An earthen berm will be constructed of local silty soils to contain and stabilize the remaining CCR in the north and middle sections of the surface impoundment.
- Structures within the surface impoundment, including culverts, the spillway structure and outfall pipe, and a sewer forcemain, will be removed or closed in place
- A final cover system consisting of, from bottom to top, a 40-mil LLDPE geomembrane, a geocomposite drainage layer, and 24 inches of soil including 6 inches of soil to support vegetative growth, shall be constructed.
- Stormwater structures will be installed on the west side of the final cover system to direct stormwater to the existing drainage ditch on the west side of the CCR surface impoundment. The noncontact stormwater will discharge from the drainage ditch in accordance with the Plant's NPDES permit.
- Additional soil will be placed in the northwest relocation area and graded to promote positive drainage toward the proposed stormwater pond.
- The disturbed areas and newly placed soils will be fertilized and planted with native grasses or pollinators. If pollinators are proposed for the capped areas, the final grading plan shall be revised as required to increase the depth of the protective soil to accommodate the deeper roots of the pollinators.

3.2. CBR-Offsite

A narrative description of how CBR-Offsite of the Ash Pond is provided below:

- Free liquids will be removed from the Ash Pond by pumping free surface water and discharged at the existing NPDES Outfall.
- A temporary water management system will be constructed within the Ash Pond, including ditches and sumps. The system will maintain the Ash Pond in an unwatered state by collecting contact stormwater during closure construction. Unwatering flows will be pumped to temporary storage locations for ultimate discharge in accordance with an NPDES permit.
- CCR will be removed from the Ash Pond using mass mechanical excavation techniques. Much of the CCR will be saturated or nearly saturated, so mass excavation will include the use of dewatering trenches or other forms of passive dewatering to moisture-condition the CCR prior to handling. Dewatering flows will be pumped to the temporary storage locations for ultimate discharge in accordance with an NPDES permit.
- CCR will be loaded into over-the-road dump trucks and hauled to the off-site receiving landfill.
- After CCR and CCR residue is removed, up to 1 foot of soil will be removed beneath this area. The subsoils will be visually observed for signs of CCR staining. If subsoils with CCR staining are observed, they will be removed and disposed in the off-site receiving landfill.
- The excavated former Ash Pond will be backfilled with an estimated volume of 900,000cy to achieve a minimum elevation of approximately 432 feet and sloped at 0.25% to promote drainage towards the existing west ditch. Backfill materials shall include clean soil material excavated from the borrow source.
- The top six inches of imported soil shall be capable of supporting vegetation. Disturbed surfaces shall be revegetated with native grasses or pollinators. Stormwater best management practices (BMPs) such as erosion control blankets and straw wattles will be used, as needed to reduce erosion during vegetation establishment. After vegetation is established, BMPs will be removed, and closure construction will be considered completed.

The CBR-Offsite final grading plan can be found in **Figure 3**.

4. CONSTRUCTION SCHEDULES

Section 845.720(a)(1)(F) requires a schedule including all activities necessary to complete closure to be prepared. Schedules have been prepared for both CIP and CBR-Offsite and are included within this section. Schedules were prepared using estimates of task durations based on IngenAE's experience, typical weather conditions at the site, and expected construction rates relative to estimated construction quantities.

4.1. CIP

The proposed closure completion schedule for CIP is provided in Section 2.6 of the Edwards Power Plant Ash Pond Final Closure Plan [4].

4.2. CBR-Offsite

The proposed closure construction schedule for CBR-Offsite is provided in **Table 2.**

5. MATERIAL, QUANTITY, COST, LABOR, AND MILEAGE ESTIMATES

5.1. Quantity and Cost Estimates

Section 845.720(d)(1) requires a cost estimate to be prepared in accordance with the Class 4 standards of the Association for the Advancement of Cost Engineering (AACE) [5]. Cost Estimates for both CIP and CBR-Offsite were prepared in accordance with the AACE Class 4 standards, utilizing the following approach:

- Major construction components and line-items were identified, in accordance with the narrative closure description (**Section 3**).
- Construction quantities were estimated based on volume estimates, area estimates, and proposed construction schedules (**Section 4**).
- Unit costs were estimated for each construction line-item utilizing RSMeans Heavy Construction Cost Data [6] (RS Means). For line-items where RSMeans data was not available, unit costs were estimated based on IngenAE's experience.
- Soil fill was assumed to come from off-site borrow sources located within 4 miles of the site, as limited borrow soil is expected to be available at EPP.
- A contingency of 5% was applied for the construction cost estimate total, based on the level of design and quantity estimate prepared as part of this Report.

5.2. Labor and Mileage Estimates

In addition to construction cost and quantity estimates, IngenAE also prepared estimates of construction labor hours, equipment usage, and haul truck mileage. These estimates were prepared using the following approach:

- For line items where RSMeans [6] was utilized to develop the costs, the corresponding RSMeans crew size, equipment description, and daily output were utilized to estimate the total number of man-hours and equipment hours.
- For line items where RSMeans data was unavailable, the crew size, equipment description, and daily output were estimated based on IngenAE's experience.
- Estimates of haul truck mileage were based on the assumed round-trip haul distance and dump truck size. All dump trucks were assumed to be filled to capacity.

5.3. Results

The total cost estimate for CIP is $52,095,260.12 including contingency. The detailed cost estimate and labor and mileage estimates are provided in **Tables 3** and **4**, respectively.

The total cost estimate for CBR-Offsite is $250,888,446.12 including contingency. The detailed cost estimate and labor and mileage estimates are provided in **Tables 5** and **6**, respectively.

6. REFERENCES

[1] Illinois Environmental Protection Agency, “35 Ill. Adm. Code Part 845, Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments,” Springfield, IL, 2021.

[2] United States Environmental Protection Agency, “40 CFR Parts 257 and 261, Hazardous and Solid Waste Management System, Disposal of Coal Combustion Residuals from Electric Utilities, Final Rule,2015,” 2015.

[3] Illinois Environmental Protection Agency, “Illinois Landfill Disposal Capacity Report,” August 2021.

[4] IngenAE, LLC, “Final Closure Plan, Edwards Power Plant, Ash Pond,” St. Louis, Missouri, March 2022.

[5] AACE International, “Recommended Practice 18R-97: Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Process Industries,” 2020.

[6] RSMeans, “Heavy Construction Costs with RSMeans Data,” Gordian, 2021.

FIGURES

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ILLINOIS POWER RESOURCES GENERATING, LLC.

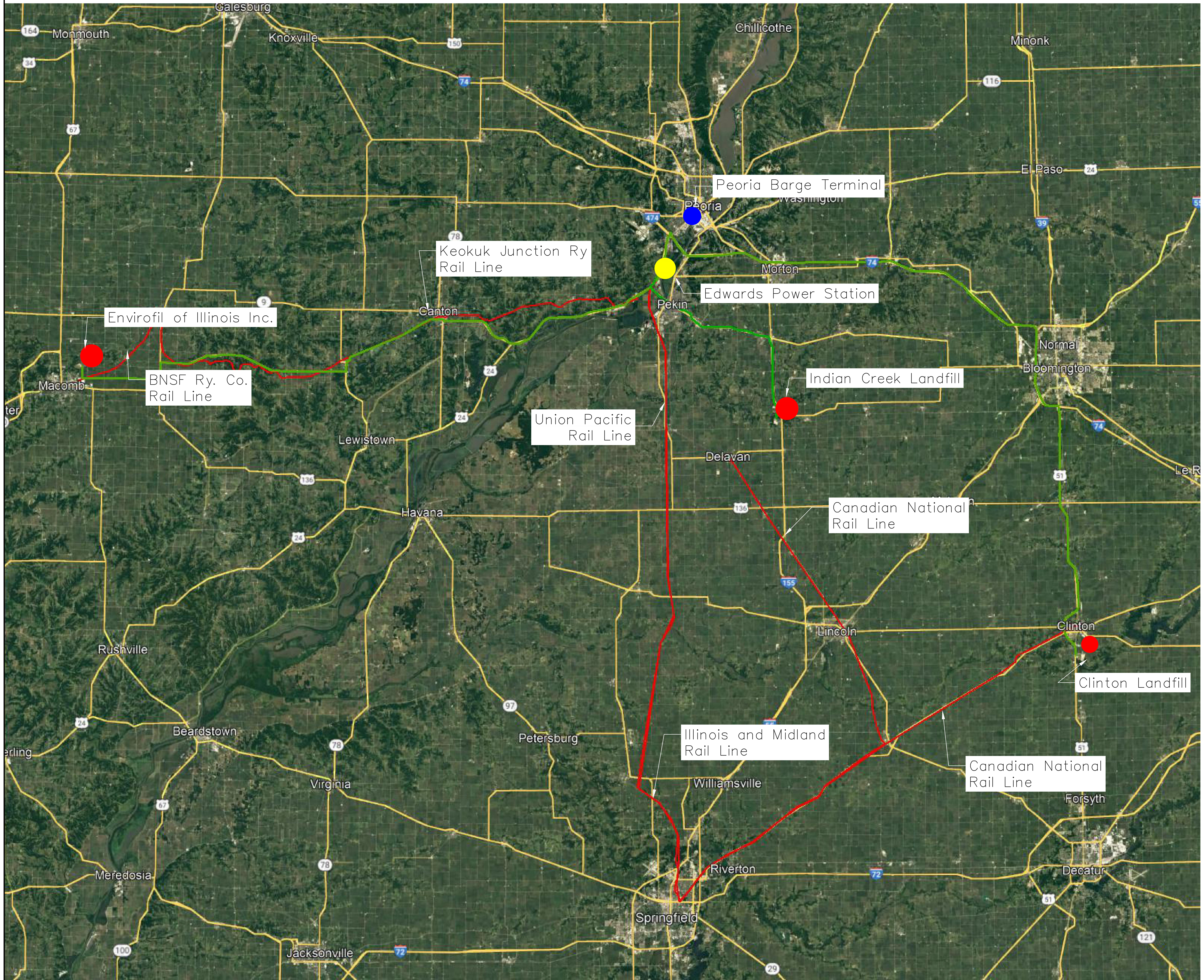
Project Name & Location:

EDWARDS POWER PLANT ASH POND CONCEPTUAL CLOSURE ALTERNATIVES

Drawing Name:

POTENTIAL ONSITE LANDFILL LOCATIONS

Date: 4/20/2022	Project No.
Type: SITE	Figure No. 1
Drawn By: MC	
Approved By: BH	
Scale: AS NOTED	



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0 1 2 MILES

LEGEND

- EDWARDS POWER PLANT
- POTENTIAL OFFSITE LANDFILL
- EXISTING BARGE TERMINAL
- POTENTIAL RAIL HAUL ROUTE
- POTENTIAL TRUCK HAUL ROUTE
- HIGHWAY

NOTES

1. Imagery and basemap from Google Earth Pro (2021)
2. Railways from Illinois Road Map (2018) by Illinois Department of Transportation

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ILLINOIS POWER RESOURCES GENERATING, LLC

Project Name & Location:

EDWARDS POWER PLANT ASH POND CONCEPTUAL CLOSURE ALTERNATIVES

Drawing Name:

OFFSITE LANDFILL TRANSPORTATION ROUTES

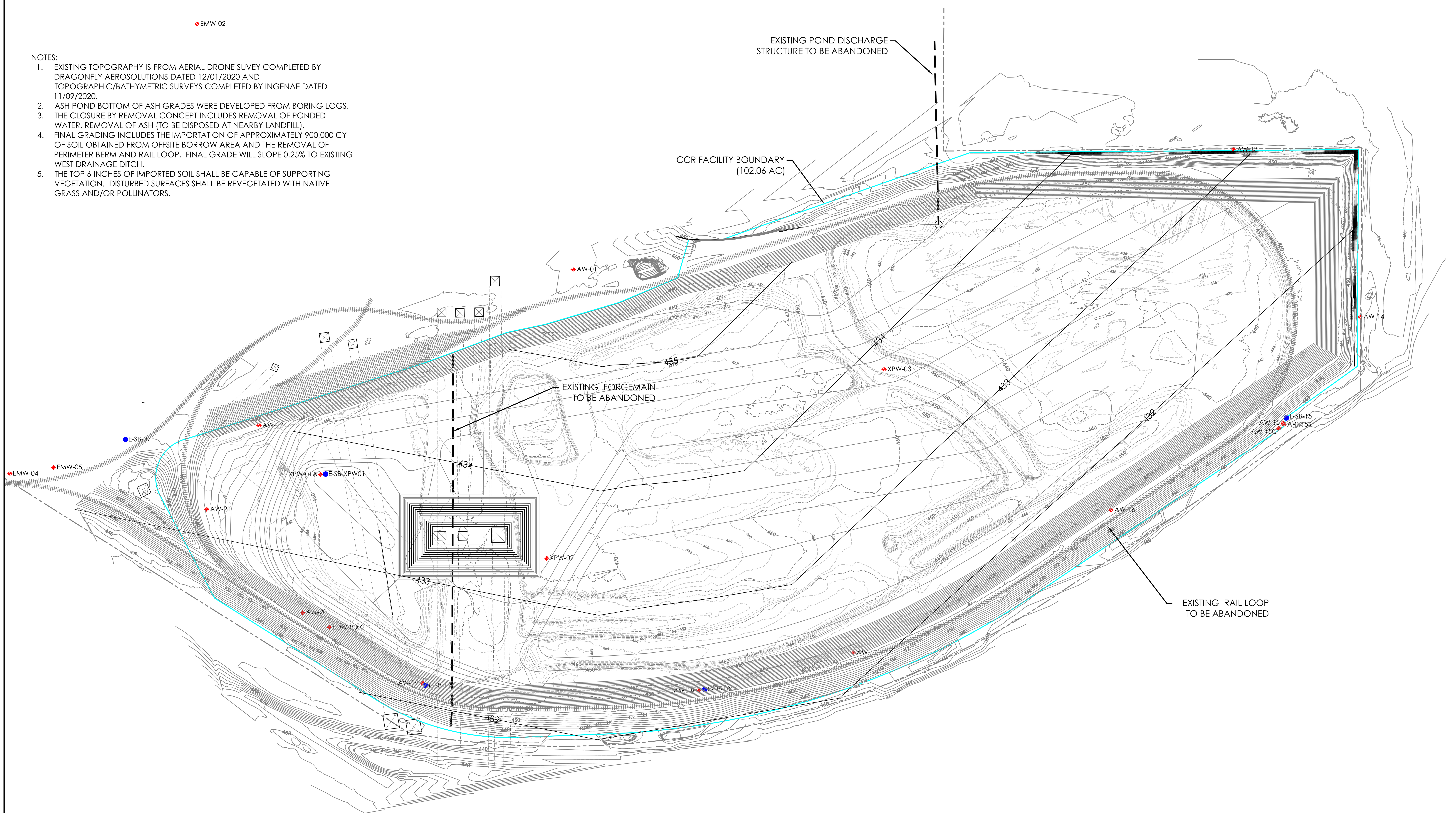
Date: 4/20/2022	Project No.
Type: SITE	Figure No. 2
Drawn By: MC	
Approved By: BH	
Scale: AS NOTED	

LEGEND

- BOTTOM OF ASH CONTOUR (2' INTERVAL)
- BOTTOM OF ASH CONTOUR (10' INTERVAL)
- RESTRICTED USE BOUNDARY
- CCR FACILITY BOUNDARY
- PROPOSED FINAL GRADE CONTOUR (2' INTERVAL)
- PROPOSED FINAL GRADE CONTOUR (10' INTERVAL)
- WELL
- BORING

NOTES:

1. EXISTING TOPOGRAPHY IS FROM AERIAL DRONE SUVEY COMPLETED BY DRAGONFLY AEROSOLUTIONS DATED 12/01/2020 AND TOPOGRAPHIC/BATHYMETRIC SURVEYS COMPLETED BY INGENAE DATED 11/09/2020.
2. ASH POND BOTTOM OF ASH GRADES WERE DEVELOPED FROM BORING LOGS.
3. THE CLOSURE BY REMOVAL CONCEPT INCLUDES REMOVAL OF PONDED WATER, REMOVAL OF ASH (TO BE DISPOSED AT NEARBY LANDFILL).
4. FINAL GRADING INCLUDES THE IMPORTATION OF APPROXIMATELY 900,000 CY OF SOIL OBTAINED FROM OFFSITE BORROW AREA AND THE REMOVAL OF PERIMETER BERM AND RAIL LOOP. FINAL GRADE WILL SLOPE 0.25% TO EXISTING WEST DRAINAGE DITCH.
5. THE TOP 6 INCHES OF IMPORTED SOIL SHALL BE CAPABLE OF SUPPORTING VEGETATION. DISTURBED SURFACES SHALL BE REVEGETATED WITH NATIVE GRASS AND/OR POLLINATORS.



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ILLINOIS POWER RESOURCES GENERATING, LLC.

Project Name & Location:

EDWARDS POWER PLANT ASH POND CONCEPTUAL CLOSURE ALTERNATIVES

DO NOT SCALE PLANS
Copying, Printing, Software and other processes required to produce these prints can stretch or shrink the actual paper or layout. Therefore, scaling of this drawing may be inaccurate. Contact IngenAE with any need for additional dimensions or clarifications.

Drawing Name:

FINAL GRADING PLAN - CLOSURE BY REMOVAL

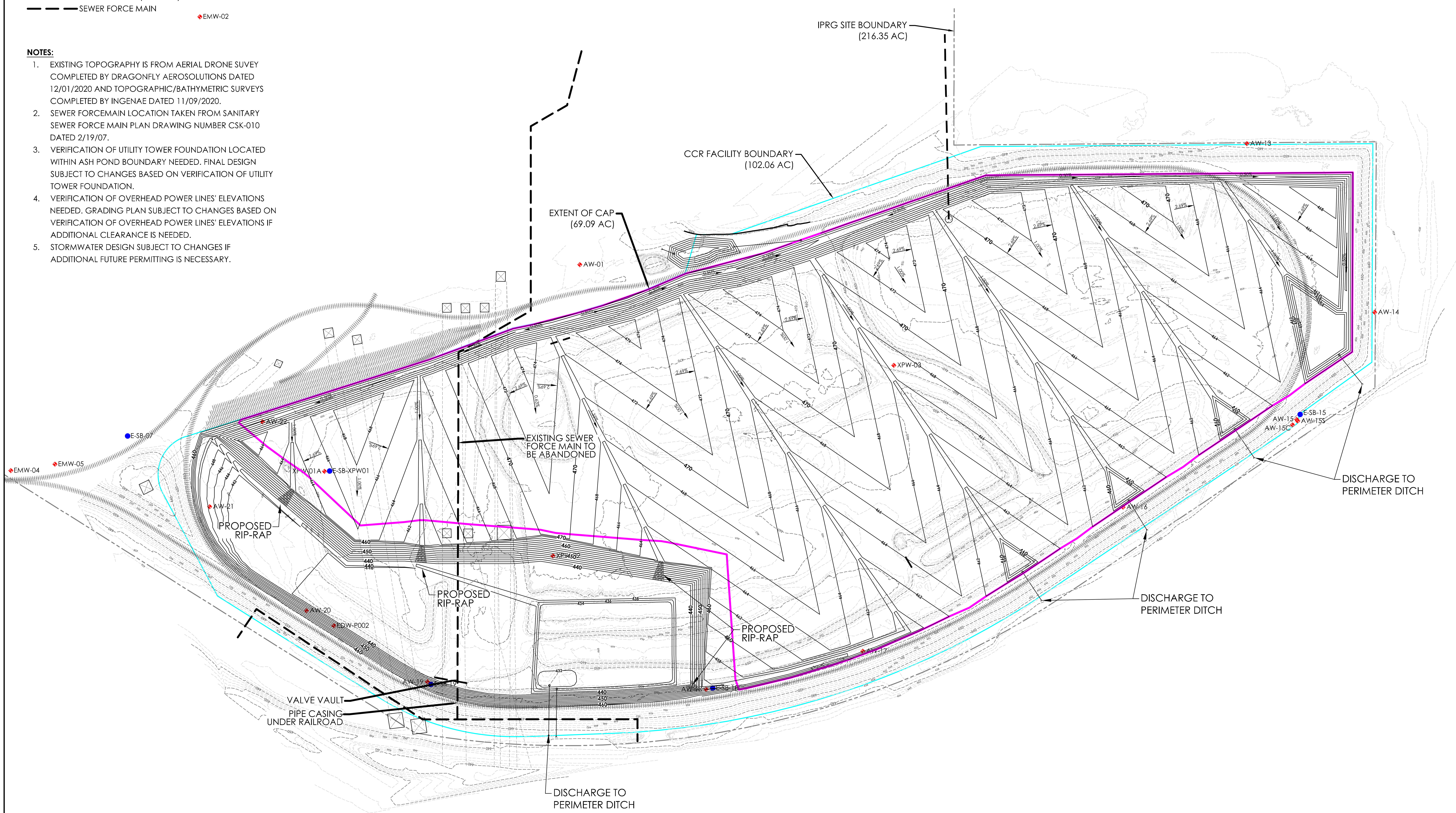
Date: 4/20/2022	Project No.
Type: PLAN	Figure No. 3
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	

LEGEND

- EXISTING CONTOUR (2' INTERVAL)
- EXISTING CONTOUR (10' INTERVAL)
- IPRG SITE BOUNDARY
- ASH POND BOUNDARY
- PROPOSED FINAL COVER CONTOUR (2' INTERVAL)
- PROPOSED FINAL COVER CONTOUR (10' INTERVAL)
- WELL
- BORING
- EXTENT OF CAP (69.00 AC)
- SEWER FORCE MAIN

NOTES:

1. EXISTING TOPOGRAPHY IS FROM AERIAL DRONE SUVEY COMPLETED BY DRAGONFLY AEROSOLUTIONS DATED 12/01/2020 AND TOPOGRAPHIC/BATHYMETRIC SURVEYS COMPLETED BY INGENAE DATED 11/09/2020.
2. SEWER FORCEMAIN LOCATION TAKEN FROM SANITARY SEWER FORCE MAIN PLAN DRAWING NUMBER CSK-010 DATED 2/19/07.
3. VERIFICATION OF UTILITY TOWER FOUNDATION LOCATED WITHIN ASH POND BOUNDARY NEEDED. FINAL DESIGN SUBJECT TO CHANGES BASED ON VERIFICATION OF UTILITY TOWER FOUNDATION.
4. VERIFICATION OF OVERHEAD POWER LINES' ELEVATIONS NEEDED. GRADING PLAN SUBJECT TO CHANGES BASED ON VERIFICATION OF OVERHEAD POWER LINES' ELEVATIONS IF ADDITIONAL CLEARANCE IS NEEDED.
5. STORMWATER DESIGN SUBJECT TO CHANGES IF ADDITIONAL FUTURE PERMITTING IS NECESSARY.



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ILLINOIS POWER RESOURCES GENERATING, LLC.

Project Name & Location:

EDWARDS POWER PLANT ASH POND CONCEPTUAL CLOSURE ALTERNATIVES

Drawing Name:

FINAL GRADING PLAN - CLOSURE IN PLACE

Date: 4/20/2022	Project No.
Type: PLAN	Figure No. 4
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	

TABLES

Table 1: Off-site Landfill Information

Landfill Name	Owner	Location	One-Way Distance from Site by Road (Miles)	2020 Five-Year Average Disposal Volume (in-place CY) [3]	2020 Remaining Capacity Reported (in-place CY) [3]
Indian Creek Landfill #2	GFL Environmental	Hopedale, IL	24	399,120	12,547,615
Envirofil of Illinois Inc.	Waste Management	Macomb, IL	60	97,327	7,690,440
Clinton Landfill #3	GFL Environmental	Clinton, IL	71	558,567	25,685,737

Table 2: Construction Schedule – CBR-Offsite

Milestone	Timeframe (Estimate)
Agency Coordination and Permit Approvals. • State permits for dewatering, land disturbance, stormwater discharge, and dam modifications.	6 to 12 months after the approval of the Final Closure Plan.
Dewater and Stabilize CCR. • Dewater surface impoundment. • Stabilize dewatered CCR.	18 to 24 months after approved permits.
CCR Ash Removal Offsite • Mass excavation and disposal of CCR from surface impoundment and rail line embankment to an approved landfill. • Removal and decontamination of the subsoils (approximately 1 foot). • Removal of existing structures. • Remove of rail line.	40 to 48 months after the completion of the dewatering and stabilization of the CCR subgrade. Can be completed in conjunction with dewatering and stabilization of CCR.
Placement of Vegetative Soil Backfill. • Backfill the surface impoundment with minimum of 6 inches of vegetative soil. • Install stormwater structures.	3 to 4 months after subsoils removal and decontamination. Can be completed in conjunction with the removal and decontamination of the subsoils.
Site Restoration. • Lime, Seed, fertilize, and mulch the final protective layer. • Demobilization.	2 to 4 months after the completion of the vegetative soil backfill. Can be completed in conjunction with the placement of the vegetative soils.
Timeframe to Complete Closure	**69 to 92 Months**

Table 3: Material Quantity and Cost Estimate - CIP (1 of 2)

TABLE 3
SCENARIO 1 - CLOSURE IN PLACE
MATERIAL QUANTITY AND COST ESTIMATE
EDWARDS POWER PLANT ASH POND

Description	Category	Units	Quantity	Unit Price	Total	Crew	Labor Hours	Equipment Hours	Mileage	Miscellaneous
Mobilization/Demobilization		**Lump Sum**	**1**	**$2,245,485.35**	**$2,245,485.35**					5 % of total project
Survey		**Lump Sum**	**1**	**$449,097.07**	**$449,097.07**					1 % of total project
Site and Borrow Area Preparation/Remediation		**Lump Sum**	**1**	**$1,740,568.00**	**$1,740,568.00**					
	Construction Trailers and Storge	Monthly Rent	40	$1,192.00	$47,680.00	2 Skwk				Rent for 2 office trailers, 2 storage Conex boxes, and 2 portable toilets (40 Months after dewater)
	Stormwater Controls	Linear feet	9,000	$3.74	$33,660.00	B62	333	110		Silt fence, 9000 linear feet (perimiter of Pond), labor .037
	Stripping Borrow	Cubic Yds	40,400	$1.07	$43,228.00	B10B	202	135		50 acres, 6 inches of stripping. The borrow is 8 feet deep = Clay construction and protective soil
	Dust Control	Day	560	$2,325.00	$1,302,000.00	B59	4,480	4,480	44,800	Dust control 3 days a week, 14 days/month, 40 months (10 miles/hr)
	Road Maintenance	Day	200	$1,570.00	$314,000.00	B86A	1,600	1,600	16,000	Road Maintenance 1 day a week, 5 days/month, 40 months (10 miles/hr)
Standing Water Removal - Ponds		**Day**	**49**	**$1,490.00**	**$73,010.00**	B-10K	588	394		Standing water on top of ash, pump 8 hrs, labor 1.5 hr
Ash Pond Dewatering		**Day**	**306**	**$1,490.00**	**$455,940.00**	B-10K	3,672	2,460		Volume to pump to 10 feet below subgrade and removal area (Porosity of 50%)
Installation of Dewatering Trenches		**BCY**	**51,250**	**$2.09**	**$107,112.50**	B12D	461	231		6,150 linear feet of 15 foot trenches benched, crossection of 225 sqft
Demolition of Rail Line		**Lump Sum**	**1**	**$374,203.00**	**$374,203.00**					
	Track and Tie Removal	Linear Feet	10,300	$19.50	$200,850.00	B13	1,751	250		Labor .170 times 10,300
	Ballast Removal	Cubic Yds	22,900	$7.57	$173,353.00	B14	2,198	366		Labor .096 time 22,900 Cyds
Demolition of Structures		**Lump Sum**	**1**	**$82,132.00**	**$82,132.00**					Outfall structure, leachate line, culverts
	Demolition of Outfall Structure	LS	1	$65,905.00	$65,905.00	B21C, B69	151	22		Catwalk, outfall structure, and grout pipe
	Demolition of Leachate Line	LS	1	$2,700.00	$2,700.00		8	4		Grout 1200 feet of 6" pipe and cap ends. Grout $200/cyd, 10 yards. 2 laborers,trucks, 4 hrs ($700)
	Demolition of Culverts	BCY	1350	$10.02	$13,527.00	B12F	96	48		Remove three culverts
Ash Relocation - Rail Line Embankment Ash		**Cubic Yds**	**210,000**	**$8.11**	**$1,703,100.00**					Rail area built with ash outside pond
	Excavate and Load Ash Subgrade	Cubic Yds	210,000	$1.45	$304,500.00	B14A	840	563		
	Haul Ash Subgrade	Cubic Yds	210,000	$3.61	$758,100.00	B34G	2,100	2,100	12,400	
	Place Ash Subgrade	Cubic Yds	210,000	$2.47	$518,700.00	B10B	2,520	1,688		
	Compact Ash Subgrade	Cubic Yds	210,000	$0.58	$121,800.00	B10Y	1,050	704		
Ash Relocation - Northwest Area/High Points		**Cubic Yds**	**1,130,000**	**$8.11**	**$9,164,300.00**					Based on grading plan & berm volumes
	Excavate and Load Ash Subgrade	Cubic Yds	1,130,000	$1.45	$1,638,500.00	B14A	4,520	3,028		
	Haul Ash Subgrade	Cubic Yds	1,130,000	$3.61	$4,079,300.00	B34G	11,300	11,300	66,600	
	Place Ash Subgrade	Cubic Yds	1,130,000	$2.47	$2,791,100.00	B10B	13,560	9,085		
	Compact Ash Subgrade	Cubic Yds	1,130,000	$0.58	$655,400.00	B10Y	5,650	3,786		
Construction of Northwest Berm		**Cubic Yds**	**410,000**	**$21.76**	**$8,921,600.00**					Clay from borrow area or west berm removal
	Purchase Offsite Clay Soils	Cubic Yds	410,000	$12.55	$5,145,500.00					8 feet deep , 50 acres, includes protective soil, total 635,000 cyds
	Excavate and Load Clay from Borrow	Cubic Yds	410,000	$1.45	$594,500.00	B14A	1,640	1,099		
	Haul Clay from Borrow	Cubic Yds	410,000	$3.91	$1,603,100.00	B34C	9,430	9,430	99,400	
	Place Clay from Borrow	Cubic Yds	410,000	$2.47	$1,012,700.00	B10B	4,920	3,296		
	Compact Lifts of clay from Borrow	Cubic Yds	410,000	$1.38	$565,800.00	B10G	3,690	2,472		based on 4 passes with Sheeps foot, cost on 6-inch lift, same cost for project 8-inch lift
Subsoil Overexcavation		**Cubic Yards**	**53,250**	**$47.01**	**$2,503,050.00**					33 acres of ash relocation area
	Excavation and Load Subsoils	Cubic Yds	53,250	$1.45	$77,212.50	B14A	213	143		
	Haul subsoils to Landfill	Cubic Yds	53,250	$16.35	$870,637.50	B34C	5,112	5112	161,500	50 mile cycle 45 miles per hour Indian Creek Landfill #2
	Tipping Fee at Landfill	Tons	28,800	$54.00	$1,555,200.00					1080 lbs per cubic yard, tipping fee from 2020 report

Table 3: Material Quantity and Cost Estimate - CIP (2 of 2)

TABLE 3 SCENARIO 1 - CLOSURE IN PLACE MATERIAL QUANTITY AND COST ESTIMATE EDWARDS POWER PLANT ASH POND										
Geomembrane Installation		**Square Feet**	**3,310,000**	**$1.25**	**$4,137,500.00**	B63B	56,270	14,068		69.09 acres - Based on Project experience
Geocomposite Installation		**Square Feet**	**3,310,000**	**$0.81**	**$2,681,100.00**	B63B	13,240	3,310		69.09 acres, cost of material per sq ft $.61, labor per sq ft is $.20. Costs based on experience.
Anchor Trench Installation		**Linear Feet**	**8,462**	**$2.82**	**$23,877.00**					Perimeter of the 69.09 acres, 8,462 linear ft, 2x2 trench, 1260 cyds
	Excavation	Cubic Yds	1,260	$10.81	$13,620.60	B11C	135	67		Perimeter of the 69.09 acres, 8,462 linear ft, 2x2 trench, 1260 cyds
	Backfilling	Cubic Yds	1,260	$3.37	$4,246.20	B10R	38	25		
	Compaction	Cubic Yds	1,260	$4.77	$6,010.20	A1D	72	72		
Protective Soil Layer		**Cubic Yds**	**566,000**	**$20.38**	**$11,535,080.00**					2 feet over 69.06 acres, Design grades in the NW Excavation (33 acres)
	Purchase Offsite Protective Soils	Cubic Yds	566,000	$12.55	$7,103,300.00					
	Excavate and Load Protective Soil from Borrow	Cubic Yds	566,000	$1.45	$820,700.00	B14A	2,264	1,517		
	Haul Protective Soil from Borrow	Cubic Yds	566,000	$3.91	$2,213,060.00	B34C	13,000	13,000	137,212	
	Place Protective Soil from Borrow	Cubic Yds	566,000	$2.47	$1,398,020.00	B10B	6,792	4,551		
Fertilizing and Seeding		**MSF**	**5,200**	**$115.27**	**$599,404.00**					Complete ash pond area closure 69.09 acres and 50 acres at borrow
	Lime	MSF	5,200	$19.74	$102,648.00	B66	57	57		
	Fertilizing	MSF	5,200	$10.19	$52,988.00	B66	57	57		
	Seeding	MSF	5,200	$34.70	$180,440.00	B66	801	801		
	Mulch	MSF	5,200	$50.64	$263,328.00	B65	156	156		
Stormwater/Erosion Controls		**Lump Sum**	**1**	**$754,175.00**	**$754,175.00**					
	Riprap Letdowns	SYD	2,500	$147.00	$367,500.00	B13	2,643	378		4 letdowns at 625 syd per letdown
	Geotextile	SYD	2,500	$0.97	$2,425.00	2 Clab	15	0		4 letdowns at 625 syd per letdown
	Stormwater Channel Erosion Blanket	SYD	25,000	$11.87	$296,750.00	B80A	1,175	388		
	Stormwater Outfalls	Lump Sum	5	$17,500.00	$87,500.00	B3A	1,000	200		5 outfall structures on west side, 5 day x $3,500
Access Road		**Linear Feet**	**2,800**	**$19.13**	**$53,555.50**					2800 feet 1 foot thick 8 feet wide
	Material	Cubic Yds	850	$20.00	$17,000.00					
	Hauling	Cubic Yds	850	$4.83	$4,105.50	B34C	24	24	208	
	Placement and Compaction	SYD	2,500	$12.98	$32,450.00	B32	20	15		
Construction Quality Assurance (CQA)		**Lump Sum**	**1**	**$2,245,485.35**	**$2,245,485.35**					5 % of total project
Additional Construction		**Lump Sum**	**1**	**$2,245,485.35**	**$2,245,485.35**					5 % of total project
Total Hours/Miles							**179,843**	**102,591**	**538,120**	
Project Cost					**$44,909,707.00**					
Total Cost (Project, Mob/Demob/Survey/CQA/Add. Cons)					**$52,095,260.12**					

Table 4: Labor, Equipment, and Mileage Estimate - CIP (1 of 2)

TABLE 4
SCENARIO 1 - CLOSURE IN PLACE
LABOR, EQUIPMENT, MILEAGE
EDWARDS POWER PLANT ASH POND

Description	Category	Crew	Labor Hours	Labor	Equipment Hours	Equipment	Mileage	Miscellaneous
Mobilization/Demobilization								
Survey								
Site and Borrow Area Preparation/Remediation								
	Construction Trailers and Storge	2 Skwk						
	Stormwater Controls	B62	333	2 Laborers, 1 Light Equipment 0perator	110	1 Loader, 1 Skid Steer, 30 H.P.		
	Stripping Borrow	B10B	202	.5 Laborer, 1 Medium Equipment Operator	135	1 Dozer, 200 H.P.		
	Dust Control	B59	4,480	1 Heavy Truck Driver	4,480	1 Truck Tractor, 220 H.P., 1 Water Tank Trailer, 5,000 Gal.	44,800	Mileage = 10 mph, 8 hours/day, 560 day
	Road Maintenance	B86A	1,600	1 Medium Equipment Operator	1,600	1 Grader, 30,000 lbs	16,000	Mileage = 10 mph, 8 hours/day, 200 day
Standing Water Removal - Ponds		B-10K	588	.5 Laborer, 1 Medium Equipment Operator	394	6" Water Pump with Suction and Discharge Hoses		
Ash Pond Dewatering		B-10K	3,672	.5 Laborer, 1 Medium Equipment Operator	2,460	6" Water Pump with Suction and Discharge Hoses		
Installation of Dewatering Trenches		B12D	461	1 Laborer, 1 Crane Operator	231	1 Excavator, 3.5 Cyds		
Demolition of Rail Line								
	Track and Tie Removal	B13	1,751	1 Labor Foreman, 4 Laborers, 1 Crane Operator, 1 Oiler	250	1 Crane, 25 Tons		
	Ballast Removal	B14	2,198	1 Labor Foreman, 4 Laborers, 1 Light Equipment Operator	366	1 Backhoe Loader, 48 H.P.		
Demolition of Structures								
	Demolition of Outfall Structure	B21C, B69	151	1 Labor Foreman, 4 Laborers, 1 Crane Operator, 1 Oiler	22	1 Boom Crane, 90 Tons		
	Demolition of Leachate Line		8	2 Laborers	4	1 Truck		
	Demolition of Culverts	B12F	96	1 Laborer, 1 Crane Operator	48	1 Excavator, .75 Cyds		
Ash Relocation - Rail Line Embankment Ash								
	Excavate and Load Ash Subgrade	B14A	840	.5 Laborer, 1 Crane Operator	563	1 Excavator, 4.5 Cyds		
	Haul Ash Subgrade	B34G	2,100	1 Heavy Truck Driver	2,100	1 Dump Truck (Off Road), 65 Tons	12,400	2 mile cycle, 6,200 loads, 34 cyd loads
	Place Ash Subgrade	B10B	2,520	.5 Laborer, 1 Medium Equipment Operator	1,688	1 Dozer, 200 H.P.		
	Compact Ash Subgrade	B10Y	1,050	.5 Laborer, 1 Medium Equipment Operator	704	1 Vibratory Roller, 12 Tons		
Ash Relocation - Northwest Area/High Points								
	Excavate and Load Ash Subgrade	B14A	4,520	.5 Laborer, 1 Crane Operator	3,028	1 Excavator, 4.5 Cyds		
	Haul Ash Subgrade	B34G	11,300	1 Heavy Truck Driver	11,300	1 Dump Truck (Off Road), 65 Tons	66,600	2 mile cycle, 33,300 loads, 34 cyd loads
	Place Ash Subgrade	B10B	13,560	.5 Laborer, 1 Medium Equipment Operator	9,085	1 Dozer, 200 H.P.		
	Compact Ash Subgrade	B10Y	5,650	.5 Laborer, 1 Medium Equipment Operator	3,786	1 Vibratory Roller, 12 Tons		
Construction of Northwest Berm								
	Purchase Offsite Clay Soils							
	Excavate and Load Clay from Borrow	B14A	1,640	.5 Laborer, 1 Crane Operator	1,099	1 Excavator, 4.5 Cyds		
	Haul Clay from Borrow	B34C	9,430	1 Heavy Truck Driver	9,430	1 Truck Tractor, 380 H.P., and Dump Trailer, 16.5 Cyds	99,400	4 mile cycle, 24,850 loads, 16.5 cyd loads
	Place Clay from Borrow	B10B	4,920	.5 Laborer, 1 Medium Equipment Operator	3,296	1 Dozer, 200 H.P.		
	Compact Lifts of clay from Borrow	B10G	3,690	.5 Laborer, 1 Medium Equipment Operator	2,472	1 Sheepsfoot Roller, 240 H.P.		
Subsoil Overexcavation								
	Excavation and Load Subsoils	B14A	213	.5 Laborer, 1 Crane Operator	143	1 Excavator, 4.5 Cyds		
	Haul subsoils to Landfill	B34C	5,112	1 Heavy Truck Driver	5,112	1 Truck Tractor, 380 H.P., and Dump Trailer, 16.5 Cyds	161,500	50 mile cycle, 3230 loads, 16.5 cyd loads
	Tipping Fee at Landfill							
Geomembrane Installation		B63B	56,270	1 Labor Foreman, 2 Laborers, 1 Light Equipment Operator	14,068	1 Loader, 1 Skid Steer, 30 H.P.		
Geocomposite Installation		B63B	13,240	1 Labor Foreman, 2 Laborers, 1 Light Equipment Operator	3,310	1 Loader, 1 Skid Steer, 30 H.P.		

Table 4: Labor, Equipment, and Mileage Estimate - CIP (2 of 2)

TABLE 4 SCENARIO 1 - CLOSURE IN PLACE LABOR, EQUIPMENT, MILEAGE EDWARDS POWER PLANT ASH POND								
Anchor Trench Installation								
	Excavation	B11C	135	1 Laborer, 1 Medium Equipment Operator	67	1 Backhoe Loader, 48 H.P.		
	Backfilling	B10R	38	.5 Laborer, 1 Medium Equipment Operator	25	1 Front End Loader, 1 Cyd		
	Compaction	A1D	72	1 Building Laborer	72	1 Vibrating Plate, 18"		
Protective Soil Layer								
	Purchase Offsite Protective Soils							
	Excavate and Load Protective Soil from Borrow	B14A	2,264	.5 Laborer, 1 Crane Operator	1,517	1 Excavator, 4.5 Cyds		
	Haul Protective Soil from Borrow	B34C	13,000	1 Heavy Truck Driver	13,000	1 Truck Tractor, 380 H.P., and Dump Trailer, 16.5 Cyds	137,212	4 mile cycle, 34,303 loads, 16.5 cyd loads
	Place Protective Soil from Borrow	B10B	6,792	.5 Laborer, 1 Medium Equipment Operator	4,551	1 Dozer, 200 H.P.		
Fertilizing and Seeding								
	Lime	B66	57	1 Light Equipment Operator	57	1 Loader-Backhoe, 40 H.P.		
	Fertilizing	B66	57	1 Light Equipment Operator	57	1 Loader-Backhoe, 40 H.P.		
	Seeding	B66	801	1 Light Equipment Operator	801	1 Loader-Backhoe, 40 H.P.		
	Mulch	B65	156	1 Laborer, 1 Light Truck Driver,	156	1 Large Power Mulcher, 1 Flatbed Truck, 1.5 Ton		
Stormwater/Erosion Controls								
	Riprap Letdowns	B13	2,643	1 Labor Foreman, 4 Laborers, 1 Crane Operator, 1 Oiler	378	1 Crane, 25 Tons		
	Geotextile	2 Clab	15	2 Laborers	0	None		
	Stormwater Channel Erosion Blanket	B80A	1,175	3 Laborers	388	1 Flatbed Truck, 3 Ton		
	Stormwater Outfalls	B3A	1,000	4 Laborers, 1 Light Equipment Operator	200	1 Excavator, 1.5 Cyds		
Access Road								
	Material							
	Hauling	B34C	24	1 Heavy Truck Driver	24	1 Truck Tractor, 380 H.P., and Dump Trailer, 16.5 Cyds	208	4 mile cycle, 52 loads, 16.5 cyd loads
	Placement and Compaction	B32	20	1 Laborer, 3 Medium Equipment Operators	15	1 Grader, 30,000 Lbs, 1 Tandem Roller, 10 Tons, 1 Dozer, 200 H.P.		
Construction Quality Assurance (CQA)								
Additional Construction								
Total Hours/Miles			179,843		102,591		538,120	

Table 5: Material Quantity and Cost Estimate - CBR-Offsite (1 of 2)

TABLE 5
SCENARIO 2 - CLOSURE BY REMOVAL OFFSITE
MATERIAL QUANTITY AND COST ESTIMATE
EDWARDS POWER PLANT ASH POND

Description	Category	Units	Quantity	Unit Price	Total	Crew	Labor Hours	Equipment Hours	Mileage	Miscellaneous
Mobilization/Demobilization		**Lump Sum**	**1**	**$2,320,263.39**	**$2,320,263.39**					1 % of total project
Survey		**Lump Sum**	**1**	**$300,000.00**	**$300,000.00**					Lump Sum
Site Area Preparation/Remediation		**Lump Sum**	**1**	**$1,389,439.00**	**$1,389,439.00**					
	Construction Trailers and Storge	Monthly Rent	40	$1,192.00	$47,680.00	2 Skwk				Rent for 2 office trailers, 2 storage Conex boxes, and 2 portable toilets (40 Months after dewater)
	Stormwater Controls	Linear feet	9,000	$3.74	$33,660.00	B62	333	110		Silt fence, 9000 linear feet (perimiter of Pond), labor .037
	Stripping Borrow	Cubic Yds	5,700	$1.07	$6,099.00	B10B	29	19		7 acres, 6 inches of strippings. Vegetative 6" layer over 102.06 acres
	Dust Control	Day	560	$2,325.00	$1,302,000.00	B59	4,480	4,480	44,800	Dust control 3 days a week, 14 days/month, 40 months (10 miles/hr)
	Road Maintenance	Day	200	$1,570.00	$314,000.00	B86A	1,600	1,600	16,000	Road Maintenance 1 day a week, 5 days/month, 40 months (10 miles/hr)
Standing Water Removal - Ponds		**Day**	**49**	**$1,490.00**	**$73,010.00**	B-10K	588	394		Standing water on top of ash
Ash Pond Dewatering		**Day**	**1,200**	**$1,490.00**	**$1,788,000.00**	B-10K	14,400	9,648		Volume to pump bottom of ash (Porosity of 50%)
Installation of Dewatering Trenches		**BCY**	**51,250**	**$2.09**	**$107,112.50**	B12D	461	231		6,150 linear feet of 15 foot trenches benched, crossection of 225 sqft (repeat as we go lower)
Demolition of Rail Line		**Lump Sum**	**1**	**$374,203.00**	**$374,203.00**					
	Track and Tie Removal	Linear Feet	10,300	$19.50	$200,850.00	B13	1,751	250		Labor .170 times 10,300
	Ballast Removal	Cubic Yds	22,900	$7.57	$173,353.00	B14	2,198	366		Labor .096 time 22,900? Cyds
Demolition of Structures		**Lump Sum**	**1**	**$82,132.00**	**$82,132.00**					Outfall structure, leachate line, culverts
	Demolition of Outfall Structure	LS	1	$65,905.00	$65,905.00	B21C, B69	151	22		Catwalk, outfall structure, and grout pipe
	Demolition of Leachate Line	LS	1	$2,700.00	$2,700.00		8	4		Grout 1200 feet of 6" pipe and cap ends. Grout $200/cyd, 10 yards. 2 laborers,trucks, 4 hrs ($700)
	Demolition of Culverts	BCY	1350	$10.02	$13,527.00	B12F	96	48		remove three culverts
Ash Removal Offsite		**Cubic Yds**	**4,391,000**	**$46.96**	**$206,201,360.00**					Pond and Rail Line Ash Embankment
	Excavate and Load Ash Subgrade	Cubic Yds	4,391,000	$1.45	$6,366,950.00	B14A	17,564	11,768		
	Haul Ash Subgrade to Landfill	Cubic Yds	4,391,000	$16.35	$71,792,850.00	B34C	421,536	421,536	13,306,061	50 mile cycle 45 miles per hour Indian Creek Landfill #2
	Tipping Fee at Landfill	Tons	2,371,140	$54.00	$128,041,560.00					1080 lbs per cubic yard, tipping fee from 2020 report
Protective Soil Layer		**Cubic Yds**	**900,000**	**$20.16**	**$18,144,000.00**					Volume of Soil to reach final grade based on CBR Option 2
	Purchase Offsite Protective Soils	Cubic Yds	900,000	$12.55	$11,295,000.00					
	Excavate and Load Protective Soil from Borrow	Cubic Yds	900,000	$1.45	$1,305,000.00	B14A	3,600	2,412		
	Haul Protective Soil from Borrow	Cubic Yds	900,000	$3.69	$3,321,000.00	B34C	20,700	20,700	218,182	
	Place Protective Soil from Borrow	Cubic Yds	900,000	$2.47	$2,223,000.00	B10B	10,800	7,236		
Clay From Berm for Interior		**Cubic Yds**	**405,000**	**$8.11**	**$3,284,550.00**		12,555	9,793		B14A, B34G, B10B, B10Y, 6,150 feet of Berm (minus 210,000 cyds of ash in berm)
Fertilizing and Seeding		**MSF**	**4,750**	**$115.27**	**$547,532.50**					Complete ash pond area closure 102.06 acres and 7 acres at borrow (protective soil 6 feet on 8.5 acres)
	Lime	MSF	4,750	$19.74	$93,765.00	B66	52	52		
	Fertilizing	MSF	4,750	$10.19	$48,402.50	B66	52	52		
	Seeding	MSF	4,750	$34.70	$164,825.00	B66	732	732		
	Mulch	MSF	4,750	$50.64	$240,540.00	B65	143	143		
Stormwater Outfalls		**Lump Sum**	**2**	**$17,500.00**	**$35,000.00**	B3A	400	80		2 outfall structures on west side, 5 day x $3,500
Construction Quality Assurance (CQA)		**Lump Sum**	**1**	**$4,640,526.78**	**$4,640,526.78**					2 % of total project

Table 5: Material Quantity and Cost Estimate - CBR-Offsite (2 of 2)

TABLE 5
SCENARIO 2 - CLOSURE BY REMOVAL OFFSITE
MATERIAL QUANTITY AND COST ESTIMATE
EDWARDS POWER PLANT ASH POND

Additional Construction		**Lump Sum**	**1**	**$11,601,316.95**	**$11,601,316.95**					5 % of total project
Total Hours/Miles							**514,229**	**491,675**	**13,585,042**	
Project Cost					**$232,026,339.00**					
Total Cost (Project, Mob/Demob/Survey/CQA/Add. Cons)					**$250,888,446.12**					

Table 6: Labor, Equipment, and Mileage Estimate - CBR-Offsite (1 of 1)

TABLE 6
SCENARIO 2 - CLOSURE BY REMOVAL
LABOR, EQUIPMENT, MILEAGE
EDWARDS POWER PLANT ASH POND

Description	Category	Crew	Labor Hours	Labor	Equipment Hours	Equipment	Mileage	Miscellaneous
Mobilization/Demobilization								
Survey								
Site and Borrow Area Preparation/Remediation								
	Construction Trailers and Storge	2 Skwk						
	Stormwater Controls	B62	333	2 Laborers, 1 Light Equipment 0perator	110	1 Loader, 1 Skid Steer, 30 H.P.		
	Stripping Borrow	B10B	29	.5 Laborer, 1 Medium Equipment Operator	19	1 Dozer, 200 H.P.		
	Dust Control	B59	4,480	1 Heavy Truck Driver	4,480	1 Truck Tractor, 220 H.P., 1 Water Tank Trailer, 5,000 Gal.	44,800	Mileage = 10 mph, 8 hours/day, 560 day
	Road Maintenance	B86A	1,600	1 Medium Equipment Operator	1,600	1 Grader, 30,000 lbs	16,000	Mileage = 10 mph, 8 hours/day, 200 day
Standing Water Removal - Ponds		B-10K	588	.5 Laborer, 1 Medium Equipment Operator	394	6" Water Pump with Suction and Discharge Hoses		
Ash Pond Dewatering		B-10K	14,400	.5 Laborer, 1 Medium Equipment Operator	9,648	6" Water Pump with Suction and Discharge Hoses		
Installation of Dewatering Trenches		B12D	461	1 Laborer, 1 Crane Operator	231	1 Excavator, 3.5 Cyds		
Demolition of Rail Line								
	Track and Tie Removal	B13	1,751	1 Labor Foreman, 4 Laborers, 1 Crane Operator, 1 Oiler	250	1 Crane, 25 Tons		
	Ballast Removal	B14	2,198	1 Labor Foreman, 4 Laborers, 1 Light Equipment Operator	366	1 Backhoe Loader, 48 H.P.		
Demolition of Structures								
	Demolition of Outfall Structure	B21C, B69	151	1 Labor Foreman, 4 Laborers, 1 Crane Operator, 1 Oiler	22	1 Boom Crane, 90 Tons		
	Demolition of Leachate Line		8	2 Laborers	4	1 Truck		
	Demolition of Culverts	B12F	96	1 Laborer, 1 Crane Operator	48	1 Excavator, .75 Cyds		
Ash Removal Offsite								
	Excavate and Load Ash Subgrade	B14A	17,564	.5 Laborer, 1 Crane Operator	11,768	1 Excavator, 4.5 Cyds		
	Haul Ash to Landfill	B34C	421,536	1 Heavy Truck Driver	421,536	1 Truck Tractor, 380 H.P., and Dump Trailer, 16.5 Cyds	13,306,061	50 mile cycle, 266,121 loads, 16.5 cyd loads
	Tipping Fee at Landfill							
Protective Soil Layer								
	Purchase Offsite Protective Soils							
	Excavate and Load Protective Soil from Borrow	B14A	3,600	.5 Laborer, 1 Crane Operator	2,412	1 Excavator, 4.5 Cyds		
	Haul Protective Soil from Borrow	B34C	20,700	1 Heavy Truck Driver	20,700	1 Truck Tractor, 380 H.P., and Dump Trailer, 16.5 Cyds	218,182	4 mile cycle, 29,400 loads, 16.5 cyd loads
	Place Protective Soil from Borrow	B10B	10,800	.5 Laborer, 1 Medium Equipment Operator	7,236	1 Dozer, 200 H.P.		
Clay From Berm for Interior			12,555	1.5 Labs, I Crane Opr, 2 Med Equipment Oprs, I Heavy Truck Driver	9,793	1 Exc 4.5 Cyds, 1 Dump Truck (Off Road), 1 200 H.P. Dozer, 1 Vib Roller		B14A, B34G, B10B, B10Y, 700 feet of Berm
Fertilizing and Seeding								
	Lime	B66	52	1 Light Equipment Operator	52	1 Loader-Backhoe, 40 H.P.		
	Fertilizing	B66	52	1 Light Equipment Operator	52	1 Loader-Backhoe, 40 H.P.		
	Seeding	B66	732	1 Light Equipment Operator	732	1 Loader-Backhoe, 40 H.P.		
	Mulch	B65	143	1 Laborer, 1 Light Truck Driver	143	1 Large Power Mulcher, 1 Flatbed Truck, 1.5 Ton		
Stormwater Outfalls		B3A	400	4 Laborers, 1 Light Equipment Operator	80	1 Excavator, 1.5 Cyds		
Construction Quality Assurance (CQA)								
Additional Construction								
Total Hours/Miles			514,229		491,675		13,585,042	

Appendix B

Final Closure Drawings

ILLINOIS POWER RESOURCES GENERATING, LLC.
EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS
ASH POND
PART 845 CONSTRUCTION DRAWINGS

PREPARED BY:

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LIST OF DRAWINGS

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Submissions / Revisions:	Date:
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ILLINOIS POWER RESOURCES GENERATING, LLC.

Project Name & Location:

ASH POND PART 845 CONSTRUCTION DRAWINGS EDWARDS ASH POND

Drawing Name: TITLE SHEET

Date: 4/20/2022	Project No.
Type: TITLE	Drawing No. 1
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	

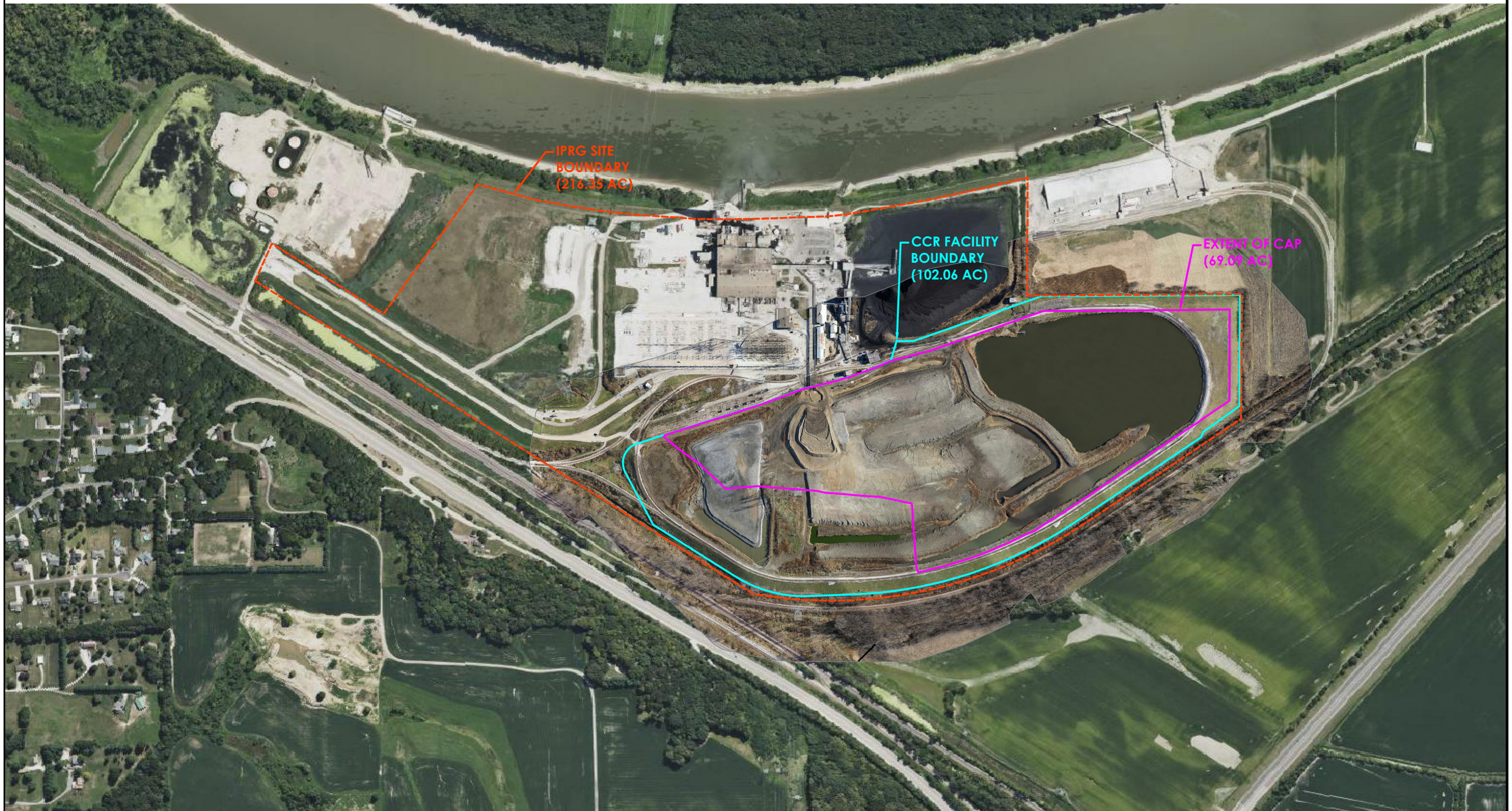
LEGEND

- IPRG SITE BOUNDARY
- CCR FACILITY BOUNDARY
- EXTENT OF CAP

NOTES:

1. AERIAL PROVIDED BY DRAGONFLY AEROSOLUTIONS DATED 12/01/2020.

0' 300' 600'



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ILLINOIS POWER RESOURCES GENERATING, LLC.

Project Name & Location:

ASH POND PART 845 CONSTRUCTION DRAWINGS EDWARDS ASH POND

Drawing Name:

SITE LOCATION PLAN

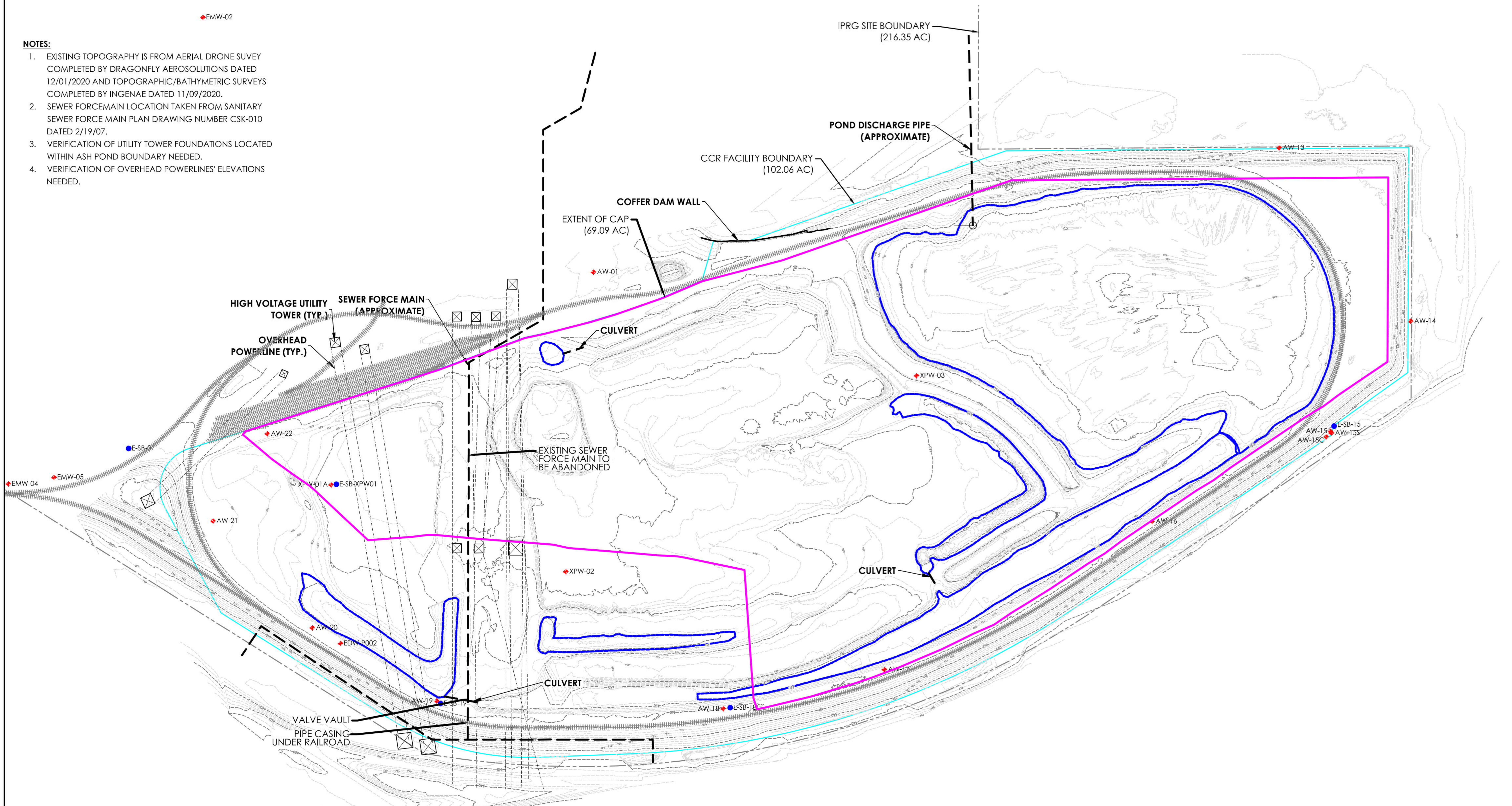
Date: 4/20/2022	Project No.
Type: PLAN	Drawing No. 2
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	

LEGEND

- EXISTING CONTOUR (2' INTERVAL)
- EXISTING CONTOUR (10' INTERVAL)
- IPRG STIE BOUNDARY
- ASH POND BOUNDARY
- BATHYMETRIC BOUNDARY
- EXTENT OF CAP
- WELL
- BORING
- SEWER FORCEMAIN

NOTES:

1. EXISTING TOPOGRAPHY IS FROM AERIAL DRONE SUVEY COMPLETED BY DRAGONFLY AEROSOLUTIONS DATED 12/01/2020 AND TOPOGRAPHIC/BATHYMETRIC SURVEYS COMPLETED BY INGENAE DATED 11/09/2020.
2. SEWER FORCEMAIN LOCATION TAKEN FROM SANITARY SEWER FORCE MAIN PLAN DRAWING NUMBER CSK-010 DATED 2/19/07.
3. VERIFICATION OF UTILITY TOWER FOUNDATIONS LOCATED WITHIN ASH POND BOUNDARY NEEDED.
4. VERIFICATION OF OVERHEAD POWERLINES' ELEVATIONS NEEDED.



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ILLINOIS POWER RESOURCES GENERATING, LLC.

Project Name & Location:

ASH POND PART 845 CONSTRUCTION DRAWINGS EDWARDS ASH POND

Drawing Name:

EXISTING CONDITIONS

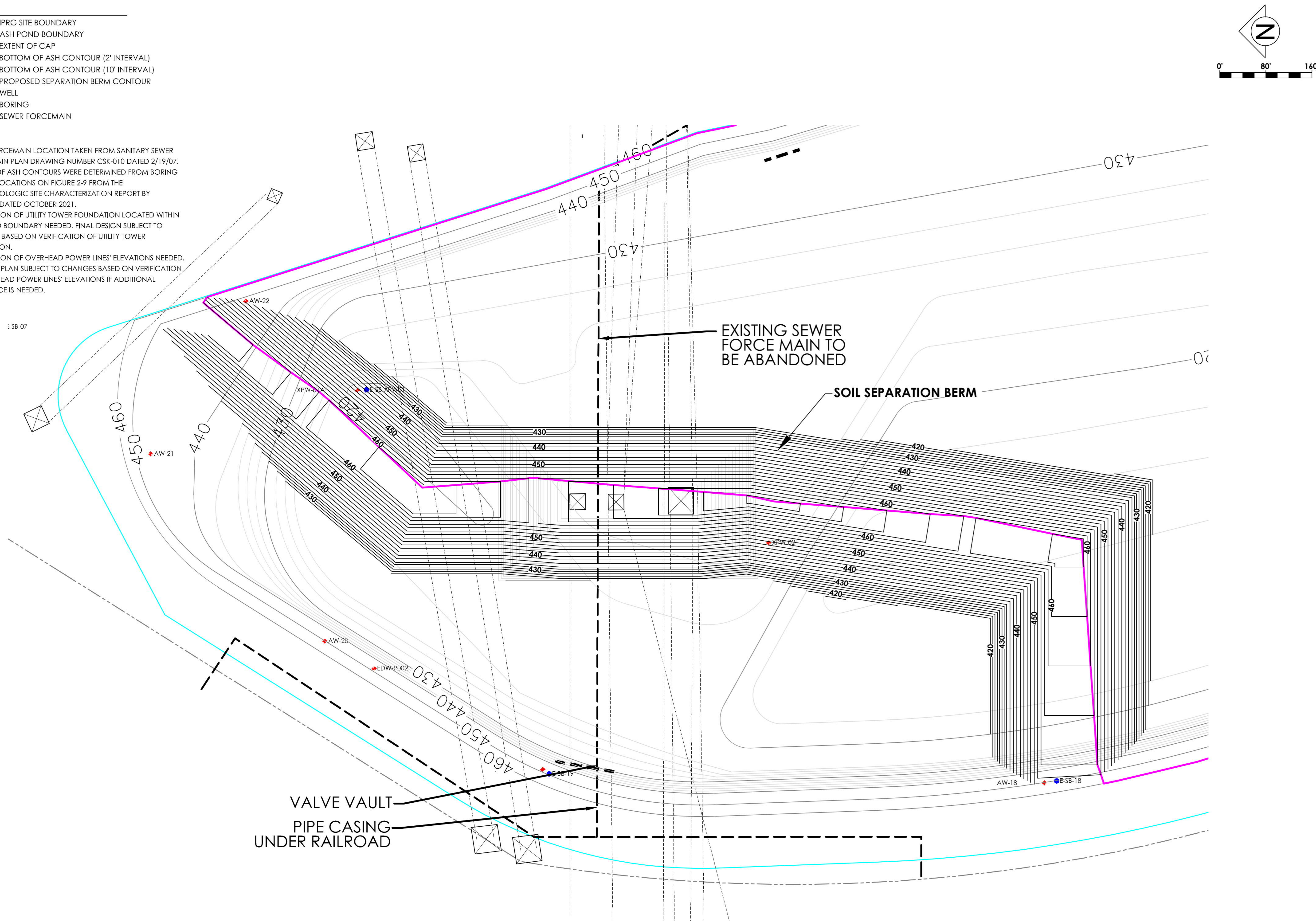
Date: 4/20/2022	Project No.
Type: PLAN	Drawing No. 3
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	

LEGEND

- IPRG SITE BOUNDARY
- ASH POND BOUNDARY
- EXTENT OF CAP
- BOTTOM OF ASH CONTOUR (2' INTERVAL)
- BOTTOM OF ASH CONTOUR (10' INTERVAL)
- PROPOSED SEPARATION BERM CONTOUR
- WELL
- BORING
- SEWER FORCEMAIN

NOTES:

1. SEWER FORCEMAIN LOCATION TAKEN FROM SANITARY SEWER FORCE MAIN PLAN DRAWING NUMBER CSK-010 DATED 2/19/07.
2. BOTTOM OF ASH CONTOURS WERE DETERMINED FROM BORING LOGS AT LOCATIONS ON FIGURE 2-9 FROM THE HYDROGEOLOGIC SITE CHARACTERIZATION REPORT BY RAMBOLL DATED OCTOBER 2021.
3. VERIFICATION OF UTILITY TOWER FOUNDATION LOCATED WITHIN ASH POND BOUNDARY NEEDED. FINAL DESIGN SUBJECT TO CHANGES BASED ON VERIFICATION OF UTILITY TOWER FOUNDATION.
4. VERIFICATION OF OVERHEAD POWER LINES' ELEVATIONS NEEDED. GRADING PLAN SUBJECT TO CHANGES BASED ON VERIFICATION OF OVERHEAD POWER LINES' ELEVATIONS IF ADDITIONAL CLEARANCE IS NEEDED.



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ILLINOIS POWER RESOURCES GENERATING, LLC.

Project Name & Location:

ASH POND PART 845 CONSTRUCTION DRAWINGS EDWARDS ASH POND

Drawing Name: SEPARATION BERM

Date: 4/20/2022	Project No.
Type: PLAN	Drawing No. 4
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	

LEGEND

- EXISTING CONTOUR (2' INTERVAL)
- EXISTING CONTOUR (10' INTERVAL)
- IPRG SITE BOUNDARY
- ASH POND BOUNDARY
- BATHYMETRIC BOUNDARY
- PROPOSED TOP OF ASH CONTOUR (2' INTERVAL)
- PROPOSED TOP OF ASH CONTOUR (10' INTERVAL)
- WELL
- BORING
- EXTENT OF CAP (69.00 AC)
- SEWER FORCE MAIN

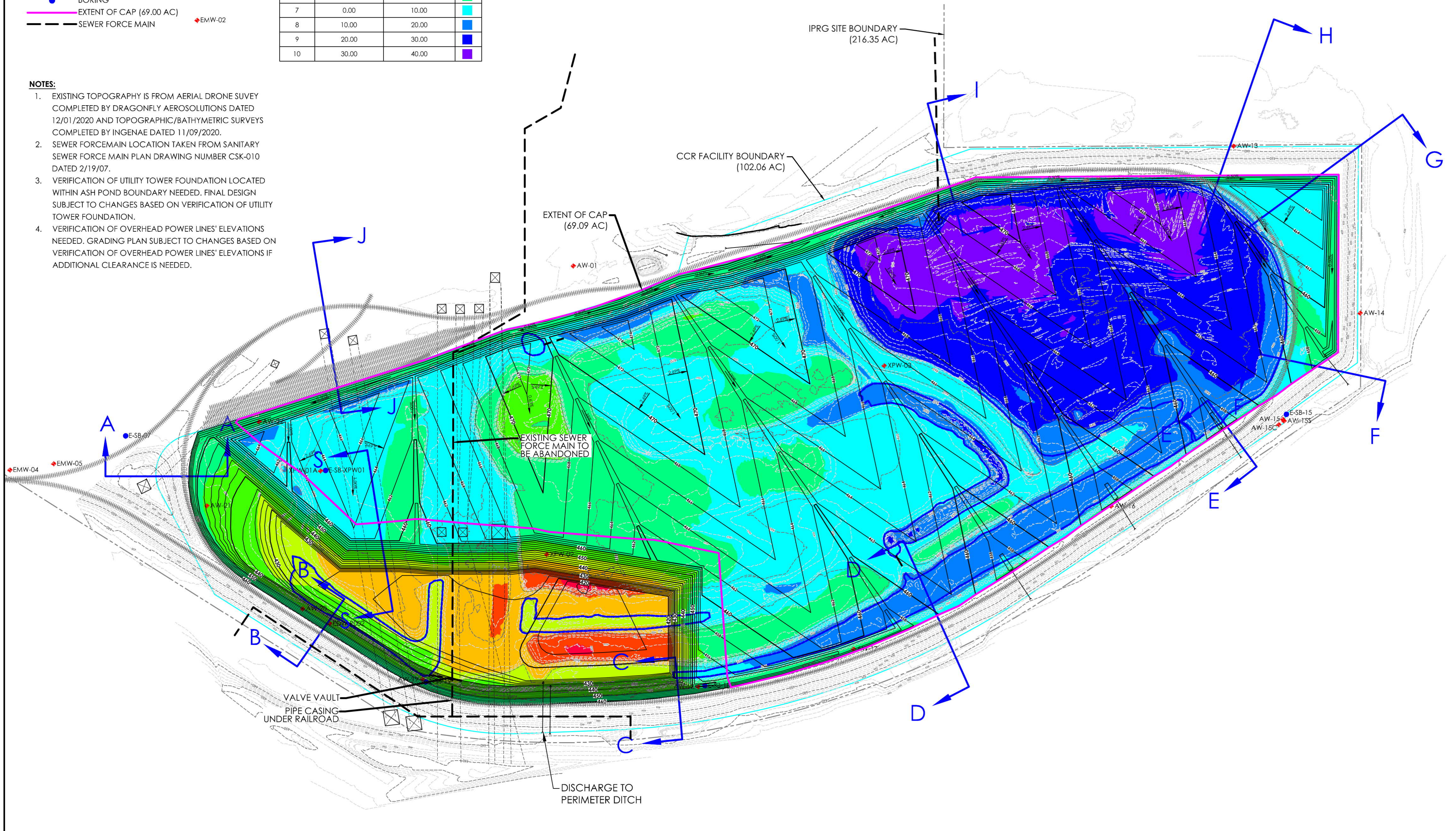
Elevations Table

Number	Minimum Elevation	Maximum Elevation	Color
1	-60.00	-50.00	
2	-50.00	-40.00	
3	-40.00	-30.00	
4	-30.00	-20.00	
5	-20.00	-10.00	
6	-10.00	0.00	
7	0.00	10.00	
8	10.00	20.00	
9	20.00	30.00	
10	30.00	40.00	

Volume
Base Surface EXIST TOPO
Comparison Surface PRO GRADING 03-01
Cut volume 734,593.53 Cu. Yd.
Fill volume 1,191,865.38 Cu. Yd.
Net volume 457,271.85 Cu. Yd.<Fill>

NOTES:

1. EXISTING TOPOGRAPHY IS FROM AERIAL DRONE SUVEY COMPLETED BY DRAGONFLY AEROSOLUTIONS DATED 12/01/2020 AND TOPOGRAPHIC/BATHYMETRIC SURVEYS COMPLETED BY INGENAE DATED 11/09/2020.
2. SEWER FORCEMAIN LOCATION TAKEN FROM SANITARY SEWER FORCE MAIN PLAN DRAWING NUMBER CSK-010 DATED 2/19/07.
3. VERIFICATION OF UTILITY TOWER FOUNDATION LOCATED WITHIN ASH POND BOUNDARY NEEDED. FINAL DESIGN SUBJECT TO CHANGES BASED ON VERIFICATION OF UTILITY TOWER FOUNDATION.
4. VERIFICATION OF OVERHEAD POWER LINES' ELEVATIONS NEEDED. GRADING PLAN SUBJECT TO CHANGES BASED ON VERIFICATION OF OVERHEAD POWER LINES' ELEVATIONS IF ADDITIONAL CLEARANCE IS NEEDED.



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ILLINOIS POWER RESOURCES GENERATING, LLC.

Project Name & Location:

ASH POND PART 845 CONSTRUCTION DRAWINGS EDWARDS ASH POND

Drawing Name:
TOP OF ASH GRADING PLAN

Date: 4/20/2022	Project No.
Type: PLAN	Drawing No. 5
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	

LEGEND

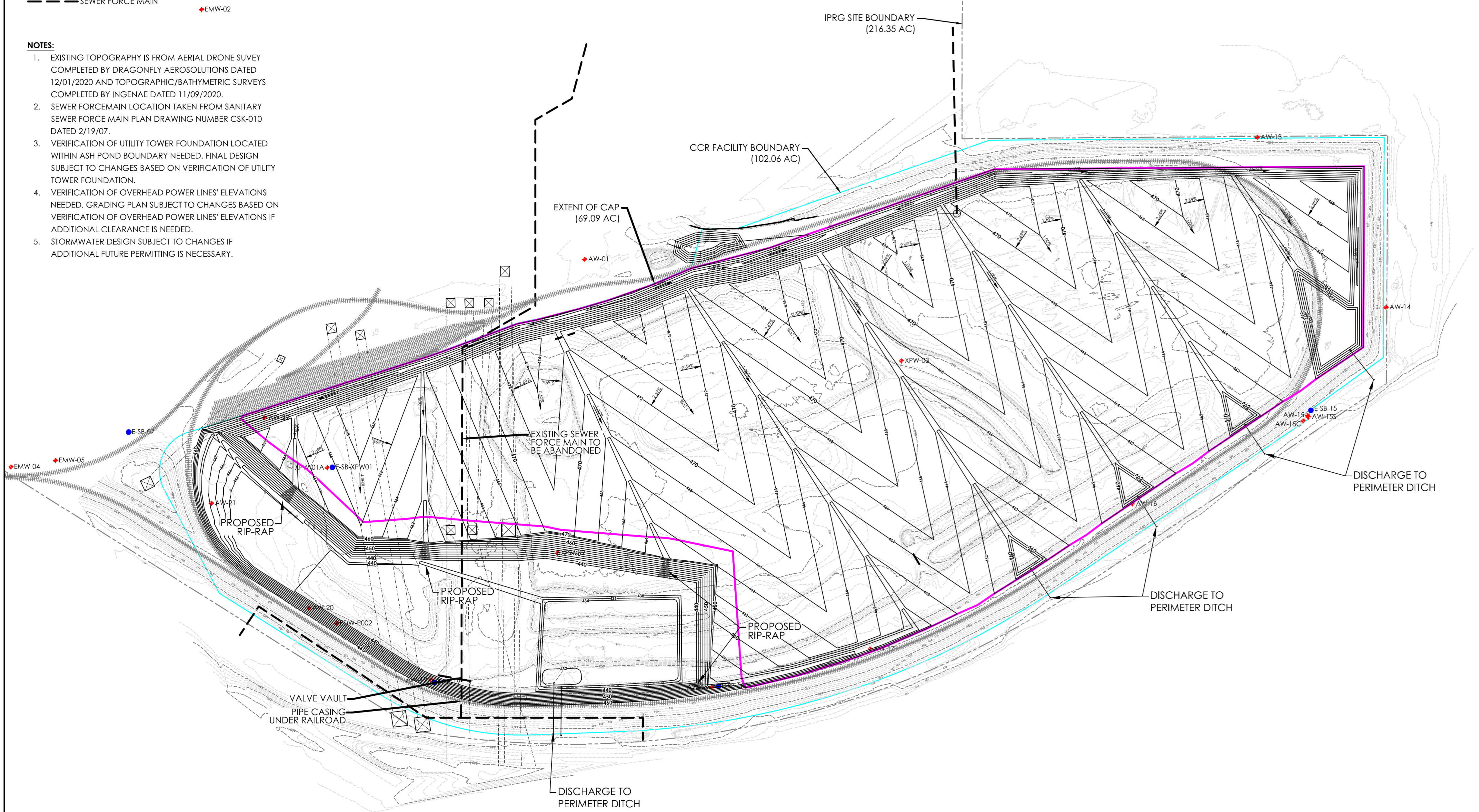
- EXISTING CONTOUR (2' INTERVAL)
- EXISTING CONTOUR (10' INTERVAL)
- IPRG SITE BOUNDARY
- ASH POND BOUNDARY
- PROPOSED FINAL COVER CONTOUR (2' INTERVAL)
- PROPOSED FINAL COVER CONTOUR (10' INTERVAL)
- WELL
- BORING
- EXTENT OF CAP (69.00 AC)
- SEWER FORCE MAIN

NOTES:

1. EXISTING TOPOGRAPHY IS FROM AERIAL DRONE SUVEY COMPLETED BY DRAGONFLY AEROSOLUTIONS DATED 12/01/2020 AND TOPOGRAPHIC/BATHYMETRIC SURVEYS COMPLETED BY INGENAE DATED 11/09/2020.
2. SEWER FORCEMAIN LOCATION TAKEN FROM SANITARY SEWER FORCE MAIN PLAN DRAWING NUMBER CSK-010 DATED 2/19/07.
3. VERIFICATION OF UTILITY TOWER FOUNDATION LOCATED WITHIN ASH POND BOUNDARY NEEDED. FINAL DESIGN SUBJECT TO CHANGES BASED ON VERIFICATION OF UTILITY TOWER FOUNDATION.
4. VERIFICATION OF OVERHEAD POWER LINES' ELEVATIONS NEEDED. GRADING PLAN SUBJECT TO CHANGES BASED ON VERIFICATION OF OVERHEAD POWER LINES' ELEVATIONS IF ADDITIONAL CLEARANCE IS NEEDED.
5. STORMWATER DESIGN SUBJECT TO CHANGES IF ADDITIONAL FUTURE PERMITTING IS NECESSARY.

N

0' 150' 300'



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ILLINOIS POWER RESOURCES GENERATING, LLC.

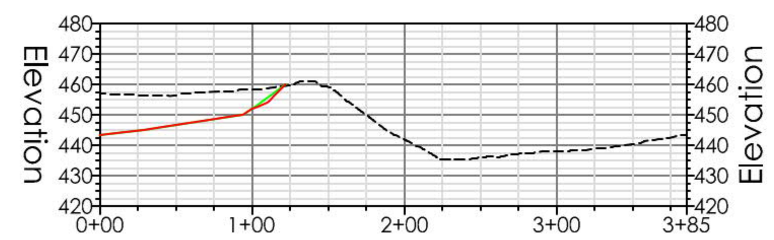
Project Name & Location:

ASH POND PART 845 CONSTRUCTION DRAWINGS EDWARDS ASH POND

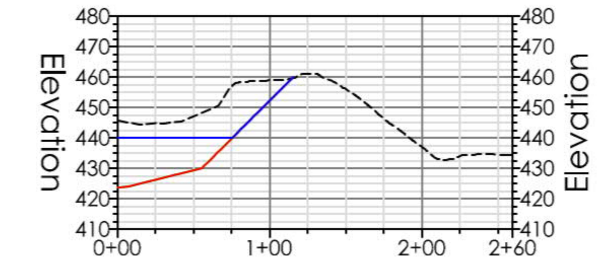
Drawing Name:

FINAL COVER & STORMWATER PLAN

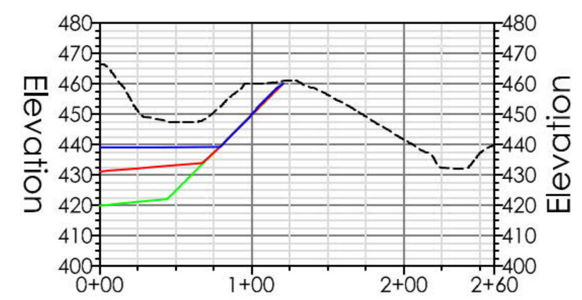
Date: 4/20/2022	Project No.
Type: PLAN	Drawing No. 6
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	



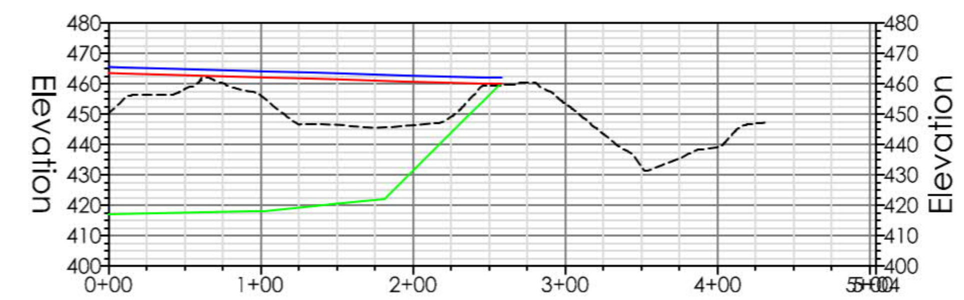
A-A CROSS SECTION



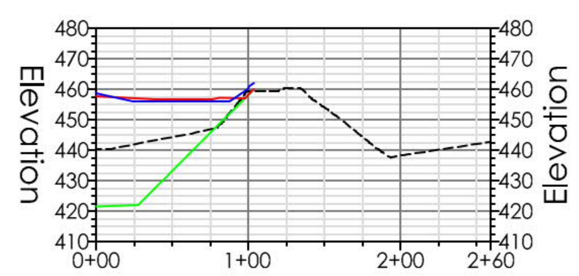
B-B CROSS SECTION



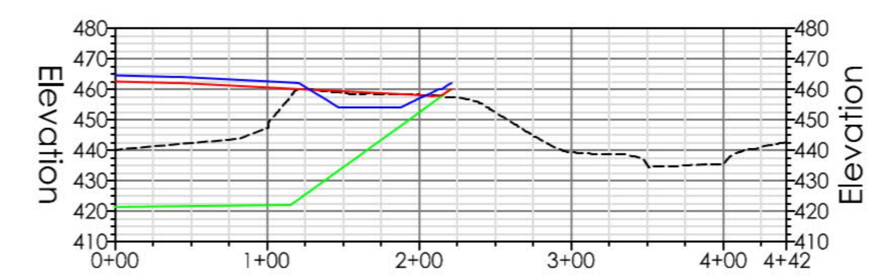
C-C CROSS SECTION



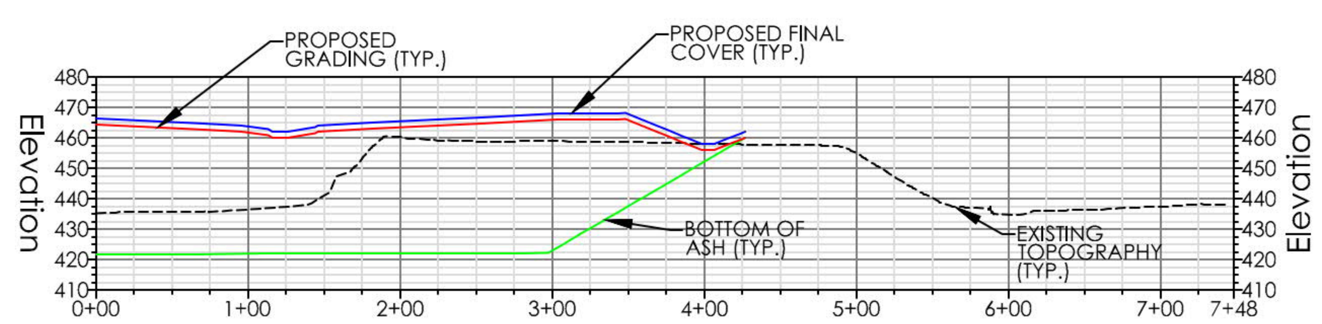
D-D CROSS SECTION



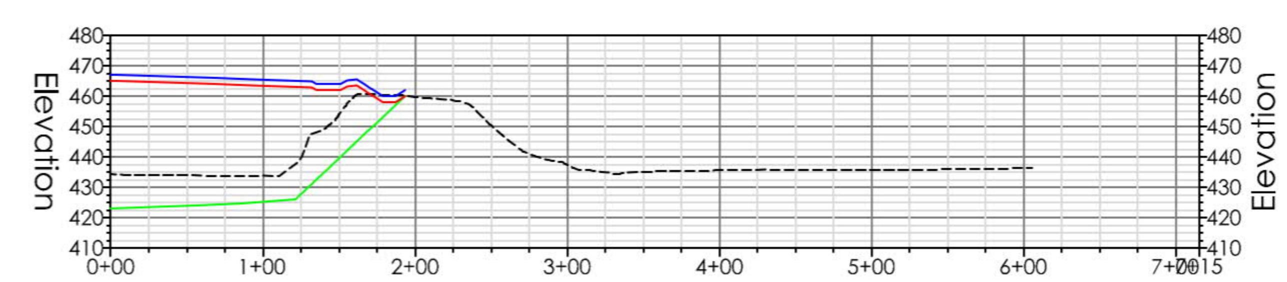
E-E CROSS SECTION



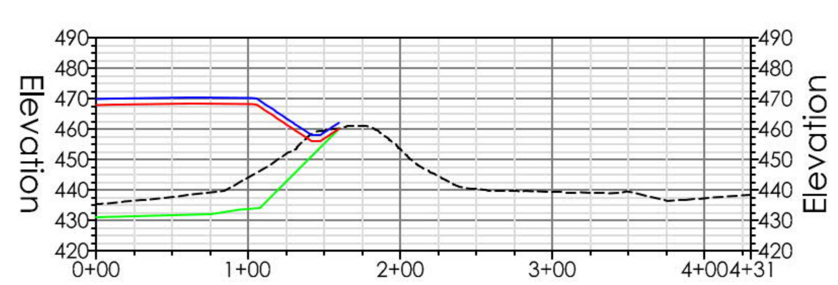
F-F CROSS SECTION



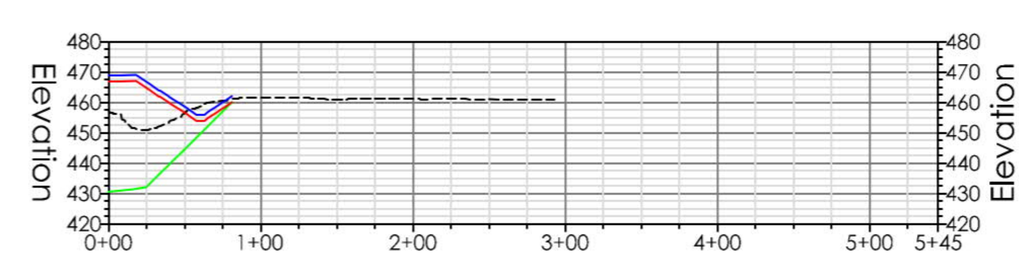
G-G CROSS SECTION



H-H CROSS SECTION



I-I CROSS SECTION



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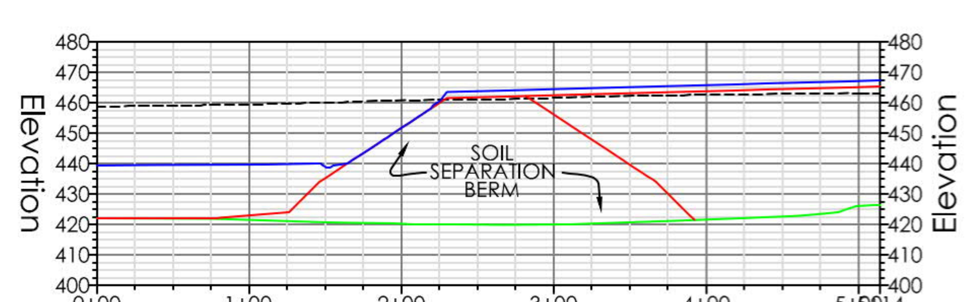

S-S CROSS SECTION

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ILLINOIS POWER RESOURCES GENERATING, LLC.

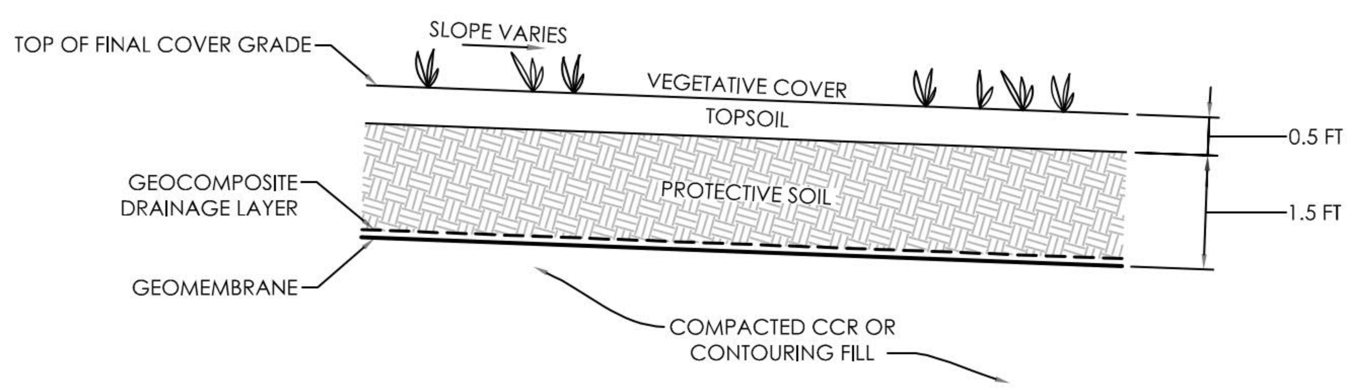
Project Name & Location:

ASH POND PART 845 CONSTRUCTION DRAWINGS EDWARDS ASH POND

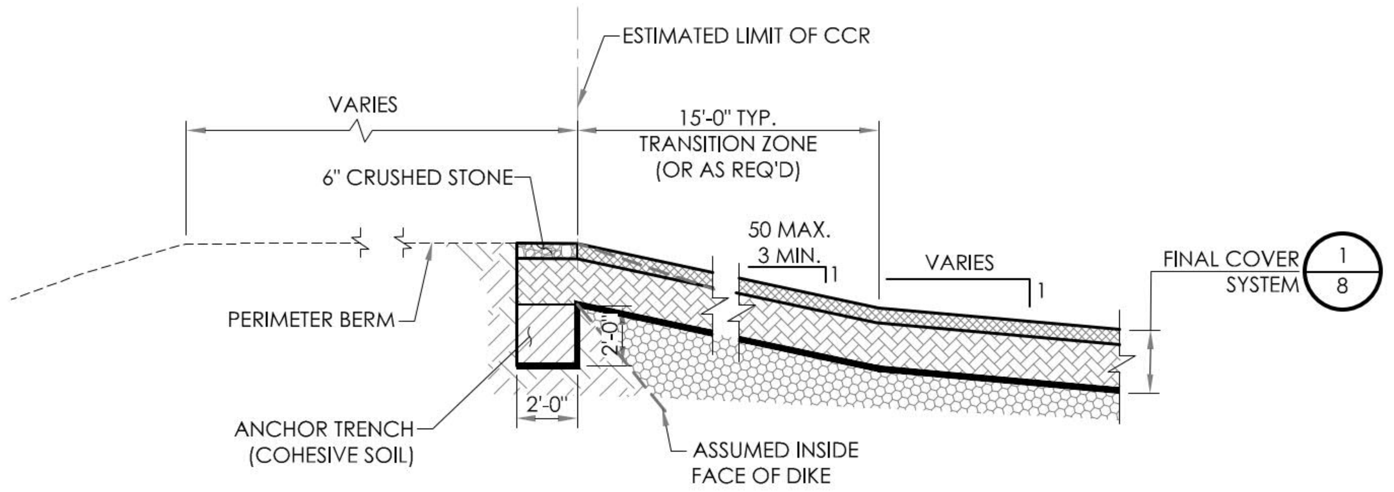
Drawing Name:

SECTIONS

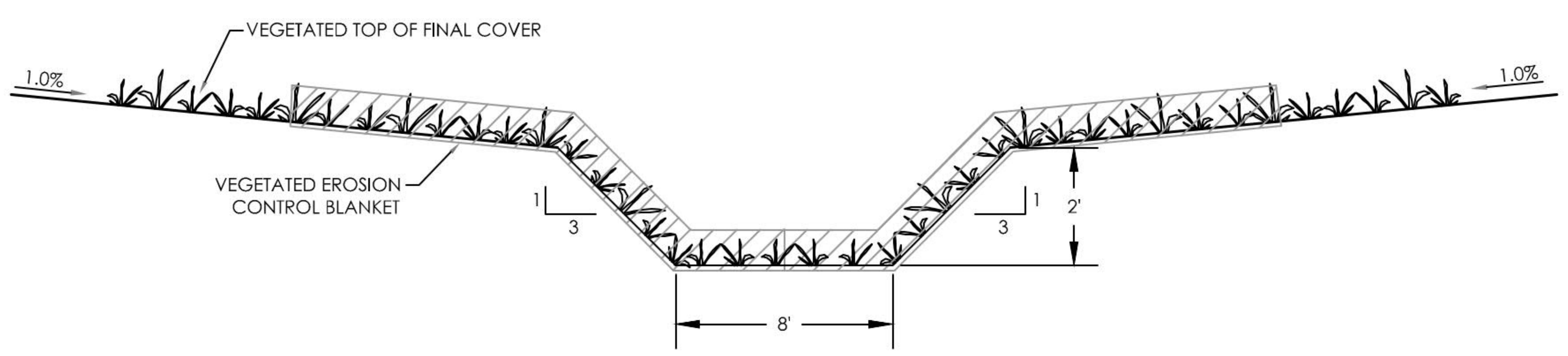
Date: 4/20/2022	Project No.
Type: PLAN	Drawing No. 7
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	



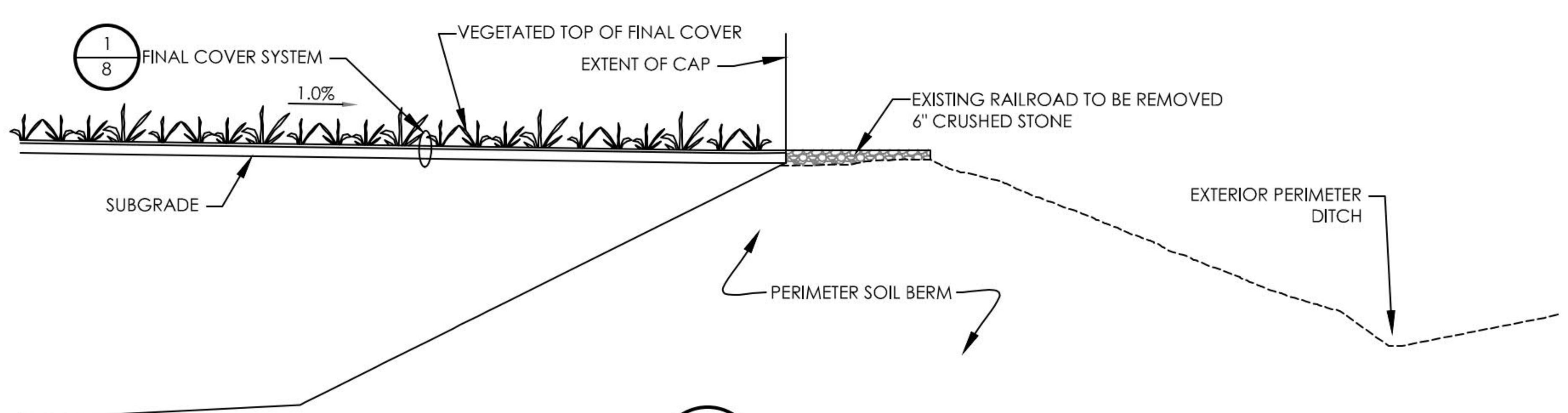
1 / 8 DETAIL
FINAL COVER
N.T.S.



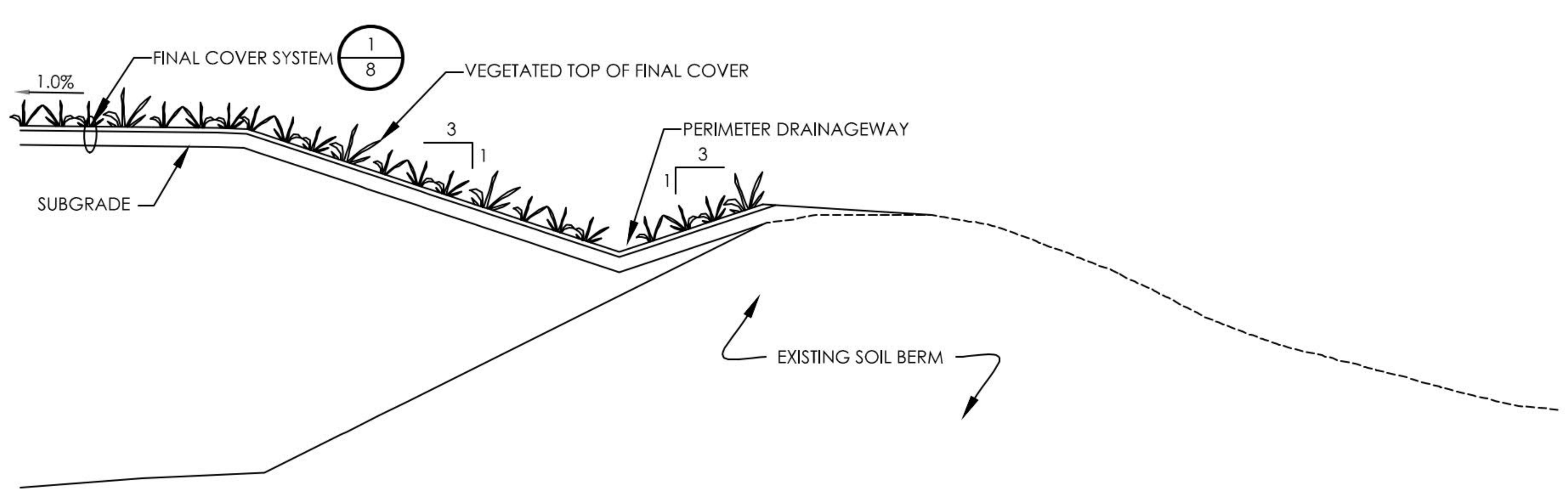
2 / 8 DETAIL
ANCHOR TRENCH
N.T.S.



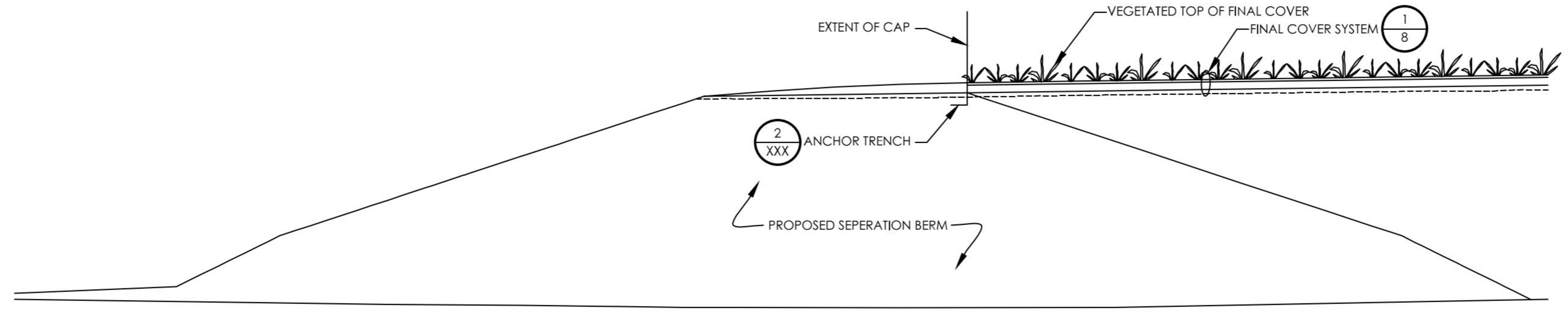
3 / 8 DETAIL
STORMWATER CHANNEL
N.T.S.



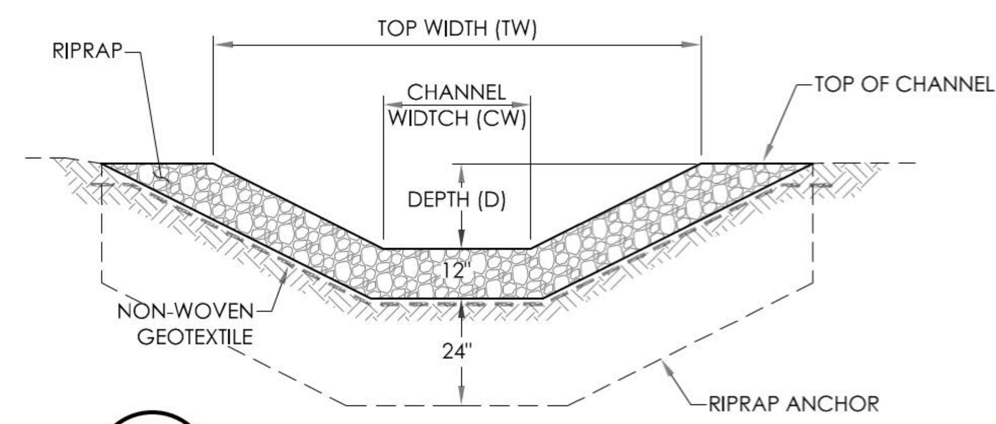
4 / 8 DETAIL
WEST TERMINATION BERM
N.T.S.



5 / 8 DETAIL
EAST TERMINATION BERM
N.T.S.



6 / 8 DETAIL
PROPOSED SEPERATION BERM
N.T.S.



7 / 8 DETAIL
RIPRAP OUTLET CHANNEL PROTECTION
N.T.S.

MATERIAL SPECIFICATIONS

1. RIPRAP
RIPRAP IS TO CONSIST OF A CRUSHED NATURAL LIMESTONE OR DOLOMITE MATERIAL WITH A D50 OF AT LEAST 11 INCHES, AND CONFORMING TO THE ILLINOIS DEPARTMENT OF TRANSPORTATION (IDOT) STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION SECTION 281 REQUIREMENTS, CLASS A OR CLASS B QUALITY.

2. EROSION CONTROL BLANKET
EROSION CONTROL BLANKETS ARE TO BE A ROLLED EROSION CONTROL PRODUCT WITH NETTING CAPABLE OF STORMWATER FLOW VELOCITIES OF UP TO 2.1 FEET PER SECOND.

3. CRUSHED STONE
CRUSHED STONE IS TO CONSIST OF A SCREENED GRAVEL MATERIAL CONFORMING TO THE IDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION SECTION 1004 REQUIREMENTS, GRADATION CA 6.

4. VEGETATIVE SOIL LAYER
THE VEGETATIVE SOIL LAYER IS TO CONSIST OF 6 INCHES OF A NATURAL SOIL MATERIAL THAT IS RELATIVELY HOMOGENOUS, FREE OF DEBRIS, FOREIGN OBJECTS, AND LARGE ROCK FRAGMENTS THAT WILL SUPPORT VEGETATIVE GROWTH. THE TOPSOIL IS TO:
   - BE CLASSIFIED AS SC, CL, ML, OR OL (PER ASTM D2487), AND
   - BE FERTILIZED, AS NECESSARY BASED ON AGRONOMIC TESTING, TO SUPPORT VEGETATION GROWTH AT THE SITE.

5. PROTECTIVE SOIL LAYER
PROTECTIVE SOIL LAYER IS TO CONSIST OF 18 INCHES OF A NATURAL SOIL MATERIAL THAT IS RELATIVELY HOMOGENOUS, FREE OF DEBRIS, FOREIGN OBJECTS, AND LARGE ROCK FRAGMENTS. THE PROTECTIVE SOIL LAYER IS TO:
   - BE CLASSIFIED AS A CL, CH, CL-CH, CL-ML, SC, OR SM (PER ASTH D2487), AND
   - HAVE A MAXIMUM PARTICLE SIZE OF 1.5 INCHES (PER ASTM D422 OR D6943).

6. GEOTEXTILE
THE GEOTEXTILE IS TO CONSIST OF A NONWOVEN POLYPROPYLENE MATERIAL MANUFACTURED IN ACCORDANCE WITH THE LATEST VERSION OF GEOSYNTHETIC INSTITUTE GRI-GT12(A) STANDARD SPECIFICATION, AND WITH THE FOLLOWING REQUIREMENTS:
   - MINIMUM MASS PER UNIT ARE OF 16 OZ/SYD (PER ASTM D5261),
   - MINIMUM GRAB STRENGTH OF 270 LB (PER ASTM D4632),
   - MINIMUM TEAR STRENGTH OF 105 LB (PER ASTM D4533), AND
   - MINIMUM PUNCTURE STRENGTH OF 725 LB (PER ASTM D6241).

   GEOTEXTILE SEAMS ARE TO OVERLAPPED BY 1 FT DURING PLACEMENT AND EITHER MACHINE-SEWN OR THERMALLY BONDED TO ONE ANOTHER.

7. GEOCOMPOSITE
THE GEOCOMPOSITE WILL CONSIST OF A GEONET MADE FROM HDPE RESIN WITH NONWOVEN POLYPROPYLENE GEOTEXTILE FABRIC HEAT BONDED ON BOTH SIDES OF THE GEONET MANUFACTURED IN ACCORDANCE WITH THE LATEST VERSION OF GEOSYNTHETIC INSTITUTE GN4 STANDARD SPECIFICATION, AND WITH THE FOLLOWING REQUIREMENTS:
   - GEONET
   - MINIMUM THICKNESS OF 200 MIL (PER ASTM D5199),
   - MINIMUM DENSITY OF 0.95G/CC (PER ASTM D1505/D792),
   - CARBON BLACK CONTENT OF 1 TO 3 PERCENT (PER ASTM D1603/D4218),
   - MINIMUM TENSILE STRENGTH OF 45 LBS/IN (PER ASTM D7179),
   - MINIMUM COMPRESSION STRENGTH OF 120 LBS/IN (PER ASTM D6364), AND
   - MINIMUM FLOW RATE/WIDTH OF 5.0 GPM/FT (PER ASTM D4716),
   - GEOTEXTILE
   - MINIMUM MASS PER UNIT ARE OF 6 OZ/SYD (PER ASTM D5261),
   - MINIMUM GRAB STRENGTH OF 157 LB (PER ASTM D4632),
   - MINIMUM TEAR STRENGTH OF 55 LB (PER ASTM D4533), AND
   - MINIMUM PUNCTURE STRENGTH OF 725 LB (PER ASTM D6241),
   - DOUBLE-SIDED COMPOSITE
   - MINIMUM FLOW RATE/WIDTH OF 2.0 GPM/FT (PER ASTM D4716), AND
   - MINIMUM PLY ADHESION OF 1.0 LB/IN (PER ASTM D7005).

8. GEOMEMBRANE
THE GEOMEMBRANE IS TO CONSIST OF A LINEAR, LOW-DENSITY POLYETHYLENE (LLDPE) MATERIAL, TEXTURED ON BOTH SIDES, MANUFACTURED IN ACCORDANCE WITH THE LATEST VERSION OF GEOSYNTHETIC INSTITUTE GM17 STANDARD SPECIFICATION, AND WITH THE FOLLOWING REQUIREMENTS:
   - MINIMUM NOMINAL HEIGHT OF 40 MIL (PER ASTM D5994),
   - MINIMUM ASPERITY HEIGHT OF 16 MIL (PER ASTM D7466),
   - MAXIMUM DENSITY OF 0.939 G/ML (PER ASTM D792, OR ASTM D1505),
   - MINIMUM TENSILE STRENGTH AT BREAK OF 60 LB/IN (PER ASTM 36692),
   - MINIMUM ELONGATION AT BREAK OF 250% (PER ASTM D6693),
   - MINIMUM TEAR RESISTANCE OF 22 LB (PER ASTM D1004), AND
   - MINIMUM PUNCTURE RESISTANCE OF 44 LB (PER ASTM D3895).

   GEOMEMBRANCE SEAMS ARE TO BE FUSION-WELDED; REPAIRS AND PENETRATIONS FOR PIPE BOOTS ARE TO BE EXTRUSION WELDED.

9. SUBGRADE MATERIALS
THE SUBGRADE MATERIALS WILL CONSIST OF ONSITE MATERIALS THAT WILL BE RELOCATED OR DISPOSED OF AS PART OF THE FINAL CLOSURE CONSTRUCTION OF THE SURFACE IMPOUNDMENT THAT ARE RELATIVELY HOMOGENOUS, FREE OF DEBRIS, AND FOREIGN OBJECTS. THE SUBGRADE MATERIALS WILL CONSIST OF:
   - CCR ASH FROM THE SURFACE IMPOUNDMENT AND THE RAIL LINE ENBANKMENTS,
   - BALLAST REMOVED DURING THE DEMOLITION OF THE RAIL LINE,
   - ANY COAL LEFT IN THE COAL PILE AFTER THE SHUTDOWN OF THE PLANT IF APPROVED BY THE OWNER, AND
   - STAINED OR ASH CONTAMINATED INSITU SOILS REMOVED FROM THE BOTTOM OF NORTHWEST ASH RELOCATION AREA.

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Submissions / Revisions:	Date:
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ILLINOIS POWER RESOURCES GENERATING, LLC.

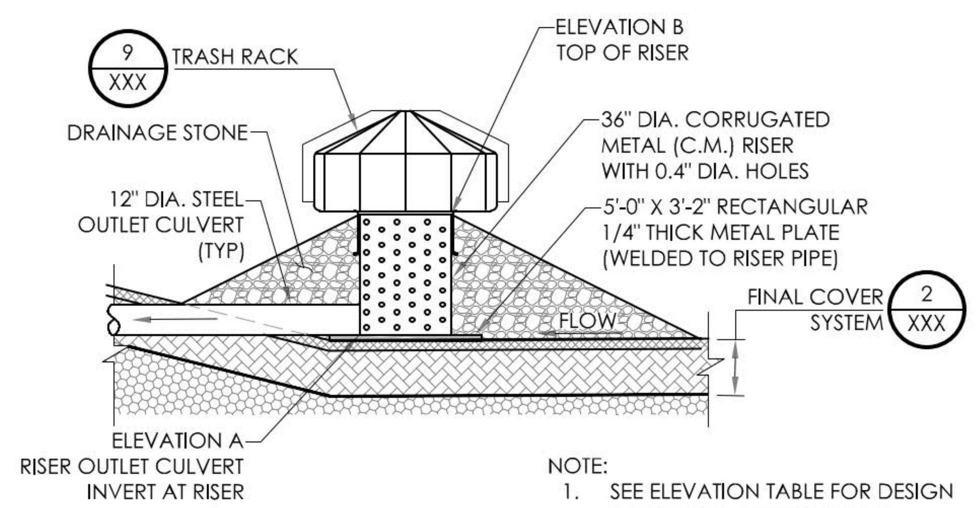
Project Name & Location:

ASH POND PART 845 CONSTRUCTION DRAWINGS EDWARDS ASH POND

Drawing Name:

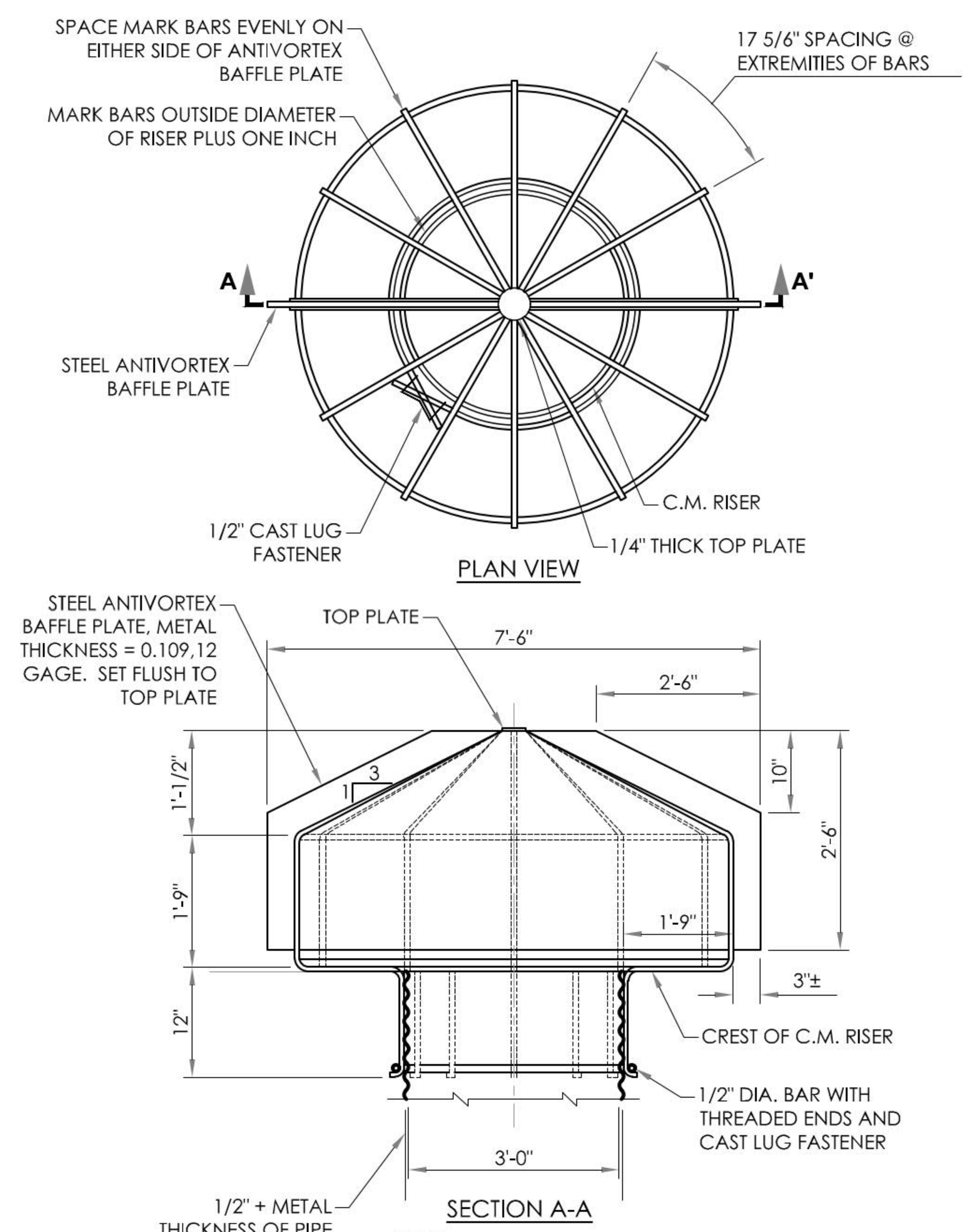
DETAILS

Date: 4/20/2022	Project No.
Type: PLAN	Drawing No. 8
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	

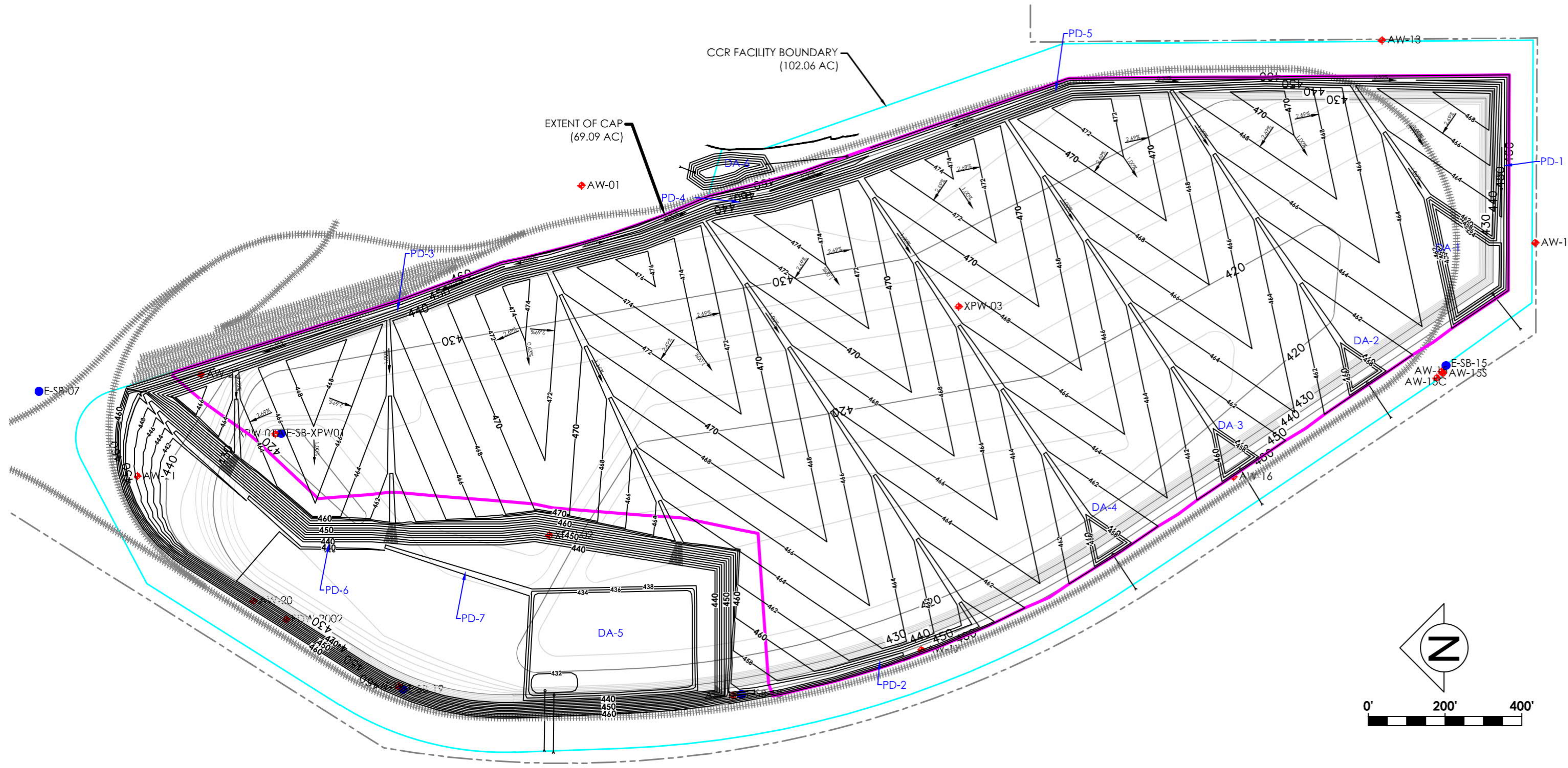


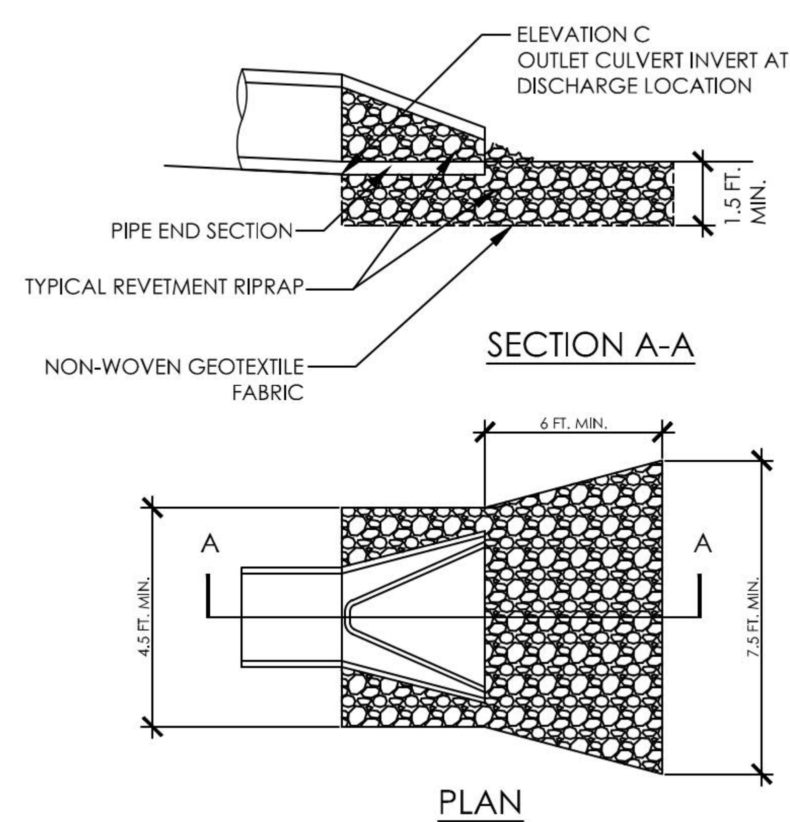
NOTE:
1. SEE ELEVATION TABLE FOR DESIGN ELEVATIONS OF EACH RISER.

8/9 DETAIL
RISER AT OUTLET
N.T.S.



9/9 DETAIL
TRASH RACK
N.T.S.





NOTES:
1. GEOTEXTILE FABRIC SPLICES SHALL OVERLAP A MINIMUM OF 18" WITH UPSTREAM GEOTEXTILE OVERLAPPING THE ABUTTING DOWNSTREAM GEOTEXTILE. BURY END OF GEOTEXTILE FABRIC 12" MINIMUM.
2. SEE ELEVATION TABLE FOR DESIGN ELEVATION.

10/9 DETAIL
CONCRETE FLARED END SECTION
N.T.S.

Drainage Area ID	Elevation A - Riser Outlet Culvert Invert at Riser	Elevation B - Top of Riser	Elevation C - Outlet Culvert Invert at Discharge Location
DA-1	458.11	454.11	436
DA-2	456	460	438
DA-3	456	460	432
DA-4	456	460	444
DA-5	434	437	433.26
PD-4/5 into DA-6	454.43	N/A	453.39
DA-6	454	458	453.5

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ILLINOIS POWER RESOURCES GENERATING, LLC.

Project Name & Location:

ASH POND PART 845 CONSTRUCTION DRAWINGS EDWARDS ASH POND

Drawing Name:

DETAILS

Date: 4/20/2022
Project No.:
Type: PLAN
Drawing No. 9
Drawn By: CB
Approved By: BH
Scale: AS NOTED

Appendix C

Alternative Final Protection Layer Equivalency Demonstration

The Alternative Final Protective Layer Equivalency Demonstration will be prepared by others for submittal and approval by the Illinois EPA.

Appendix D

Storm Water Calculations

STORMWATER MANAGEMENT PLAN

EDWARDS POWER PLANT
ASH POND
(IEPA ID W1438050005-01)
Bartonville, Illinois

April 2022

PREPARED FOR:
Illinois Power Resources Generating, LLC
1500 Eastport Plaza Drive
Collinsville, Illinois 62234

PREPARED BY:

IngenAE, LLC
502 Earth City Expressway, Suite 120
Earth City, MO 63045

Project Number: VST002-D22-001-01

TABLE OF CONTENTS

1.0 INTRODUCTION

The objective of this Stormwater Management Plan is to evaluate the hydrology of the stormwater runoff and the hydraulics of the designed stormwater controls of the Edwards Power Plant Ash Pond Closure Design. A combination of HydroCAD Version 10.00-25 and excel spreadsheets were used for most of the calculations. A summary of the supporting design models, calculations, and reference material are included in this report.

2.0 STORMWATER MANAGMENT

Surface stormwater will be routed off the top of the surface impoundment final cover, conveyed to drainage stormwater channels, and discharge into the west perimeter ditch and northeast stormwater pond.

3.0 DRAINAGE SYSTEM DESIGN

Drainage calculations for the final cover system erosion control structures and perimeter drainage system are based on the peak flow rate resulting from the 2-year, 24-hour and the 25-year, 24-hour storm event. The model program HydroCAD Version 10.00-25. was used to compute the drainage calculations. Design slopes along the primary drainage channels were kept to 1.0% minimum and perimeter drainage slopes were kept at a 0.5% minimum.

3.1 Hydrology Watershed Subcatchments and Schematization

The final cover will produce stormwater runoff that flow into the sedimentation basins and perimeter ditches. The final cover is divided into subcatchment areas to calculate the peak flows for the design of the perimeter drainage ditch. These areas were calculated using AutoCAD 2018 Civil 3D,and can be found in the attached Exhibit. Hydrographs were developed for each subcatchment area, stormwater channel, and perimeter ditch that conveys into the stormwater ponds.

Maximum surface runoff overland flow distance will be minimized by designing grass-lined stormwater channels. Grass-lined channels typically results in peak velocity <4.0 fps, but when additional erosion protection is required, channels with include rip rap lining; all discharge channels will be designed with rip rap lining.

3.2 Time of Concentration

The Time of Concentration (Tc) was calculated in HydroCAD based on manually calculated input distances. Watershed criteria included a maximum length of 100 feet for sheet flow during the time of concentration. Overland flow distance beyond 100’ was treated as shallow concentrated flow up to the point where flow paths intercept secondary or primary drainage channels. The remaining distance to the outfalls was defined as channel flow.

3.3 Rainfall Data

Rainfall depths were based on the Table 1. Rainfall Depth-Duration-Frequency Data for Peoria County of 3.02 inches for a 2-year, 24-hour storm event and 4.32 inches for a 25-year, 24-hour storm event. Refer to Appendix A.

3.4 Runoff Curve Number

A curve number of 78 was selected assuming a level D hydrologic soil with a meadow or grassed surface. The SCS/NRCS TR-55 publication and a copy of this table is found at the end of this report. Refer to Appendix A.

3.5 Hydraulic design

Hydraulic analysis calculations were preformed using HydroCAD SCS Unit Hydrograph method (TR-20) to show that stormwater channels and perimeter ditches on the final cover will be able to handle the peak flow of the 25-year, 24-hour storm event The stormwater management system includes the stormwater channels and perimeter ditches that will collect and direct stormwater runoff to the perforated 36" riser and culvert pipes that will be constructed at each drainage outfall area. A manning's number .030 was used to calculate the peak discharge, maximum velocity, and maximum flow depth.

Each outfall within the Ash Pond will have its own temporary stormwater detention area. The stage storage relationships within these detention areas were calculated using AutoCAD and manually entered into HydroCAD. The discharge control devices through which peak flow attenuation is achieved include the 36" perforated riser pipe, ranging from 4.0 to 7.0 fps for each outfall location, besides DA-4 resulted in a peak velocity of 7.36 fps. An IDOT or equivalent rip rap will surround each riser to prevent clogging of the perforations. The outfall culvert pipes will be 12-inch diameter steel pipe, except for PD-4/PD-5 that drains into DA-6 is designed to be 24-inch diameter steel pipe.

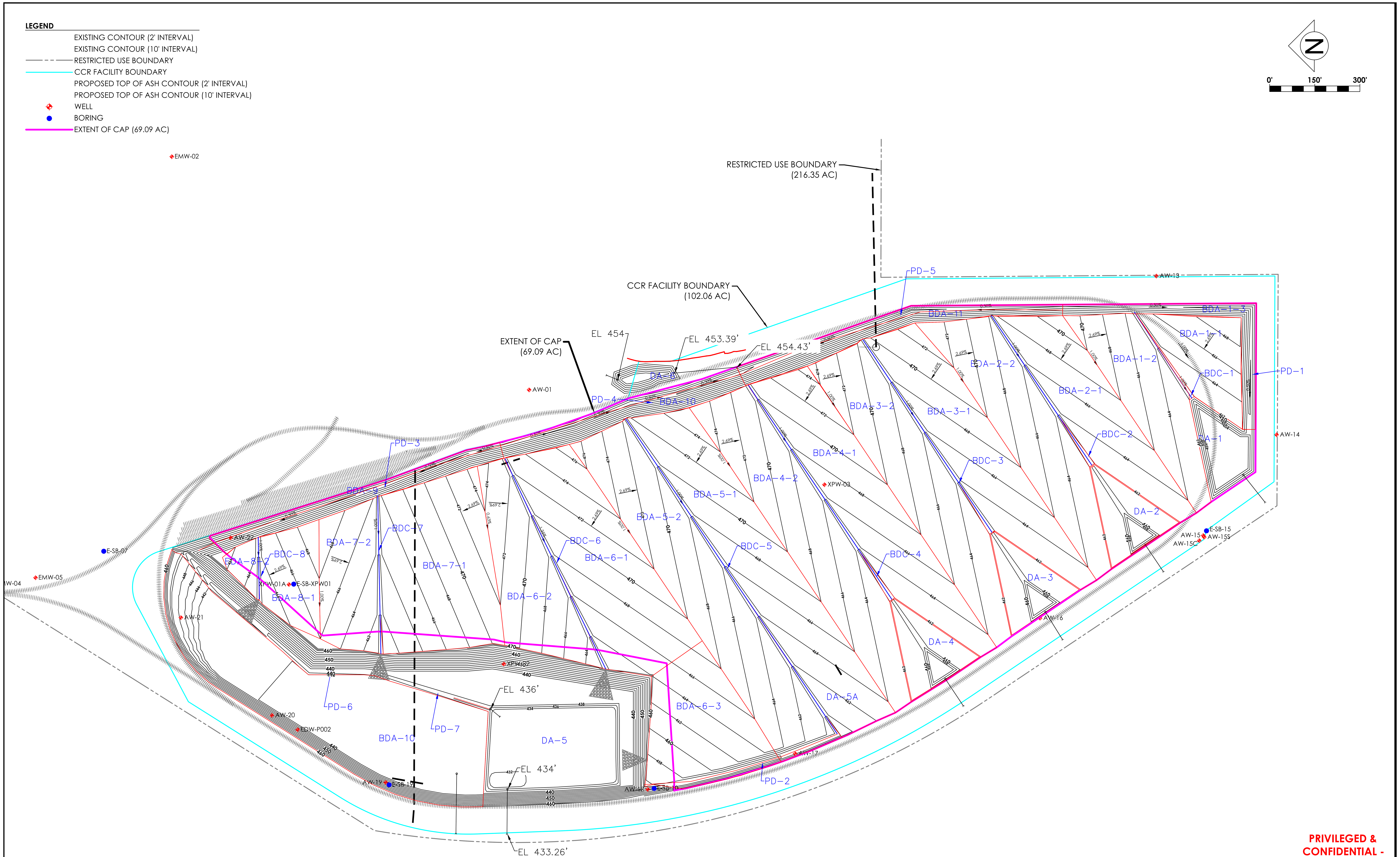
4.0 CONCLUSION

The 36" perforated riser pipe and culverts from each drainage outfall area have been designed to accommodate and attenuate the peak discharges for storm events of a 24-hour/25-year storm event without having the peak elevation over top the riser, and the stormwater channels and perimeter ditches were designed so that no ditches will over top the flow depths.

EXHIBIT – STORMWATER DRAINAGE AREAS

LEGEND

- EXISTING CONTOUR (2' INTERVAL)
- EXISTING CONTOUR (10' INTERVAL)
- RESTRICTED USE BOUNDARY
- CCR FACILITY BOUNDARY
- PROPOSED TOP OF ASH CONTOUR (2' INTERVAL)
- PROPOSED TOP OF ASH CONTOUR (10' INTERVAL)
- WELL
- BORING
- EXTENT OF CAP (69.09 AC)



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Drawing Name:
STORMWATER EXHIBIT

Date: 3/31/22	Project No.
Type: PLAN	Drawing No. 1
Drawn By: CB	
Approved By: BH	
Scale: AS NOTED	

APPENDIX A – RAINFALL DATA AND CURVE NUMBER

The following are the minimum standard, methods and procedures to be used to comply with the stormwater design requirements of Sections 3.12 ("General Erosion and Sediment Control Permits"), 3.13 ("Erosion, Sediment, and Stormwater Control Permits"), and 7.13 ("Erosion, Sediment, and Stormwater Control"). If an applicant determines that different methods are necessary based on site specific conditions, the applicant must request approval from the erosion control administrator to use other methods prior to submittal.

The design methods listed below are readily available in a number of computer programs, including the Soil Conservation Service's TR 20 (SCS) and HEC-1 (U.S. Army Corps of Engineers. Additionally, a simplified methodology which is based on the use of these methods is available in TR 55 (SCS, 1986). TR 55 can be applied using either manual computations or a computerized version.

Rainfall depth and intensity data. Use data for Peoria County (Illinois State Water Survey, BUL-70/89, 1989) as presented in attached Table I and graphically in Figure 1.

Storm event rainfall runoff. Use the SCS Runoff Curve Number Method to determine rainfall runoff depth. See Figure 2-1 and Tables 2-2a through 2-2c (attached) from TR 55. Soil type information is available from the SCS Peoria County Soil Survey, 1992.

Storm distribution (cumulative rainfall versus time). Use the SCS Type 11 storm distribution. See attached Table 3 and Figure 3.

Runoff hydrograph. Use the SCS dimensionless hydrograph. See SCS (1974) for in- formation regarding this procedure. As a substitute for detailed hydrograph analysis, TR 55 (SCS, 1986) can be used, either manually or computer program.

Storage routing (detention pond analysis). Use the continuity equation, also known as the Modified-Pula and Storage indication methods. As a substitute for detailed storage routing of a hydrograph, TR 55 (SCS, 1986) can be used, either manually or computer program. If TR 55 is used and a detention basin with a two-stage outlet control structure including a rectangular weir and/or orifice outlet is included as a part of the control measures, use the attached detention basin outlet work sheet to determine and present the structure design information.

TABLE 1

RAINFALL DEPTH-DURATION-FREQUENCY DATA FOR PEORIA COUNTY

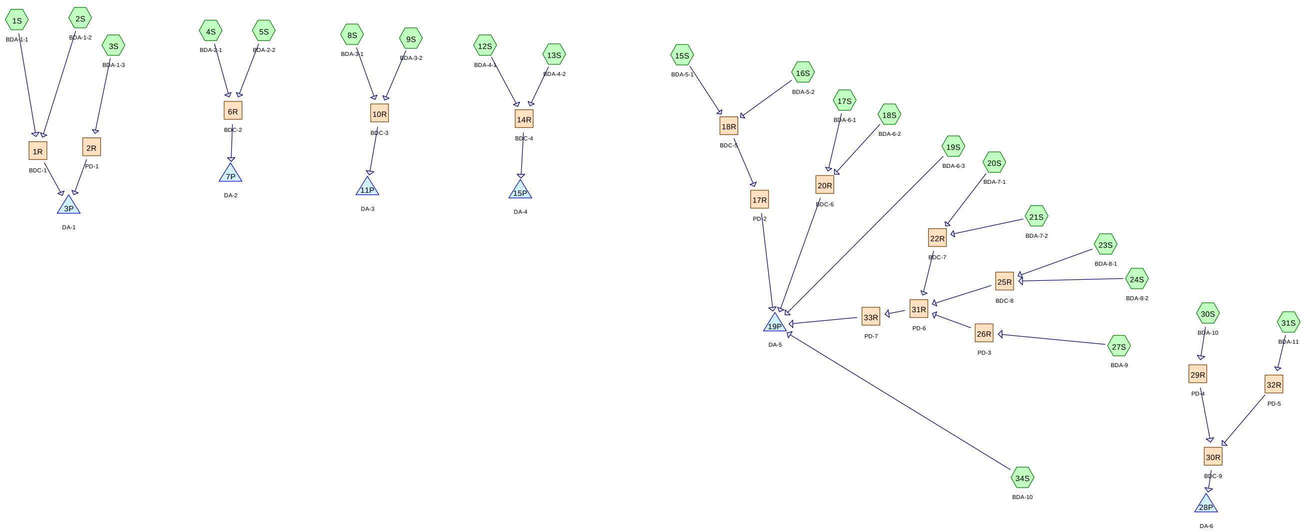
Rainfall Depth (inches) for Given Frequency

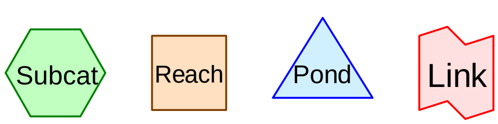
Duration	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr
5-min.	0.36	0.45	0.53	0.64	0.73	0.83
10-min.	0.66	0.83	0.98	1.17	1.34	1.52
15-min.	0.81	1.02	1.20	1.44	1.64	1.87
30-min.	1.12	1.39	1.64	1.97	2.25	2.56
1-hr.	1.42	1.77	2.09	2.50	2.86	3.25
2-hr.	1.78	2.22	2.62	3.14	3.59	4.08
3-hr.	1.93	2.41	2.85	3.41	3.89	4.43
6-hr.	2.26	2.82	3.33	3.99	4.56	5.19
12-hr.	2.62	3.27	3.87	4.63	5.29	6.02
18-hr.	2.75	3.46	4.09	4.90	5.59	6.37
24-hr.	3.02	3.76	4.45	4.32	6.08	6.92
48-hr.	3.38	4.19	4.86	5.78	6.62	7.51
72-hr.	3.70	4.55	5.26	6.15	7.25	8.16
5-day	4.17	5.11	5.84	6.96	7.98	9.21

Select Curve Number

ne	Description	Condition	A	B	C	D	Condensed Description
	CN Values for Ia = 0.20 S						
	FULLY DEVELOPED URBAN AREAS	Veg Estab					
	Open space (Lawns,parks etc.)						
	grass cover < 50%	Poor	68	79	86	89	<50% Grass cover, Poor
	grass cover 50% to 75%	Fair	49	69	79	84	50-75% Grass cover, Fair
	grass cover > 75%	Good	39	61	74	80	>75% Grass cover, Good
V1	Pond and Lake Surfaces						
V2	Classified as Impervious		98	98	98	98	Water Surface
V3	Classified as Pervious	0% imp	98	98	98	98	Water Surface, 0% imp
	Impervious Areas						
	Paved parking lots, driveways		98	98	98	98	Paved parking
'a	Unconnected Impervious		98	98	98	98	Unconnected pavement
'b	Roofs		98	98	98	98	Roofs
'c	Unconnected Impervious		98	98	98	98	Unconnected roofs
	Streets and roads						
	Paved; curbs and storm sewers		98	98	98	98	Paved roads w/curbs & sewers
0	Paved; open ditches (w/ROW)	50% imp	83	89	92	93	Paved roads w/open ditches, 5
1a	Gravel (w/o right-of-way)		96	96	96	96	Gravel surface
1	Gravel (w/ right-of-way)		76	85	89	91	Gravel roads
2	Dirt (w/ right-of-way)		72	82	87	89	Dirt roads
3	Urban Districts	impervious					
4	Commercial & business	85% imp	89	92	94	95	Urban commercial, 85% imp
5	Industrial	72% imp	81	88	91	93	Urban industrial, 72% imp
6	Residential districts						
7	(by average lot size)	impervious					
8	1/8 acre (town houses)	65% imp	77	85	90	92	1/8 acre lots, 65% imp
9	1/4 acre	38% imp	61	75	83	87	1/4 acre lots, 38% imp
0	1/3 acre	30% imp	57	72	81	86	1/3 acre lots, 30% imp
1	1/2 acre	25% imp	54	70	80	85	1/2 acre lots, 25% imp
2	1 acre	20% imp	51	68	79	84	1 acre lots, 20% imp
3	2 acre	12% imp	46	65	77	82	2 acre lots, 12% imp
4	Western Desert Urban Areas						
5	Natural desert (pervious areas only)		63	77	85	88	Natural western desert
6	Artifical desert landscaping		96	96	96	96	Artifical desert landscape
9	DEVELOPING URBAN AREA	(No Veg)					
0	Newly graded area (pervious only)		77	86	91	94	Newly graded area
1	CULTIVATED AGRICULTURAL LAND						
2	Fallow						
3	Bare soil		77	86	91	94	Fallow, bare soil
4	Crop residue (CR)	Poor	76	85	90	93	Fallow, crop residue, Poor
5	Crop residue (CR)	Good	74	83	88	90	Fallow, crop residue, Good
6	Row crops						
7	Straight row (SR)	Poor	72	81	88	91	Row crops, straight row, Poor
8	Straight row (SR)	Good	67	78	85	89	Row crops, straight row, Good
9	SR + Crop residue	Poor	71	80	87	90	Row crops, SR + CR, Poor
0	SR + Crop residue	Good	64	75	82	85	Row crops, SR + CR, Good
1	Contoured (C)	Poor	70	79	84	88	Row crops, contoured, Poor
2	Contoured (C)	Good	65	75	82	86	Row crops, contoured, Good
3	C + Crop residue	Poor	69	78	83	87	Row crops, C + CR, Poor
4	C + Crop residue	Good	64	74	81	85	Row crops, C + CR, Good
5	Contoured & terraced (C&T)	Poor	66	74	80	82	Row crops, C&T, Poor
6	Contoured & terraced (C&T)	Good	62	71	78	81	Row crops, C&T, Good
7	C&T + Crop residue	Poor	65	73	79	81	Row crops, C&T + CR, Poor
8	C&T + Crop residue	Good	61	70	77	80	Row crops, C&T + CR, Good
9	Small grain						
0	Straight row (SR)	Poor	65	76	84	88	Small grain, straight row, Poor
1	Straight row (SR)	Good	63	75	83	87	Small grain, straight row, Good
2	SR + Crop residue	Poor	64	75	83	86	Small grain, SR + CR, Poor
3	SR + Crop residue	Good	60	72	80	84	Small grain, SR + CR, Good
4	Contoured (C)	Poor	63	74	82	85	Small grain, contoured, Poor
5	Contoured (C)	Good	61	73	81	84	Small grain, contoured, Good
6	C + Crop residue	Poor	62	73	81	84	Small grain, C + CR, Poor
7	C + Crop residue	Good	60	72	80	83	Small grain, C + CR, Good
8	Contoured & terraced (C&T)	Poor	61	72	79	82	Small grain, C&T, Poor
9	Contoured & terraces (C&T)	Good	59	70	78	81	Small grain, C&T, Good
0	C&T + Crop residue	Poor	60	71	78	81	Small grain, C&T + CR, Poor
1	C&T + Crop residue	Good	58	69	77	80	Small grain, C&T + CR, Good
2	Close-seeded legumes/rotat.meadow						
3	Straight row	Poor	66	77	85	89	Legumes, straight row, Poor
4	Straight row	Good	58	72	81	85	Legumes, straight row, Good
5	Contoured	Poor	64	75	83	85	Legumes, contoured, Poor
6	Contoured	Good	55	69	78	83	Legumes, contoured, Good
7	Cont & terraced	Poor	63	73	80	83	Legumes, C&T, Poor
8	Cont & terraced	Good	51	67	76	80	Legumes, C&T, Good
9	OTHER AGRICULTURAL LAND						
0	Pasture, grassland or range	Poor	68	79	86	89	Pasture/grassland/range, Poor
1		Fair	49	69	79	84	Pasture/grassland/range, Fair
2		Good	39	61	74	80	Pasture/grassland/range, Good
3	Meadow, cont. grass, non-grazed		30	58	71	78	Meadow, non-grazed
4	Brush, brush/weed/grass mix	Poor	48	67	77	83	Brush, Poor
5		Fair	35	56	70	77	Brush, Fair

APPENDIX B – 25-YEAR 24-HOUR HYDROCAD RESULTS





Routing Diagram for EDWARDS STORMWATER HYDROCAD CALCS
Prepared by {enter your company name here}, Printed 3/31/2022
HydroCAD® 10.00-26 s/n 10085 © 2020 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
74.410	78	(1S, 2S, 3S, 4S, 5S, 8S, 9S, 12S, 13S, 15S, 16S, 17S, 18S, 19S, 20S, 21S, 23S, 24S, 27S, 30S, 31S, 34S)
74.410	**78**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
74.410	Other	1S, 2S, 3S, 4S, 5S, 8S, 9S, 12S, 13S, 15S, 16S, 17S, 18S, 19S, 20S, 21S, 23S, 24S, 27S, 30S, 31S, 34S
74.410		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	74.410	74.410		1S, 2S, 3S, 4S, 5S, 8S, 9S, 12S, 13S, 15S, 16S, 17S, 18S, 19S, 20S, 21S, 23S, 24S, 27S, 30S, 31S, 34S
0.000	**0.000**	**0.000**	**0.000**	**74.410**	**74.410**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	30R	454.43	453.39	207.0	0.0050	0.030	24.0	0.0	0.0
2	3P	454.11	436.00	111.0	0.1632	0.030	12.0	0.0	0.0
3	7P	456.00	438.00	105.0	0.1714	0.025	12.0	0.0	0.0
4	11P	456.00	432.00	105.0	0.2286	0.025	12.0	0.0	0.0
5	15P	456.00	440.00	104.5	0.1531	0.025	12.0	0.0	0.0
6	19P	434.00	433.26	147.0	0.0050	0.025	12.0	0.0	0.0
7	28P	454.00	453.50	100.0	0.0050	0.025	12.0	0.0	0.0

Time span=0.00-48.00 hrs, dt=0.04 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: BDA-1-1 Runoff Area=1.740 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=241' Slope=0.0269 '/' Tc=11.5 min CN=78 Runoff=5.42 cfs 0.311 af

Subcatchment 2S: BDA-1-2 Runoff Area=2.780 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=265' Slope=0.0269 '/' Tc=11.9 min CN=78 Runoff=8.54 cfs 0.497 af

Subcatchment 3S: BDA-1-3 Runoff Area=0.960 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=27' Slope=0.3300 '/' Tc=5.0 min CN=78 Runoff=3.77 cfs 0.172 af

Subcatchment 4S: BDA-2-1 Runoff Area=3.320 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=201' Slope=0.0269 '/' Tc=11.0 min CN=78 Runoff=10.51 cfs 0.593 af

Subcatchment 5S: BDA-2-2 Runoff Area=3.940 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=260' Slope=0.0269 '/' Tc=11.8 min CN=78 Runoff=12.15 cfs 0.704 af

Subcatchment 8S: BDA-3-1 Runoff Area=4.270 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=187' Slope=0.0269 '/' Tc=10.8 min CN=78 Runoff=13.62 cfs 0.763 af

Subcatchment 9S: BDA-3-2 Runoff Area=4.510 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=1,570' Slope=0.0269 '/' Tc=30.8 min CN=78 Runoff=8.19 cfs 0.806 af

Subcatchment 12S: BDA-4-1 Runoff Area=4.710 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=204' Slope=0.0269 '/' Tc=11.0 min CN=78 Runoff=14.92 cfs 0.842 af

Subcatchment 13S: BDA-4-2 Runoff Area=4.940 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=205' Slope=0.0269 '/' Tc=11.0 min CN=78 Runoff=15.64 cfs 0.883 af

Subcatchment 15S: BDA-5-1 Runoff Area=5.710 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=297' Slope=0.0269 '/' Tc=12.4 min CN=78 Runoff=17.24 cfs 1.021 af

Subcatchment 16S: BDA-5-2 Runoff Area=5.860 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=327' Slope=0.0269 '/' Tc=12.8 min CN=78 Runoff=17.44 cfs 1.048 af

Subcatchment 17S: BDA-6-1 Runoff Area=5.060 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=224' Slope=0.0269 '/' Tc=11.3 min CN=78 Runoff=15.86 cfs 0.904 af

Subcatchment 18S: BDA-6-2 Runoff Area=2.980 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=130' Slope=0.0269 '/' Tc=9.9 min CN=78 Runoff=9.79 cfs 0.533 af

Subcatchment 19S: BDA-6-3 Runoff Area=3.200 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=413' Slope=0.0269 '/' Tc=14.0 min CN=78 Runoff=9.13 cfs 0.572 af

Subcatchment 20S: BDA-7-1 Runoff Area=4.860 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=371' Slope=0.0269 '/' Tc=13.4 min CN=78 Runoff=14.16 cfs 0.869 af

Subcatchment 21S: BDA-7-2 Runoff Area=2.140 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=206' Slope=0.0269 '/' Tc=11.0 min CN=78 Runoff=6.78 cfs 0.383 af

Subcatchment 23S: BDA-8-1 Runoff Area=1.440 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=213' Slope=0.0269 '/' Tc=11.1 min CN=78 Runoff=4.55 cfs 0.257 af

Subcatchment 24S: BDA-8-2 Runoff Area=0.340 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=96' Slope=0.0269 '/' Tc=9.2 min CN=78 Runoff=1.15 cfs 0.061 af

Subcatchment 27S: BDA-9 Runoff Area=1.280 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=40' Slope=0.3300 '/' Tc=5.0 min CN=78 Runoff=5.02 cfs 0.229 af

Subcatchment 30S: BDA-10 Runoff Area=1.330 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=96' Slope=0.3300 '/' Tc=5.0 min CN=78 Runoff=5.22 cfs 0.238 af

Subcatchment 31S: BDA-11 Runoff Area=1.390 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=40' Slope=0.3300 '/' Tc=5.0 min CN=78 Runoff=5.45 cfs 0.248 af

Subcatchment 34S: BDA-10 Runoff Area=7.650 ac 0.00% Impervious Runoff Depth=2.15"
Flow Length=1,194' Slope=0.0130 '/' Tc=35.5 min CN=78 Runoff=12.61 cfs 1.367 af

Reach 1R: BDC-1 Avg. Flow Depth=0.51' Max Vel=2.81 fps Inflow=13.95 cfs 0.808 af
n=0.030 L=344.0' S=0.0100 '/' Capacity=169.91 cfs Outflow=13.57 cfs 0.808 af

Reach 2R: PD-1 Avg. Flow Depth=0.70' Max Vel=1.68 fps Inflow=3.77 cfs 0.172 af
n=0.030 L=1,000.0' S=0.0050 '/' Capacity=40.58 cfs Outflow=2.50 cfs 0.172 af

Reach 6R: BDC-2 Avg. Flow Depth=0.66' Max Vel=3.27 fps Inflow=22.64 cfs 1.298 af
n=0.030 L=600.0' S=0.0100 '/' Capacity=169.91 cfs Outflow=21.42 cfs 1.298 af

Reach 10R: BDC-3 Avg. Flow Depth=0.56' Max Vel=3.05 fps Inflow=17.87 cfs 1.569 af
n=0.030 L=771.7' S=0.0104 '/' Capacity=173.00 cfs Outflow=16.64 cfs 1.569 af

Reach 14R: BDC-4 Avg. Flow Depth=0.78' Max Vel=3.48 fps Inflow=30.56 cfs 1.725 af
n=0.030 L=857.9' S=0.0093 '/' Capacity=164.08 cfs Outflow=27.89 cfs 1.725 af

Reach 17R: PD-2 Avg. Flow Depth=0.81' Max Vel=3.41 fps Inflow=30.23 cfs 2.068 af
n=0.030 L=667.0' S=0.0086 '/' Capacity=157.21 cfs Outflow=28.87 cfs 2.068 af

Reach 18R: BDC-5 Avg. Flow Depth=0.79' Max Vel=3.68 fps Inflow=34.67 cfs 2.068 af
n=0.030 L=1,262.7' S=0.0103 '/' Capacity=172.40 cfs Outflow=30.23 cfs 2.068 af

Reach 20R: BDC-6 Avg. Flow Depth=0.64' Max Vel=3.74 fps Inflow=25.58 cfs 1.437 af
n=0.030 L=774.6' S=0.0135 '/' Capacity=197.35 cfs Outflow=23.85 cfs 1.437 af

Reach 22R: BDC-7 Avg. Flow Depth=0.58' Max Vel=3.53 fps Inflow=20.80 cfs 1.251 af
n=0.030 L=527.8' S=0.0133 '/' Capacity=195.68 cfs Outflow=20.10 cfs 1.251 af

Reach 25R: BDC-8 Avg. Flow Depth=0.30' Max Vel=2.07 fps Inflow=5.67 cfs 0.318 af
n=0.030 L=206.8' S=0.0100 '/' Capacity=170.00 cfs Outflow=5.57 cfs 0.318 af

Reach 26R: PD-3 Avg. Flow Depth=0.78' Max Vel=1.83 fps Inflow=5.02 cfs 0.229 af
n=0.030 L=1,062.6' S=0.0052 '/' Capacity=6.50 cfs Outflow=3.36 cfs 0.229 af

Reach 29R: PD-4 Avg. Flow Depth=0.83' Max Vel=1.87 fps Inflow=5.22 cfs 0.238 af
n=0.030 L=832.0' S=0.0050 '/' Capacity=6.39 cfs Outflow=3.86 cfs 0.238 af

Reach 30R: BDC-9 Avg. Flow Depth=1.74' Max Vel=2.52 fps Inflow=7.44 cfs 0.486 af
24.0" Round Pipe n=0.030 L=207.0' S=0.0050 '/' Capacity=6.95 cfs Outflow=7.27 cfs 0.486 af

Reach 31R: PD-6 Avg. Flow Depth=0.69' Max Vel=3.78 fps Inflow=28.60 cfs 1.798 af
n=0.030 L=1,060.0' S=0.0126 '/' Capacity=190.90 cfs Outflow=26.04 cfs 1.798 af

Reach 32R: PD-5 Avg. Flow Depth=0.81' Max Vel=1.85 fps Inflow=5.45 cfs 0.248 af
n=0.030 L=1,107.0' S=0.0050 '/' Capacity=6.41 cfs Outflow=3.60 cfs 0.248 af

Reach 33R: PD-7 Avg. Flow Depth=0.89' Max Vel=2.74 fps Inflow=26.04 cfs 1.798 af
n=0.030 L=125.0' S=0.0050 '/' Capacity=119.67 cfs Outflow=26.01 cfs 1.798 af

Pond 3P: DA-1 Peak Elev=455.62' Storage=0.960 af Inflow=15.99 cfs 0.980 af
Outflow=0.02 cfs 0.062 af

Pond 7P: DA-2 Peak Elev=459.84' Storage=0.599 af Inflow=21.42 cfs 1.298 af
Outflow=2.47 cfs 1.296 af

Pond 11P: DA-3 Peak Elev=460.13' Storage=0.678 af Inflow=16.64 cfs 1.569 af
Outflow=4.12 cfs 1.568 af

Pond 15P: DA-4 Peak Elev=460.25' Storage=0.728 af Inflow=27.89 cfs 1.725 af
Outflow=5.78 cfs 1.723 af

Pond 19P: DA-5 Peak Elev=436.34' Storage=8.786 af Inflow=91.83 cfs 7.243 af
Outflow=1.21 cfs 2.920 af

Pond 28P: DA-6 Peak Elev=455.11' Storage=0.599 af Inflow=7.27 cfs 0.486 af
Outflow=0.42 cfs 0.389 af

Total Runoff Area = 74.410 ac Runoff Volume = 13.301 af Average Runoff Depth = 2.15"
100.00% Pervious = 74.410 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: BDA-1-1

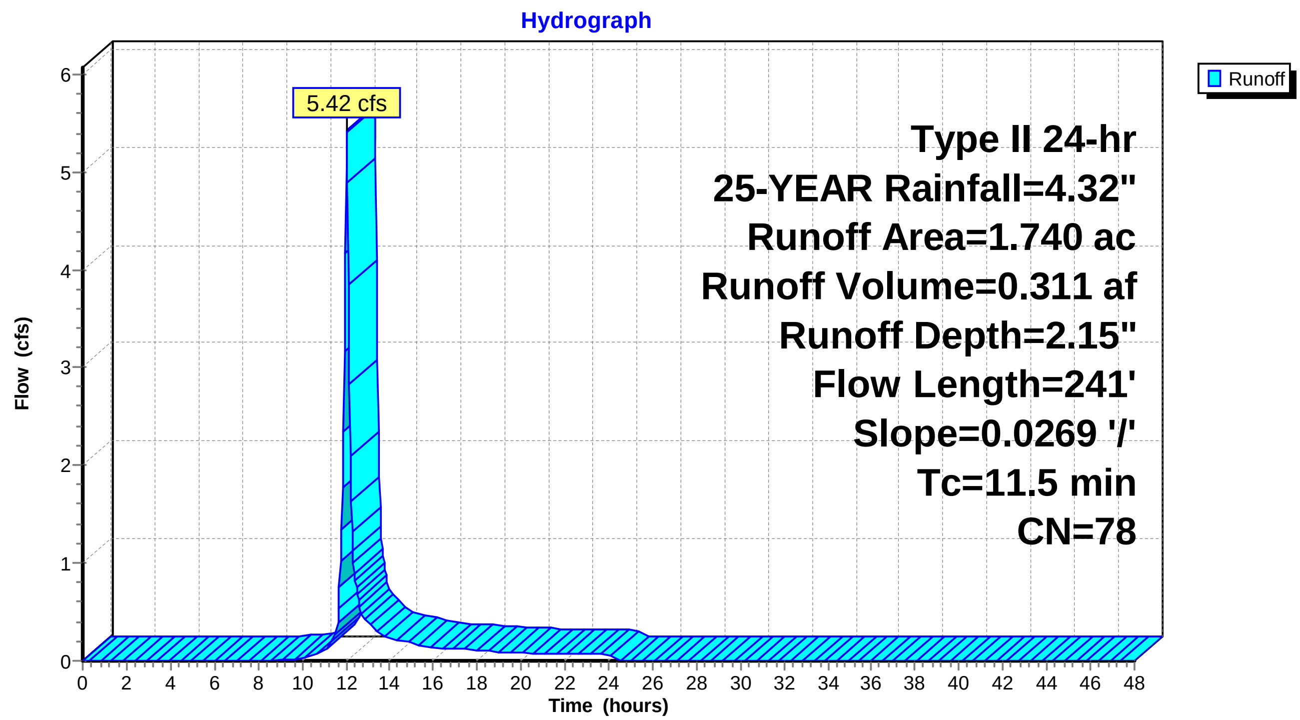
Runoff = 5.42 cfs @ 12.03 hrs, Volume= 0.311 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	1.740	78	
	1.740		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
2.0	141	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.5	241	Total			

Subcatchment 1S: BDA-1-1



Summary for Subcatchment 2S: BDA-1-2

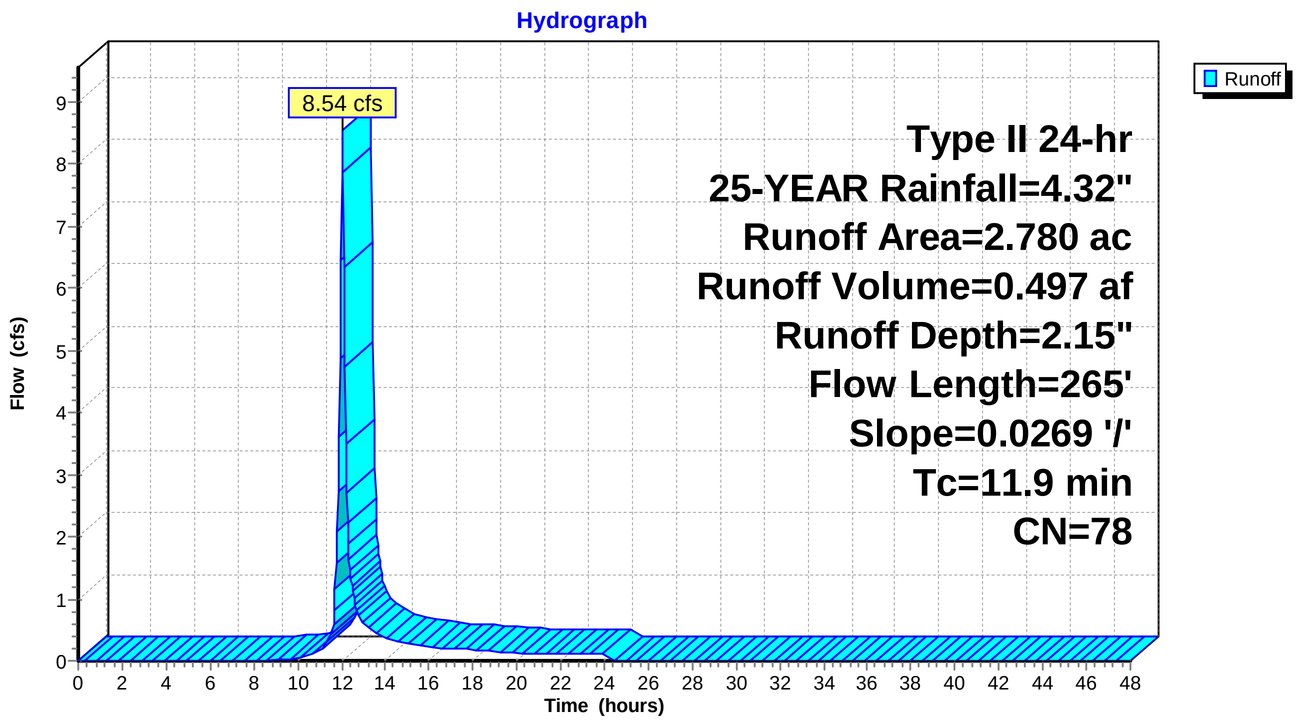
Runoff = 8.54 cfs @ 12.04 hrs, Volume= 0.497 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	2.780	78	
	2.780		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
2.4	165	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.9	265	Total			

Subcatchment 2S: BDA-1-2



Summary for Subcatchment 3S: BDA-1-3

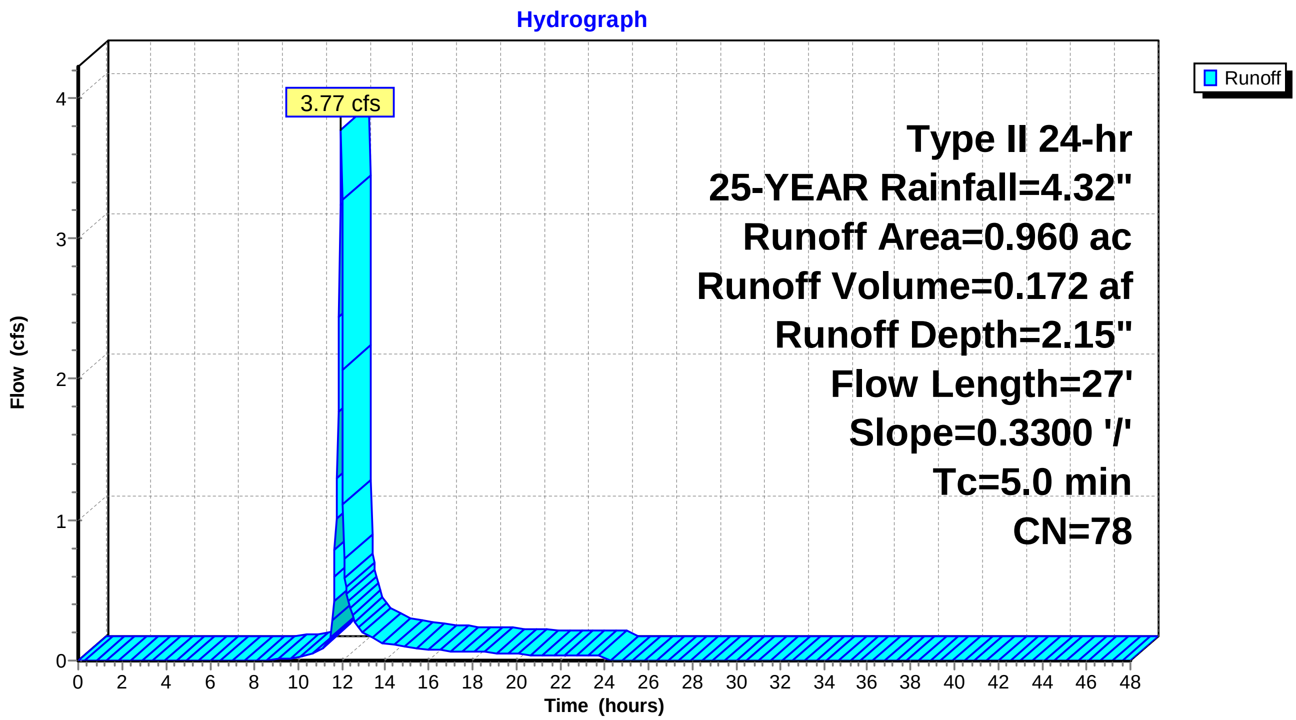
Runoff = 3.77 cfs @ 11.96 hrs, Volume= 0.172 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	0.960	78	
	0.960		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	27	0.3300	0.37		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.2	27	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 3S: BDA-1-3



Summary for Subcatchment 4S: BDA-2-1

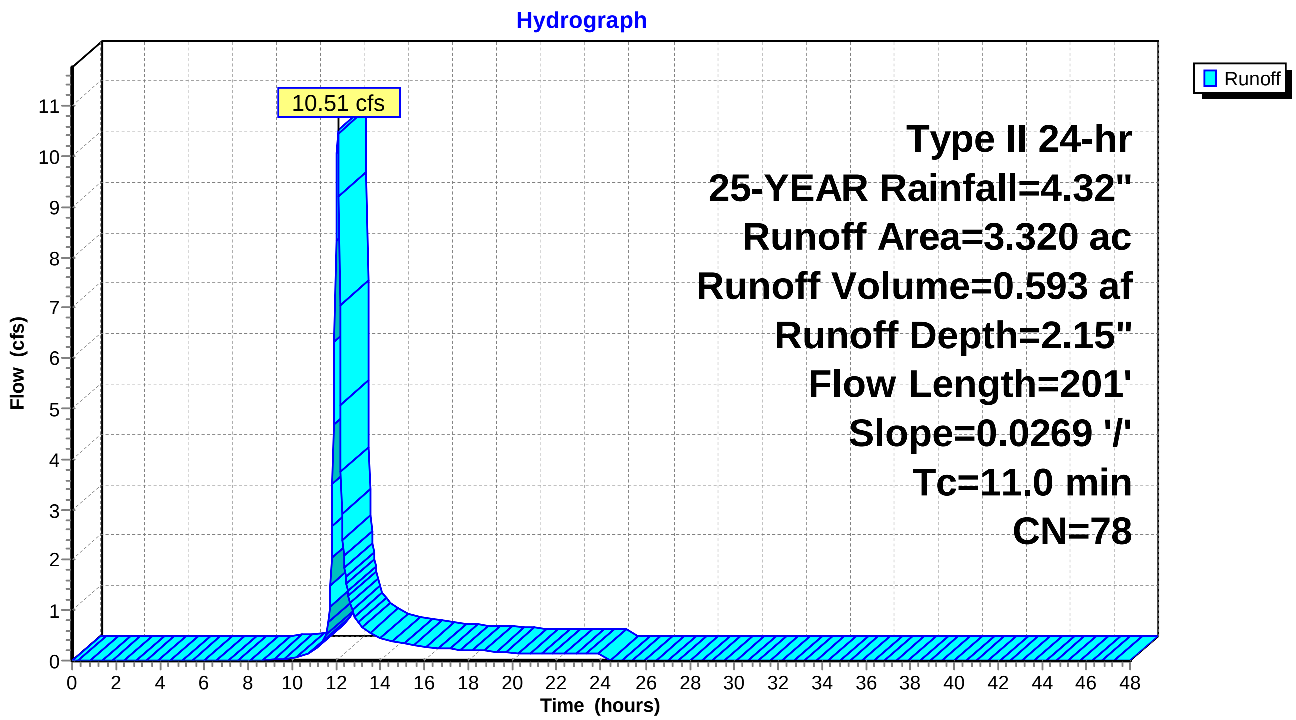
Runoff = 10.51 cfs @ 12.03 hrs, Volume= 0.593 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	3.320	78	
	3.320		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.5	101	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.0	201	Total			

Subcatchment 4S: BDA-2-1



Summary for Subcatchment 5S: BDA-2-2

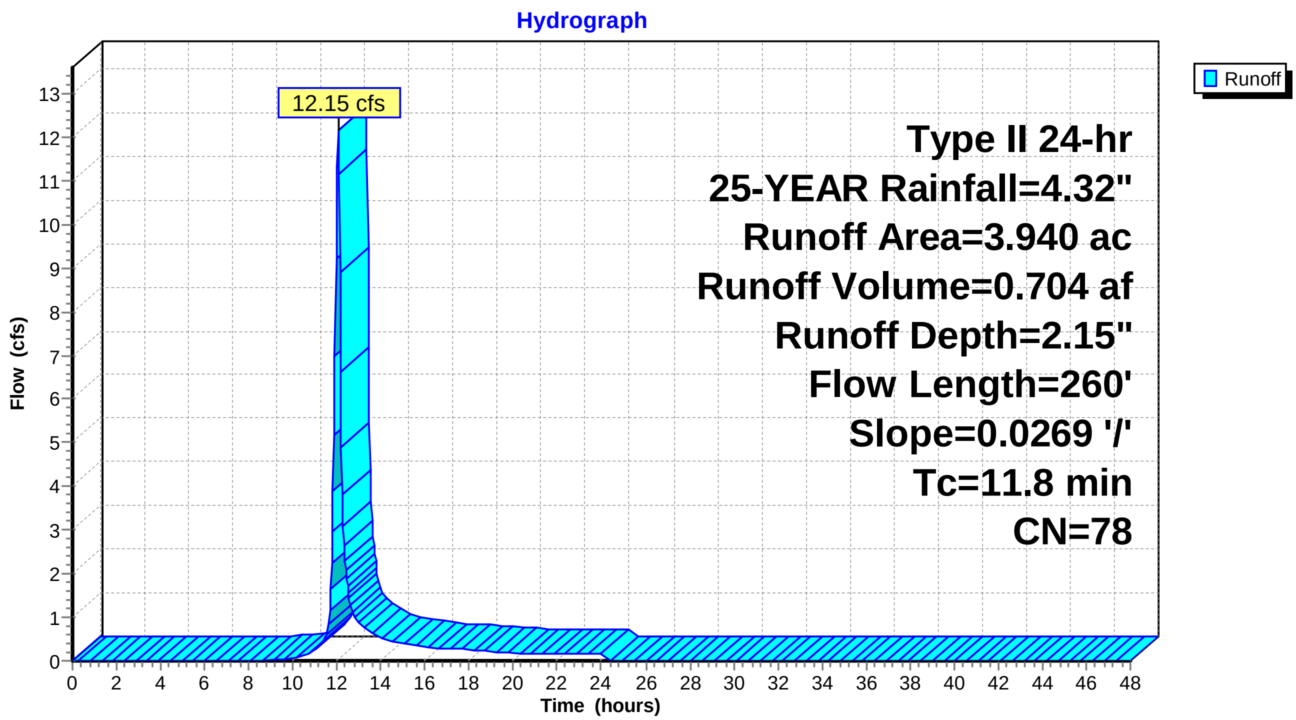
Runoff = 12.15 cfs @ 12.04 hrs, Volume= 0.704 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	3.940	78	
	3.940		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
2.3	160	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.8	260	Total			

Subcatchment 5S: BDA-2-2



Summary for Subcatchment 8S: BDA-3-1

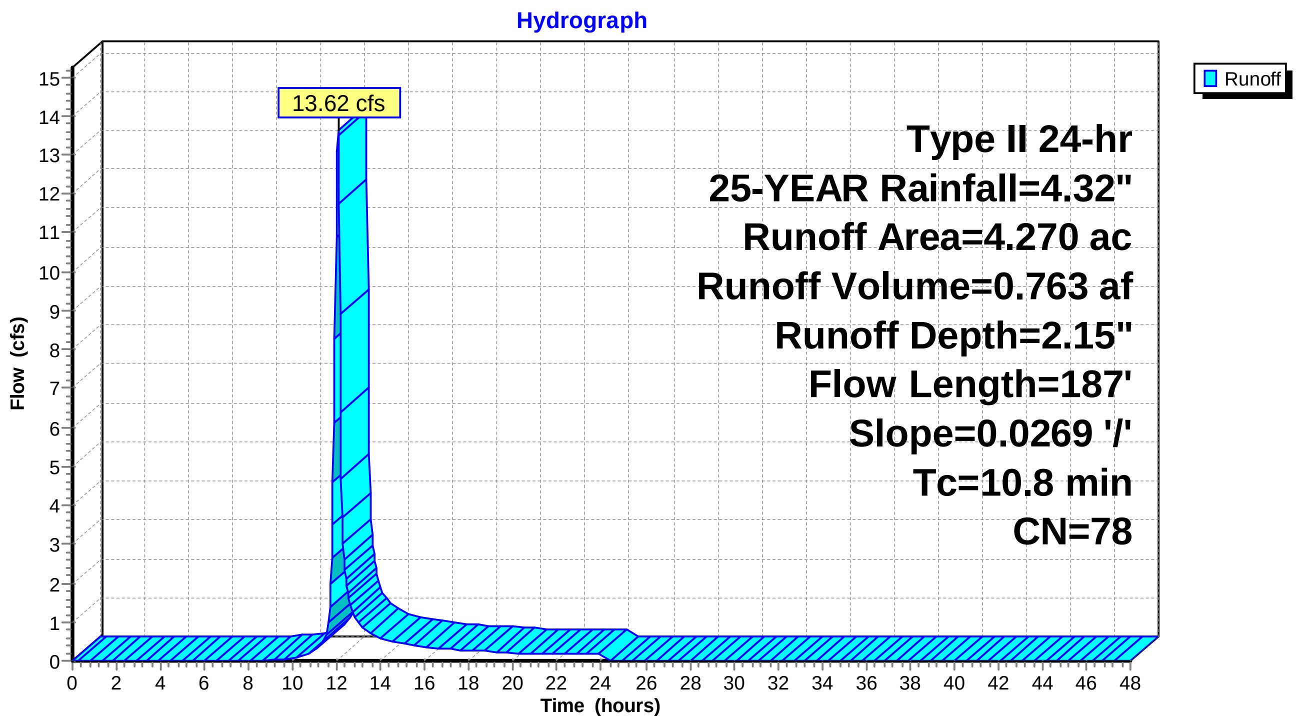
Runoff = 13.62 cfs @ 12.03 hrs, Volume= 0.763 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	4.270	78	
	4.270		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.3	87	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.8	187	Total			

Subcatchment 8S: BDA-3-1



Summary for Subcatchment 9S: BDA-3-2

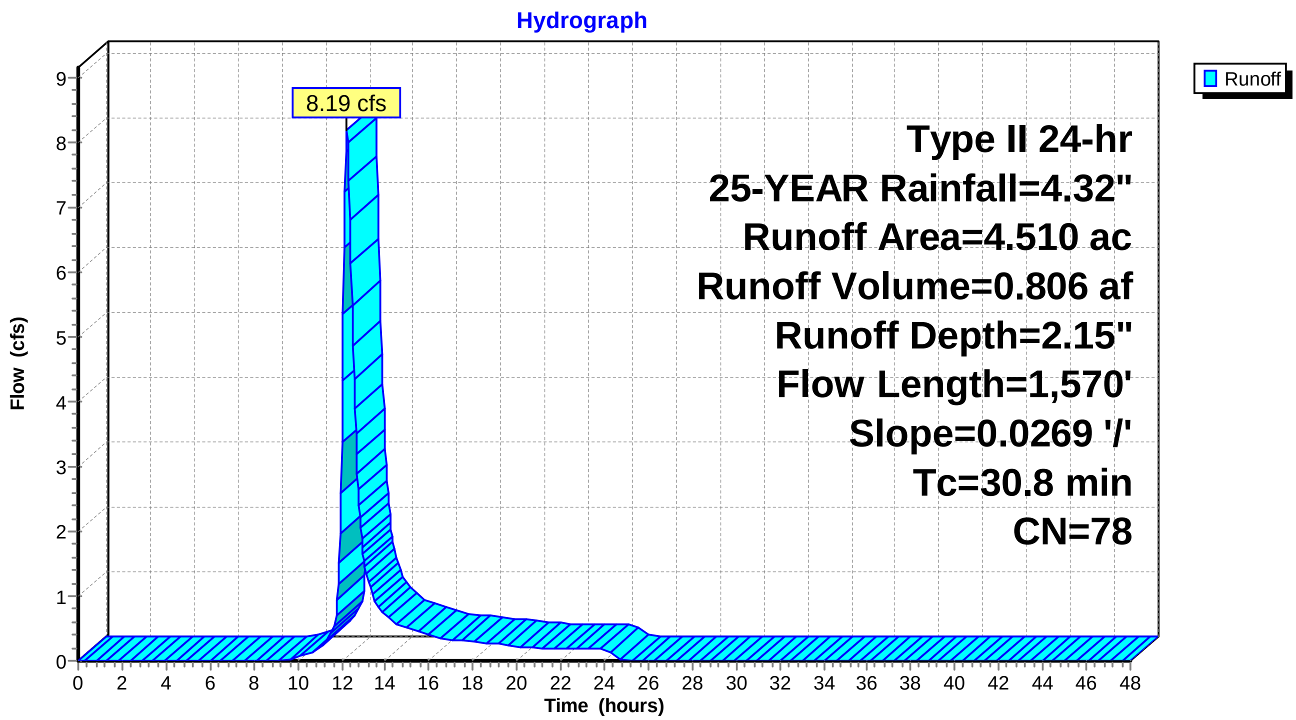
Runoff = 8.19 cfs @ 12.26 hrs, Volume= 0.806 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	4.510	78	
	4.510		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
21.3	1,470	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
30.8	1,570	Total			

Subcatchment 9S: BDA-3-2



Summary for Subcatchment 12S: BDA-4-1

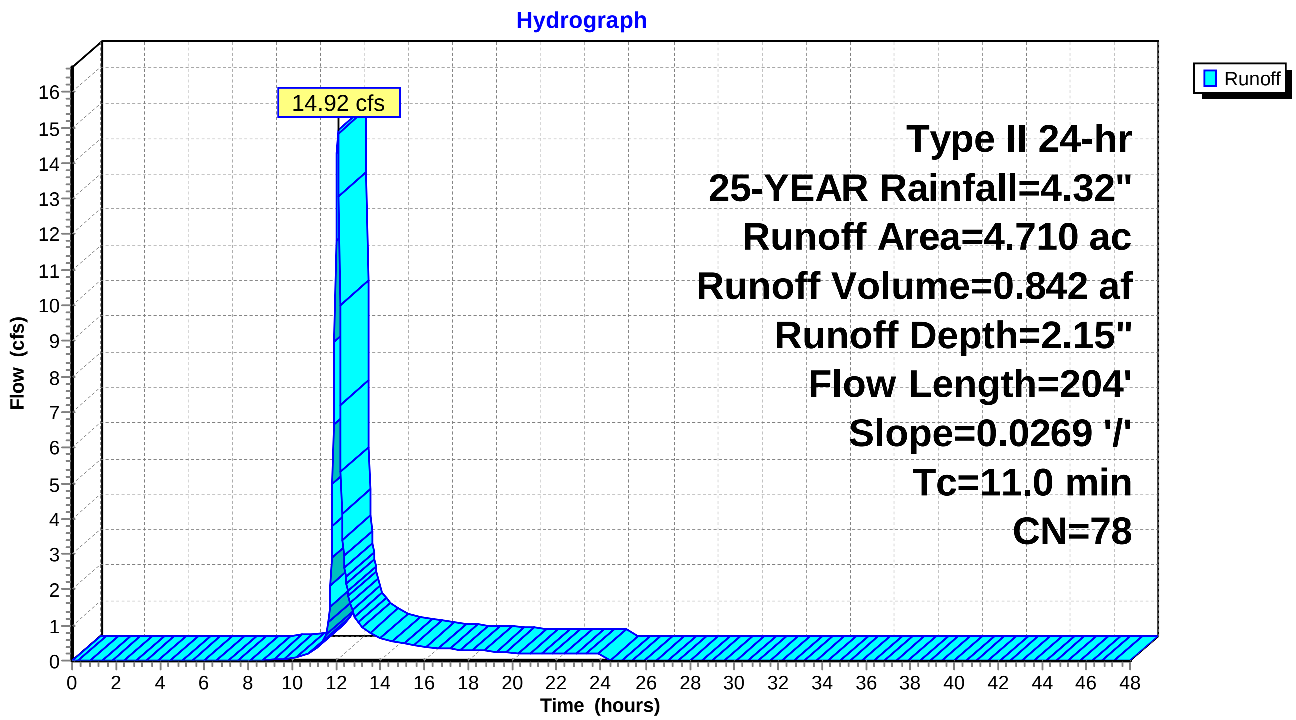
Runoff = 14.92 cfs @ 12.03 hrs, Volume= 0.842 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	4.710	78	
	4.710		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.5	104	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.0	204	Total			

Subcatchment 12S: BDA-4-1



Summary for Subcatchment 13S: BDA-4-2

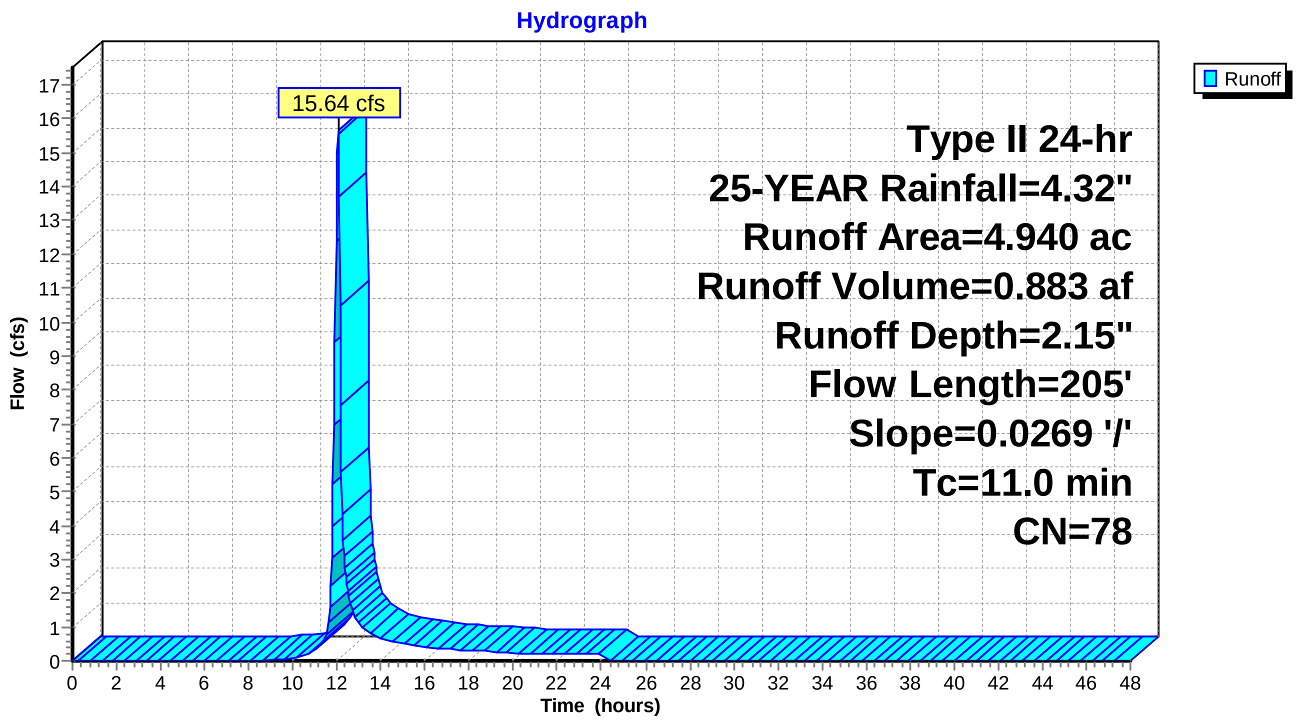
Runoff = 15.64 cfs @ 12.03 hrs, Volume= 0.883 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	4.940	78	
	4.940		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.5	105	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.0	205	Total			

Subcatchment 13S: BDA-4-2



Summary for Subcatchment 15S: BDA-5-1

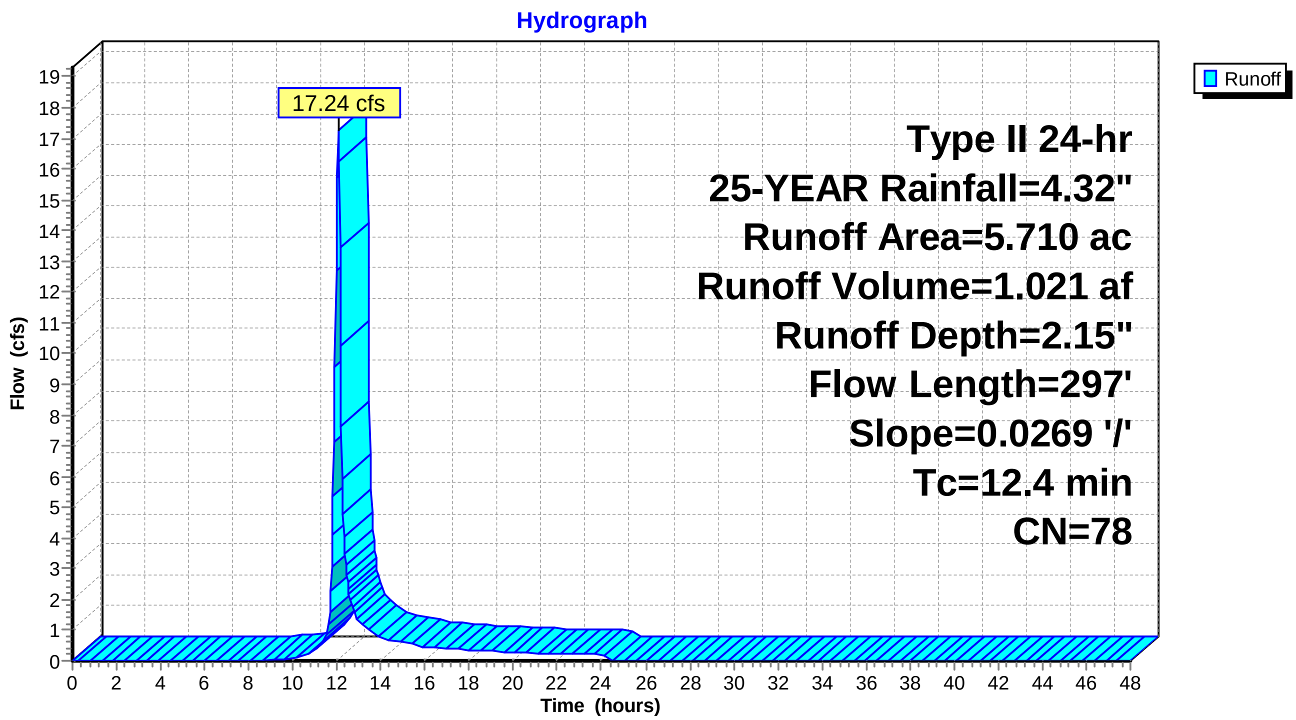
Runoff = 17.24 cfs @ 12.04 hrs, Volume= 1.021 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	5.710	78	
	5.710		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
2.9	197	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.4	297	Total			

Subcatchment 15S: BDA-5-1



Summary for Subcatchment 16S: BDA-5-2

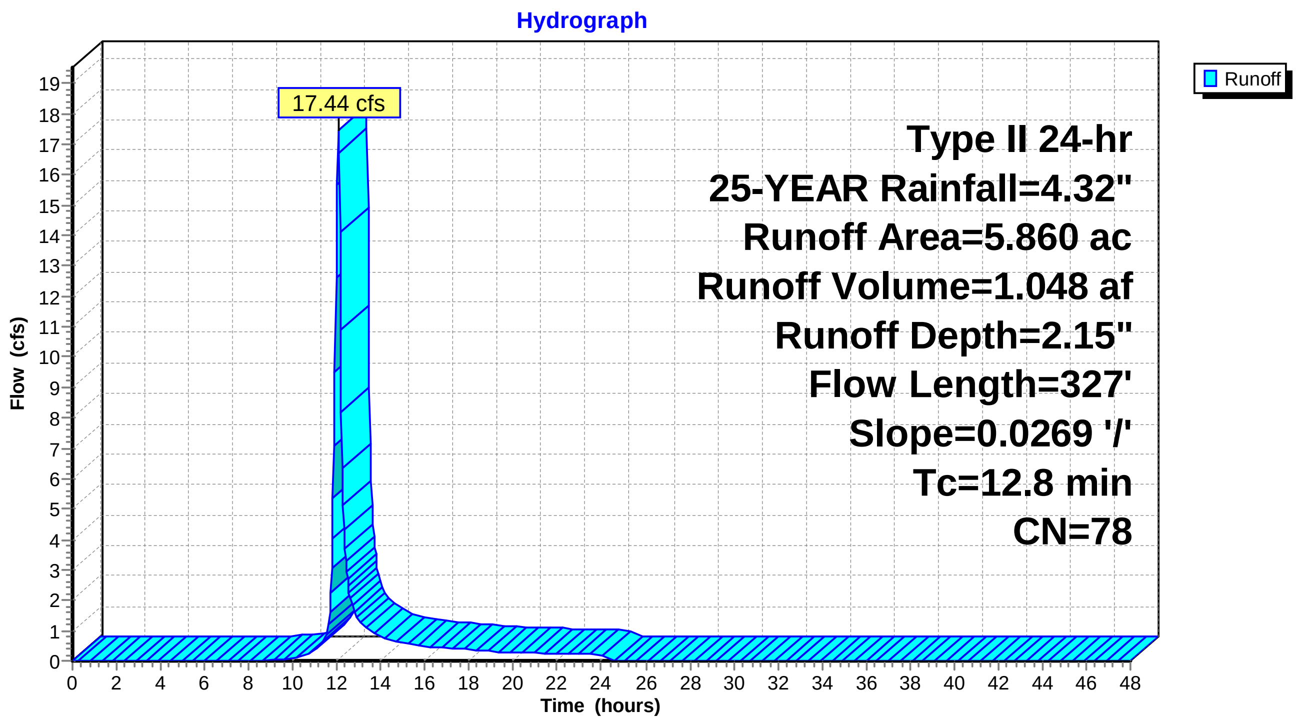
Runoff = 17.44 cfs @ 12.05 hrs, Volume= 1.048 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	5.860	78	
	5.860		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
3.3	227	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.8	327	Total			

Subcatchment 16S: BDA-5-2



Summary for Subcatchment 17S: BDA-6-1

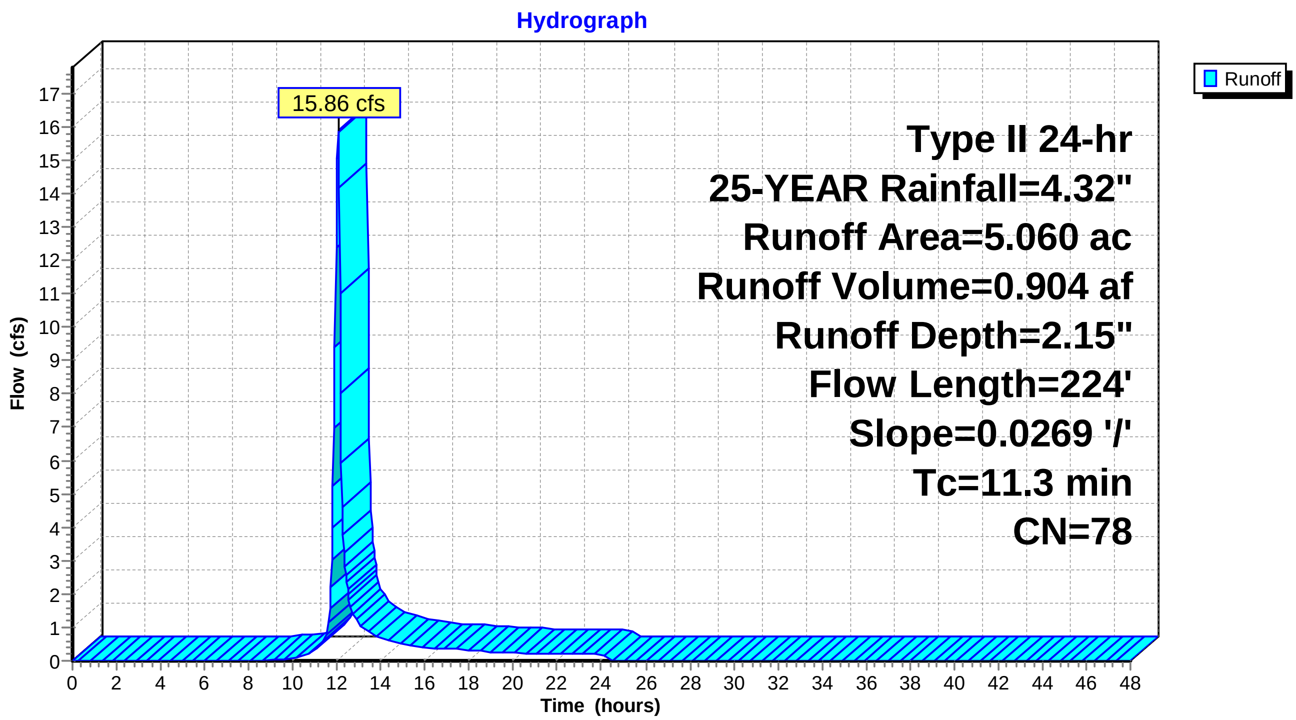
Runoff = 15.86 cfs @ 12.03 hrs, Volume= 0.904 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	5.060	78	
	5.060		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.8	124	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.3	224	Total			

Subcatchment 17S: BDA-6-1



Summary for Subcatchment 18S: BDA-6-2

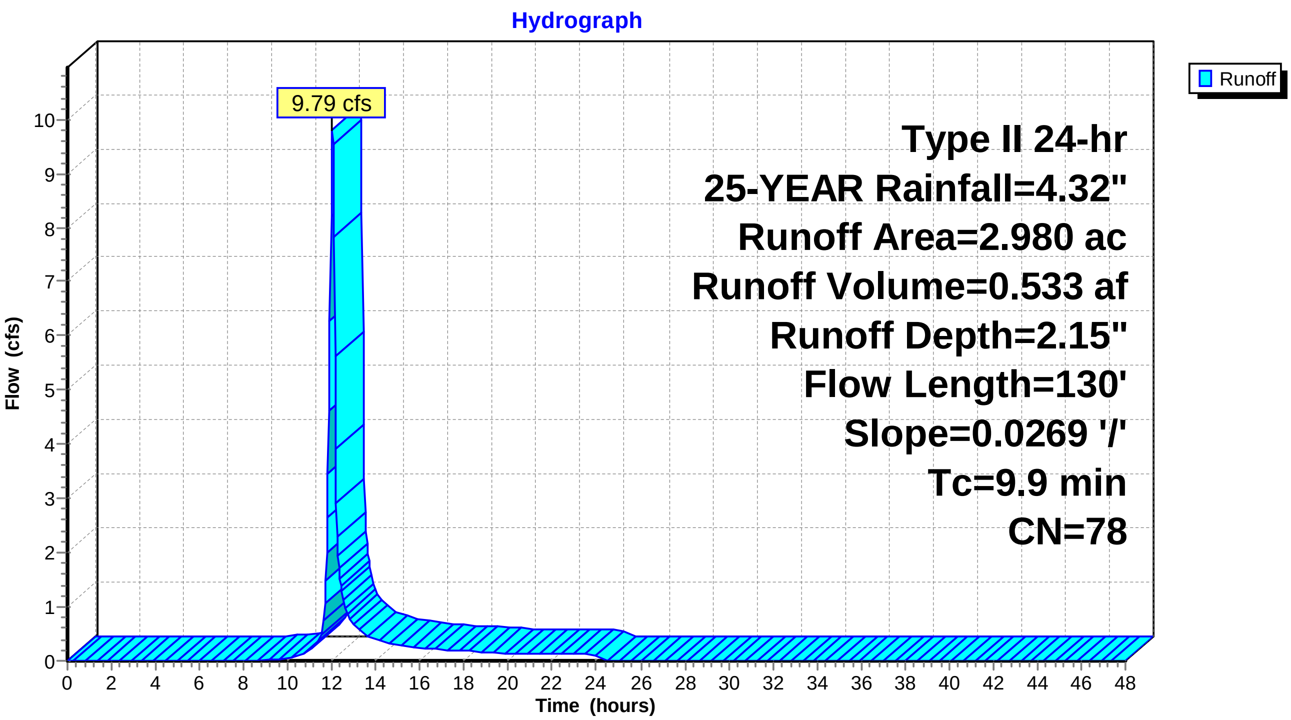
Runoff = 9.79 cfs @ 12.02 hrs, Volume= 0.533 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	2.980	78	
	2.980		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
0.4	30	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.9	130	Total			

Subcatchment 18S: BDA-6-2



Summary for Subcatchment 19S: BDA-6-3

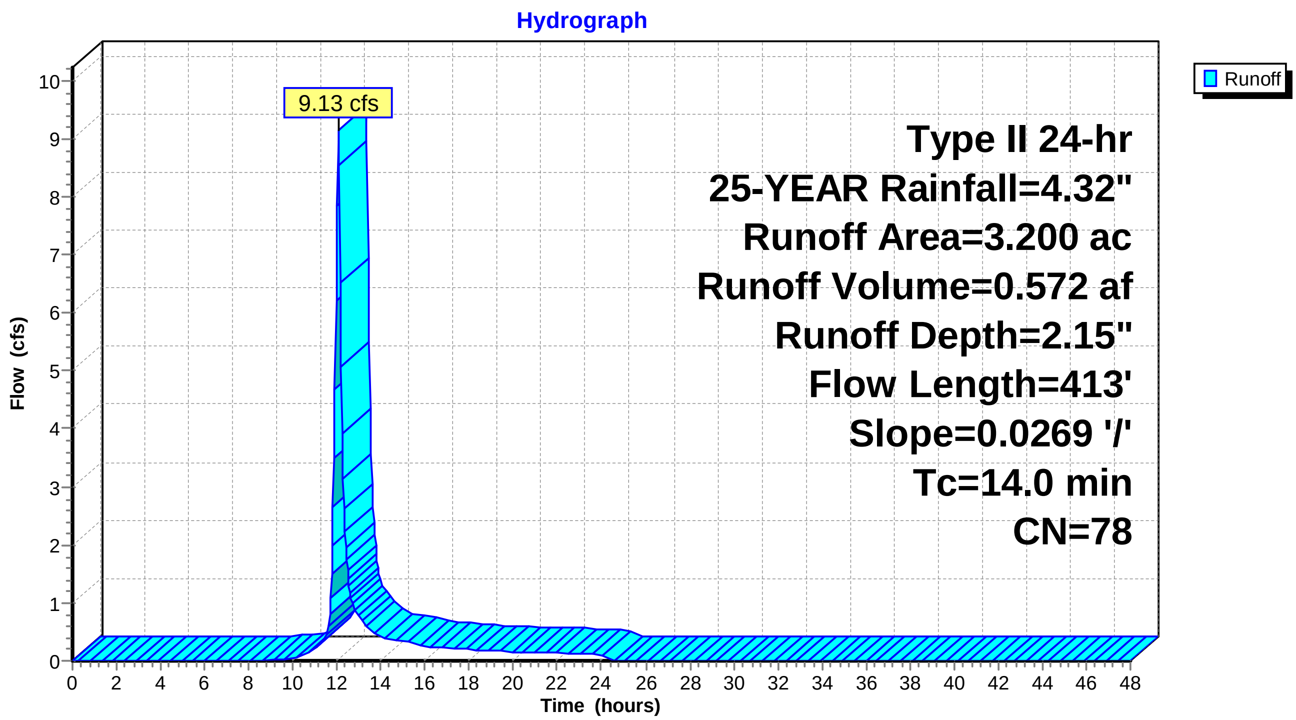
Runoff = 9.13 cfs @ 12.06 hrs, Volume= 0.572 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	3.200	78	
	3.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
4.5	313	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.0	413	Total			

Subcatchment 19S: BDA-6-3



Summary for Subcatchment 20S: BDA-7-1

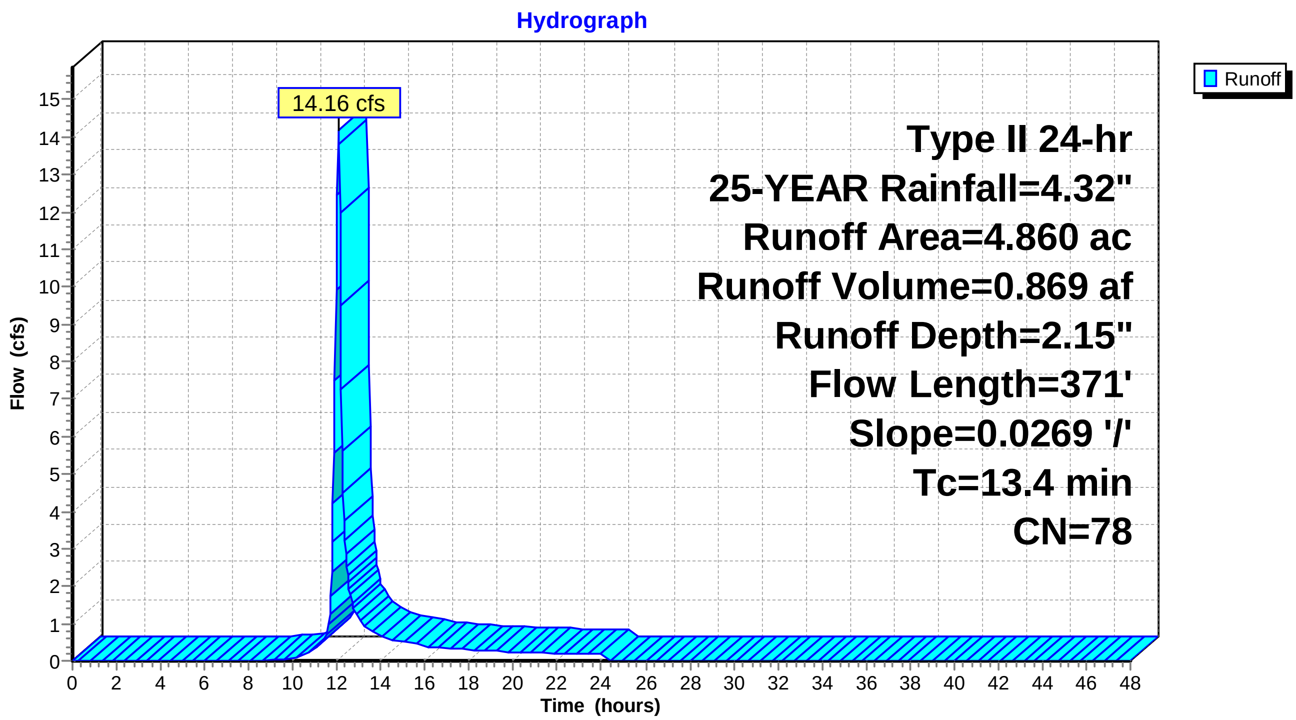
Runoff = 14.16 cfs @ 12.06 hrs, Volume= 0.869 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	4.860	78	
	4.860		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
3.9	271	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.4	371	Total			

Subcatchment 20S: BDA-7-1



Summary for Subcatchment 21S: BDA-7-2

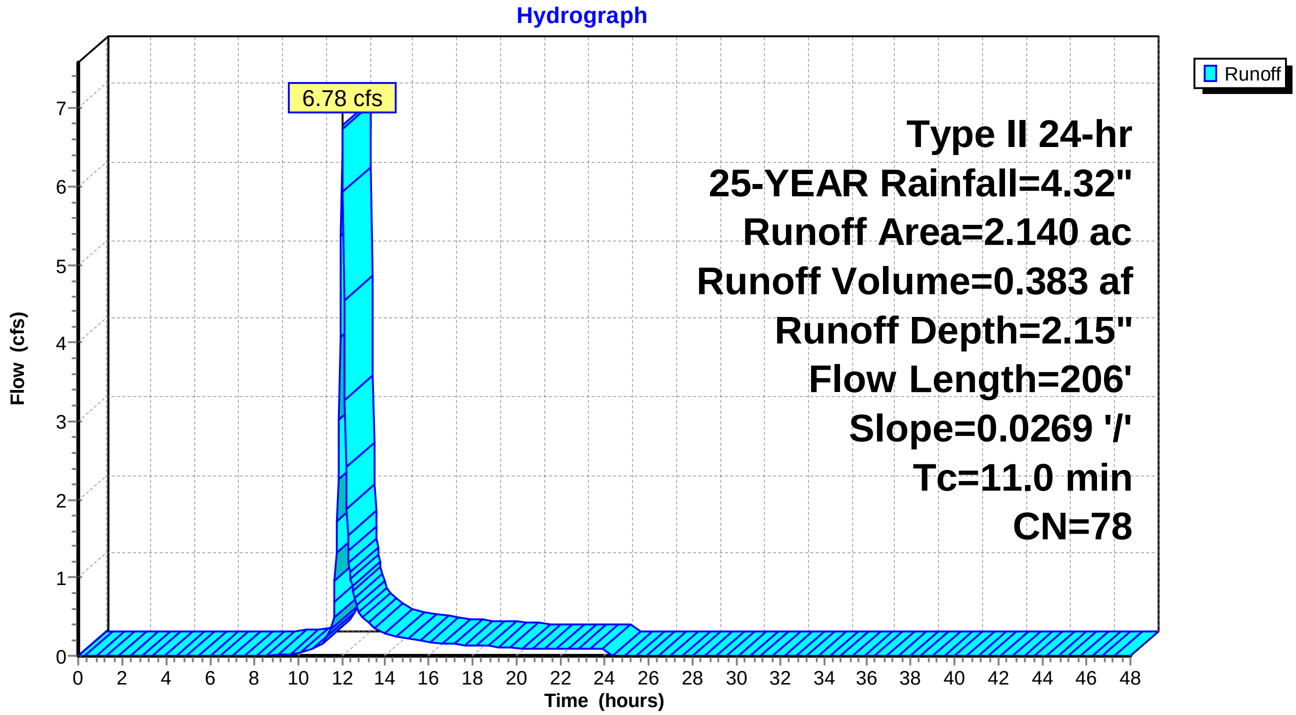
Runoff = 6.78 cfs @ 12.03 hrs, Volume= 0.383 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	2.140	78	
	2.140		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.5	106	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.0	206	Total			

Subcatchment 21S: BDA-7-2



Summary for Subcatchment 23S: BDA-8-1

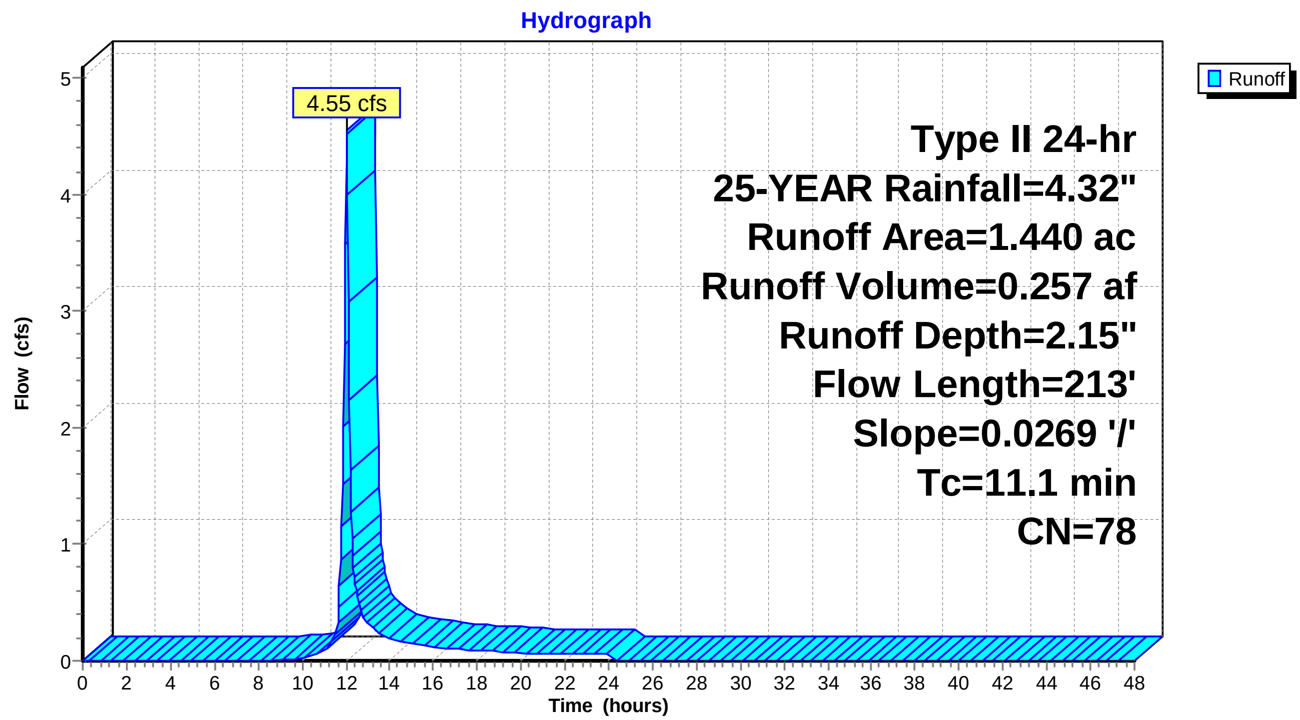
Runoff = 4.55 cfs @ 12.03 hrs, Volume= 0.257 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	1.440	78	
	1.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.6	113	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.1	213	Total			

Subcatchment 23S: BDA-8-1



Summary for Subcatchment 24S: BDA-8-2

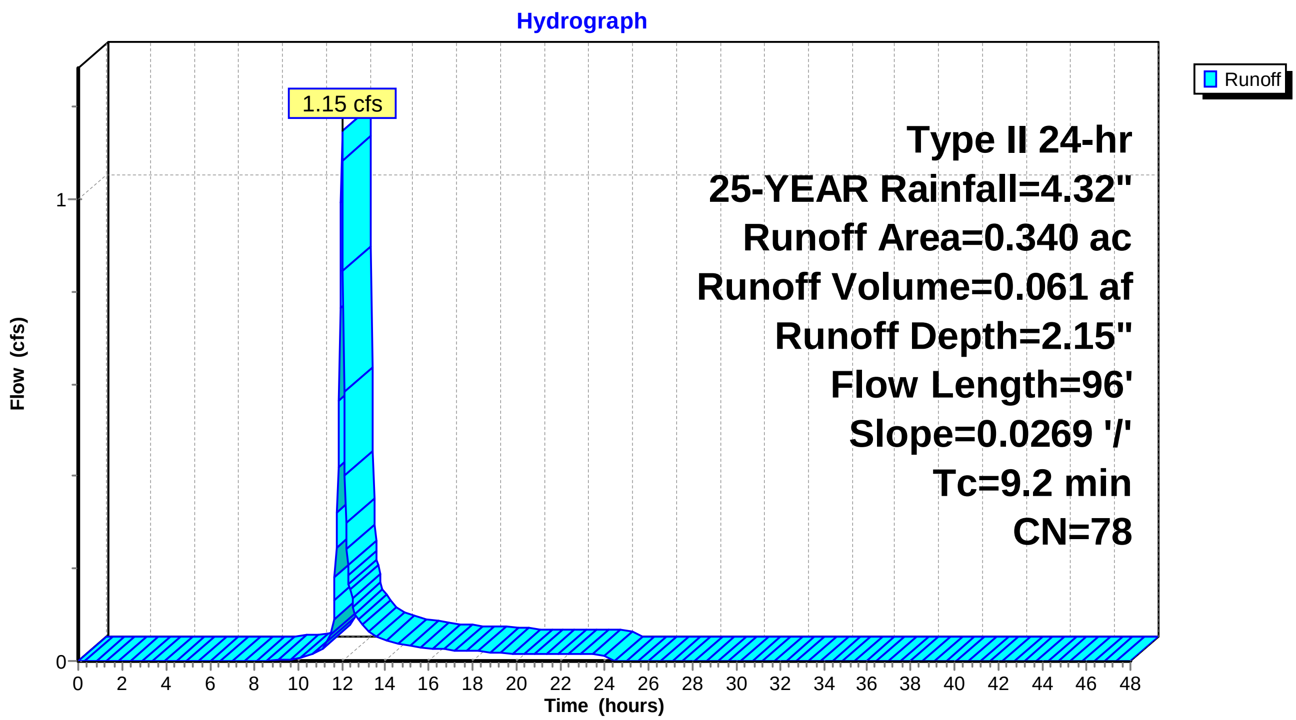
Runoff = 1.15 cfs @ 12.01 hrs, Volume= 0.061 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	0.340	78	
	0.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	96	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"

Subcatchment 24S: BDA-8-2



Summary for Subcatchment 27S: BDA-9

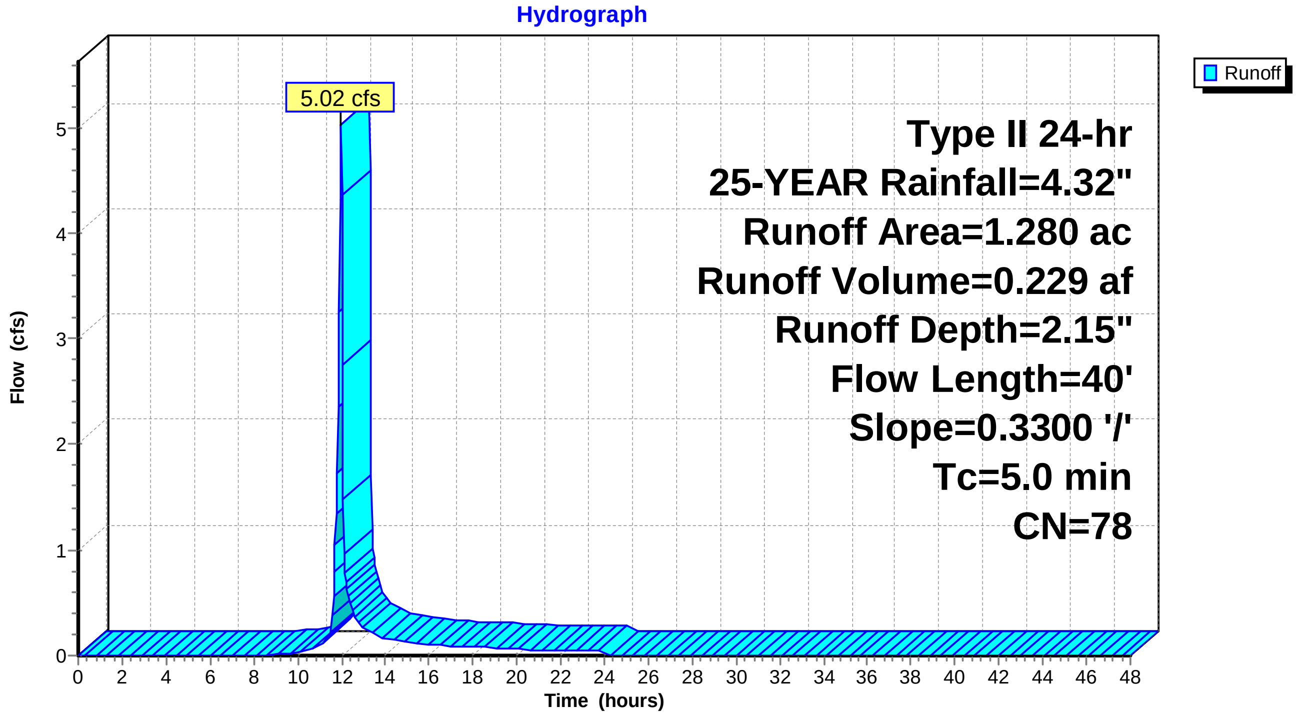
Runoff = 5.02 cfs @ 11.96 hrs, Volume= 0.229 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	1.280	78	
	1.280		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	40	0.3300	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.7	40	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 27S: BDA-9



Summary for Subcatchment 30S: BDA-10

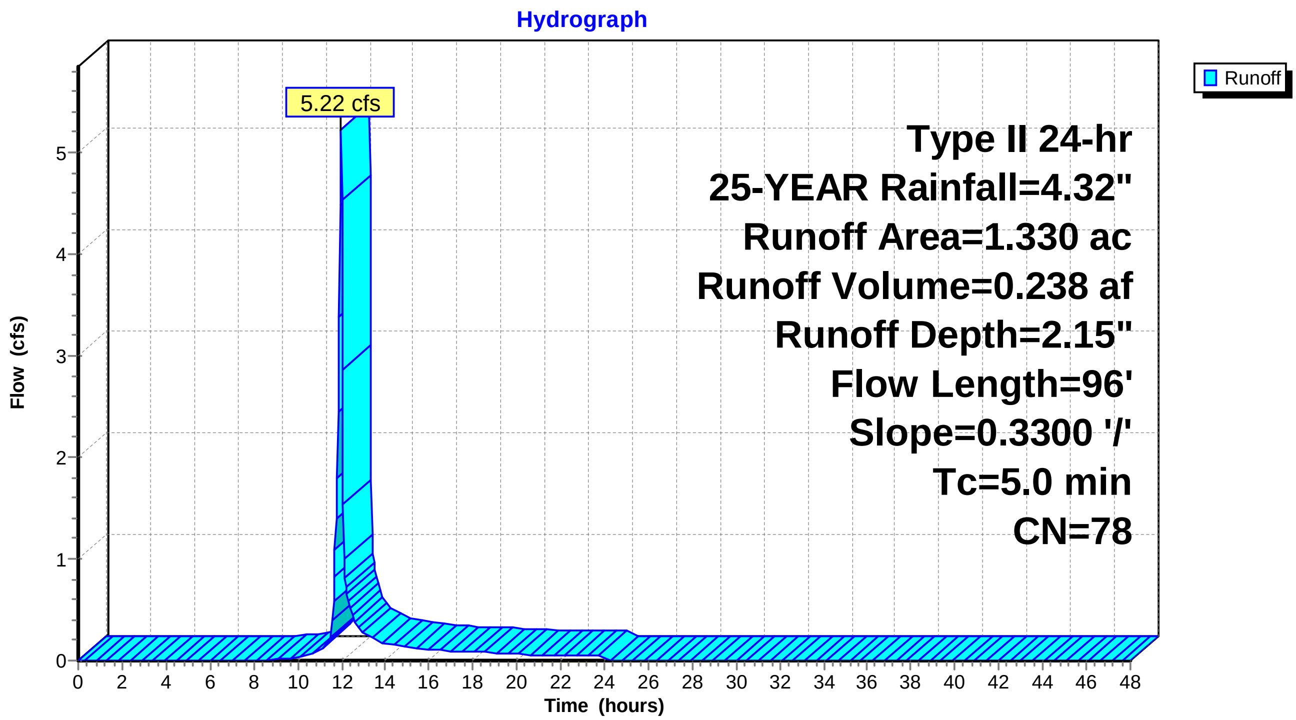
Runoff = 5.22 cfs @ 11.96 hrs, Volume= 0.238 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	1.330	78	
	1.330		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	96	0.3300	0.47		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
3.4	96	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 30S: BDA-10



Summary for Subcatchment 31S: BDA-11

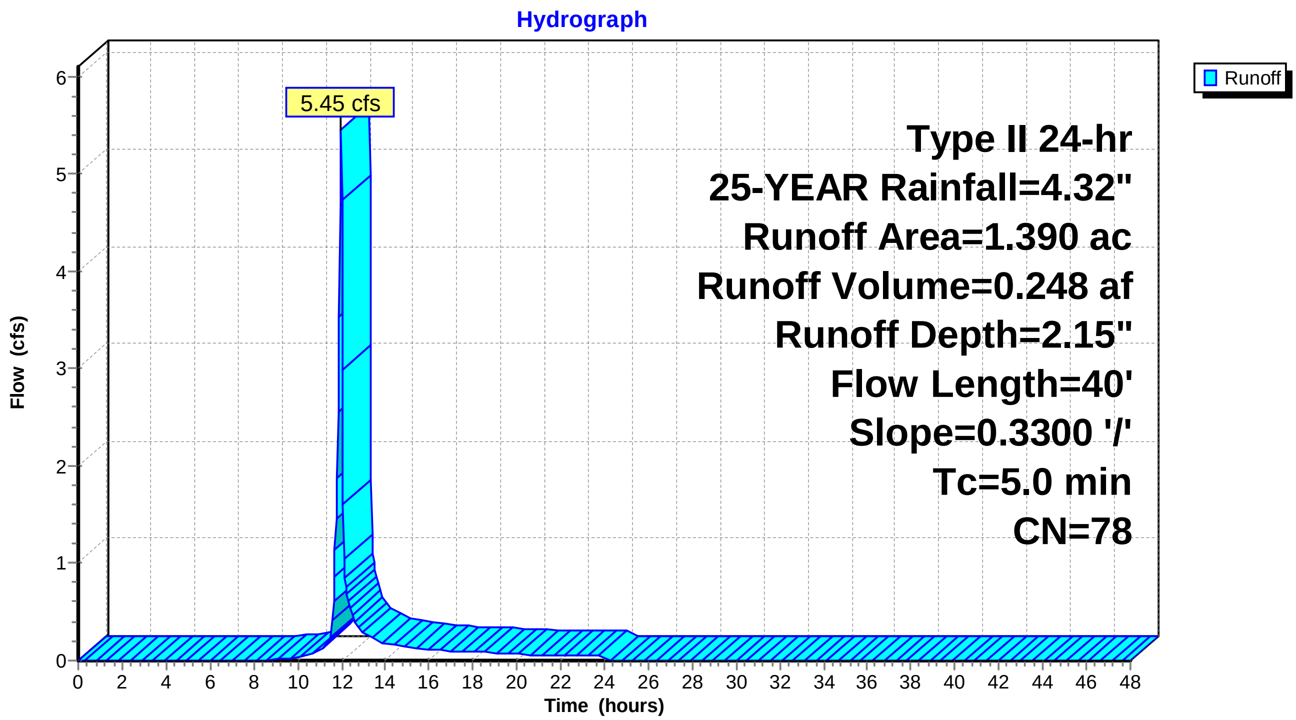
Runoff = 5.45 cfs @ 11.96 hrs, Volume= 0.248 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	1.390	78	
	1.390		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	40	0.3300	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.7	40	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 31S: BDA-11



Summary for Subcatchment 34S: BDA-10

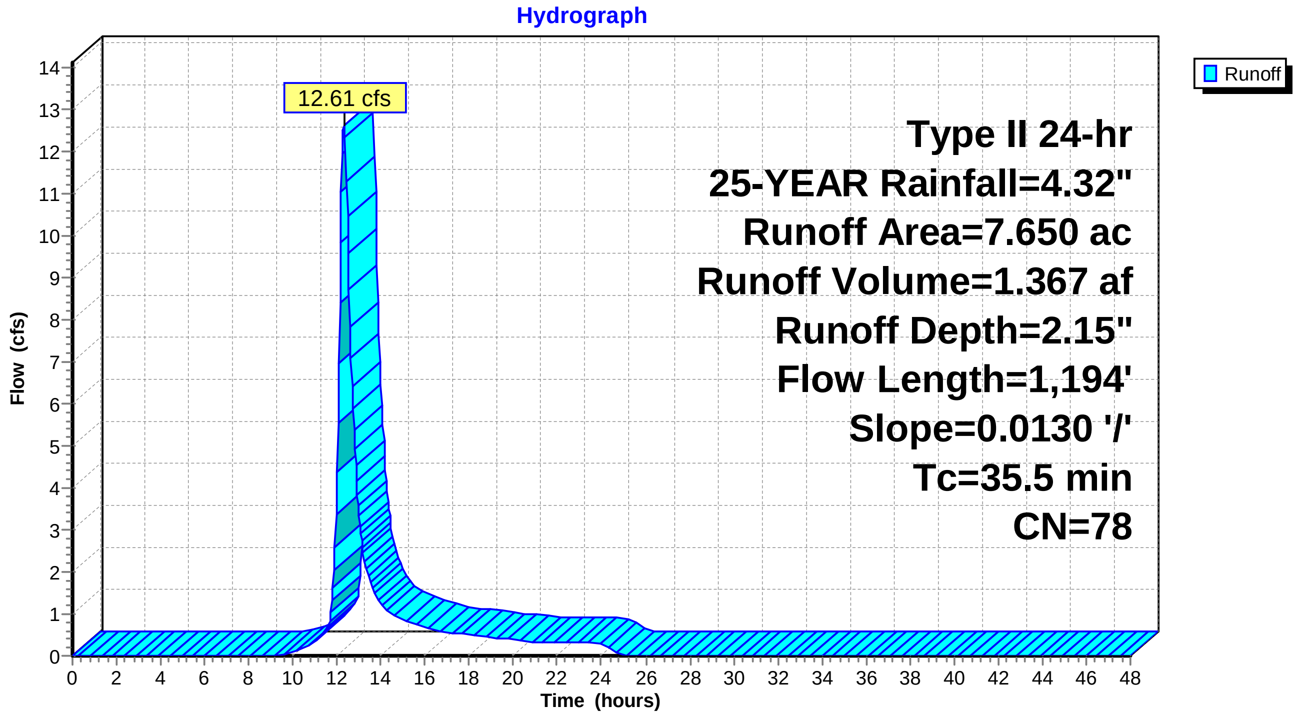
Runoff = 12.61 cfs @ 12.32 hrs, Volume= 1.367 af, Depth= 2.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 25-YEAR Rainfall=4.32"

	Area (ac)	CN	Description
*	7.650	78	
	7.650		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	100	0.0130	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
22.8	1,094	0.0130	0.80		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
35.5	1,194	Total			

Subcatchment 34S: BDA-10



Summary for Reach 1R: BDC-1

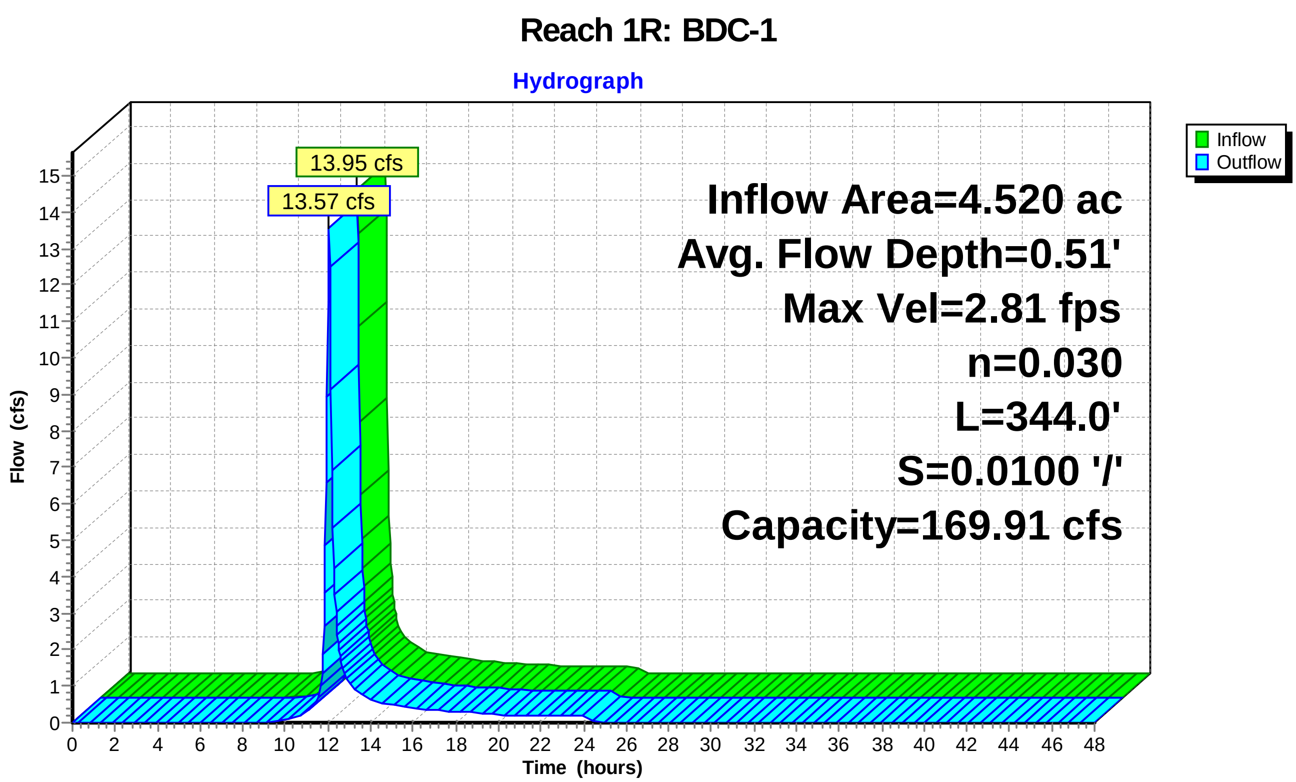
Inflow Area = 4.520 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 13.95 cfs @ 12.04 hrs, Volume= 0.808 af
Outflow = 13.57 cfs @ 12.06 hrs, Volume= 0.808 af, Atten= 3%, Lag= 1.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 2.81 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.71 fps, Avg. Travel Time= 8.1 min

Peak Storage= 1,655 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.51'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 169.91 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 344.0' Slope= 0.0100 '/'
Inlet Invert= 464.00', Outlet Invert= 460.56'

‡



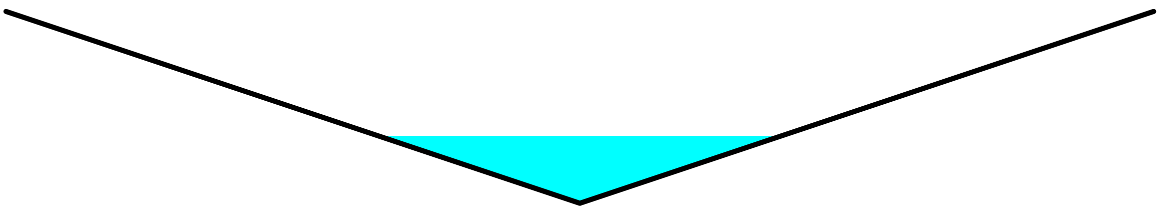
Summary for Reach 2R: PD-1

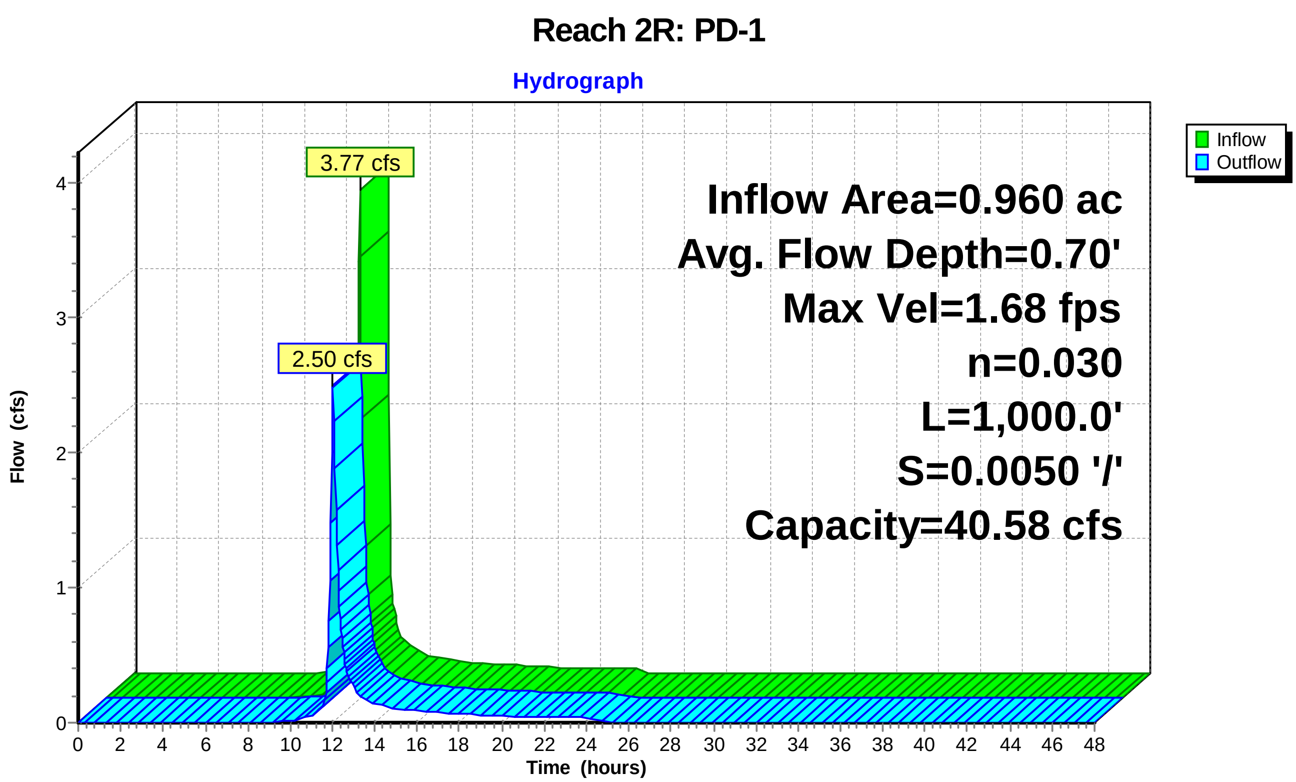
Inflow Area = 0.960 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 3.77 cfs @ 11.96 hrs, Volume= 0.172 af
Outflow = 2.50 cfs @ 12.03 hrs, Volume= 0.172 af, Atten= 34%, Lag= 4.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 1.68 fps, Min. Travel Time= 9.9 min
Avg. Velocity = 0.53 fps, Avg. Travel Time= 31.7 min

Peak Storage= 1,482 cf @ 12.03 hrs
Average Depth at Peak Storage= 0.70'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 40.58 cfs

0.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 1,000.0' Slope= 0.0050 '/'
Inlet Invert= 460.00', Outlet Invert= 455.00'





Summary for Reach 6R: BDC-2

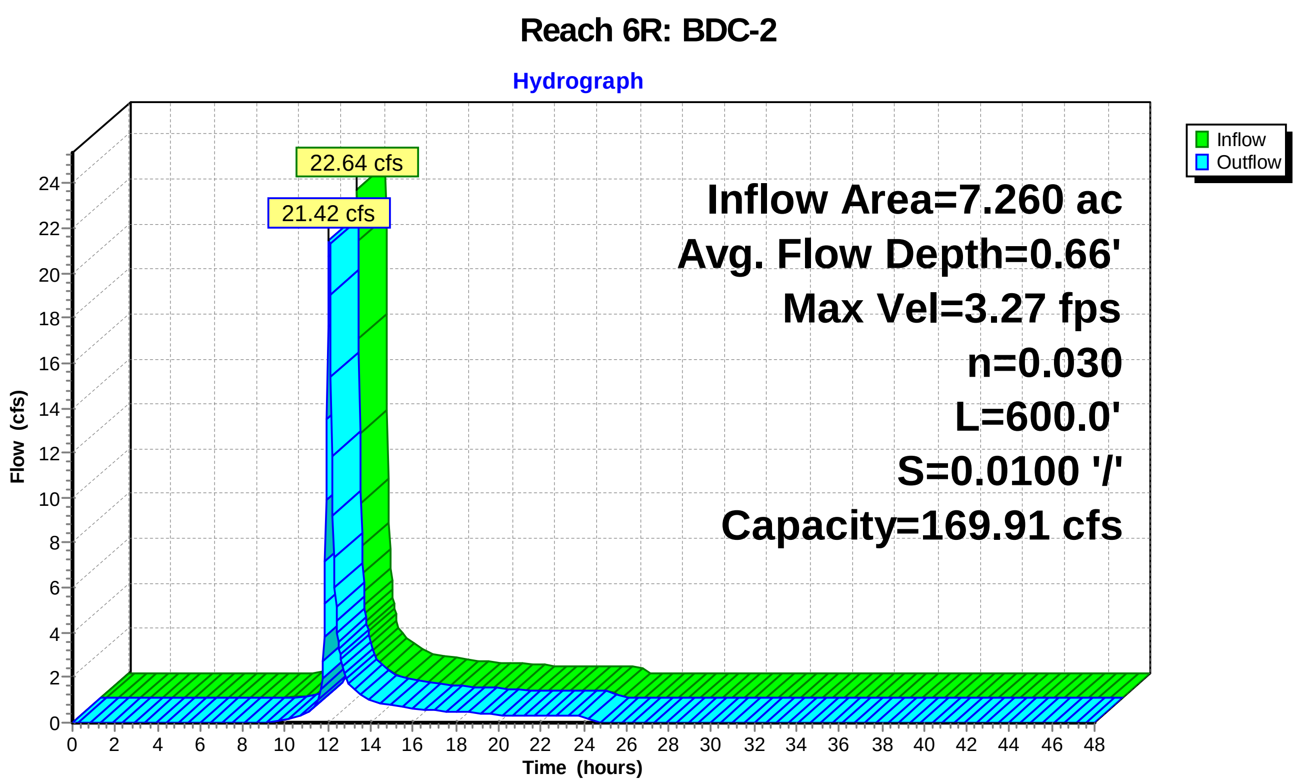
Inflow Area = 7.260 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 22.64 cfs @ 12.03 hrs, Volume= 1.298 af
Outflow = 21.42 cfs @ 12.07 hrs, Volume= 1.298 af, Atten= 5%, Lag= 2.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 3.27 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 0.79 fps, Avg. Travel Time= 12.6 min

Peak Storage= 3,922 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.66'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 169.91 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 600.0' Slope= 0.0100 '/'
Inlet Invert= 466.00', Outlet Invert= 460.00'

‡



Summary for Reach 10R: BDC-3

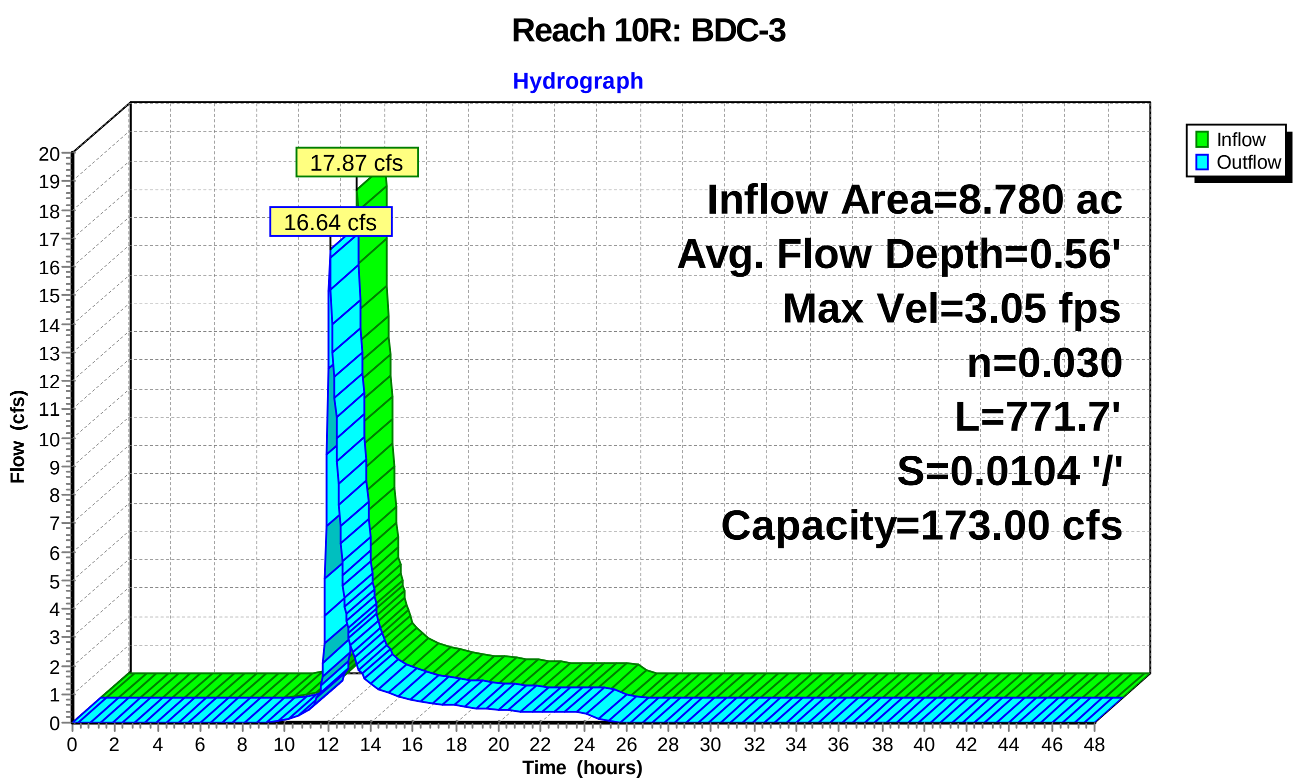
Inflow Area = 8.780 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 17.87 cfs @ 12.05 hrs, Volume= 1.569 af
Outflow = 16.64 cfs @ 12.09 hrs, Volume= 1.569 af, Atten= 7%, Lag= 2.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 3.05 fps, Min. Travel Time= 4.2 min
Avg. Velocity = 0.84 fps, Avg. Travel Time= 15.4 min

Peak Storage= 4,203 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.56'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 173.00 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 771.7' Slope= 0.0104 '/'
Inlet Invert= 468.00', Outlet Invert= 460.00'

‡



Summary for Reach 14R: BDC-4

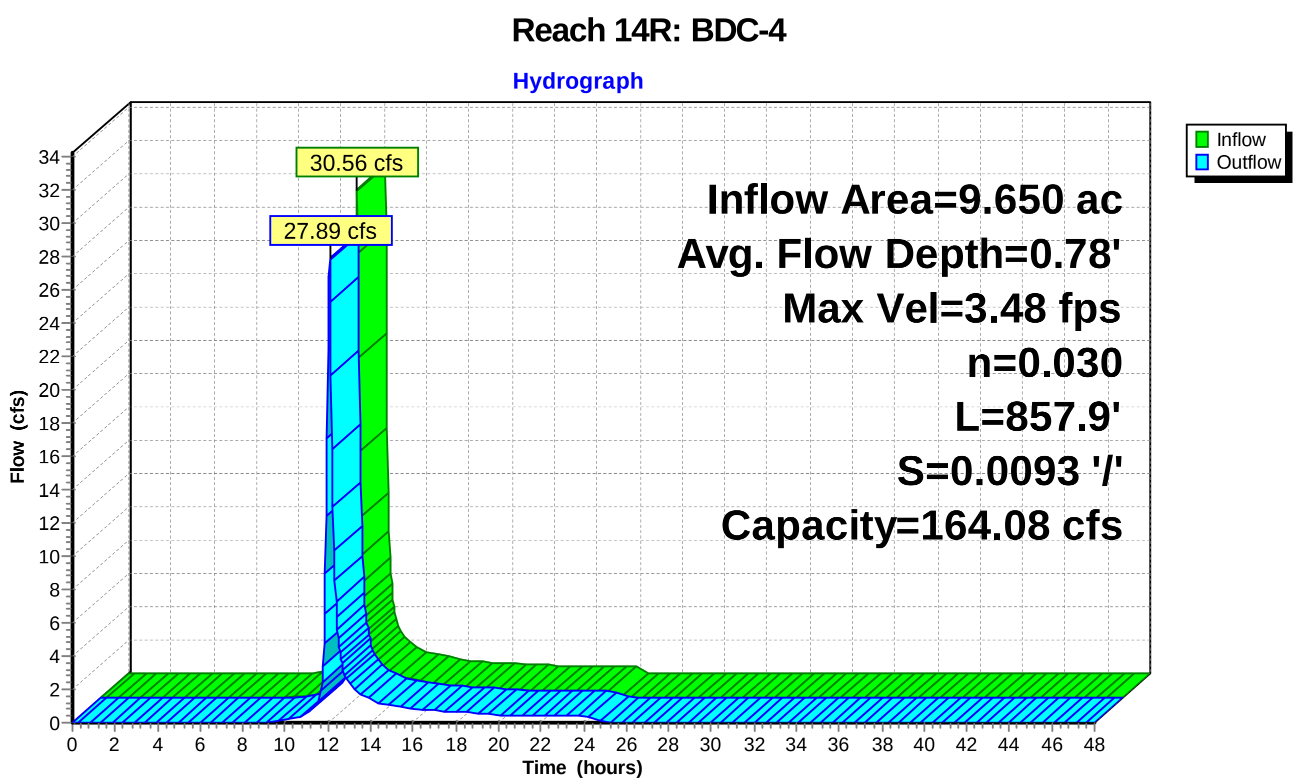
Inflow Area = 9.650 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 30.56 cfs @ 12.03 hrs, Volume= 1.725 af
Outflow = 27.89 cfs @ 12.07 hrs, Volume= 1.725 af, Atten= 9%, Lag= 2.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 3.48 fps, Min. Travel Time= 4.1 min
Avg. Velocity = 0.81 fps, Avg. Travel Time= 17.6 min

Peak Storage= 6,874 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.78'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 164.08 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 857.9' Slope= 0.0093 '/'
Inlet Invert= 470.00', Outlet Invert= 462.00'

‡



Summary for Reach 17R: PD-2

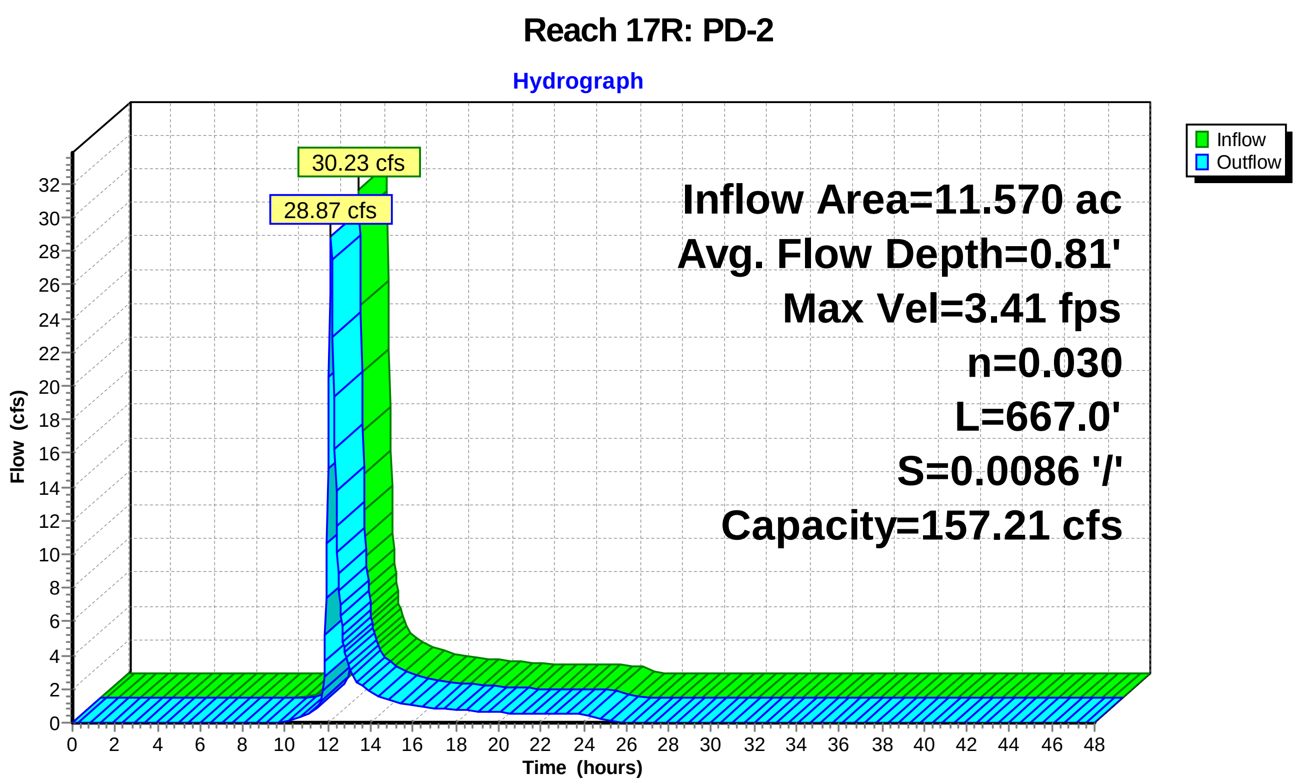
Inflow Area = 11.570 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 30.23 cfs @ 12.10 hrs, Volume= 2.068 af
Outflow = 28.87 cfs @ 12.14 hrs, Volume= 2.068 af, Atten= 4%, Lag= 2.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 3.41 fps, Min. Travel Time= 3.3 min
Avg. Velocity = 0.77 fps, Avg. Travel Time= 14.4 min

Peak Storage= 5,636 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.81'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 157.21 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 667.0' Slope= 0.0086 '/'
Inlet Invert= 457.00', Outlet Invert= 451.29'

‡



Summary for Reach 18R: BDC-5

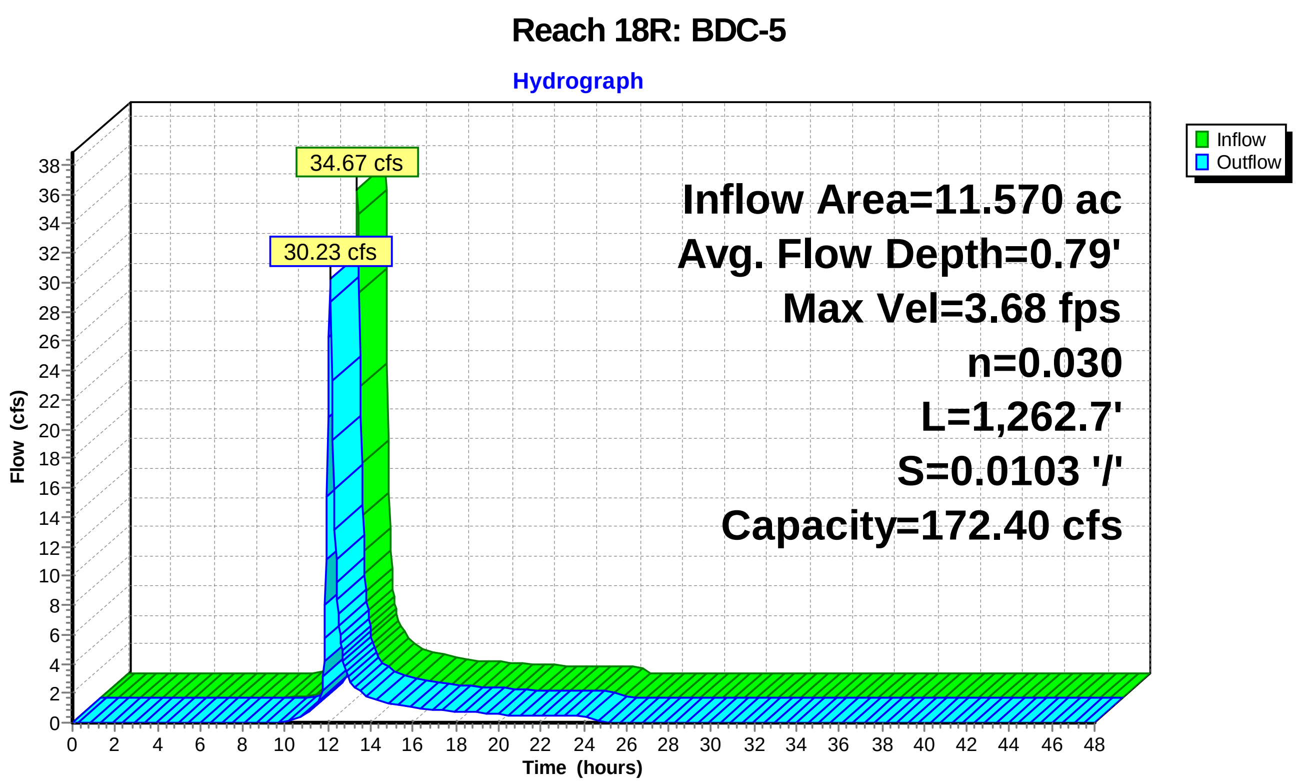
Inflow Area = 11.570 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 34.67 cfs @ 12.05 hrs, Volume= 2.068 af
Outflow = 30.23 cfs @ 12.10 hrs, Volume= 2.068 af, Atten= 13%, Lag= 3.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 3.68 fps, Min. Travel Time= 5.7 min
Avg. Velocity = 0.84 fps, Avg. Travel Time= 25.0 min

Peak Storage= 10,336 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.79'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 172.40 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 1,262.7' Slope= 0.0103 '/'
Inlet Invert= 470.00', Outlet Invert= 457.00'

‡



Summary for Reach 20R: BDC-6

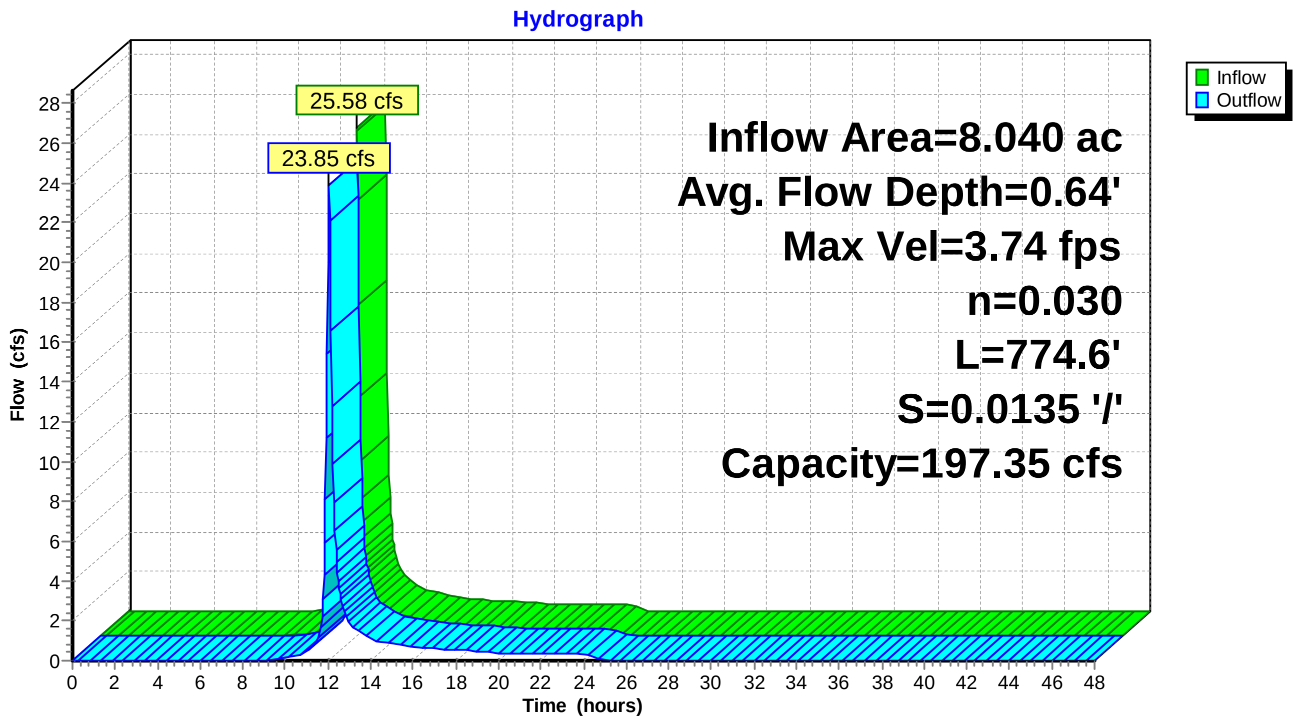
Inflow Area = 8.040 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 25.58 cfs @ 12.03 hrs, Volume= 1.437 af
Outflow = 23.85 cfs @ 12.06 hrs, Volume= 1.437 af, Atten= 7%, Lag= 2.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 3.74 fps, Min. Travel Time= 3.5 min
Avg. Velocity = 0.90 fps, Avg. Travel Time= 14.4 min

Peak Storage= 4,922 cf @ 12.06 hrs
Average Depth at Peak Storage= 0.64'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 197.35 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 774.6' Slope= 0.0135 '/'
Inlet Invert= 469.45', Outlet Invert= 459.00'

‡



Summary for Reach 22R: BDC-7

Inflow Area = 7.000 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 20.80 cfs @ 12.05 hrs, Volume= 1.251 af
Outflow = 20.10 cfs @ 12.07 hrs, Volume= 1.251 af, Atten= 3%, Lag= 1.7 min

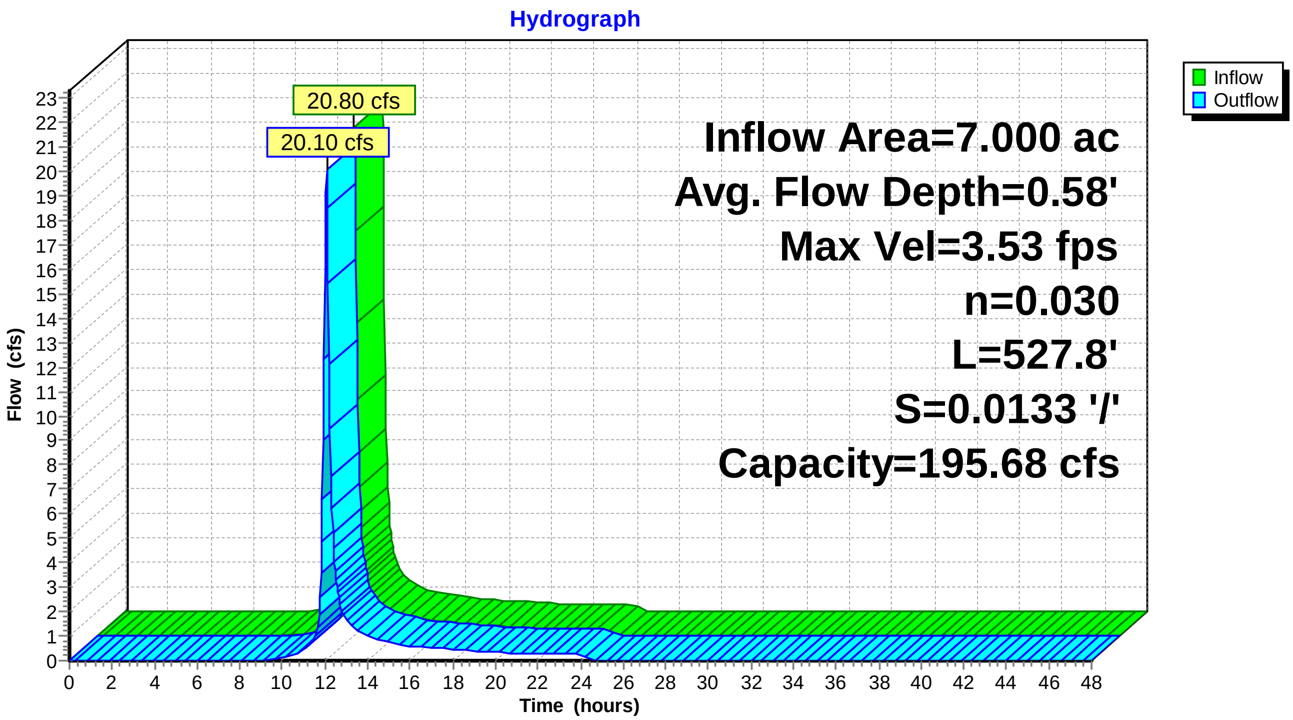
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 3.53 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 0.88 fps, Avg. Travel Time= 10.0 min

Peak Storage= 3,005 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.58'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 195.68 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 527.8' Slope= 0.0133 '/'
Inlet Invert= 462.00', Outlet Invert= 455.00'

‡

Reach 22R: BDC-7



Summary for Reach 25R: BDC-8

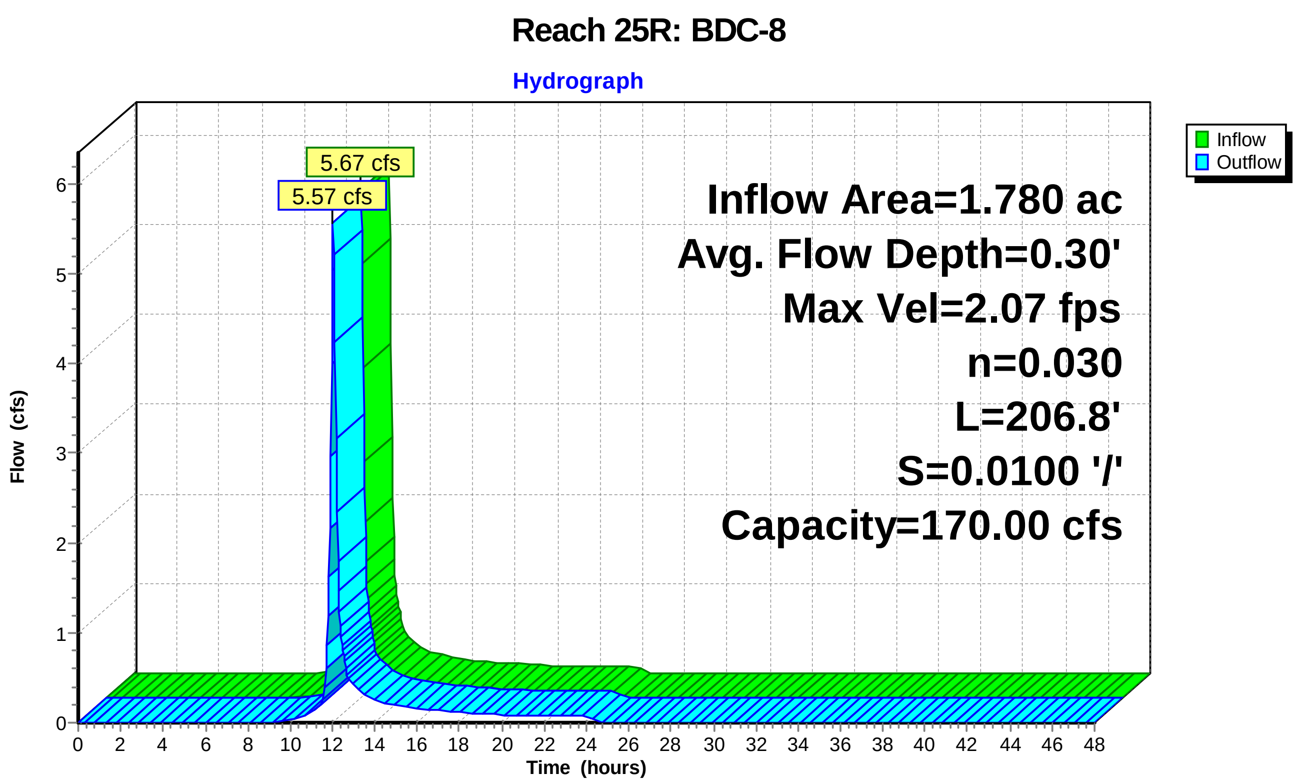
Inflow Area = 1.780 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 5.67 cfs @ 12.03 hrs, Volume= 0.318 af
Outflow = 5.57 cfs @ 12.04 hrs, Volume= 0.318 af, Atten= 2%, Lag= 1.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 2.07 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 0.53 fps, Avg. Travel Time= 6.5 min

Peak Storage= 555 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 170.00 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 206.8' Slope= 0.0100 '/'
Inlet Invert= 461.97', Outlet Invert= 459.90'

‡



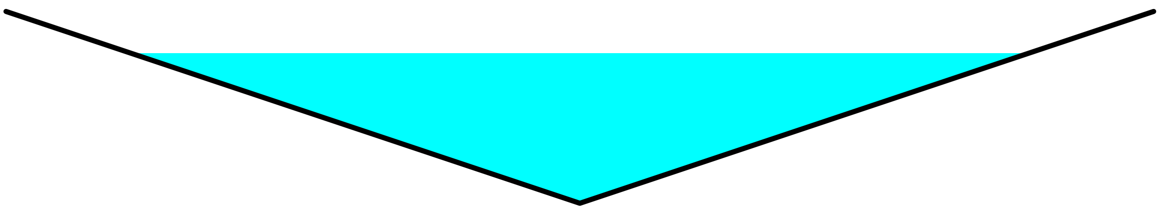
Summary for Reach 26R: PD-3

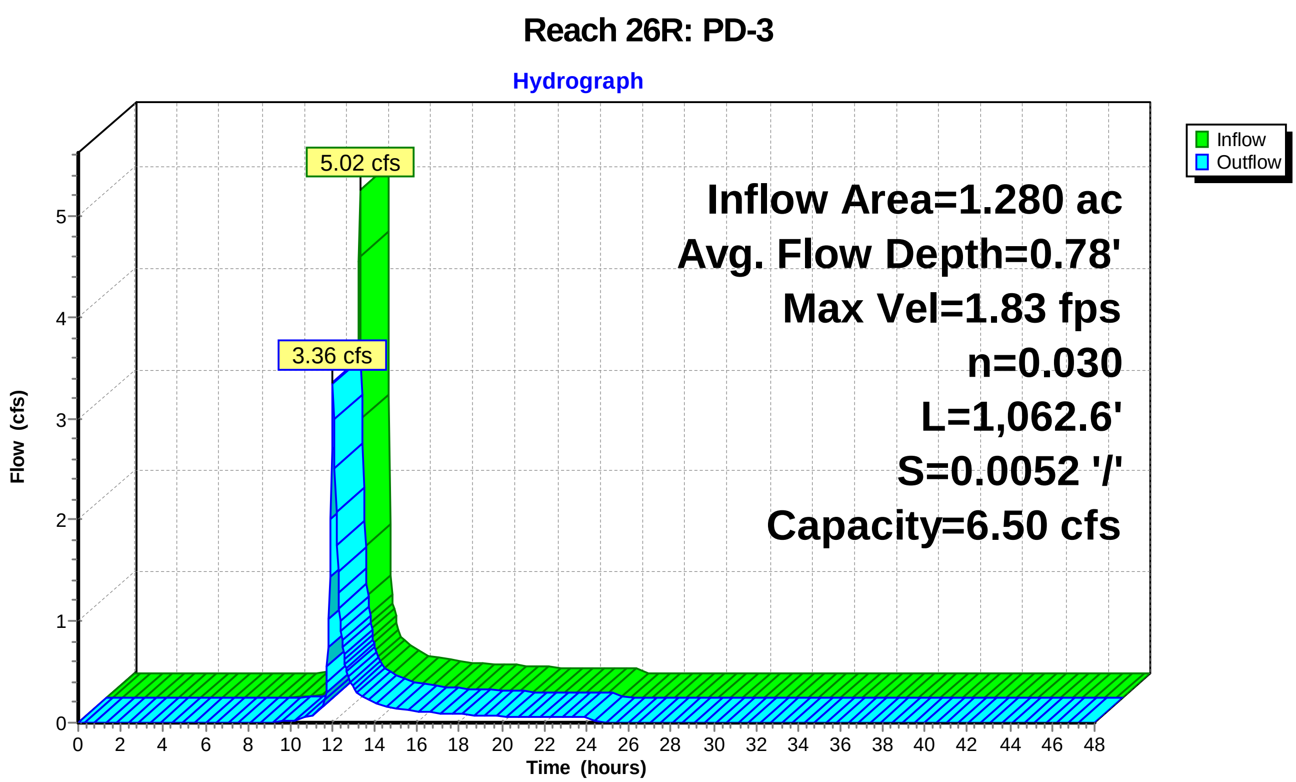
Inflow Area = 1.280 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 5.02 cfs @ 11.96 hrs, Volume= 0.229 af
Outflow = 3.36 cfs @ 12.03 hrs, Volume= 0.229 af, Atten= 33%, Lag= 4.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 1.83 fps, Min. Travel Time= 9.7 min
Avg. Velocity = 0.52 fps, Avg. Travel Time= 33.9 min

Peak Storage= 1,945 cf @ 12.03 hrs
Average Depth at Peak Storage= 0.78'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 6.50 cfs

0.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 1,062.6' Slope= 0.0052 '/'
Inlet Invert= 457.49', Outlet Invert= 452.00'





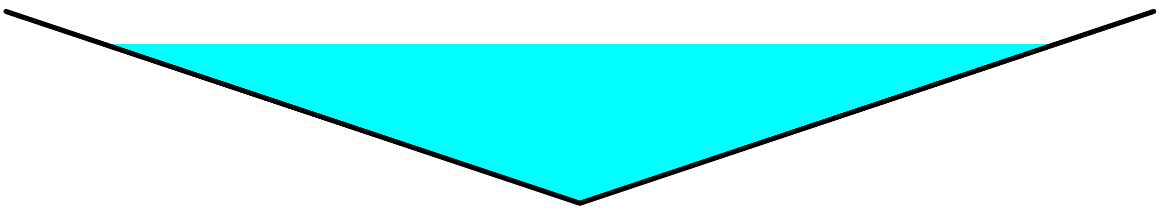
Summary for Reach 29R: PD-4

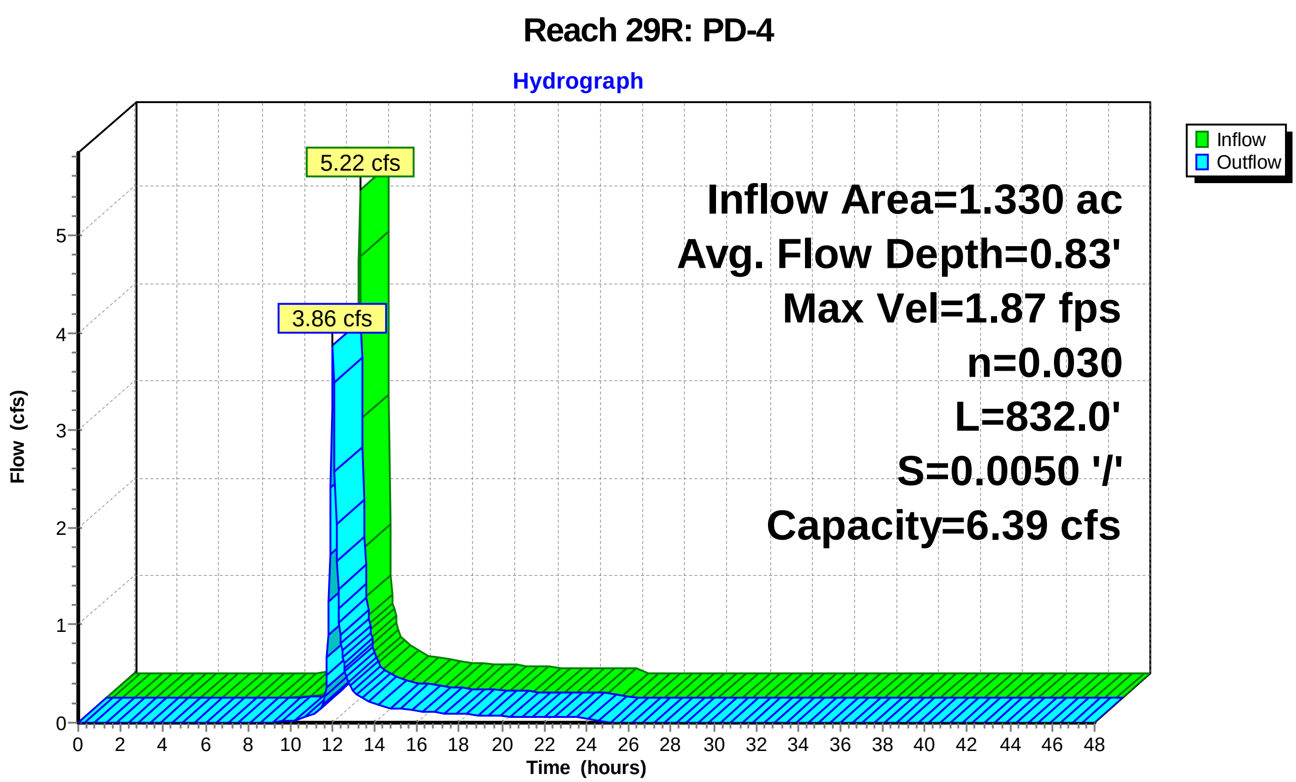
Inflow Area = 1.330 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 5.22 cfs @ 11.96 hrs, Volume= 0.238 af
Outflow = 3.86 cfs @ 12.02 hrs, Volume= 0.238 af, Atten= 26%, Lag= 3.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 1.87 fps, Min. Travel Time= 7.4 min
Avg. Velocity = 0.55 fps, Avg. Travel Time= 25.2 min

Peak Storage= 1,710 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.83'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 6.39 cfs

0.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 832.0' Slope= 0.0050 '/'
Inlet Invert= 458.59', Outlet Invert= 454.43'





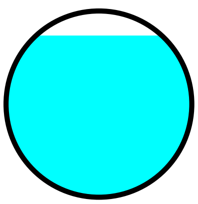
Summary for Reach 30R: BDC-9

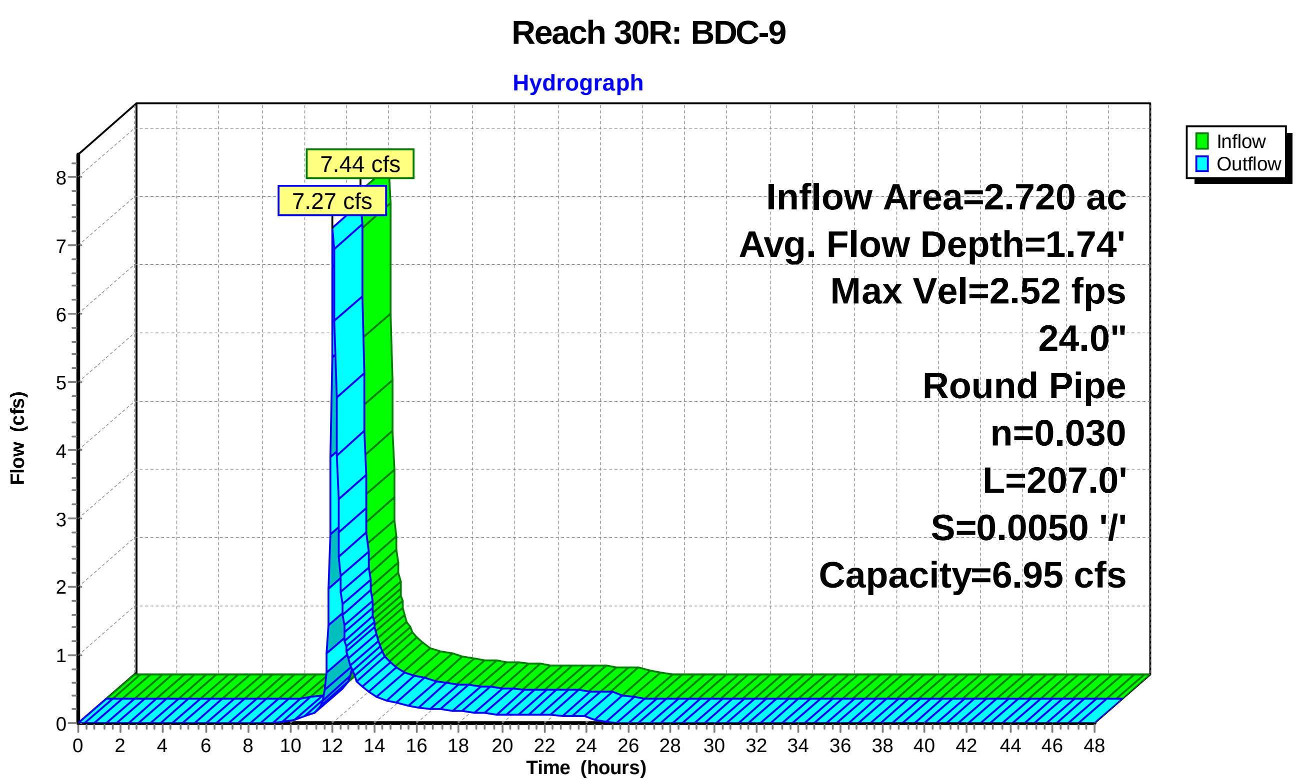
Inflow Area = 2.720 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 7.44 cfs @ 12.02 hrs, Volume= 0.486 af
Outflow = 7.27 cfs @ 12.05 hrs, Volume= 0.486 af, Atten= 2%, Lag= 1.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 2.52 fps, Min. Travel Time= 1.4 min
Avg. Velocity = 0.69 fps, Avg. Travel Time= 5.0 min

Peak Storage= 600 cf @ 12.05 hrs
Average Depth at Peak Storage= 1.74'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 6.95 cfs

24.0" Round Pipe
n= 0.030 Corrugated metal
Length= 207.0' Slope= 0.0050 '/'
Inlet Invert= 454.43', Outlet Invert= 453.39'





Summary for Reach 31R: PD-6

Inflow Area = 10.060 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 28.60 cfs @ 12.06 hrs, Volume= 1.798 af
Outflow = 26.04 cfs @ 12.11 hrs, Volume= 1.798 af, Atten= 9%, Lag= 3.1 min

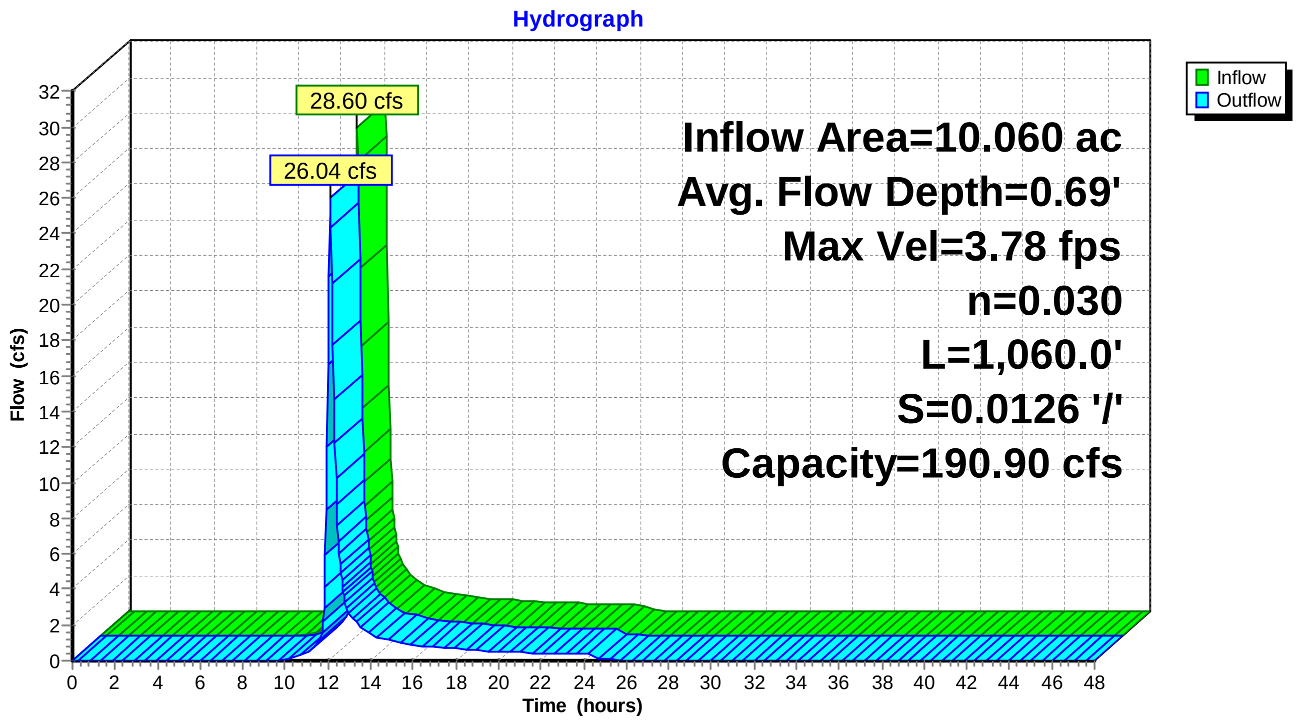
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 3.78 fps, Min. Travel Time= 4.7 min
Avg. Velocity = 0.86 fps, Avg. Travel Time= 20.4 min

Peak Storage= 7,309 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.69'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 190.90 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, clean & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 1,060.0' Slope= 0.0126 '/'
Inlet Invert= 450.00', Outlet Invert= 436.62'

‡

Reach 31R: PD-6



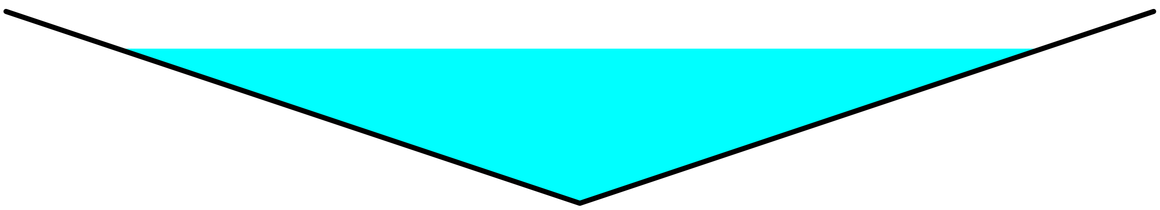
Summary for Reach 32R: PD-5

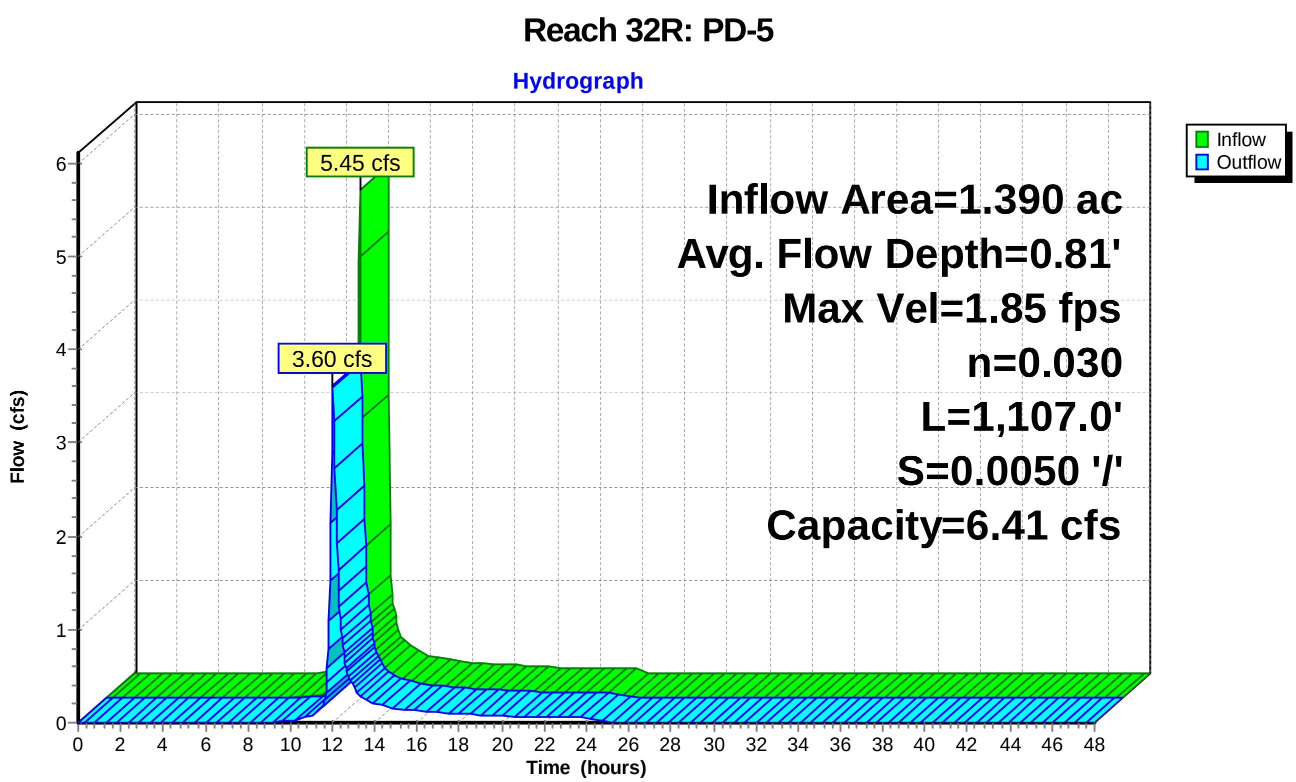
Inflow Area = 1.390 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 5.45 cfs @ 11.96 hrs, Volume= 0.248 af
Outflow = 3.60 cfs @ 12.03 hrs, Volume= 0.248 af, Atten= 34%, Lag= 4.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 1.85 fps, Min. Travel Time= 10.0 min
Avg. Velocity = 0.52 fps, Avg. Travel Time= 35.6 min

Peak Storage= 2,155 cf @ 12.03 hrs
Average Depth at Peak Storage= 0.81'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 6.41 cfs

0.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 1,107.0' Slope= 0.0050 '/'
Inlet Invert= 460.00', Outlet Invert= 454.43'





Summary for Reach 33R: PD-7

Inflow Area = 10.060 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 26.04 cfs @ 12.11 hrs, Volume= 1.798 af
Outflow = 26.01 cfs @ 12.12 hrs, Volume= 1.798 af, Atten= 0%, Lag= 0.5 min

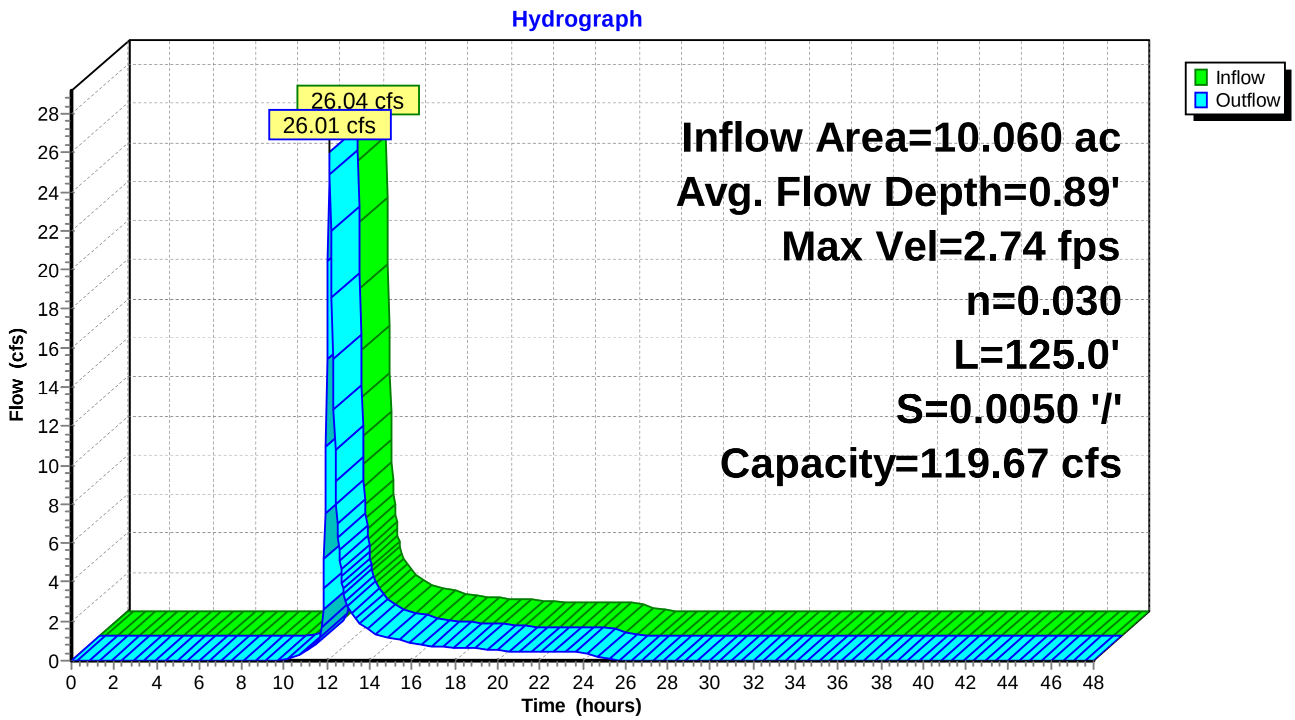
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 2.74 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 0.61 fps, Avg. Travel Time= 3.4 min

Peak Storage= 1,186 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.89'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 119.67 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, clean & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 125.0' Slope= 0.0050 '/'
Inlet Invert= 436.62', Outlet Invert= 436.00'

‡

Reach 33R: PD-7



Summary for Pond 3P: DA-1

Inflow Area = 5.480 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 15.99 cfs @ 12.06 hrs, Volume= 0.980 af
Outflow = 0.02 cfs @ 24.73 hrs, Volume= 0.062 af, Atten= 100%, Lag= 760.3 min
Primary = 0.02 cfs @ 24.73 hrs, Volume= 0.062 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Peak Elev= 455.62' @ 24.73 hrs Surf.Area= 0.635 ac Storage= 0.960 af

Plug-Flow detention time= 1,186.3 min calculated for 0.062 af (6% of inflow)
Center-of-Mass det. time= 1,014.8 min (1,856.9 - 842.1)

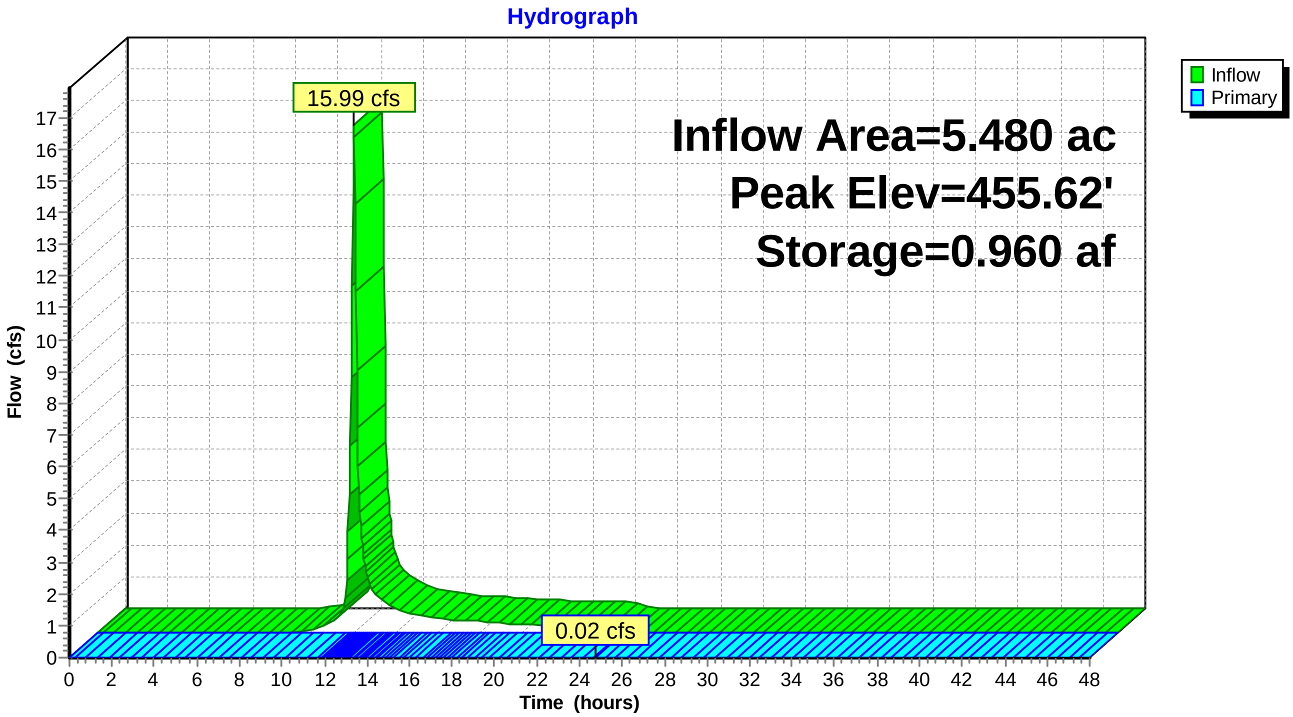
Volume	Invert	Avail.Storage	Storage Description
#1	454.00'	6.154 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
454.00	0.553	0.000	0.000
456.00	0.654	1.207	1.207
458.00	0.764	1.418	2.625
460.00	0.880	1.644	4.269
462.00	1.005	1.885	6.154

Device	Routing	Invert	Outlet Devices
#1	Device 3	458.11'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	454.11'	**0.4" Vert. Orifice/Grate** X 40 rows with 3.0" cc spacing C= 0.600
#3	Primary	454.11'	**12.0" Round Culvert** L= 111.0' Ke= 0.900 Inlet / Outlet Invert= 454.11' / 436.00' S= 0.1632 '/' Cc= 0.900 n= 0.030, Flow Area= 0.79 sf

Primary OutFlow Max=0.02 cfs @ 24.73 hrs HW=455.62' (Free Discharge)
↑—**3=Culvert** (Passes 0.02 cfs of 2.99 cfs potential flow)
  ↑—**1=Orifice/Grate** (Controls 0.00 cfs)
  └—**2=Orifice/Grate** (Orifice Controls 0.02 cfs @ 4.23 fps)

Pond 3P: DA-1


Hydrograph
15.99 cfs
0.02 cfs
Inflow Area=5.480 ac
Peak Elev=455.62'
Storage=0.960 af
Inflow
Primary
Flow (cfs)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
Time (hours)
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48

Summary for Pond 7P: DA-2

Inflow Area = 7.260 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 21.42 cfs @ 12.07 hrs, Volume= 1.298 af
Outflow = 2.47 cfs @ 12.67 hrs, Volume= 1.296 af, Atten= 88%, Lag= 35.9 min
Primary = 2.47 cfs @ 12.67 hrs, Volume= 1.296 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Peak Elev= 459.84' @ 12.67 hrs Surf.Area= 0.239 ac Storage= 0.599 af

Plug-Flow detention time= 183.8 min calculated for 1.295 af (100% of inflow)
Center-of-Mass det. time= 183.8 min (1,026.9 - 843.1)

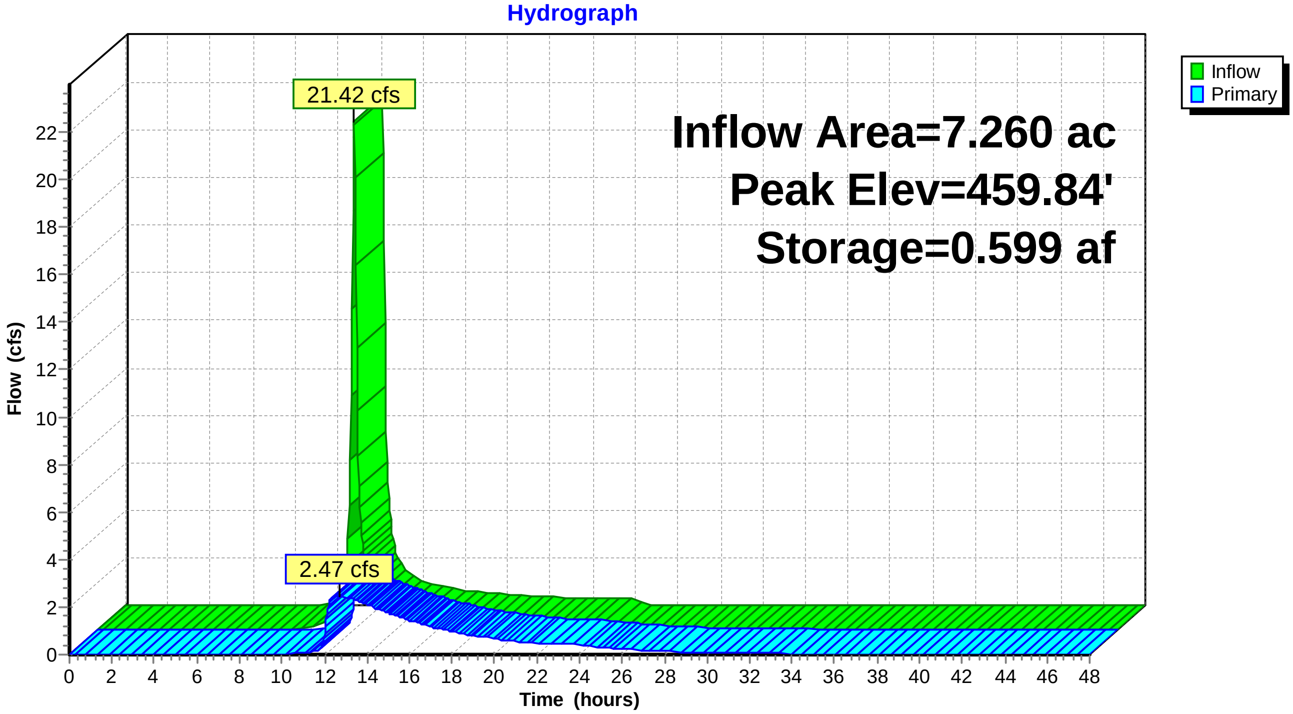
Volume	Invert	Avail.Storage	Storage Description
#1	456.00'	2.374 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
456.00	0.090	0.000	0.000
458.00	0.150	0.240	0.240
460.00	0.247	0.397	0.637
461.00	1.034	0.640	1.277
462.00	1.160	1.097	2.374

Device	Routing	Invert	Outlet Devices
#1	Device 3	460.00'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	456.00'	**0.4" Vert. Orifice/Grate X 28.00 columns** X 40 rows with 3.0" cc spacing C= 0.600
#3	Primary	456.00'	**12.0" Round Culvert** L= 105.0' Ke= 0.900 Inlet / Outlet Invert= 456.00' / 438.00' S= 0.1714 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.79 sf

Primary OutFlow Max=2.47 cfs @ 12.67 hrs HW=459.84' (Free Discharge)
└─**3=Culvert** (Passes 2.47 cfs of 5.46 cfs potential flow)
  ├─**1=Orifice/Grate** (Controls 0.00 cfs)
  └─**2=Orifice/Grate** (Orifice Controls 2.47 cfs @ 6.32 fps)

Pond 7P: DA-2


Hydrograph
21.42 cfs
2.47 cfs
Inflow Area=7.260 ac
Peak Elev=459.84'
Storage=0.599 af
Inflow
Primary
Flow (cfs)
Time (hours)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48

Summary for Pond 11P: DA-3

Inflow Area = 8.780 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 16.64 cfs @ 12.09 hrs, Volume= 1.569 af
Outflow = 4.12 cfs @ 12.80 hrs, Volume= 1.568 af, Atten= 75%, Lag= 42.2 min
Primary = 4.12 cfs @ 12.80 hrs, Volume= 1.568 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Peak Elev= 460.13' @ 12.80 hrs Surf.Area= 0.350 ac Storage= 0.678 af

Plug-Flow detention time= 176.5 min calculated for 1.566 af (100% of inflow)
Center-of-Mass det. time= 176.5 min (1,030.1 - 853.6)

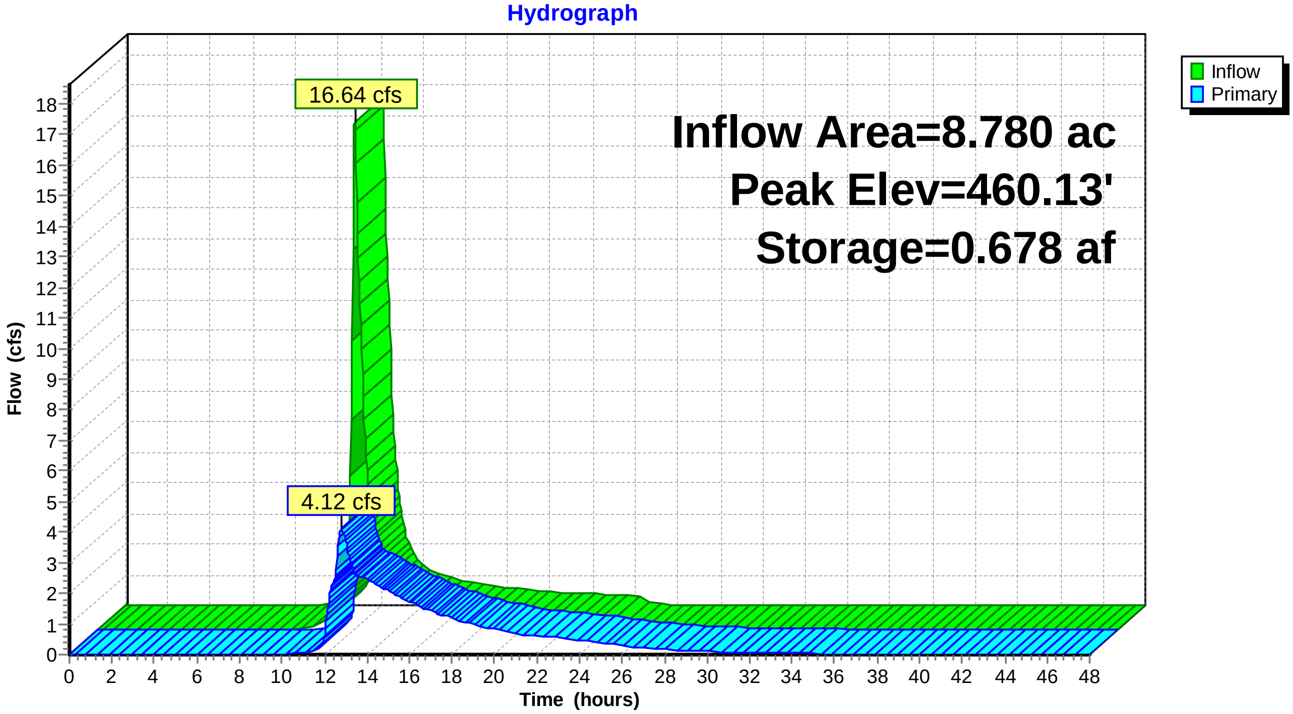
Volume	Invert	Avail.Storage	Storage Description
#1	456.00'	2.357 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
456.00	0.090	0.000	0.000
458.00	0.150	0.240	0.240
460.00	0.250	0.400	0.640
461.00	1.040	0.645	1.285
462.00	1.104	1.072	2.357

Device	Routing	Invert	Outlet Devices
#1	Device 3	460.00'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	456.00'	**0.4" Vert. Orifice/Grate X 28.00 columns** X 40 rows with 3.0" cc spacing C= 0.600
#3	Primary	456.00'	**12.0" Round Culvert** L= 105.0' Ke= 0.900 Inlet / Outlet Invert= 456.00' / 432.00' S= 0.2286 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.79 sf

Primary OutFlow Max=4.12 cfs @ 12.80 hrs HW=460.13' (Free Discharge)
└─**3=Culvert** (Passes 4.12 cfs of 5.69 cfs potential flow)
  ├─**1=Orifice/Grate** (Weir Controls 1.38 cfs @ 1.16 fps)
  └─**2=Orifice/Grate** (Orifice Controls 2.74 cfs @ 6.59 fps)

Pond 11P: DA-3


Hydrograph
16.64 cfs
4.12 cfs
Inflow Area=8.780 ac
Peak Elev=460.13'
Storage=0.678 af
Inflow
Primary
Flow (cfs)
Time (hours)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48

Summary for Pond 15P: DA-4

Inflow Area = 9.650 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 27.89 cfs @ 12.07 hrs, Volume= 1.725 af
Outflow = 5.78 cfs @ 12.43 hrs, Volume= 1.723 af, Atten= 79%, Lag= 21.5 min
Primary = 5.78 cfs @ 12.43 hrs, Volume= 1.723 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Peak Elev= 460.25' @ 12.43 hrs Surf.Area= 0.461 ac Storage= 0.728 af

Plug-Flow detention time= 168.0 min calculated for 1.723 af (100% of inflow)
Center-of-Mass det. time= 167.2 min (1,012.3 - 845.1)

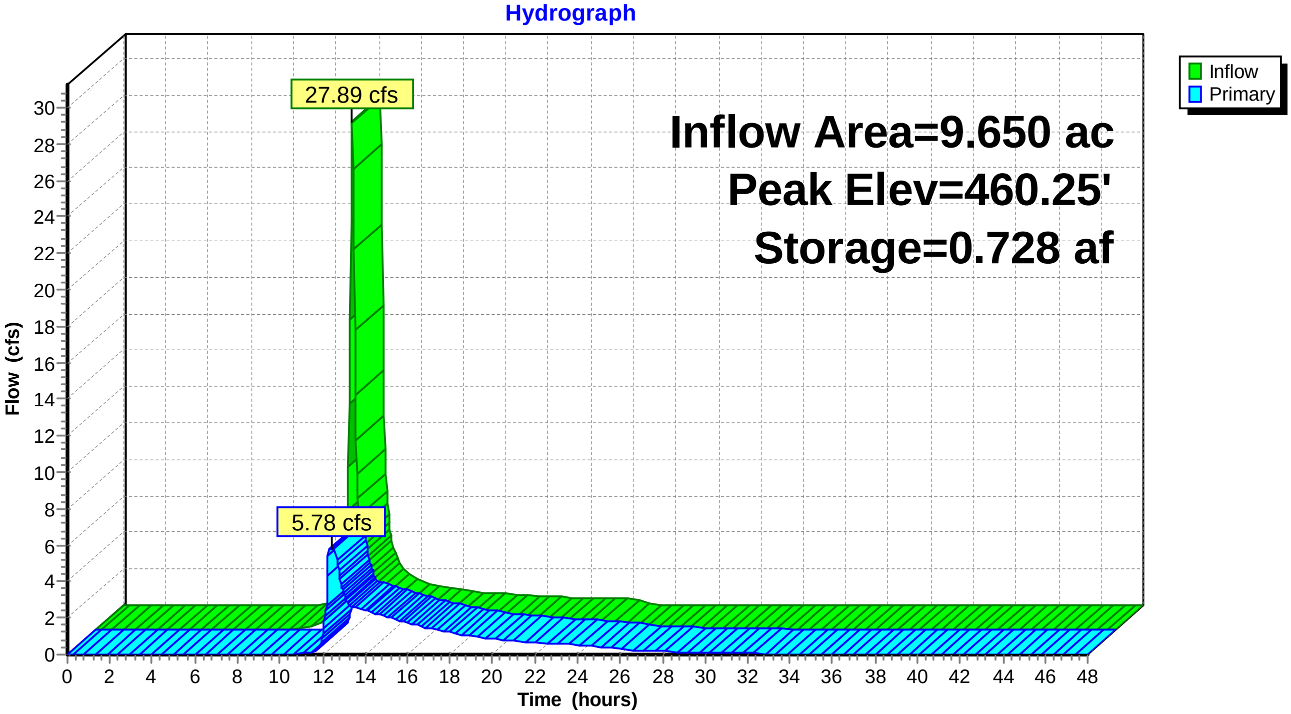
Volume	Invert	Avail.Storage	Storage Description
#1	456.00'	2.418 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
456.00	0.090	0.000	0.000
458.00	0.150	0.240	0.240
460.00	0.250	0.400	0.640
461.00	1.103	0.676	1.317
462.00	1.100	1.101	2.418

Device	Routing	Invert	Outlet Devices
#1	Device 3	460.00'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	456.00'	**0.4" Vert. Orifice/Grate X 28.00 columns** X 40 rows with 3.0" cc spacing C= 0.600
#3	Primary	456.00'	**12.0" Round Culvert** L= 104.5' Ke= 0.900 Inlet / Outlet Invert= 456.00' / 440.00' S= 0.1531 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.79 sf

Primary OutFlow Max=5.78 cfs @ 12.43 hrs HW=460.25' (Free Discharge)
└─**3=Culvert** (Inlet Controls 5.78 cfs @ 7.36 fps)
  ├─**1=Orifice/Grate** (Passes < 3.77 cfs potential flow)
  └─**2=Orifice/Grate** (Passes < 2.84 cfs potential flow)

Pond 15P: DA-4


Hydrograph
27.89 cfs
5.78 cfs
Inflow Area=9.650 ac
Peak Elev=460.25'
Storage=0.728 af
Inflow
Primary
Flow (cfs)
Time (hours)
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48

Summary for Pond 19P: DA-5

Inflow Area = 40.520 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 91.83 cfs @ 12.11 hrs, Volume= 7.243 af
Outflow = 1.21 cfs @ 24.30 hrs, Volume= 2.920 af, Atten= 99%, Lag= 731.1 min
Primary = 1.21 cfs @ 24.30 hrs, Volume= 2.920 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Starting Elev= 434.00' Surf.Area= 2.510 ac Storage= 2.640 af
Peak Elev= 436.34' @ 24.30 hrs Surf.Area= 2.734 ac Storage= 8.786 af (6.146 af above start)

Plug-Flow detention time= 2,083.2 min calculated for 0.279 af (4% of inflow)
Center-of-Mass det. time= 904.6 min (1,757.2 - 852.7)

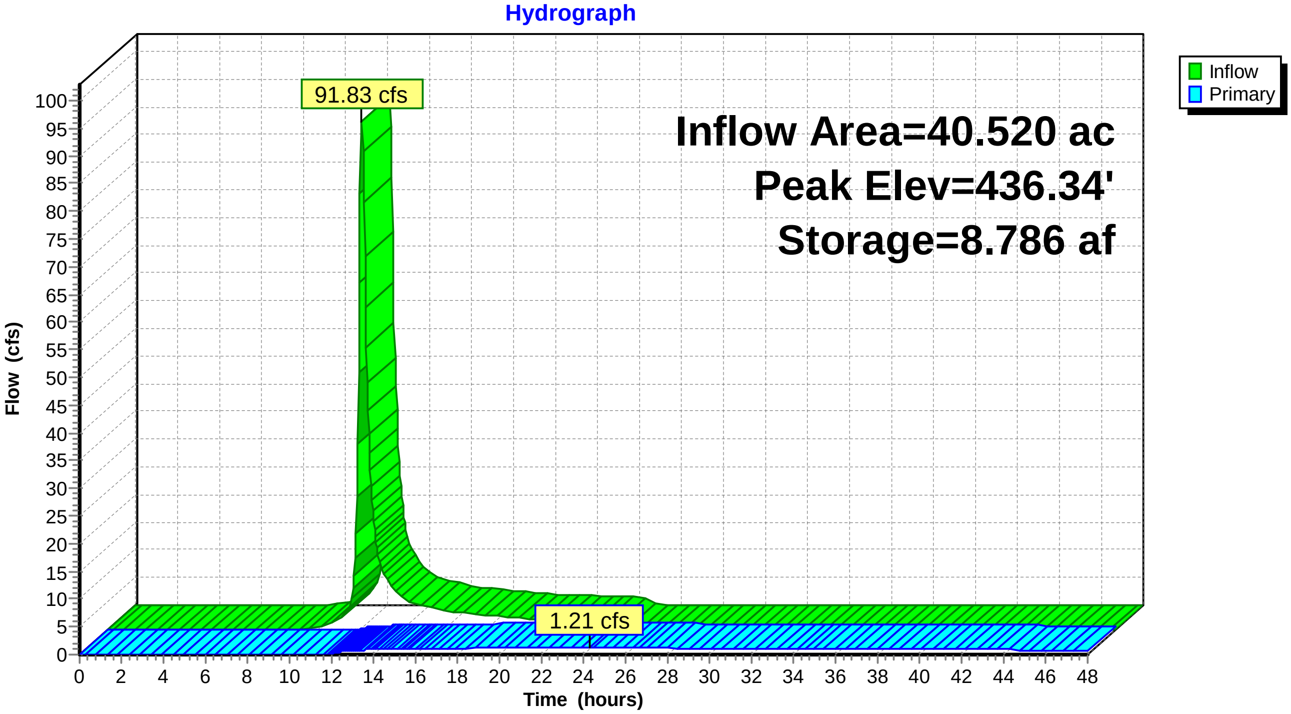
Volume	Invert	Avail.Storage	Storage Description
#1	432.00'	13.450 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
432.00	0.130	0.000	0.000
434.00	2.510	2.640	2.640
436.00	2.700	5.210	7.850
438.00	2.900	5.600	13.450

Device	Routing	Invert	Outlet Devices
#1	Device 3	437.00'	**36.0" Horiz. Orifice/Grate X 0.00** C= 0.600 Limited to weir flow at low heads
#2	Device 3	434.00'	**0.4" Vert. Orifice/Grate X 28.00 columns** X 31 rows with 3.0" cc spacing C= 0.600
#3	Primary	434.00'	**12.0" Round Culvert** L= 147.0' Ke= 0.900 Inlet / Outlet Invert= 434.00' / 433.26' S= 0.0050 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.79 sf

Primary OutFlow Max=1.21 cfs @ 24.30 hrs HW=436.34' (Free Discharge)
└─**3=Culvert** (Passes 1.21 cfs of 2.09 cfs potential flow)
  ├─**1=Orifice/Grate** (Controls 0.00 cfs)
  └─**2=Orifice/Grate** (Orifice Controls 1.21 cfs @ 4.95 fps)

Pond 19P: DA-5


Hydrograph
91.83 cfs
1.21 cfs
Inflow Area=40.520 ac
Peak Elev=436.34'
Storage=8.786 af
Inflow
Primary
Flow (cfs)
Time (hours)
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48

Summary for Pond 28P: DA-6

Inflow Area = 2.720 ac, 0.00% Impervious, Inflow Depth = 2.15" for 25-YEAR event
Inflow = 7.27 cfs @ 12.05 hrs, Volume= 0.486 af
Outflow = 0.42 cfs @ 13.85 hrs, Volume= 0.389 af, Atten= 94%, Lag= 108.0 min
Primary = 0.42 cfs @ 13.85 hrs, Volume= 0.389 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Starting Elev= 453.39' Surf.Area= 0.137 ac Storage= 0.324 af
Peak Elev= 455.11' @ 13.85 hrs Surf.Area= 0.185 ac Storage= 0.599 af (0.275 af above start)

Plug-Flow detention time= 1,183.6 min calculated for 0.065 af (13% of inflow)
Center-of-Mass det. time= 359.2 min (1,206.9 - 847.7)

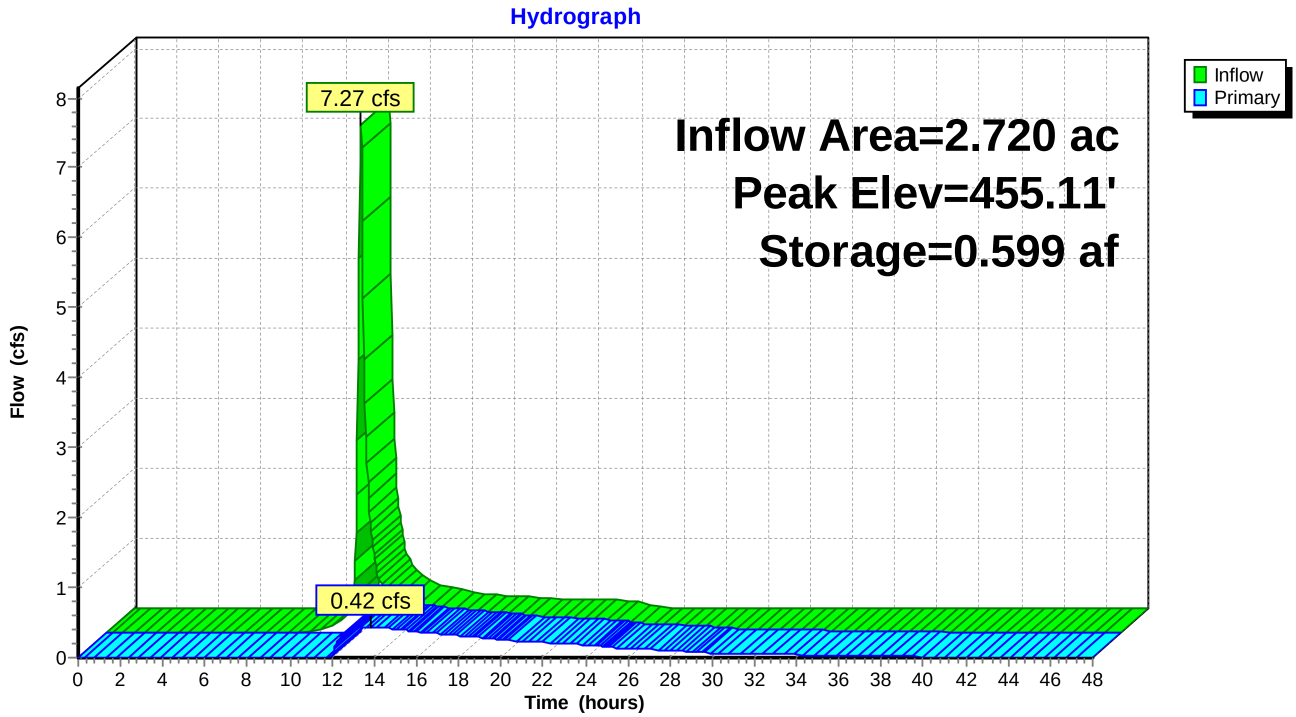
Volume	Invert	Avail.Storage	Storage Description
#1	450.00'	1.895 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
450.00	0.057	0.000	0.000
452.00	0.101	0.158	0.158
454.00	0.153	0.254	0.412
456.00	0.210	0.363	0.775
458.00	0.280	0.490	1.265
460.00	0.350	0.630	1.895

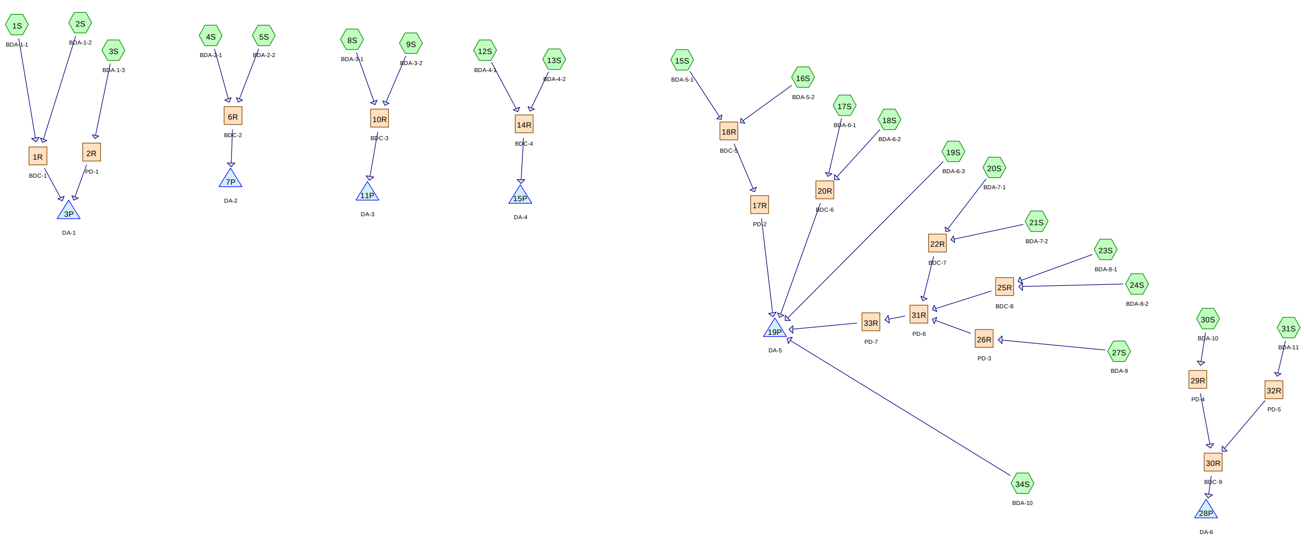
Device	Routing	Invert	Outlet Devices
#1	Device 3	458.00'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	454.00'	**0.4" Vert. Orifice/Grate X 28.00 columns** X 31 rows with 3.0" cc spacing C= 0.600
#3	Primary	454.00'	**12.0" Round Culvert** L= 100.0' Ke= 0.900 Inlet / Outlet Invert= 454.00' / 453.50' S= 0.0050 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.79 sf

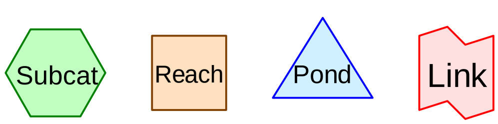
Primary OutFlow Max=0.42 cfs @ 13.85 hrs HW=455.11' (Free Discharge)
└─**3=Culvert** (Passes 0.42 cfs of 1.50 cfs potential flow)
  ├─**1=Orifice/Grate** (Controls 0.00 cfs)
  └─**2=Orifice/Grate** (Orifice Controls 0.42 cfs @ 3.48 fps)

Pond 28P: DA-6


Hydrograph
Inflow
Primary
7.27 cfs
0.42 cfs
Inflow Area=2.720 ac
Peak Elev=455.11'
Storage=0.599 af
Flow (cfs)
0
1
2
3
4
5
6
7
8
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
Time (hours)

APPENDIX C – 2-YEAR 24-HOUR HYDROCAD RESULTS





Routing Diagram for EDWARDS STORMWATER HYDROCAD CALCS
Prepared by {enter your company name here}, Printed 3/31/2022
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Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
74.410	78	(1S, 2S, 3S, 4S, 5S, 8S, 9S, 12S, 13S, 15S, 16S, 17S, 18S, 19S, 20S, 21S, 23S, 24S, 27S, 30S, 31S, 34S)
74.410	**78**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
74.410	Other	1S, 2S, 3S, 4S, 5S, 8S, 9S, 12S, 13S, 15S, 16S, 17S, 18S, 19S, 20S, 21S, 23S, 24S, 27S, 30S, 31S, 34S
74.410		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	74.410	74.410		1S, 2S, 3S, 4S, 5S, 8S, 9S, 12S, 13S, 15S, 16S, 17S, 18S, 19S, 20S, 21S, 23S, 24S, 27S, 30S, 31S, 34S
0.000	**0.000**	**0.000**	**0.000**	**74.410**	**74.410**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	30R	454.43	453.39	207.0	0.0050	0.030	24.0	0.0	0.0
2	3P	454.11	436.00	111.0	0.1632	0.030	12.0	0.0	0.0
3	7P	456.00	438.00	105.0	0.1714	0.025	12.0	0.0	0.0
4	11P	456.00	432.00	105.0	0.2286	0.025	12.0	0.0	0.0
5	15P	456.00	440.00	104.5	0.1531	0.025	12.0	0.0	0.0
6	19P	434.00	433.26	147.0	0.0050	0.025	12.0	0.0	0.0
7	28P	454.00	453.50	100.0	0.0050	0.025	12.0	0.0	0.0

Time span=0.00-48.00 hrs, dt=0.04 hrs, 1201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment 1S: BDA-1-1 Runoff Area=1.740 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=241' Slope=0.0269 '/' Tc=11.5 min CN=78 Runoff=2.86 cfs 0.166 af

Subcatchment 2S: BDA-1-2 Runoff Area=2.780 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=265' Slope=0.0269 '/' Tc=11.9 min CN=78 Runoff=4.49 cfs 0.265 af

Subcatchment 3S: BDA-1-3 Runoff Area=0.960 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=27' Slope=0.3300 '/' Tc=5.0 min CN=78 Runoff=2.01 cfs 0.091 af

Subcatchment 4S: BDA-2-1 Runoff Area=3.320 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=201' Slope=0.0269 '/' Tc=11.0 min CN=78 Runoff=5.55 cfs 0.316 af

Subcatchment 5S: BDA-2-2 Runoff Area=3.940 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=260' Slope=0.0269 '/' Tc=11.8 min CN=78 Runoff=6.39 cfs 0.375 af

Subcatchment 8S: BDA-3-1 Runoff Area=4.270 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=187' Slope=0.0269 '/' Tc=10.8 min CN=78 Runoff=7.19 cfs 0.407 af

Subcatchment 9S: BDA-3-2 Runoff Area=4.510 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=1,570' Slope=0.0269 '/' Tc=30.8 min CN=78 Runoff=4.22 cfs 0.430 af

Subcatchment 12S: BDA-4-1 Runoff Area=4.710 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=204' Slope=0.0269 '/' Tc=11.0 min CN=78 Runoff=7.87 cfs 0.449 af

Subcatchment 13S: BDA-4-2 Runoff Area=4.940 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=205' Slope=0.0269 '/' Tc=11.0 min CN=78 Runoff=8.25 cfs 0.471 af

Subcatchment 15S: BDA-5-1 Runoff Area=5.710 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=297' Slope=0.0269 '/' Tc=12.4 min CN=78 Runoff=9.06 cfs 0.544 af

Subcatchment 16S: BDA-5-2 Runoff Area=5.860 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=327' Slope=0.0269 '/' Tc=12.8 min CN=78 Runoff=9.16 cfs 0.558 af

Subcatchment 17S: BDA-6-1 Runoff Area=5.060 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=224' Slope=0.0269 '/' Tc=11.3 min CN=78 Runoff=8.36 cfs 0.482 af

Subcatchment 18S: BDA-6-2 Runoff Area=2.980 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=130' Slope=0.0269 '/' Tc=9.9 min CN=78 Runoff=5.18 cfs 0.284 af

Subcatchment 19S: BDA-6-3 Runoff Area=3.200 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=413' Slope=0.0269 '/' Tc=14.0 min CN=78 Runoff=4.79 cfs 0.305 af

Subcatchment 20S: BDA-7-1 Runoff Area=4.860 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=371' Slope=0.0269 '/' Tc=13.4 min CN=78 Runoff=7.42 cfs 0.463 af

Subcatchment 21S: BDA-7-2 Runoff Area=2.140 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=206' Slope=0.0269 '/' Tc=11.0 min CN=78 Runoff=3.57 cfs 0.204 af

Subcatchment 23S: BDA-8-1 Runoff Area=1.440 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=213' Slope=0.0269 '/' Tc=11.1 min CN=78 Runoff=2.40 cfs 0.137 af

Subcatchment 24S: BDA-8-2 Runoff Area=0.340 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=96' Slope=0.0269 '/' Tc=9.2 min CN=78 Runoff=0.61 cfs 0.032 af

Subcatchment 27S: BDA-9 Runoff Area=1.280 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=40' Slope=0.3300 '/' Tc=5.0 min CN=78 Runoff=2.68 cfs 0.122 af

Subcatchment 30S: BDA-10 Runoff Area=1.330 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=96' Slope=0.3300 '/' Tc=5.0 min CN=78 Runoff=2.79 cfs 0.127 af

Subcatchment 31S: BDA-11 Runoff Area=1.390 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=40' Slope=0.3300 '/' Tc=5.0 min CN=78 Runoff=2.91 cfs 0.132 af

Subcatchment 34S: BDA-10 Runoff Area=7.650 ac 0.00% Impervious Runoff Depth=1.14"
Flow Length=1,194' Slope=0.0130 '/' Tc=35.5 min CN=78 Runoff=6.48 cfs 0.729 af

Reach 1R: BDC-1 Avg. Flow Depth=0.35' Max Vel=2.25 fps Inflow=7.35 cfs 0.431 af
n=0.030 L=344.0' S=0.0100 '/' Capacity=169.91 cfs Outflow=7.06 cfs 0.431 af

Reach 2R: PD-1 Avg. Flow Depth=0.53' Max Vel=1.40 fps Inflow=2.01 cfs 0.091 af
n=0.030 L=1,000.0' S=0.0050 '/' Capacity=40.58 cfs Outflow=1.19 cfs 0.091 af

Reach 6R: BDC-2 Avg. Flow Depth=0.45' Max Vel=2.63 fps Inflow=11.93 cfs 0.692 af
n=0.030 L=600.0' S=0.0100 '/' Capacity=169.91 cfs Outflow=11.01 cfs 0.692 af

Reach 10R: BDC-3 Avg. Flow Depth=0.38' Max Vel=2.41 fps Inflow=9.22 cfs 0.836 af
n=0.030 L=771.7' S=0.0104 '/' Capacity=173.00 cfs Outflow=8.24 cfs 0.836 af

Reach 14R: BDC-4 Avg. Flow Depth=0.53' Max Vel=2.79 fps Inflow=16.12 cfs 0.919 af
n=0.030 L=857.9' S=0.0093 '/' Capacity=164.08 cfs Outflow=14.13 cfs 0.919 af

Reach 17R: PD-2 Avg. Flow Depth=0.54' Max Vel=2.71 fps Inflow=15.00 cfs 1.102 af
n=0.030 L=667.0' S=0.0086 '/' Capacity=157.21 cfs Outflow=14.03 cfs 1.102 af

Reach 18R: BDC-5 Avg. Flow Depth=0.53' Max Vel=2.94 fps Inflow=18.22 cfs 1.102 af
n=0.030 L=1,262.7' S=0.0103 '/' Capacity=172.40 cfs Outflow=15.00 cfs 1.102 af

Reach 20R: BDC-6 Avg. Flow Depth=0.44' Max Vel=3.00 fps Inflow=13.50 cfs 0.766 af
n=0.030 L=774.6' S=0.0135 '/' Capacity=197.35 cfs Outflow=12.20 cfs 0.766 af

Reach 22R: BDC-7 Avg. Flow Depth=0.40' Max Vel=2.83 fps Inflow=10.92 cfs 0.667 af
n=0.030 L=527.8' S=0.0133 '/' Capacity=195.68 cfs Outflow=10.39 cfs 0.667 af

Reach 25R: BDC-8 Avg. Flow Depth=0.21' Max Vel=1.64 fps Inflow=2.99 cfs 0.170 af
n=0.030 L=206.8' S=0.0100 '/' Capacity=170.00 cfs Outflow=2.91 cfs 0.170 af

Reach 26R: PD-3 Avg. Flow Depth=0.59' Max Vel=1.53 fps Inflow=2.68 cfs 0.122 af
n=0.030 L=1,062.6' S=0.0052 '/' Capacity=6.50 cfs Outflow=1.61 cfs 0.122 af

Reach 29R: PD-4 Avg. Flow Depth=0.63' Max Vel=1.57 fps Inflow=2.79 cfs 0.127 af
n=0.030 L=832.0' S=0.0050 '/' Capacity=6.39 cfs Outflow=1.88 cfs 0.127 af

Reach 30R: BDC-9 Avg. Flow Depth=1.01' Max Vel=2.22 fps Inflow=3.59 cfs 0.259 af
24.0" Round Pipe n=0.030 L=207.0' S=0.0050 '/' Capacity=6.95 cfs Outflow=3.53 cfs 0.259 af

Reach 31R: PD-6 Avg. Flow Depth=0.46' Max Vel=2.98 fps Inflow=14.69 cfs 0.958 af
n=0.030 L=1,060.0' S=0.0126 '/' Capacity=190.90 cfs Outflow=12.78 cfs 0.958 af

Reach 32R: PD-5 Avg. Flow Depth=0.61' Max Vel=1.54 fps Inflow=2.91 cfs 0.132 af
n=0.030 L=1,107.0' S=0.0050 '/' Capacity=6.41 cfs Outflow=1.72 cfs 0.132 af

Reach 33R: PD-7 Avg. Flow Depth=0.60' Max Vel=2.18 fps Inflow=12.78 cfs 0.958 af
n=0.030 L=125.0' S=0.0050 '/' Capacity=119.67 cfs Outflow=12.71 cfs 0.958 af

Pond 3P: DA-1 Peak Elev=454.89' Storage=0.514 af Inflow=8.20 cfs 0.522 af
Outflow=0.01 cfs 0.025 af

Pond 7P: DA-2 Peak Elev=458.36' Storage=0.298 af Inflow=11.01 cfs 0.692 af
Outflow=1.22 cfs 0.690 af

Pond 11P: DA-3 Peak Elev=458.67' Storage=0.352 af Inflow=8.24 cfs 0.836 af
Outflow=1.46 cfs 0.835 af

Pond 15P: DA-4 Peak Elev=458.88' Storage=0.392 af Inflow=14.13 cfs 0.919 af
Outflow=1.63 cfs 0.918 af

Pond 19P: DA-5 Peak Elev=435.32' Storage=6.029 af Inflow=45.11 cfs 3.860 af
Outflow=0.54 cfs 1.308 af

Pond 28P: DA-6 Peak Elev=454.47' Storage=0.487 af Inflow=3.53 cfs 0.259 af
Outflow=0.13 cfs 0.163 af

Total Runoff Area = 74.410 ac Runoff Volume = 7.088 af Average Runoff Depth = 1.14"
100.00% Pervious = 74.410 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: BDA-1-1

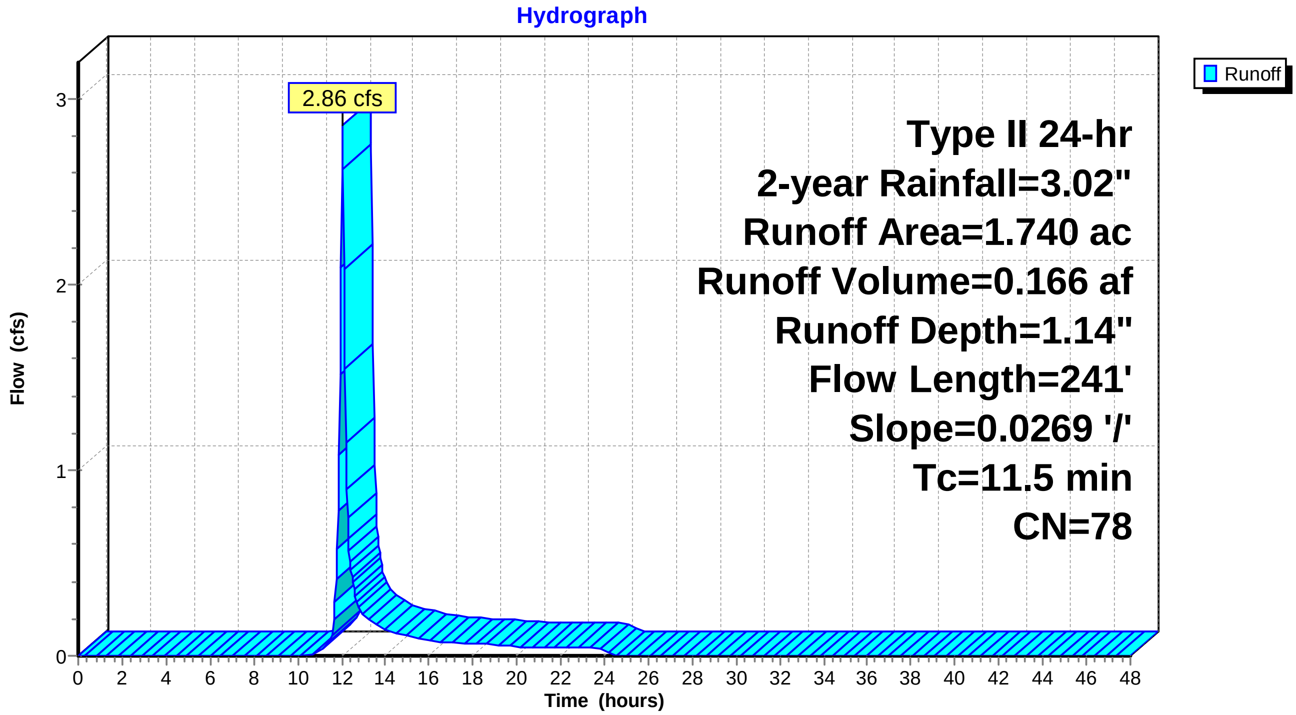
Runoff = 2.86 cfs @ 12.04 hrs, Volume= 0.166 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	1.740	78	
	1.740		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
2.0	141	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.5	241	Total			

Subcatchment 1S: BDA-1-1



Summary for Subcatchment 2S: BDA-1-2

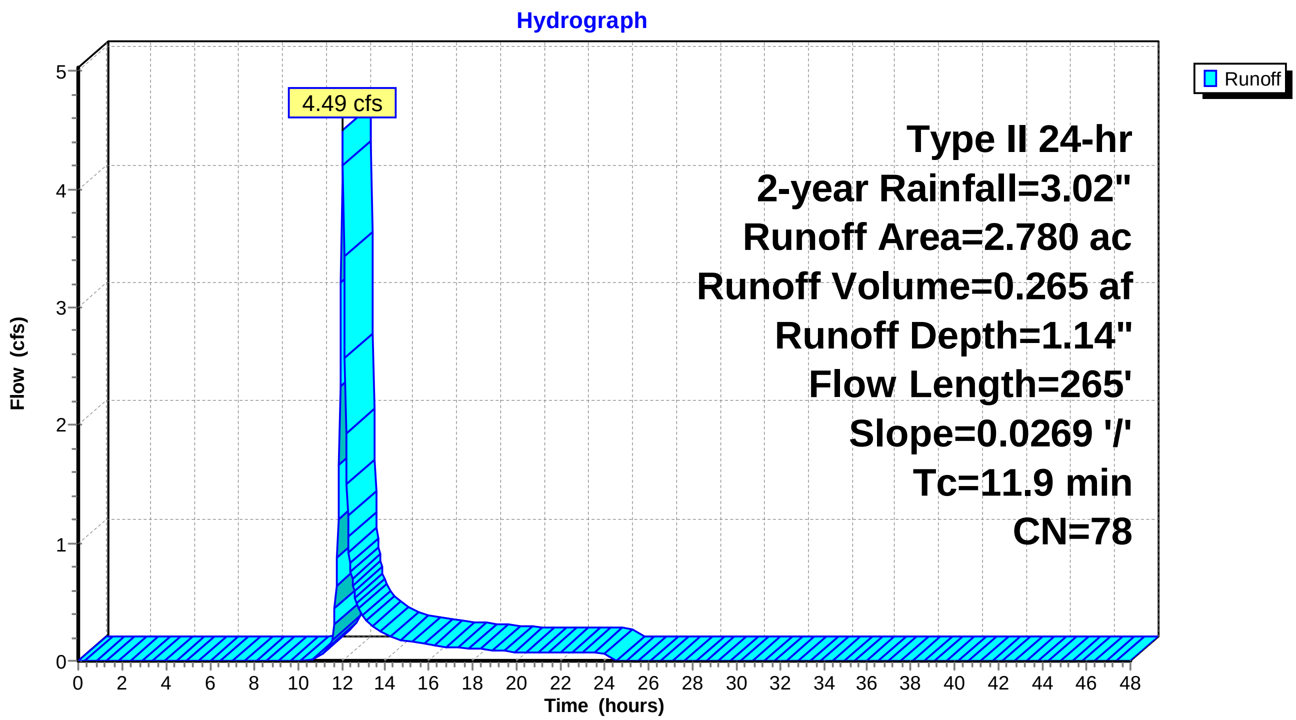
Runoff = 4.49 cfs @ 12.04 hrs, Volume= 0.265 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	2.780	78	
	2.780		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
2.4	165	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.9	265	Total			

Subcatchment 2S: BDA-1-2



Summary for Subcatchment 3S: BDA-1-3

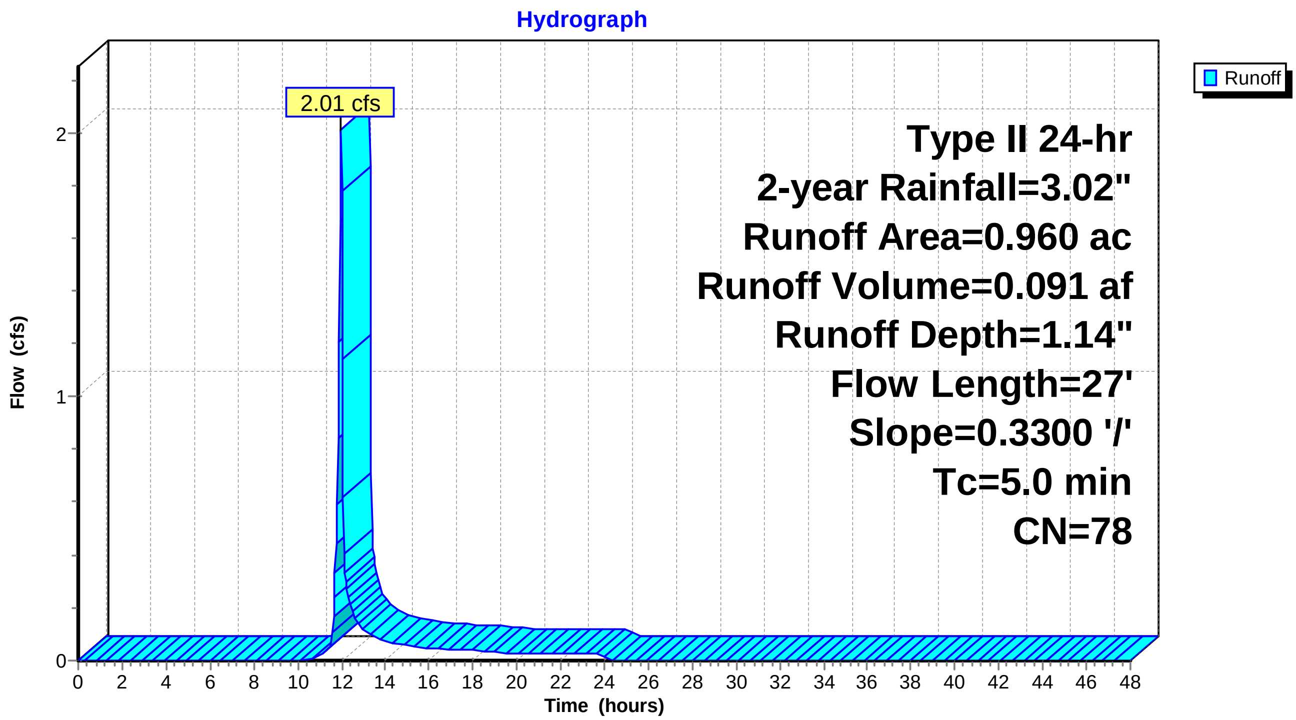
Runoff = 2.01 cfs @ 11.96 hrs, Volume= 0.091 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	0.960	78	
	0.960		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	27	0.3300	0.37		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.2	27	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 3S: BDA-1-3



Summary for Subcatchment 4S: BDA-2-1

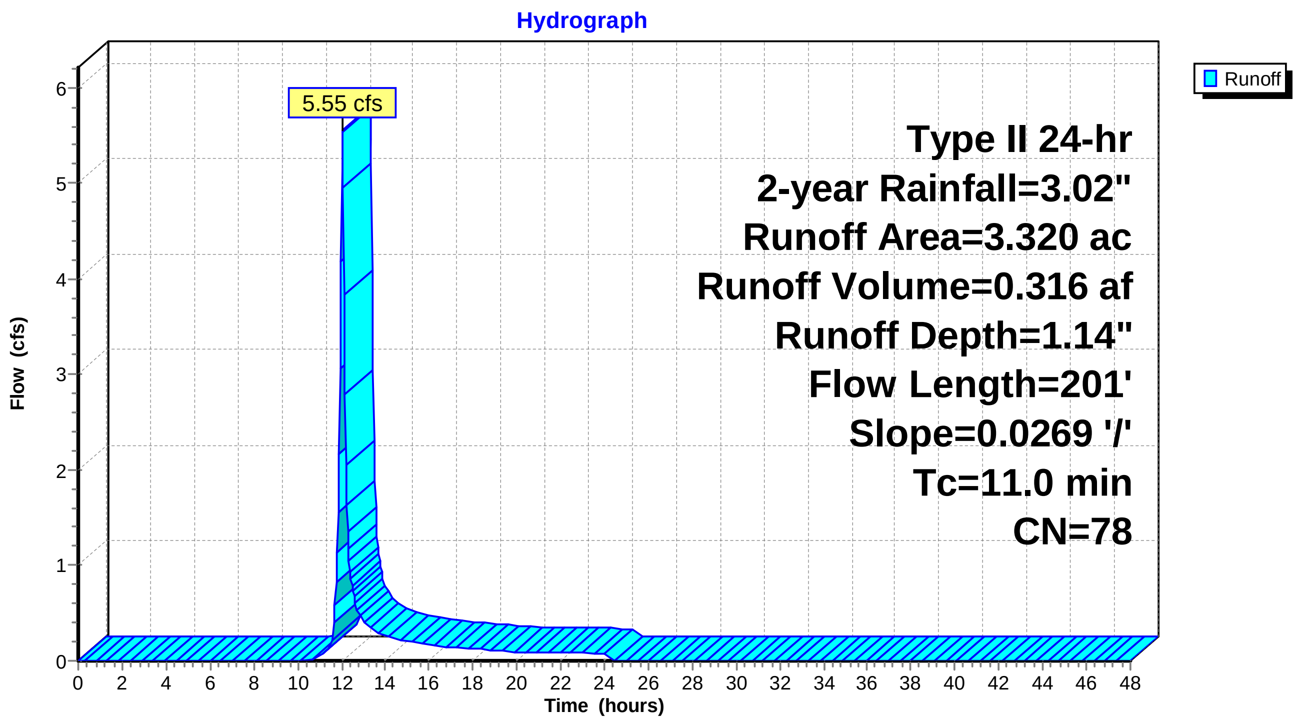
Runoff = 5.55 cfs @ 12.03 hrs, Volume= 0.316 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	3.320	78	
	3.320		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.5	101	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.0	201	Total			

Subcatchment 4S: BDA-2-1



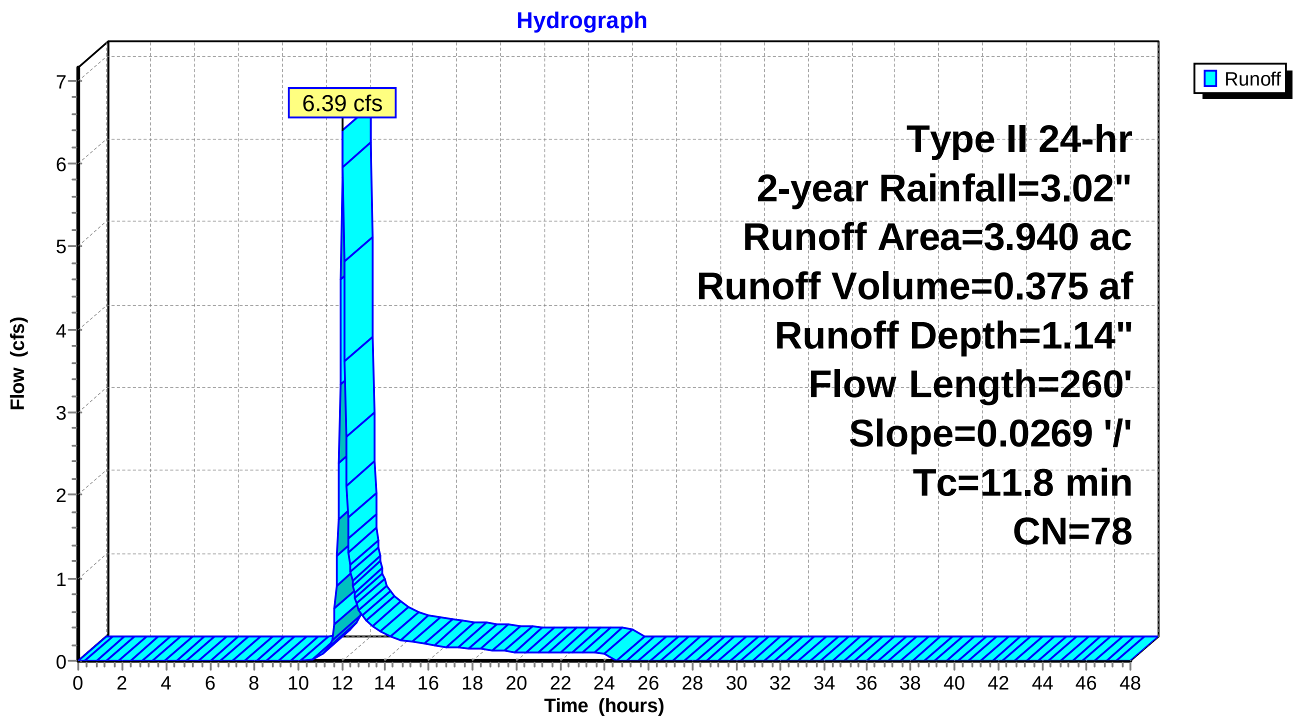
Summary for Subcatchment 5S: BDA-2-2

Runoff = 6.39 cfs @ 12.04 hrs, Volume= 0.375 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	3.940	78	
	3.940		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
2.3	160	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.8	260	Total			



Summary for Subcatchment 8S: BDA-3-1

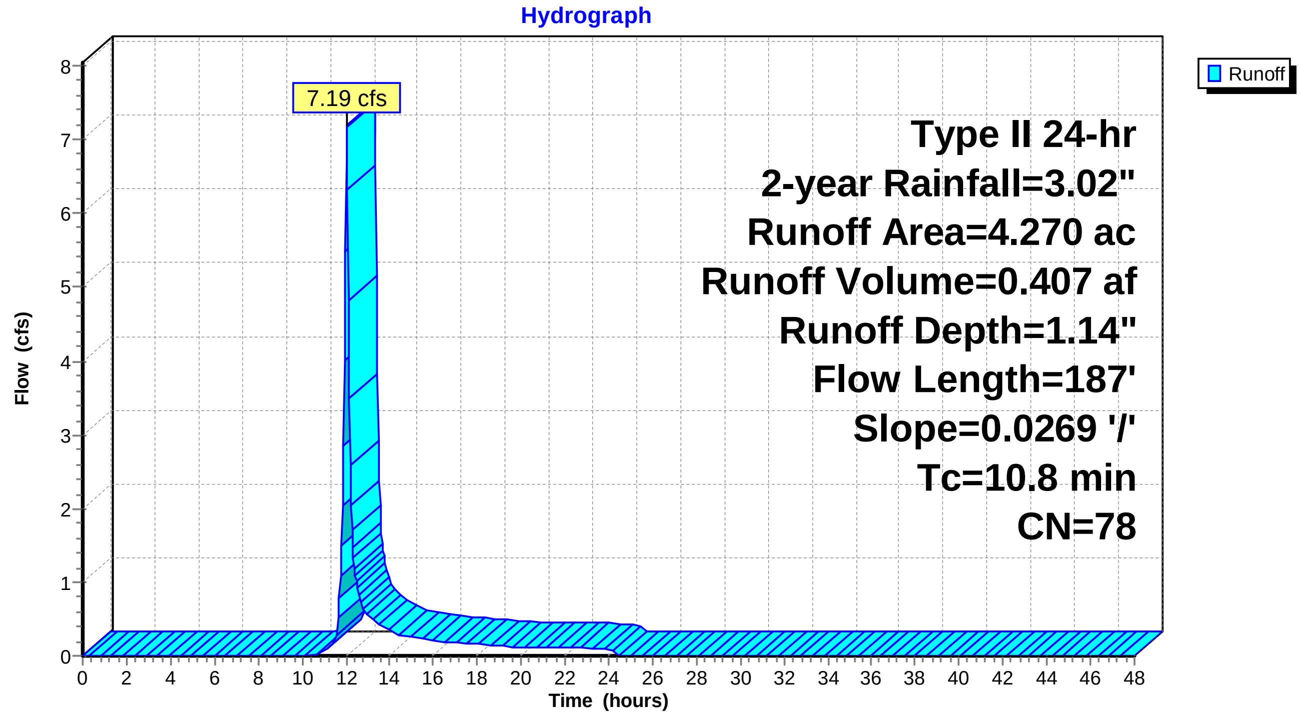
Runoff = 7.19 cfs @ 12.03 hrs, Volume= 0.407 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	4.270	78	
	4.270		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.3	87	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.8	187	Total			

Subcatchment 8S: BDA-3-1



Summary for Subcatchment 9S: BDA-3-2

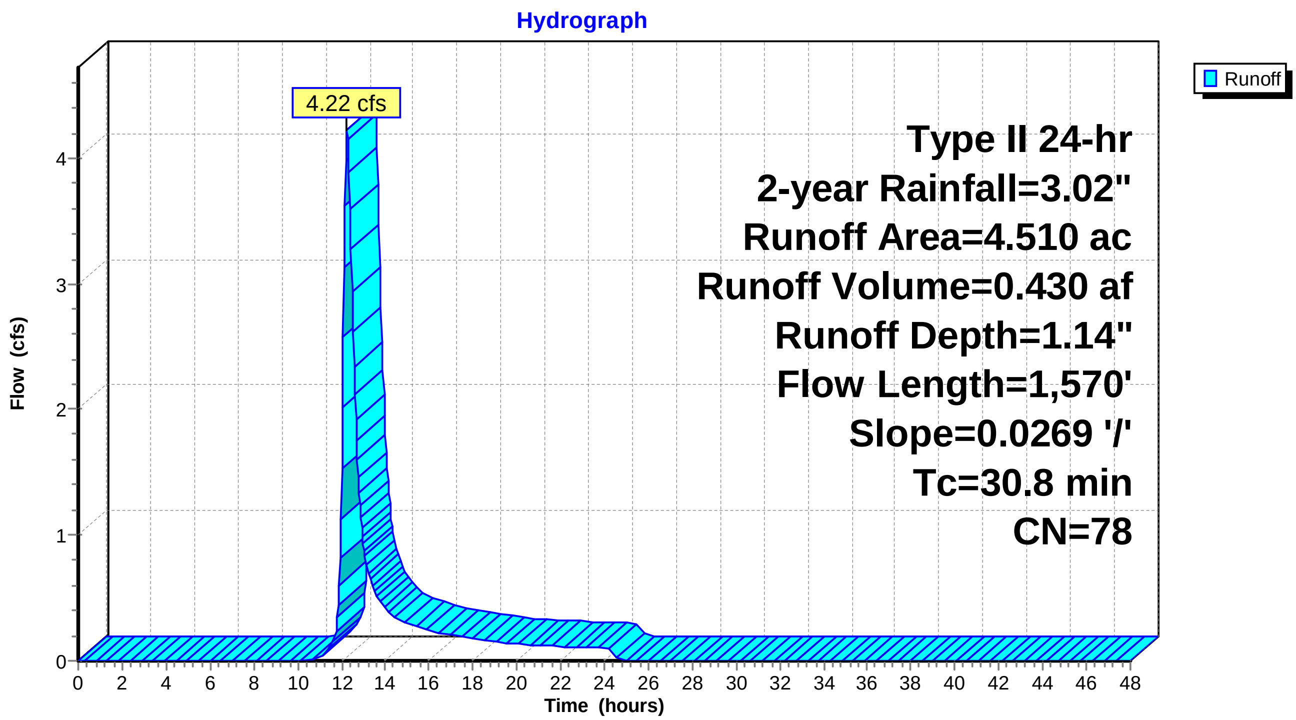
Runoff = 4.22 cfs @ 12.27 hrs, Volume= 0.430 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	4.510	78	
	4.510		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
21.3	1,470	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
30.8	1,570	Total			

Subcatchment 9S: BDA-3-2



Summary for Subcatchment 12S: BDA-4-1

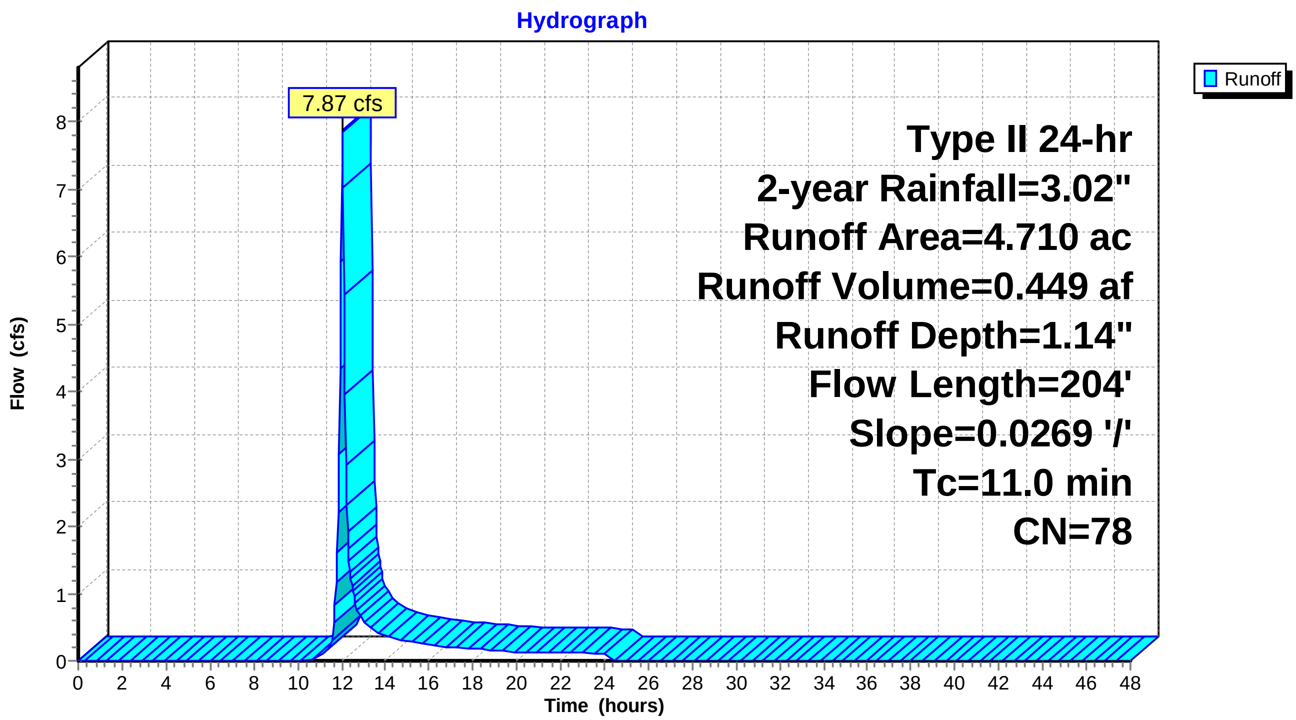
Runoff = 7.87 cfs @ 12.03 hrs, Volume= 0.449 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	4.710	78	
	4.710		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.5	104	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.0	204	Total			

Subcatchment 12S: BDA-4-1



Summary for Subcatchment 13S: BDA-4-2

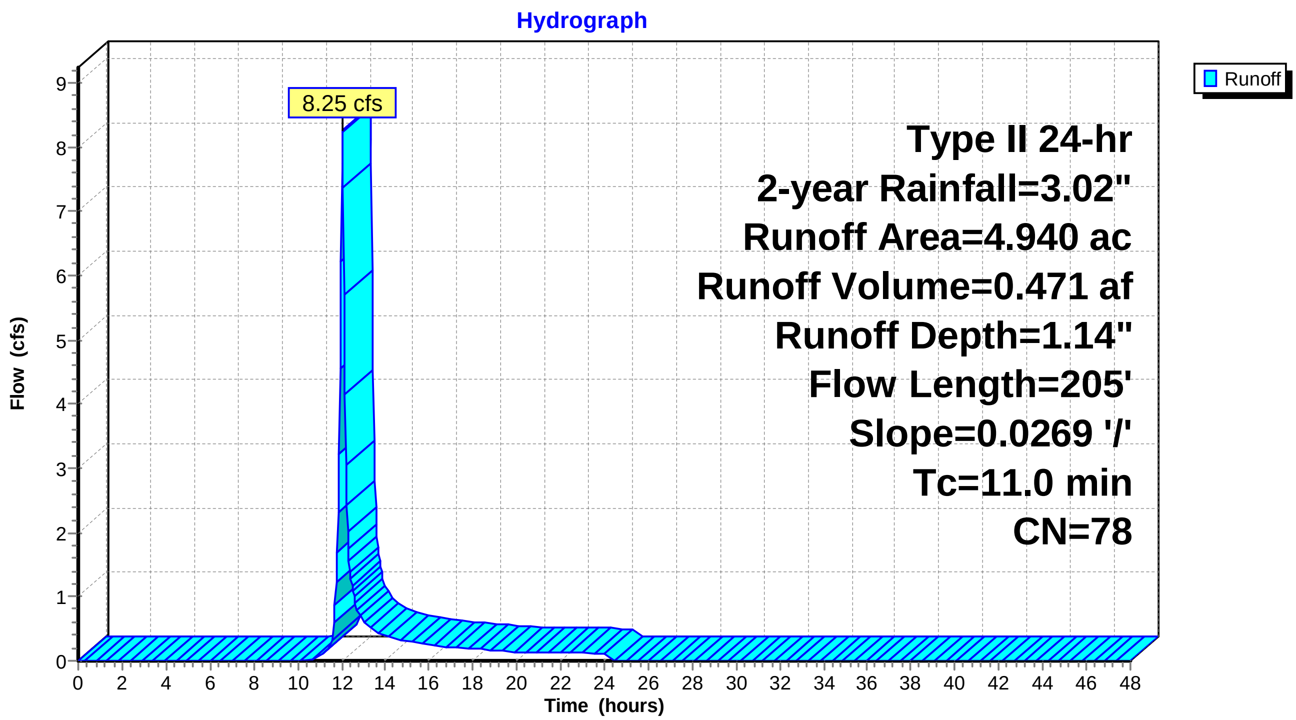
Runoff = 8.25 cfs @ 12.03 hrs, Volume= 0.471 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	4.940	78	
	4.940		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.5	105	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.0	205	Total			

Subcatchment 13S: BDA-4-2



Summary for Subcatchment 15S: BDA-5-1

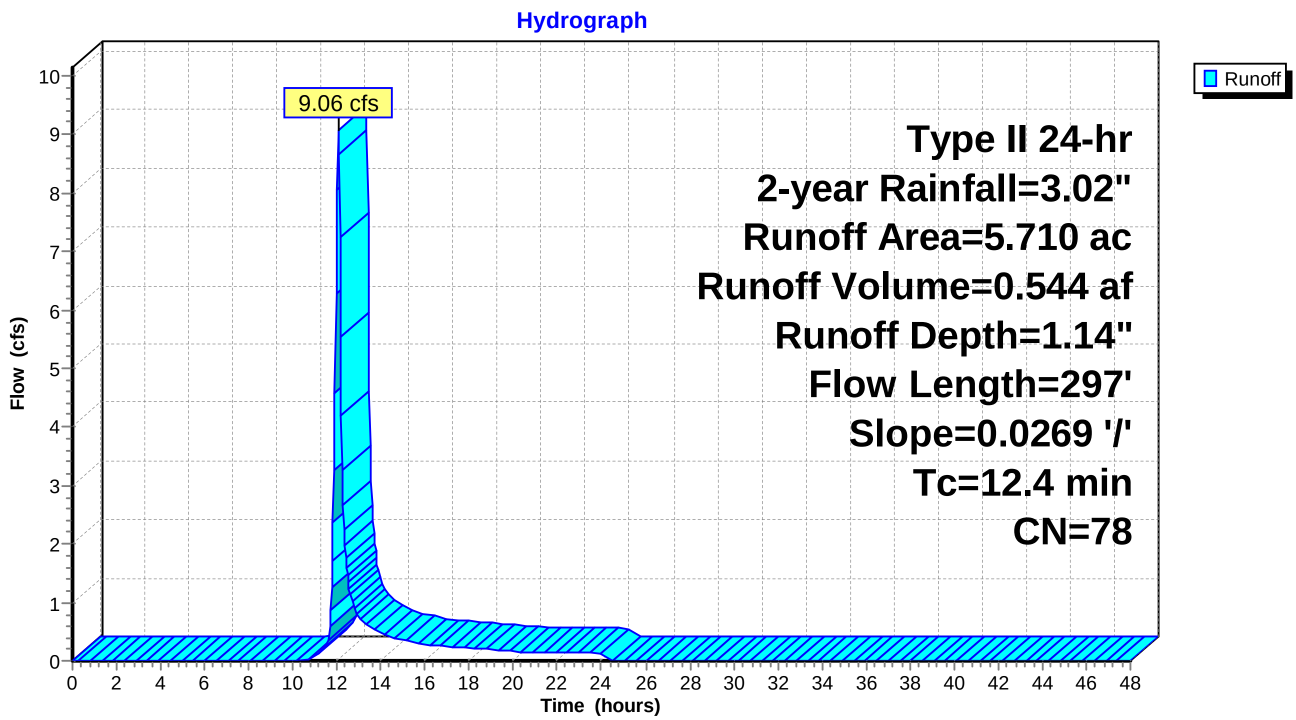
Runoff = 9.06 cfs @ 12.05 hrs, Volume= 0.544 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	5.710	78	
	5.710		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
2.9	197	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.4	297	Total			

Subcatchment 15S: BDA-5-1



Summary for Subcatchment 16S: BDA-5-2

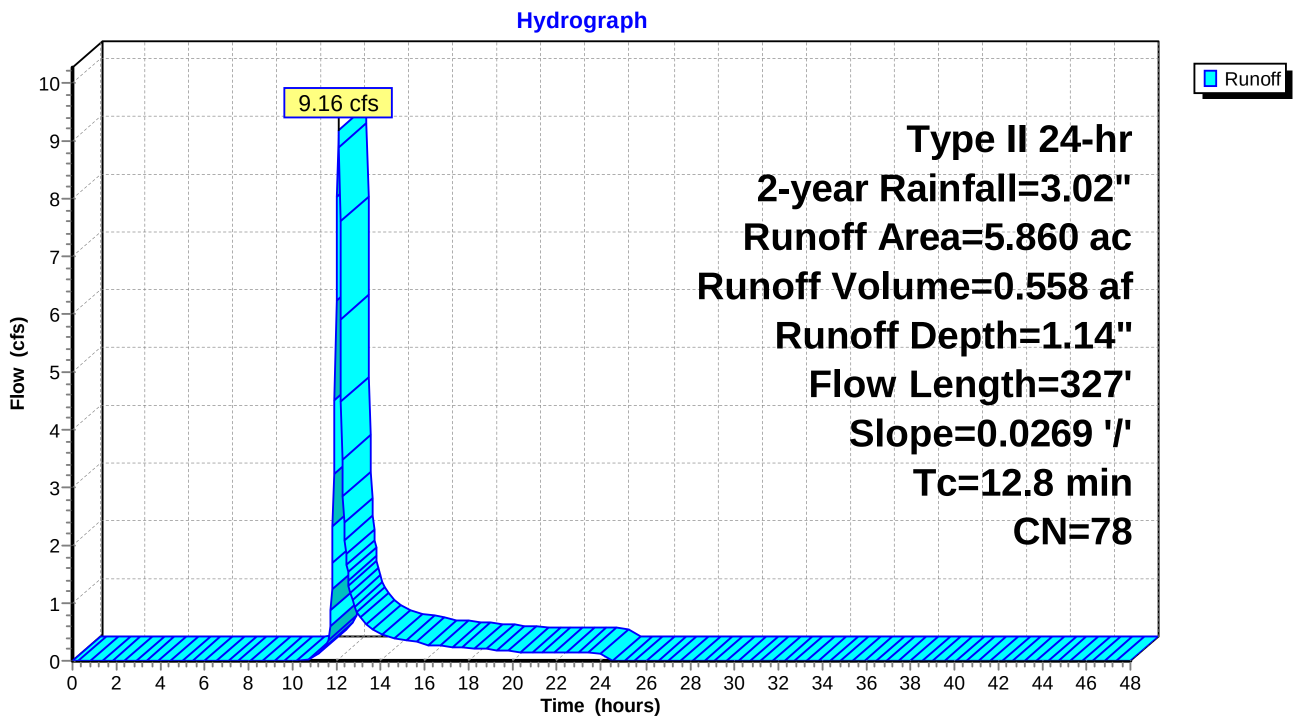
Runoff = 9.16 cfs @ 12.05 hrs, Volume= 0.558 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	5.860	78	
	5.860		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
3.3	227	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
12.8	327	Total			

Subcatchment 16S: BDA-5-2



Summary for Subcatchment 17S: BDA-6-1

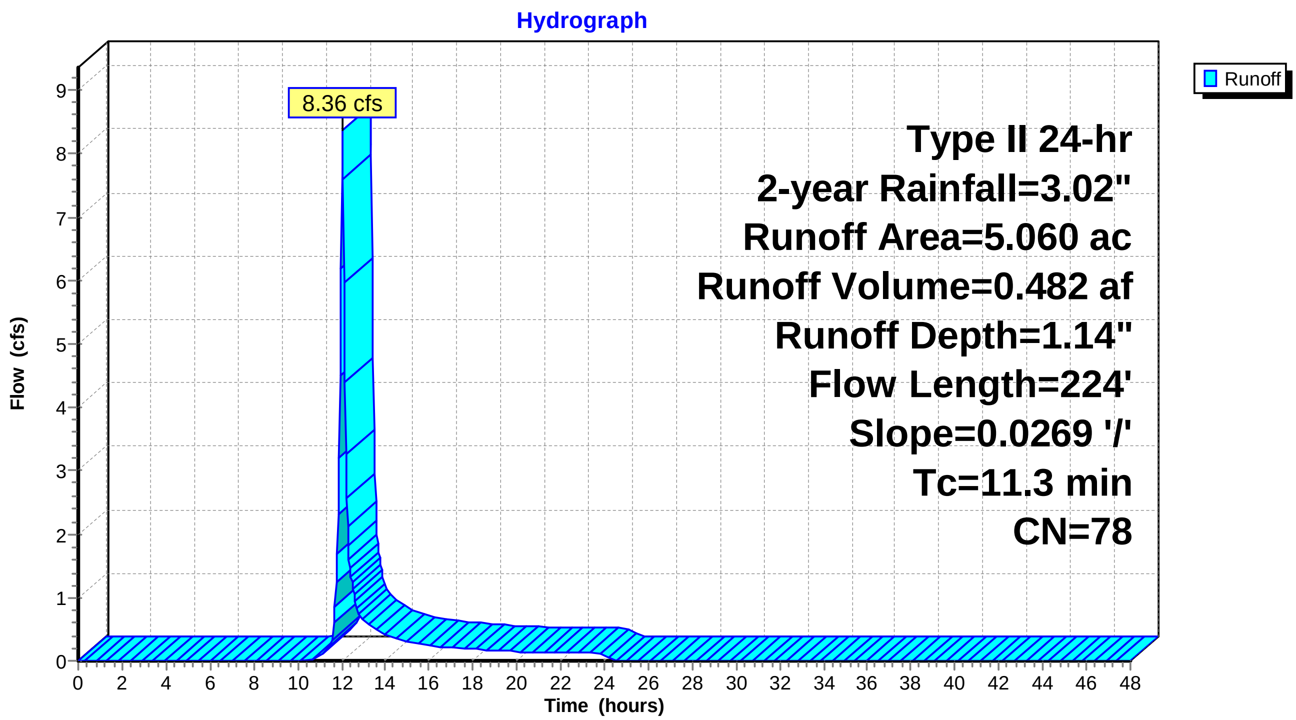
Runoff = 8.36 cfs @ 12.04 hrs, Volume= 0.482 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	5.060	78	
	5.060		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.8	124	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.3	224	Total			

Subcatchment 17S: BDA-6-1



Summary for Subcatchment 18S: BDA-6-2

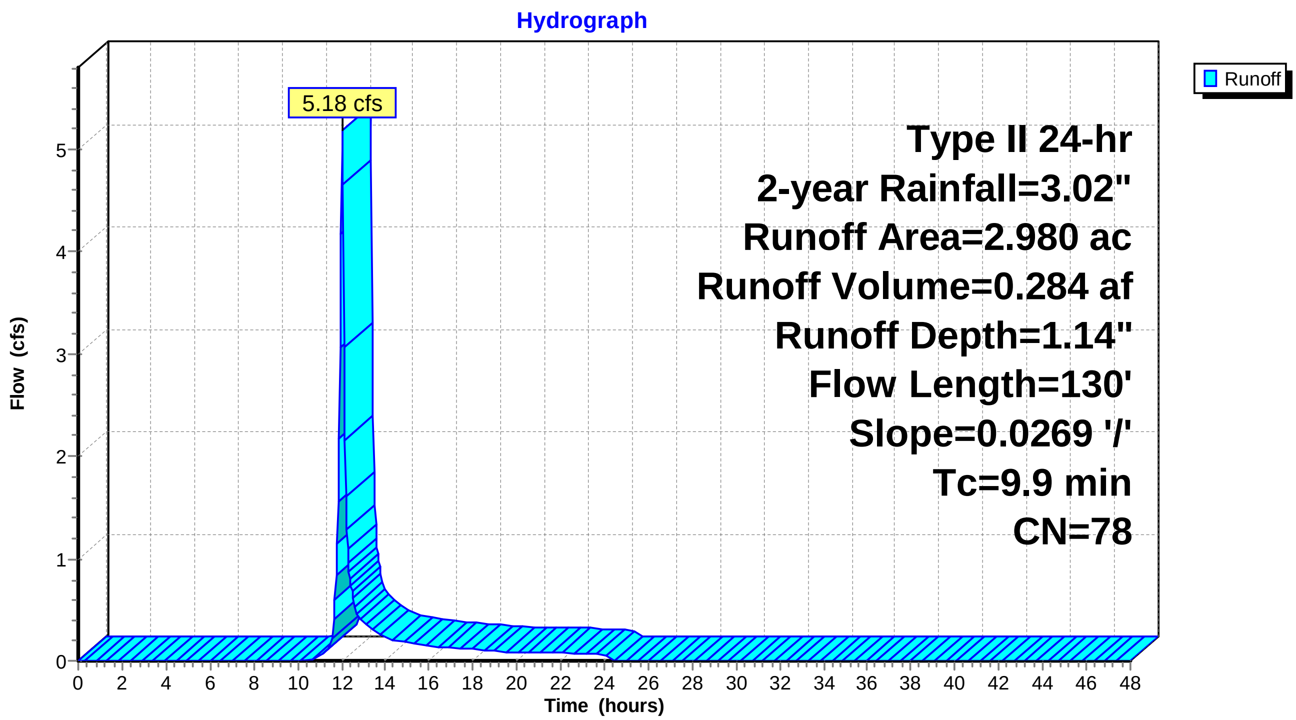
Runoff = 5.18 cfs @ 12.02 hrs, Volume= 0.284 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	2.980	78	
	2.980		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
0.4	30	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.9	130	Total			

Subcatchment 18S: BDA-6-2



Summary for Subcatchment 19S: BDA-6-3

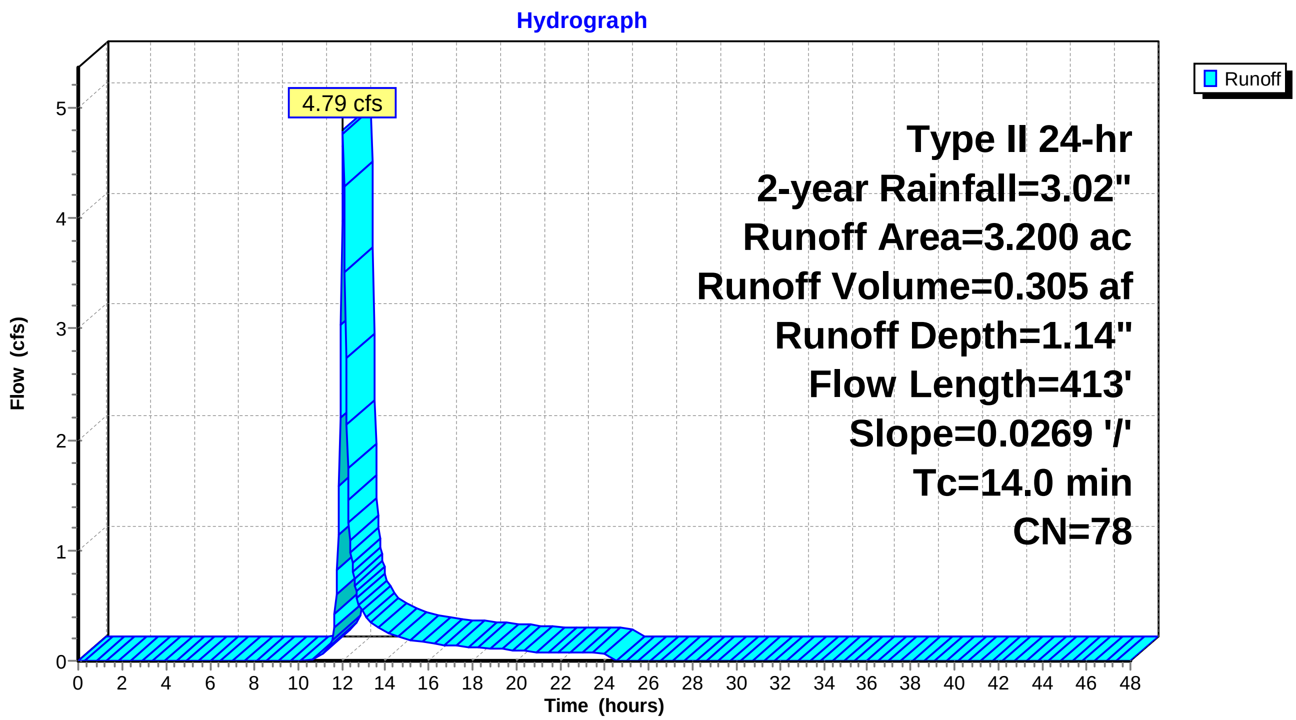
Runoff = 4.79 cfs @ 12.07 hrs, Volume= 0.305 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	3.200	78	
	3.200		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
4.5	313	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
14.0	413	Total			

Subcatchment 19S: BDA-6-3



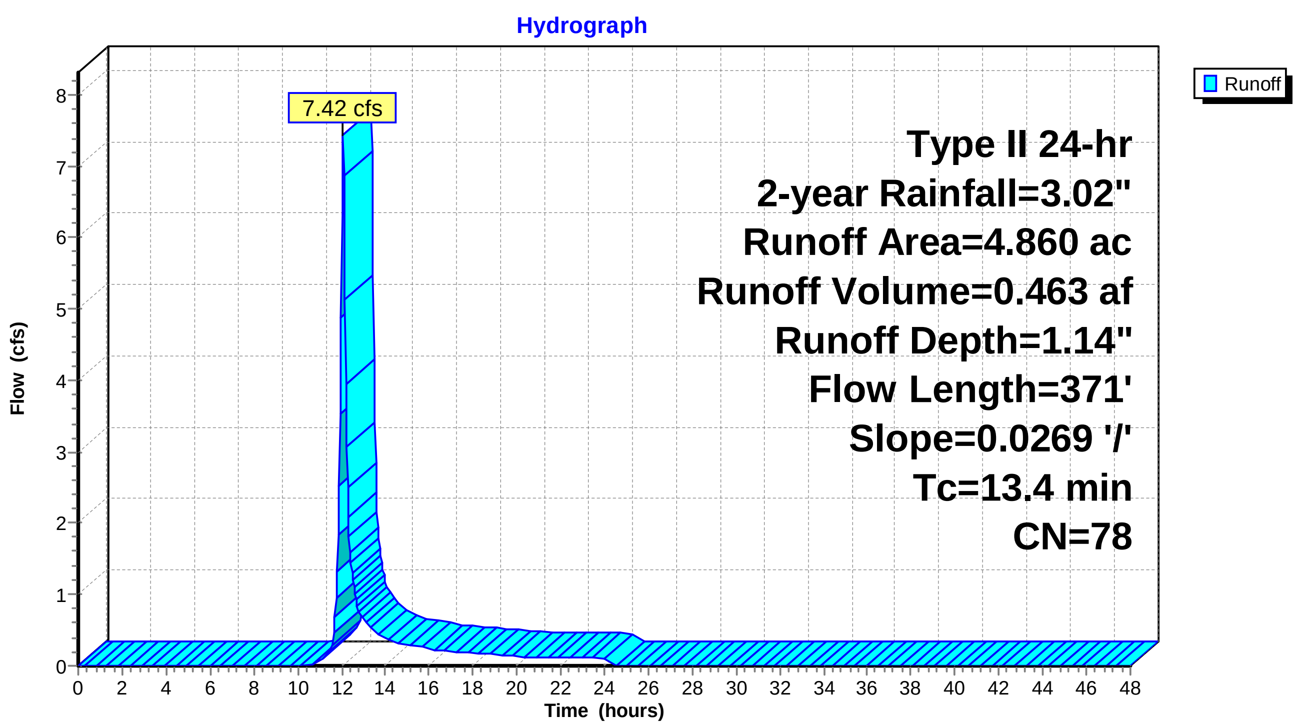
Summary for Subcatchment 20S: BDA-7-1

Runoff = 7.42 cfs @ 12.06 hrs, Volume= 0.463 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	4.860	78	
	4.860		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
3.9	271	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.4	371	Total			



Summary for Subcatchment 21S: BDA-7-2

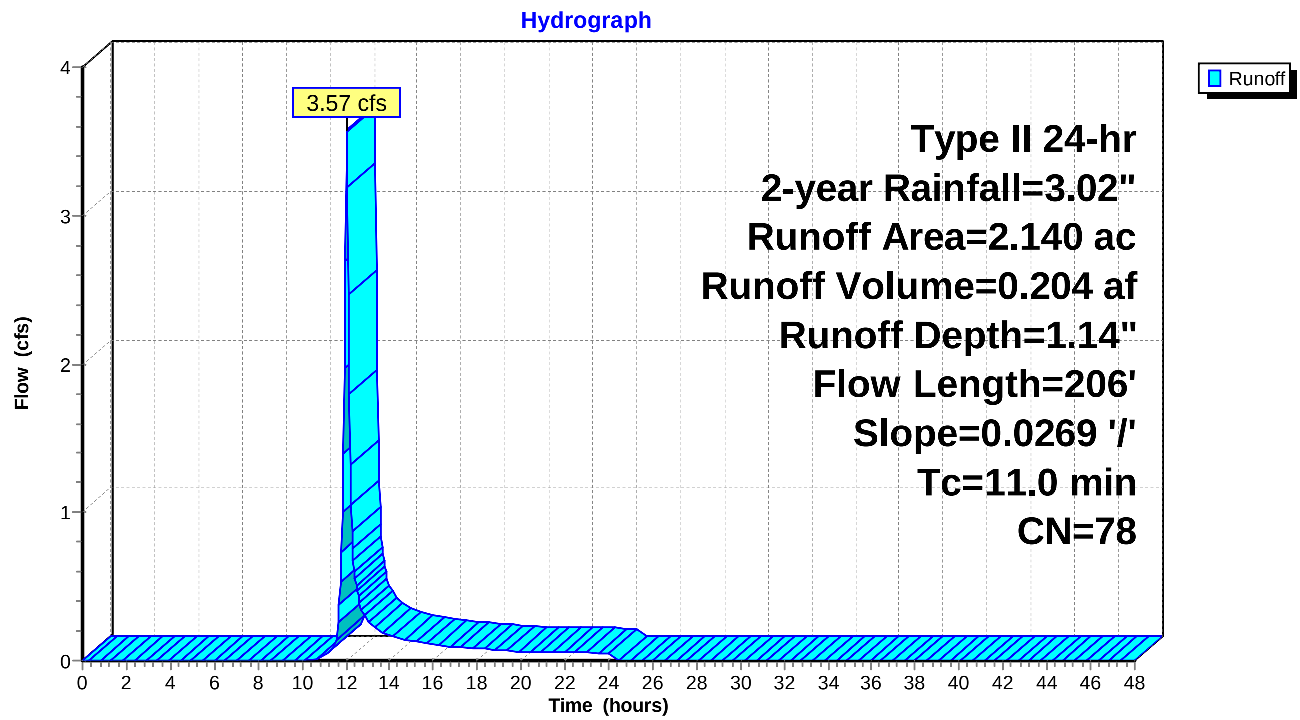
Runoff = 3.57 cfs @ 12.03 hrs, Volume= 0.204 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	2.140	78	
	2.140		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.5	106	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.0	206	Total			

Subcatchment 21S: BDA-7-2



Summary for Subcatchment 23S: BDA-8-1

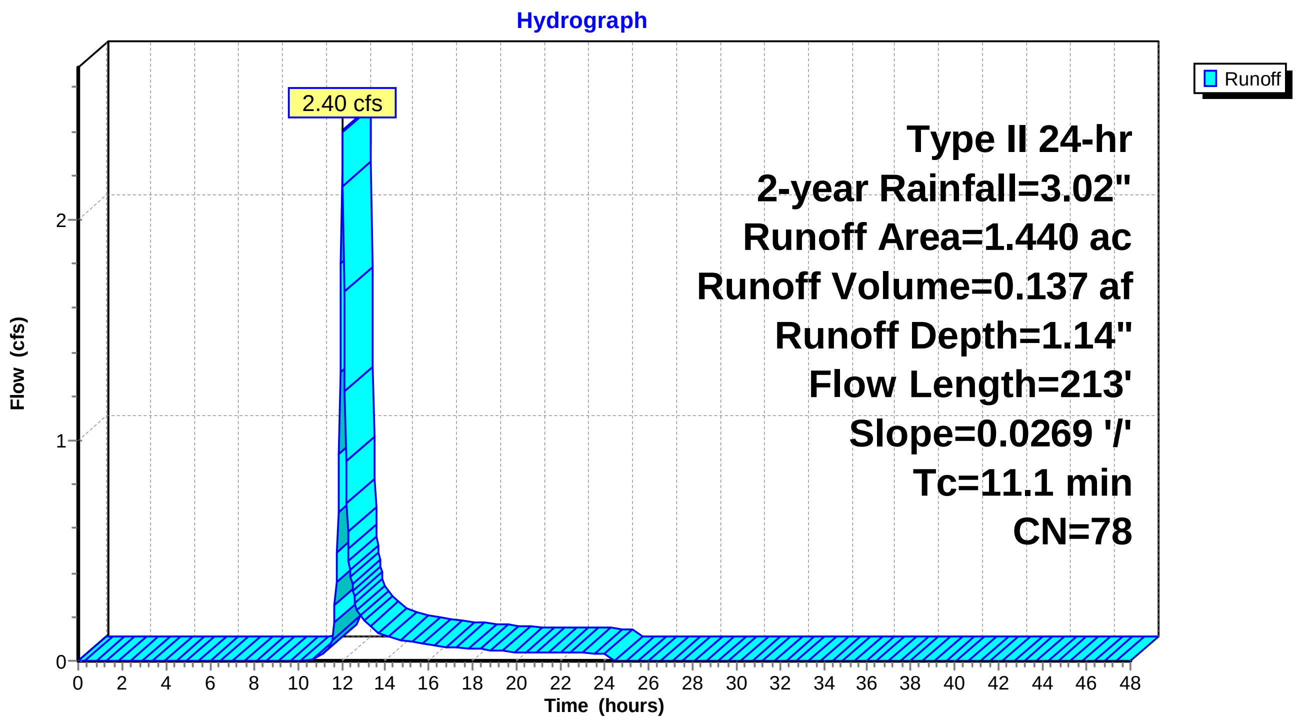
Runoff = 2.40 cfs @ 12.04 hrs, Volume= 0.137 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	1.440	78	
	1.440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	100	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.6	113	0.0269	1.15		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.1	213	Total			

Subcatchment 23S: BDA-8-1



Summary for Subcatchment 24S: BDA-8-2

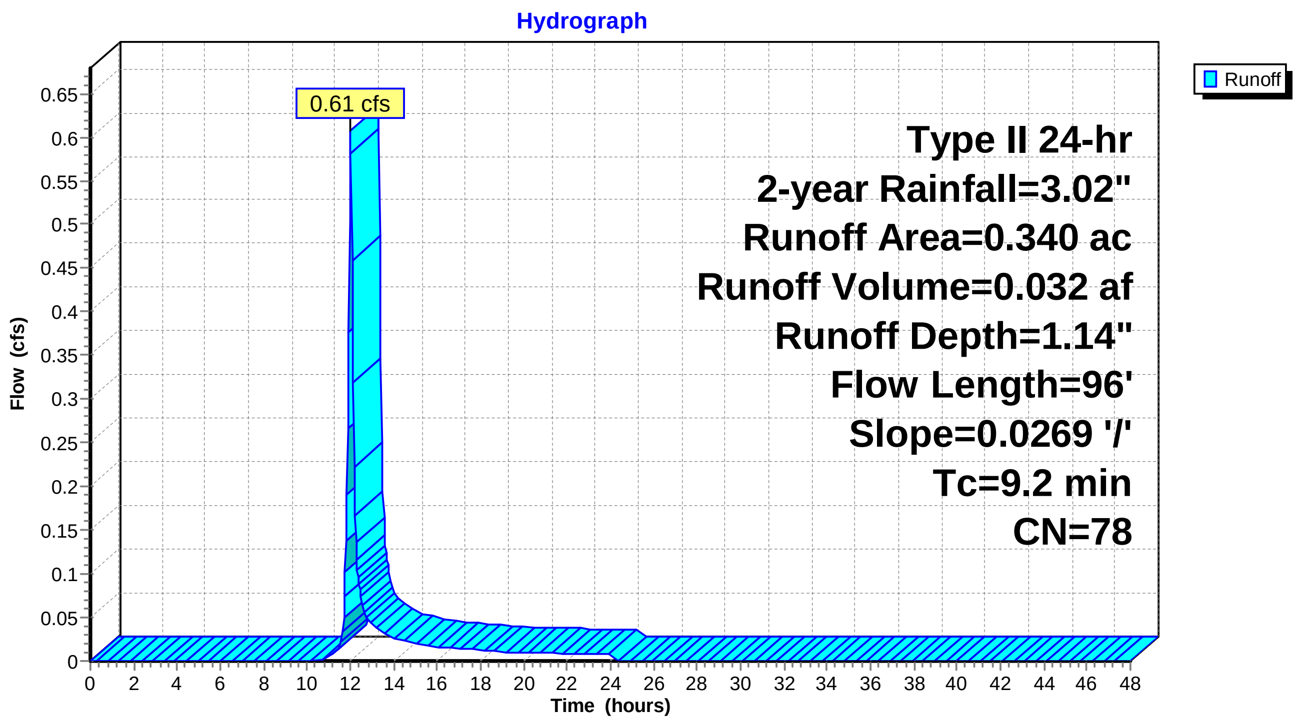
Runoff = 0.61 cfs @ 12.01 hrs, Volume= 0.032 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	0.340	78	
	0.340		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.2	96	0.0269	0.17		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"

Subcatchment 24S: BDA-8-2



Summary for Subcatchment 27S: BDA-9

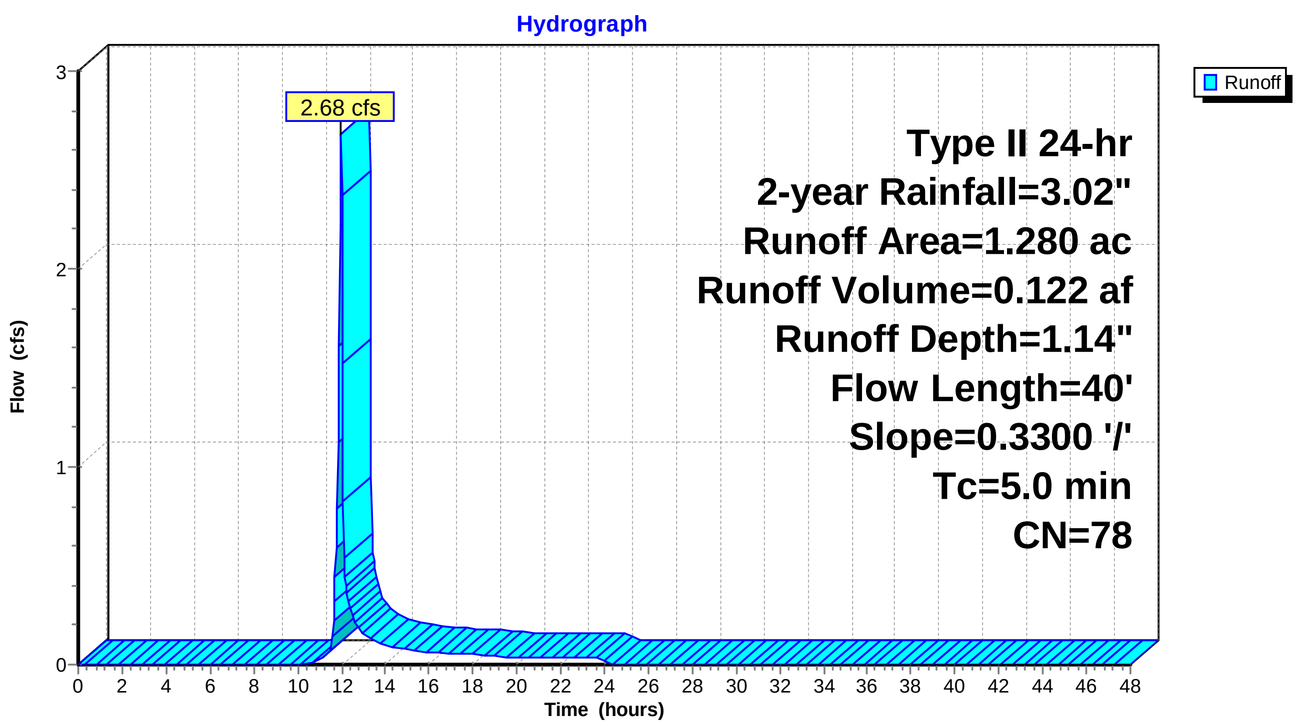
Runoff = 2.68 cfs @ 11.96 hrs, Volume= 0.122 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	1.280	78	
	1.280		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	40	0.3300	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.7	40	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 27S: BDA-9



Summary for Subcatchment 30S: BDA-10

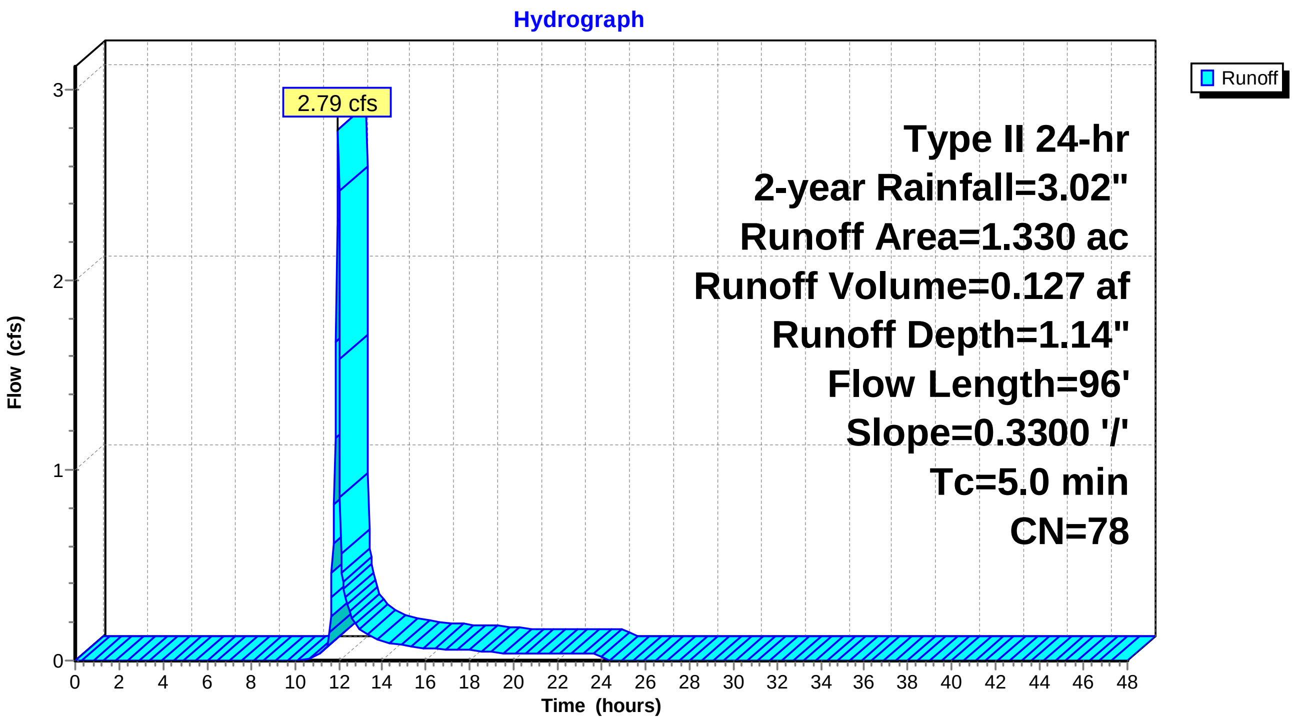
Runoff = 2.79 cfs @ 11.96 hrs, Volume= 0.127 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	1.330	78	
	1.330		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.4	96	0.3300	0.47		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
3.4	96	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 30S: BDA-10



Summary for Subcatchment 31S: BDA-11

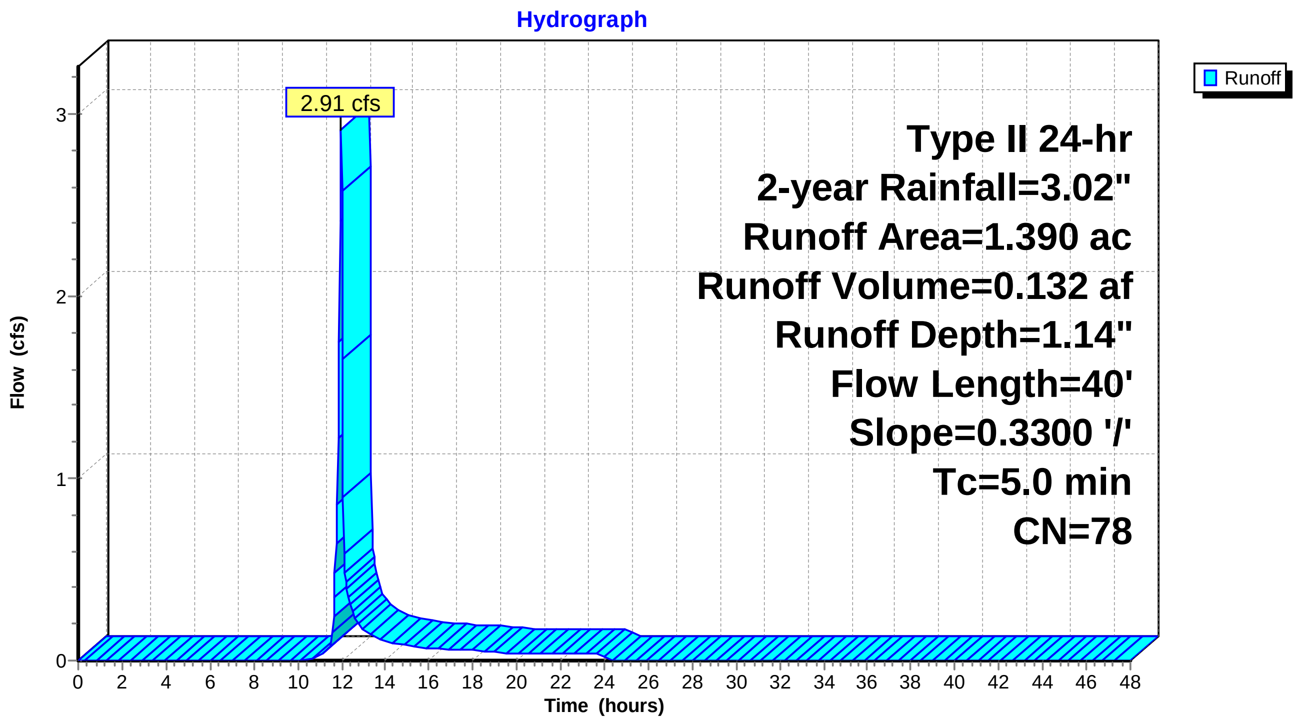
Runoff = 2.91 cfs @ 11.96 hrs, Volume= 0.132 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	1.390	78	
	1.390		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	40	0.3300	0.40		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
1.7	40	Total, Increased to minimum Tc = 5.0 min			

Subcatchment 31S: BDA-11



Summary for Subcatchment 34S: BDA-10

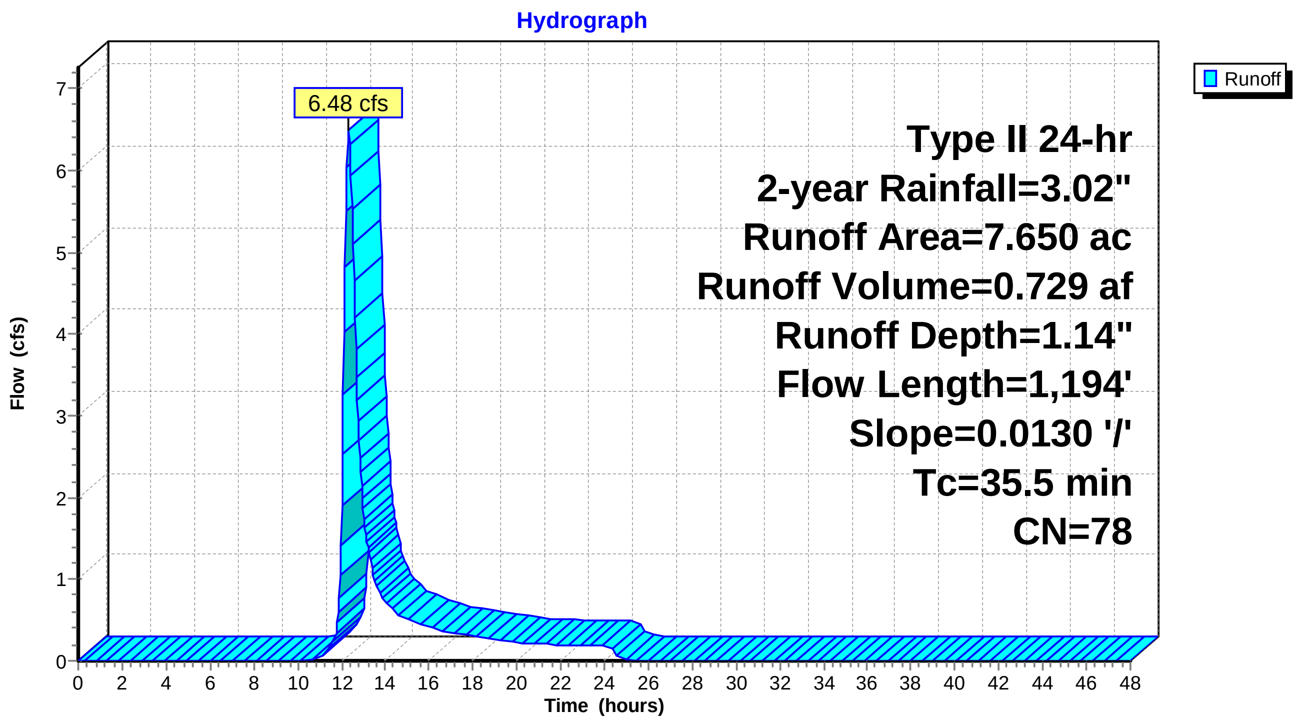
Runoff = 6.48 cfs @ 12.33 hrs, Volume= 0.729 af, Depth= 1.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Type II 24-hr 2-year Rainfall=3.02"

	Area (ac)	CN	Description
*	7.650	78	
	7.650		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	100	0.0130	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.67"
22.8	1,094	0.0130	0.80		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
35.5	1,194	Total			

Subcatchment 34S: BDA-10



Summary for Reach 1R: BDC-1

Inflow Area = 4.520 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 7.35 cfs @ 12.04 hrs, Volume= 0.431 af
Outflow = 7.06 cfs @ 12.07 hrs, Volume= 0.431 af, Atten= 4%, Lag= 1.7 min

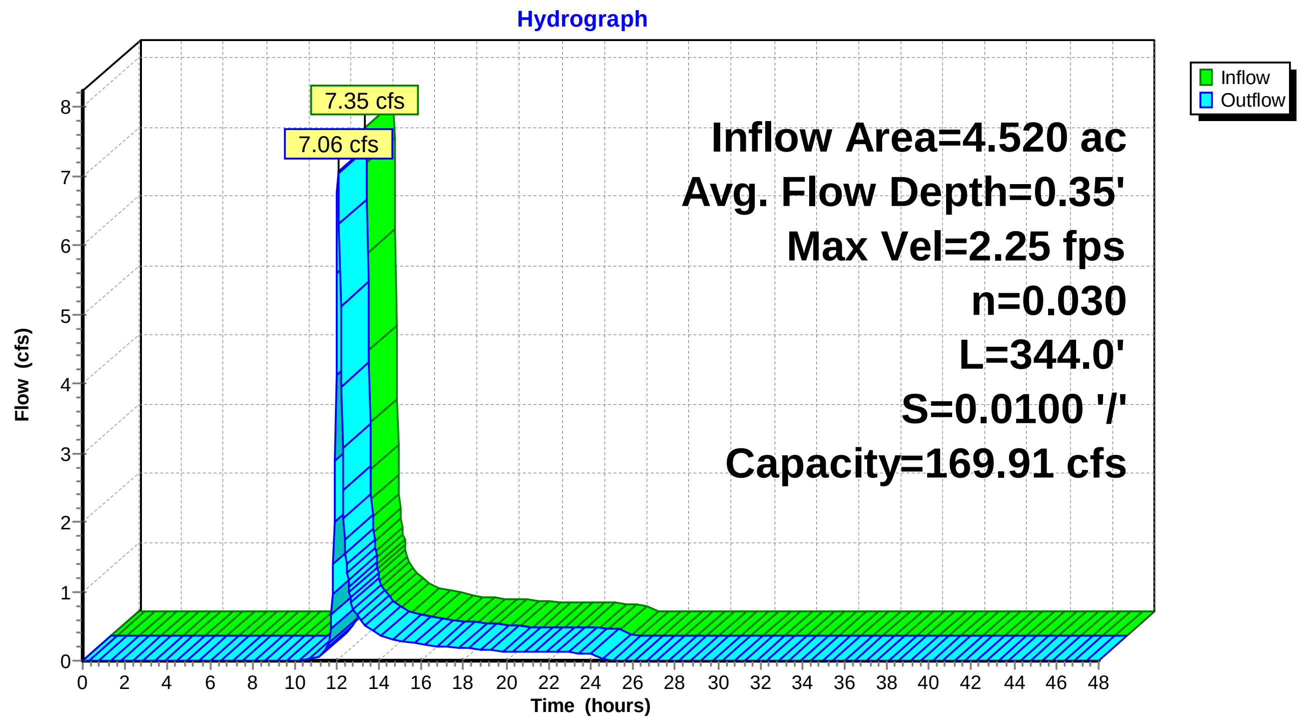
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 2.25 fps, Min. Travel Time= 2.5 min
Avg. Velocity = 0.61 fps, Avg. Travel Time= 9.5 min

Peak Storage= 1,077 cf @ 12.07 hrs
Average Depth at Peak Storage= 0.35'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 169.91 cfs

8.00' x 2.00' deep channel, n= 0.030
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 344.0' Slope= 0.0100 '/'
Inlet Invert= 464.00', Outlet Invert= 460.56'

‡

Reach 1R: BDC-1



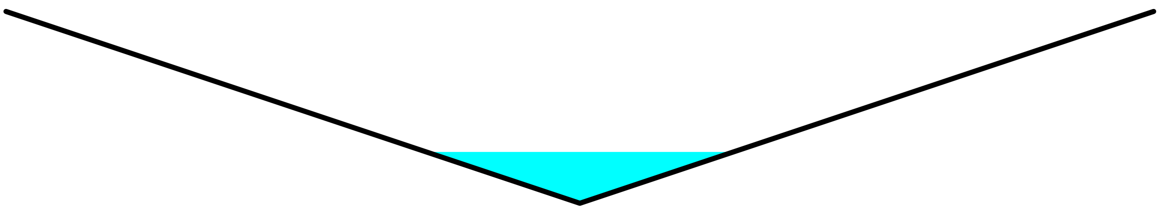
Summary for Reach 2R: PD-1

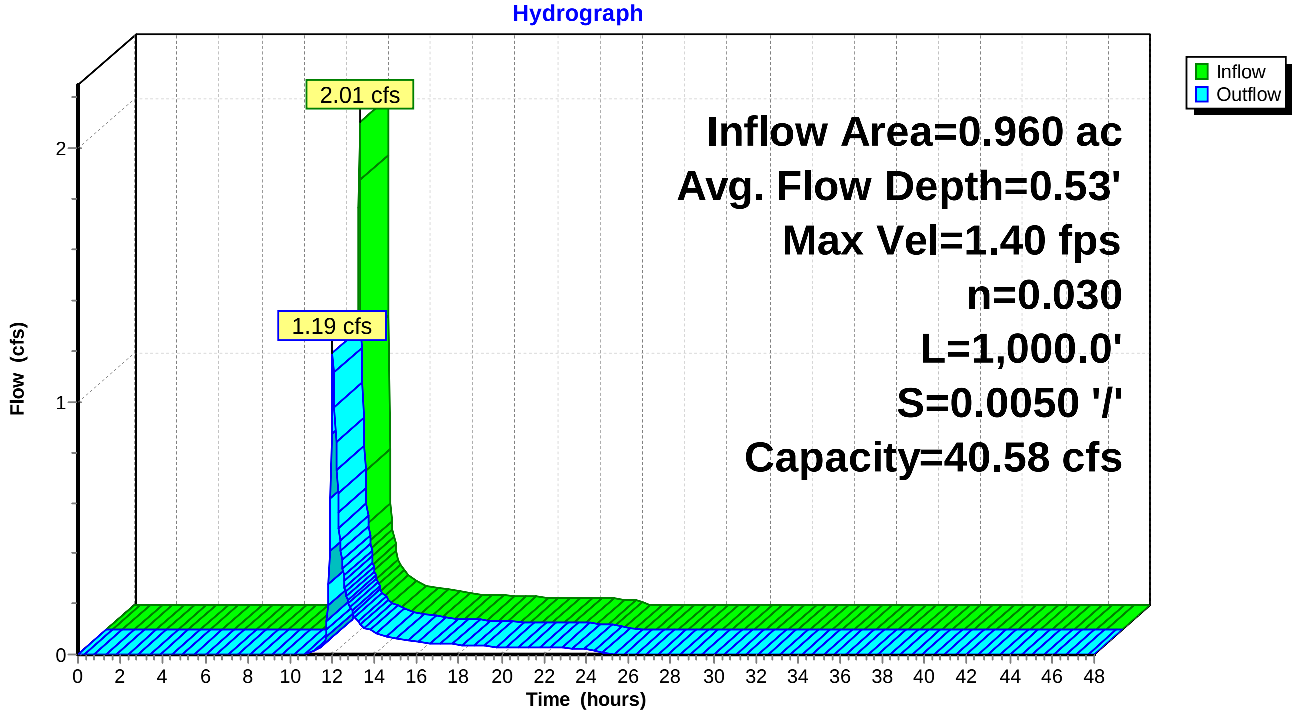
Inflow Area = 0.960 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 2.01 cfs @ 11.96 hrs, Volume= 0.091 af
Outflow = 1.19 cfs @ 12.04 hrs, Volume= 0.091 af, Atten= 41%, Lag= 4.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 1.40 fps, Min. Travel Time= 11.9 min
Avg. Velocity = 0.47 fps, Avg. Travel Time= 35.3 min

Peak Storage= 850 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.53'
Bank-Full Depth= 2.00' Flow Area= 12.0 sf, Capacity= 40.58 cfs

0.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 1,000.0' Slope= 0.0050 '/'
Inlet Invert= 460.00', Outlet Invert= 455.00'





Summary for Reach 6R: BDC-2

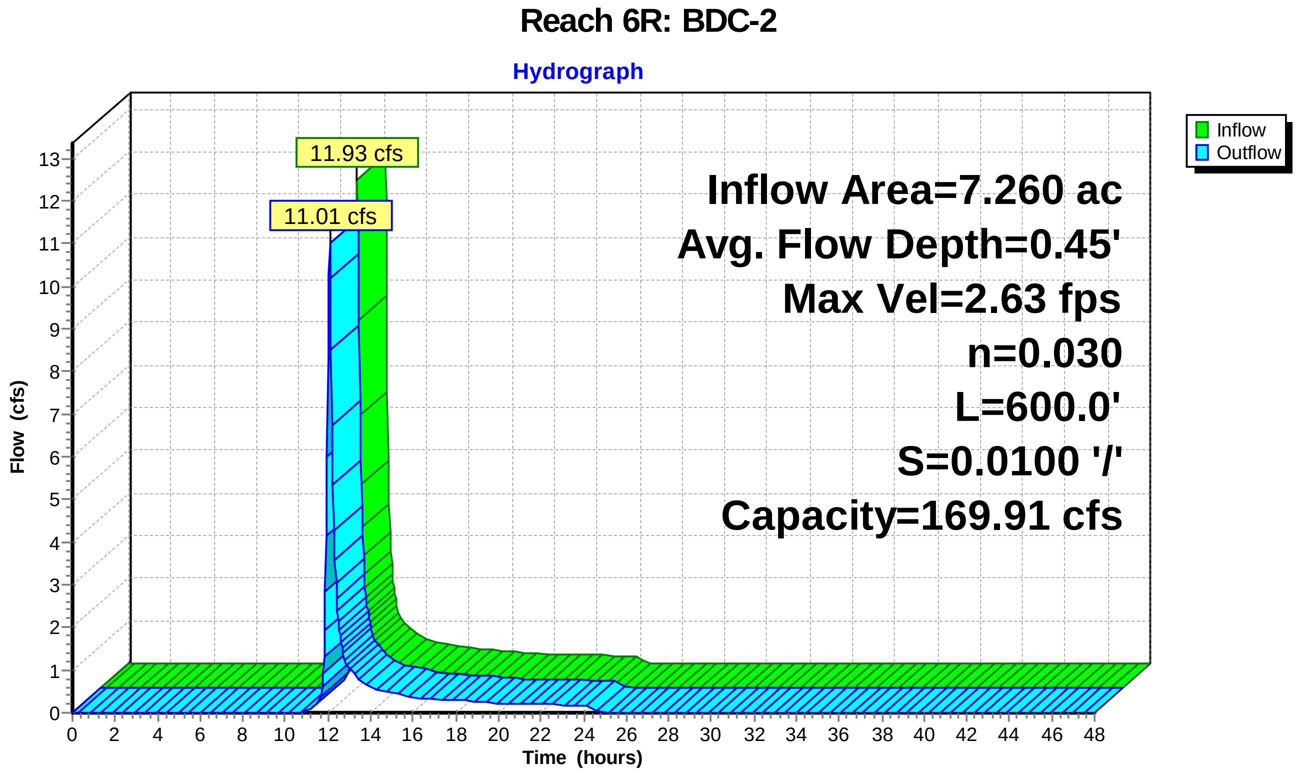
Inflow Area = 7.260 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 11.93 cfs @ 12.04 hrs, Volume= 0.692 af
Outflow = 11.01 cfs @ 12.08 hrs, Volume= 0.692 af, Atten= 8%, Lag= 2.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 2.63 fps, Min. Travel Time= 3.8 min
Avg. Velocity = 0.68 fps, Avg. Travel Time= 14.8 min

Peak Storage= 2,513 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.45'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 169.91 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 600.0' Slope= 0.0100 '/'
Inlet Invert= 466.00', Outlet Invert= 460.00'

‡



Summary for Reach 10R: BDC-3

Inflow Area = 8.780 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 9.22 cfs @ 12.05 hrs, Volume= 0.836 af
Outflow = 8.24 cfs @ 12.11 hrs, Volume= 0.836 af, Atten= 11%, Lag= 3.9 min

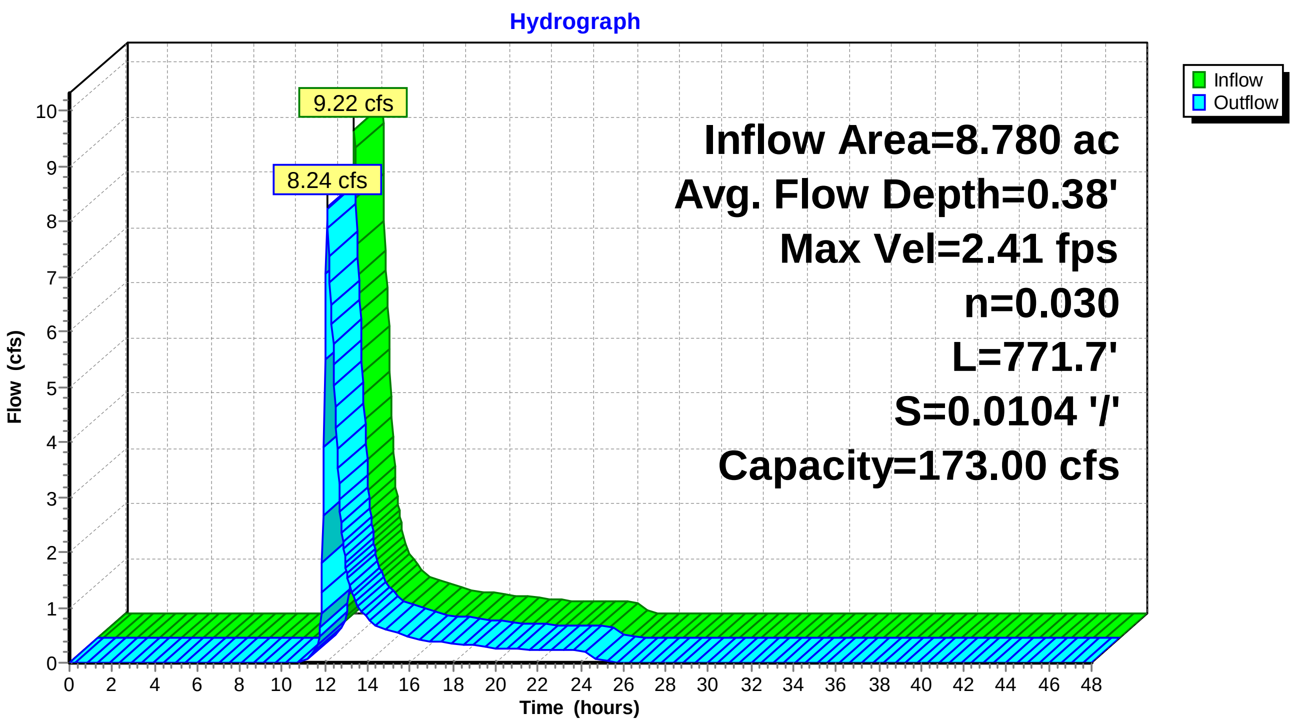
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 2.41 fps, Min. Travel Time= 5.3 min
Avg. Velocity = 0.72 fps, Avg. Travel Time= 18.0 min

Peak Storage= 2,641 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.38'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 173.00 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 771.7' Slope= 0.0104 '/'
Inlet Invert= 468.00', Outlet Invert= 460.00'

‡

Reach 10R: BDC-3



Summary for Reach 14R: BDC-4

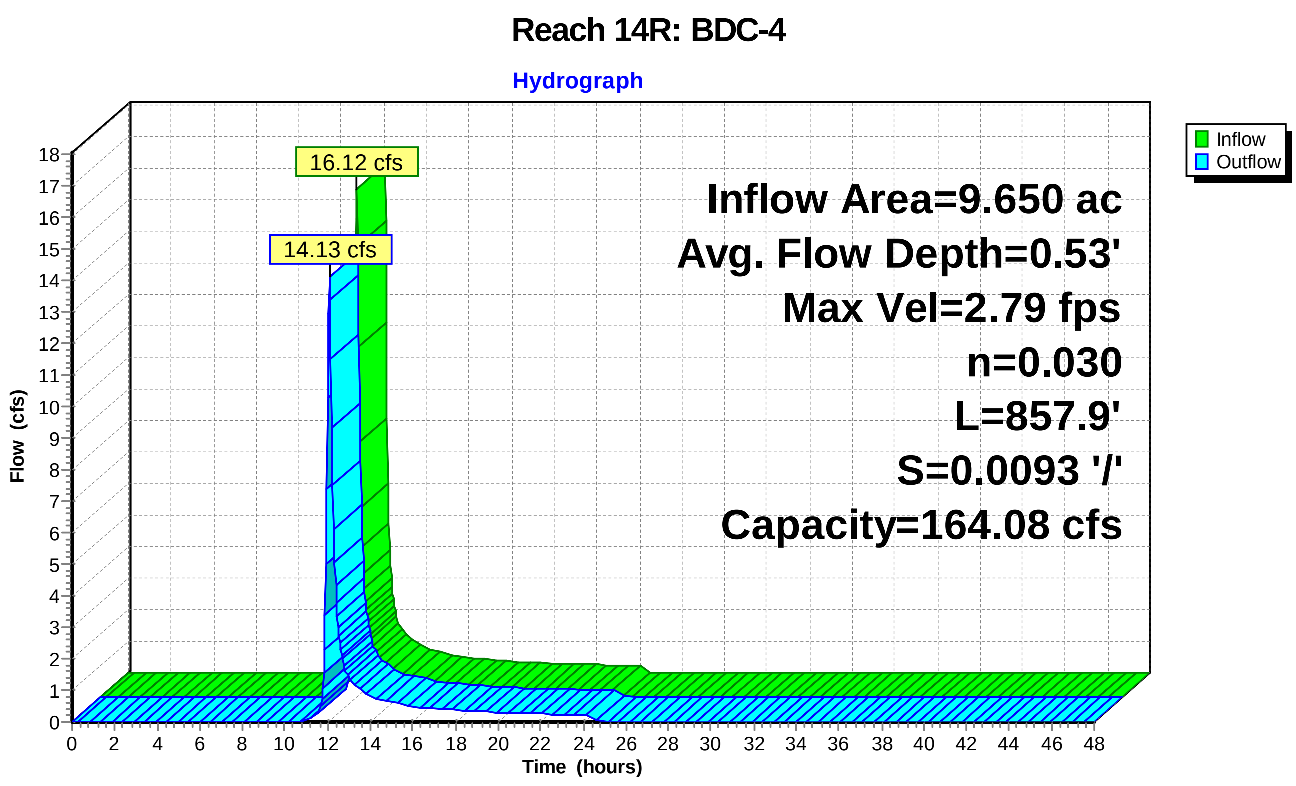
Inflow Area = 9.650 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 16.12 cfs @ 12.03 hrs, Volume= 0.919 af
Outflow = 14.13 cfs @ 12.08 hrs, Volume= 0.919 af, Atten= 12%, Lag= 3.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 2.79 fps, Min. Travel Time= 5.1 min
Avg. Velocity = 0.69 fps, Avg. Travel Time= 20.6 min

Peak Storage= 4,340 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.53'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 164.08 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 857.9' Slope= 0.0093 '/'
Inlet Invert= 470.00', Outlet Invert= 462.00'

‡



Summary for Reach 17R: PD-2

Inflow Area = 11.570 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 15.00 cfs @ 12.12 hrs, Volume= 1.102 af
Outflow = 14.03 cfs @ 12.17 hrs, Volume= 1.102 af, Atten= 6%, Lag= 2.9 min

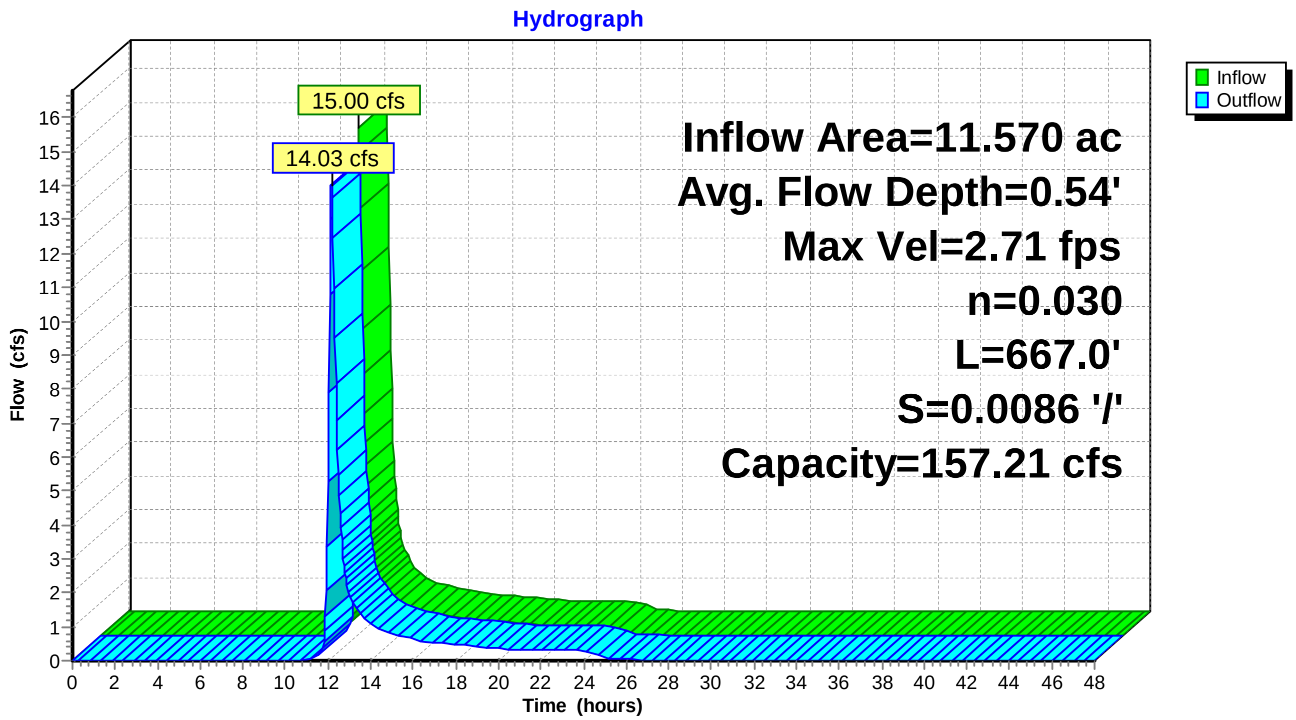
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 2.71 fps, Min. Travel Time= 4.1 min
Avg. Velocity = 0.67 fps, Avg. Travel Time= 16.7 min

Peak Storage= 3,456 cf @ 12.17 hrs
Average Depth at Peak Storage= 0.54'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 157.21 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 667.0' Slope= 0.0086 '/'
Inlet Invert= 457.00', Outlet Invert= 451.29'

‡

Reach 17R: PD-2



Summary for Reach 18R: BDC-5

Inflow Area = 11.570 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 18.22 cfs @ 12.05 hrs, Volume= 1.102 af
Outflow = 15.00 cfs @ 12.12 hrs, Volume= 1.102 af, Atten= 18%, Lag= 4.2 min

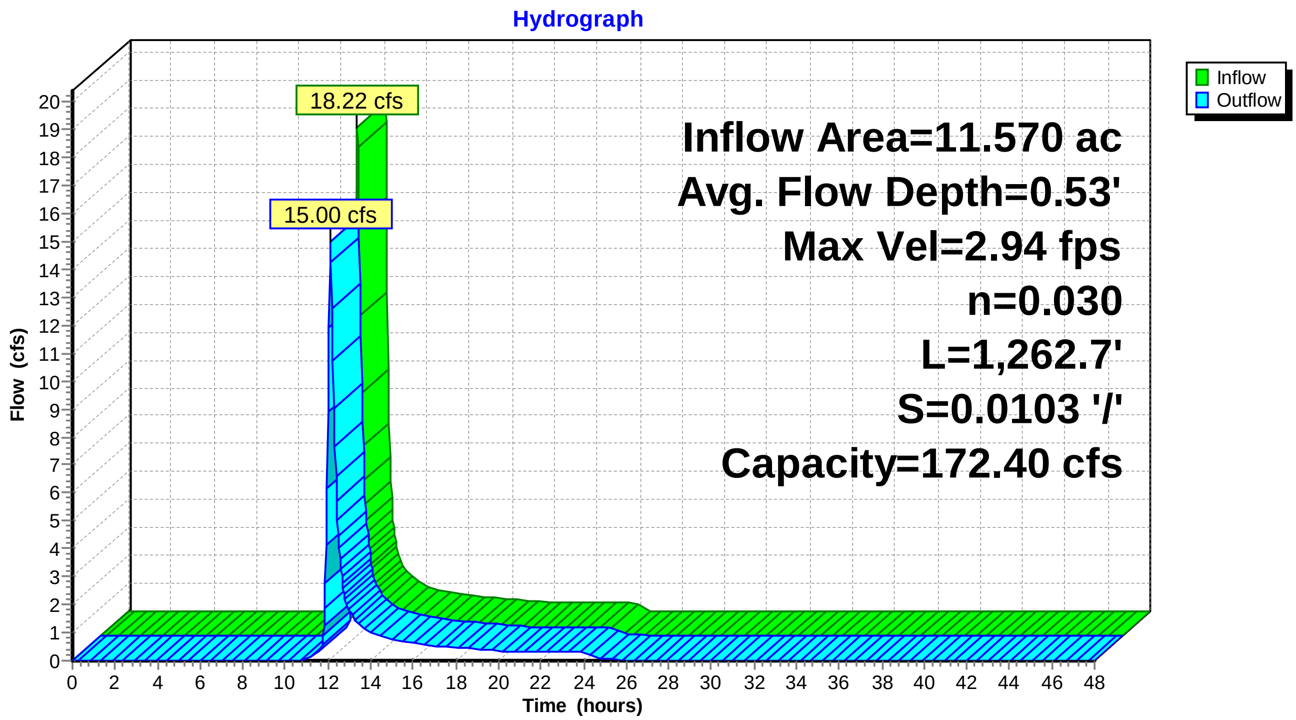
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 2.94 fps, Min. Travel Time= 7.1 min
Avg. Velocity = 0.72 fps, Avg. Travel Time= 29.2 min

Peak Storage= 6,431 cf @ 12.12 hrs
Average Depth at Peak Storage= 0.53'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 172.40 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 1,262.7' Slope= 0.0103 '/'
Inlet Invert= 470.00', Outlet Invert= 457.00'

‡

Reach 18R: BDC-5



Summary for Reach 20R: BDC-6

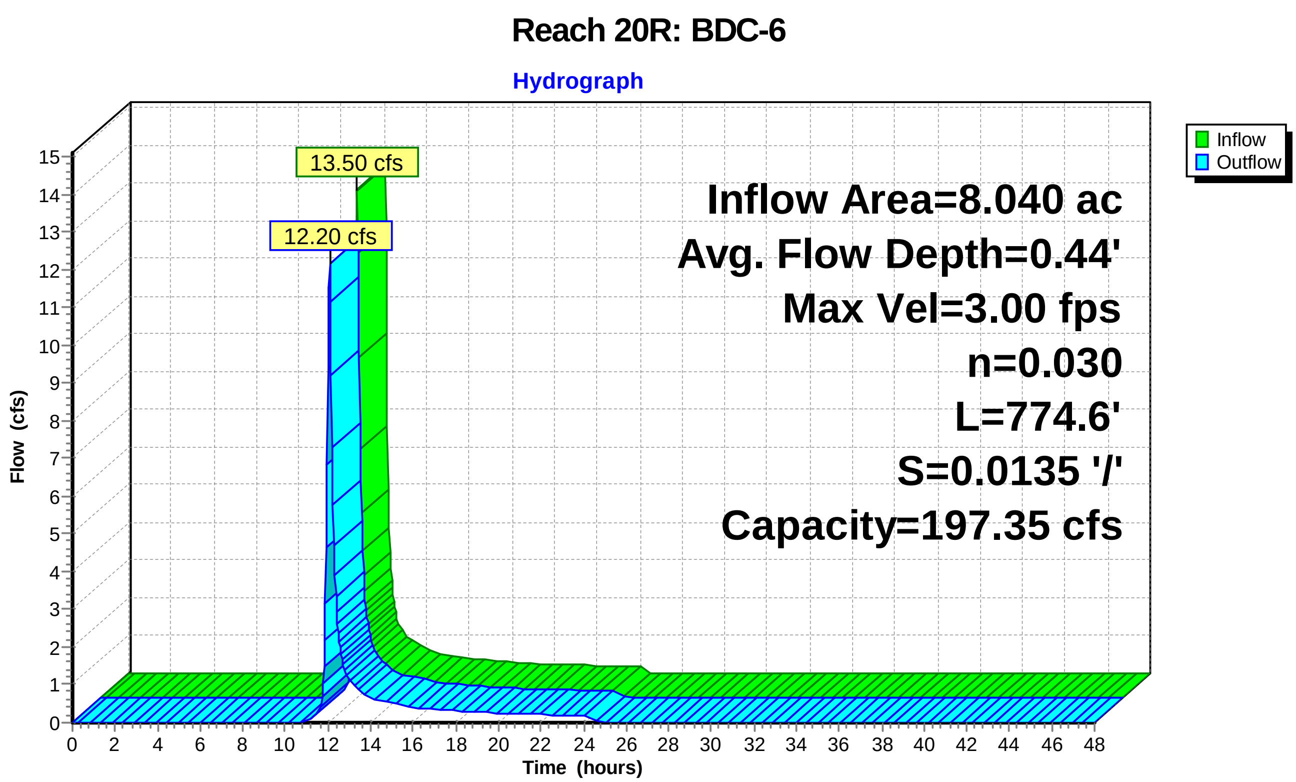
Inflow Area = 8.040 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 13.50 cfs @ 12.03 hrs, Volume= 0.766 af
Outflow = 12.20 cfs @ 12.08 hrs, Volume= 0.766 af, Atten= 10%, Lag= 2.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 3.00 fps, Min. Travel Time= 4.3 min
Avg. Velocity = 0.77 fps, Avg. Travel Time= 16.8 min

Peak Storage= 3,144 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.44'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 197.35 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 774.6' Slope= 0.0135 '/'
Inlet Invert= 469.45', Outlet Invert= 459.00'

‡



Summary for Reach 22R: BDC-7

Inflow Area = 7.000 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 10.92 cfs @ 12.05 hrs, Volume= 0.667 af
Outflow = 10.39 cfs @ 12.09 hrs, Volume= 0.667 af, Atten= 5%, Lag= 2.1 min

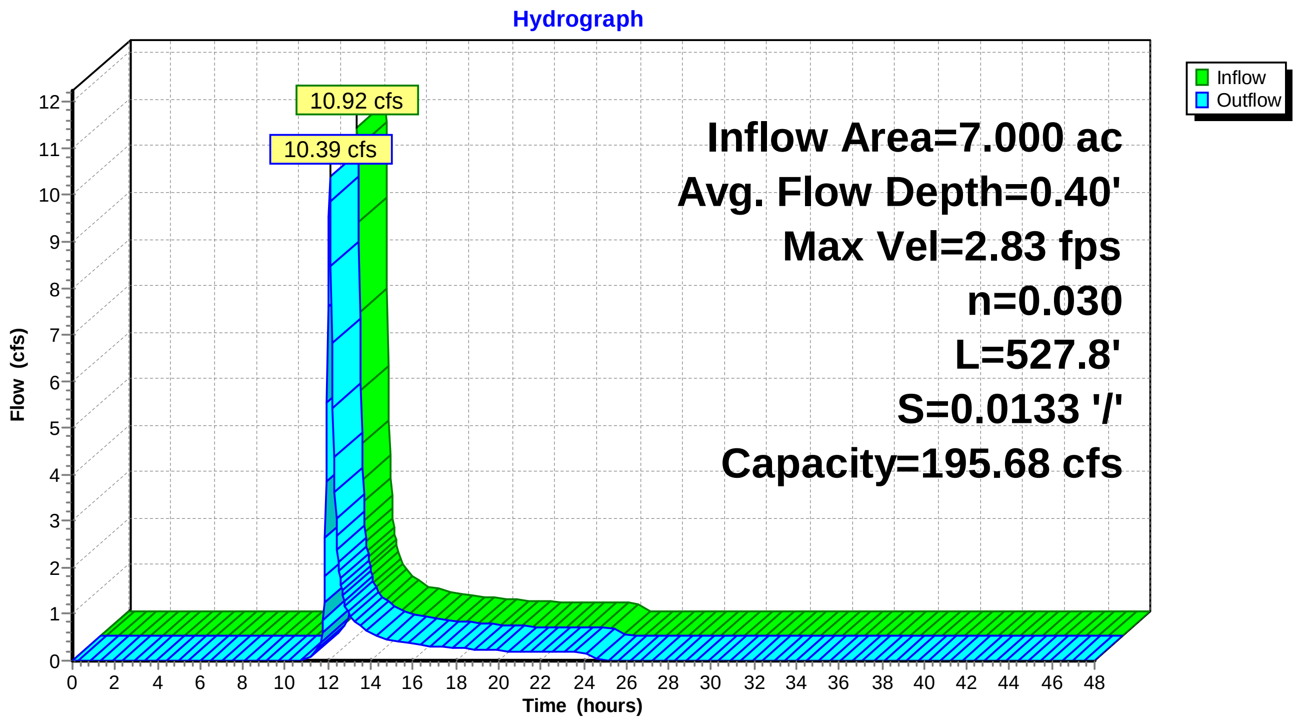
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 2.83 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 0.75 fps, Avg. Travel Time= 11.7 min

Peak Storage= 1,939 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.40'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 195.68 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 527.8' Slope= 0.0133 '/'
Inlet Invert= 462.00', Outlet Invert= 455.00'

‡

Reach 22R: BDC-7



Summary for Reach 25R: BDC-8

Inflow Area = 1.780 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 2.99 cfs @ 12.03 hrs, Volume= 0.170 af
Outflow = 2.91 cfs @ 12.05 hrs, Volume= 0.170 af, Atten= 3%, Lag= 1.3 min

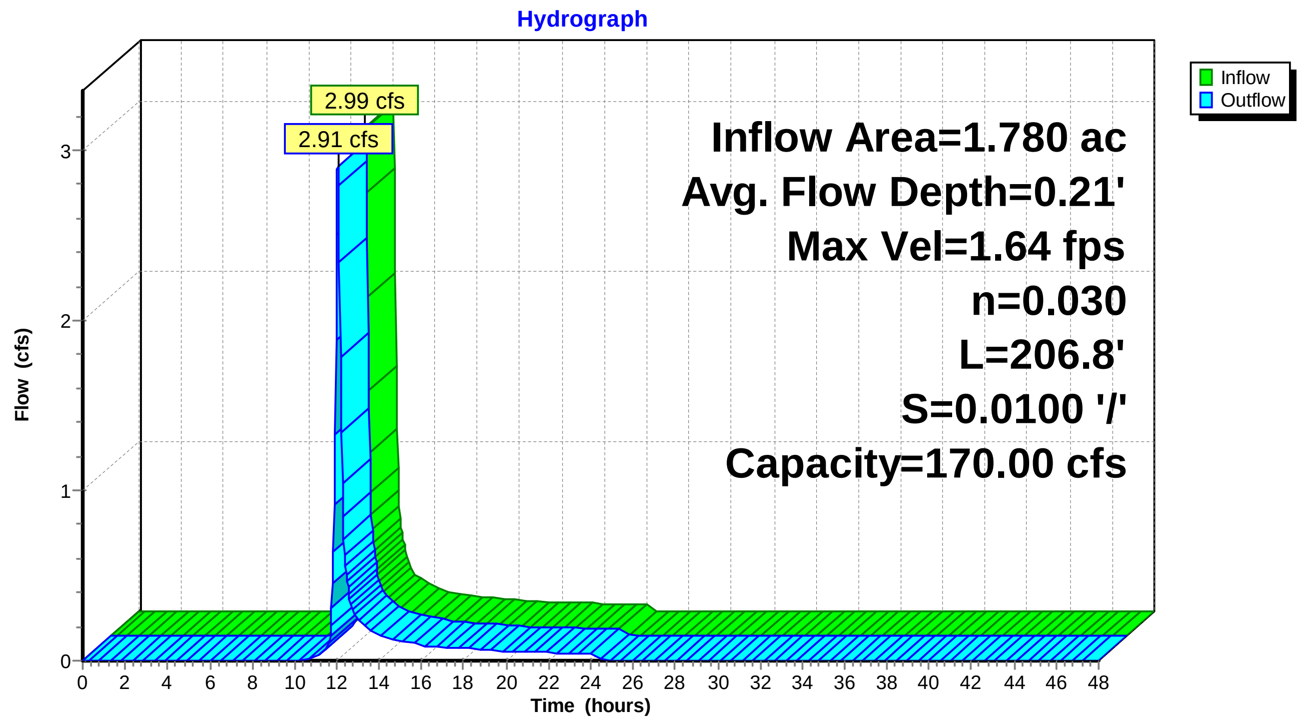
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 1.64 fps, Min. Travel Time= 2.1 min
Avg. Velocity = 0.46 fps, Avg. Travel Time= 7.6 min

Peak Storage= 366 cf @ 12.05 hrs
Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 170.00 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 206.8' Slope= 0.0100 '/'
Inlet Invert= 461.97', Outlet Invert= 459.90'

‡

Reach 25R: BDC-8



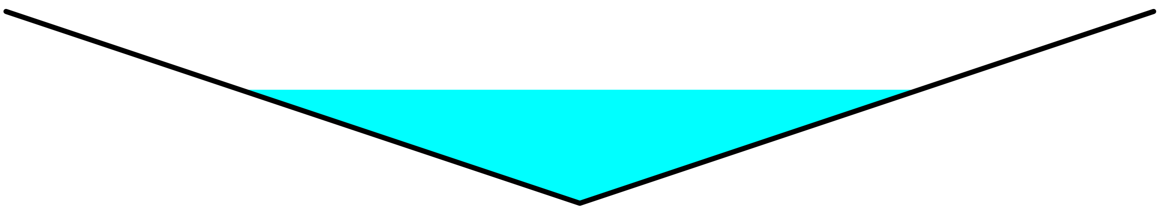
Summary for Reach 26R: PD-3

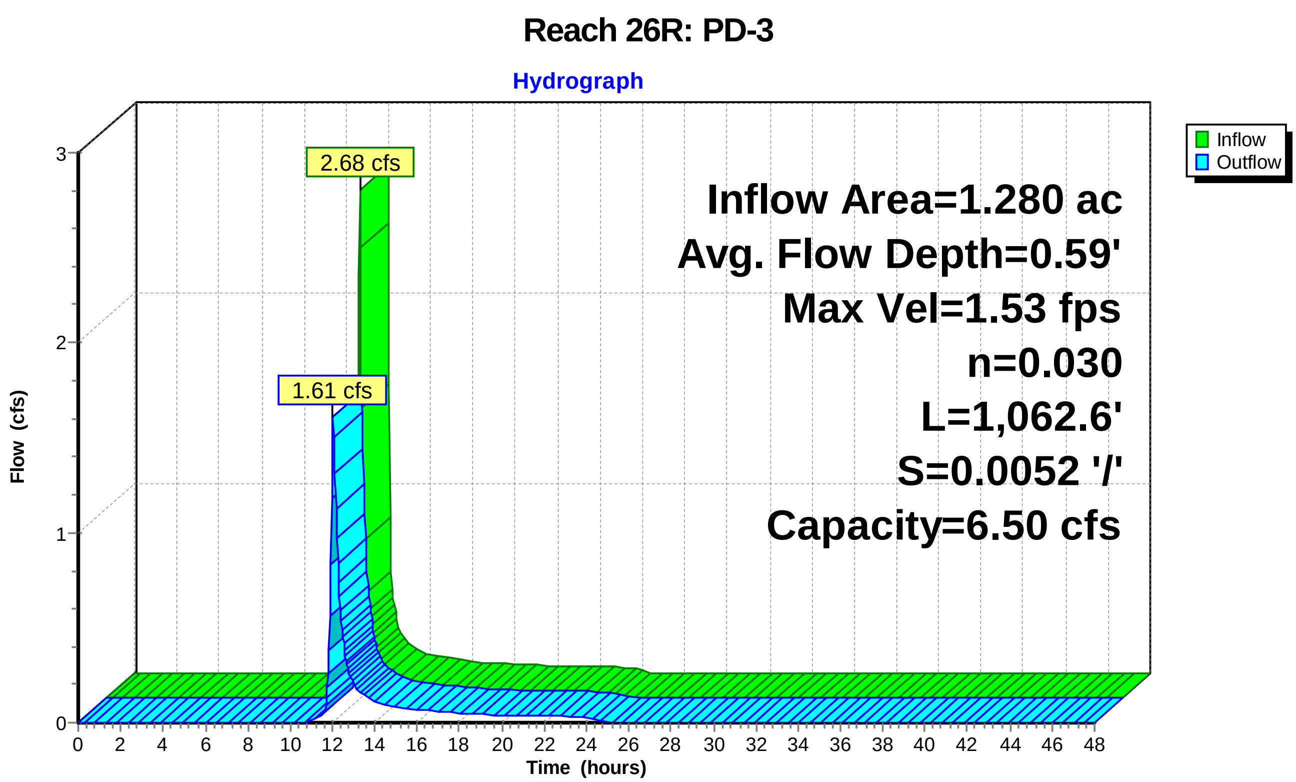
Inflow Area = 1.280 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 2.68 cfs @ 11.96 hrs, Volume= 0.122 af
Outflow = 1.61 cfs @ 12.04 hrs, Volume= 0.122 af, Atten= 40%, Lag= 4.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 1.53 fps, Min. Travel Time= 11.6 min
Avg. Velocity = 0.46 fps, Avg. Travel Time= 38.2 min

Peak Storage= 1,118 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.59'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 6.50 cfs

0.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 1,062.6' Slope= 0.0052 '/'
Inlet Invert= 457.49', Outlet Invert= 452.00'





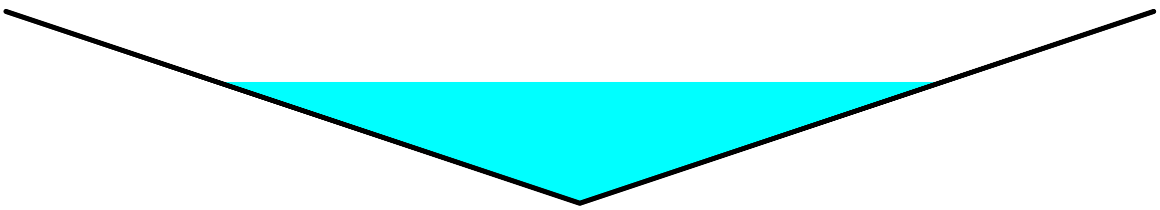
Summary for Reach 29R: PD-4

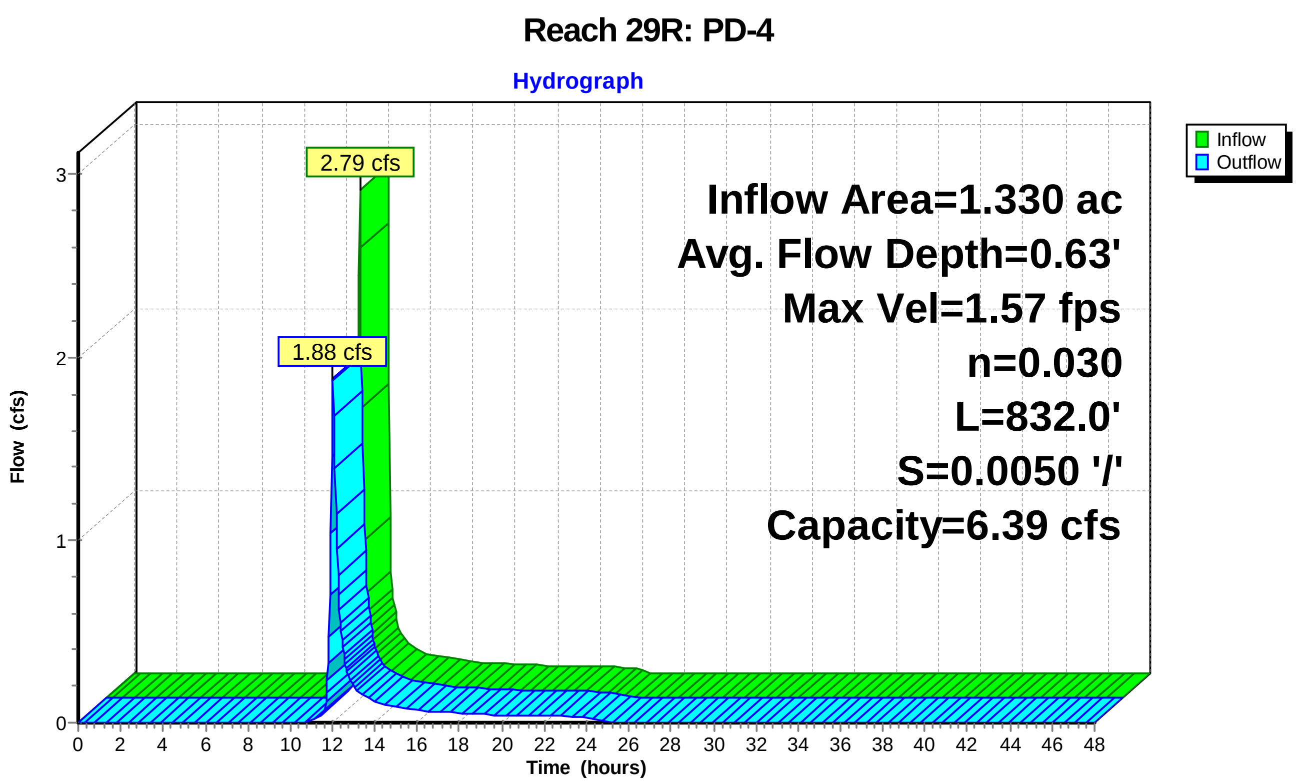
Inflow Area = 1.330 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 2.79 cfs @ 11.96 hrs, Volume= 0.127 af
Outflow = 1.88 cfs @ 12.03 hrs, Volume= 0.127 af, Atten= 32%, Lag= 4.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 1.57 fps, Min. Travel Time= 8.8 min
Avg. Velocity = 0.49 fps, Avg. Travel Time= 28.4 min

Peak Storage= 997 cf @ 12.03 hrs
Average Depth at Peak Storage= 0.63'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 6.39 cfs

0.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 832.0' Slope= 0.0050 '/'
Inlet Invert= 458.59', Outlet Invert= 454.43'





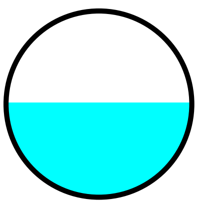
Summary for Reach 30R: BDC-9

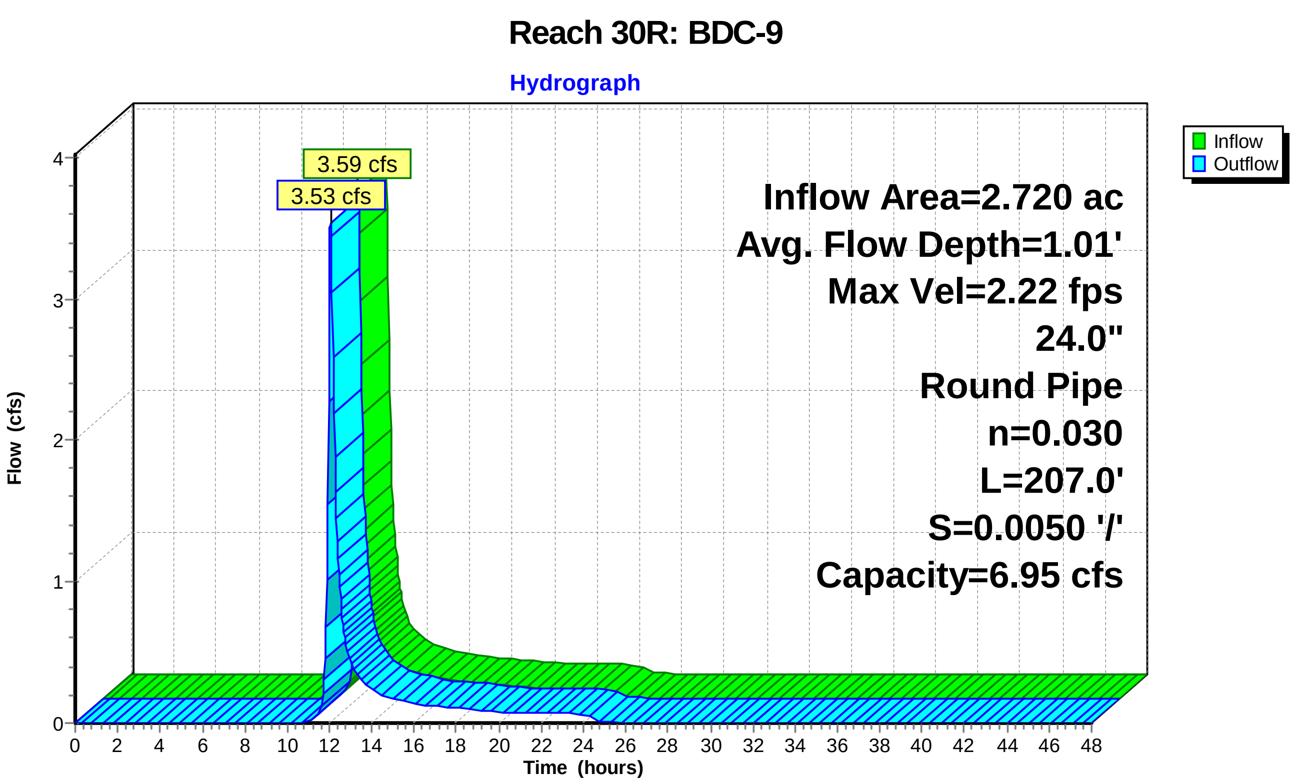
Inflow Area = 2.720 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 3.59 cfs @ 12.04 hrs, Volume= 0.259 af
Outflow = 3.53 cfs @ 12.06 hrs, Volume= 0.259 af, Atten= 2%, Lag= 1.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 2.22 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 0.60 fps, Avg. Travel Time= 5.7 min

Peak Storage= 329 cf @ 12.06 hrs
Average Depth at Peak Storage= 1.01'
Bank-Full Depth= 2.00' Flow Area= 3.1 sf, Capacity= 6.95 cfs

24.0" Round Pipe
n= 0.030 Corrugated metal
Length= 207.0' Slope= 0.0050 '/'
Inlet Invert= 454.43', Outlet Invert= 453.39'





Summary for Reach 31R: PD-6

Inflow Area = 10.060 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 14.69 cfs @ 12.07 hrs, Volume= 0.958 af
Outflow = 12.78 cfs @ 12.14 hrs, Volume= 0.958 af, Atten= 13%, Lag= 3.7 min

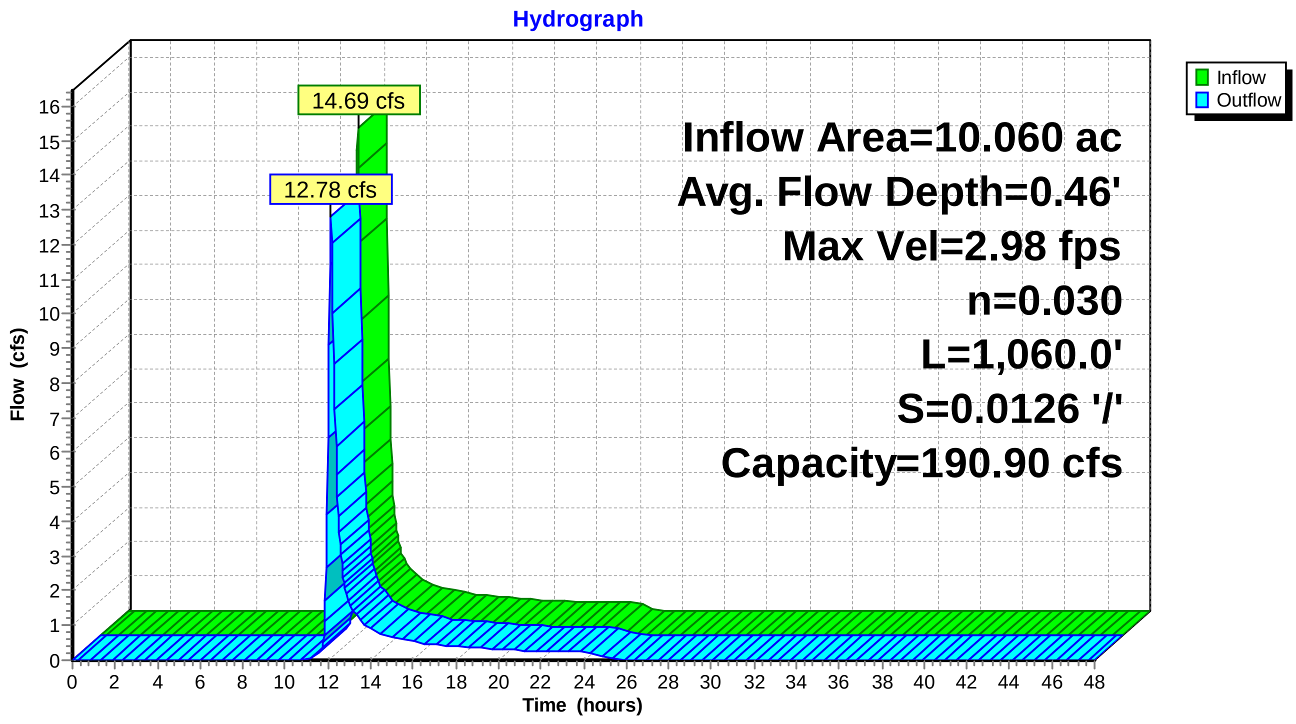
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 2.98 fps, Min. Travel Time= 5.9 min
Avg. Velocity = 0.74 fps, Avg. Travel Time= 23.7 min

Peak Storage= 4,537 cf @ 12.14 hrs
Average Depth at Peak Storage= 0.46'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 190.90 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, clean & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 1,060.0' Slope= 0.0126 '/'
Inlet Invert= 450.00', Outlet Invert= 436.62'

‡

Reach 31R: PD-6



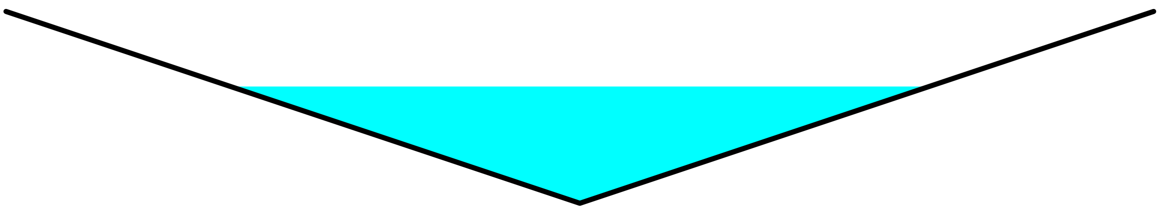
Summary for Reach 32R: PD-5

Inflow Area = 1.390 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 2.91 cfs @ 11.96 hrs, Volume= 0.132 af
Outflow = 1.72 cfs @ 12.04 hrs, Volume= 0.132 af, Atten= 41%, Lag= 4.7 min

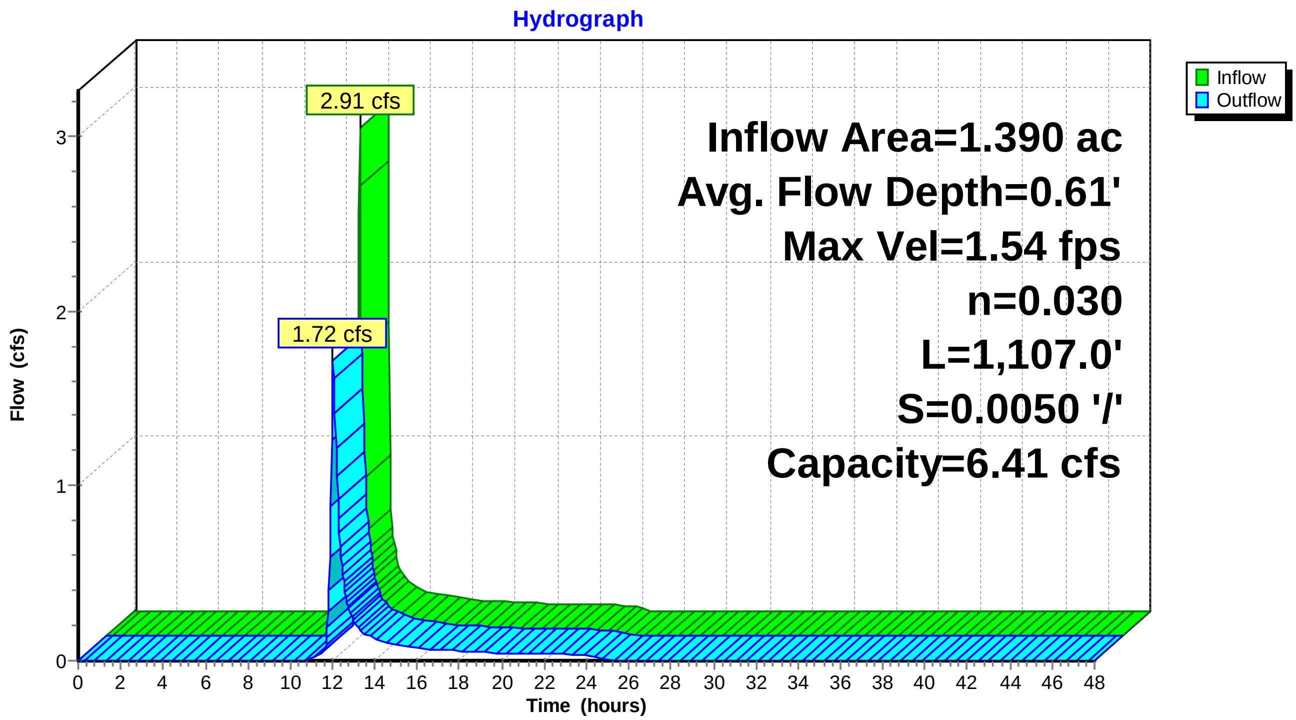
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 1.54 fps, Min. Travel Time= 12.0 min
Avg. Velocity = 0.46 fps, Avg. Travel Time= 40.0 min

Peak Storage= 1,236 cf @ 12.04 hrs
Average Depth at Peak Storage= 0.61'
Bank-Full Depth= 1.00' Flow Area= 3.0 sf, Capacity= 6.41 cfs

0.00' x 1.00' deep channel, n= 0.030 Earth, grassed & winding
Side Slope Z-value= 3.0 '/' Top Width= 6.00'
Length= 1,107.0' Slope= 0.0050 '/'
Inlet Invert= 460.00', Outlet Invert= 454.43'



Reach 32R: PD-5



Summary for Reach 33R: PD-7

Inflow Area = 10.060 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 12.78 cfs @ 12.14 hrs, Volume= 0.958 af
Outflow = 12.71 cfs @ 12.15 hrs, Volume= 0.958 af, Atten= 1%, Lag= 0.8 min

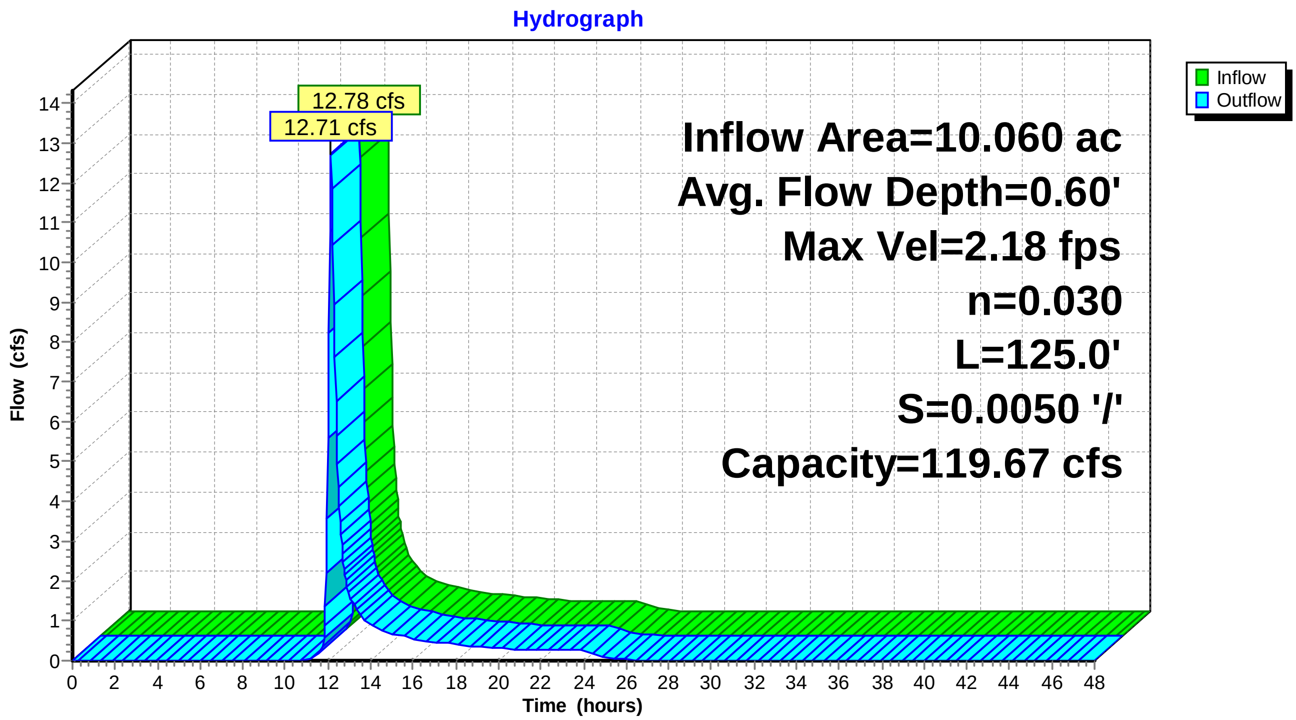
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Max. Velocity= 2.18 fps, Min. Travel Time= 1.0 min
Avg. Velocity = 0.53 fps, Avg. Travel Time= 4.0 min

Peak Storage= 728 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.60'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 119.67 cfs

8.00' x 2.00' deep channel, n= 0.030 Earth, clean & winding
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 125.0' Slope= 0.0050 '/'
Inlet Invert= 436.62', Outlet Invert= 436.00'

‡

Reach 33R: PD-7



Summary for Pond 3P: DA-1

```
Inflow Area =      5.480 ac,   0.00% Impervious,  Inflow Depth =   1.14"    for  2-year event
Inflow      =      8.20 cfs @  12.07 hrs,  Volume=         0.522 af
Outflow     =      0.01 cfs @  24.93 hrs,  Volume=         0.025 af,  Atten= 100%,  Lag= 771.7 min
Primary     =      0.01 cfs @  24.93 hrs,  Volume=         0.025 af
```

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Peak Elev= 454.89' @ 24.93 hrs Surf.Area= 0.598 ac Storage= 0.514 af

Plug-Flow detention time= 1,166.7 min calculated for 0.025 af (5% of inflow)
Center-of-Mass det. time= 1,004.0 min (1,866.0 - 862.0)

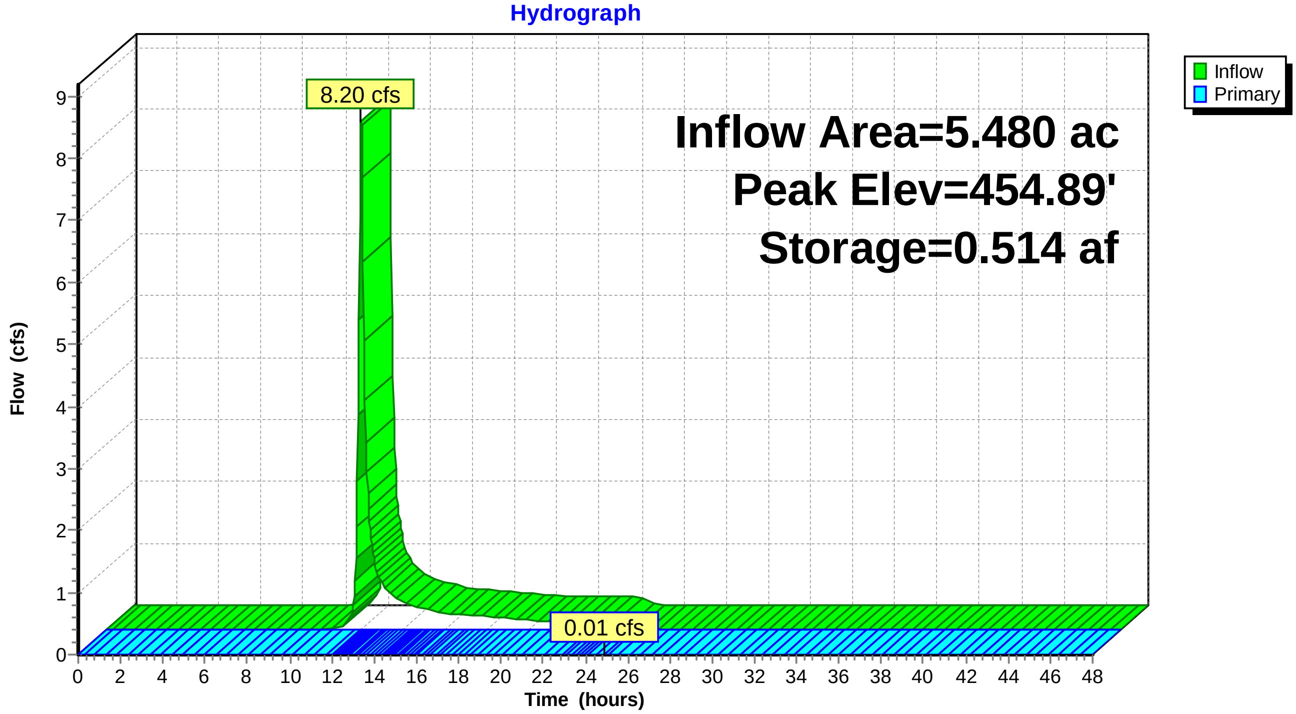
Volume	Invert	Avail.Storage	Storage Description
#1	454.00'	6.154 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
454.00	0.553	0.000	0.000
456.00	0.654	1.207	1.207
458.00	0.764	1.418	2.625
460.00	0.880	1.644	4.269
462.00	1.005	1.885	6.154

Device	Routing	Invert	Outlet Devices
#1	Device 3	458.11'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	454.11'	**0.4" Vert. Orifice/Grate** X 40 rows with 3.0" cc spacing C= 0.600
#3	Primary	454.11'	**12.0" Round Culvert** L= 111.0' Ke= 0.900 Inlet / Outlet Invert= 454.11' / 436.00' S= 0.1632 '/' Cc= 0.900 n= 0.030, Flow Area= 0.79 sf

Primary OutFlow Max=0.01 cfs @ 24.93 hrs HW=454.89' (Free Discharge)
└─**3=Culvert** (Passes 0.01 cfs of 1.57 cfs potential flow)
  ├─**1=Orifice/Grate** (Controls 0.00 cfs)
  └─**2=Orifice/Grate** (Orifice Controls 0.01 cfs @ 2.70 fps)

Pond 3P: DA-1


Hydrograph
8.20 cfs
0.01 cfs
Inflow Area=5.480 ac
Peak Elev=454.89'
Storage=0.514 af
Inflow
Primary
Flow (cfs)
Time (hours)
0
1
2
3
4
5
6
7
8
9
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48

Summary for Pond 7P: DA-2

Inflow Area = 7.260 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 11.01 cfs @ 12.08 hrs, Volume= 0.692 af
Outflow = 1.22 cfs @ 12.79 hrs, Volume= 0.690 af, Atten= 89%, Lag= 42.8 min
Primary = 1.22 cfs @ 12.79 hrs, Volume= 0.690 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Peak Elev= 458.36' @ 12.79 hrs Surf.Area= 0.168 ac Storage= 0.298 af

Plug-Flow detention time= 194.5 min calculated for 0.689 af (100% of inflow)
Center-of-Mass det. time= 194.0 min (1,057.2 - 863.3)

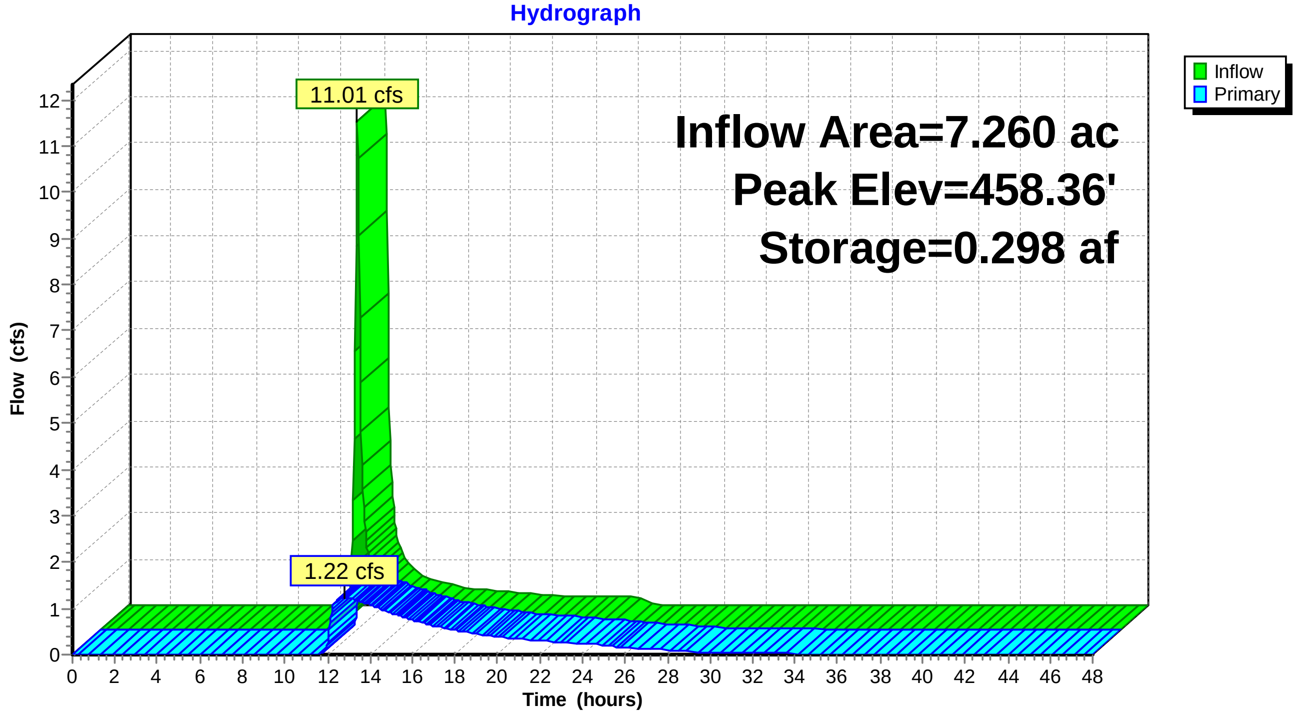
Volume	Invert	Avail.Storage	Storage Description
#1	456.00'	2.374 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
456.00	0.090	0.000	0.000
458.00	0.150	0.240	0.240
460.00	0.247	0.397	0.637
461.00	1.034	0.640	1.277
462.00	1.160	1.097	2.374

Device	Routing	Invert	Outlet Devices
#1	Device 3	460.00'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	456.00'	**0.4" Vert. Orifice/Grate X 28.00 columns** X 40 rows with 3.0" cc spacing C= 0.600
#3	Primary	456.00'	**12.0" Round Culvert** L= 105.0' Ke= 0.900 Inlet / Outlet Invert= 456.00' / 438.00' S= 0.1714 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.79 sf

Primary OutFlow Max=1.22 cfs @ 12.79 hrs HW=458.36' (Free Discharge)
└─**3=Culvert** (Passes 1.22 cfs of 4.08 cfs potential flow)
  ├─**1=Orifice/Grate** (Controls 0.00 cfs)
  └─**2=Orifice/Grate** (Orifice Controls 1.22 cfs @ 5.01 fps)

Pond 7P: DA-2


Hydrograph
11.01 cfs
1.22 cfs
Inflow Area=7.260 ac
Peak Elev=458.36'
Storage=0.298 af
Inflow
Primary
Flow (cfs)
Time (hours)
0
1
2
3
4
5
6
7
8
9
10
11
12
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48

Summary for Pond 11P: DA-3

Inflow Area = 8.780 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 8.24 cfs @ 12.11 hrs, Volume= 0.836 af
Outflow = 1.46 cfs @ 13.14 hrs, Volume= 0.835 af, Atten= 82%, Lag= 61.3 min
Primary = 1.46 cfs @ 13.14 hrs, Volume= 0.835 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Peak Elev= 458.67' @ 13.14 hrs Surf.Area= 0.184 ac Storage= 0.352 af

Plug-Flow detention time= 191.2 min calculated for 0.835 af (100% of inflow)
Center-of-Mass det. time= 189.9 min (1,064.1 - 874.2)

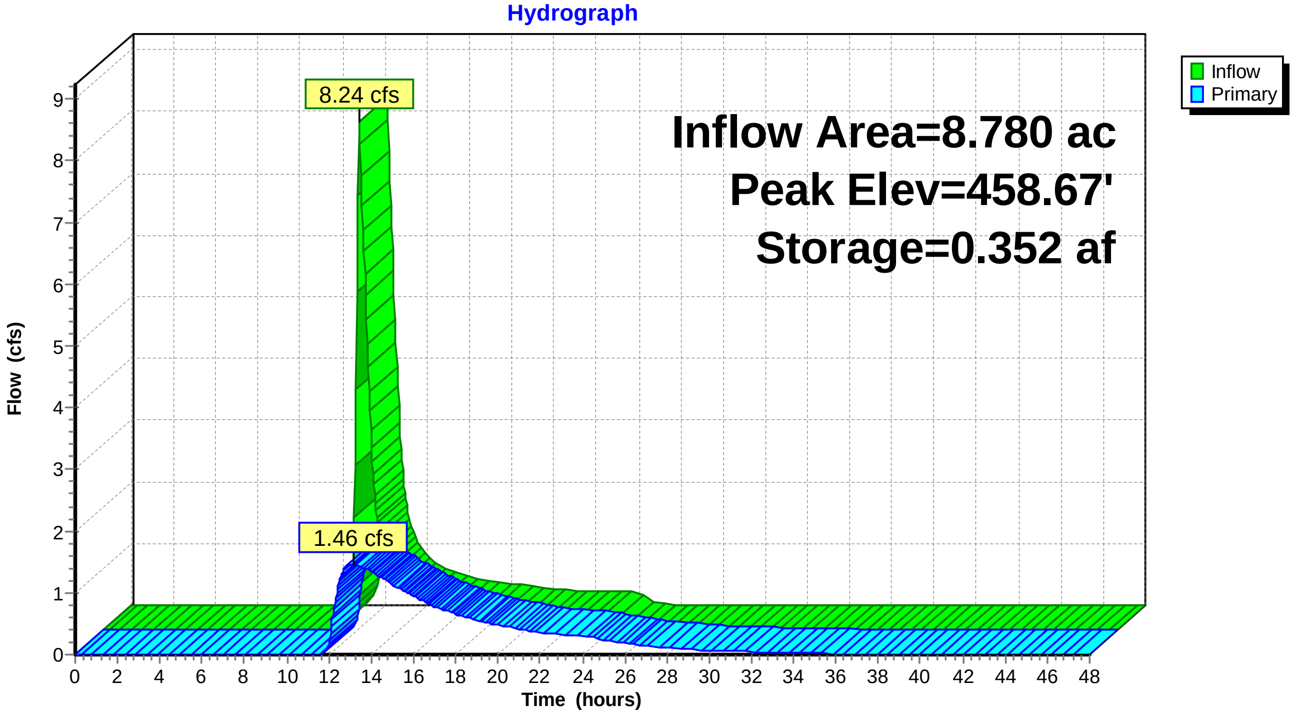
Volume	Invert	Avail.Storage	Storage Description
#1	456.00'	2.357 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
456.00	0.090	0.000	0.000
458.00	0.150	0.240	0.240
460.00	0.250	0.400	0.640
461.00	1.040	0.645	1.285
462.00	1.104	1.072	2.357

Device	Routing	Invert	Outlet Devices
#1	Device 3	460.00'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	456.00'	**0.4" Vert. Orifice/Grate X 28.00 columns** X 40 rows with 3.0" cc spacing C= 0.600
#3	Primary	456.00'	**12.0" Round Culvert** L= 105.0' Ke= 0.900 Inlet / Outlet Invert= 456.00' / 432.00' S= 0.2286 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.79 sf

Primary OutFlow Max=1.46 cfs @ 13.14 hrs HW=458.67' (Free Discharge)
└**3=Culvert** (Passes 1.46 cfs of 4.40 cfs potential flow)
 ├**1=Orifice/Grate** (Controls 0.00 cfs)
 └**2=Orifice/Grate** (Orifice Controls 1.46 cfs @ 5.41 fps)

Pond 11P: DA-3


Hydrograph
8.24 cfs
1.46 cfs
Inflow Area=8.780 ac
Peak Elev=458.67'
Storage=0.352 af
Inflow
Primary
Flow (cfs)
0
1
2
3
4
5
6
7
8
9
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48
Time (hours)

Summary for Pond 15P: DA-4

Inflow Area = 9.650 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 14.13 cfs @ 12.08 hrs, Volume= 0.919 af
Outflow = 1.63 cfs @ 12.83 hrs, Volume= 0.918 af, Atten= 88%, Lag= 44.5 min
Primary = 1.63 cfs @ 12.83 hrs, Volume= 0.918 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Peak Elev= 458.88' @ 12.83 hrs Surf.Area= 0.194 ac Storage= 0.392 af

Plug-Flow detention time= 189.4 min calculated for 0.918 af (100% of inflow)
Center-of-Mass det. time= 188.2 min (1,054.0 - 865.8)

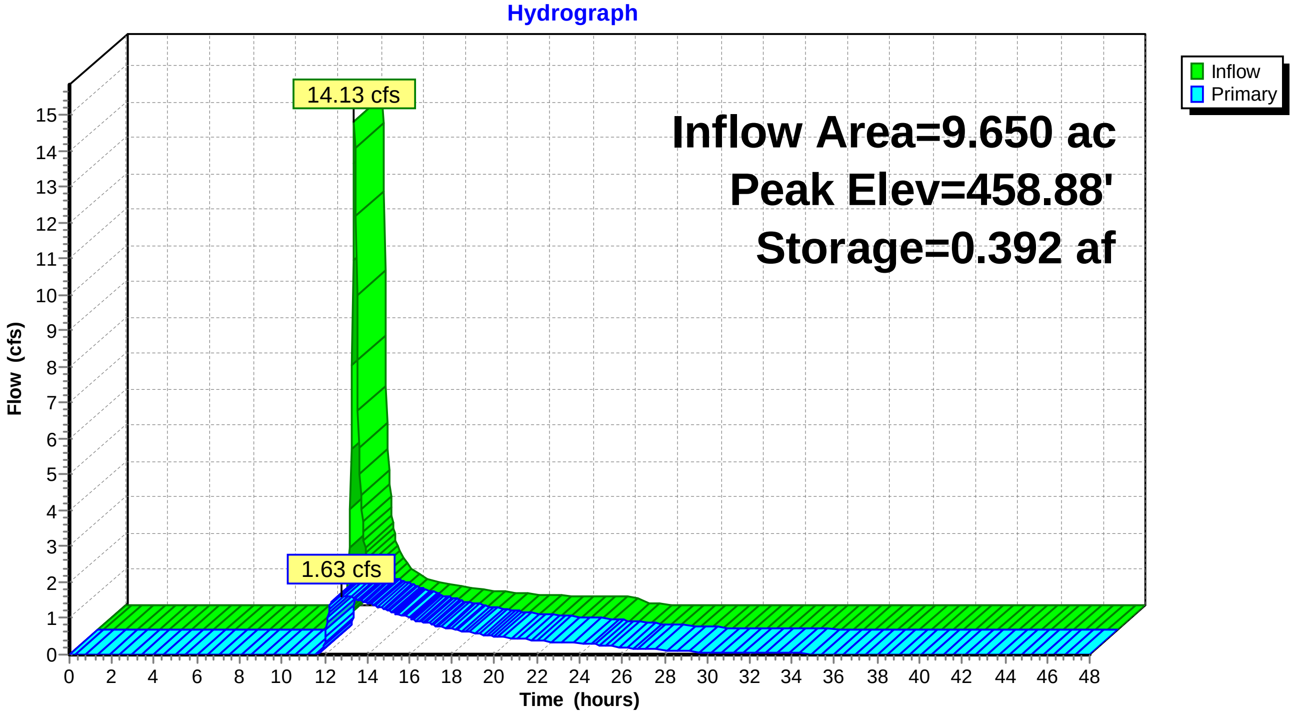
Volume	Invert	Avail.Storage	Storage Description
#1	456.00'	2.418 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
456.00	0.090	0.000	0.000
458.00	0.150	0.240	0.240
460.00	0.250	0.400	0.640
461.00	1.103	0.676	1.317
462.00	1.100	1.101	2.418

Device	Routing	Invert	Outlet Devices
#1	Device 3	460.00'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	456.00'	**0.4" Vert. Orifice/Grate X 28.00 columns** X 40 rows with 3.0" cc spacing C= 0.600
#3	Primary	456.00'	**12.0" Round Culvert** L= 104.5' Ke= 0.900 Inlet / Outlet Invert= 456.00' / 440.00' S= 0.1531 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.79 sf

Primary OutFlow Max=1.63 cfs @ 12.83 hrs HW=458.88' (Free Discharge)
└─**3=Culvert** (Passes 1.63 cfs of 4.61 cfs potential flow)
  ├─**1=Orifice/Grate** (Controls 0.00 cfs)
  └─**2=Orifice/Grate** (Orifice Controls 1.63 cfs @ 5.54 fps)

Pond 15P: DA-4


Hydrograph
Inflow
Primary
14.13 cfs
1.63 cfs
Inflow Area=9.650 ac
Peak Elev=458.88'
Storage=0.392 af
Flow (cfs)
Time (hours)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48

Summary for Pond 19P: DA-5

Inflow Area = 40.520 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 45.11 cfs @ 12.13 hrs, Volume= 3.860 af
Outflow = 0.54 cfs @ 24.47 hrs, Volume= 1.308 af, Atten= 99%, Lag= 740.5 min
Primary = 0.54 cfs @ 24.47 hrs, Volume= 1.308 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Starting Elev= 434.00' Surf.Area= 2.510 ac Storage= 2.640 af
Peak Elev= 435.32' @ 24.47 hrs Surf.Area= 2.635 ac Storage= 6.029 af (3.389 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 919.5 min (1,793.6 - 874.1)

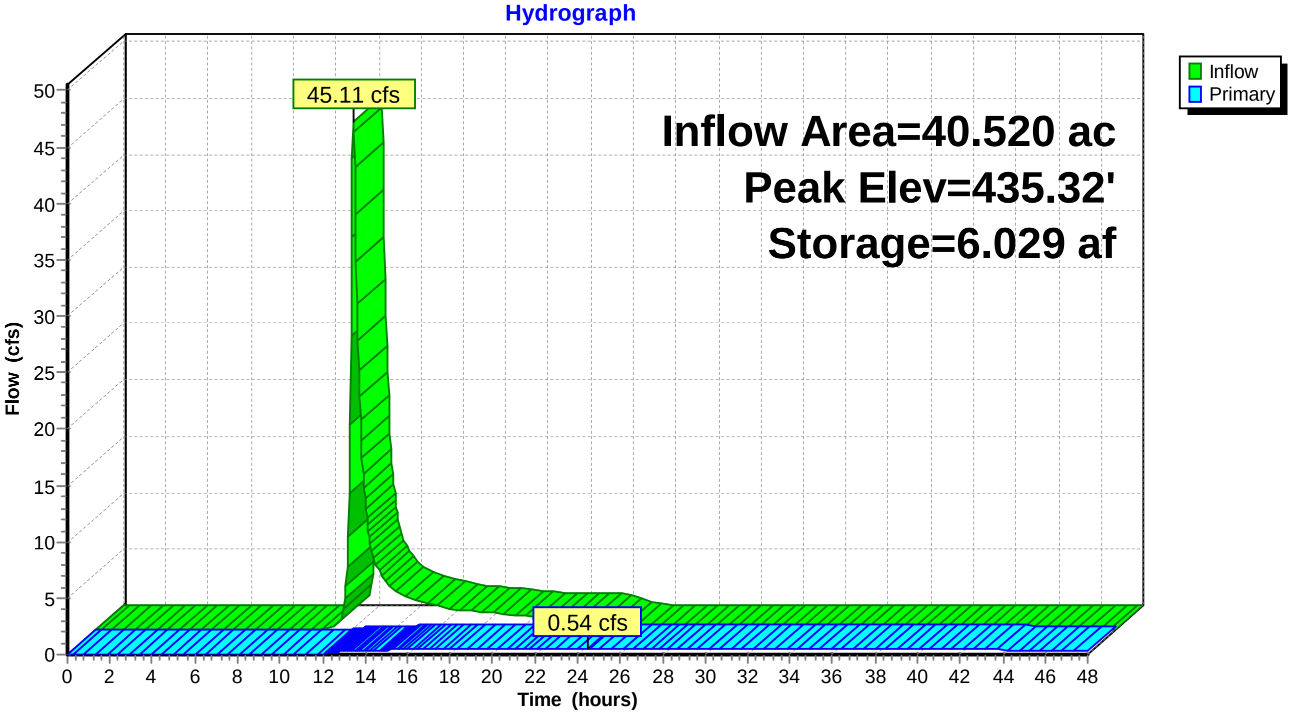
Volume	Invert	Avail.Storage	Storage Description
#1	432.00'	13.450 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
432.00	0.130	0.000	0.000
434.00	2.510	2.640	2.640
436.00	2.700	5.210	7.850
438.00	2.900	5.600	13.450

Device	Routing	Invert	Outlet Devices
#1	Device 3	437.00'	**36.0" Horiz. Orifice/Grate X 0.00** C= 0.600 Limited to weir flow at low heads
#2	Device 3	434.00'	**0.4" Vert. Orifice/Grate X 28.00 columns** X 31 rows with 3.0" cc spacing C= 0.600
#3	Primary	434.00'	**12.0" Round Culvert** L= 147.0' Ke= 0.900 Inlet / Outlet Invert= 434.00' / 433.26' S= 0.0050 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.79 sf

Primary OutFlow Max=0.54 cfs @ 24.47 hrs HW=435.32' (Free Discharge)
└─**3=Culvert** (Passes 0.54 cfs of 1.56 cfs potential flow)
  ├─**1=Orifice/Grate** (Controls 0.00 cfs)
  └─**2=Orifice/Grate** (Orifice Controls 0.54 cfs @ 3.67 fps)

Pond 19P: DA-5


Hydrograph
45.11 cfs
Inflow Area=40.520 ac
Peak Elev=435.32'
Storage=6.029 af
0.54 cfs
Inflow
Primary
Flow (cfs)
Time (hours)
0
5
10
15
20
25
30
35
40
45
50
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48

Summary for Pond 28P: DA-6

Inflow Area = 2.720 ac, 0.00% Impervious, Inflow Depth = 1.14" for 2-year event
Inflow = 3.53 cfs @ 12.06 hrs, Volume= 0.259 af
Outflow = 0.13 cfs @ 16.36 hrs, Volume= 0.163 af, Atten= 96%, Lag= 258.0 min
Primary = 0.13 cfs @ 16.36 hrs, Volume= 0.163 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.04 hrs
Starting Elev= 453.39' Surf.Area= 0.137 ac Storage= 0.324 af
Peak Elev= 454.47' @ 16.36 hrs Surf.Area= 0.166 ac Storage= 0.487 af (0.163 af above start)

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= 438.2 min (1,307.4 - 869.2)

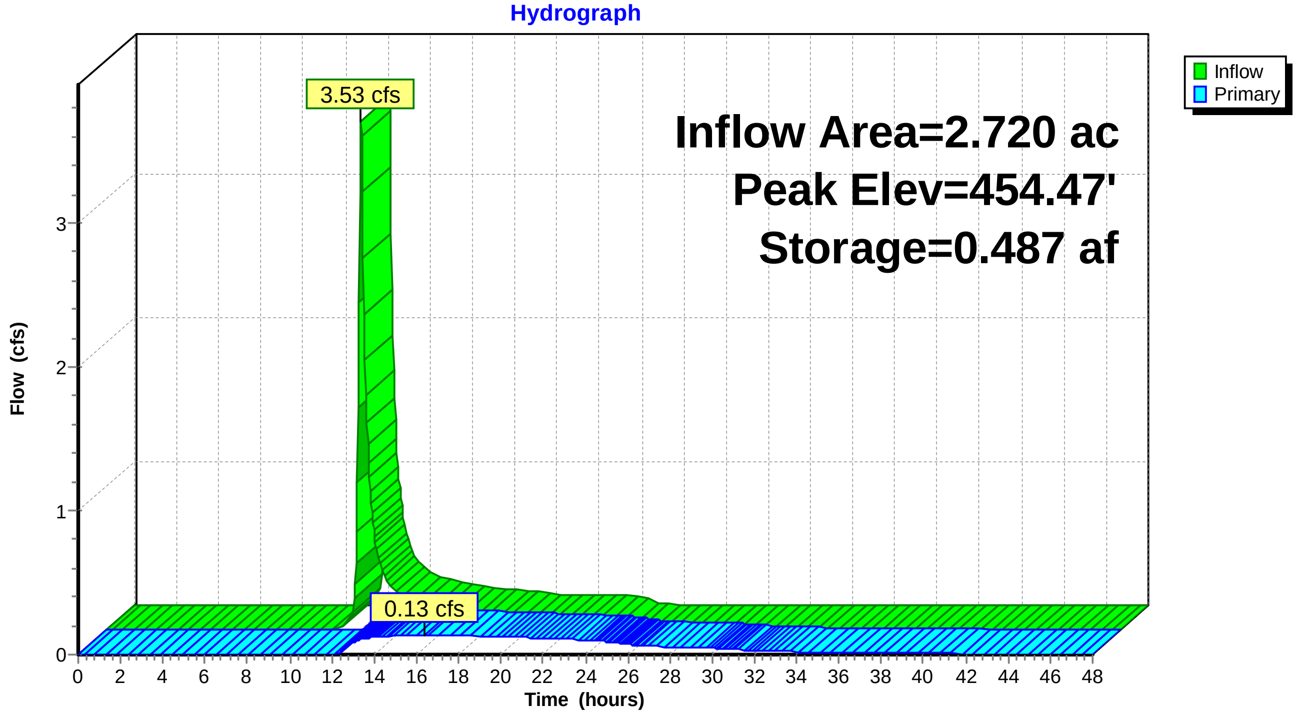
Volume	Invert	Avail.Storage	Storage Description
#1	450.00'	1.895 af	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (acres)	Inc.Store (acre-feet)	Cum.Store (acre-feet)
450.00	0.057	0.000	0.000
452.00	0.101	0.158	0.158
454.00	0.153	0.254	0.412
456.00	0.210	0.363	0.775
458.00	0.280	0.490	1.265
460.00	0.350	0.630	1.895

Device	Routing	Invert	Outlet Devices
#1	Device 3	458.00'	**36.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Device 3	454.00'	**0.4" Vert. Orifice/Grate X 28.00 columns** X 31 rows with 3.0" cc spacing C= 0.600
#3	Primary	454.00'	**12.0" Round Culvert** L= 100.0' Ke= 0.900 Inlet / Outlet Invert= 454.00' / 453.50' S= 0.0050 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 0.79 sf

Primary OutFlow Max=0.13 cfs @ 16.36 hrs HW=454.47' (Free Discharge)
└─**3=Culvert** (Passes 0.13 cfs of 0.36 cfs potential flow)
  ├─**1=Orifice/Grate** (Controls 0.00 cfs)
  └─**2=Orifice/Grate** (Orifice Controls 0.13 cfs @ 2.70 fps)

Pond 28P: DA-6


Hydrograph
3.53 cfs
0.13 cfs
Inflow Area=2.720 ac
Peak Elev=454.47'
Storage=0.487 af
Inflow
Primary
Flow (cfs)
0
1
2
3
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
42
44
46
48
Time (hours)

Appendix E

Slope Stability Calculations

Geotechnical Report

Slope Stability and Related Considerations
Coal Combustion Residual Storage Pond Closure
Edwards Power Station
Bartonville, Illinois

Prepared For:
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Millennia Project Number MG21023
March 31, 2022

Contents

Geotechnical Report
Coal Combustion Residual Storage Pond Closure
Edwards Power Station
Bartonville, Illinois

1.0 Project Description

1.1 Introduction

Millennia Professional Services (Millennia) is pleased to submit this geotechnical report to IngenAE, performed for the design and construction of the coal combustion residual storage pond closure project at the Edwards Power Station in Bartonville, Illinois. The purpose of this study was to provide a geotechnical assessment, based on subsurface conditions encountered at the boring locations performed by Millennia. This report describes the exploration procedures used (by others), presents the field and laboratory data (by others), and includes an assessment of the subsurface conditions in the area. The work was performed in general accordance with the proposal for the project, dated June 9, 2021.

1.2 Project Description

The Edwards Power Station is located on the west bank of the Illinois River, northeast of the intersection of Illinois Routes 24 and 9. The plant began operating around 1960. The plant is scheduled to shut down operations in December, 2022.

Fly ash and bottom ash have been placed by sluice into a storage pond situated west and south of the plant. The pond includes an area of about 102 acres. At this time, it is anticipated that the pond will be closed in-place, which is expected to involve dewatering and re-grading the ash within the existing pond limits, as appropriate, installing a cover system and establishing vegetation, and performing related site restoration activities.

The elevation of the natural floodplain south and west of the pond is approximately 440 feet, while the top of the perimeter pond embankment is approximately 464, suggesting a typical embankment height of 24 feet. The crest width varies, but is wide enough to accommodate a railway loop that was constructed in 2004 to expedite coal delivery and unloading.

Based on information provided by IngenAE, the interior ash pond slopes will be temporarily re-graded at inclinations of approximately 2H:1V once removal and replacement of the existing ash has been completed. The exterior slopes will generally remain unchanged. The ash will be reconsolidated throughout the footprint of the existing ash pond, with areas regraded to included additional amounts of ash placed near the southern half of the enclosure. Current preliminary grading plans indicate the northwestern portion of the ash pond enclosure remaining open after removal of the existing ash. This area will be backfilled with a soil to a minimum elevation of 432 feet, and a portion of this area will act as additional stormwater storage to approximately Elevation 437.5.

The grading plans also include a proposed berm to be placed within the northwestern portion of the interior of the enclosure. Existing transmission line foundation elements shall remain in place within this area. The foundation as-built documentation was not available for review. Details of the berm construction and grading may require revision upon review of the as-built documentation.

The approximate locations of the cross sectional areas used for this study are presented in Appendix A.

1.3 Purpose and Scope

The purpose of Millennia's services is to assist IngenAE with the geotechnical aspects of the project. This primarily involves assessing the stability of the permanent slopes, along with the stability of selected slopes during temporary or interim conditions during the closure period. Because the project will involve dewatering the pond to some degree, the potential effects of the dewatering on slope stability also requires consideration. In addition, slope stability assessments of this type usually consider short term and long term, seismic effects, and in some situations, rapid drawdown effects.

It is our understanding that dewatering of the pond will be accomplished primarily by gravity drainage.

2.0 Subsurface Exploration and Laboratory Testing

2.1 Previous Studies

The geotechnical assessment and recommendations summarized in this report are based on the soil borings and laboratory test results that were performed by others at the Edwards Power Station Ash Pond. Specifically, this report references the data presented in the geotechnical report performed by AECOM and dated, October 7, 2016. The same cross sectional areas presented within the report have been reanalyzed for the regrading and closure of the ash pond.

2.2 Data

Neither the soil borings nor the laboratory testing prepared for the previous geotechnical investigations were performed by Millennia. The soil and rock samples are no longer available for viewing or further testing, and Millennia is unable to physically verify the classifications and other test results. However, the work was done by established, experienced geotechnical firms, and the content of the reports appear to be reliable for use in preparing this report.

Typically, the results of the field tests and measurements were recorded on field logs and appropriate data sheets in the field. These data sheets and logs contain information concerning the drilling methods, samples attempted and recovered, indications of the presence of various subsurface materials, and the observation of groundwater. The field logs and data sheets contain the engineer's interpretations of the conditions between samples, based on the performance of the equipment and cuttings brought to the surface by the drilling tools.
Data and observations from laboratory tests were recorded on laboratory data sheets during the course of the testing program.

3.0 Subsurface Conditions

3.1 Geotechnical Soil Parameters

Millennia reviewed the laboratory test results and parameters presented within Appendix F of the 2016 geotechnical report performed by AECOM. The parameters appear to be reliable for use in the global stability analyses presented within this report submittal.

A summary of the soil and bedrock parameters use in the stability analyses are as follows:

Table 1: Summary of Global Stability Soil Parameters

Material	Unit Weight Above WT (pcf)	Unit Weight Below WT (pcf)	Effective (drained) Shear Strength Parameters		Total (undrained) Shear Strength Parameters	
			c' (psf)	Φ' (°)	c (psf)	Φ (°)
New Embankment	115	115	200	30	2,500	0
Old Embankment 1	125	125	200	28	2,500	0
Old Embankment 2	125	125	100	29	1,250	0
Native Clay Crust	120	120	200	27.5	1,250	0
Native Clay 1	117	117	100	26	650	0
Native Clay 2	105	105	200	26	700	0
Native Clay 3	105	105	200	26	900	0
Fly	105	105	100	27	600	0
Historic Ash	105	105	100	26	750	0
Historic Fill	125	125	200	28	1,000	0
Recent Fill	115	115	200	30	1,250	0
GP (Very Dense)	135	135	0	36	0	36
New Embankment (Crushed Stone - Sandy Gravel)	120	120	0	32	0	32
Bedrock - Shale	140	140	1,000	36	1,000	36

Consistent with current practices within the profession, Millennia used reduced shear strength values (approximately 2/3 of the total undrained shear strength), as well as conservative estimated friction angle values for the rapid drawdown condition.

3.2 Groundwater

Groundwater assumptions were based on information provided within the AECOM geotechnical report, as well as information provided by IngenAE. The base flood elevation for the project area is generally Elevation 457.5 according to the Floodplain Compliance document prepared by Burns & McDonnell in 2021.

4.0 Geotechnical Recommendations

4.1 Global Stability Assessment

As previously mentioned, the engineering properties of the soil used in the stability assessment are based on the results of the field and laboratory tests performed by others on the materials that comprise the embankment and subgrade. The groundwater level was conservatively positioned for the computer models to generally match those assumed for the previous study. Seismic influences were assessed using psuedo-static forces, with the horizontal acceleration conservatively selected as being equal to the PGA available through the IBC ASCE/SEI 7-22 hazards report.

Based on cross section drawings provided by IngenAE, Millennia selected eight sections to perform detailed slope stability assessments. The slope stability assessments were performed at the areas near cross sections B-B through I-I. The locations were selected based upon slope height, inclination, and the general proposed grading for the specific cross section. As stated previously, the interior slopes will be temporarily re-graded to 2H:1V inclinations and the exterior slopes will remain essentially unchanged.

The parameters used for the stability assessments were based on the results of the field and laboratory investigations, along with Millennia's experience in the area, and are shown on the Summary Stability Profiles provided in Appendix B.

The global stability assessments were conducted for short term (undrained, or total stress) for temporary construction for the interior slope conditions, as well as the exterior existing slope, long term (drained, or effective stress), seismic, and rapid drawdown scenarios using the program SLOPE/W. The results are summarized in the following table:

Table 2:
Summary of Global Stability Results

Analysis Location Section	Minimum Computed Factor of Safety				
	Short Term (Temporary Construction)	Short Term (Exterior Slope)	Long-Term	Seismic	Rapid Drawdown
Cross Section B-B	1.97	2.74	1.96	1.76	1.76
Cross Section C-C – Storage Pond	1.49	2.07	2.25	1.47	1.47
Cross Section D-D	1.37	1.62	1.80	1.17	1.11
Cross Section E-E	1.35	1.96	1.59	1.50	1.23
Cross Section F-F	1.94	3.68	3.10	2.38	2.38
Cross Section G-G	1.49	2.33	2.17	1.59	1.26
Cross Section H-H	1.31	1.60	2.07	1.09	1.17
Cross Section I-I	1.68	2.10	2.29	1.34	1.38

N/A = not applicable for this scenario

The minimum desired safety factor with regard to the potential for massive, global slope failure is 1.3 for short-term (undrained or temporary construction) conditions and 1.5 for long-term (drained) conditions. For the seismic condition, a factor of safety 1.0 or greater is desired. For the rapid drawdown condition, a factor of safety 1.1 or greater is desired.

On this basis, the results of the stability assessments at the eight sections summarized above are considered acceptable for all scenarios.

Soil types such as those found within the existing embankments are highly erosive, a mechanism of soil movement unrelated to global stability. Future erosion and shallow, superficial slumps are always a possibility, despite the results of advanced computer modeling for slope stability. Maintaining healthy vegetation, along with appropriate erosion control practices, will reduce the potential for these issues to become problematic.

In addition, the geotechnical conditions between the boring locations are essentially unknown. If the contractor exposes conditions during excavation and other earthwork activities that differ from those indicated at the boring locations, Millennia should be notified to assess the effect (if any) of the unanticipated conditions upon the findings of the global slope stability assessment. This recommendation is of particular importance regarding the amounts of existing fly ash materials anticipated to be removed. Undetected zones of unsuitable materials placed during prior site development or other human activity, such as buried wood or other debris, could also result in risks to slope stability considerations.

As mentioned previously, an interior berm is proposed for near the northwestern portion of the project, separating the planned stormwater storage and re-graded fly ash areas. Existing transmission line foundation elements are located within the planned footprint of the berm. Details such as the composition of the foundations were not provided for review. As such, Millennia will evaluate the global stability of the interior berm once that information becomes available.

In addition, a sheet pile wall is present along an existing section outside the perimeter embankment on the east side of the pond. At this time, details regarding the structural design and construction of the wall are not available. Slope stability at the sheet pile wall shalle be assessed after the disposition of the wall becomes available.

5.0 Construction Considerations

5.1 Excavations

Trenching, excavating, and bracing should be performed in accordance with Occupational Safety and Health Administration (OSHA) regulations, and other applicable regulatory agencies. In accordance with the OSHA excavation standards, the soil at the site is considered to be Type C, which requires a side slope for excavations no steeper than 1.5H:1.0V. However, worker safety and classification of the excavation soil is the responsibility of the contractor. According to OSHA requirements, any excavation extending to a depth of more than 20 feet must be designed by a registered professional engineer. Where the excavation lies within the zone of influence of existing pavements, buildings, utilities, or other structures, the integrity of those elements should be maintained by a properly designed earth retention system, underpinning, or other suitable means.

Portions of the excavations may be constructed within a few feet horizontally of existing utilities. Some of these utilities are likely backfilled with granular material. The granular backfill may contain free water and could be unstable when excavating beneath or adjacent to it. The undermining of these utilities and the adjacent area could occur due to running and caving of the granular backfill and surrounding soils. Temporary support of any utilities, if present, that cross over or lie adjacent to the excavations will likely be required.

Adequate benching along the slopes to allow for construction equipment and production should be utilized and follow OSHA standards. Heavy machinery, equipment, and tooling should not be stored on the construction benches for extended periods of time. The benches should be constructed with positive drainage in a way to eliminate ponding or standing water while in use. The benches should be backfilled and dressed as the construction advances to eliminate the potential for saturating the slopes.

5.2 Subgrade Preparation

Where further excavation is not planned, the exposed subgrade should be proof-rolled, which is accomplished by passing over the subgrade with a loaded tandem axle dump truck and observing the subgrade for pockets of excessively soft, wet, disturbed, or otherwise unsuitable soils. Any unacceptable materials thus found should be excavated and either recompacted or replaced with new fill.

Generally, prior to placing fill, pavement materials, or structural elements in any area, the subgrade should be scarified to a depth of about six inches, the moisture content of the soil adjusted to near its optimum moisture content, and the subgrade recompacted in accordance with recommendations made in subsequent sections of this report. This recommended proof-rolling and recompaction of the subgrade may be waived by Millennia if it is determined based on field observations that it is unnecessary or could be detrimental to the existing subgrade condition.

5.3 Subgrade Protection

Construction areas should be properly drained in order to reduce or prevent surface runoff from collecting on the subgrade. Any ponded water on the exposed subgrade should be removed immediately. To prevent unnecessary disturbance of the subgrade soils, trucks and other heavy construction vehicles should be restricted from traveling through the finished subgrade area. If disturbed areas develop, they should be reworked and compacted as previously described.

5.4 Fill Material

The required site and structural fill and backfill may be constructed using the natural lean clay materials available from on-site excavations. Fill material from off-site borrow sources may also be used, but should be approved by a registered professional engineer prior to placement. In general, structural fill should consist of low plasticity lean clays or clayey silts with a liquid limit of less than 50 and a plasticity index of less than 25.

At the time of construction, the moisture content of the fill materials may be variable, and may not be within the range considered necessary for proper placement and compaction. Prior to compaction, some of the soil may require moisture content adjustment. During warm weather, moisture reduction can generally be accomplished by disking, or otherwise aerating, the soil.

If earthwork is performed during a period of dry weather, some of the fill may require the addition of moisture prior to compaction. This should be performed in a controlled manner using a tank truck with a spray bar, and the moistened soil should be thoroughly blended with a disk to produce a uniform moisture content. Repeated passages of the equipment may be required to achieve a reasonably uniform moisture content.

5.5 Fill Placement

Fill for general site grading should be placed in layers not exceeding eight inches in loose thickness and compacted to the required dry density. Backfill compacted by handheld equipment should be placed in layers not greater than six inches. The layer thickness may be increased if tests indicate that compaction could be achieved uniformly throughout the layer using a greater thickness. At the time of compaction, fill should generally be within three percent, wet or dry, of the optimum moisture content of the material as determined by the standard Proctor compaction test, ASTM D 698. Fill should be compacted to a dry density of not less than 95 percent of the standard Proctor maximum dry density of the material.

Backfill placed next to walls or foundations should be compacted with hand-operated compaction equipment and not large self-propelled or machine-operated equipment. The operation of large pieces of equipment adjacent to these structures can result in overcompaction and higher lateral pressures than those recommended herein for design. Compaction should be reduced within approximately one foot of the wall. Structures should be observed periodically during backfilling for signs of movement. If movement is detected, it may be necessary to change backfilling procedures.

5.6 Groundwater Considerations

The potential for groundwater seepage will depend in-part upon the magnitude of cuts and fills required to develop the site, which will be governed by the eventual final grading plan. Groundwater seepage is anticipated to be significant during general site grading activities for the fly ash removal and regrading. Should groundwater seepage be encountered during excavation, groundwater may be handled by an excavation drainage system consisting of drainage ditches, sumps, and pumps. In the absence of significant rainfall, saturated zones should drain over a period of days.

5.7 Soft Subgrade

Soft subgrade conditions should be anticipated within the ash pond once the ash has been removed and the natural soil subgrade is exposed. If during the course of construction, soft or disturbed soils are encountered, the recommendations in the following paragraph should be followed. Millennia recommends utilizing a performance specification for the initial lift of fill material placed on the exposed soil subgrade. A thicker lift of material may need to be placed to effectively “bridge” over any soft areas. The material should then be compacted by making several passes over the bridge lift until the areas appear to be stable. Millennia should be consulted if extensive areas of soft subgrade soils are encountered that prove difficult to compact and additional alternatives are required.

5.8 Soil Sensitivity

The silty soil and fly ash present at the site are considered potentially sensitive and susceptible to strength loss caused by excess moisture or disturbance by construction activity. Repetitious passage of equipment can result in rutting and “pumping” (deflection under passing load), even if the soil was properly compacted. Once disturbed, extensive effort is required to restore the integrity of the soils.

General site grading activities and excavations must be performed in a manner that limits disturbance to subgrade soils. The contractor should select earth moving equipment appropriately and should be prepared to adjust the type or usage of the equipment as necessary to minimize distress to the subgrade. It is sometimes necessary to remove topsoil or perform limited cuts using a trackhoe rather than a highlift, scrapers, or other equipment that might repeatedly pass directly over the subgrade.

6.0 Construction Phase Services

It is recommended that Millennia review the plans and specifications for the project prior to bid solicitation in order to determine the relationship of the geotechnical information presented in this report with the final grading design of the ash pond closure. This additional service is recommended in order to reduce construction phase problems that might otherwise arise in the field and result in construction delays or change orders.

7.0 Closing

This report has been prepared for the exclusive use of IngenAE for use in the design and construction for the Coal Combustion Residual Storage Pond Closure project at the Edwards Power Station in Bartonville, Illinois. This report has been prepared in accordance with generally accepted soil and foundation engineering practices. No other warranty, expressed or implied, is made to the professional advice and recommendations included herein. This report is not for use by parties other than those named or for purposes other than those stated herein. It may not contain sufficient information for the use of other parties or for other purposes.

If there is a substantial lapse of time between the submission of this report and the start of work at the site, or if conditions have changed due to natural causes or construction operations at or adjacent to the site, this report should be reviewed by Millennia to determine the applicability of the analyses and recommendations considering the changed conditions and time lapse. The report should also be reviewed by Millennia if changes occur in structure location, size, and type, or in the planned loads, elevations, grading plans, and project concepts.

These analyses and recommendations are based on data obtained from site reconnaissance, the borings performed for this study and other pertinent information presented herein. This report does not reflect any variations between, beyond, or below the borings. Should such variations become evident, it may be necessary to re-evaluate the recommendations of this report after performing on-site observation during the construction period and noting the characteristics of any such variation.

We appreciate this opportunity to be of service to you and would be pleased to discuss any aspect of this report with you at your convenience.

Sincerely,

Millennia Professional Services, Ltd.

Jacob A. Schaeffer, P.E.
Project Manager

LICENSED PROFESSIONAL ENGINEER
JACOB ALLEN
SCHAEFFER
062.068397
Exp. 11-30-23
STATE OF ILLINOIS

Appendix A

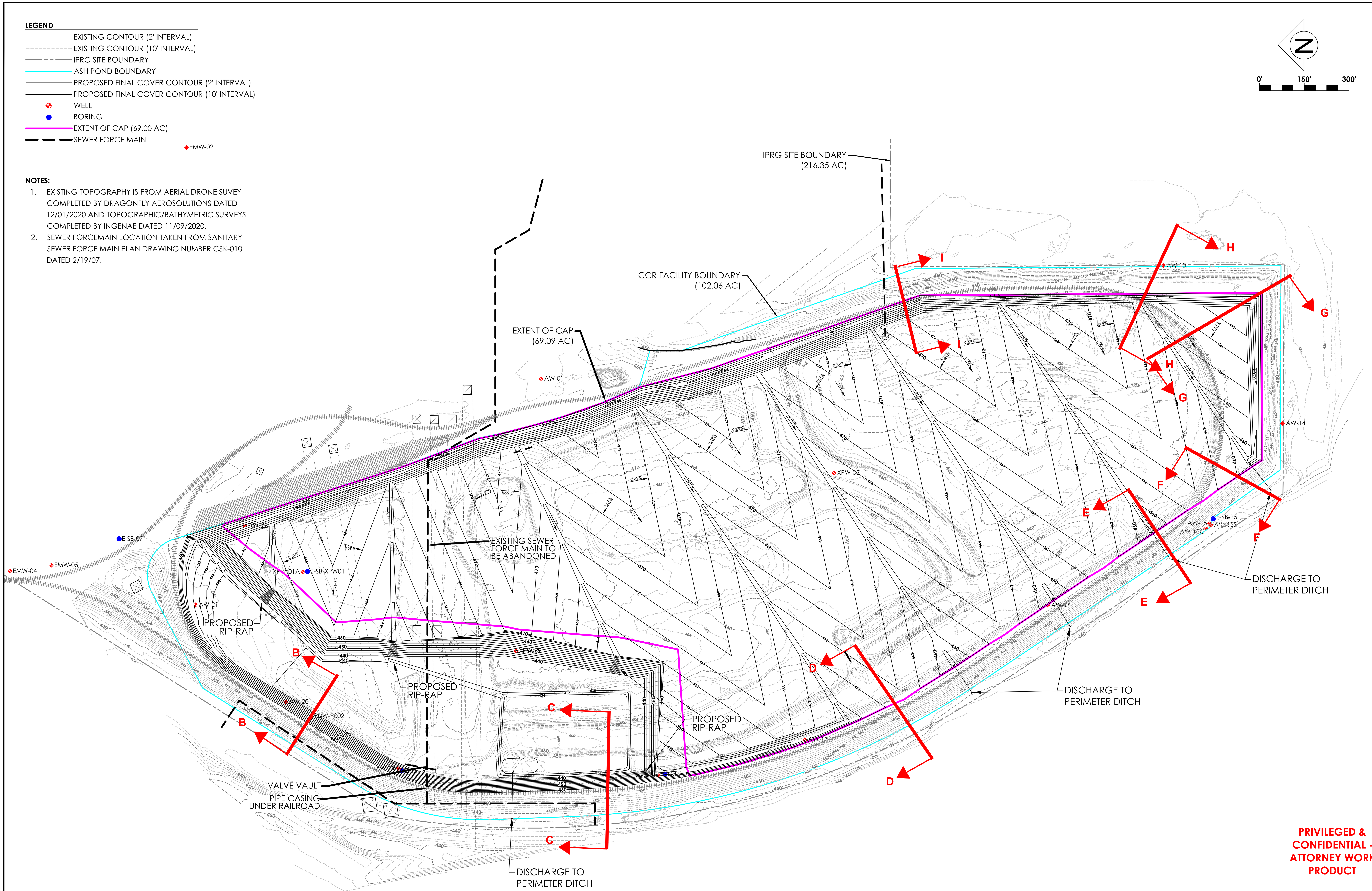
Cross Section Location Plan

LEGEND

- EXISTING CONTOUR (2' INTERVAL)
- EXISTING CONTOUR (10' INTERVAL)
- IPRG SITE BOUNDARY
- ASH POND BOUNDARY
- PROPOSED FINAL COVER CONTOUR (2' INTERVAL)
- PROPOSED FINAL COVER CONTOUR (10' INTERVAL)
- WELL
- BORING
- EXTENT OF CAP (69.00 AC)
- SEWER FORCE MAIN

NOTES:

1. EXISTING TOPOGRAPHY IS FROM AERIAL DRONE SUVEY COMPLETED BY DRAGONFLY AEROSOLUTIONS DATED 12/01/2020 AND TOPOGRAPHIC/BATHYMETRIC SURVEYS COMPLETED BY INGENAE DATED 11/09/2020.
2. SEWER FORCEMAIN LOCATION TAKEN FROM SANITARY SEWER FORCE MAIN PLAN DRAWING NUMBER CSK-010 DATED 2/19/07.



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DRAFT

Submissions / Revisions:	Date:
1	
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ILLINOIS POWER RESOURCES GENERATING, LLC.

Project Name & Location:

ASH POND PART 845 CONSTRUCTION DRAWINGS EDWARDS ASH POND

Drawing Name:
FINAL COVER & STORMWATER PLAN

Date: 3/30/2022
Project No.:
Type: PLAN
Drawing No. 6
Drawn By: CB
Approved By: BH
Scale: AS NOTED

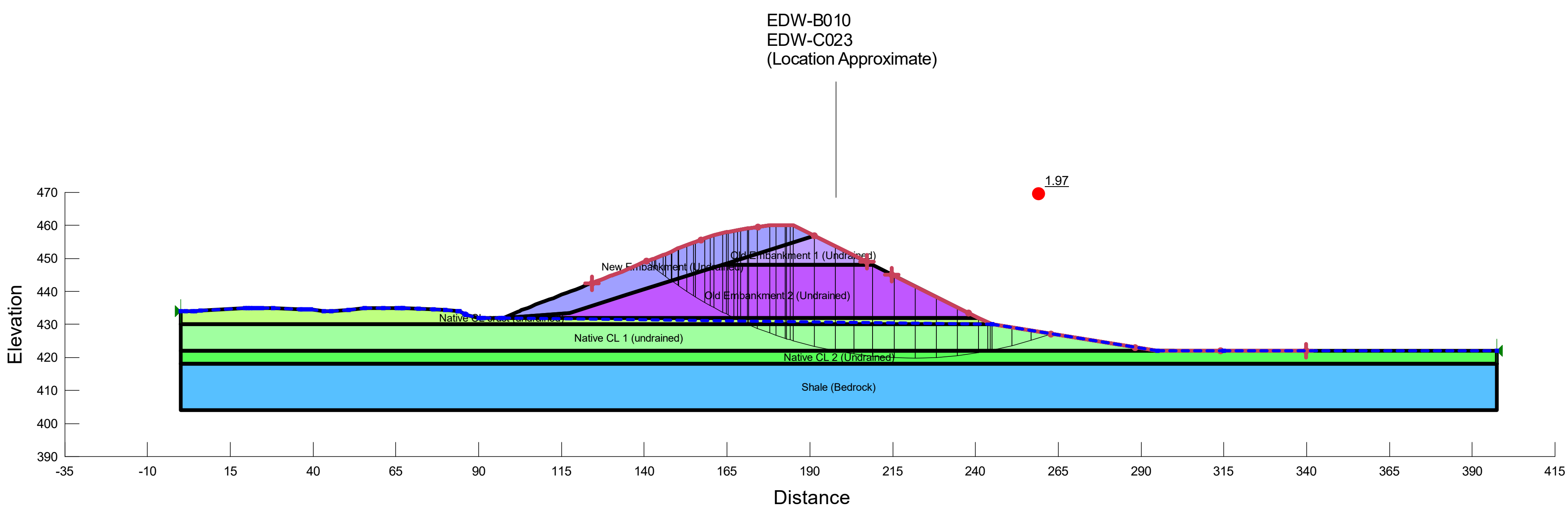
PRIVILEGED & CONFIDENTIAL - ATTORNEY WORK PRODUCT

Appendix B

Global Stability Models

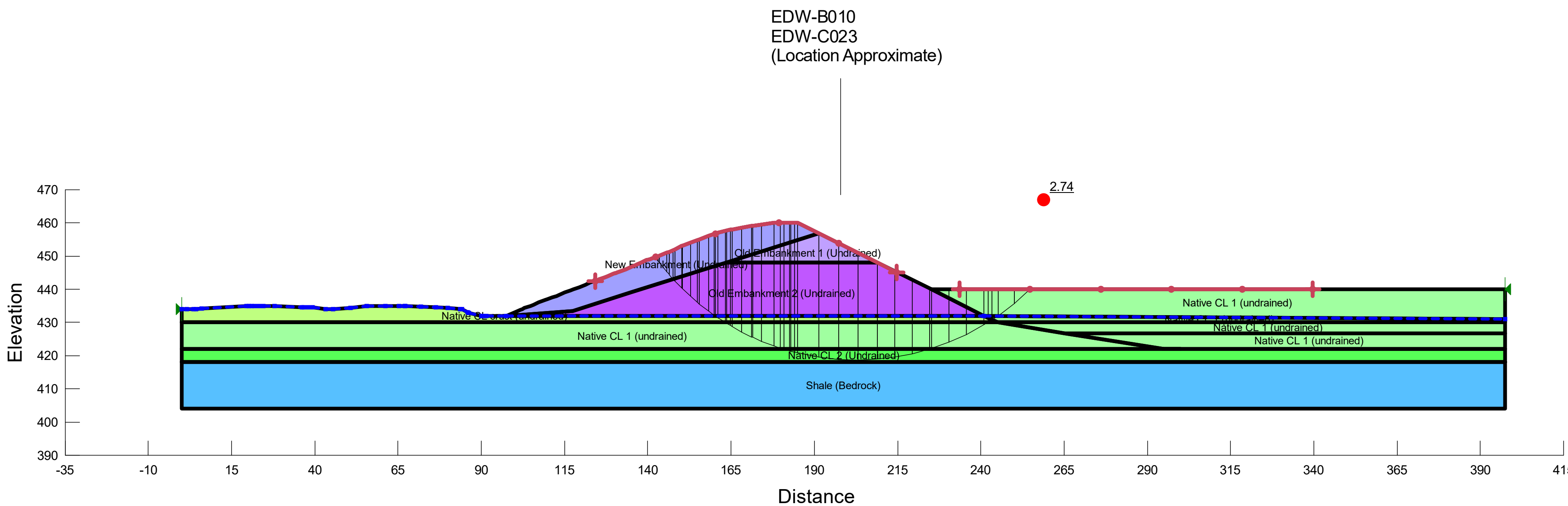
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL crust (undrained)	120	1,250	0	1
	New Embankment (Undrained)	115	2,500	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section B
Slope Stability - Temporary Construction



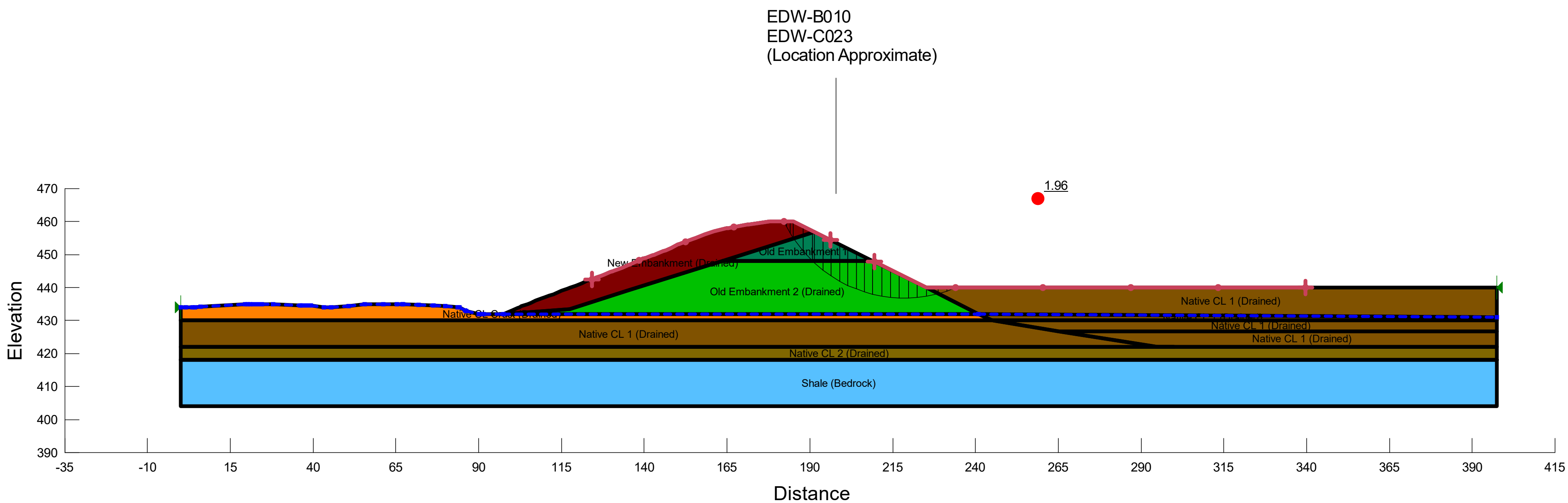
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL crust (undrained)	120	1,250	0	1
	New Embankment (Undrained)	115	2,500	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section B - Storage Pond
Slope Stability - Undrained



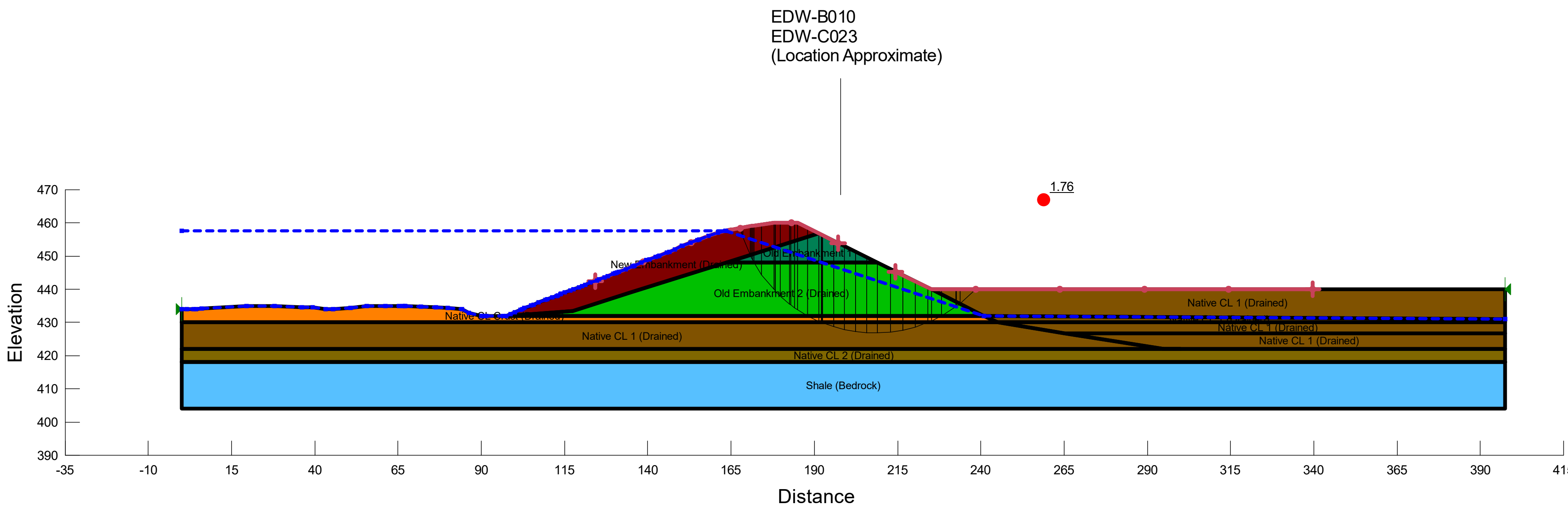
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Native CL 1 (Drained)	117	100	26	1
	Native CL 2 (Drained)	105	200	26	1
	Native CL Crust (Drained)	120	200	27.5	1
	New Embankment (Drained)	115	200	30	1
	Old Embankment 1	125	200	28	1
	Old Embankment 2 (Drained)	125	100	29	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section B - Storage Pond
Slope Stability - Drained



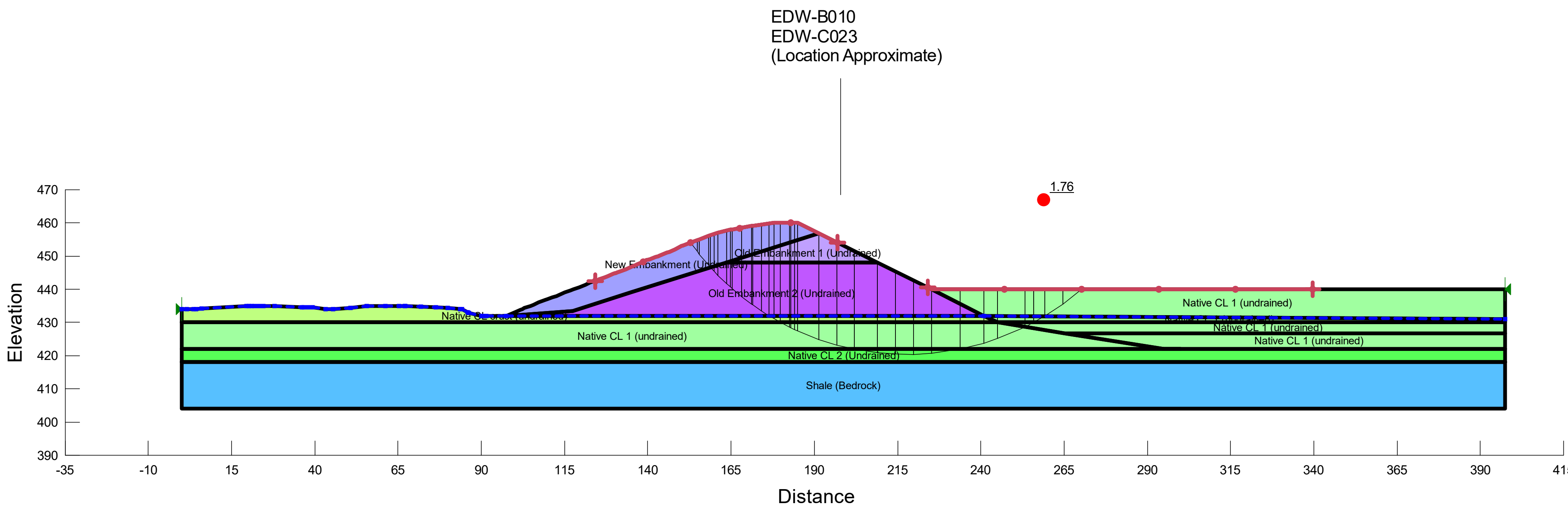
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Line	Piezometric Line After Drawdown
	Native CL 1 (Drained)	117	100	26	430	5	1	2
	Native CL 2 (Drained)	105	200	26	430	5	1	2
	Native CL Crust (Drained)	120	200	27.5	830	10	1	2
	New Embankment (Drained)	115	200	30	1,670	10	1	2
	Old Embankment 1	125	200	28	1,670	10	1	2
	Old Embankment 2 (Drained)	125	100	29	830	10	1	2
	Shale (Bedrock)	140	1,000	36	1,150	35	1	2

Dynegy Edwards
Cross-section B
Slope Stability - Drawdown



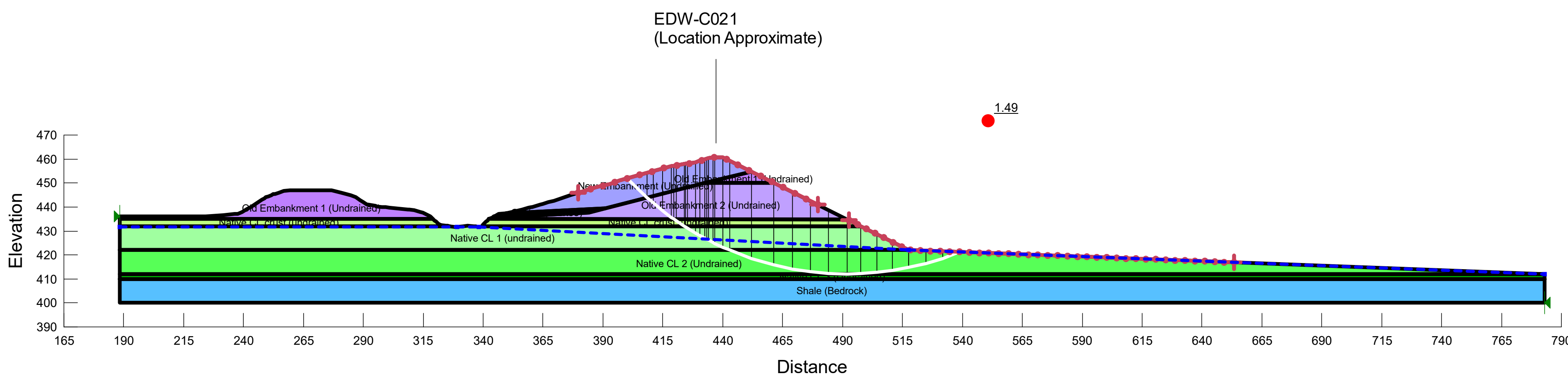
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL crust (undrained)	120	1,250	0	1
	New Embankment (Undrained)	115	2,500	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section B - Storage Pond
Slope Stability - Seismic - PGA = 0.1g



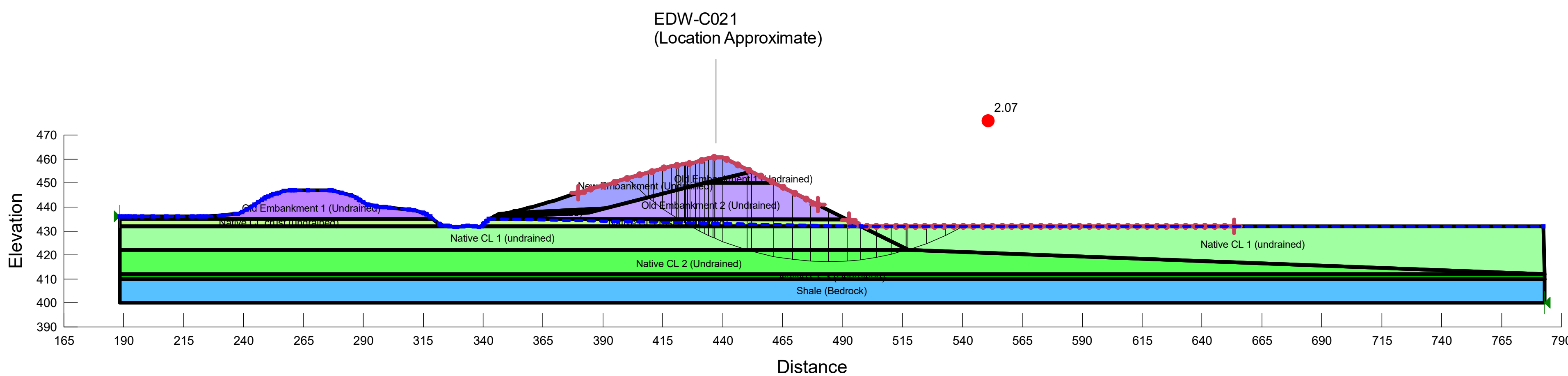
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	GP (very dense)	135	0	36	1
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	Native CL crust (undrained)	120	1,250	0	1
	New Embankment (Undrained)	115	2,500	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Hennepin
Cross-section C
Slope Stability - Temporary Construction



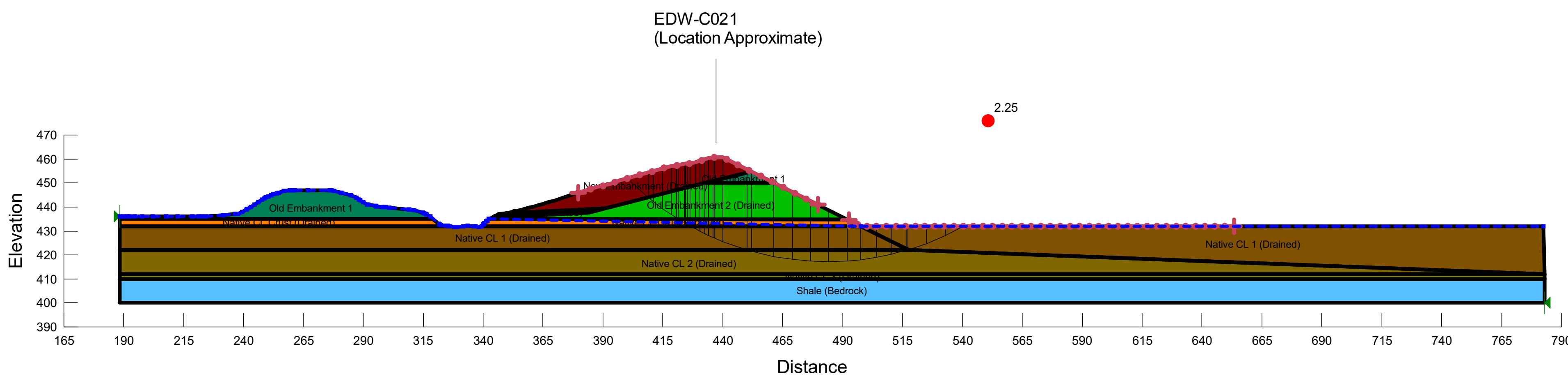
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	GP (very dense)	135	0	36	1
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	Native CL crust (undrained)	120	1,250	0	1
	New Embankment (Undrained)	115	2,500	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Hennepin
Cross-section C
Slope Stability - Undrained



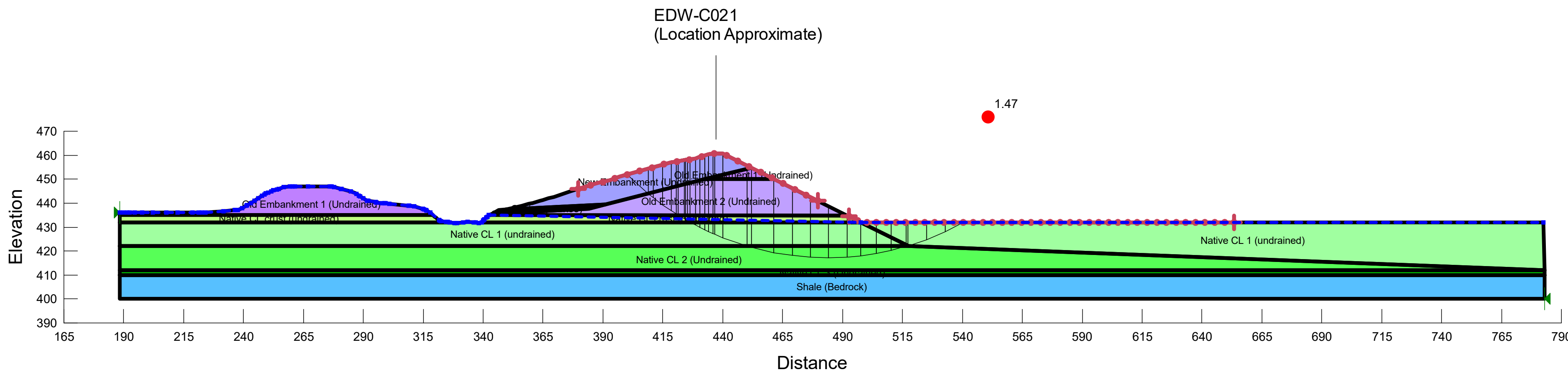
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	GP (very dense)	135	0	36	1
	Native CL 1 (Drained)	117	100	26	1
	Native CL 2 (Drained)	105	200	26	1
	Native CL 3 (Drained)	105	200	26	1
	Native CL Crust (Drained)	120	200	27.5	1
	New Embankment (Drained)	115	200	30	1
	Old Embankment 1	125	200	28	1
	Old Embankment 2 (Drained)	125	100	29	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Hennepin
Cross-section C
Slope Stability - Drained



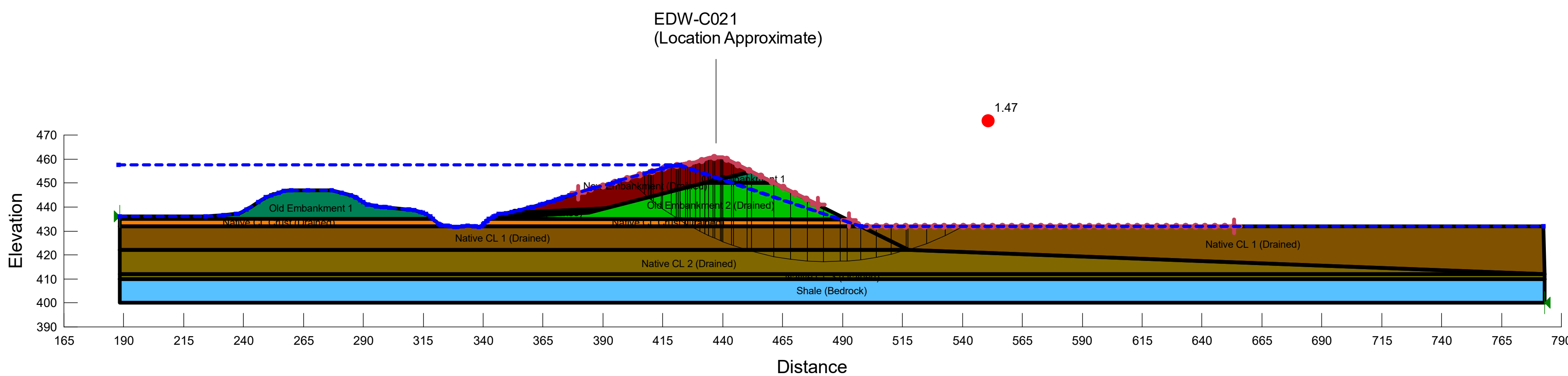
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	GP (very dense)	135	0	36	1
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	Native CL crust (undrained)	120	1,250	0	1
	New Embankment (Undrained)	115	2,500	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Hennepin
Cross-section C
Slope Stability - Seismic - PGA = 0.1g



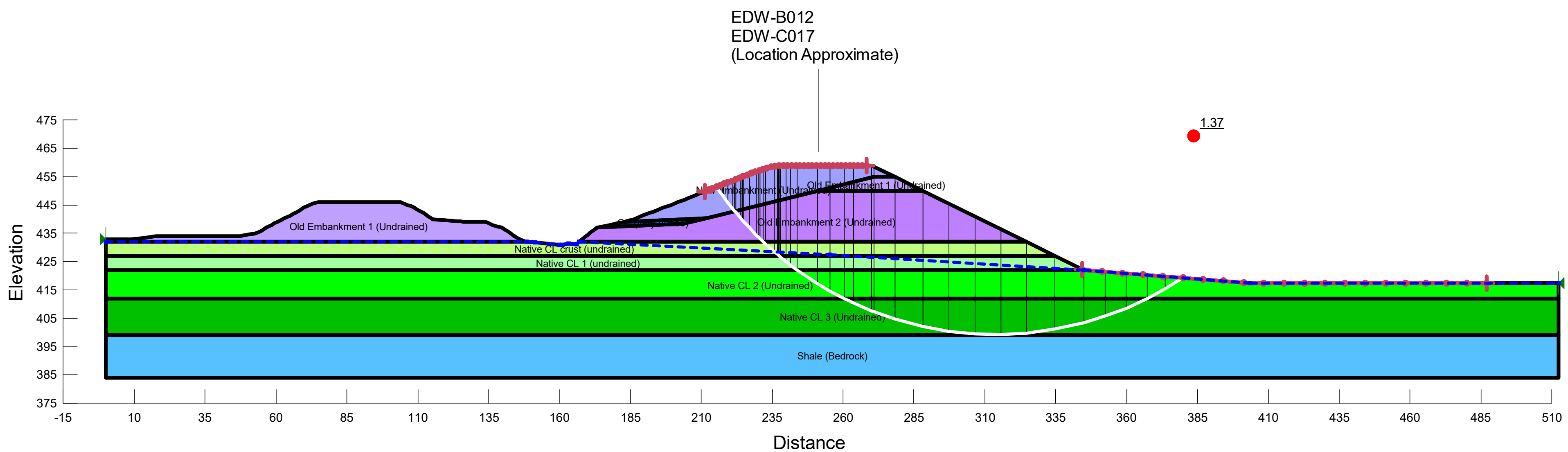
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Line	Piezometric Line After Drawdown
	GP (very dense)	135	0	36	5	34	1	2
	Native CL 1 (Drained)	117	100	26	430	5	1	2
	Native CL 2 (Drained)	105	200	26	470	5	1	2
	Native CL 3 (Drained)	105	200	26	600	8	1	2
	Native CL Crust (Drained)	120	200	27.5	830	10	1	2
	New Embankment (Drained)	115	200	30	1,670	10	1	2
	Old Embankment 1	125	200	28	1,670	10	1	2
	Old Embankment 2 (Drained)	125	100	29	830	10	1	2
	Shale (Bedrock)	140	1,000	36	1,150	35	1	2

Dynegy Hennepin
Cross-section C
Slope Stability - Drawdown



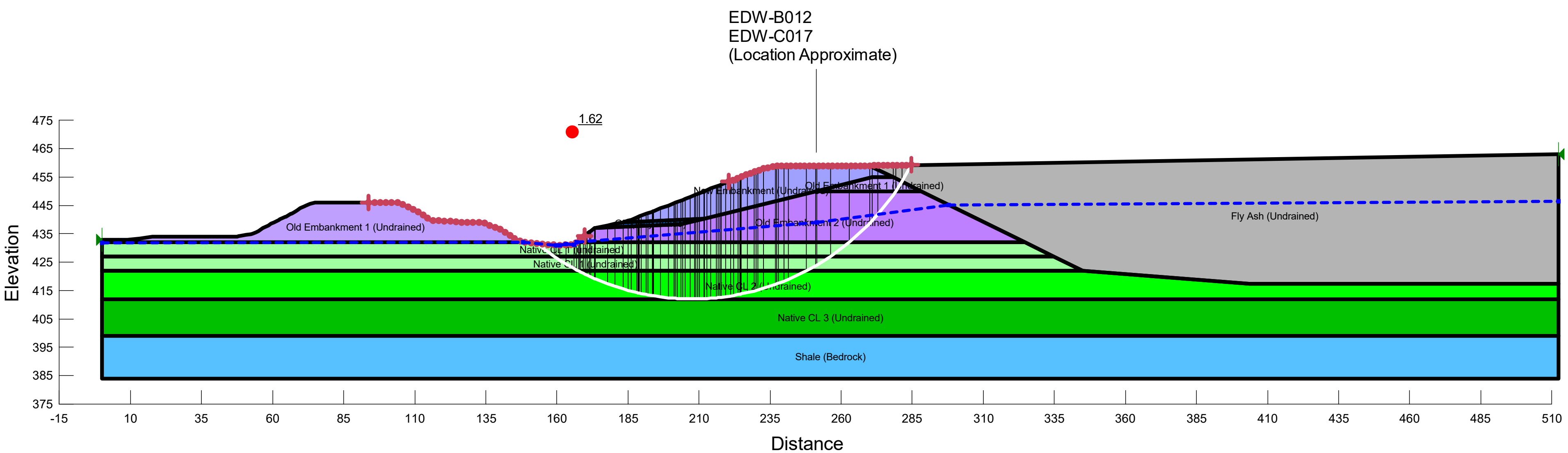
Color	Name	Unit Weight (pcf)	Cohesion (psf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	GP (very dense)	135		0	36	1
	Native CL 1 (undrained)	117	650			1
	Native CL 2 (Undrained)	105	700			1
	Native CL 3 (Undrained)	105	900			1
	Native CL crust (undrained)	120	1,250			1
	New Embankment (Undrained)	115	2,500			1
	Old Embankment 1 (Undrained)	125	2,500			1
	Old Embankment 2 (Undrained)	125	1,250			1
	Shale (Bedrock)	140		1,000	36	1

Dynegy Edwards
Cross-section D
Slope Stability - Temporary Construtcion



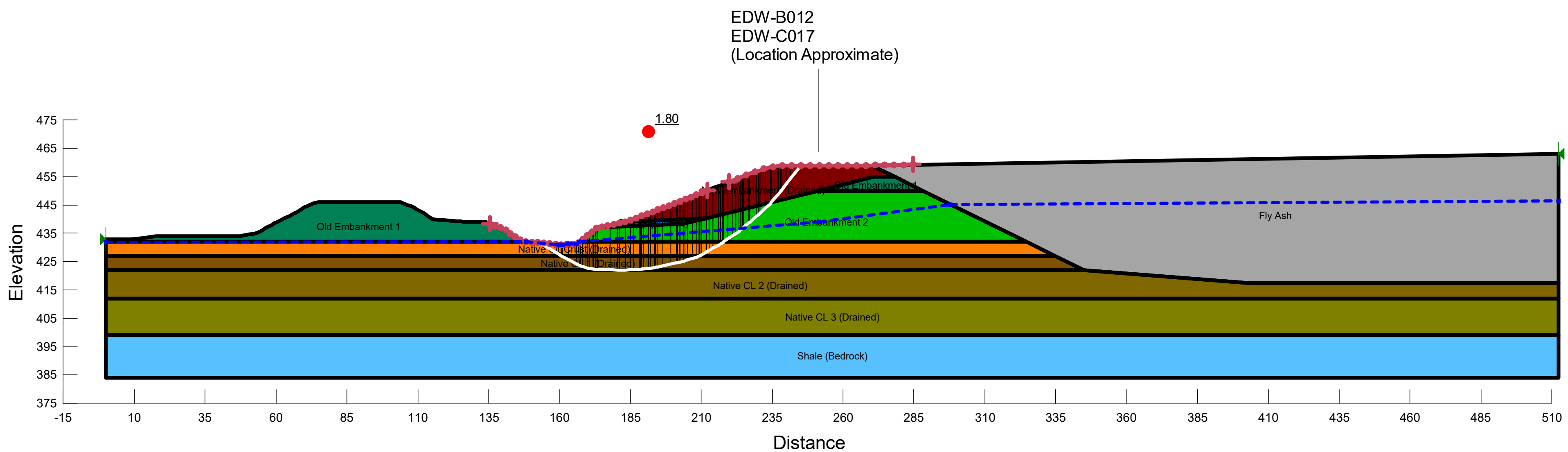
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Fly Ash (Undrained)	105	600	0	1
	GP (very dense)	135	0	36	1
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	New Embankment (Undrained)	115	2,500	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section D
Slope Stability - Undrained



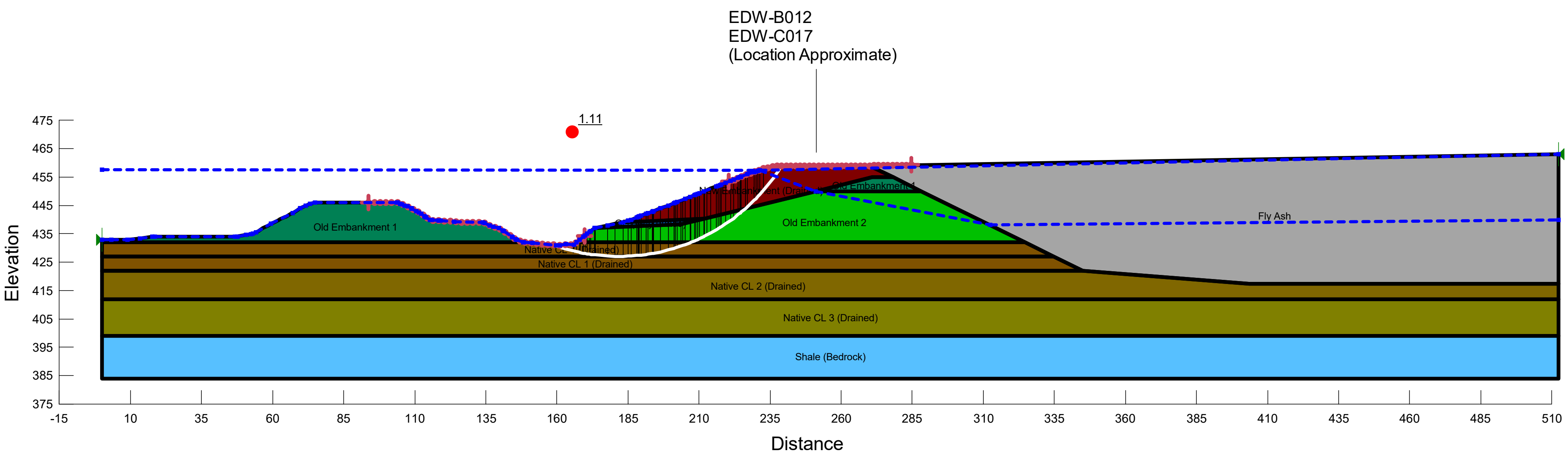
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Fly Ash	105	100	27	1
	GP (very dense)	135	0	36	1
	Native CL 1 (Drained)	117	100	26	1
	Native CL 2 (Drained)	105	200	26	1
	Native CL 3 (Drained)	105	200	26	1
	Native CL Crust (Drained)	120	200	27.5	1
	New Embankment (Drained)	115	200	30	1
	Old Embankment 1	125	200	28	1
	Old Embankment 2	125	100	29	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section D
Slope Stability - Drained



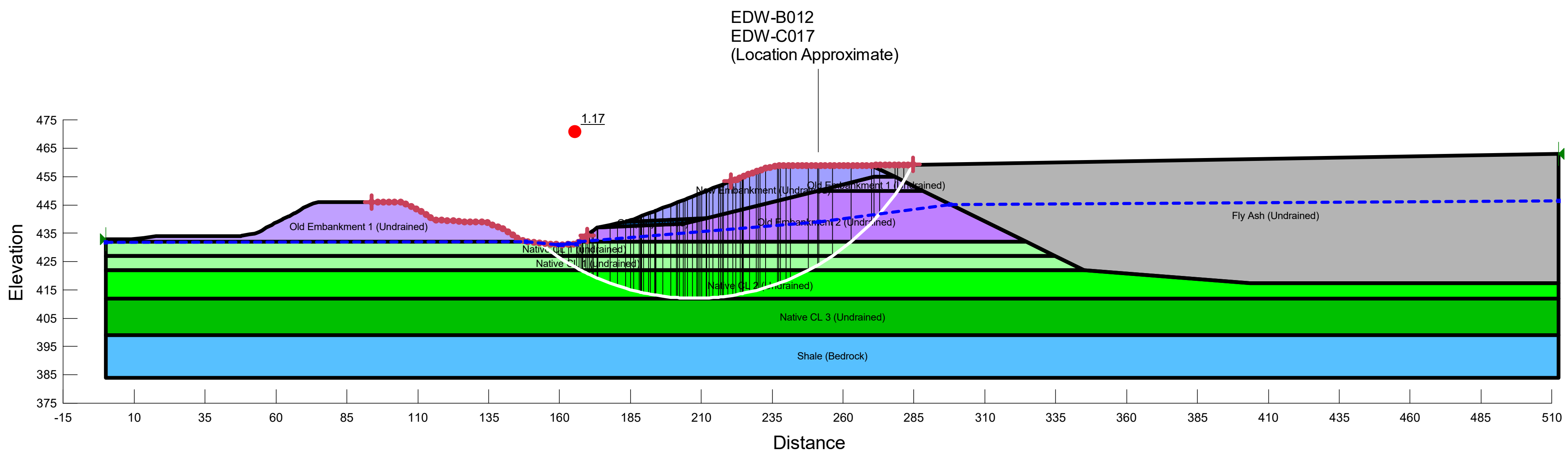
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Line	Piezometric Line After Drawdown
	Fly Ash	105	100	27	400	8	1	2
	GP (very dense)	135	0	36	5	34	1	2
	Native CL 1 (Drained)	117	100	26	430	8	1	2
	Native CL 2 (Drained)	105	200	26	470	8	1	2
	Native CL 3 (Drained)	105	200	26	600	10	1	2
	New Embankment (Drained)	115	200	30	1,670	10	1	2
	Old Embankment 1	125	200	28	1,670	10	1	2
	Old Embankment 2	125	100	29	830	10	1	2
	Shale (Bedrock)	140	1,000	36	1,150	35	1	2

Dynegy Edwards
Cross-section D
Slope Stability - Rapid Drawdown



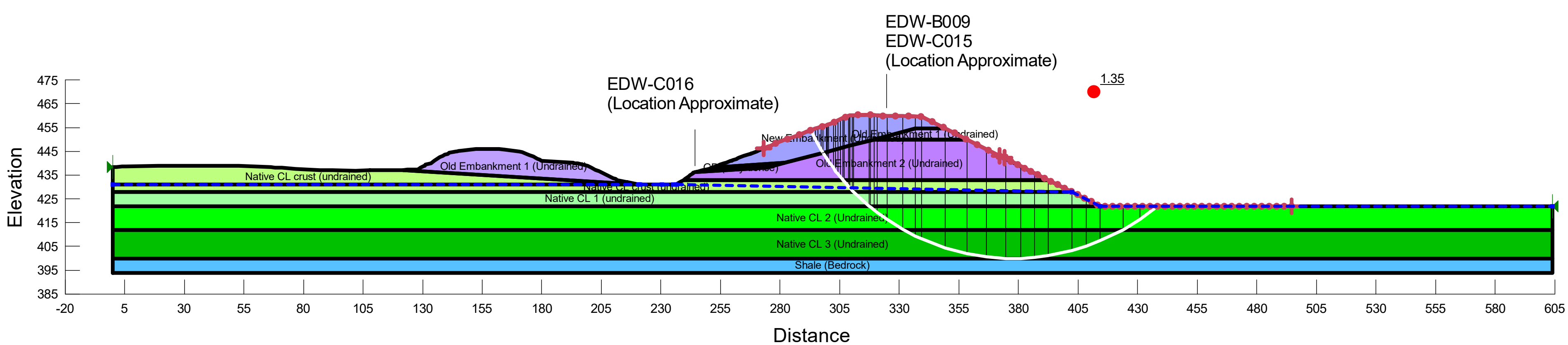
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Fly Ash (Undrained)	105	600	0	1
	GP (very dense)	135	0	36	1
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	New Embankment (Undrained)	115	2,500	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section D
Slope Stability - Seismic - PGA = 0.1g



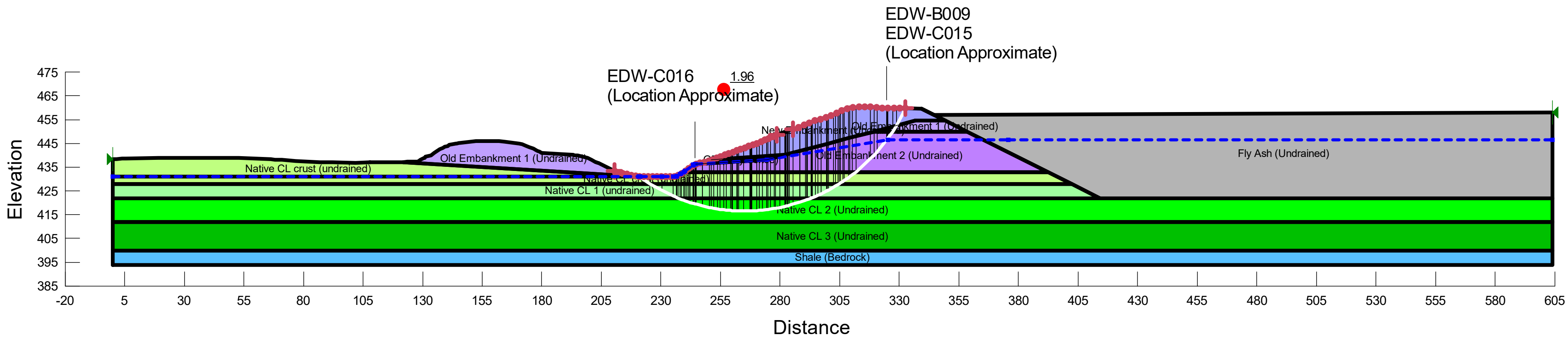
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	GP (very dense)	135	0	36	1
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	Native CL crust (undrained)	120	1,250	0	1
	New Embankment (Undrained)	115	2,500	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section E
Slope Stability - Temporary Construction



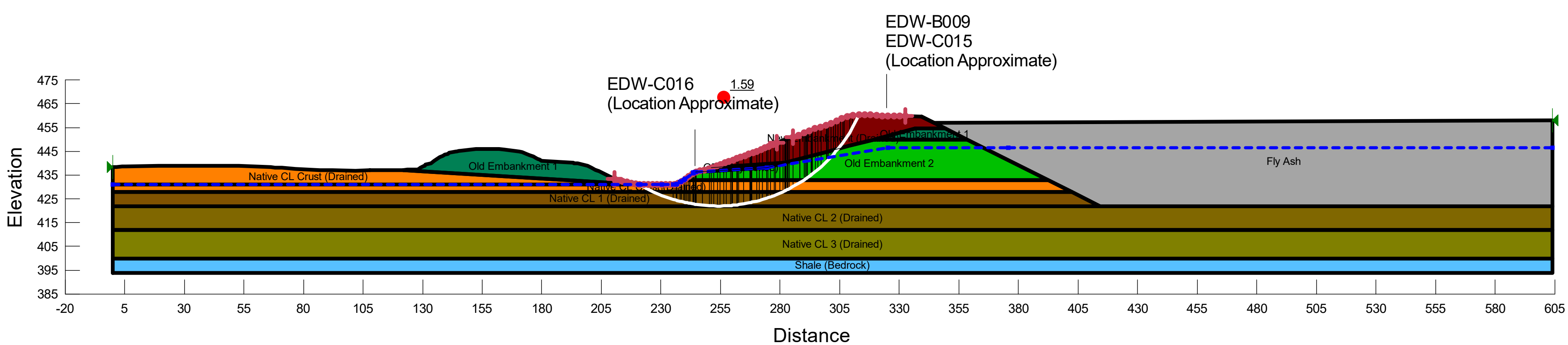
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Fly Ash (Undrained)	105	600	0	1
	GP (very dense)	135	0	36	1
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	Native CL crust (undrained)	120	1,250	0	1
	New Embankment (Undrained)	115	2,500	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section E
Slope Stability - Undrained



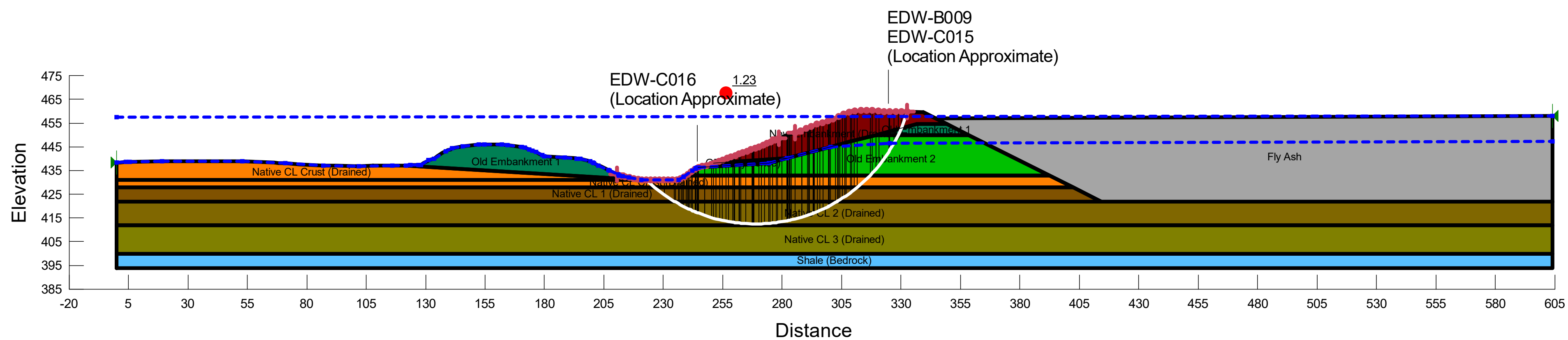
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Fly Ash	105	100	27	1
	GP (very dense)	135	0	36	1
	Native CL 1 (Drained)	117	100	26	1
	Native CL 2 (Drained)	105	200	26	1
	Native CL 3 (Drained)	105	200	26	1
	Native CL Crust (Drained)	120	200	27.5	1
	New Embankment (Drained)	115	200	30	1
	Old Embankment 1	125	200	28	1
	Old Embankment 2	125	100	29	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section E
Slope Stability - Drained



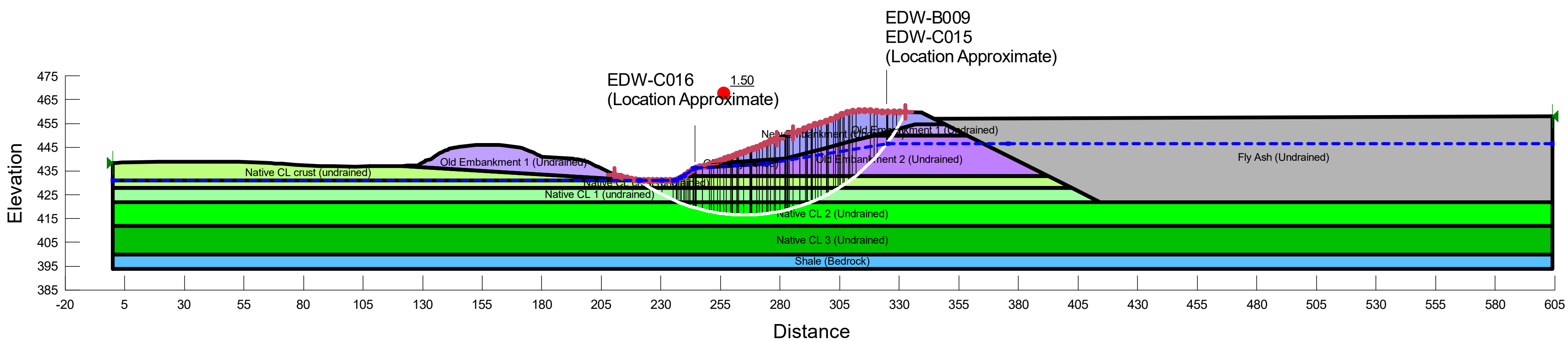
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Line	Piezometric Line After Drawdown
	Fly Ash	105	100	27	400	5	1	2
	GP (very dense)	135	0	36	5	34	1	2
	Native CL 1 (Drained)	117	100	26	430	5	1	2
	Native CL 2 (Drained)	105	200	26	470	5	1	2
	Native CL 3 (Drained)	105	200	26	600	8	1	2
	Native CL Crust (Drained)	120	200	27.5	830	10	1	2
	New Embankment (Drained)	115	200	30	1,670	10	1	2
	Old Embankment 1	125	200	28	1,670	10	1	2
	Old Embankment 2	125	100	29	830	10	1	2
	Shale (Bedrock)	140	1,000	36	1,150	35	1	2

Dynegy Edwards
Cross-section E
Slope Stability - Rapid Drawdown



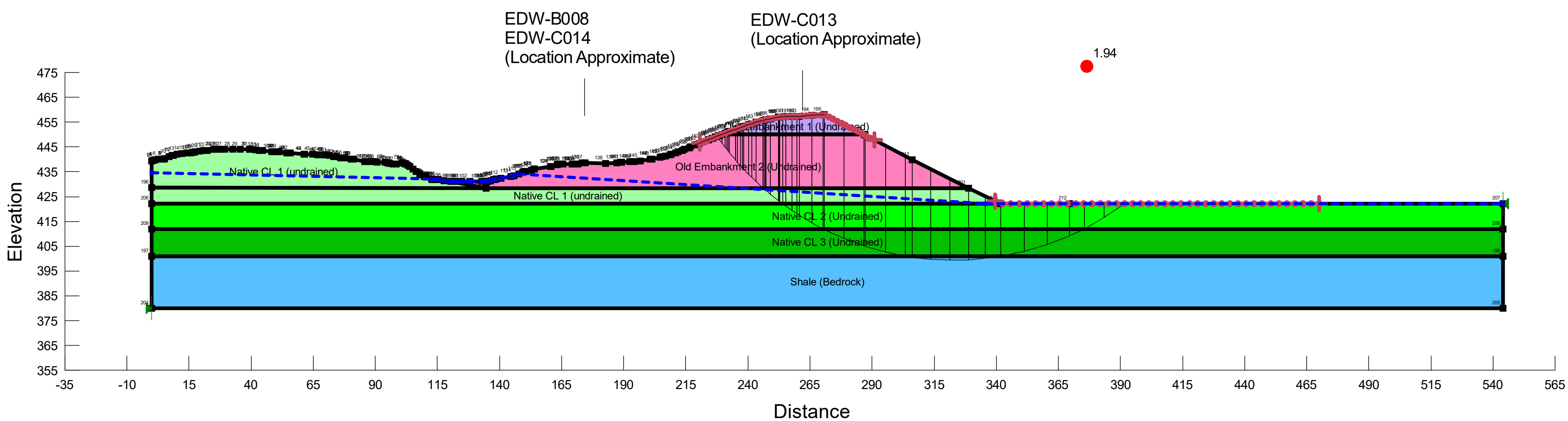
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Fly Ash (Undrained)	105	600	0	1
	GP (very dense)	135	0	36	1
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	Native CL crust (undrained)	120	1,250	0	1
	New Embankment (Undrained)	115	2,500	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section E
Slope Stability - Seismic - PGA = 0.1g



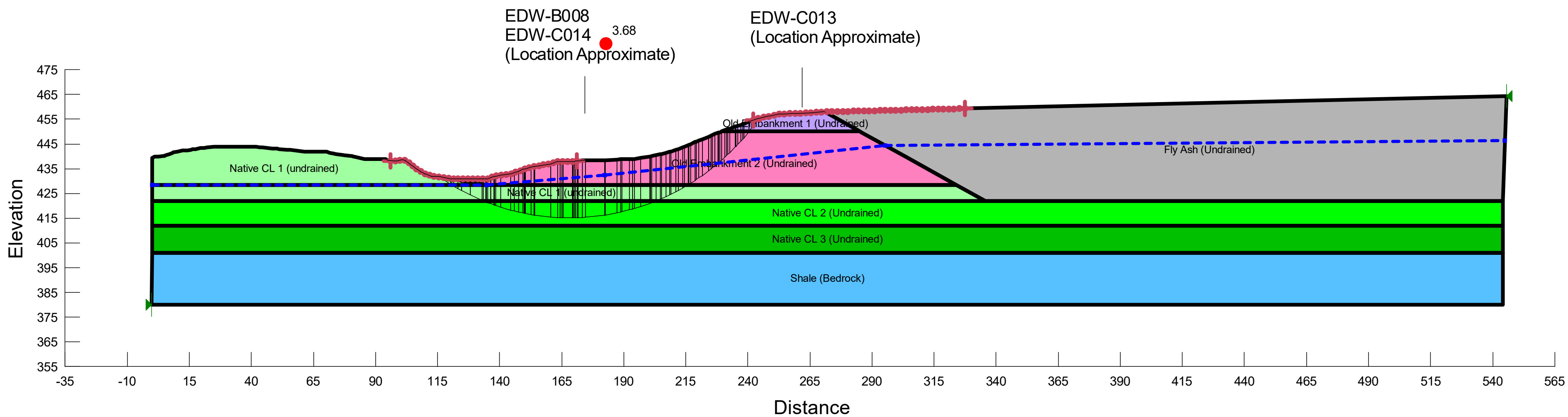
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section F
Slope Stability - Temporary Construction



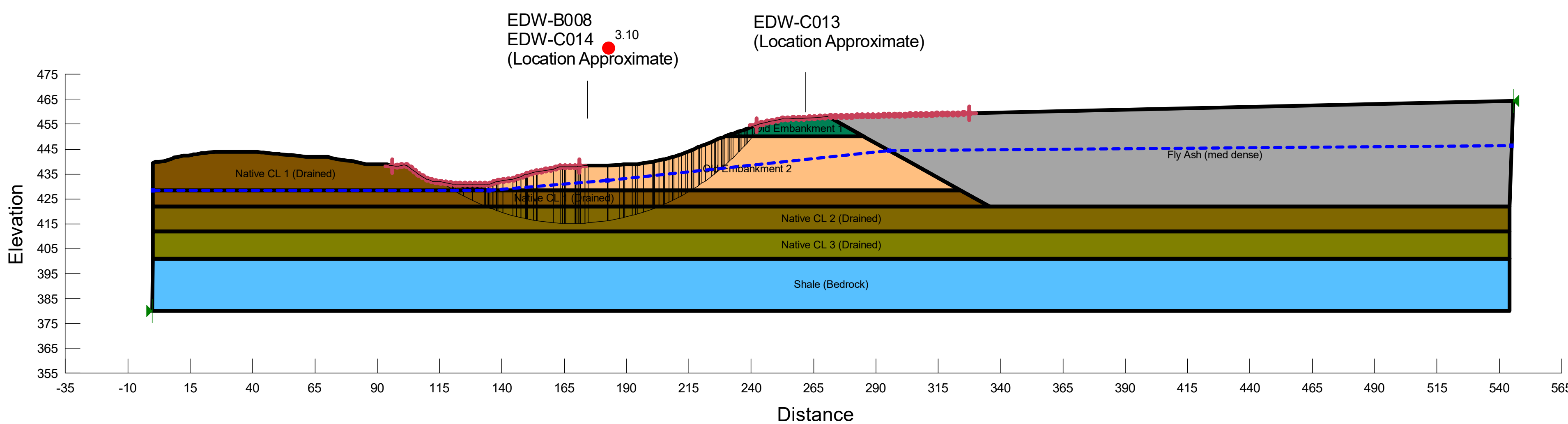
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Fly Ash (Undrained)	105	600	0	1
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section F
Slope Stability - Undrained



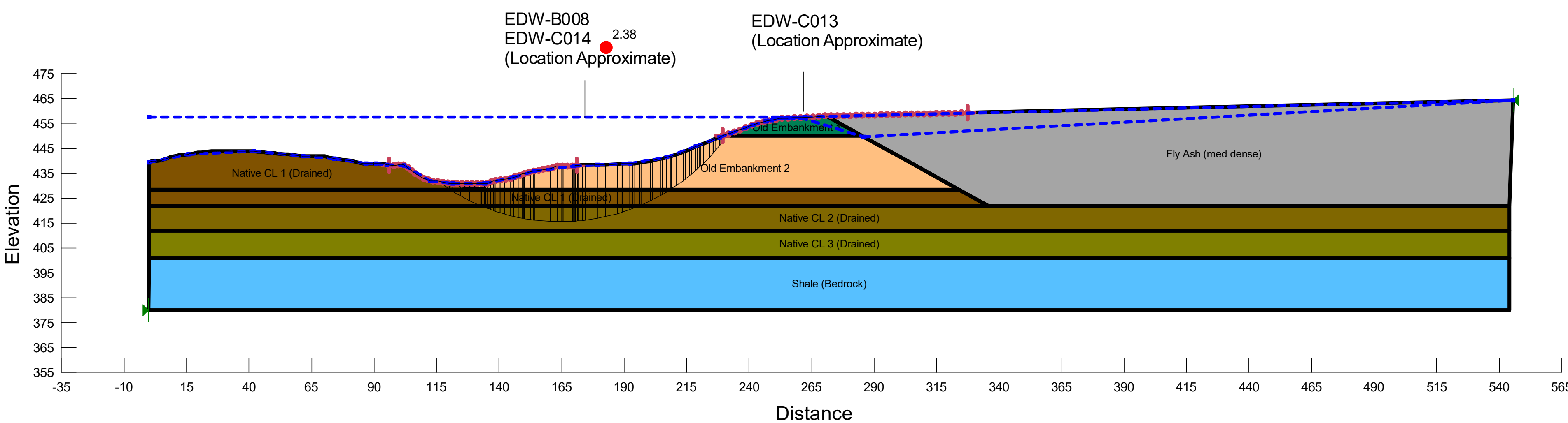
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Fly Ash (med dense)	105	100	27	1
	Native CL 1 (Drained)	117	200	26	1
	Native CL 2 (Drained)	105	200	26	1
	Native CL 3 (Drained)	105	200	26	1
	Old Embankment 1	125	200	28	1
	Old Embankment 2	125	100	29	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section F
Slope Stability - Drained



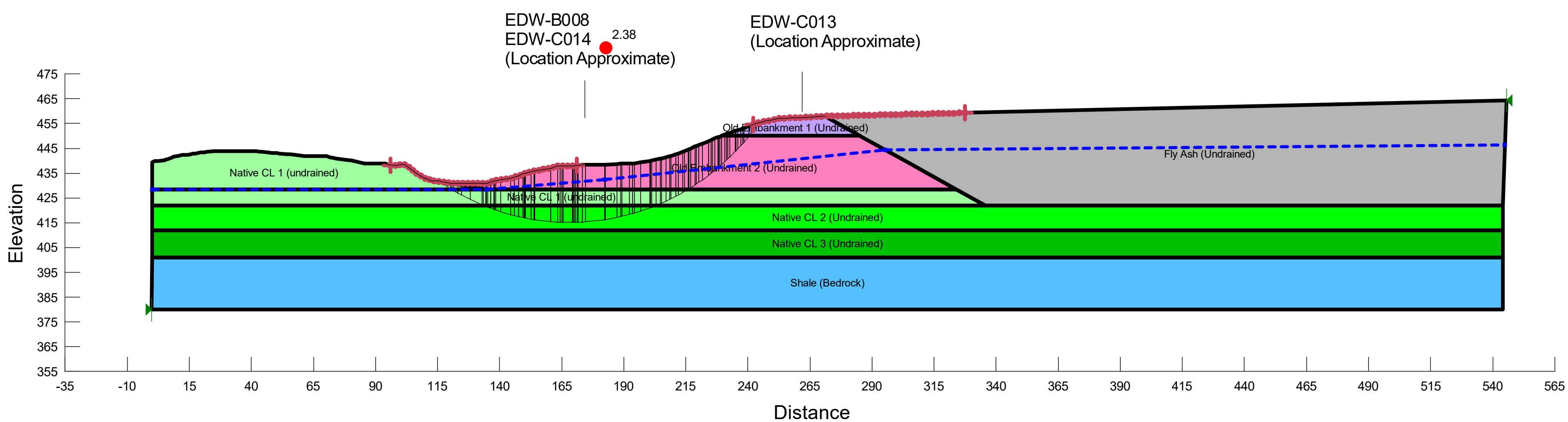
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Line	Piezometric Line After Drawdown
	Fly Ash (med dense)	105	100	27	400	5	1	2
	Native CL 1 (Drained)	117	200	26	430	5	1	2
	Native CL 2 (Drained)	105	200	26	470	5	1	2
	Native CL 3 (Drained)	105	200	26	600	8	1	2
	Old Embankment 1	125	200	28	1,670	10	1	2
	Old Embankment 2	125	100	29	830	10	1	2
	Shale (Bedrock)	140	1,000	36	1,150	35	1	2

Dynegy Edwards
Cross-section F
Slope Stability - Rapid Drawdown



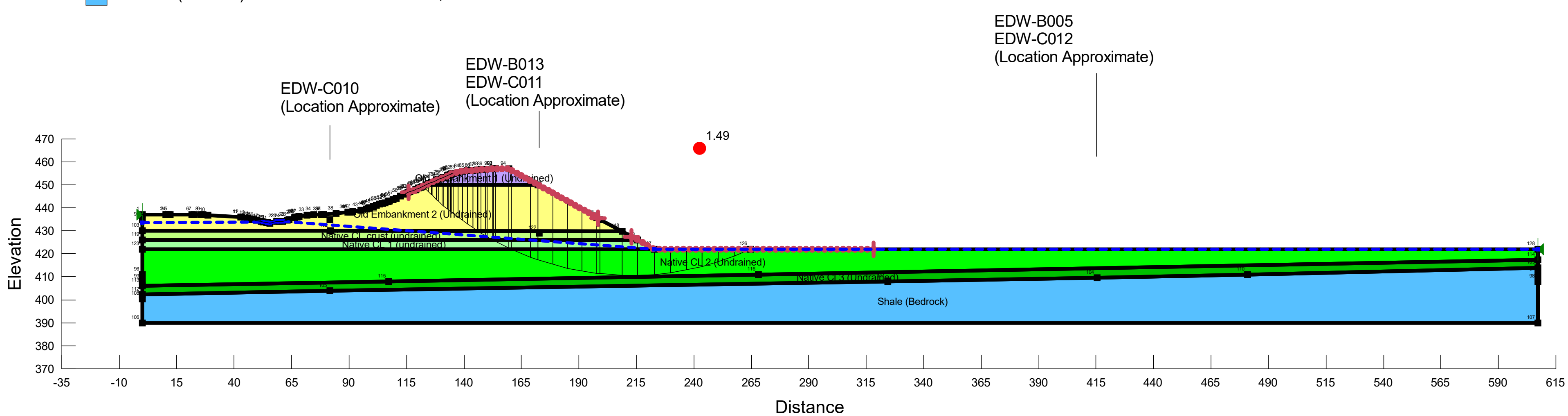
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Fly Ash (Undrained)	105	600	0	1
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section F
Slope Stability - Seismic - PGA = 0.1g



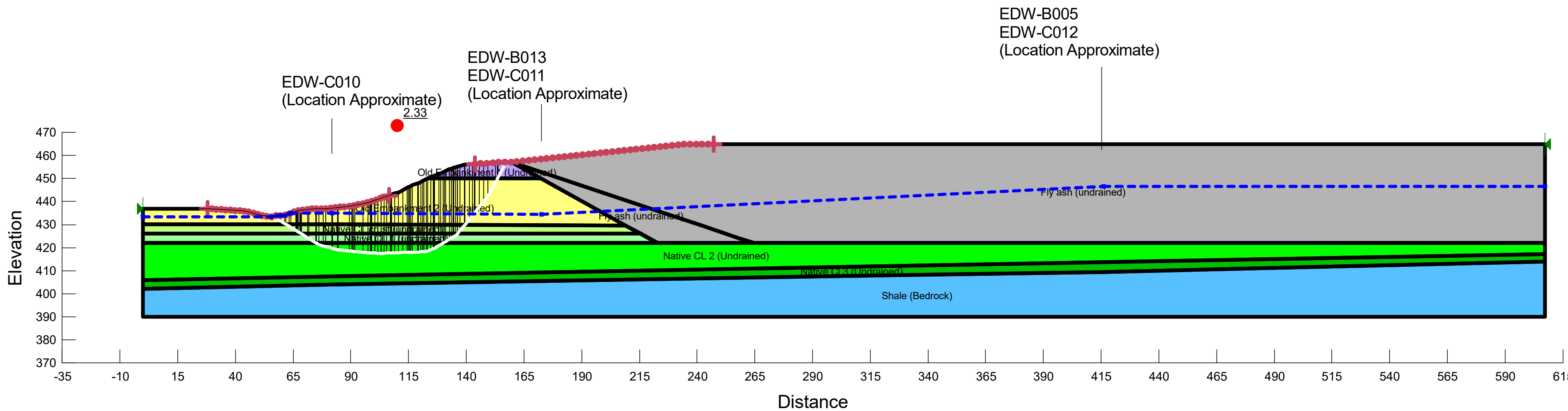
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native Cl 3 (Undrained)	105	900	0	1
	Native CL crust (undrained)	120	1,250	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section G
Slope Stability - Temporary Construction



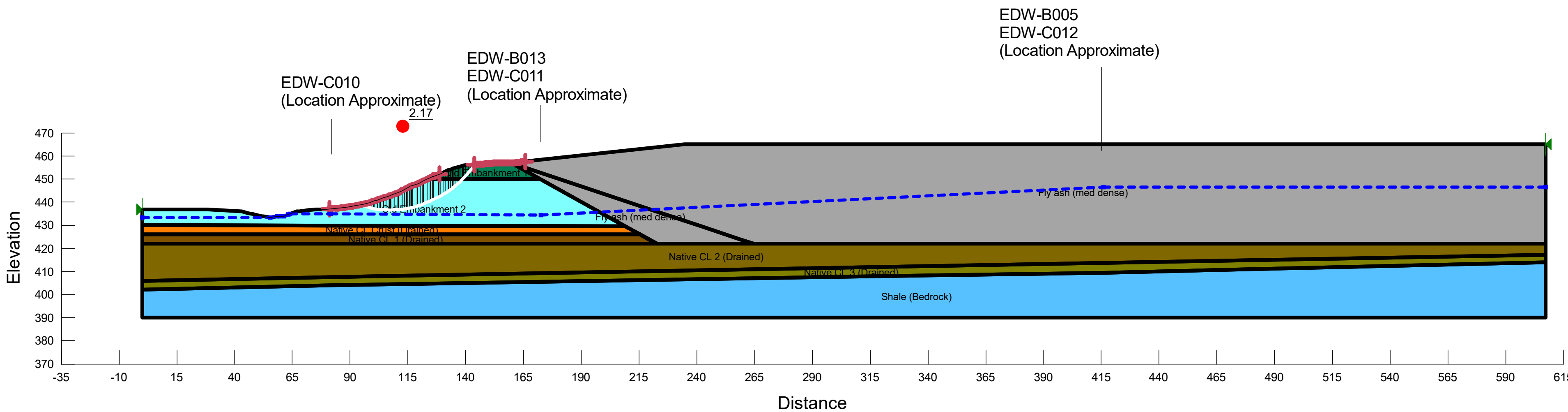
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion (psf)	Piezometric Line
	Fly ash (undrained)	105			600	1
	Native CL 1 (undrained)	117	650	0		1
	Native CL 2 (Undrained)	105	700	0		1
	Native Cl 3 (Undrained)	105	900	0		1
	Native CL crust (undrained)	120	1,250	0		1
	Old Embankment 1 (Undrained)	125	2,500	0		1
	Old Embankment 2 (Undrained)	125	1,250	0		1
	Shale (Bedrock)	140	1,000	36		1

Dynegy Edwards
Cross-section G
Slope Stability - Undrained



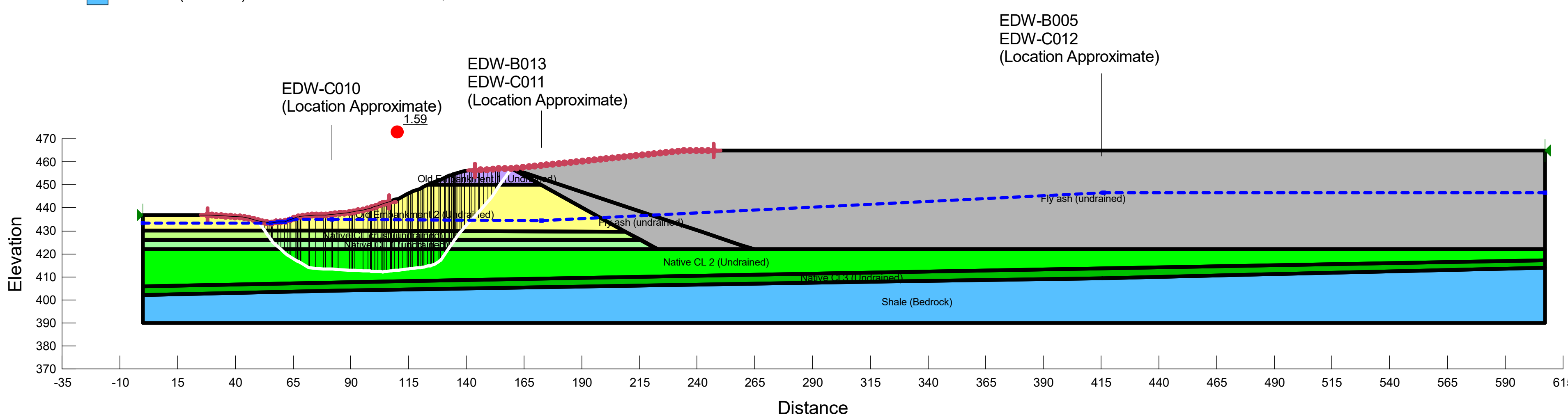
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Fly ash (med dense)	105	100	27	1
	Native CL 1 (Drained)	117	100	26	1
	Native CL 2 (Drained)	105	200	26	1
	Native CL 3 (Drained)	105	200	26	1
	Native CL Crust (Drained)	120	200	27.5	1
	Old Embankment 1	125	200	28	1
	Old Embankment 2	125	100	29	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section G
Slope Stability - Drained



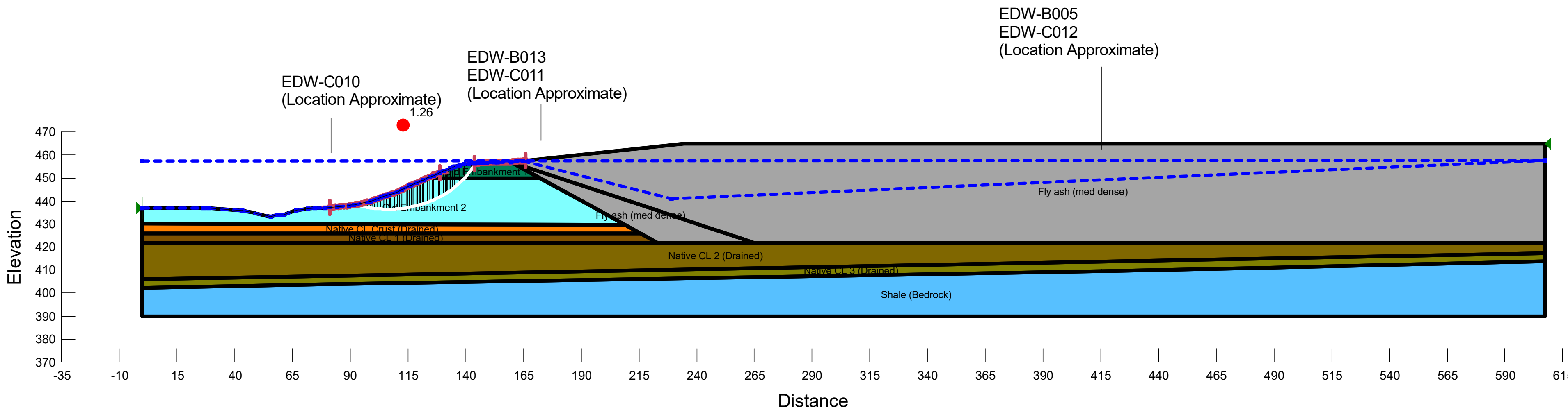
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion (psf)	Piezometric Line
	Fly ash (undrained)	105			600	1
	Native CL 1 (undrained)	117	650	0		1
	Native CL 2 (Undrained)	105	700	0		1
	Native Cl 3 (Undrained)	105	900	0		1
	Native CL crust (undrained)	120	1,250	0		1
	Old Embankment 1 (Undrained)	125	2,500	0		1
	Old Embankment 2 (Undrained)	125	1,250	0		1
	Shale (Bedrock)	140	1,000	36		1

Dynegy Edwards
Cross-section G
Slope Stability - Seismic - PGA = 0.1g



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Line	Piezometric Line After Drawdown
	Fly ash (med dense)	105	100	27	400	5	1	2
	Native CL 1 (Drained)	117	100	26	430	5	1	2
	Native CL 2 (Drained)	105	200	26	470	5	1	2
	Native CL 3 (Drained)	105	200	26	600	8	1	2
	Native CL Crust (Drained)	120	200	27.5	830	10	1	2
	Old Embankment 1	125	200	28	1,670	10	1	2
	Old Embankment 2	125	100	29	830	10	1	2
	Shale (Bedrock)	140	1,000	36	1,150	35	1	2

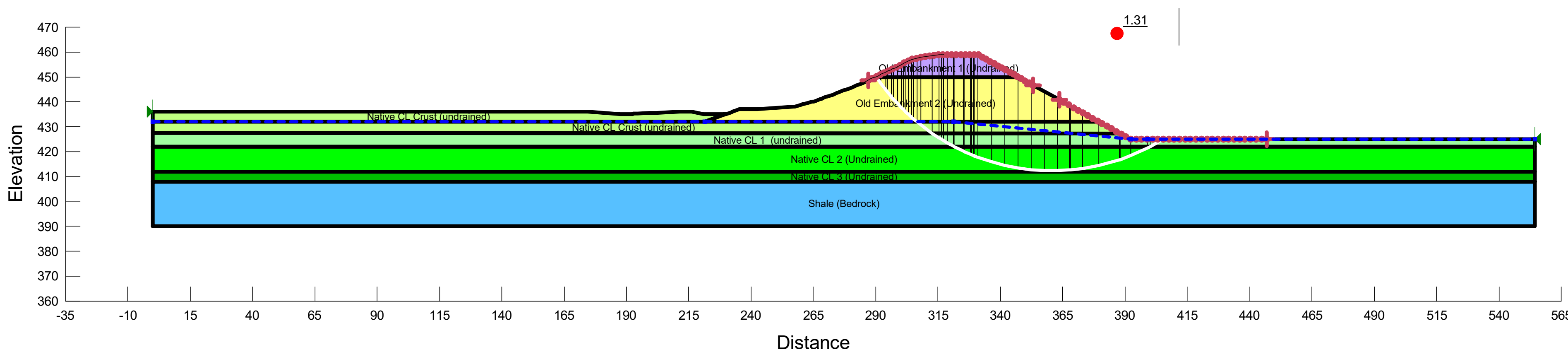
Dynegy Edwards
Cross-section G
Slope Stability - Rapid Drawdown



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	117	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	Native CL Crust (undrained)	120	1,250	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

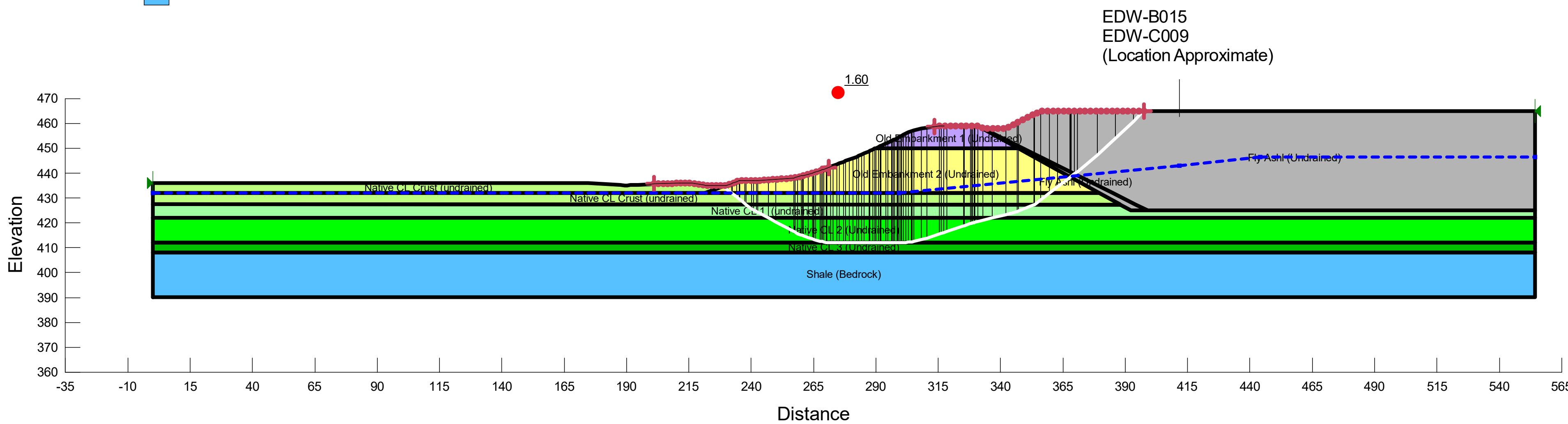
Dynegy Edwards
Cross-section H
Slope Stability - Temporary Construction

EDW-B015
EDW-C009
(Location Approximate)



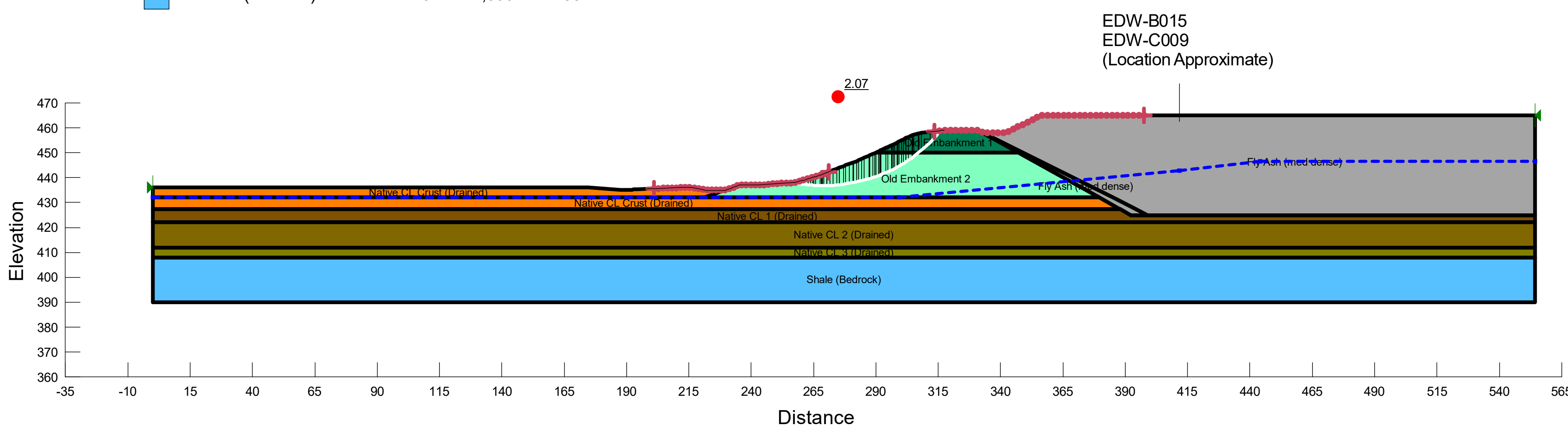
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Fly Ashl (Undrained)	105	600	0	1
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	117	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	Native CL Crust (undrained)	120	1,250	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section H
Slope Stability - Undrained



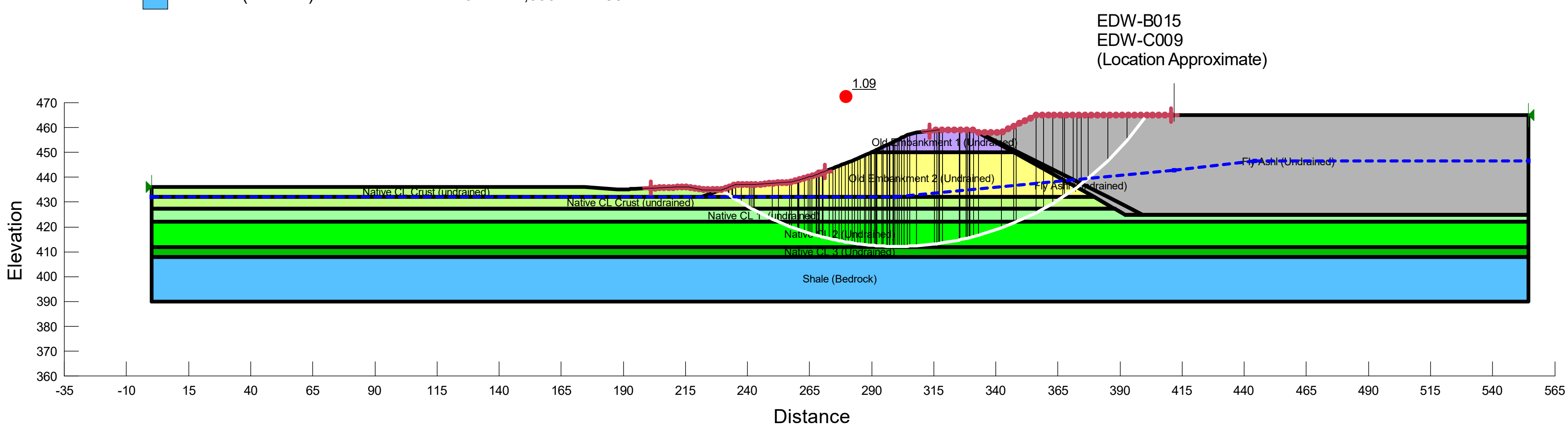
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Fly Ash (med dense)	105	100	27	1
	Native CL 1 (Drained)	117	100	26	1
	Native CL 2 (Drained)	105	200	26	1
	Native CL 3 (Drained)	105	200	26	1
	Native CL Crust (Drained)	120	200	27.5	1
	Old Embankment 1	125	200	28	1
	Old Embankment 2	125	100	29	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section H
Slope Stability - Drained



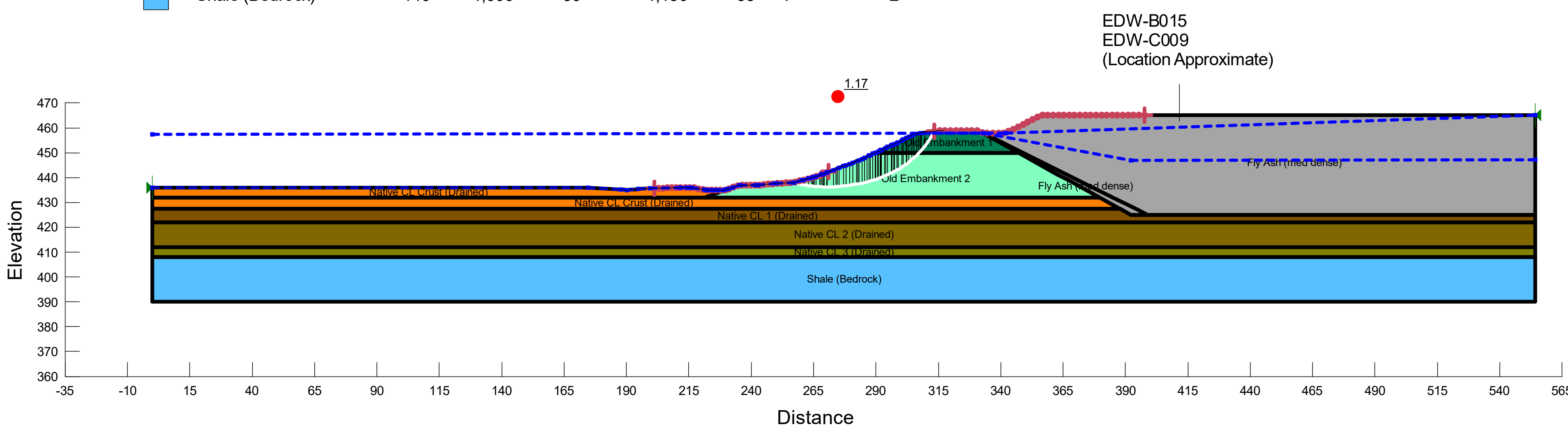
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Fly Ashl (Undrained)	105	600	0	1
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	117	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	Native CL Crust (undrained)	120	1,250	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section H
Seismic - PGA = 0.1g



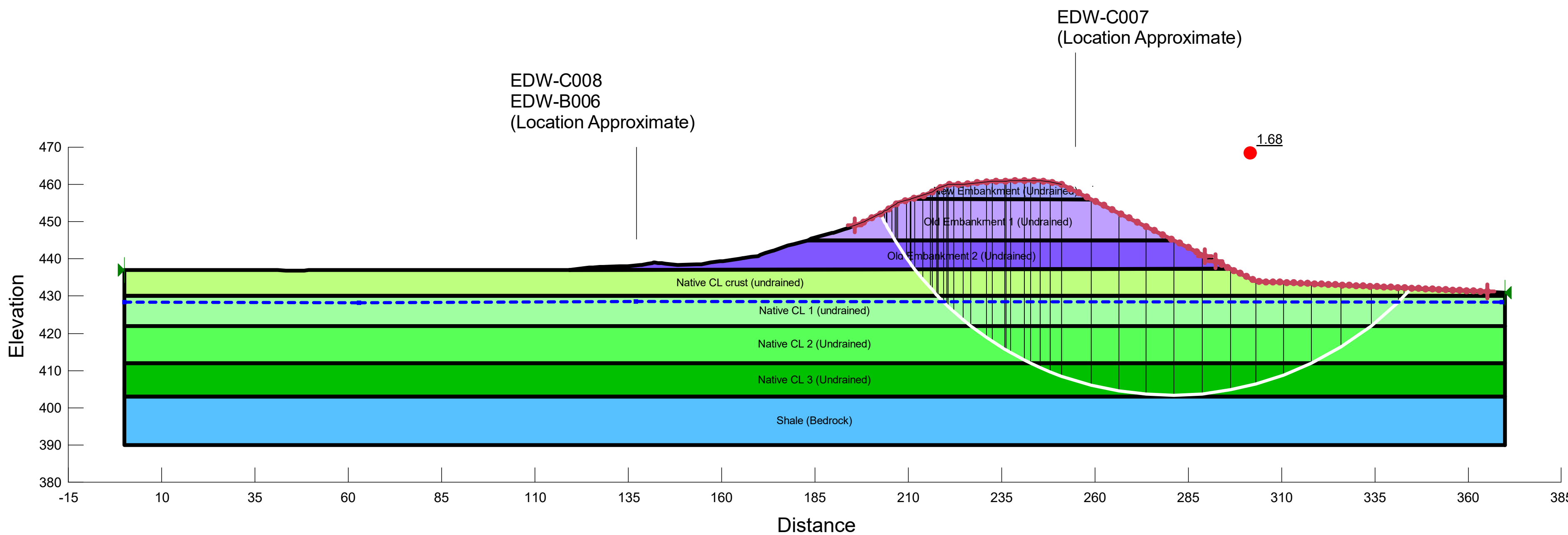
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Line	Piezometric Line After Drawdown
	Fly Ash (med dense)	105	100	27	400	5	1	2
	Native CL 1 (Drained)	117	100	26	430	5	1	2
	Native CL 2 (Drained)	105	200	26	470	5	1	2
	Native CL 3 (Drained)	105	200	26	600	8	1	2
	Native CL Crust (Drained)	120	200	27.5	830	10	1	2
	Old Embankment 1	125	200	28	1,670	10	1	2
	Old Embankment 2	125	100	29	830	10	1	2
	Shale (Bedrock)	140	1,000	36	1,150	35	1	2

Dynegy Edwards
Cross-section H
Slope Stability - Rapid Drawdown



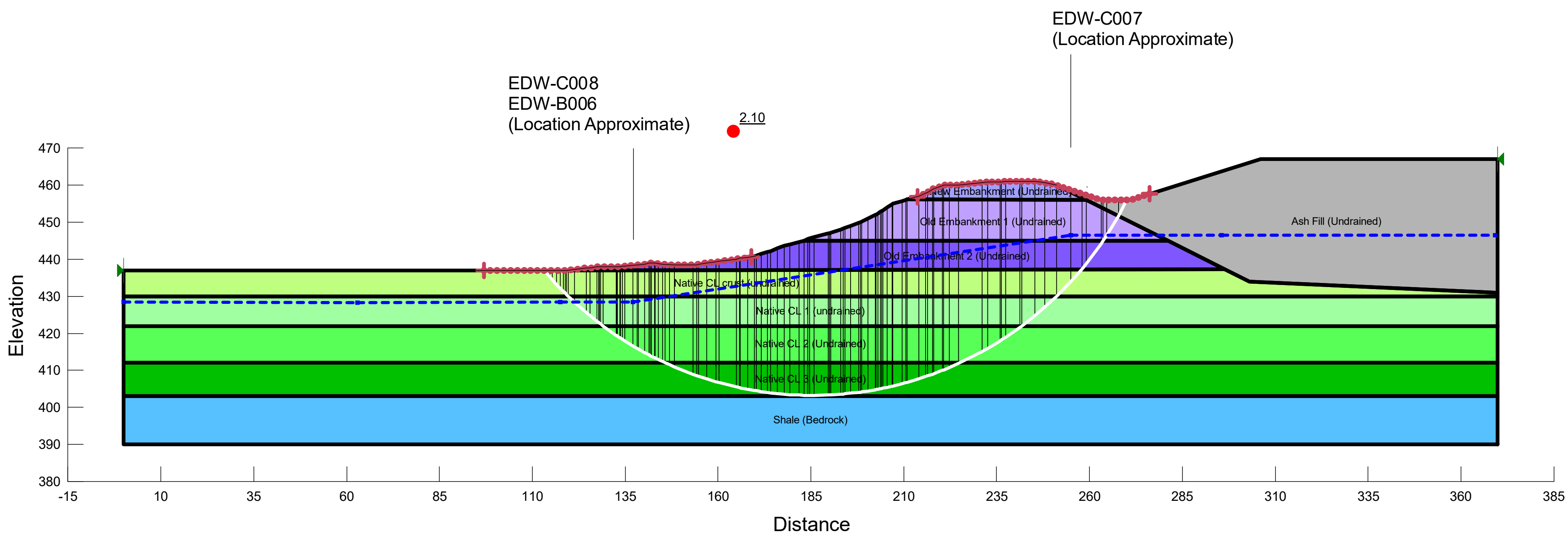
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	Native CL crust (undrained)	120	1,250	0	1
	New Embankment (Undrained)	115	2,500	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section I
Slope Stability - Temporary Construction



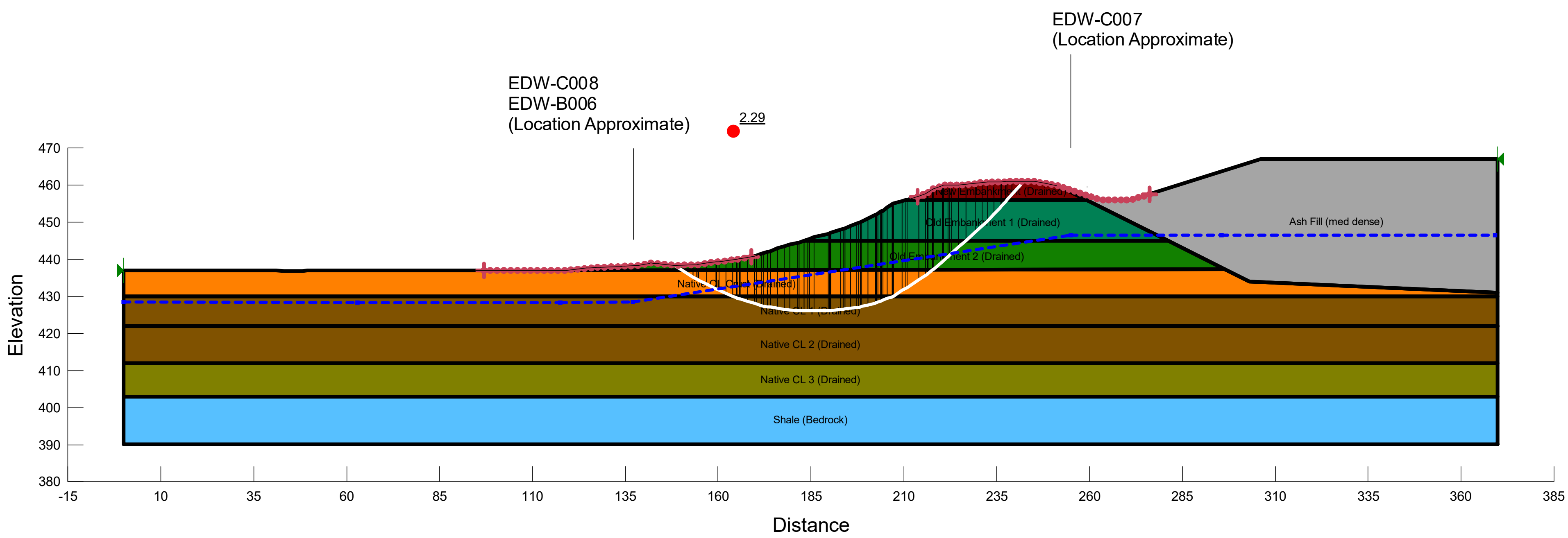
Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Ash Fill (Undrained)	105	600	0	1
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	Native CL crust (undrained)	120	1,250	0	1
	New Embankment (Undrained)	115	2,500	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section I
Slope Stability - Undrained



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Ash Fill (med dense)	105	100	27	1
	Native CL 1 (Drained)	117	100	26	1
	Native CL 2 (Drained)	105	200	26	1
	Native CL 3 (Drained)	105	200	26	1
	Native CL Crust (Drained)	120	200	27.5	1
	New Embankment (Drained)	115	200	30	1
	Old Embankment 1 (Drained)	125	200	28	1
	Old Embankment 2 (Drained)	125	100	29	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross-section I
Slope Stability - Drained



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Cohesion R (psf)	Phi R (°)	Piezometric Line	Piezometric Line After Drawdown
	Ash Fill (med dense)	105	100	27	400	5	1	2
	Native CL 1 (Drained)	117	100	26	430	5	1	2
	Native CL 2 (Drained)	105	200	26	470	5	1	2
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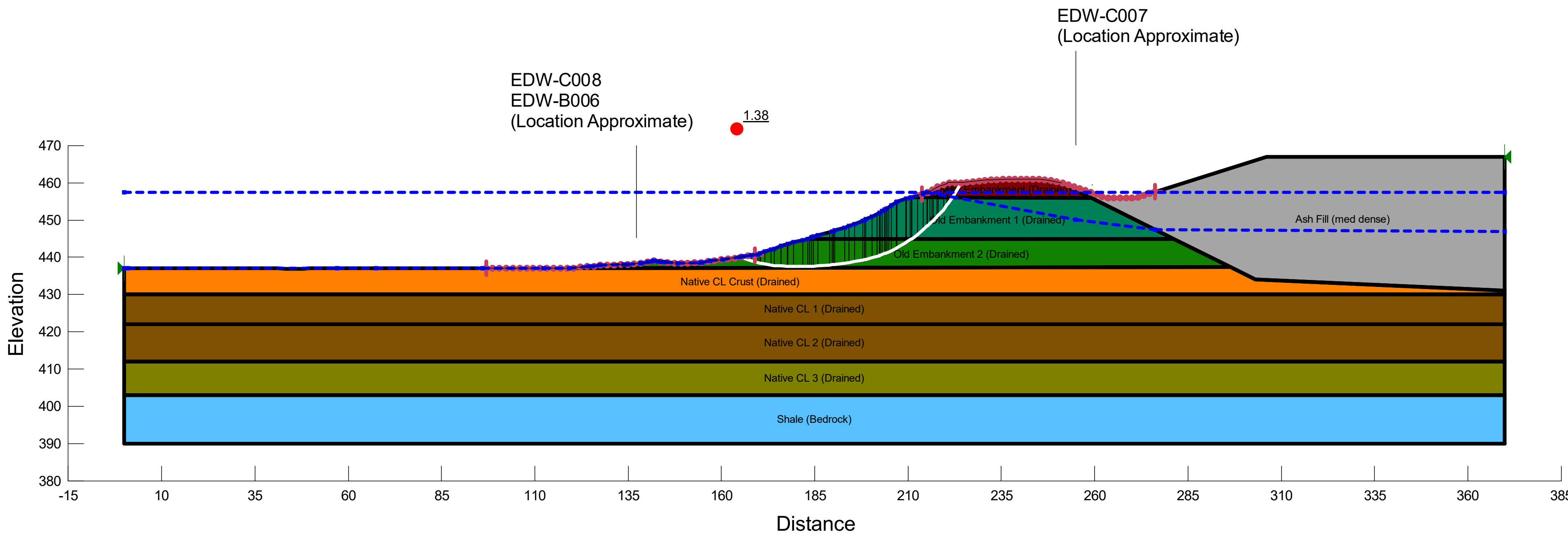
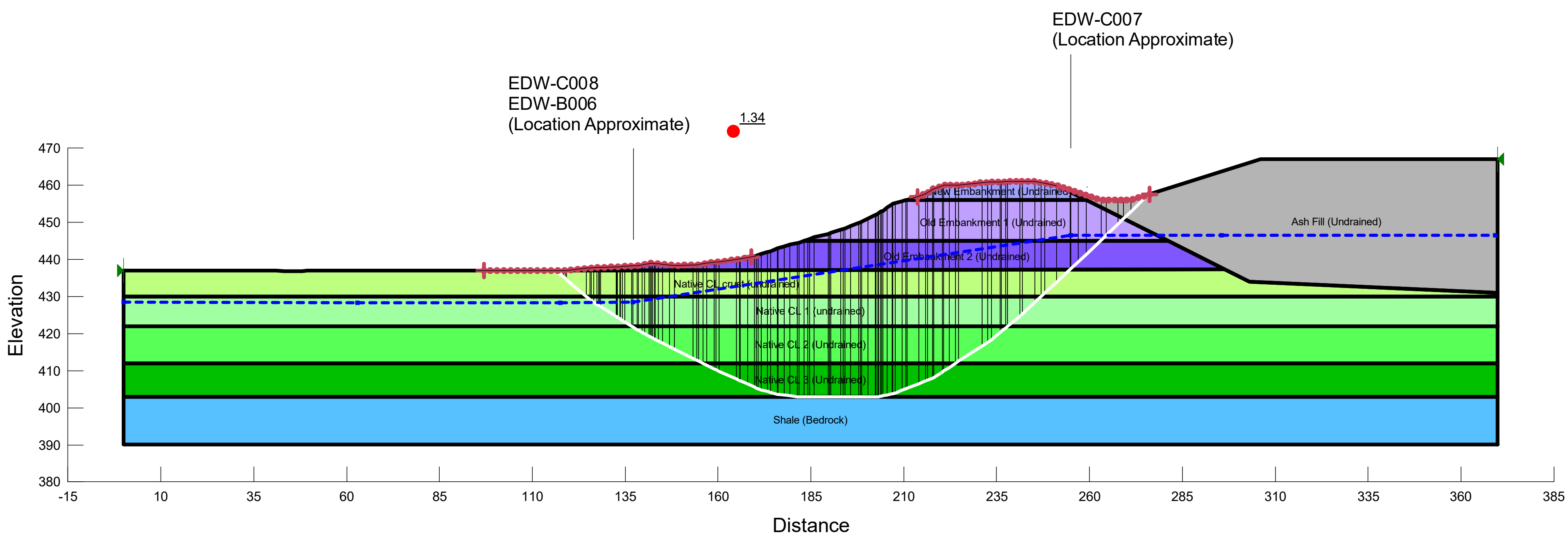
	New Embankment (Drained)	115	200	30	1,670	10	1	2
	Old Embankment 1 (Drained)	125	200	28	1,670	10	1	2
	Old Embankment 2 (Drained)	125	100	29	830	10	1	2
	Shale (Bedrock)	140	1,000	36	1,150	35	1	2

Dynegy Edwards
Cross-section I
Slope Stability - Rapid Drawdown



Color	Name	Unit Weight (pcf)	Effective Cohesion (psf)	Effective Friction Angle (°)	Piezometric Line
	Ash Fill (Undrained)	105	600	0	1
	Native CL 1 (undrained)	117	650	0	1
	Native CL 2 (Undrained)	105	700	0	1
	Native CL 3 (Undrained)	105	900	0	1
	Native CL crust (undrained)	120	1,250	0	1
	New Embankment (Undrained)	115	2,500	0	1
	Old Embankment 1 (Undrained)	125	2,500	0	1
	Old Embankment 2 (Undrained)	125	1,250	0	1
	Shale (Bedrock)	140	1,000	36	1

Dynegy Edwards
Cross Section I
Seismic - PGA = 0.1g



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314.429.0100 tel
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October 7, 2016

Mr. Matt Ballance, PE
Senior Project Engineer
Dynegy Inc.
1500 Eastport Plaza Drive
Collinsville, Illinois 62234

RE: Geotechnical Report
Edwards Power Station
Ash Pond

Dear Mr. Ballance:

AECOM is pleased to provide this Geotechnical Report for the Illinois Power Resource Generating, LLC (IPRG) Ash Pond Coal Combustion Residuals (CCR) unit at the Edwards Power Station located in Bartonville, Illinois. This Geotechnical Report has been prepared to document the analysis performed to check that the facility meets the geotechnical slope stability requirements including Factors of Safety required by 40 CFR § 257.73.

AECOM looks forward to providing continued support to Illinois Power Resource Generating, LLC and working together on this important program. Please do not hesitate to call Ron Hager at 314-429-0100 (office) / 440-591-7868 (mobile), if you have any questions or comments on this Geotechnical Report.

Sincerely,

AECOM

Jeremy Thomas, PE
Site Manager
jeremy.thomas@aecom.com

Ronald Hager
Program Manager
ronald.hager@aecom.com

cc: Mark Rokoff, PE – AECOM

Attachments:

A. Figures
B. Boring Logs
C. Piezometer Logs
D. CPT Data Report
E. Laboratory Test Data
F. Material Characterization Calculations
G. Slope Stability Analysis
H. Liquefaction Analysis

1. INTRODUCTION

1.1. Purpose of This Report

This report presents the results of the geotechnical analyses prepared by AECOM for the Illinois Power Resources Generating, LLC (IPRG[1]) Coal Combustion Residuals (CCR) Ash Pond at the Edwards Power Station, located in Bartonville, Illinois (see **Figure 1, Attachment A** for Location Map). The purpose of the geotechnical investigation and analyses performed is to evaluate the design, performance, and condition of the impoundment and associated structures using the data collected from surface and subsurface investigations, available design drawings, construction records, inspection reports, previous engineering investigations, and other pertinent historic documents provided to AECOM by IPRG. This information was then used to evaluate the design and operation of the surface impoundment against the regulatory standards set in 40 CFR § 257.73.

The geotechnical field exploration was conducted between August 19 and November 5, 2015. The field program consisted of conventional mud rotary borings, Standard Penetration Testing (SPT), Cone Penetration testing (CPT), and piezometer installation. Laboratory testing was conducted on the materials obtained through various sampling techniques to assist in characterization of the subsurface conditions, especially with respect to defining material parameters in stability analyses. Stability analyses were performed by AECOM to evaluate the potential for slope instabilities, in accordance with the Environmental Protection Agency (EPA) regulation 40 CFR § 257.73(d) and (e).

A summary of the geotechnical field program, laboratory testing program, and stability evaluations are presented herein. Detailed interpretations, calculations, and presentation of analysis results are provided in the Attachments to this report.

1.2. Description of Impoundment

There is one CCR unit at the Edwards Power Station: the Ash Pond. The Ash Pond is approximately 95 acres in size and is contained by a perimeter embankment that forms the exterior of the impoundment on all but the northeast side of the Ash Pond. The northeast side is bordered by the Edwards Station building grounds and switch yard which are at approximately the same elevation as the top of the pond embankment.

The original Ash Pond embankment is composed primarily of low plasticity compacted clays. An engineered raise of the embankment, constructed of ash placed on the crest and outboard side of the existing embankment, was completed in 2004 to facilitate the addition of a rail loop at the crest of the embankment. Additionally, this raise project also included constructing a new crushed stone embankment through and within the southern end of the Ash Pond, isolating a portion of the Ash Pond that was filled with ash and is vegetated. The original embankment still forms the perimeter of the Ash Pond at the southern end of this filled and vegetated area.

[1] Although the Ash Pond is owned by IPRG, Dynegy Administrative Services Company (Dynegy) contracted AECOM to develop this geotechnical report on behalf of IPRG. Therefore, “Dynegy” is referenced in materials attached to this geotechnical report.

Embankment heights range from approximately 0 feet (east and northeastern side of the embankment) to 29 feet (south and western side of the embankment), relative to the outboard toe. The typical crest elevation is approximately elevation 460 to 461 feet (all elevations in this report are listed in the NAVD88 datum, unless otherwise stated), based on the 2015 Maurer-Stutz survey for the site. Based on 2015 Illinois state LiDAR data, embankment outboard slopes range from approximately 2.5H:1V (horizontal to vertical) at the southern end of Ash Pond to 3.4H:1V at the western side of Ash Pond. Embankment crest widths range from approximately 15 feet to 42 feet, with narrower crest widths along the northern portion of the embankment and wider crest widths along the south, east, and west sides of the CCR unit.

Site location and site vicinity maps are included **Attachment A**, **Figure 1**.

2. SUMMARY OF FIELD INVESTIGATIONS

A subsurface exploration program was undertaken at the Ash Pond, including 14 soil borings, installation of 4 standpipe piezometers, and 22 cone penetration test (CPT) soundings with shear wave velocity (Vs) measurements and pore pressure dissipation (PPD) testing. The borings were drilled by AECOM's subcontractor Strata Earth Services, LLC of Palatine, IL, under the full-time supervision of AECOM geotechnical personnel. Strata Earth Services used both an All-Terrain Vehicle-mounted Diedrich D-120 drill rig and a truck-mounted Mobile B-57 drill rig, in conjunction with 3¼-inch inner diameter hollow stem augers and mud rotary methods to drill the borings. CPT soundings were performed by AECOM's subcontractor ConeTec, Inc., again with full-time oversight by AECOM personnel.

Boring depths varied from 37 to 66.5 feet below ground surface (bgs) and CPT depths varied from approximately 15 to 56 feet bgs. Boring and CPT sounding locations are depicted in **Figure 2** and piezometer locations are depicted in **Figure 3**. Logs of the borings are presented in **Attachment B**. Logs of the CPT soundings are presented in **Attachment D**, and piezometer logs are presented in **Attachment C**. Approximate locations of borings and CPTs are listed in **Table 1**.

Representative soil samples were collected from each of the borings for classification and/or testing. The SPT soil samples were obtained with a split-spoon sampler, in accordance with ASTM D 1586. Undisturbed samples of fly ash and fine-grained soils were obtained using 3-inch outside diameter steel (Shelby) tubes, either conventionally pushed in accordance with ASTM D 1587 or by utilizing a piston sampler in accordance with ASTM D 6519 (in ash and very soft soils). Results of the laboratory testing are presented in **Attachment E**.

Table 1
Boring and CPT Exploration Location[1] Data

Exploration ID	Easting (ft NAD83)	Northing (ft NAD83)	Elevation (ft NAVD88)
Auger Borings			
EDW-B001	2435307.9	1431922.3	461.0
EDW-B002	2435311.8	1431230.1	454.9
EDW-B003	2435399.3	1430502.0	460.0
EDW-B003A	2435404.3	1430502.0	460.0
EDW-B004	2435844.2	1430395.2	460.5
EDW-B005	2436105.4	1428429.4	459.0
EDW-B006	2436239.1	1429340.9	436.0
EDW-B008	2435578.9	1428207.8	438.8
EDW-B009	2435438.4	1428498.4	460.1
EDW-B010	2434755.0	1431482.0	459.0
EDW-B011	2435211.9	1429262.2	456.4
EDW-B012	2434793.9	1429514.9	459.0
EDW-B013	2436189.5	1428284.1	457.0
EDW-B014	2434647.2	1430898.4	457.7
EDW-B015	2436104.4	1428611.5	460.0
EDW-B015A	2436099.4	1428606.5	460.0
CPT Soundings			
EDW-C001	2435307.9	1431922.3	461.0
EDW-C003	2435533.2	1431377.1	461.9
EDW-C005	2435844.2	1430395.2	460.5
EDW-C006	2435902.5	1429921.9	462.0
EDW-C007	2436127.3	1429449.6	458.1
EDW-C008	2436239.1	1429340.9	436.0
EDW-C009	2436104.4	1428611.5	460.0
EDW-C010	2436245.5	1428211.6	437.8
EDW-C011	2436189.5	1428284.1	457.0
EDW-C012	2436105.4	1428429.4	459.0
EDW-C013	2435634.1	1428281.0	457.9
EDW-C014	2435578.9	1428207.8	438.8
EDW-C015	2435438.4	1428498.4	460.1
EDW-C015A	2435501.3	1428444.5	460.1
EDW-C016	2435383.1	1428461.7	436.9
EDW-C017	2434793.9	1429514.9	459.0
EDW-C019	2434931.7	1429697.8	457.0
EDW-C021	2434538.8	1430424.2	460.0
EDW-C022	2434647.2	1430898.4	457.7
EDW-C023	2434755.0	1431482.0	459.0
EDW-C025	2435311.8	1431230.1	454.9
EDW-C026	2435399.3	1430502.0	460.0
EDW-C026B	2435404.2	1430505.4	460.0
EDW-C027	2435211.9	1429262.2	456.4

[1] Locations above were not surveyed. Locations were approximated based on handheld GPS measurements taken during the investigation. Elevations are based on site topographic LiDAR survey from Illinois Geospatial Data Clearinghouse for Peoria County downloaded in December of 2015. The expected accuracy of these measurements is expected to be approximately ±5 feet horizontal and ±1 foot vertical.

3. SUMMARY OF SITE-SPECIFIC SUBSURFACE CONDITIONS

3.1. Site Stratigraphy

New Embankment Fill Materials: The perimeter embankment dike of the Ash Pond was constructed in two stages, with an original embankment, and a later raise constructed on top of and on the outboard slope of the existing embankment. This raise brought the embankment crest from an original elevation around 455 feet to the current elevation around 460 to 461 feet. This newer embankment fill material is comprised of fly ash from the plant (as beneficial use material), classified as lean silt (United Soil Classification of ML) to poorly graded silty sand with gravel (SP). The consistency of the new embankment fill, as measured by uncorrected SPT N-values, ranged from soft to very stiff, but generally had a stiff to very stiff consistency and appeared to be well-compacted.

Old Embankment Fill Materials: The original perimeter embankment of the Ash Pond is largely comprised of clay fill with trace sand and shell fragments, classified as lean clay (CL). The consistency of the old embankment fill, as measured by uncorrected SPT N-values, ranged from soft to stiff, but generally had a stiff consistency and appeared to be well-compacted. It was noted that the old embankment fill generally had a higher measured shear strength above approximately elevation 450 ft, so this material was split into two materials within the slope stability analytical models.

Impounded Ash Materials: Ash materials were encountered in the borings drilled within the Ash Pond. The material was classified as a silt (ML - fly ash) with some sand and clay and trace gravel. The measured consistency of the ash ranged from very loose to very dense, though generally, the consistency of ash was loose to very loose and was saturated below the pool level in the Ash Pond.

Native Alluvial Clay Crust: The Ash Pond is underlain by native clay of alluvial origin. This material was typically classified as lean clay (CL), with occasional zones of interbedded fat clay (CH). Much of the clay has a liquid limit near 50, denoting borderline fat/lean clay. The uppermost approximate 5 feet of this native alluvial clay measured significantly higher in strength, signifying a desiccated crust layer near the original ground surface. The consistency of this clay was generally stiff.

Native Alluvial Clay: As noted above, the Ash Pond is underlain by native clay of alluvial origin, typically classified as lean clay (CL) with occasional zones of interbedded fat clay (CH). Much of the clay has a liquid limit near 50 moderate to high plasticity. Beneath the upper crust material, the clay exhibited significantly less shear strength, and was normally consolidated to slightly overconsolidated, with shear strengths increasing with depth. The clay consistency varied from soft to medium stiff near the top of the stratum, generally increasing with depth to a consistency of medium stiff to stiff near the level of the bedrock. To capture this strength increase within the stability models, this material was divided into three layers.

Shale Bedrock: Shale bedrock was encountered below the native alluvial soils in the deeper borings. The shale was found to be slightly weathered to weathered near the upper contact, and became hard with depth. The shale was cored in two locations to verify classification, but no further testing was completed on this material.

Other Materials: Other materials were encountered in relatively small quantities at the site, appearing at only one or two exploration locations, and were not considered part of the site-wide stratigraphy. These materials include old and recent fill (similar in properties to the old and new embankment fill materials), historic ash material (similar in properties to the more recent ash fill), and crushed stone embankment fill in the rail loop embankment that constructed the isolated filled and vegetated area in the southern end of the Ash Pond. The crushed stone embankment fill was observed to be medium dense, fine to coarse, crushed stone gravel with sand, classified as poorly graded gravel (GP). A clean crushed stone toe drain material was also noted on available historical design drawings, but was not encountered in the borings performed for this investigation.

Specific information used to assess and develop the design site stratigraphy can be found in **Attachment B** – Boring Logs, **Attachment D** – CPT Data Report, and **Attachment E** – Lab Test Data.

3.2. Phreatic Conditions

AECOM evaluated piezometer data from five measurement events (10/28/15, 11/24/15, 12/17/15, 1/14/16, and 2/11/16), interpreted pore pressure data from CPT soundings, and measured phreatic water in boreholes immediately after drilling. Piezometer data were judged to be the most representative of in-situ, steady state conditions. Data from CPT PPD tests in ash were judged to be representative of steady state phreatic conditions, but PPD tests within and outboard of the embankment were not consistently representative. Water was encountered in 6 of the 14 borings during drilling, observations which were unlikely to be representative of steady state conditions due to the time required for water levels to equilibrate in the relatively low-permeability embankment and foundation soils.

A total of four open standpipe piezometers were installed at the Ash Pond. All of the piezometers were installed through the perimeter embankment. Two of the piezometers (EDW-P002 and EDW-P004) were installed with the screened elevation within sluiced as in the Ash Pond. The remaining two piezometers (EDW-P001 and EDW-P003) were installed with the screen elevations located within the foundation soils. Piezometer locations and measurements are summarized in **Table 2**.

Table 2
Piezometer Location and Phreatic Level Data

Piezometer No.	Impoundment Embankment	Northing (ft NAD83)[1]	Easting (ft NAD83)	Ground Surface Elevation (ft NAVD88)	Location	Piezometer Type[2]	Total Depth[3] (feet)	Phreatic Elevation (ft NAVD88)				
								10/28/2015[4]	11/24/2015	12/17/2015	1/14/2016	2/11/2016
EDW-P001	North	2440516.6	1426796.5	461	Crest	OSP	36.5	-	436.7	438.9	441.8	438.3
EDW-P002	Northwest	2440043.6	1427380.9	459	Crest	OSP	29.0	449.7	449.8	450.2	451.0	450.4
EDW-P003	West	2438062.1	1427345.5	459.6	Crest	OSP	49.6	437.3	438.7	439.1	439.6	439.8
EDW-P004	Southeast	2437206.1	1426013.0	455.6	Crest	OSP	30.2	-	442.8	442.9	445.2	442.8

Notes:

1. Locations above were not surveyed. Locations are approximated based on handheld GPS measurements taken during investigation. Elevations are based on site topographic LiDAR survey from Illinois Geospatial Data Clearinghouse for Peoria County downloaded in December of 2015. The expected accuracy of these measurements is expected to be approximately ±5 feet horizontal and ±1 foot vertical.
2. OSP = open standpipe piezometer.
3. Total Depth = Approx. bottom of screen for standpipe piezometers.
4. Readings on 10/28/2015 at EDW-P001 and EDW-P004 were before piezometers were developed, and are not presented.

4. SUMMARY OF LABORATORY TESTING

4.1. Summary of Laboratory Testing Scope

Soil samples collected from the subsurface exploration were sealed at the site and were then transported to the lab of AECOM's laboratory testing subcontractors; Terracon of Vernon Hills, Illinois, where an AECOM geotechnical engineer reviewed the samples and selected samples for laboratory testing. The laboratory testing program performed for the Ash Pond was intended to obtain information on index and shear strength properties of the subsurface material at the site. The laboratory testing program for characterization of the materials at the Ash Pond is summarized in **Table 3**.

Table 3
Summary of Laboratory Testing Program for the Ash Pond

ASTM Designation	Test Type	Number of Tests							
		Total	Ash	New Embankment Fill	Old Embankment Fill	Other Fill Materials	Native Clay Crust	Native Clay	Bedrock
D2216	Moisture Content	181	47	15	21	19	5	56	18
D4318	Atterberg Limits	26	4	1	5	1	1	14	-
T311[1], D1140, D422	Gradation / Hydrometer	10	7	3	-	-	-	-	-
D854	Specific Gravity	9	5	-	-	-	4	-	-
D5084	Hydraulic Conductivity	3	2	-	-	-	-	1	-
D2435	Consolidation	2	-	-	-	-	-	2	-
D 2166	Unconfined Compression	5	-	-	-	-	-	5	-
D4767	Consolidated Undrained Triaxial (CIU)	5	-	-	3	-	-	2	-
D6528	Direct Shear (DS)	8	2	-	-	-	1	5	-
G57, G51	Corrosion Suite	5	4	-	-	-	-	1	-

[1] American Association of State Highway and Transportation Officials (AASHTO) test designation

4.2. Summary of Laboratory Testing Results

A summary of laboratory test results for the impounded ash, new embankment fill, old embankment fill, native clay crust, and native clay at the Ash Pond are presented in **Tables 4, 5, 6, 7** and **8**, respectively. A summary of laboratory tests results for other fill materials and shale bedrock are presented in **Tables 9** and **10**. Laboratory test data is included in **Attachment E**. Graphical displays of the shear strength characterization for the stratigraphic materials are included in the Material Characterization Calculation Package in **Attachment F**.

Table 4
Summary of Laboratory Test Results – Impounded Ash

Boring Number	Sample Number	Depth	USCS Classification	Water Content %	Qp (tsf)	% Gravel	% Sand	% Silt	% Clay	Liquid Limit	Plastic Limit	Plasticity Index	Specific Gravity	Direct Shear		Hydraulic Conductivity (cm/sec)	Corrosion Suite (ANS Point Rating)
														c' (psf)	phi' (deg)		
EDW-B002	S-1	0.0'-1.5'	SM	38.4	4.50+												
EDW-B002	S-2	2.5'-4.0'	ML	62.4	3.50												
EDW-B002	S-3	5.0'-7.0'	MH	66.6						65	36	29					
EDW-B002	S-4	7.5'-10.0'		79.0		0.0	7.4	73.1	19.5								
EDW-B002	S-5	10.0'-12.0'		76.9						17	27	NP		112	29.8	9.19E-05	
EDW-B002	S-6	15.0'-16.5'		52.5													14.5
EDW-B002	S-7	20.0'-21.5'		67.8													
EDW-B002	S-8	25.0'-27.0'		63.9									2.471				
EDW-B003	S-1	0.0'-1.5'		44.4									2.469				
EDW-B003	S-10	35.0'-36.5'		51.9													
EDW-B003	S-2	2.5'-4.0'		27.3	2.00												
EDW-B003	S-3	5.0'-6.5'	OL	37.2	1.00												
EDW-B003	S-4	7.5'-9.5'		55.5													
EDW-B003	S-5	10.0'-11.5'		50.6		2.3	19.8	56.3	21.6								
EDW-B003	S-6	15.0'-16.5'		29.7									2.772				
EDW-B003	S-7	20.0'-21.5'		42.1													
EDW-B003	S-8	25.0'-27.0'		54.9													
EDW-B003	S-9	30.0'-32.0'		71.7		0.0	20.6	66.4	13.0					82.8	26.9	6.79E-05	
EDW-B004	S-1	0.0'-1.5'		18.9	4.50+												
EDW-B004	S-2	2.5'-3.5'		28.5	4.00												
EDW-B004	S-2A	3.5'-4.0'	CL	20.1	3.25												
EDW-B004	S-3	5.0'-6.5'	CL	21.6	1.75												3.0
EDW-B004	S-4	7.5'-9.0'	CL	23.4	4.00	0.0	9.3	43.3	47.4	37	16	21					
EDW-B004	S-5	10.0'-11.5'	CL	21.5	2.25												
EDW-B005	S-1	0.0'-1.5'	SC	45.8	4.50												
EDW-B005	S-2	2.5'-4.0'	ML	26.0													
EDW-B005	S-3	5.0'-6.5'	MH	50.9	3.25					61	54	7					
EDW-B005	S-4	8.5'-10.0'	ML	37.4	4.50+												
EDW-B005	S-5	10.0'-11.5'	SC	44.3													
EDW-B011	S-1	0.0'-1.5'		27.7	4.50+												
EDW-B011	S-10	35.0'-37.0'		93.9													
EDW-B011	S-2	2.5'-4.0'		16.3	4.50+												
EDW-B011	S-3	5.0'-6.5'		29.4	4.50+												
EDW-B011	S-4	7.5'-9.0'		45.3	3.00												
EDW-B011	S-5	9.0'-11.0'		70.0		15.5	21.3	46.0	17.2								
EDW-B011	S-6	15.0'-17.0'		63.2													14.5
EDW-B011	S-7	19.5'-21.5'		84.9		0.2	16.7	58.0	25.1								
EDW-B011	S-8	25.0'-27.0'		74.7									2.691				
EDW-B011	S-9	30.0'-32.0'		73.7													
EDW-B014	S-1	0.0'-1.5'		28.2	4.00												
EDW-B014	S-2	2.5'-3.5'	CL-ML	40.8	1.50												
EDW-B014	S-2A	3.5'-4.0'	CL-ML	50.0													
EDW-B014	S-4	7.0'-8.5'	SM	60.2		0.0	35.1	45.4	19.5								
EDW-B014	S-6	15.0'-17.0'		78.7	3.50												
EDW-B014	S-7	20.0'-22.5'		86.5	1.50								2.524				15.0
EDW-B014	S-8	25.0'-26.7'		73.1													
EDW-B014	S-9	30.0'-31.5'	CL	48.7													

Table 5
Summary of Laboratory Test Results – New Embankment Fill

Boring Number	Sample Number	Depth	USCS Classification	Water Content %	Qp (tsf)	% Gravel	% Sand	% Silt	% Clay	Liquid Limit	Plastic Limit	Plasticity Index
EDW-B005	S-6	15.0'-16.5'	ML	41.4								
EDW-B005	S-7	20.0'-21.5'		51.1	1.75	3.1	21.3	51.7	23.9			
EDW-B005	S-8	25.0'-26.0'	ML	55.3								
EDW-B010	S-1 BOTTOM	0.0'-0.5'	CL	17.4	4.50+							
EDW-B010	S-1 TOP	0.0'-0.5'	SP	7.2								
EDW-B010	S-1A	0.5'-1.5'		27.9								
EDW-B010	S-2	2.5'-3.0'		20.9								
EDW-B010	S-2A	3.0'-4.0'		30.7	4.50							
EDW-B010	S-3	5.0'-6.5'	SP	14.8		12.6	54.8	26.0	6.6			
EDW-B010	S-4	7.5'-9.0'	CL	22.0	3.75							
EDW-B012	S-1	0.0'-1.5'	ML	23.0								
EDW-B012	S-2	2.5'-4.0'		23.8	4.50+					28	26	2
EDW-B012	S-3	5.0'-6.5'		26.5		0.0	9.6	73.7	16.7			
EDW-B012	S-4	7.5'-9.0'		26.5	4.50							
EDW-B012	S-5	10.0'-11.0'	CL	24.7	3.75							

Table 6
Summary of Laboratory Test Results – Old Embankment Fill

Boring Number	Sample Number	Depth	USCS Classification	Water Content %	Qp (tsf)	Liquid Limit	Plastic Limit	Plasticity Index	Consolidated Undrained Triaxial			
									c (psf)	phi (deg)	c' (psf)	phi' (deg)
EDW-B008	S-1	0.0'-1.5'	CL	13.2	4.50+							
EDW-B008	S-2	2.5'-4.0'	CL	19.5	3.75	42	22	20				
EDW-B008	S-3	5.0'-6.5'	CL	42.3	2.00							
EDW-B008	S-4	7.5'-9.0'	CL	22.8	2.00							
EDW-B010	S-5	10.0'-11.5'	CL	24.0	2.00							
EDW-B010	S-6	12.5'-14.0'	CL	28.0	1.25							
EDW-B010	S-7	15.0'-17.0'	CL	30.5		48	18	30	420	11.1	199.6	24.8
EDW-B010	S-8	20.0'-21.5'	CL	32.9	0.75							
EDW-B010	S-9	25.0'-26.5'	CL	21.4	0.50							
EDW-B012	S-5A	11.0'-11.5'	CL	24.9	2.00							
EDW-B012	S-6	12.5'-14.0'	CL	22.0	3.50							
EDW-B012	S-7	15.0'-16.5'	CL	24.3	3.25	48	19	29	426	14.6	496	23.5
EDW-B012	S-8	20.0'-22.0'	CL	23.8								
EDW-B012	S-9	25.0'-26.5'	CL	23.2	1.25							
EDW-B013	S-2	2.5'-4.0'	CL	17.4	4.50+							
EDW-B013	S-3	6.0'-8.0'	CL	24.3		49	21	28	418	15.2	115.2	29.7
EDW-B013	S-4	8.0'-9.5'	CL	24.3	3.00							
EDW-B013	S-5	10.0'-11.5'	CL	25.4	2.25							
EDW-B013	S-6	15.0'-16.5'	CL	25.5	1.50	41	17	24				
EDW-B013	S-7	20.0'-21.5'	CL	23.5	1.75							
EDW-B013	S-8	25.0'-26.5'	CL	27.7								

Table 7
Summary of Laboratory Test Results – Native Clay Crust

Boring Number	Sample Number	Depth	USCS Classification	Water Content %	Qp (tsf)	Liquid Limit	Plastic Limit	Plasticity Index	Specific Gravity	Direct Shear	
										c' (psf)	phi' (deg)
EDW-B006	S-1	0.0'-1.5'	CL	26.4	2.25						
EDW-B006	S-2	2.5'-5.0'	CL	30.1	1.25						
EDW-B012	S-10	30.0'-31.5'	CL	24.8	1.50						
EDW-B013	S-9	30.0'-31.5'	CL	20.2	0.50						
EDW-B015	S-10	31.0'-33.0'	CL	20.2		24	13	11		193.4	27.6

Table 8
Summary of Laboratory Test Results – Native Clay

Boring Number	Sample Number	Depth	USCS Classification	Water Content %	Qp (tsf)	Liquid Limit	Plastic Limit	Plasticity Index	Specific Gravity	Unconfined Compression	Consolidated Undrained Triaxial				Direct Shear		Hydraulic Conductivity (cm/sec)	Corrosion Suite (ANS Point Rating)	Consolidation, Pc (psf)
										c (psf)	c (psf)	phi (deg)	c' (psf)	phi' (deg)	c' (psf)	phi' (deg)			
EDW-B002	S-10	35.0'-37.0'	CL	31.6		36	18	18		273.46			273.46						
EDW-B002	S-11	40.0'-41.5'	CL	42.9	1.00				2.592										
EDW-B002	S-12	45.0'-46.5'	CL	57.7	0.75														
EDW-B002	S-9	30.0'-30.5'	CL	126.1	<.25														
EDW-B002	S-9A	30.5'-31.5'	CL	31.1	0.50														
EDW-B003	S-10A	36.5'-37.0'	CL	43.0	2.25														
EDW-B003	S-11	40.0'-41.5'	CL	31.6	1.25														
EDW-B003	S-12	45.0'-47.0'	CH	46.0		51	17	34		632.48									2200
EDW-B003	S-13	50.0'-51.5'	CL	55.4	0.50														
EDW-B004	S-11	36.0'-38.0'	CL	20.1		35	17	18		615.04							7.20E-07		
EDW-B004	S-12	40.0'-41.5'	CL	30.0	1.25														
EDW-B004	S-13	45.0'-46.0'	CL	39.5	1.00														
EDW-B004	S-13A	46.0'-46.5'	CL	35.1															
EDW-B004	S-14	50.0'-51.5'	CL	65.2	1.75				2.617										
EDW-B004	S-15	55.0'-56.5'	CL	33.4	1.25														
EDW-B004	S-15A	56.0'-56.5'	ML	13.2															
EDW-B005	S-11	41.0'-43.0'	CH	44.8		57	22	35							262	27.2			
EDW-B005	S-12	45.0'-46.5'	CL	88.7	1.00				2.521									10.0	
EDW-B006	S-10	30.0'-31.0'	CL	43.4	0.50														
EDW-B006	S-10A	31.0'-31.5'	CL	19.6															
EDW-B006	S-3	5.0'-6.5'	CL	24.8	2.25	48	19	29											
EDW-B006	S-4	7.5'-10.0'	CL	26.0	2.50														
EDW-B006	S-5	10.0'-11.5'	CL	34.2	1.25														
EDW-B006	S-6	13.0'-15.0'	CH	31.1		62	20	42							316	23.7			
EDW-B006	S-7	15.0'-16.5'	CL	40.8	1.00														
EDW-B006	S-8	20.0'-21.5'	CL	43.4	0.75														
EDW-B006	S-9	26.0'-28.0'	OH	76.0		72	37	35			666	8.5	396	28.5					
EDW-B008	S-10	35.0'-36.5'	CL	56.9	0.25														
EDW-B008	S-5	11.0'-13.0'	CH	33.6		52	19	33		354									1860
EDW-B008	S-6	15.0'-16.5'	CL	64.6	0.50														
EDW-B008	S-7	20.0'-21.5'	CL	44.4	0.50														
EDW-B008	S-8	24.0'-26.5'	CH	68.9		67	31	36							848	27.3			
EDW-B008	S-9	30.0'-31.5'	CL	71.4	0.50														
EDW-B010	S-10	30.0'-32.0'	CL	30.0		40	15	25							31.8	24.1			
EDW-B010	S-11	35.0'-36.5'	CL	28.2	1.50														
EDW-B011	S-13	40.0'-41.5'	CL	47.9	1.00														
EDW-B011	S-14	45.0'-46.5'	CH	63.3	0.50	63	21	42											
EDW-B011	S-15	50.0'-51.5'	CL	62.5	0.50														
EDW-B011	S-16	55.0'-56.5'	CL	52.9	0.75														
EDW-B012	S-11	35.0'-36.5'	CL	28.3	1.50														
EDW-B012	S-12	40.0'-41.5'	CL	32.2	1.00														
EDW-B012	S-13	45.0'-46.5'	CL	50.2	1.25														
EDW-B012	S-14	47.0'-49.0'	CH	50.8		54	20	34							31.2	26			
EDW-B012	S-15	49.0'-50.5'	CL	67.4	1.00														
EDW-B012	S-16	55.0'-55.5'	CL	50.5	1.75														
EDW-B013	S-10	32.0'-34.0'	CL	33.3		42	23	19			450	11.8	116.6	26.4					
EDW-B013	S-11	34.0'-35.5'	CL	58.0	0.50														
EDW-B013	S-12	40.0'-41.5'	CL	54.5	1.75														
EDW-B013	S-13	45.0'-46.5'	CL	66.2	1.25														
EDW-B014	S-10	35.0'-36.7'	CL	31.6	0.75														
EDW-B014	S-11	40.0'-40.5'	CL	27.3	4.00				2.719										
EDW-B015	S-11	35.0'-36.5'	CL	33.8	1.50														
EDW-B015	S-12	37.0'-39.0'	CH	41.0		66	23	43		1072.18									
EDW-B015	S-13	39.0'-40.5'	CL	36.2	0.50														
EDW-B015	S-14	45.0'-46.5'	CL	49.4	1.00														
EDW-B015	S-15	50.0'-51.0'	CL	30.9	1.50														

Table 9
Summary of Laboratory Test Results – Other Fill Materials

Boring Number	Sample Number	Depth	Material Unit	USCS Classification	Water Content %	Qp (tsf)	Liquid Limit	Plastic Limit	Plasticity Index
EDW-B005	S-10	35.0'-36.5'	Historic Ash Fill	CL	37.3	1.00			
EDW-B005	S-8A	26.0'-27.0'	Historic Ash Fill	OL	47.6		44	29	15
EDW-B005	S-9	29.0'-31.0'	Historic Ash Fill		69.3				
EDW-B013	S-1	0.0'-1.5'	Historic Ash Fill	CL	13.6	4.50+			
EDW-B004	S-10	30.0'-31.5'	Historic Fill	CL	19.7	3.75			
EDW-B004	S-6	12.5'-14.0'	Historic Fill	CL	25.4	1.25			
EDW-B004	S-7	15.0'-16.5'	Historic Fill	CL	25.8	2.50			
EDW-B004	S-8	20.0'-21.5'	Historic Fill	CL	31.3	1.00			
EDW-B004	S-9	25.0'-26.0'	Historic Fill	CL	23.0	1.25			
EDW-B004	S-9A	26.0'-26.5'	Historic Fill	SC	19.5	0.75			
EDW-B015	S-1	0.0'-1.5'	Rock Embankment Fill	ML	54.7				
EDW-B015	S-2	2.5'-4.0'	Rock Embankment Fill	SP	4.5				
EDW-B015	S-3	5.0'-6.5'	Rock Embankment Fill	SP	5.4				
EDW-B015	S-4	7.5'-9.0'	Rock Embankment Fill	SP	7.2				
EDW-B015	S-5	10.0'-11.5'	Rock Embankment Fill	SP	6.5				
EDW-B015	S-6	13.0'-14.25'	Rock Embankment Fill	GP	3.6				
EDW-B015	S-7	15.0'-16.5'	Rock Embankment Fill	GP	8.2				
EDW-B015	S-8	20.0'-21.5'	Rock Embankment Fill	GP	7.8				
EDW-B015	S-9	25.0'-26.5'	Rock Embankment Fill	GP	8.1				

Table 10
Summary of Laboratory Test Results – Shale Bedrock

Boring Number	Sample Number	Depth	USCS Classification	Water Content %	Qp (tsf)
EDW-B002	S-13	50.0'-50.25'	ML	11.1	4.50+
EDW-B003	S-14	55.0'-55.5'	ML	23.3	3.50
EDW-B003	S-14A	55.5'-55.92'	ML	9.8	
EDW-B003	S-15	60.0'-60.25'	ML	7.1	
EDW-B004	S-16	60.0'-60.25'		8.8	
EDW-B005	S-13	50.0'-51.0'	CL-ML	15.9	4.50+
EDW-B005	S-14	51.0'-51.5'		12.8	
EDW-B006	S-11	35.0'-35.42'	ML	14.2	3.50
EDW-B008	S-11	40.0'-40.33'	ML	12.6	3.00
EDW-B010	S-12	40.0'-41.0'	SM	17.0	
EDW-B010	S-13	45.0'-45.25'	CL-ML	16.4	4.50
EDW-B011	S-17	60.0'-60.25'		9.1	
EDW-B012	S-16A	55.5'-56.5'	CL-ML	15.3	4.50
EDW-B012	S-17	60.0'-60.21'	CL-ML	17.9	1.50
EDW-B014	S-11A	40.5'-41.0'	ML	19.6	4.50+
EDW-B014	S-11B	41.0'-41.5'		10.2	
EDW-B014	S-12	45.0'-45.5'	ML	14.5	4.50
EDW-B015	S-16	55.0'-55.5'	ML	11.0	4.25

5. SLOPE STABILITY ANALYSES

Slope stability analyses were performed for varying loading conditions at selected representative embankment cross-sections, as described in the following sub-sections. Development of cross-sections for analysis, soil material properties, and seismic analyses related to the slope stability analysis are also discussed in the following sub-sections.

5.1. Cross-Sections for Analysis

Ten cross sections were identified as representative cross sections for the evaluation of the Ash Pond perimeter embankment slope stability. Cross-sections were selected at various locations around the perimeter embankments based on critical slope orientation, height, and subsurface conditions. The location of each analysis section and the relevant CPT soundings and test borings that were used to develop subsurface stratigraphy are listed in **Table 11** and shown on **Figure 3** (**Attachment A**):

Table 11
Cross Section Locations for Slope Stability Analyses

Cross-Section	Approximate Station	Location (Crest/Toe)	Boring/CPT Number
A	15+00	CREST	EDW-B001, EDW-C001
		TOE	-
B	21+00	CREST	EDW-B010, EDW-C023
		TOE	-
C	31+00	CREST	EDW-C021
		TOE	-
D	40+00	CREST	EDW-B012, EDW-C017
		TOE	-
E	51+00	CREST	EDW-B009, EDW-C015
		TOE	EDW-C016
F	54+00	CREST	EDW-C013
		TOE	EDW-B008, EDW-C014
G	58+00	CREST	EDW-B005, EDW-B013, EDW-C011, EDW-C012
		TOE	EDW-C010
H	60+00	CREST	EDW-B015, EDW-C009
		TOE	-
I	67+00	CREST	EDW-C007
		TOE	EDW-B006, EDW-C008
J	87+00	CREST	EDW-C003
		TOE	-

The surface geometry for each analysis cross-section was determined based on the LiDAR ground surface topographic contours obtained from the Illinois Geospatial Data Clearinghouse (IGDC, 2015), shown on **Figure 3 (Attachment A)**. Additionally, design drawings from “Proposed 150 Car Loop Track For Edwards Power Plant Bartonville, Illinois” by Design Nine, Inc. (2003) were used to supplement the subsurface investigation in developing the subsurface embankment geometry. The phreatic surfaces for each analysis section were estimated based on the normal pool elevations of 447.2 and 449.5 feet for the Clarification Pond and Cooling Pond, respectively, based on the

AECOM hydraulics and hydrology report (AECOM, 2016), and phreatic readings in the piezometers, CPT soundings and borings. The development of the analysis cross-sections is further discussed in **Attachment G**.

5.2. Stability Analysis Conditions Considered

Consistent with the criteria provided in the USEPA CCR Rule § 257.73(e), the stability of the ash pond embankment was evaluated for the following three load cases:

Static, Steady-State, Normal Pool Condition*:* This case models the embankment under static, long-term conditions, at normal water levels within the impoundment. Drained (effective stress) shear strength parameters were used for all materials, and phreatic conditions were estimated based on available piezometer and CPT data. The normal storage pool elevation within the Process Water[2] and Clarification Ponds were modeled at 449.5 ft and 447.2 ft, respectively, based on AECOM's *Hydrologic and Hydraulic Summary Report* for the Ash Pond (AECOM, 2016). ***Target Factor of Safety of 1.50.***

Static, Maximum Surcharge Pool Condition: This case models the conditions under short-term surcharge pool conditions; water surface elevations of 457.8 ft and 457.4 ft for the Process Water and Clarification Ponds, respectively, based on AECOM's *Hydrologic and Hydraulic Summary Report* for the Ash Pond (AECOM, 2016). Drained (effective stress) shear strength parameters were used for all materials, as the critical surface in the normal pool case was found to be in the downstream slope of the embankment. Due to the relatively large width of the embankment, the increase in pool level does not add driving force to this slip surface and is therefore unlikely to initiate total stress mechanisms of failure. It was assumed that the temporary surcharge load was not of a sufficient duration to significantly alter the phreatic surface (i.e. saturation line within the embankment); although the phreatic surface was increased in the raised fill part of the embankment, where more permeable materials are present. Therefore, the phreatic surface was modeled equivalent in the clay embankment fill and foundation to the steady state case in all cases except cross-section J. In this cross-section, horizontal phreatic surfaces at the elevations noted above were assumed as the section is located several hundred feet from the free water pool in the Cooling Pond. ***Target Factor of Safety of 1.40.***

Seismic Slope Stability Analysis: These analyses incorporate a horizontal seismic coefficient k_h selected to be representative of expected loading during the design earthquake event (i.e., a "pseudostatic" analysis). The analyses utilized peak undrained strengths for all materials. The pool levels and phreatic surface corresponding to the steady state pool from the static analyses were utilized. ***Target Factor of Safety of 1.00***.

Post-Liquefaction Slope Stability Analyses: Soils susceptible to liquefaction were not identified in the embankment or foundation soils at the Ash Pond. Therefore, post-liquefaction conditions were not evaluated.

[2] The Process Water Pond was historically referred to as the Cooling Pond, and may be called the Cooling Pond in the attachments to this report.

5.3. ***Material Properties***

Material properties for slope stability analyses were developed using both laboratory testing data (index and strength testing) and strength correlations from CPT and SPT data. The material characterization and development of strength parameters is described further in **Attachment F**.

Unit weights for the materials were evaluated using laboratory test results from relatively undisturbed samples. New embankment fill was conservatively assigned unit weights consistent with the observed material type based on previous experience with similar materials.

Shear strengths for the native alluvial clays and the old embankment fill were evaluated for the normal operating (steady-state) loading condition using results from the consolidated undrained triaxial (CIU) and direct shear (DS) tests, as well as correlations with SPT data. Shear strengths for the native clay crust and the fly ash material for the steady-state loading condition were evaluated using results from DS tests, as well as correlations with SPT data. In general, when assigning lab tests, direct shear tests were assigned for deeper samples and CIU tests were assigned to shallower samples to match the assumed orientation of the slope stability slip surface. For the new embankment fill and the crushed stone (rail loop embankment) materials, where undisturbed Shelby tube samples were not obtained, unit weights and shear strengths were based on published correlations for SPT and CPT data, and previous experience with similar materials.

For the pseudo-static analyses, undrained shear strengths for the old embankment fill and native alluvial clays were developed using CIU and unconfined compression (UC) tests, published correlations for SPT and CPT data, as well as previous experience with similar materials.

The material properties developed for use in slope stability analysis are listed in **Table 12**.

Table 12
Material Properties for Slope Stability Analyses

Material	Total Unit Weight Above and Below Water Table (pcf)	Effective (Drained) Shear Strength Parameters		Total (Undrained) Shear Strength Parameters	
		c' (psf)	Φ' (°)	c (psf)	Φ (°)
New Embankment	115	200	30	2500	0
Old Embankment 1	125	200	28	2500	0
Old Embankment 2	125	100	29	1250	0
Native Clay Crust	120	200	27.5	1250	0
Native Clay 1	117	100	26	650	0
Native Clay 2	105	200	26	700	0
Native Clay 3	105	200	26	900	0
Impounded Ash	105	100	27	600	0
Historic Ash	105	100	26	750	0
Historic Fill	125	200	28	1000	0
Recent Fill	115	200	30	1250	0
GP (Very Dense)	135	0	36	0	36
New Embankment (Crushed Stone - Sandy Gravel)	120	0	32	0	32
Bedrock - Shale	140	1000	36	1000	36

5.4. Methodology of Analyses

Limit equilibrium stability analyses were completed using the two-dimensional SLOPE/W 2012 (v. 8.15.4.11512 by GeoStudio) computer program. Factors of safety were calculated with Spencer's method using circular search routines with optimization to develop non-circular sliding surfaces through lower-strength layers which may represent a lower factor of safety than circular sliding surfaces. Slip surfaces which intersected the embankment crest and could result in a release of CCR materials were analyzed. Pore pressures were assigned as hydrostatic pressures under the phreatic surface.

A brief summary of the analyses is presented in the following sections. A more detailed discussion is provided in **Attachment G**.

5.4.1. Static Analysis Conditions

Static stability was evaluated for steady-state conditions using both the normal pool elevation and the maximum flood surcharge pool elevation. The normal pool elevation of 449.5 feet and surcharge pool elevation of 457.8 ft was used for the northern portion of the site (Cross-Sections A, B, and J). A normal pool elevation of 447.2 feet and surcharge pool elevation of 457.4 ft was used for the southern portion of the site (Cross-Sections C, D, E, F, G, H, and I). All elevations were taken from the 2016 AECOM *Hydrologic and Hydraulic Summary Report* for the Ash Pond (AECOM, 2016).

5.4.2. Earthquake Analysis Conditions

Earthquake ground motions at the site were developed using simplified procedures, as described in the following sub-sections.

5.4.3. Determination of Ground Motion Parameters

Seismic ground motions were estimated using the United States Geological Survey (USGS) 2008 Interactive Deaggregation tool (http:earthquake.usgs.gov/hazards/apps/). This application generates acceleration values, including peak ground acceleration (PGA) for top of rock, and mean and modal moment magnitudes based on user entered values of location, exceedance probability, and spectral period. Results are computed based on the 2008 National Seismic Hazard Mapping Project (NSHMP) Probabilistic Seismic Hazard Analysis (PSHA) Maps.

For the Edwards Power Station, the calculated PGA for an event with a probability of exceedance of 2% in 50 years (approximately a 2,500 year average return period) was 0.067g at the top of hard rock. To estimate the free-field, ground surface horizontal acceleration, the site was classified according to the site classes defined in International Building Code (IBC, 2003) and amplified using the site amplification factors found in National Earthquake Hazards Reduction Program (NEHRP, 2009). The site class was determined based on the weighted average of the shear wave velocity of the upper 100 feet of the stratigraphic profile and found to be Site Class D ($600 \le V_s \le 1{,}200$ ft/sec). This corresponds to a NEHRP amplification factor of 1.6, resulting in a ground surface acceleration of 0.107g. The Peak Transverse Acceleration at the dike crest was estimated using the ground surface acceleration and the procedure proposed by Idriss (2015), resulting in a peak crest acceleration of 0.32g. Details of the estimation of ground motion parameters are included in **Attachment G**.

5.4.4. Seismic Coefficient

The horizontal acceleration (k_h) calculated for use in the pseudostatic slope stability analysis was based on the simplified procedure developed by Makdisi and Seed (1978). For the estimated peak crest acceleration value of 0.32g and the full-height critical slip surfaces that were identified in the analyses (presented in **Attachment G**), a seismic coefficient of 0.109g was estimated for k_h in the pseudostatic analysis.

5.4.5. Liquefaction Triggering Analysis

Liquefaction is used to describe the contraction of coarse-grained (i.e. cohesionless) sand and gravel soils under cyclic loading imposed by earthquake shaking. The result is a reduction in the effective confining stress within the soil and an associated loss of strength (Idriss and Boulanger 2008). Liquefaction only occurs in saturated soils. Liquefaction susceptibility also largely depends on compositional characteristics such as particle size, shape, and gradation; however, laboratory and field observations also indicate that plasticity characteristics influence liquefaction susceptibility (Kramer 1996). Idriss and Boulanger (2008) suggested that soils with a plasticity index (PI) greater than about 7 are not susceptible to liquefaction.

AECOM's field exploration did not encounter cohesionless soils in the embankment or foundation of the Ash Pond. Only cohesive soils were encountered by AECOM, and out of the 52 Atterberg limit tests performed, all but one sample had a PI of above 7. This means that the soils encountered in AECOM's field exploration are not susceptible to liquefaction. Consequently, a formal liquefaction analysis was determined to be unnecessary as the embankment and foundation soils at the site are not susceptible to liquefaction based on their composition and observed index properties. Due to the generally medium stiff to stiff nature of the embankment and foundation clays, and the relatively low seismicity at the site, the embankment and foundation soils are also unlikely to be susceptible to cyclic softening.

6. RESULTS

6.1. Results of Static Stability Analyses

The results of the limit equilibrium slope stability analyses for the static load cases are summarized in **Table 13**. The Slope/W output figures showing the critical slip surfaces and details of the analyses are included in **Attachment G.1**.

Table 13
Summary of Minimum Slope Stability Factors of Safety for Static Load Cases

Load Case	Program Criteria	Section									
		A	B	C	D	E	F	G	H	I	J
Steady State (Normal Pool)	FS≥1.50	2.02	1.59	1.83	1.79	1.54	2.31	2.12	2.08	2.26	2.08
Surcharge Pool (Flood Pool)	FS≥1.40	2.02	1.59	1.82	1.79	1.54	2.31	2.12	2.08	2.26	2.00

6.2. Results of Earthquake Stability Analyses

6.2.2. Seismic Stability Analysis

The results of the slope stability analyses for the seismic load cases are summarized in **Table 14**. The Slope/W output figures showing the critical slip surfaces and details of the analyses are included in **Attachment G.1**.

Table 14
Summary of Minimum Slope Stability Factors of Safety for Earthquake Load Cases

Load Case	Program Criteria	Section									
		A	B	C	D	E	F	G	H	I	J
Seismic (Pseudostatic)	FS ≥ 1.00	1.37	1.28	1.09	1.18	1.11	1.08	1.13	1.08	1.30	2.08

7. CONCLUSIONS

The calculated factors of safety from the limit equilibrium slope stability analysis satisfy the USEPA CCR Rule § 257.73(e) requirements for each loading condition at all of the analysis sections that represent the embankments of Ash Pond at the Edwards Power Station. Load cases analyzed for this study included static (steady-state) normal pool, maximum flood surcharge pool and seismic (pseudo-static).

8. LIMITATIONS

Background information, design basis, and other data have been furnished to AECOM by IPRG. AECOM has used this data in preparing this report. AECOM has relied on this information as furnished, and is not responsible for the accuracy of this information.

Borings have been spaced as closely as economically feasible, but variations in soil properties between borings, that may become evident at a later date, are possible. The conclusions developed in this report are based on the assumption that the subsurface soil, rock, and phreatic conditions do not deviate appreciably from those encountered in the site-specific exploratory borings. If any variations or undesirable conditions are encountered in any future exploration, we should be notified so that additional analyses can be made, if necessary.

The conclusions presented in this report are intended only for the purpose, site location, and project indicated. The recommendations presented in this report should not be used for other projects or purposes. Conclusions or recommendations made from these data by others are their responsibility. The conclusions and recommendations are based on AECOM's understanding of current plant operations, maintenance, stormwater handling, and ash handling procedures at the station, as provided by IPRG. Changes in any of these operations or procedures may invalidate the findings in this report until AECOM has had the opportunity to review the changes, and revise the report if necessary.

This geotechnical investigation was performed in accordance with the standard of care commonly used as state-of-practice in our profession. Specifically, our services have been performed in accordance with accepted principles and practices of the geological and geotechnical engineering profession. The conclusions presented in this report are professional opinions based on the indicated project criteria and data available at the time this report was prepared. Our services were provided in a manner consistent with the level of care and skill ordinarily exercised by other professional consultants under similar circumstances. No other representation is intended.

9. REFERENCES

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Attachment A. Figures

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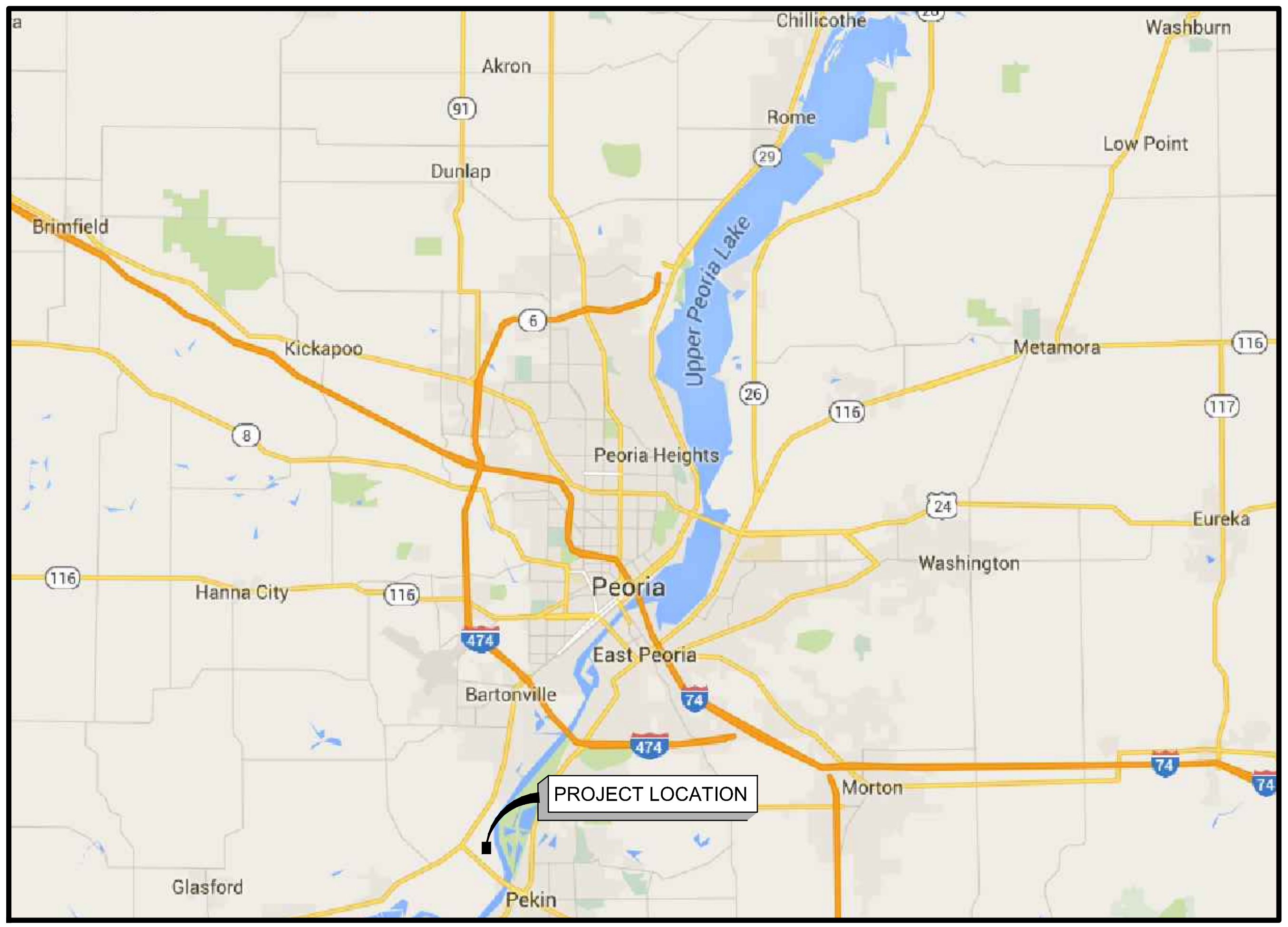
DYNEGY

Dynegy Inc.
1500 East Port Plaza Drive
Collinsville, IL 62234

CCR RULE ASSESSMENT OF PLANTS

EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

GEOTECHNICAL REPORT
ASH POND



LOCATION MAP
NOT TO SCALE

VICINITY MAP
NOT TO SCALE

AERIAL FROM GOOGLE EARTH PRO
MAP FROM GOOGLE

ISSUED FOR BIDDING	DATE BY
ISSUED FOR CONSTRUCTION	DATE BY

REVISIONS

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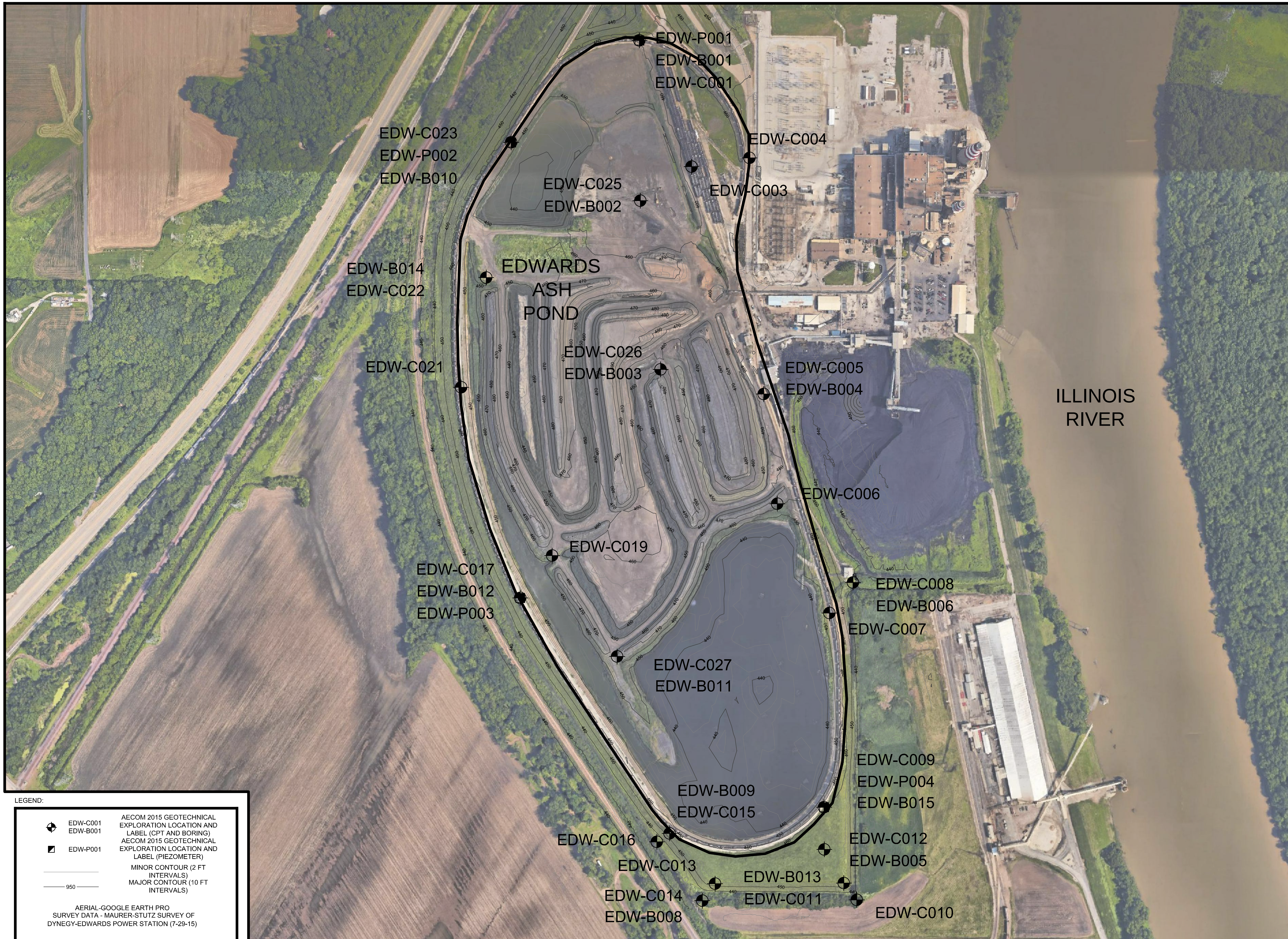
AECOM PROJECT NO:	60440742
DRAWN BY:	TPB
DESIGNED BY:	_
CHECKED BY:	_
DATE CREATED:	2/17/2016
PLOT DATE:	2/17/2016
SCALE:	AS SHOWN
ACAD VER:	2014

SHEET TITLE

LOCATION MAP AND SITE VICINITY MAP

Figure 1



LEGEND:

Symbol	Description
EDW-C001 EDW-B001	AECOM 2015 GEOTECHNICAL EXPLORATION LOCATION AND LABEL (CPT AND BORING)
EDW-P001	AECOM 2015 GEOTECHNICAL EXPLORATION LOCATION AND LABEL (PIEZOMETER)
	MINOR CONTOUR (2 FT INTERVALS)
950	MAJOR CONTOUR (10 FT INTERVALS)

AERIAL-GOOGLE EARTH PRO
SURVEY DATA - MAURER-STUTZ SURVEY OF DYNEGY-EDWARDS POWER STATION (7-29-15)

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DYNEGY
Dynegy Inc.
1500 East Port Plaza Drive
Collinsville, IL 62234

EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

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PLOT DATE:	2/17/2016
SCALE:	AS SHOWN
ACAD VER:	2014

SHEET TITLE

OVERALL GEOTECHNICAL SITE PLAN

Figure 2

AECOM DRAWING PATH: K:\Projects\60427894-Dynegy\900-WORKING DOCS-CAD\902-SHEETS\30% Design Sheets_Edwards\EDW 2-1 OVERALL GEOTECHNICAL SITE PLAN.dwg
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BRAND, TRAVIS, 10/3/2016 10:13 AM

AECOM DRAWING PATH: K:\Projects\60427894-Dynegy\900-WORKING DOCS-CAD\902-SHEETS\30% Design Sheets_Edwards\EDW 2-2 ASH POND GEOTECHNICAL SITE PLAN.dwg

LEGEND:

Symbol	Label	Description
CPT and boring symbol	EDW-C001 EDW-B001	AECOM 2015 GEOTECHNICAL EXPLORATION LOCATION AND LABEL (CPT AND BORING)
Piezometer symbol	EDW-P001	AECOM 2015 GEOTECHNICAL EXPLORATION LOCATION AND LABEL (PIEZOMETER)
Line		MINOR CONTOUR (2 FT INTERVALS)
Line labeled 950		MAJOR CONTOUR (10 FT INTERVALS)
A A arrows		CROSS SECTION

AERIAL-GOOGLE EARTH PRO
SURVEY DATA - MAURER-STUTZ SURVEY OF DYNEGY-EDWARDS POWER STATION (7-29-15)

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EDWARDS POWER PLANT
BARTONVILLE, ILLINOIS

N

SCALE IN FEET

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REVISIONS

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DRAWN BY:	TPB
DESIGNED BY:	_
CHECKED BY:	_
DATE CREATED:	2/17/2016
PLOT DATE:	2/17/2016
SCALE:	AS SHOWN
ACAD VER:	2014

SHEET TITLE

ASH POND
GEOTECHNICAL
SITE PLAN

Figure 3

Attachment B. Boring Logs

Project:	EDWARDS POWER STATION	Key to Soil Boring Logs	
Project Location:	BARTONVILLE, ILLINOIS	Sheet 1 of 1	
Project Number:	60440202		

	Graphic Symbol	Description	USCS Classification
SAND AND GRAVEL		SAND poorly graded	SP
		SAND well graded	SW
		Silty SAND	SM
		Clayey SAND	SC
		GRAVEL poorly graded	GP
LOW PLASTIC SILTS AND CLAYS		Inorganic low plastic SILT	ML
		Inorganic low plastic CLAY	CL
		Inorganic low plastic SILTY-CLAY	CL-ML
HIGH PLASTIC SILT AND CLAYS		Inorganic high plastic CLAY	CH
		Sandy Inorganic high plastic CLAY	CH
		Inorganic elastic SILT	MH
SURFACE MATERIALS		Asphalt, Pavement	
		Topsoil	
		Gravel Limestone	
		Fly Ash	
		Bottom Ash	
		Fill	

TERMS DESCRIBING DENSITY OR CONSISTENCY

Coarse grained soils (major portion retained on No. 200 sieve) include gravels and sands. Density is based on the Standard Penetration Test (SPT).

Density	SPT blows per foot
Very loose	0 - 5
Loose	5 - 10
Medium dense	10 - 30
Dense	30 - 50
Very dense	Greater than 50

Fine grained soils (major portion passing No. 200 sieve) include clays and silts. Consistency is rated according to shearing strength, as indicated by uncorrected SPT blows per foot.

Descriptive Term	SPT blows per foot	Estimated undrained shear strength (ksf)	Hand Test
Very soft	0-2	< 0.25	Extrudes between fingers
Soft	2-4	0.25-0.5	Molded by slight pressure
Medium stiff	4-8	0.5-1.0	Molded by strong pressure
Stiff	8-15	1.0-2.0	Indented by thumb
Very stiff	15-30	2.0-4.0	Indented by thumbnail
Hard	> 30	> 4.0	Difficult to indent

LEGEND AND NOMENCLATURE

Standard penetration split spoon test sample

Undisturbed shelby tube sample

PP qu	Pocket penetrometer unconfined compressive strength
NMC	Natural Moisture Content, %
LL	Liquid Limit
PL	Plastic Limit
PI	Plasticity Index
NP	Non-plastic
∇	Depth Groundwater enters at time of drilling.
▼	Groundwater Level at some specified time after drilling
Su	Undrained Shear Strength
TXUU	Triaxial Unconsolidated Undrained
DTW	Depth to water
N/A	Not Applicable

SAMPLING RESISTANCE

P	Sample pushed by hydraulic rig action.
3 6 9	Numbers indicate blows per 6 in. of sampler penetration. Standard penetration test sampler, (2-in O.D.) and oversize penetration sample (3-in O.D.) are driven by a 140 lb hammer falling freely 30-in
50/2	Number of blows (50) used to drive a penetration sampler a certain number of inches (2)
WOH	Weight of hammer
WOR	Weight of rods

ABBREVIATIONS USED UNDER "REMARKS"

HSA	Hollow Stem Auger	No.	Number
ATD	At Time of Drilling	CIU	Isotropically Consolidated Undrained
AD	After Drilling	ST	Shelby Tube
ID	Inside Diameter	SS	Split Spoon
OD	Outside Diameter		
RQD	Rock Quality Designation		
-#200	(% Pass #200 Sieve)		
Sa (%)	Sieve Analysis (% Passing #200)		

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B001

Date(s) Drilled	11/05/2015 to 11/05/2015	Logged By	Robert Weseljak	Checked By	NDS
Drilling Method	Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	51.0 ft
Drill Rig Type	Mobile B-57 Truck Mounted	Drilling Contractor	Strata Earth Services	Surface Elevation	461.0 ft
Borehole Backfill	Portland Cement and Bentonite	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Material Description (Elevation / Depth)	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	Remarks
461.0	0.0	Split spoon	SS-1	2 6 8	61	Stiff, dry, gray mottled with brown, lean CLAY (CL).					3.0			
458.5	2.5	Split spoon	SS-2	3 4 5	94	Stiff, moist, brown mottled with gray and black, lean CLAY (CL), trace shell fragments.					3.0			
	5	Split spoon	SS-3	3 3 3	75	Becomes medium stiff.					1.0			
		Shelby tube	ST-4	200 psi	100									*Pushed shelby tube from 7.0 to 9.0 feet*
451.0	10.0	Split spoon	SS-5	3 3 6	83	Stiff, moist, grayish black, lean CLAY (CL), trace organics.					1.0 1.5			
	15	Split spoon	SS-6	1 3 5	78						1.25			
441.0	20.0	Split spoon	SS-7	1 6 7	100	Stiff, moist, very dark gray to grayish black with some brown, lean CLAY (CL).					1.5 2.5			
436.0	25.0	Split spoon	SS-8	WOH WOH 2	100	Very soft, wet, brown mottled with gray, sandy lean CLAY (CL).					1.0 0.5			
431.0	30.0													

Elevation (feet)	Depth (feet)	Samples: Type / Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	Material Description (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	Remarks
430	30	ST-9	150 psi	100		Soft, wet, gray, silty lean CLAY (CL-ML).					1.25			*Pushed shelby tube from 30.0 to 32.0 feet*
426.0 / 425	35	SS-10	2 2 4	100		426.0 / 35.0 Loose, wet, gray, silty SAND (SM), trace wood fragments.					0.5 1.0			
425.2	35.8					Medium stiff, moist, gray, lean CLAY (CL).								
421.0 / 420	40	SS-11	50/3"	100		421.0 / 40.0 CLAYSTONE: Brown and gray, weathered, hard.								
	45	SS-12	50/2"											
415.0 / 415	46.0	Run 1	16.7	36.7		415.0 / 46.0 SILTSTONE: Thin to medium bedding, fresh, argillaceous.								*Run 1 - Start 13:46, End 14:00*
410.0 / 410	51.0					End of Boring at 51 ft								*Boring backfilled with Portland Cement and bentonite*
405	55													
400	60													
	65													

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B002

Date(s) Drilled	09/03/2015 to 09/03/2015	Logged By	Norm Seiler	Checked By	NDS
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	52.5 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	454.9 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	7.5 ft on 9/3/2015		

Elevation (feet)	Depth (feet)	Sample Type / Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	MATERIAL DESCRIPTION (Elevation / Depth)	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
454.9	0.0	SS-1	7 6 8	89	Medium dense, moist, dark brown, FLY ASH [Fill].	38.4							
452.4	2.5	SS-1	3 2 2	100	Loose, moist, dark gray, FLY ASH [Fill].	62.4							
450	5	ST-3	150 psi	62.5		66.6		65	29				*Pushed shelby tube from 5.0 to 7.0 feet*
447.4	7.5 ▽	SS-4	WOR	100	Very loose, wet, black, FLY ASH [Fill].	79.0							
445	10	ST-5		55		76.9	90.8 94.3 91.2	17	NP				*10.0 feet switch to mud rotary Pushed shelby tube from 10.0 to 12.0 feet*
					Becomes dark gray.								
					Hard layer at tip of tube.								
440	15	SS-6	1 2 3	100	Becomes loose.	52.5							
434.9	20.0	SS-7	12 17 2	37	Medium dense, wet, dark gray, FLY ASH [Fill], with cementous layers.	67.8							
429.9	25.0	SS-8	1 WOH WOH	100	Very loose, wet, dark gray, FLY ASH [Fill].	63.9							
425	30												

Log of Boring EDW-B002

Elevation (feet)	Depth (feet)	Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Elevation (feet)	MATERIAL DESCRIPTION	Depth (feet)	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		SS-9	WOR WOH WOH	100	424.4	With clay.	30.5	126.1				0.5			
							Very soft, wet, brown, lean CLAY (CL), with sand.		31.1							
420	35		ST-10	100 psi	100	419.9	Very soft, gray, lean CLAY (CL), with sand, trace shells.	35.0	31.6		36	18	0.25			
415	40		SS-11	WOH WOH WOH	100				42.9				0.75			
410	45		SS-12	WOH WOH 2	100		Grades with trace organics.		57.7				0.25			
						407.9	SHALE: Light gray, silt sized.	47.0								
405	50		SS-13	50/3"	100				11.1							
						402.4	End of Boring at 52.5 ft	52.5								*Boring backfilled with bentonite and cement fluid*
400	55															
395	60															
390	65															

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B003

Date(s) Drilled	09/03/2015 to 09/03/2015	Logged By	Norm Seiler	Checked By	NDS
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	60.5 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	460.0 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	7 ft on 9/3/2015		

Elevation (feet)	Depth (feet)	Samples: Type / Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
460	0	SS-1	7 7 7	83	Ash	460.0 / 0.0 Medium dense, moist, dark gray, FLY ASH [Fill].	44.4							
		SS-2	3 2 2	100	Ash	Becomes loose.	27.3							
455	5	SS-3	1 WOH 2		Clay	455.0 / 5.0 Very soft, moist, lean CLAY (CL) with ash, sand, and organics. ∇	37.2							
		ST-4	<100 psi	100	Ash	452.5 / 7.5 Ash, dark gray [Fill].	55.5							*Pushed shelby tube from 7.5 to 9.5 feet*
450	10	SS-5	WOR WOR WOR	67	Ash		50.6							*10.0 feet: Switch to mud rotary*
					Ash	447.0 / 13.0 Very dense, dark gray, moist, fine to coarse ASH with sand and gravel, slightly cemented [Fill].								*13.0 feet: Hard drilling*
445	15	SS-6	26 37 29	100	Ash		29.7							
440	20	SS-7	1 1 1	100	Ash	Becomes very loose, dark gray, fine.	42.1							
435	25	ST-8	100 psi	100	Ash	Grades with sand.	54.9							*Pushed shelby tube from 25.0 to 27.0 feet*
430	30													

Elevation (feet)	Depth (feet)	Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
430	30	ST	ST-9	100 psi	100	Varved FLY ASH [Fill].	71.7	91.2 92.9 92.0						*Pushed shelby tube from 30.0 to 32.0 feet*
425	35	SS	SS-10	WOR WOR WOR	100		51.9 43.0							
423.5	36.5					Very soft, moist, brown to gray, silty CLAY (CL), trace sand, shells, and organics.								
420	40	SS	SS-11	WOH WOH WOR	100		31.6				.75			
415.0	45.0	ST	ST-12	100 psi	100	Soft, moist, dark gray, fat CLAY (CH) with sand.	46.0				1.0			*Pushed shelby tube from 45.0 to 47.0 feet*
410.0	50.0	SS	SS-13	1 2 3	100	Medium stiff, moist, brownish to greenish, gray, lean CLAY (CL), with sand.	55.4				1.0			
406.0	54.0					SHALE, gray, weathered, silt sized.								
405	55	SS	SS-14	11 50/5"	100		23.3 9.8							
400	60	SS	SS-15	50/3"	100		7.1							
399.5	60.5					End of Boring at 60.5 ft								*Boring backfilled with bentonite and cement fluid*
395	65													

Project: Edwards Power Station	**Log of Boring EDW-B003A**
Project Location: Bartonville, Illinois	Sheet 1 of 1
Project Number: 60440202	

Date(s) Drilled	**09/03/2015 to 09/03/2015**	Logged By	**Norm Seiler**	Checked By	**NDS**
Drilling Method	**Mud Rotary**	Drill Bit Size/Type	**3 7/8" Tricone Roller Bit**	Borehole Depth	**9.5 ft**
Drill Rig Type	**Diedrich D-120 Rubber Tired ATV**	Drilling Contractor	**Strata Earth Services**	Surface Elevation	**460.0 ft**
Borehole Backfill	**Bentonite and Cement Fluid**	Sampling Method(s)	**Split Spoon/3" Thin Walled Tube**	Hammer Data	**Automatic, 140 lbs, 30" drop**
Boring Location	**5' East of EDW-B003 (ft NAD83)**	Groundwater Level(s)	**7 ft on 9/3/2015**		

Elevation (feet)	Depth (feet)	SAMPLES Type	SAMPLES Number	SAMPLES Sampling Resist. OR Core RQD (%)	SAMPLES Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
460	0						Elevation (feet) 460.0, Depth (feet) 0.0: Offset boring to attempt shelby tube at 7.5 feet								
455	5						∇ (7 ft)								
		Thin Walled Tube	ST-1		0										*Pushed shelby tube from 7.5 to 9.5 feet*
							450.5 / 9.5: End of Boring at 9.5 ft								*Boring backfilled with bentonite and cement fluid*
450	10														
445	15														
440	20														
435	25														
430	30														

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B004

Date(s) Drilled	09/11/2015 to 09/11/2015	Logged By	Norm Seiler	Checked By	NDS
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	60.3 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	460.5 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	Sample Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Material Description	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	Remarks
460.5–460.0	0.0–0.5				6" stone at surface [Fill].								
460.0–457.0	0.5–3.5	SS-1	16 12 15	83	Medium dense, moist, dark gray, ASH [Fill].	18.9							
		SS-2	3 2 2	100		28.5 20.1							
457.0–448.0	3.5–12.5	SS-3	2 2 4	77	Becomes dark gray to dark brown, trace silty clay, sand and gravel [Fill].					1.25			
		SS-4	2 3 4	100		21.6				2.0			
		SS-5	2 2 2	67		21.5				2.0			*10.0 feet: Switch to mud rotary*
448.0–434.5	12.5–26.0	SS-6	2 2 2	100	Soft, wet, brown mottled, silty CLAY (CL), trace sand and gravel.	25.4				1.25			
		SS-7	2 3 3	77		25.8				1.25			
		SS-8	WOH 2 3	89	Grades brown, with sand.	31.3				.75			
		SS-9	2 2 3	89		23.0 19.5							
434.5–434.0	26.0–26.5				Medium stiff, wet, brown, clayey SAND (SC).								
434.0–430.5	26.5–30.0				Medium stiff, wet, dark gray to gray, silty CLAY (CL), trace sand.								

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B004

Elevation (feet)	Depth (feet)	Type / Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Material Description	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	Remarks
430	30	SS-10	2 7 6	89	Stiff, gray, wet, lean CLAY (CL), with sand, and organics.	19.7				4.0			
425.5	35.0	ST-11		100	Stiff, wet, gray mottled, lean CLAY (CL) with sand.	20.1				1.25			Pushed shelby tube from 36.0 to 38.0 feet
420.5	40.0	SS-12	2 3 3	89	Stiff, wet, brown mottled, lean CLAY (CL), trace sand.	30.0				1.75			
415.5	45.0	SS-13	2 3 5	83	Medium stiff, wet, dark gray, lean CLAY (CL).	39.5 35.1				1.25			
410.5	50.0	SS-14	2 2 3	100	Medium, stiff, wet, gray, lean CLAY (CL) with sand, trace shells and organics.	65.2				1.25			
405	55	SS-15	3 8 23			33.4 13.2							
404.5	56.0				SHALE: Light gray, weathered.								56.5 to 60.0 feet: Solid drilling
400.5	60.0	SS-16	50/3"	100	End of Boring at 60.3 ft	8.8							Boring backfilled with bentonite and cement fluid

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:21:57 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B005

Date(s) Drilled	09/10/2015 to 09/10/2015	Logged By	Norm Seiler	Checked By	NDS
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	53.0 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	459.0 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	8 ft on 9/10/2015		

Elevation (feet)	Depth (feet)	Sample Type / Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
459.0	0.0	SS-1	4 4 5	95	Medium, stiff, moist, brown, clayey SAND (SC), trace gravel, topsoil, roots and fill.	45.8				2.0			
456.5	2.5	SS-2	9 15 11	100	Medium dense, moist, brown, sandy SILT (ML) with gravel.	26.0							
454.0	5.0	SS-3	2 2 2	100	Loose, moist, brown, sandy elastic SILT (MH) with clay.	50.9				1.8			
451.0	8.0 ▽	SS-4		100	Loose, wet, brown, sandy SILT (ML) with gravel.	37.4							
449.0	10.0	SS-5	1 2 5	100	Medium stiff, wet, light brown and gray, clayey SAND (SC) with gravel.	44.3							*10.0 feet: Switch to mud rotary*
444.0	15.0	SS-6	2 8 10	100	Very stiff, wet, brown, sand SILT (ML) with gravel.	41.4							
439.0	20.0	SS-7	1 1 1	100	Soft, wet, brown, gravelly CLAY (CL), trace sand.	51.1							
		SS-8	2"	100		55.3 47.6							
432.5	26.5				Very loose, wet, dark brown ASH [Fill].								
		SS-9		100		69.3							

Elevation scale: 455, 450, 445, 440, 435, 430. Depth scale: 0, 5, 10, 15, 20, 25, 30.

Elevation (feet)	Depth (feet)	Type / Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Material Description (Elevation / Depth, feet)	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	Remarks
	30	SS-9		100		69.3							
424.0	35.0	SS-10	WOR WOH WOH	67	Very loose, wet, black, ASH, with organic clay [Fill].	37.3							
421.0	38.0				Soft, wet, gray, fat CLAY (CH), trace sand, shells, and organics.								
		ST-11	150 psi	100		44.8		57	35				*Pushed shelby tube from 41.0 to 43.0 feet*
414.0	45.0	SS-12	WOH 2 2	100	Soft, wet, dark gray and greenish gray, lean CLAY (CL), with sand, organics and shale.	88.7							
409.5	49.5				SHALE: light gray, weathered.								
		SS-13	11 18 44	89		15.9 12.8							
406.0	53.0				End of Boring at 53 ft								*Boring backfilled with bentonite and cement fluid*

Elevation scale: 425, 420, 415, 410, 405, 400, 395. Depth scale: 30, 35, 40, 45, 50, 55, 60, 65.

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B006

Date(s) Drilled	09/08/2015 to 09/08/2015	Logged By	Norm Seiler	Checked By	NDS
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	37.0 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	436.0 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	Sample Type/Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Material Description (Elevation / Depth)	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	Remarks
436.0	0.0	SS-1	3 4 6	94	Stiff, moist, dark brown, lean CLAY (CL) with sand and glass.	26.4				3.0			
433.5	2.5	SS-2	3 3 3	67	Medium stiff, brown to dark brown lean CLAY (CL), trace sand.	30.1				1.25			
431.0	5.0	SS-3	2 3 4	100	Medium stiff, moist, gray and mottled brown, lean CLAY (CL), trace sand.	24.8		48	29	2.0			
		SS-4	3 4 4	100		26.0				1.5			
	10	SS-5	1 2 1	100	Becomes soft.	34.2				1.0			*10.0 feet: Switch to mud rotary* *Pushed shelby tube from 12.0 to 14.0 feet*
423.0	13.0	ST-6		100	Soft, moist, gray fat CLAY (CH) with sand and shells.	31.1		62	42	1.25			
421.0	15.0	SS-7	1 1 1	100	Soft, moist, brownish gray, lean CLAY (CL).	40.8				1.0			
	20	SS-8	WOH WOH 1	100	Becomes very soft, brown and gray, with sand.	43.4				0.75			
410.0	26.0	ST-9		100	Very soft, moist, dark gray, organic SILT (OH).	76.0		72	35	0.75			*Pushed shelby tube from 26.0 to 28.0 feet*
406.0	30.0												

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Elevation (feet)	Depth (feet)	SAMPLES Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30	SS-10		89		Very soft, moist, gray lean CLAY (CL) with sand, pockets of organics.	43.4				0.75			
405						405.0 — 31.0 Very soft, moist, grayish brown, lean CLAY (CL) with sand, silt, and organics.	19.6							
						403.0 — 33.0 SHALE: light gray, weathered.								
	35	SS-11		84			14.2							
400						399.0 — 37.0 End of Boring at 37 ft								*Boring backfilled with bentonite and cement fluid*
395	40													
390	45													
385	50													
380	55													
375	60													
	65													

Report: GEO_SOIL; File K:\PROJECTS\60440202_DYNEGY CCR EDWARDS\400-TECHNICAL\BORING LOGS\60440202_DYNEGYEDWARDSBORINGLOGS.GPJ; 2/24/2016 7:22:15 PM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B008

Date(s) Drilled	09/13/2015 to 09/13/2015	Logged By	Norm Seiler	Checked By	NDS
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	42.5 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	438.8 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
438.8	0.0	SS-1	3 4 4	100	Stiff, moist, brown, lean CLAY (CL) with sand and gravel, trace roots.	13.2				4.0			
435		SS-2	3 4 6	100		19.5		42	20	4.25			
	5	SS-3	2 3 5	67	Becomes medium stiff.	42.3				2.0			
431.3	7.5	SS-4	1 3 2	89	Medium stiff, moist, gray and mottled brown, lean CLAY (CL), trace sand.	22.8				2.5			
430	10												10.0 feet: Switch to mud rotary
427.8	11.0	ST-5	150 psi	85	Medium stiff, moist, brown and gray fat CLAY (CH), trace sand.	33.6		52	33	0.75			
423.8	15.0	SS-6	WOH 1 1	100	Soft, moist, dark brown, lean CLAY (CL), trace shells.	64.6				0.75			
420	20	SS-7	WOH WOH WOH	100	Becomes very soft.	44.4				0.75			
414.8	24.0	ST-8	150 psi		Very soft, moist, dark gray, fat CLAY (CL), trace organics.	68.9		67	36	1.0			
408.8	30.0												

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Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B008

Elevation (feet)	Depth (feet)	Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	Elevation (feet)	MATERIAL DESCRIPTION	Depth (feet)	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30		SS-9	WOH WOH WOH	100			Very soft, moist, gray and brownish gray, lean CLAY (CL), trace sand.		71.4				0.5			
405	35		SS-10	WOH WOH WOH	100			Trace wood, organics, and shells.		56.9				0.75			
400							399.8	SHALE: Light gray, slightly weathered.	39.0								
	40		SS-11	66/4"	100					12.6							*40.0 to 42.5 feet: Solid drilling*
							396.3	End of Boring at 42.5 ft	42.5								*Boring backfilled with bentonite and cement fluid*
395	45																
390	50																
385	55																
380	60																
375	65																

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B009

Date(s) Drilled	11/05/2015 to 11/05/2015	Logged By	Robert Weseljak	Checked By	NDS
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	66.5 ft
Drill Rig Type	Mobile B-57 Truck Mounted	Drilling Contractor	Strata Earth Services	Surface Elevation	460.1 ft
Borehole Backfill	Portland Cement and Bentonite	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	Type / Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
460	0	SS-1	11 13 15	100		460.1 / 0.0; 459.6 / 0.5 Medium dense, moist, brown silty SAND (SM).					1.0 1.25			
						Very stiff, moist, gray and brown, sandy SILT (ML).								
		SS-2	2 1 1	67		457.6 / 2.5 Soft, dry, gray and brown sandy SILT (ML)					0.25			
455	5					455.6 / 4.5 Concrete from 4.5 to 5.5 [Fill].								
		SS-3	5 2 5	11		454.6 / 5.5 Light brown, well graded GRAVEL (GW).								*5.5 feet: Limestone cobbles*
		SS-4	5 4 4	89		452.6 / 7.5 Stiff, dry, brownish gray, silty SAND with GRAVEL (SM).					1.0			
						451.6 / 8.5 Medium dense, moist, black, sandy SILT (ML).								
450	10													
		ST-5	250 psi	75		449.1 / 11.0 Medium stiff, moist, brownish gray, lean CLAY (CL).					1.5			*Pushed shelby tube from 11.0 to 13.0 feet* *Trace gravel in top of tube*
445	15	SS-6	1 5 5	89		445.1 / 15.0 Medium dense, moist, brown mottled with reddish brown, lean CLAY (CL).					2.0			
440	20	SS-7	WOH 2 4	94		440.1 / 20.0 Very soft to medium dense, moist to wet, gray, lean CLAY (CL) with shell and wood fragments.					1.0			
435	25	SS-8	WOH WOH 3	100		435.1 / 25.0 Very soft to soft, wet, gray, lean CLAY (CL) with shell fragments.					0.5 1.0			
	30													

AECOM

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B009

Elevation (feet)	Depth (feet)	Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Material Description (Elevation / Depth)	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	Remarks
430	30	SS	SS-9	WOH 7 7	100	429.6 / 30.5: Stiff, dry, black, lean CLAY (CL), low plasticity.					1.0 1.25			
425	35	ST	ST-10	125 psi	100	Becomes gray.					1.0			*Pushed shelby tube from 35.0 to 37.0 feet*
420	40	SS	SS-11	WOH WOH 4	100	420.1 / 40.0: Soft, moist to wet, gray, lean CLAY (CL) with shell fragments, low to medium plasticity.					0.5			
415	45	SS	SS-12	WOH 1 4	100						1.0			
410	50	SS	SS-13	WOH WOH WOH	100	410.1 / 50.0: Very soft, wet, gray, SILT (ML) with shell fragments, low plasticity.					1.0			
405	55	SS	SS-14	WOH WOH 17	100	404.1 / 56.0: Medium dense, wet, gray, fine to coarse clayey GRAVEL (GC), trace fine to coarse sand, reddish brown gravel.					3.0			
400	60	SS	SS-15	50/3"	17	400.1 / 60.0: CLAYSTONE: Gray.								
		Core	Run 1	0	0									*61.5 feet: Run 1 - Start 7:57, End 8:10*
	65													

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B009

Elevation (feet)	Depth (feet)	Type / Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
395		Run 1	0	0		393.6 — 66.5								
						End of Boring at 66.5 ft								
390	70													
385	75													
380	80													
375	85													
370	90													
365	95													
	100													

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B010

Date(s) Drilled	09/04/2015 to 09/04/2015	Logged By	Norm Seiler	Checked By	NDS
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	45.3 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	459.0 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	Sample Type	Sample Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
459.0	0		SS-1	10 6 10	56	458.5 / 0.5 Medium dense, moist, brown, SAND (SP) with gravel and clay.	7.2							
						Medium dense, moist, dark gray, fine to coarse ASH [Fill].	17.4 27.9							
			SS-2	9 8 8	83		20.9 30.7							
455	5		SS-3	3 6 4	100		14.8							
451.5	7.5		SS-4	3 3 6	78	Stiff, moist, brown lean CLAY (CL), trace sand and gravel.	22.0							
449.0	10		SS-5	2 3 4	78	Medium stiff, moist, brown and mottled gray, lean CLAY (CL), trace sand.	24.0							
			SS-6	2 2 3	78		28.0							*12.0 feet: Switch to mud rotary*
445	15		ST-7	250 psi	83		30.5		48	30				*Pushed shelby tube from 15.0 to 17.0 feet*
440.0	19.0					Soft, wet, gray, lean CLAY (CL), trace sand and shells.								
	20		SS-8	1 1 1	83		32.9							
435	25		SS-6	WOH WOH 3	89		21.4							
430	30													

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Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B010

Elevation (feet)	Depth (feet)	Samples: Type / Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30	ST-10		72			30.0	117.6 118.9 118.6	40	25				*Pushed shelby tube from 30.0 to 32.0 feet*
425														
	35	SS-11	1 2 3	94		Becomes medium stiff.	28.2							
420														
419.0	40	SS-12	6 7 50/3.5"	83		40.0 Medium dense, wet, brown, fine to coarse silty SAND (SP) with gravel.	17.0							
418.0						41.0 SHALE: Light gray, weathered.								*41.0 to 43.0 feet: Hard drilling*
415														
413.8	45	SS-13	50/3"	35		45.3 End of Boring at 45.25 ft	16.4							*Boring backfilled with bentonite and cement fluid*
410	50													
405	55													
400	60													
395	65													

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B011

Date(s) Drilled	09/12/2015 to 09/12/2015	Logged By	Norm Seiler	Checked By	NDS
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	62.0 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	456.4 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	7.5 ft on 9/12/2015		

Elevation (feet)	Depth (feet)	Samples: Type / Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation 456.4 / Depth 0.0)	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	0	SS-1	9 12 12	89	ASH	Medium dense, moist, dark gray, ASH [Fill].	27.7							
455		SS-2	8 9 14	100	ASH		16.3							
	5	SS-3	6 9 9	94	ASH		29.4							
450		SS-4	2 1 1	100	ASH	∇ Becomes loose, wet.	45.3							
	10	SS-5		84	ASH		70.0							*10.0 feet: Switch to mud rotary*
445					ASH									
440	15	SS-6	WOR WOR WOR WOR	100	ASH	Becomes very loose.	63.2							
435	20	SS-7		56	ASH		84.9							
430	25	SS-8	WOR WOR WOR WOR	89	ASH		74.7							
	30													

Elevation (feet)	Depth (feet)	Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
425	30		SS-9	WOR WOR WOR WOR	100			73.7							
420	35		SS-10	WOR WOR WOR WOR	84			93.9							
415	40		SS-11	WOH 1 2	100		416.4 / 40.0 Soft, wet, gray, silty CLAY (CL), trace sand, shells, and organics.	47.9							
410	45		SS-12	WOR WOR WOH	94		411.4 / 45.0 Very soft, wet, gray, fat CLAY (CH), trace sand, shells, and wood.	63.3		63	42				
405	50		SS-13	WOR WOR WOH	89		406.4 / 50.0 Very soft, wet, dark gray and grayish brown, lean CLAY (CL).	62.5							
400	55		SS-14	WOR WOR WOH	100		Grades gray.	52.9							
							398.4 / 58.0 SHALE: Light gray, soft.								*58.0 to 62.0 feet: Solid drilling*
395	60		SS-15	50/3"	100			9.1							
							394.4 / 62.0 End of Boring at 62 ft								*Boring backfilled with bentonite and cement fluid*
	65														

Date(s) Drilled	09/09/2015 to 09/09/2015	Logged By	Norm Seiler	Checked By	NDS
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	60.0 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	459.0 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	Sample Type / Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
459.0–458.6	0.0–0.4				Limestone gravel [Fill].								
458.6–456.5	0.4–2.5	SS-1	6 6 4	94	Stiff, moist, brown sandy SILT (ML), trace clay, gravel, and topsoil.	23.0							
456.5–448.0	2.5–11.0	SS-2	5 4 3	78	Loose, moist, dark brown ASH [Fill].	23.8		28	2				
		SS-3	3 4 11	56		26.5							
		SS-4	10 10 7	89		26.5							
		SS-5	2 3 4	89	With clay.	24.7							
448.0	11.0				Stiff, moist, brown to gray, silty CLAY (CL), trace sand, shells, and roots.	24.9							
		SS-6	3 3 6	94		22.0							
	15	SS-7	2 3 4	61	Becomes medium stiff.	24.3		48	29				*15.0 feet: Switch to mud rotary*
	20	ST-8	100 psi	75		23.8							*Pushed shelby tube from 20.0 to 22.0 feet*
	25	SS-9	3 3 3	100		23.2							
429	30												

Elevation (feet)	Depth (feet)	Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Material Description (Elevation / Depth)	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	Remarks
	30	SS-10	2 2 4	61		24.8							
425	35	SS-11	2 2 2	100	Becomes soft, trace sand.	28.3							
420	40	SS-12	WOH 2 2	100	Becomes soft, trace sand, shells, and organics.	32.2							
415	45	SS-13	1 2 3	100		50.2							
412.0	47.0	ST-14		100	Medium stiff, moist, dark gray, fat CLAY (CH).	50.8	104.4 104.9 104.0	54	34				*Pushed shelby tube from 47.0 to 49.0 feet*
410.0	49.0	SS-15	3 2 4	100	Medium stiff, moist, gray and brownish gray, lean CLAY (CL), trace sand.	67.4							
403.5	55.5	SS-16	11 21 23	100	Gray broken rock, weathered.	50.5 15.3							
402.0	57.0				Light gray rock, weathered.								
398.8	60.2	SS-17	50/2.5"	75	End of Boring at 60 ft	17.9							*Boring backfilled with bentonite and cement fluid*
395	65												

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B013

Date(s) Drilled	09/11/2015 to 09/11/2015	Logged By	Norm Seiler	Checked By	NDS
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	53.0 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	457.0 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
457.0	0	▨	SS-1	4 4 7	44	▨	Medium stiff, moist, dark gray to brown, CLAY (CL) with ASH [Fill].	13.6							
454.5	2.5	▨	SS-2	1 3 4	83	▨	Medium stiff, moist, brown, silty CLAY (CL), trace sand, gravel, and roots.	17.4				2.0			
		▨	SS-3		46	▨		24.3 20.0		49	28				
449.0	8.0	▨	SS-4	3 4 6	72	▨	Stiff, moist, dark gray, silty CLAY (CL), trace sand.	24.3				2.0			
	10	▨	SS-5	2 4 7	83	▨		25.4				2.0			*10.0 feet: Switch to mud rotary*
						▨	Gray and mottled brown silty CLAY (CL), trace sand.								
	15	▨	SS-6	2 2 4	100	▨	Becomes medium stiff, gray and mottled brown.	25.5		41	29	1.0			
	20	▨	SS-7	2 3 3	67	▨		23.5				1.0			
	25	▨	SS-8	3 3 4	67	▨	Becomes gray, trace organics.	27.7				1.25			
427.0	30.0														

Elevation scale: 455, 450, 445, 440, 435, 430. Depth scale: 0, 5, 10, 15, 20, 25, 30.

Elevation (feet)	Depth (feet)	Type Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Material Description	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	Remarks
	30	SS-9	1 2 2	94	Medium stiff, moist, brown mottled gray, sandy CLAY (CL), trace silt and shells.	20.2				1.5			
425.0	32.0	ST-10		100	Medium stiff, moist, gray and brown lean CLAY (CL) with sand.	33.3		42	19	1.25			*Pushed shelby tube from 32.0 to 34.0 feet*
	35	SS-11	2 2 2	89	Becomes dark gray, trace organics.	58.0				1.0			
	40	SS-12	2 2 3	100		54.5				1.25			
	45	SS-13	2 2 4	100	Grades with calcium carbonate seams and shells.	66.2				1.75			
					Gravel layer 47.5 feet to 49.0 feet								
404.0	53.0				End of Boring at 53 ft								*Boring backfilled with bentonite and cement fluid*

Elevation scale: 425, 420, 415, 410, 405, 400, 395. Depth scale: 30, 35, 40, 45, 50, 55, 60, 65.

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B014

Date(s) Drilled	09/12/2015 to 09/12/2015	Logged By	Norm Seiler	Checked By	NDS
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	45.5 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	457.7 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	5 ft on 9/12/2015		

Elevation (feet)	Depth (feet)	Type / Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
457.7	0.0	SS-1	1 4 10	89	Medium dense, moist, dark gray, ASH [Fill].	28.2							
455		SS-2	7 2 1	100	Becomes wet, gray.	40.8							
	5	ST-3		35	▽ (groundwater at 5 ft)								*Pushed shelby tube from 5.0 to 7.0 feet*
450		SS-4	1 1 1	100	Becomes light gray.	60.2							
	10	SS-5		100	Becomes dark gray.	78.7							*10.0 feet: Switch to mud rotary Pushed shelby tube from 10.0 to 12.0 feet*
445													
	15	ST-6	1/12" 1/12"	100	Becomes light gray.	86.5							
440													
	20	SS-7	1/12" 1/12"	100		73.1							
435													
	25	SS-8	WOR WOR WOR	100		48.7							
430													
427.7	30.0												

Elevation (feet)	Depth (feet)	Samples: Type / Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Elevation (feet)	Depth (feet)	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
	30	SS-9	WOR WOR WOR	67		Very loose, wet, black to gray, ASH with clay [Fill].			31.6							
425																
	35	SS-10	WOH 1 2	100		Soft, wet, gray, silty CLAY (CL), trace shells and wood.	422.7	35.0								
420																
	40	SS-11	2 18 34	100		SHALE: Light gray, weathered.	417.2	40.5	27.3 19.6 10.2							
415																*42.0 to 45.0 feet: Solid drilling*
	45	SS-12	56	100		End of Boring at 45.5 ft	412.2	45.5	14.2							*Boring backfilled with bentonite and cement fluid*
410																
	50															
405																
	55															
400																
	60															
395																
	65															

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B015

Date(s) Drilled	09/10/2015 to 09/10/2015	Logged By	Norm Seiler	Checked By	NDS
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	57.0 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	460.0 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
		Groundwater Level(s)	ft on		

Elevation (feet)	Depth (feet)	Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
460	0						460.0 / 0.0								
							459.6 / 0.4 Brown gravel.								
		SS	SS-1	5 4 1	72		Medium stiff, moist, gray to brown, sandy CLAY (CL), trace silt.	54.7							
							457.5 / 2.5								
		SS	SS-2	5 9 13	50		Medium dense, moist, light brown to white, fine to coarse GRAVEL (GP) with sand, trace silt and limestone.	4.5							
455	5	SS	SS-3	6 10 13	39			5.4							
		SS	SS-4	6 9 7	39			7.2							
450	10	SS	SS-5	4 5 6	39			6.5							*10.0 feet: Switch to mud rotary; borehole collapsed*
		SS	SS-6	10 3 2	11			3.6							
445	15						Some coarse limestone.								
		SS	SS-7	4 4 4	39			8.2							
440	20	SS	SS-8	10 7 9	39			7.8							
															23.0 to 25.0 feet: Drove casing with hammer 23.0 to 29.0 feet: Hard drilling
435	25	SS	SS-9	7 4 11	33			8.1							
430	30														

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B015

Elevation (feet)	Depth (feet)	Type	Number	Sampling Resist. OR Core RQD (%)	Recovery (%)	Elevation (feet)	MATERIAL DESCRIPTION	Depth (feet)	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
430	30															
		ST	ST-10	300 psi	100	429.0	Medium stiff, wet, gray, sandy CLAY (CL), trace silt, shells, and organics.	31.0	20.2	122.2 121.0 119.8	24	11	2.5			*Pushed shelby tube from 31.0 to 33.0 feet*
425	35	SS	SS-11	WOH 2 3	94	425.0	Medium stiff, wet, gray and dark gray lean CLAY (CL)	35.0	33.8				1.25			
		ST	ST-12	175 psi		423.0	Soft, wet, dark gray, fat CLAY (CH).	37.0	41.0		66	43	1.0			*Pushed shelby tube from 37.0 to 39.0 feet*
420	40	SS	SS-13	WOH 2 2	100	421.0	Soft, wet, brown and gray, lean CLAY (CL).	39.0	36.2				1.0			
415	45	SS	SS-14	WOH 2 2	83		Grades with sand.		49.4				1.0			
410	50	SS	SS-15	3 5 14	22		Grades without sand.		30.9				0.5			
						408.0	SHALE: Light gray, silt sized, weathered.	52.0								*52.0 feet: Solid drilling*
405	55	SS	SS-16	71/6"	oK				11.0							
						403.0	End of Boring at 57 ft	57.0								*Boring backfilled with bentonite and cement fluid*
400	60															
395	65															

Project: Edwards Power Station

Project Location: Bartonville, Illinois

Project Number: 60440202

Log of Boring EDW-B015A

Date(s) Drilled	09/10/2015 to 09/10/2015	Logged By	Norm Seiler	Checked By	NDS
Drilling Method	Power Auger/ Mud Rotary	Drill Bit Size/Type	3 7/8" Tricone Roller Bit	Borehole Depth	30.0 ft
Drill Rig Type	Diedrich D-120 Rubber Tired ATV	Drilling Contractor	Strata Earth Services	Surface Elevation	460.0 ft
Borehole Backfill	Bentonite and Cement Fluid	Sampling Method(s)	Split Spoon/3" Thin Walled Tube	Hammer Data	Automatic, 140 lbs, 30" drop
Boring Location	5' SW of EDW-B015 (ft NAD83)	Groundwater Level(s)	ft on		

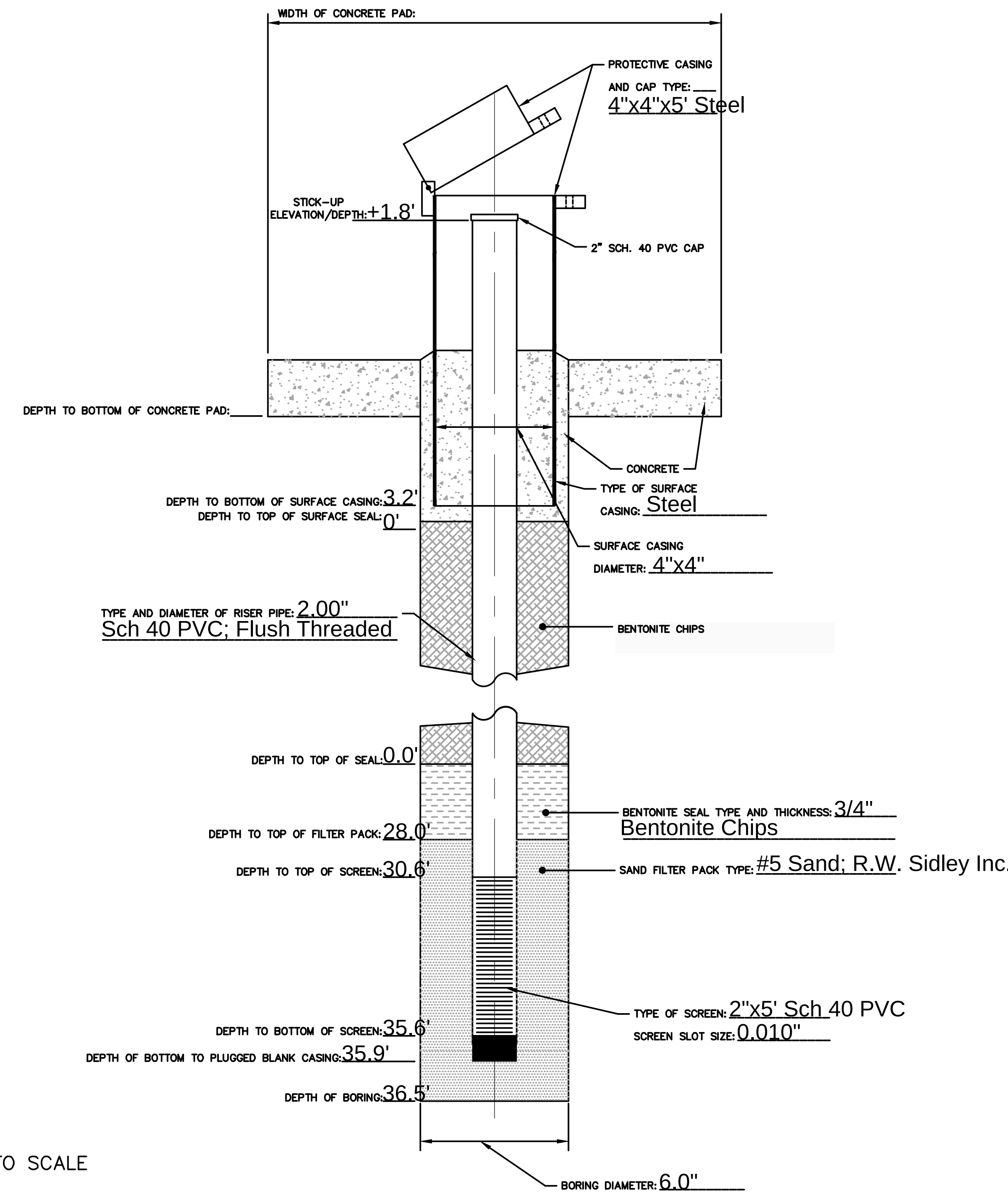
Elevation (feet)	Depth (feet)	SAMPLES: Type	SAMPLES: Number	SAMPLES: Sampling Resist. OR Core RQD (%)	SAMPLES: Recovery (%)	Graphic Symbol	MATERIAL DESCRIPTION (Elevation (feet) / Depth (feet))	Natural Moisture Content (%)	Total Unit Weight (pcf)	Liquid Limit	Plasticity Index	Pocket Pen. Su (ksf)	Torvane Su (ksf)	TXUU (ksf)	REMARKS
460	0						460.0 / 0.0 Blank power auger to 30.0 feet to confirm 29.0 feet of gravel.								*Offset 5.0 feet west of EDW-B015*
455	5														*5.0 to 30.0 feet: No cuttings*
															7.0 feet: Borehole collapsed; created a 14" diameter hole with no cuttings
450	10														
445	15														
440	20														*20.0 feet: Groundwater encountered*
435	25														*Auger hole collapsed and auger removed. No clay on auger.*
430	30						430.0 / 30.0								

End of Boring at 30 ft

Attachment C. Piezometer Logs

Project: Dynegy	Log of Piezometer
Project Location: Bartonville, IL	Sheet 1 of 1
Project Number: 60440202	

Piezometer Location	EDW-P001	Date Installed	11/05/15	Time	5:30 P.M.
Installed By	Josh Kohn	Observed By	R. Weseljak	Total Depth	36.5'
Method of Installation	6" Mud Rotary	Drilling Contractor	Strata	Surface Elevation	461.0 (NAVD88)
Screened Interval	30.6-35.6'				
		Groundwater Level(s)	24.64' from top of casing		

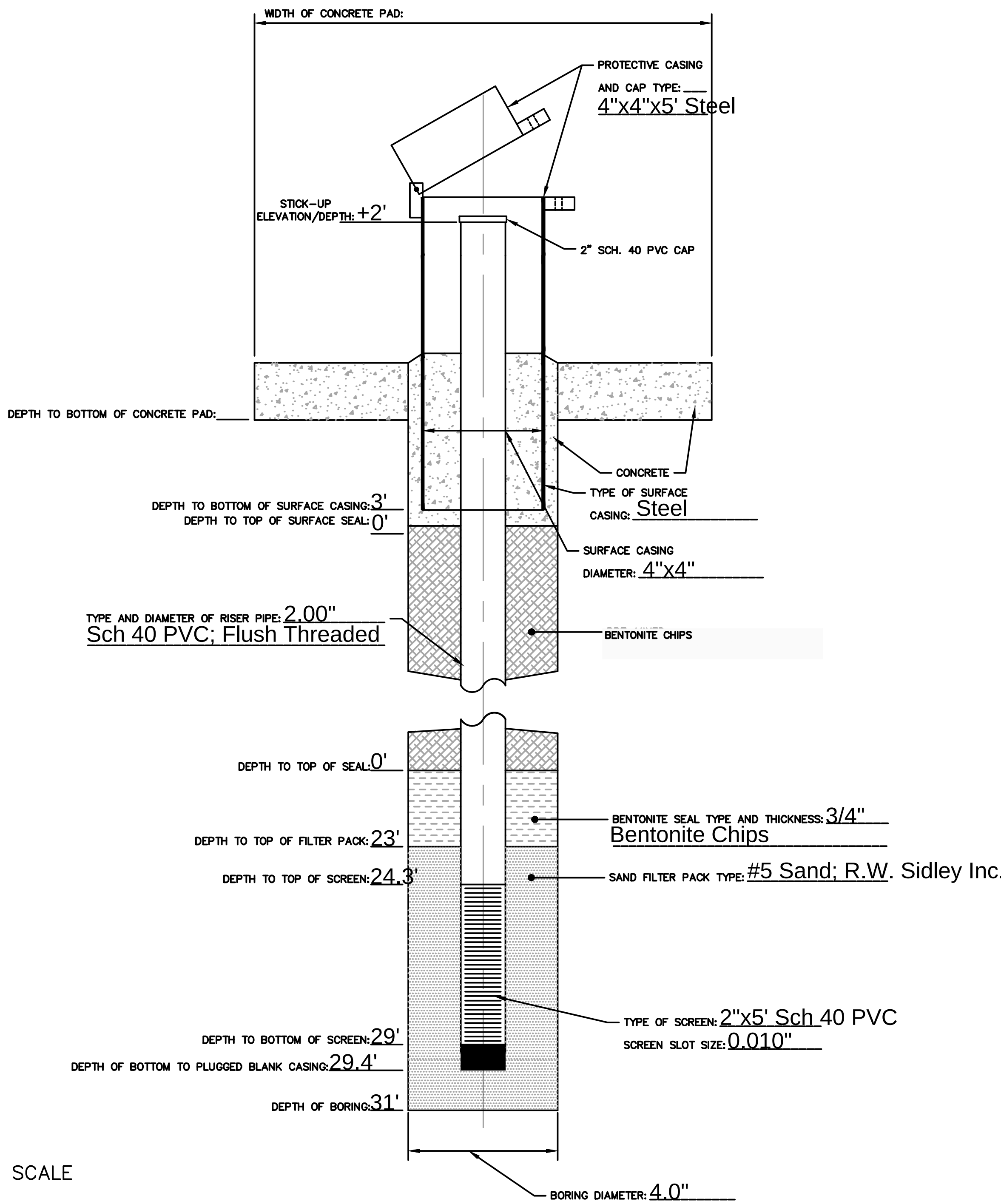


NOT TO SCALE

AECOM

Project: Dynegy	Log of Piezometer
Project Location: Bartonville, IL	
Project Number: 60440202	Sheet 1 of 1

Piezometer Location	EDW-P002	Date Installed	09/04/15	Time	11:00-12:00 P.M.
Installed By	Scott Komen	Observed By	N. Seiler	Total Depth	31'
Method of Installation	4" Power Auger	Drilling Contractor	Strata	Surface Elevation	459.0 (NAVD88)
Screened Interval	24-29'				
		Groundwater Level(s)	29' After Drilling		



NOT TO SCALE

Project: Dynegy

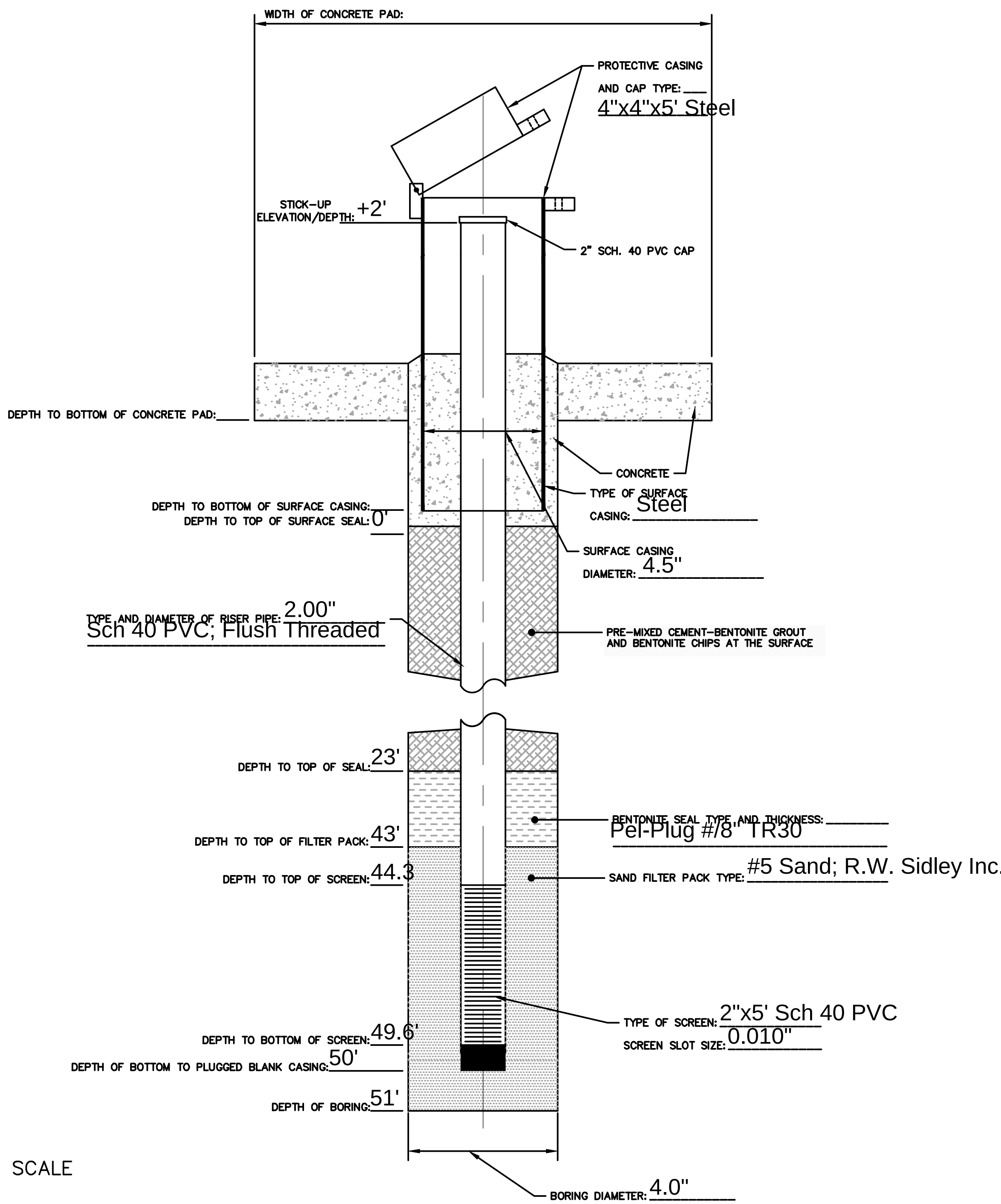
Project Location: Bartonville, IL

Project Number: 60440202

Log of Piezometer

Sheet 1 of 1

Piezometer Location	EDW-P003	Date Installed	09/04/15	Time	3:30-6:00 P.M.
Installed By	Scott Komen	Observed By	N. Seiler	Total Depth	51'
Method of Installation	3 7/8" Rock Bit	Drilling Contractor	Strata	Surface Elevation	459.6 (NAVD88)
Screened Interval	44.3-49.6'				

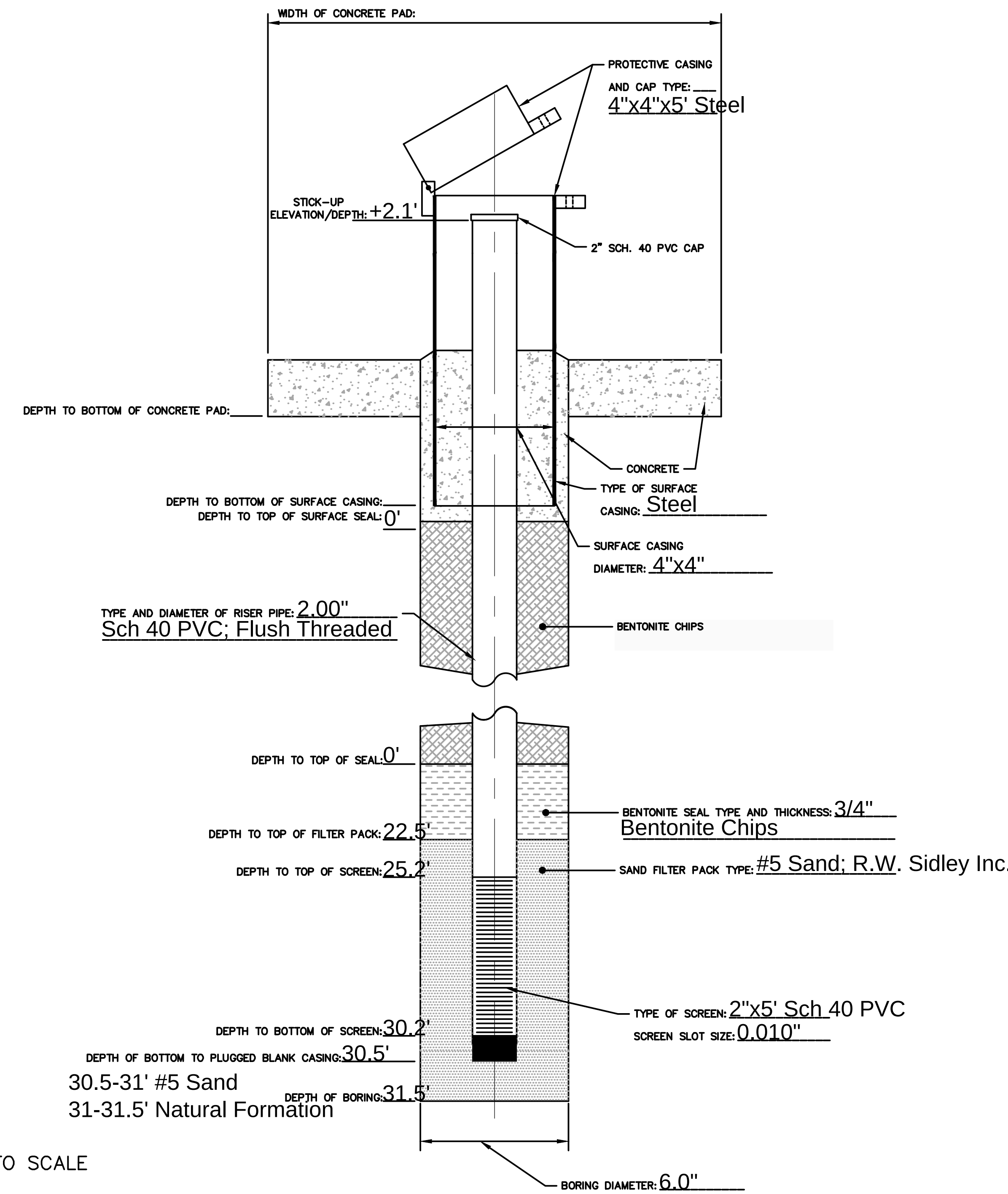


NOT TO SCALE

AECOM

Project: Dynegy	Log of Piezometer
Project Location: Bartonville, IL	
Project Number: 60440202	Sheet 1 of 1

Piezometer Location	EDW-P004	Date Installed	11/04/15	Time	12:00
Installed By	Josh Kohn	Observed By	R. Weseljak	Total Depth	31.5'
Method of Installation	6" Mud Rotary	Drilling Contractor	Strata	Surface Elevation	455.6 (NAVD88)
Screened Interval	25.2-30.2'				
		Groundwater Level(s)	14.85 From Top of Casing		



NOT TO SCALE

AECOM

Attachment D. CPT Data Report

PRESENTATION OF SITE INVESTIGATION RESULTS

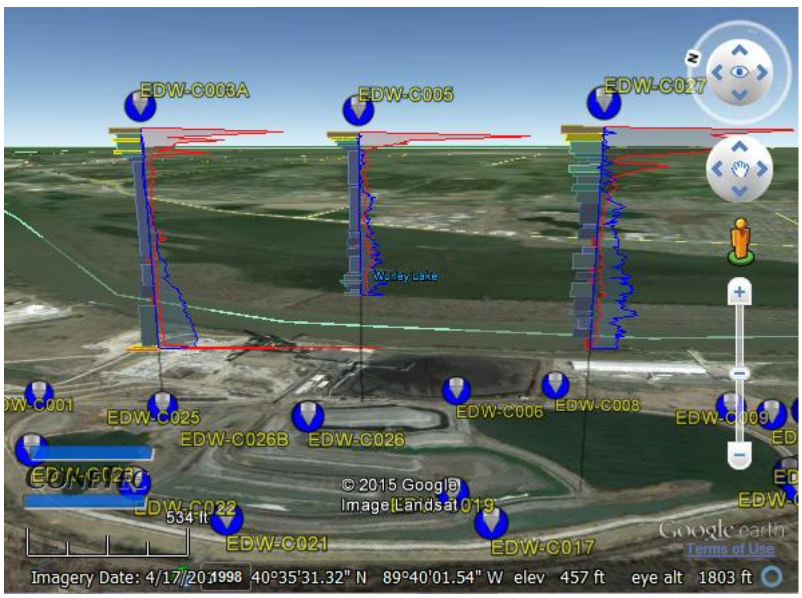
Edwards Power Station
Peoria, Illinois

Prepared for:

AECOM

ConeTec Job No: 15-53073

Project Start Date: 19-Aug-2015
Project End Date: 29-Aug-2015
Report Date: 31-Aug-2015



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www.conetecdataservices.com

CONETEC

Introduction

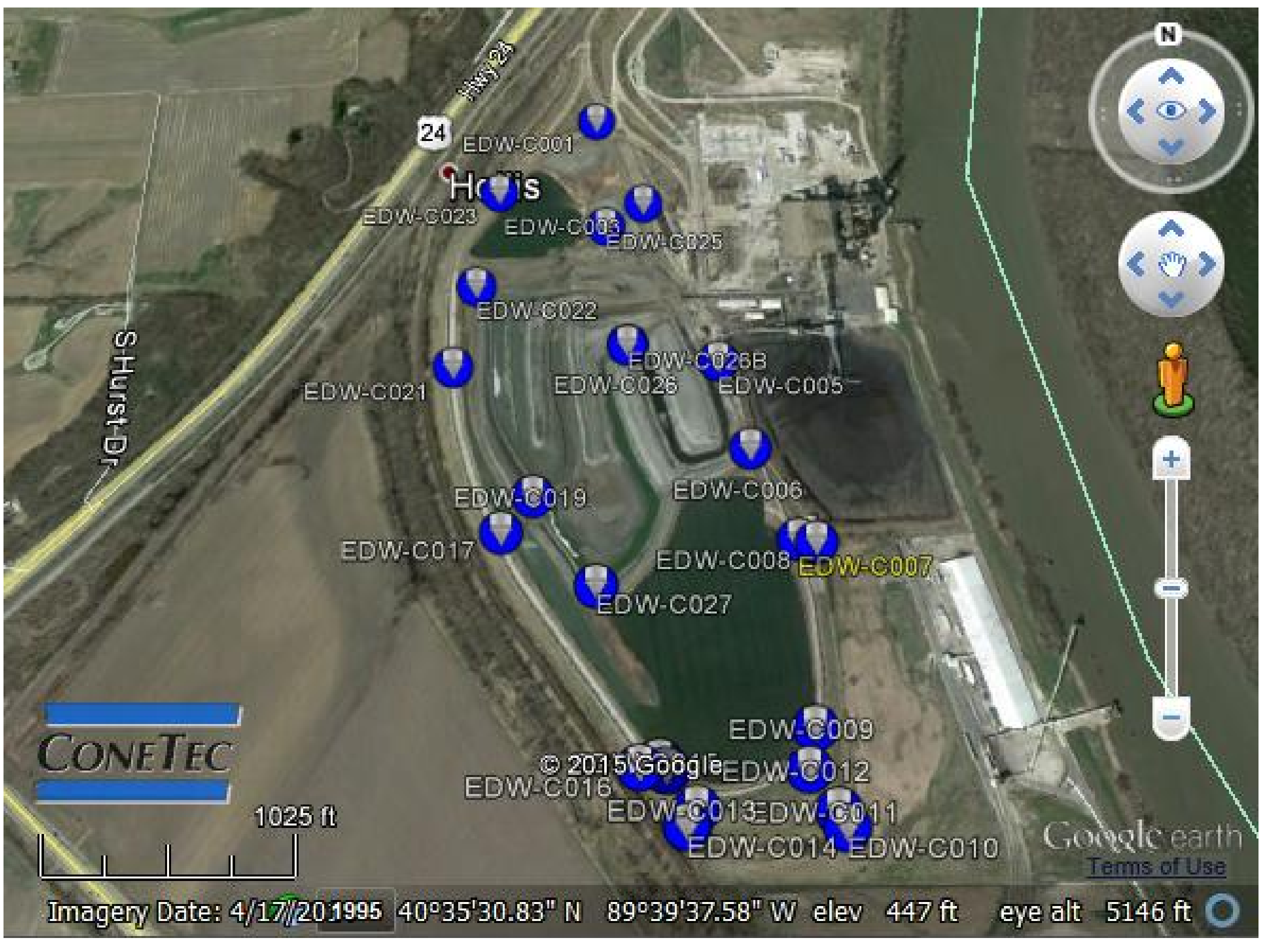
The enclosed report presents the results of a piezocone penetration testing (CPTu or CPT) and seismic piezocone penetration testing (SCPTu or SCPT) program carried out at the Edwards Power Station site located in Peoria, Illinois. The site investigation program was conducted by ConeTec Inc., under contract to AECOM of Chicago, Illinois.

A total of fourteen cone penetration tests and ten seismic cone penetration tests were completed at twenty two locations (There were two shallow refusals). The CPT and SCPT program was performed to evaluate the subsurface soil conditions. CPT and SCPT sounding locations were selected and numbered under the supervision of AECOM personnel (Mr. Daryle Harrison and Mr. Adam Grossman).

Project Information

Project	
Client	AECOM
Project	Edwards Power Station, Peoria, IL
ConeTec project number	15-53073

A map from Google earth including the CPT test locations is presented below.



Rig Description	Deployment System	Test Type
CPT Truck Rig CPT Track Rig	25 ton truck mounted (twin cylinders) 20 ton track mounted (twin cylinders)	CPT and SCPT CPT and SCPT

Coordinates		
Test Type	Collection Method	EPSG Number
CPT and SCPT	GPS (Handheld)	32616 (WGS 84 / UTM North)

Cone Penetration Test (CPT)	
Depth reference	Ground surface at the time of the investigation.
Tip and sleeve data offset	0.1 meter. This has been accounted for in the CPT data files.
Pore pressure dissipation (PPD) tests	Fifty seven pore pressure dissipation tests were completed primarily to determine the phreatic surface.
Additional Comments	Shear wave velocity tests were conducted at five foot intervals at ten locations.

Cone Description	Cone Number	Cross Sectional Area (cm^2)	Sleeve Area (cm^2)	Tip Capacity (bar)	Sleeve Capacity (bar)	Pore Pressure Capacity (psi)
335:T1500F15U500	335	15	225	1500	15	500
340:T1500F15U500	340	15	225	1500	15	500
374:T1500F15U500	374	15	225	1500	15	500

Limitations

This report has been prepared for the exclusive use of AECOM (Client) for the project titled “Edwards Power Station, Peoria, IL”. The report’s contents may not be relied upon by any other party without the express written permission of ConeTec, Inc. (ConeTec). ConeTec has provided site investigation services, prepared the factual data reporting, and provided geotechnical parameter calculations consistent with current best practices. No other warranty, expressed or implied, is made.

The information presented in the report document and the accompanying data set pertain to the specific project, site conditions and objectives described to ConeTec by the Client. In order to properly understand the factual data, assumptions and calculations, reference must be made to the documents provided and their accompanying data sets, in their entirety.

The cone penetration tests (CPTu) are conducted using an integrated electronic piezocone penetrometer and data acquisition system manufactured by Adara Systems Ltd. of Richmond, British Columbia, Canada.

ConeTec's piezocone penetrometers are compression type designs in which the tip and friction sleeve load cells are independent and have separate load capacities. The piezocones use strain gauged load cells for tip and sleeve friction and a strain gauged diaphragm type transducer for recording pore pressure. The piezocones also have a platinum resistive temperature device (RTD) for monitoring the temperature of the sensors, an accelerometer type dual axis inclinometer and a geophone sensor for recording seismic signals. All signals are amplified down hole within the cone body and the analog signals are sent to the surface through a shielded cable.

ConeTec penetrometers are manufactured with various tip, friction and pore pressure capacities in both 10 cm^2 and 15 cm^2 tip base area configurations in order to maximize signal resolution for various soil conditions. The 15 cm^2 penetrometers do not require friction reducers as they have a diameter larger than the deployment rods. The 10 cm^2 piezocones use a friction reducer consisting of a rod adapter extension behind the main cone body with an enlarged cross sectional area (typically 44 mm diameter over a length of 32 mm with tapered leading and trailing edges) located at a distance of 585 mm above the cone tip.

The penetrometers are designed with equal end area friction sleeves, a net end area ratio of 0.8 and cone tips with a 60 degree apex angle.

All ConeTec piezocones can record pore pressure at various locations. Unless otherwise noted, the pore pressure filter is located directly behind the cone tip in the "u_2" position (ASTM Type 2). The filter is 6 mm thick, made of porous plastic (polyethylene) having an average pore size of 125 microns (90-160 microns). The function of the filter is to allow rapid movements of extremely small volumes of water needed to activate the pressure transducer while preventing soil ingress or blockage.

The piezocone penetrometers are manufactured with dimensions, tolerances and sensor characteristics that are in general accordance with the current ASTM D5778 standard. ConeTec's calibration criteria also meet or exceed those of the current ASTM D5778 standard. An illustration of the piezocone penetrometer is presented in Figure CPTu.

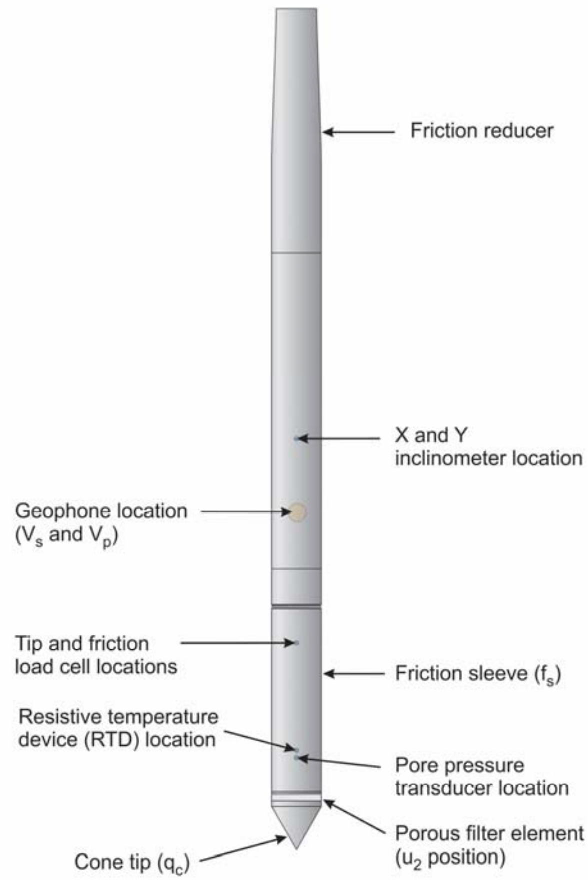


Figure CPTu. Piezocone Penetrometer (15 cm^2)

The ConeTec data acquisition systems consist of a Windows based computer and a signal conditioner and power supply interface box with a 16 bit (or greater) analog to digital (A/D) converter. The data is recorded at fixed depth increments using a depth wheel attached to the push cylinders or by using a spring loaded rubber depth wheel that is held against the cone rods. The typical recording intervals are either 2.5 cm or 5.0 cm depending on project requirements; custom recording intervals are possible. The system displays the CPTu data in real time and records the following parameters to a storage media during penetration:

- Depth
- Uncorrected tip resistance (q_c)
- Sleeve friction (f_s)
- Dynamic pore pressure (u)
- Additional sensors such as resistivity, passive gamma, ultra violet induced fluorescence, if applicable

All testing is performed in accordance to ConeTec's CPT operating procedures which are in general accordance with the current ASTM D5778 standard.

Prior to the start of a CPTu sounding a suitable cone is selected, the cone and data acquisition system are powered on, the pore pressure system is saturated with either glycerin or silicone oil and the baseline readings are recorded with the cone hanging freely in a vertical position.

The CPTu is conducted at a steady rate of 2 cm/s, within acceptable tolerances. Typically one meter length rods with an outer diameter of 1.5 inches are added to advance the cone to the sounding termination depth. After cone retraction final baselines are recorded.

Additional information pertaining to ConeTec's cone penetration testing procedures:

- Each filter is saturated in silicone oil or glycerin under vacuum pressure prior to use
- Recorded baselines are checked with an independent multi-meter
- Baseline readings are compared to previous readings
- Soundings are terminated at the client's target depth or at a depth where an obstruction is encountered, excessive rod flex occurs, excessive inclination occurs, equipment damage is likely to take place, or a dangerous working environment arises
- Differences between initial and final baselines are calculated to ensure zero load offsets have not occurred and to ensure compliance with ASTM standards

The interpretation of piezocone data for this report is based on the corrected tip resistance (q_t), sleeve friction (f_s) and pore water pressure (u). The interpretation of soil type is based on the correlations developed by Robertson (1990) and Robertson (2009). It should be noted that it is not always possible to accurately identify a soil type based on these parameters. In these situations, experience, judgment and an assessment of other parameters may be used to infer soil behavior type.

The recorded tip resistance (q_c) is the total force acting on the piezocone tip divided by its base area. The tip resistance is corrected for pore pressure effects and termed corrected tip resistance (q_t) according to the following expression presented in Robertson et al, 1986:

$$q_t = q_c + (1-a) \bullet u_2$$

where: q_t is the corrected tip resistance
q_c is the recorded tip resistance
u_2 is the recorded dynamic pore pressure behind the tip (u_2 position)
a is the Net Area Ratio for the piezocone (0.8 for ConeTec probes)

The sleeve friction (f_s) is the frictional force on the sleeve divided by its surface area. As all ConeTec piezocones have equal end area friction sleeves, pore pressure corrections to the sleeve data are not required.

The dynamic pore pressure (u) is a measure of the pore pressures generated during cone penetration. To record equilibrium pore pressure, the penetration must be stopped to allow the dynamic pore pressures to stabilize. The rate at which this occurs is predominantly a function of the permeability of the soil and the diameter of the cone.

The friction ratio (Rf) is a calculated parameter. It is defined as the ratio of sleeve friction to the tip resistance expressed as a percentage. Generally, saturated cohesive soils have low tip resistance, high friction ratios and generate large excess pore water pressures. Cohesionless soils have higher tip resistances, lower friction ratios and do not generate significant excess pore water pressure.

A summary of the CPTu soundings along with test details and individual plots are provided in the appendices. A set of interpretation files were generated for each sounding based on published correlations and are provided in Excel format in the data release folder. Information regarding the interpretation methods used is included in an appendix.

For additional information on CPTu interpretations, refer to Robertson et al. (1986), Lunne et al. (1997), Robertson (2009), Mayne (2013, 2014) and Mayne and Peuchen (2012).

References

ASTM D5778-12, 2012, "Standard Test Method for Performing Electronic Friction Cone and Piezocone Penetration Testing of Soils", ASTM, West Conshohocken, US.

Lunne, T., Robertson, P.K. and Powell, J. J. M., 1997, “Cone Penetration Testing in Geotechnical Practice”, Blackie Academic and Professional.

Mayne, P.W., 2013, “Evaluating yield stress of soils from laboratory consolidation and in-situ cone penetration tests”, Sound Geotechnical Research to Practice (Holtz Volume) GSP 230, ASCE, Reston/VA: 406-420.

Mayne, P.W. and Peuchen, J., 2012, “Unit weight trends with cone resistance in soft to firm clays”, Geotechnical and Geophysical Site Characterization *4,* Vol. 1 (Proc. ISC-4, Pernambuco), CRC Press, London: 903-910.

Mayne, P.W., 2014, “Interpretation of geotechnical parameters from seismic piezocone tests”, CPT’14 Keynote Address, Las Vegas, NV, May 2014.

Robertson, P.K., Campanella, R.G., Gillespie, D. and Greig, J., 1986, “Use of Piezometer Cone Data”, Proceedings of InSitu 86, ASCE Specialty Conference, Blacksburg, Virginia.

Robertson, P.K., 1990, “Soil Classification Using the Cone Penetration Test”, Canadian Geotechnical Journal, Volume 27: 151-158.

Robertson, P.K., 2009, “Interpretation of cone penetration tests – a unified approach”, Canadian Geotechnical Journal, Volume 46: 1337-1355.

Shear wave velocity testing is performed in conjunction with the piezocone penetration test (SCPTu) in order to collect interval velocities. For some projects seismic compression wave (Vp) velocity is also determined.

ConeTec's piezocone penetrometers are manufactured with a horizontally active geophone (28 hertz) that is rigidly mounted in the body of the cone penetrometer, 0.2 meters behind the cone tip.

Shear waves are typically generated by using an impact hammer horizontally striking a beam that is held in place by a normal load. In some instances an auger source or an imbedded impulsive source maybe used for both shear waves and compression waves. The hammer and beam act as a contact trigger that triggers the recording of the seismic wave traces. For impulsive devices an accelerometer trigger may be used. The traces are recorded using an up-hole integrated digital oscilloscope which is part of the SCPTu data acquisition system. An illustration of the shear wave testing configuration is presented in Figure SCPTu-1.

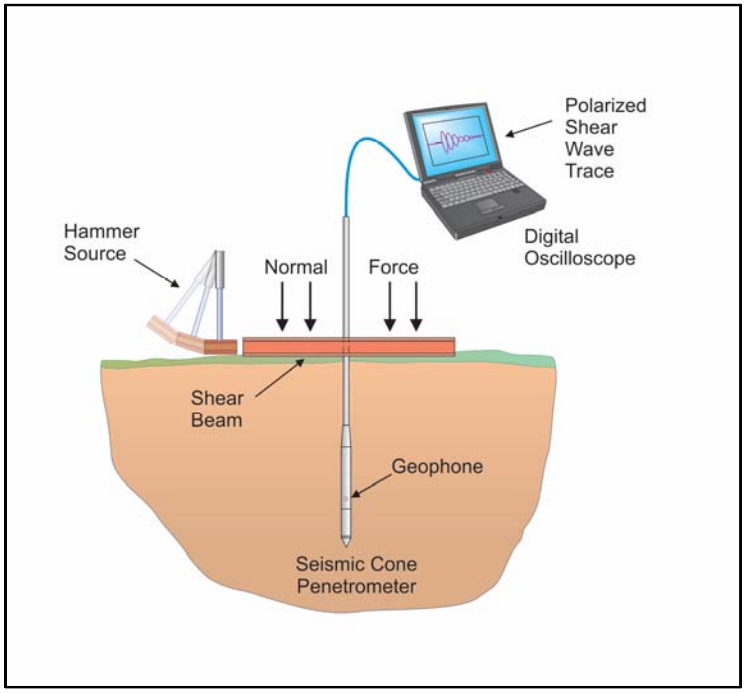


Figure SCPTu-1. Illustration of the SCPTu system

All testing is performed in accordance to ConeTec's SCPTu operating procedures.

Prior to the start of a SCPTu sounding, the procedures described in the Cone Penetration Test section are followed. In addition, the active axis of the geophone is aligned parallel to the beam (or source) and the horizontal offset between the cone and the source is measured and recorded.

Prior to recording seismic waves at each test depth, cone penetration is stopped and the rods are decoupled from the rig to avoid transmission of rig energy down the rods. Multiple wave traces are recorded for quality control purposes. After reviewing wave traces for consistency the cone is pushed to the next test depth (typically one meter intervals or as requested by the client). Figure SCPTu-2 presents an illustration of a SCPTu test.

For additional information on seismic cone penetration testing refer to Robertson et.al. (1986).

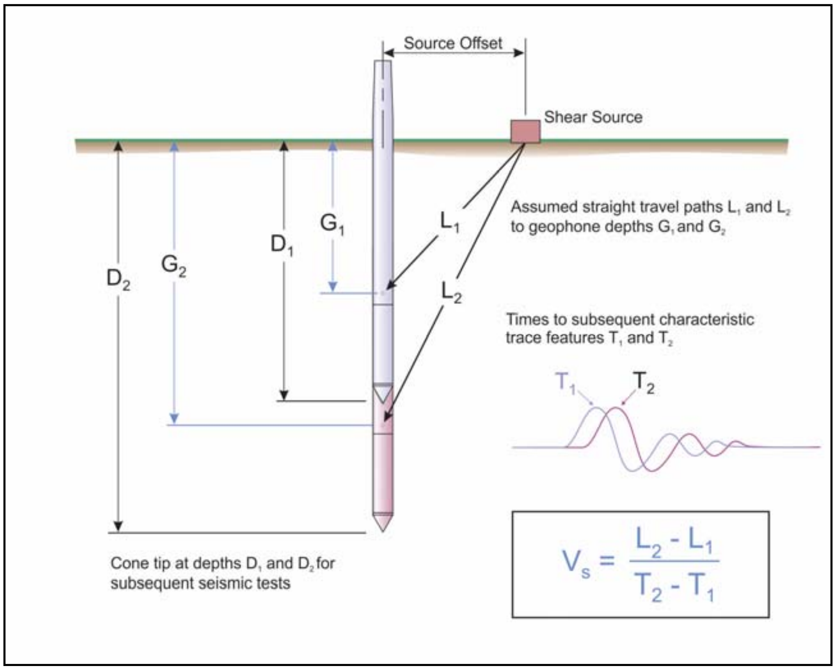


Figure SCPTu-2. Illustration of a seismic cone penetration test

Calculation of the interval velocities are performed by visually picking a common feature (e.g. the first characteristic peak, trough, or crossover) on all of the recorded wave sets and taking the difference in ray path divided by the time difference between subsequent features. Ray path is defined as the straight line distance from the seismic source to the geophone, accounting for beam offset, source depth and geophone offset from the cone tip.

The average shear wave velocity to a depth of 100 feet (30 meters) ($\bar{v}_s$) has been calculated and provided for all applicable soundings using the following equation presented in ASCE, 2010.

$$\bar{v}_s = \frac{\sum_{i=1}^{n} d_i}{\sum_{i=1}^{n} \frac{d_i}{v_{si}}}$$

where: $\bar{v}_s$ = average shear wave velocity ft/s (m/s)
d_i = the thickness of any layer between 0 and 100 ft (30 m)
v_{si} = the shear wave velocity in ft/s (m/s)
$\sum_{i=1}^{n} d_i$ = 100 ft (30 m)

Average shear wave velocity, $\bar{v}_s$ is also referenced to V_{s100} or V_{s30}.

The layer travel times refers to the travel times propagating in the vertical direction, not the measured travel times from an offset source.

Tabular results and SCPTu plots are presented in the relevant appendix.

References

American Society of Civil Engineers (ASCE), 2010, “Minimum Design Loads for Buildings and Other Structures”, Standard ASCE/SEI 7-10, American Society of Civil Engineers, ISBN 978-0-7844-1085-1, Reston, Virginia.

Robertson, P.K., Campanella, R.G., Gillespie D and Rice, A., 1986, “Seismic CPT to Measure In-Situ Shear Wave Velocity”, Journal of Geotechnical Engineering ASCE, Vol. 112, No. 8: 791-803.

The cone penetration test is halted at specific depths to carry out pore pressure dissipation (PPD) tests, shown in Figure PPD-1. For each dissipation test the cone and rods are decoupled from the rig and the data acquisition system measures and records the variation of the pore pressure (u) with time (t).

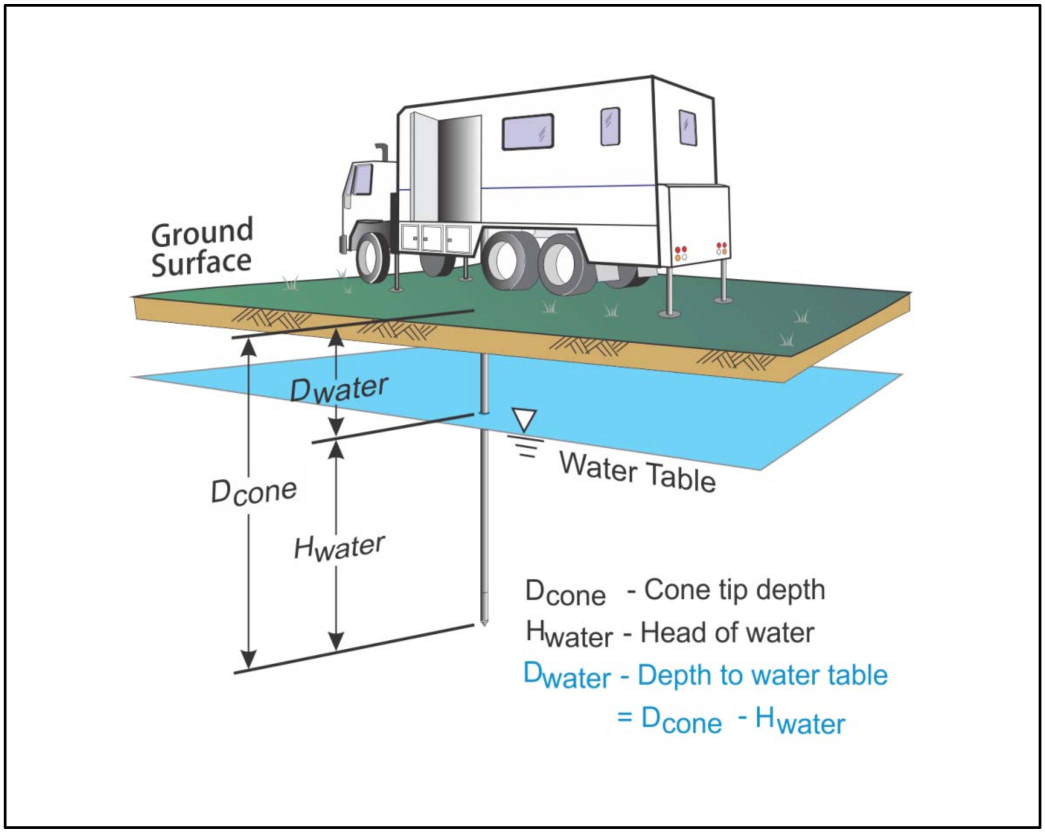


Figure PPD-1. Pore pressure dissipation test setup

Pore pressure dissipation data can be interpreted to provide estimates of ground water conditions, permeability, consolidation characteristics and soil behavior.

The typical shapes of dissipation curves shown in Figure PPD-2 are very useful in assessing soil type, drainage, in situ pore pressure and soil properties. A flat curve that stabilizes quickly is typical of a freely draining sand. Undrained soils such as clays will typically show positive excess pore pressure and have long dissipation times. Dilative soils will often exhibit dynamic pore pressures below equilibrium that then rise over time. Overconsolidated fine-grained soils will often exhibit an initial dilatory response where there is an initial rise in pore pressure before reaching a peak and dissipating.

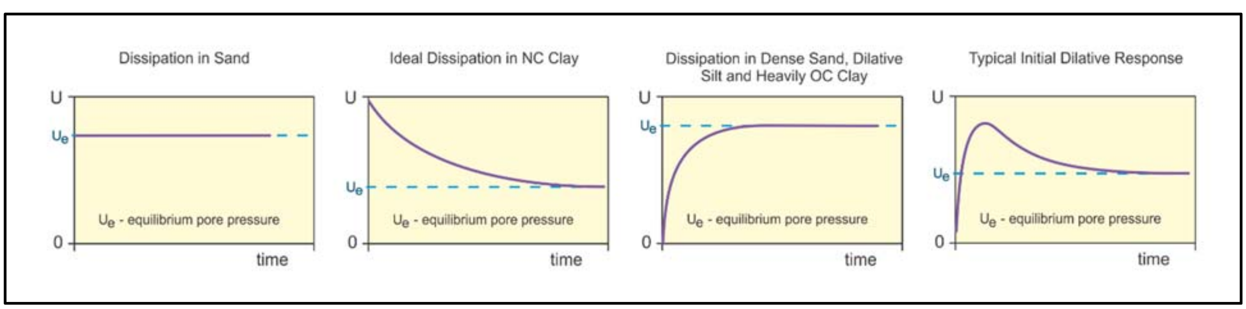


Figure PPD-2. Pore pressure dissipation curve examples

In order to interpret the equilibrium pore pressure (u_{eq}) and the apparent phreatic surface, the pore pressure should be monitored until such time as there is no variation in pore pressure with time as shown for each curve of Figure PPD-2.

In fine grained deposits the point at which 100% of the excess pore pressure has dissipated is known as t_{100}. In some cases this can take an excessive amount of time and it may be impractical to take the dissipation to t_{100}. A theoretical analysis of pore pressure dissipations by Teh and Houlsby (1991) showed that a single curve relating degree of dissipation versus theoretical time factor (T*) may be used to calculate the coefficient of consolidation (c_h) at various degrees of dissipation resulting in the expression for c_h shown below.

$$c_h = \frac{T^* \cdot a^2 \cdot \sqrt{I_r}}{t}$$

Where:

T* is the dimensionless time factor (Table Time Factor)

a is the radius of the cone

I_r is the rigidity index

t is the time at the degree of consolidation

Table Time Factor. T* versus degree of dissipation (Teh and Houlsby, 1991)

Degree of Dissipation (%)	20	30	40	50	60	70	80
T* (u_2)	0.038	0.078	0.142	0.245	0.439	0.804	1.60

The coefficient of consolidation is typically analyzed using the time (t_{50}) corresponding to a degree of dissipation of 50% (u_{50}). In order to determine t_{50}, dissipation tests must be taken to a pressure less than u_{50}. The u_{50} value is half way between the initial maximum pore pressure and the equilibrium pore pressure value, known as u_{100}. To estimate u_{50}, both the initial maximum pore pressure and u_{100} must be known or estimated. Other degrees of dissipations may be considered, particularly for extremely long dissipations.

At any specific degree of dissipation the equilibrium pore pressure (u at t_{100}) must be estimated at the depth of interest. The equilibrium value may be determined from one or more sources such as measuring the value directly (u_{100}), estimating it from other dissipations in the same profile, estimating the phreatic surface and assuming hydrostatic conditions, from nearby soundings, from client provided information, from site observations and/or past experience, or from other site instrumentation.

For calculations of c_h (Teh and Houlsby, 1991), t_{50} values are estimated from the corresponding pore pressure dissipation curve and a rigidity index (I_r) is assumed. For curves having an initial dilatory response in which an initial rise in pore pressure occurs before reaching a peak, the relative time from the peak value is used in determining t_{50}. In cases where the time to peak is excessive, t_{50} values are not calculated.

Due to possible inherent uncertainties in estimating I_r, the equilibrium pore pressure and the effect of an initial dilatory response on calculating t_{50}, other methods should be applied to confirm the results for c_h.

Additional published methods for estimating the coefficient of consolidation from a piezocone test are described in Burns and Mayne (1998, 2002), Jones and Van Zyl (1981), Robertson et al. (1992) and Sully et al. (1999).

A summary of the pore pressure dissipation tests and dissipation plots are presented in the relevant appendix.

References

Burns, S.E. and Mayne, P.W., 1998, "Monotonic and dilatory pore pressure decay during piezocone tests", Canadian Geotechnical Journal 26 (4): 1063-1073.

Burns, S.E. and Mayne, P.W., 2002, "Analytical cavity expansion-critical state model cone dissipation in fine-grained soils", Soils & Foundations, Vol. 42(2): 131-137.

Jones, G.A. and Van Zyl, D.J.A., 1981, "The piezometer probe: a useful investigation tool", Proceedings, 10th International Conference on Soil Mechanics and Foundation Engineering, Vol. 3, Stockholm: 489-495.

Robertson, P.K., Sully, J.P., Woeller, D.J., Lunne, T., Powell, J.J.M. and Gillespie, D.G., 1992, "Estimating coefficient of consolidation from piezocone tests", Canadian Geotechnical Journal, 29(4): 551-557.

Sully, J.P., Robertson, P.K., Campanella, R.G. and Woeller, D.J., 1999, "An approach to evaluation of field CPTU dissipation data in overconsolidated fine-grained soils", Canadian Geotechnical Journal, 36(2): 369-381.

Teh, C.I., and Houlsby, G.T., 1991, "An analytical study of the cone penetration test in clay", Geotechnique, 41(1): 17-34.

The appendices listed below are included in the report:

- Cone Penetration Test Summary and Standard Cone Penetration Test Plots
- Seismic Cone Penetration Test Plots
- Seismic Cone Penetration Test Tabular Results
- Pore Pressure Dissipation Summary and Pore Pressure Dissipation Plots

Cone Penetration Test Summary and

Standard Cone Penetration Test Plots

Job No: 15-53073
Client: AECOM
Project: Edwards Power Station, Peoria, IL
Start Date: 19-Aug-2015
End Date: 29-Aug-2015

CONE PENETRATION TEST SUMMARY

Sounding ID	File Name	Date	Cone	Assumed Phreatic Surface[1] (ft)	Final Depth (ft)	Shear Wave Velocity Tests	Northing[2] (m)	Easting (m)	Refer to Notation Number
EDW-C001	15-53073_SP01	19-Aug-2015	374:T1500F15U500	9.4	38.88	8	4497502	274312	
EDW-C003	15-53073_SP03	27-Aug-2015	340:T1500F15U500	9.0	54.63	8	4497325	274377	
EDW-C005	15-53073_CP05	26-Aug-2015	374:T1500F15U500	7.0	40.03		4497026	274468	3
EDW-C006	15-53073_CP06	25-Aug-2015	374:T1500F15U500	11.5	40.03		4496880	274500	
EDW-C007	15-53073_CP07	29-Aug-2015	340:T1500F15U500	8.9	54.79		4496737	274551	
EDW-C008	15-53073_CP08	27-Aug-2015	374:T1500F15U500	10.0	33.63		4496731	274576	3
EDW-C009	15-53073_CP09	28-Aug-2015	340:T1500F15U500	19.9	52.17		4496476	274538	
EDW-C010	15-53073_CP10	27-Aug-2015	374:T1500F15U500	2.2	30.02		4496351	274562	
EDW-C011	15-53073_CP11	28-Aug-2015	340:T1500F15U500	22.5	47.08		4496372	274553	
EDW-C012	15-53073_SP12	28-Aug-2015	340:T1500F15U500	23.3	50.20	10	4496424	274524	
EDW-C013	15-53073_SP13	28-Aug-2015	340:T1500F15U500	22.7	56.27	11	4496386	274376	
EDW-C014	15-53073_CP14	27-Aug-2015	374:T1500F15U500	4.9	38.22		4496366	274362	
EDW-C015	15-53073_SP15	19-Aug-2015	335:T1500F15U500		8.04	2	4496447	274334	4
EDW-C015A	15-53073_SP15A	19-Aug-2015	335:T1500F15U500	12.0	40.03	8	4496435	274342	3
EDW-C016	15-53073_CP16	28-Aug-2015	374:T1500F15U500	3.8	36.91		4496442	274308	
EDW-C017	15-53073_SP17	27-Aug-2015	340:T1500F15U500	24.2	55.94	12	4496775	274137	
EDW-C019	15-53073_CP19	27-Aug-2015	340:T1500F15U500	6.5	53.31		4496825	274184	
EDW-C021	15-53073_CP21	27-Aug-2015	340:T1500F15U500	13.0	49.38		4497046	274071	3
EDW-C022	15-53073_SP22	26-Aug-2015	374:T1500F15U500	6.7	20.01	4	4497185	274108	
EDW-C023	15-53073_CP23	27-Aug-2015	340:T1500F15U500	15.1	40.68		4497364	274147	
EDW-C025	15-53073_CP25	25-Aug-2015	374:T1500F15U500	6.0	20.01		4497285	274315	
EDW-C026	15-53073_SP26	26-Aug-2015	374:T1500F15U500	7.2	14.27	3	4497062	274334	
EDW-C026B	15-53073_SP26B	26-Aug-2015	374:T1500F15U500	6.8	14.60	2	4497064	274335	
EDW-C027	15-53073_CP27	25-Aug-2015	374:T1500F15U500	7.4	40.03		4496687	274266	
Totals	24 soundings				929.12	68			

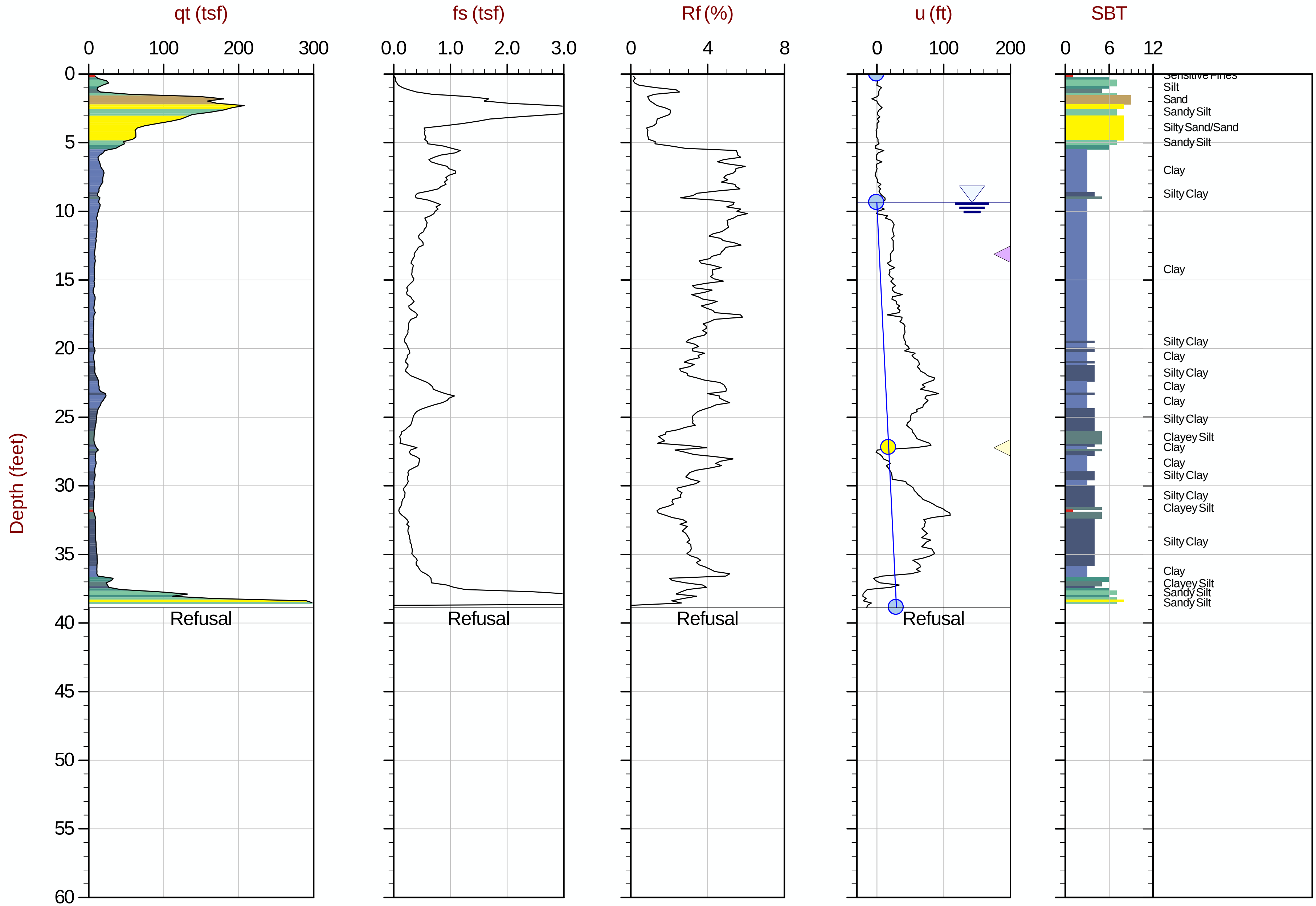
1. Assumed phreatic surface depths were determined from the pore pressure data unless otherwise noted. Hydrostatic data were used for calculated parameters.
2. Coordinates are WGS 84 / UTM Zone 16 and were collected using a handheld GPS Receiver.
3. Assumed phreatic surface estimated from dynamic pore pressure response.
4. No phreatic surface detected

CONETEC

AECOM

Job No: 15-53073
Date: 08:19:15 13:46
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C001
Cone: 374:T1500F15U500



Max Depth: 11.850 m / 38.88 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

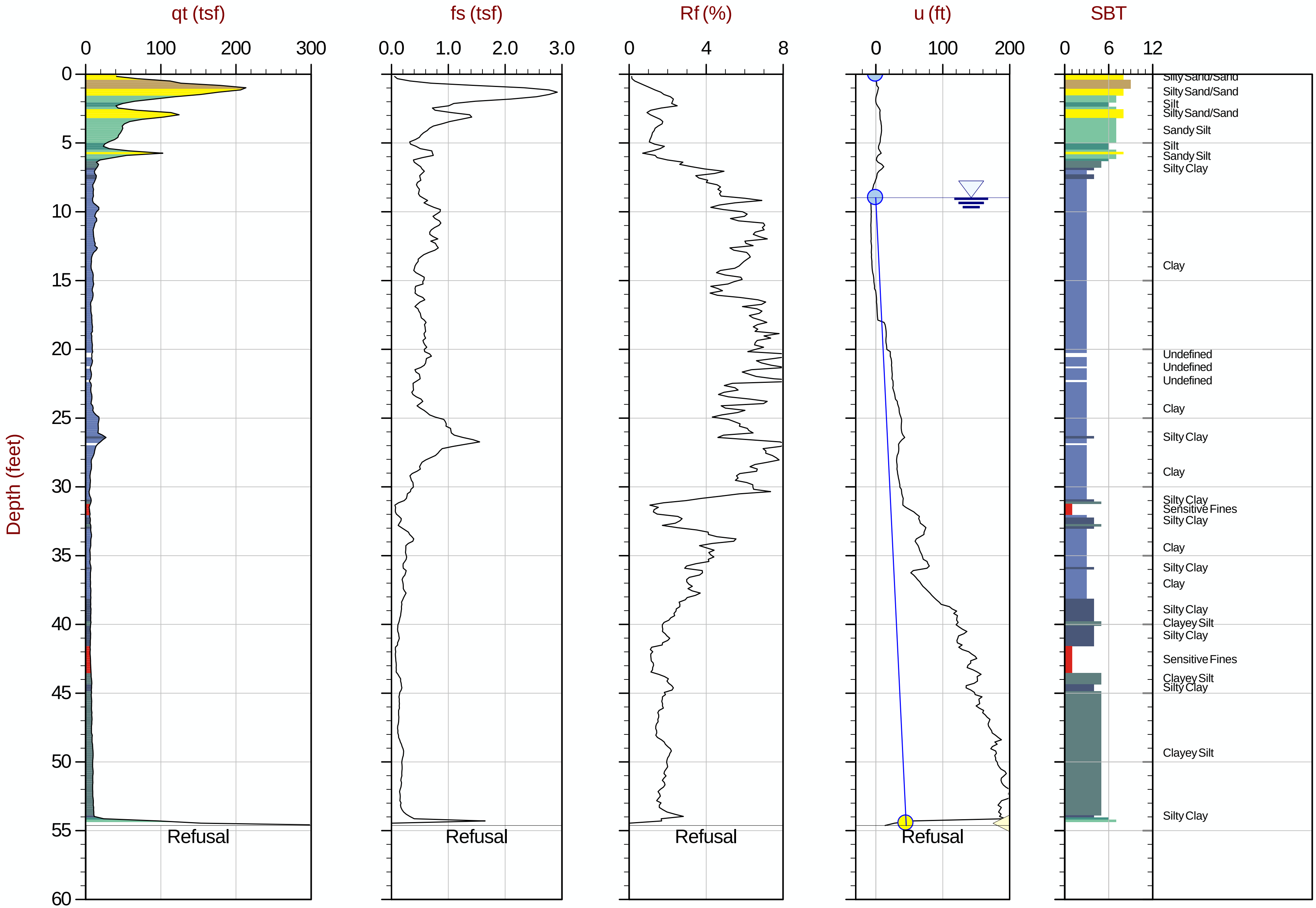
File: 15-53073_SP01.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497502m E: 274312m

Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

AECOM	Job No: 15-53073	Sounding: EDW-C003
	Date: 08:27:15 15:22	Cone: 340:T1500F15U500
	Site: Edwards Power Station, Peoria, Il	



Max Depth: 16.650 m / 54.63 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP03.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497325m E: 274377m

Hydrostatic Line | Ueq | Assumed Ueq | PPD, Ueq achieved | PPD, Ueq not achieved

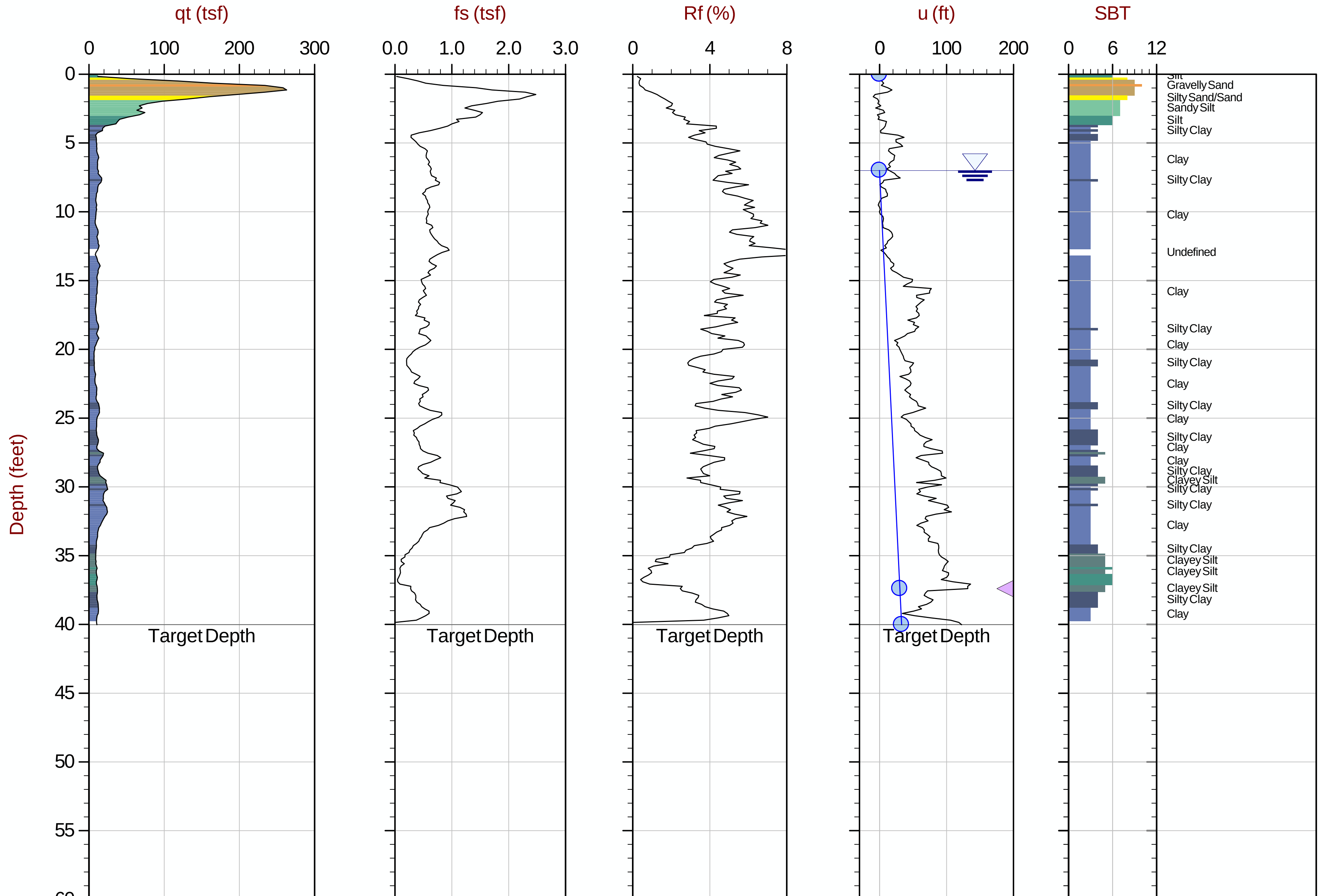
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:26:15 15:05
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C005
Cone: 374:T1500F15U500



Max Depth: 12.200 m / 40.03 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP05.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497026m E: 274468m

Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

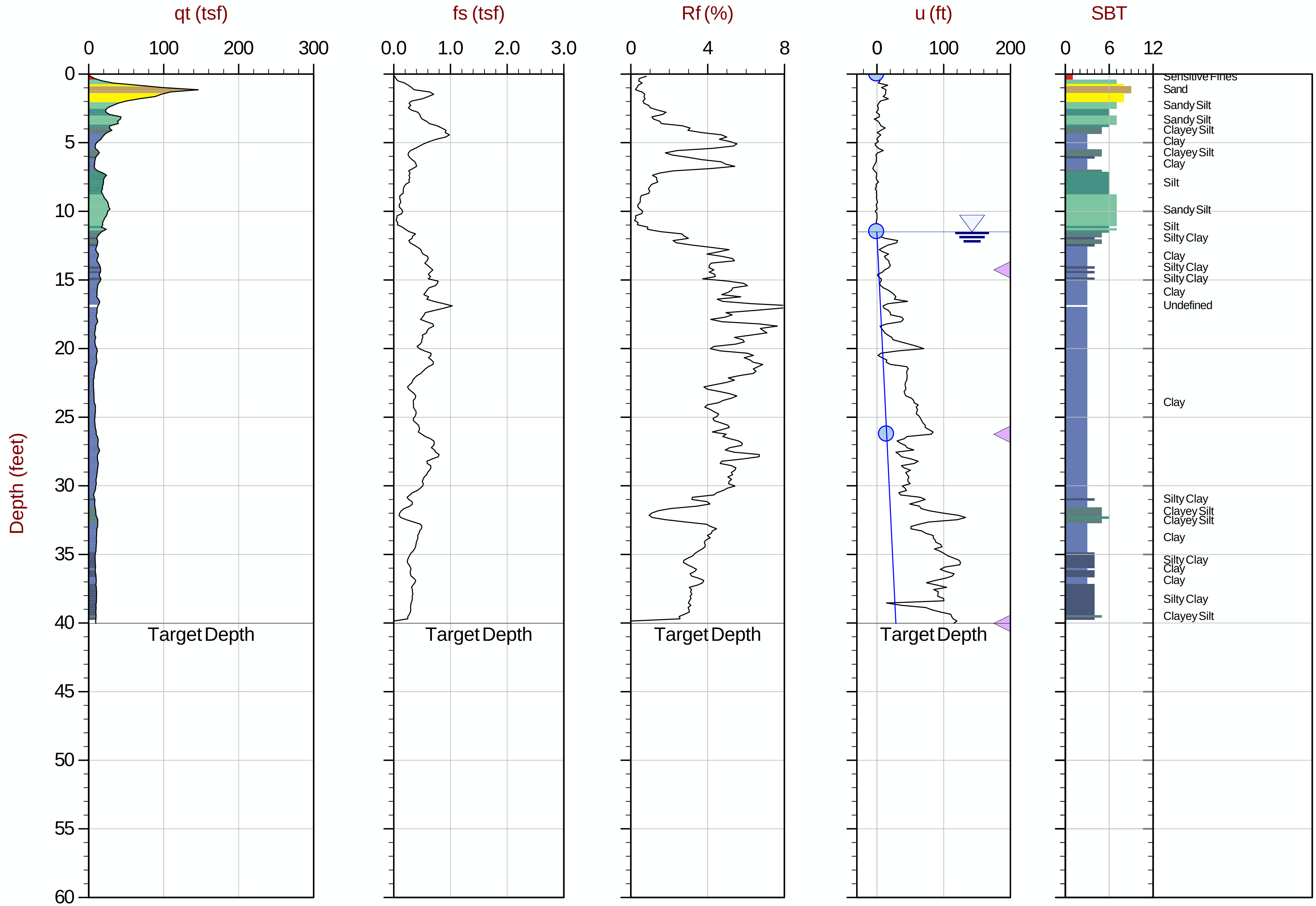
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:25:15 15:52
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C006
Cone: 374:T1500F15U500



Max Depth: 12.200 m / 40.03 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP06.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496880m E: 274500m

Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

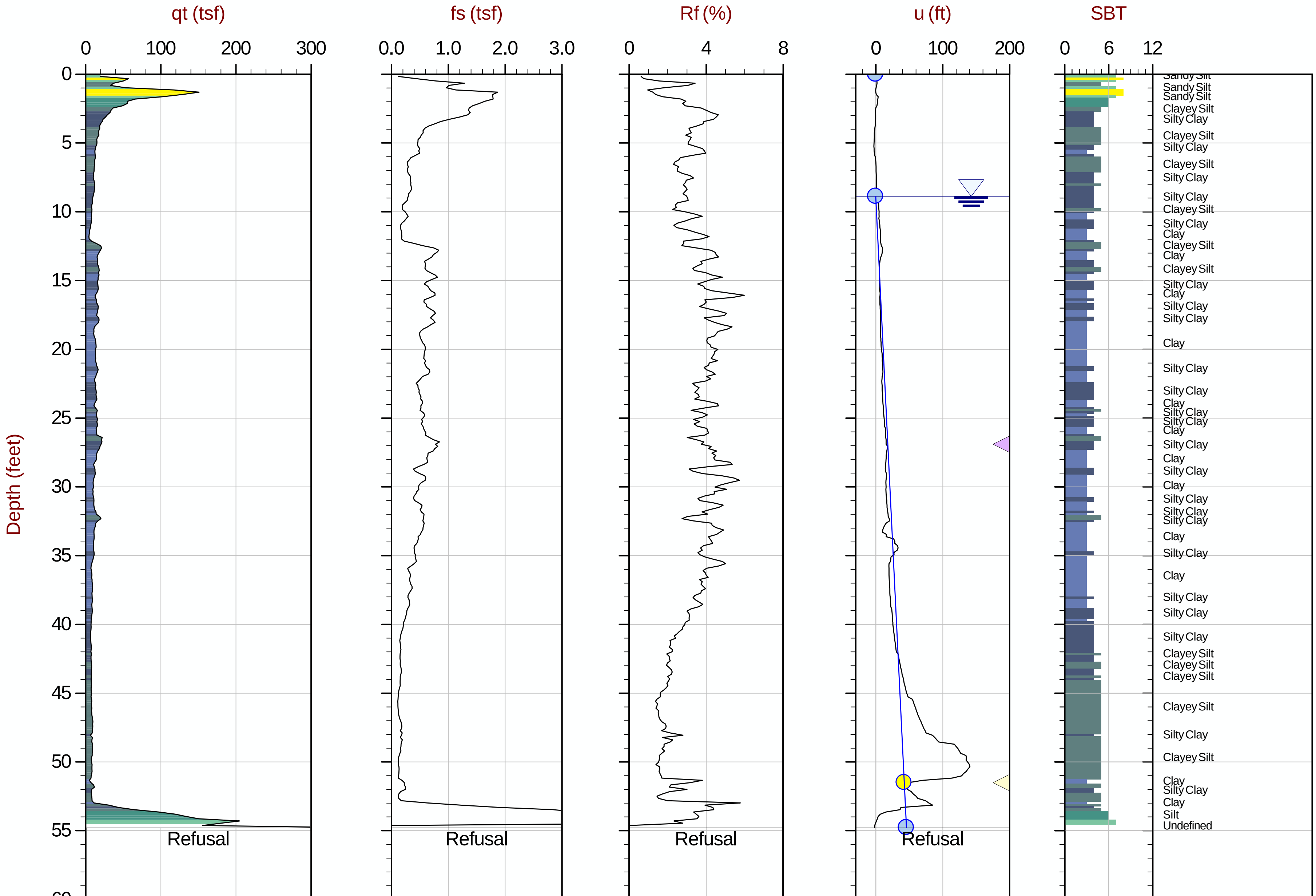
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

ConeTec

AECOM

Job No: 15-53073
Date: 08:29:15 09:19
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C007
Cone: 340:T1500F15U500



Max Depth: 16.700 m / 54.79 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP07.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496736m E: 274551m

Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

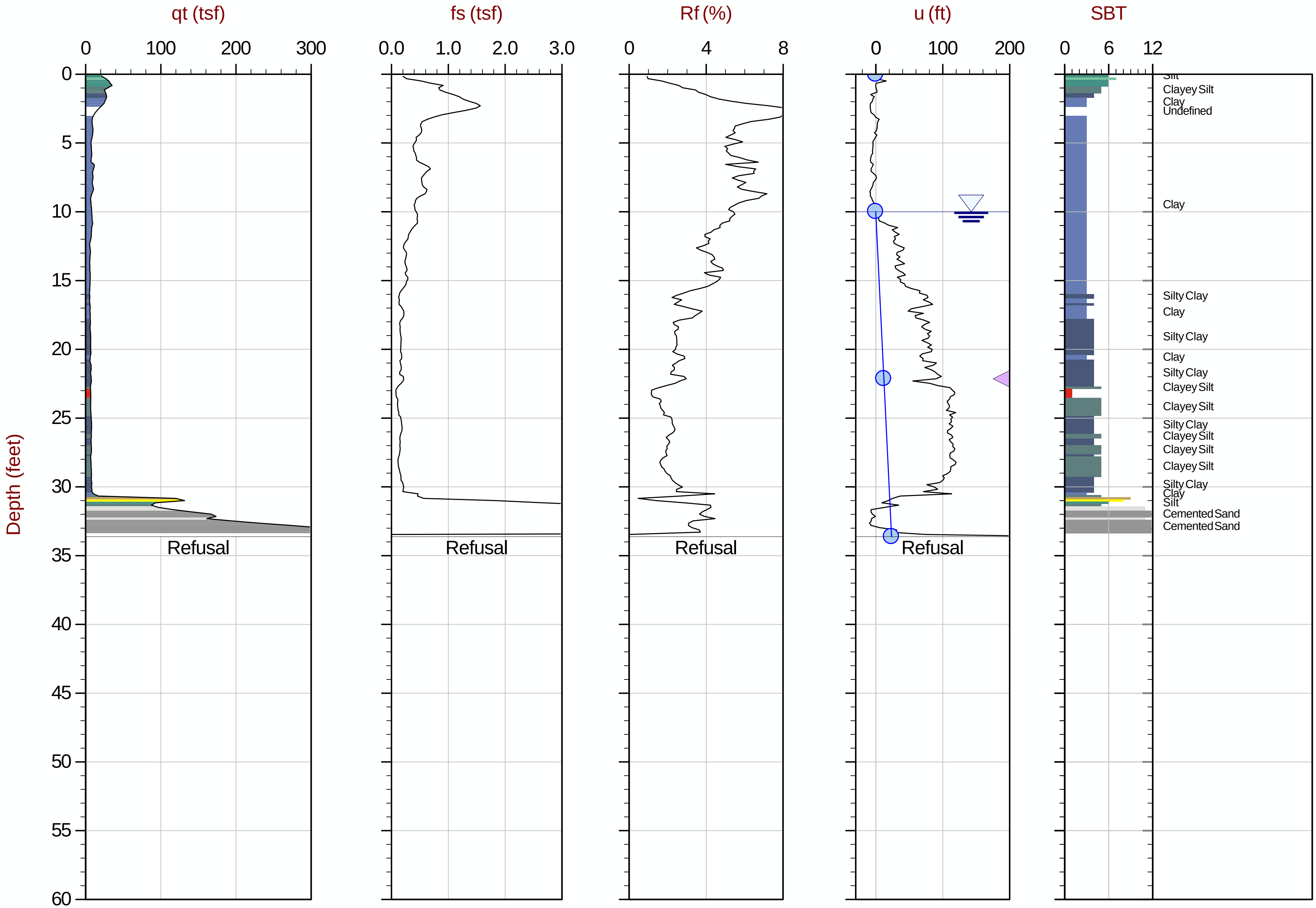
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:27:15 08:50
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C008
Cone: 374:T1500F15U500



Max Depth: 10.250 m / 33.63 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP08.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496731m E: 274576m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

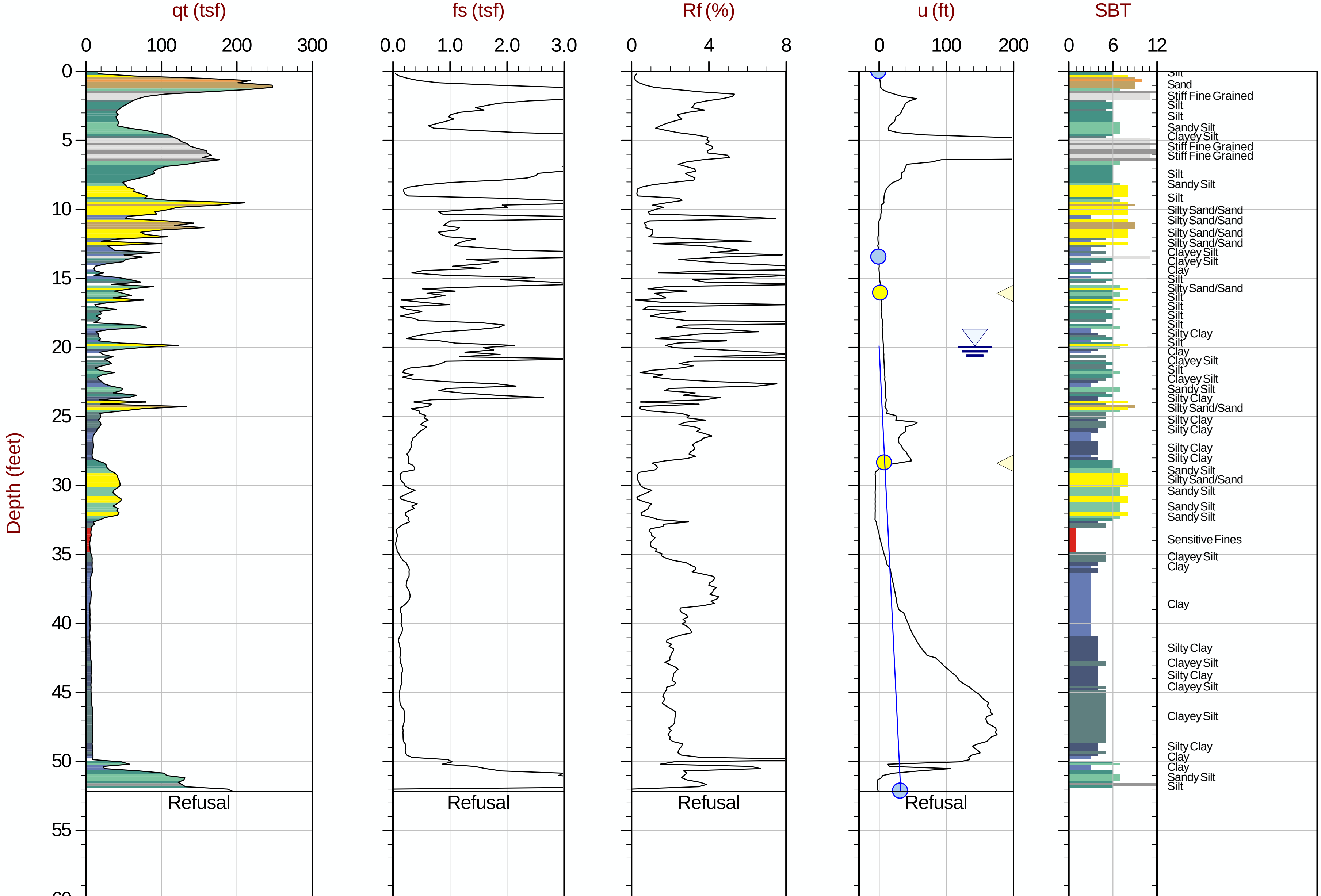
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:28:15 16:08
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C009
Cone: 340:T1500F15U500



Max Depth: 15.900 m / 52.16 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

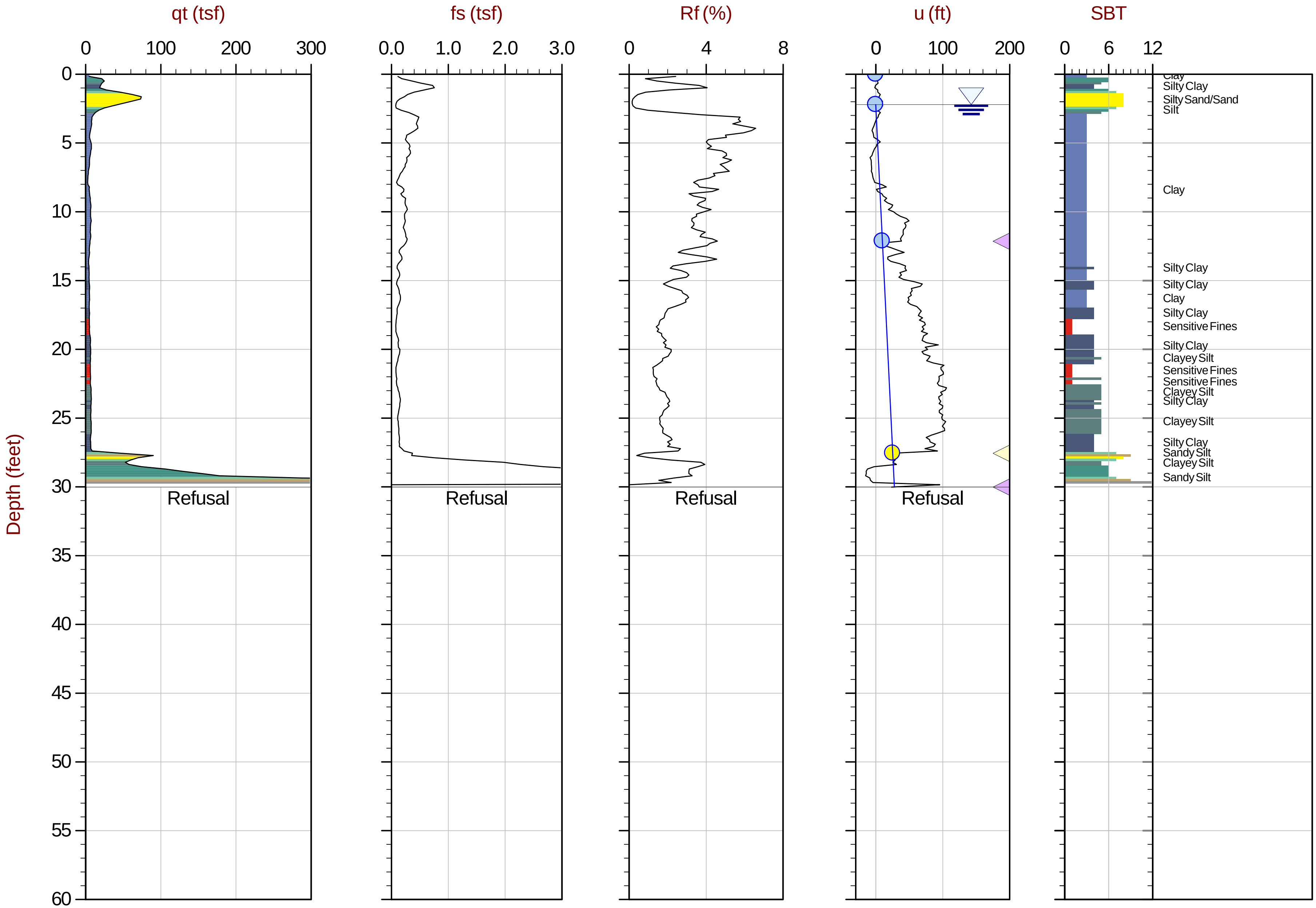
File: 15-53073_CP09.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496476m E: 274538m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

AECOM	Job No: 15-53073	Sounding: EDW-C010
	Date: 08:27:15 12:10	Cone: 374:T1500F15U500
	Site: Edwards Power Station, Peoria, IL	



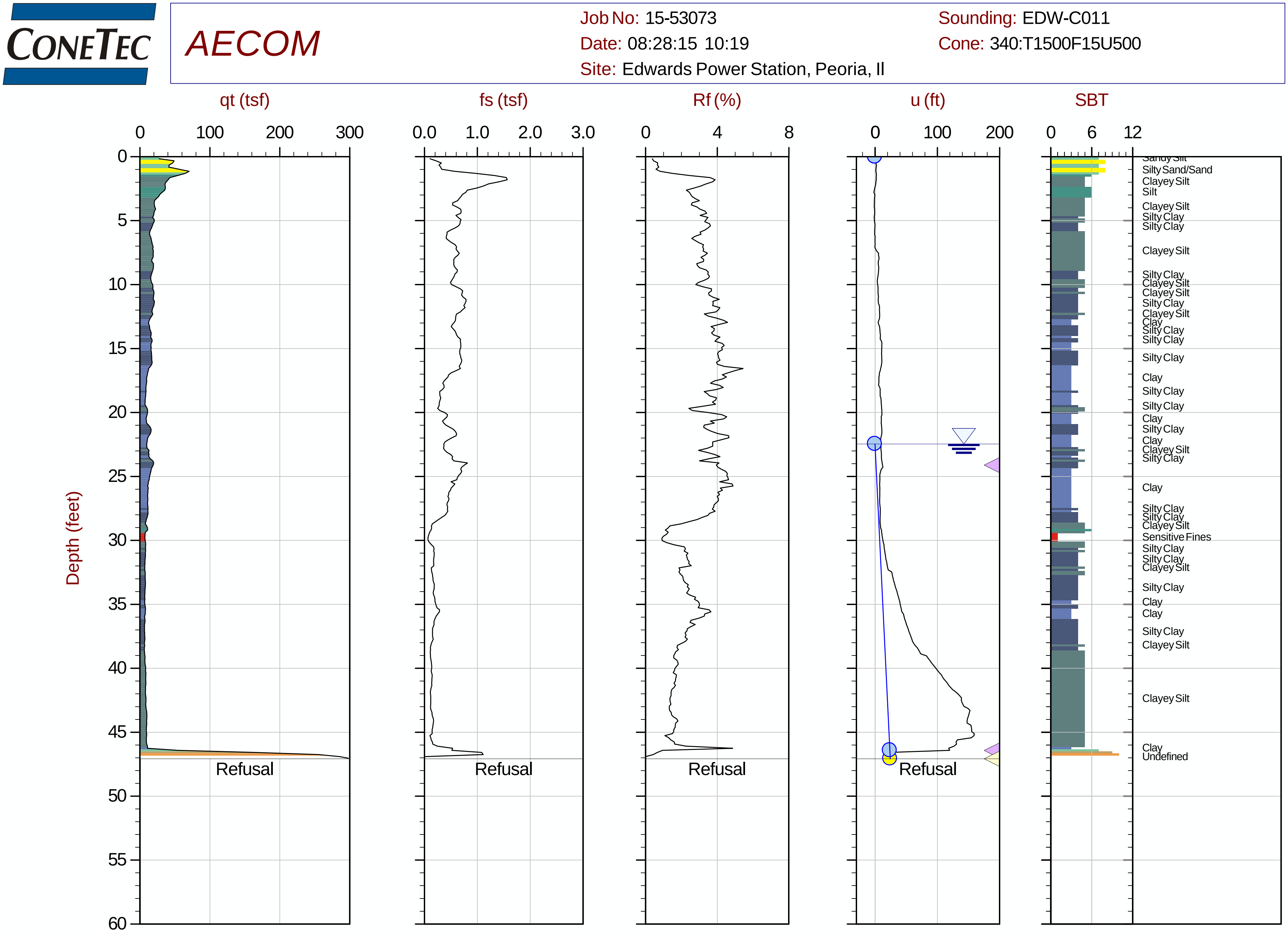
Max Depth: 9.150 m / 30.02 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP10.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496351m E: 274562m

Hydrostatic Line · Ueq · Assumed Ueq · PPD, Ueq achieved · PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.



Max Depth: 14.350 m / 47.08 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point
File: 15-53073_CP11.COR
SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496372m E: 274553m

Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

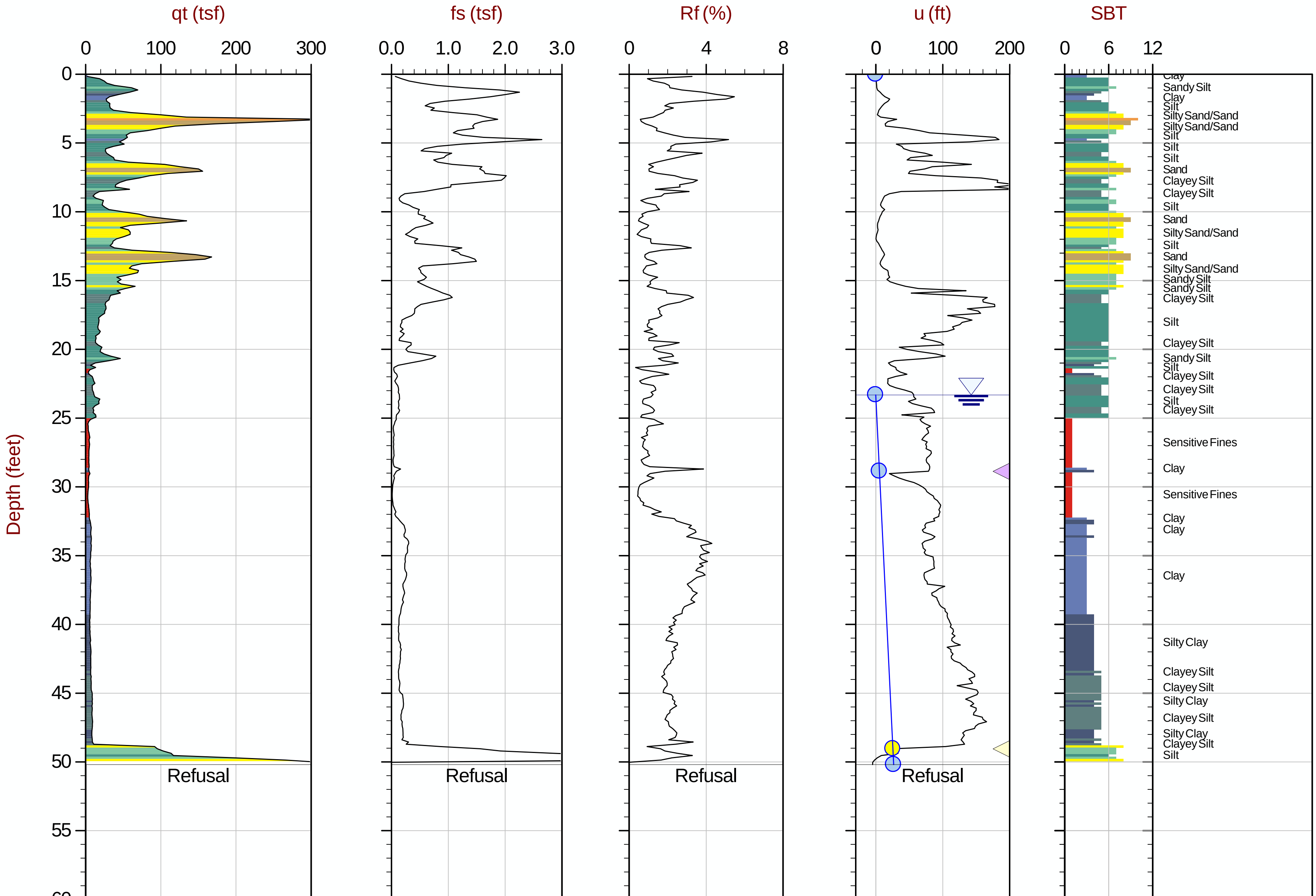
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:28:15 14:27
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C012
Cone: 340:T1500F15U500



Max Depth: 15.300 m / 50.20 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP12.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496424m E: 274524m

Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

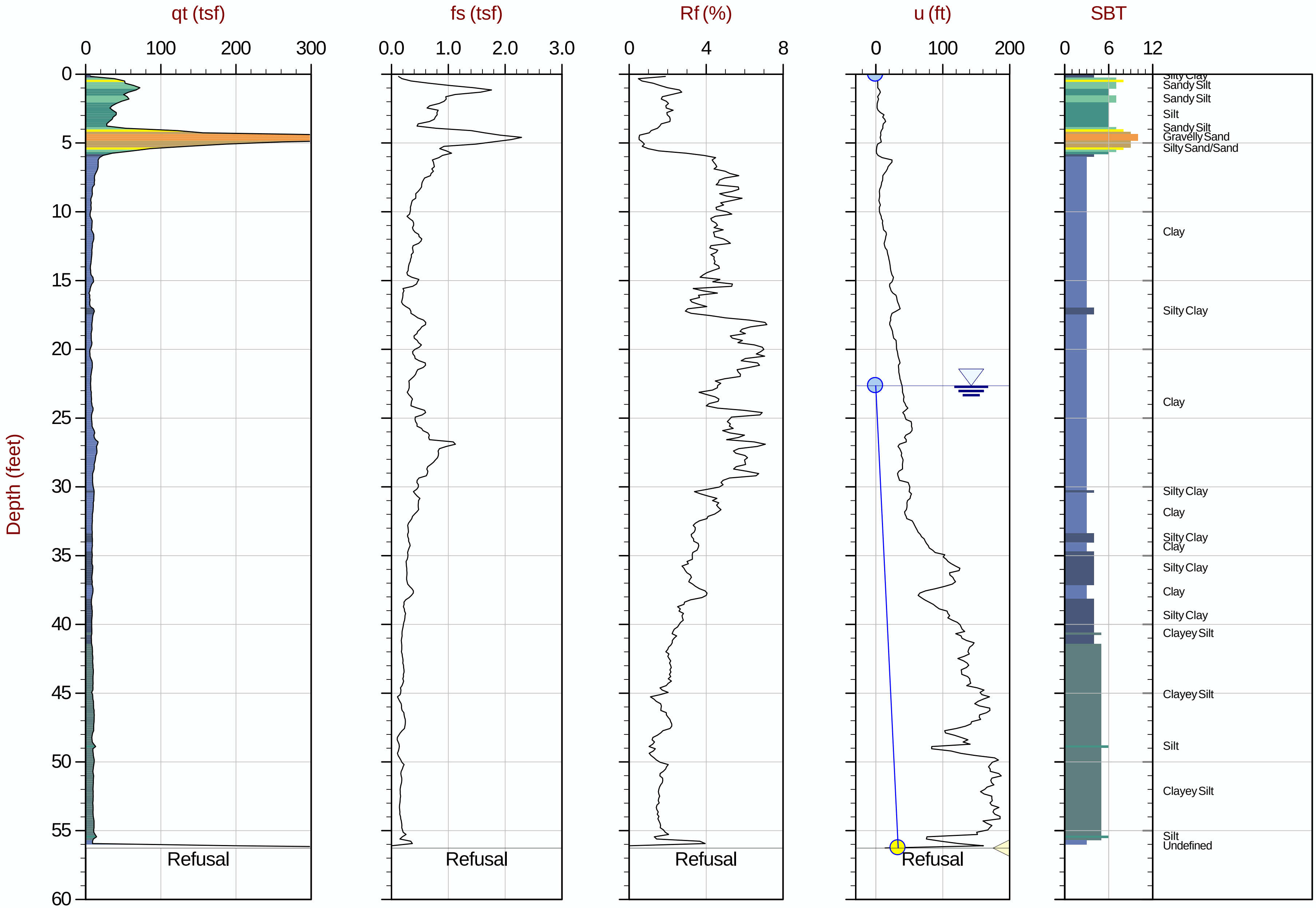
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:28:15 08:45
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C013
Cone: 340:T1500F15U500



Max Depth: 17.150 m / 56.27 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP13.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496386m E: 274376m

Hydrostatic Line | Ueq | Assumed Ueq | PPD, Ueq achieved | PPD, Ueq not achieved

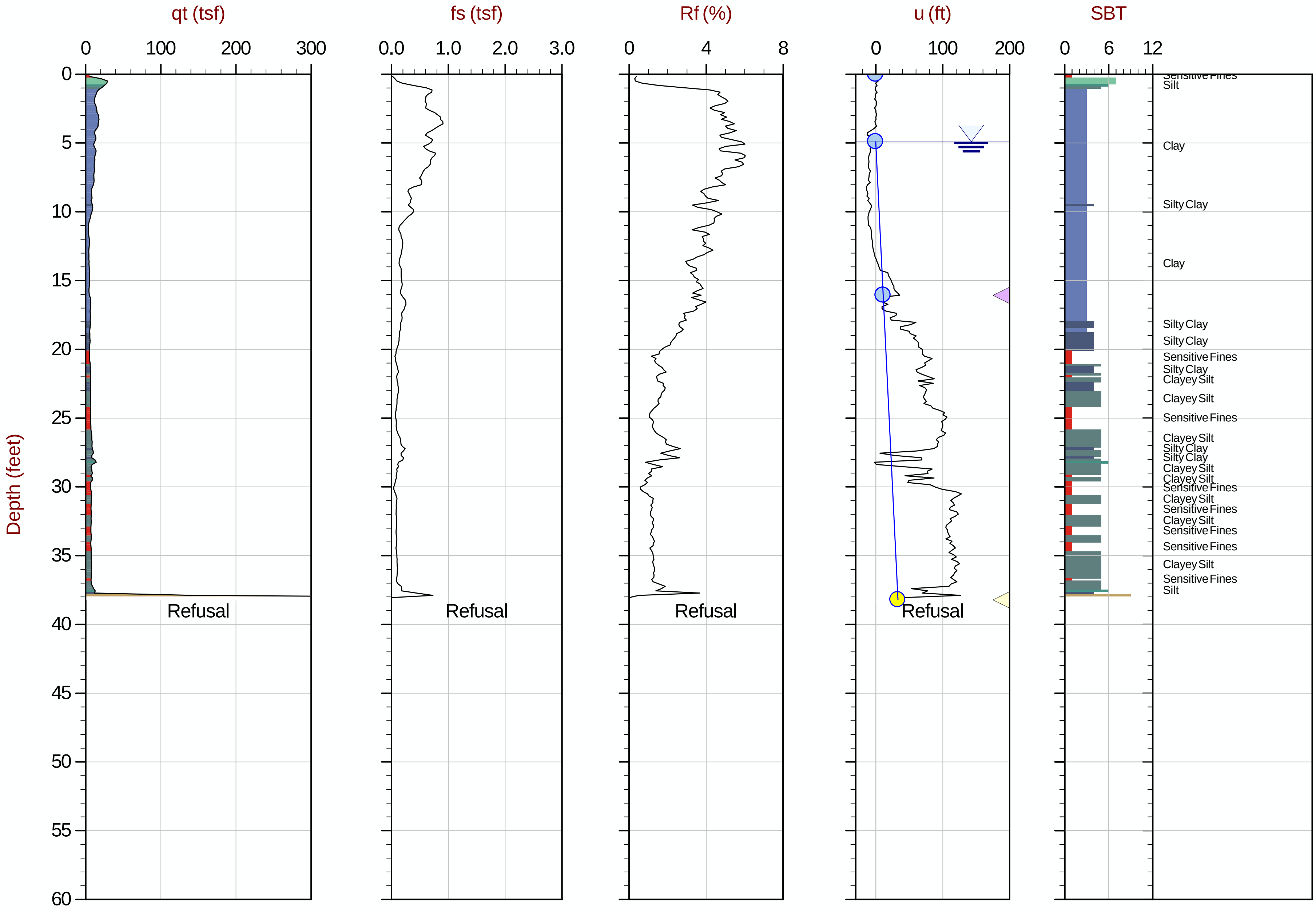
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:27:15 14:29
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C014
Cone: 374:T1500F15U500



Max Depth: 11.650 m / 38.22 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP14.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496366m E: 274362m

Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

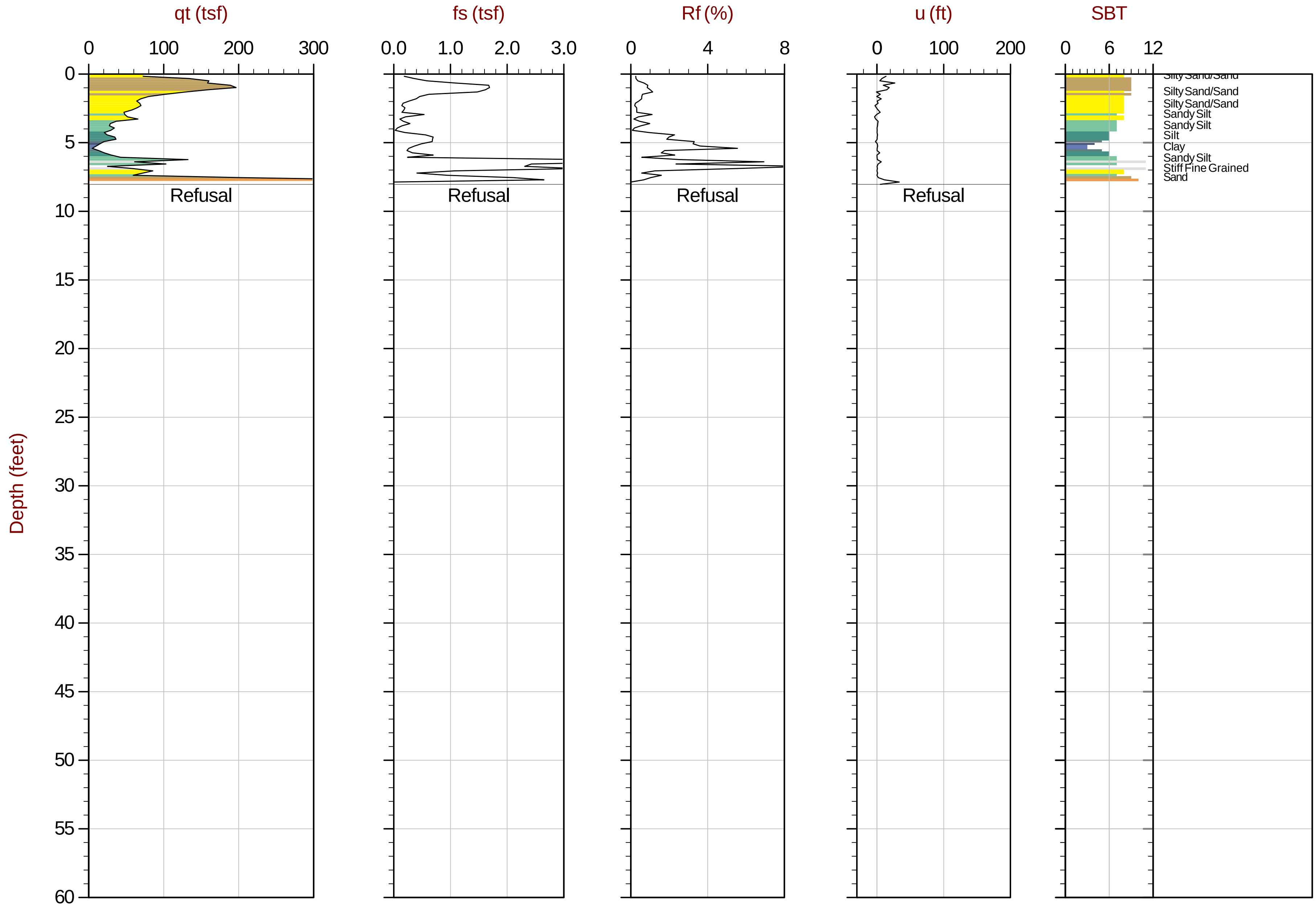
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:19:15 13:31
Site: Edwards Power Station

Sounding: EDW-C015
Cone: 335:T1500F15U500



Max Depth: 2.450 m / 8.04 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

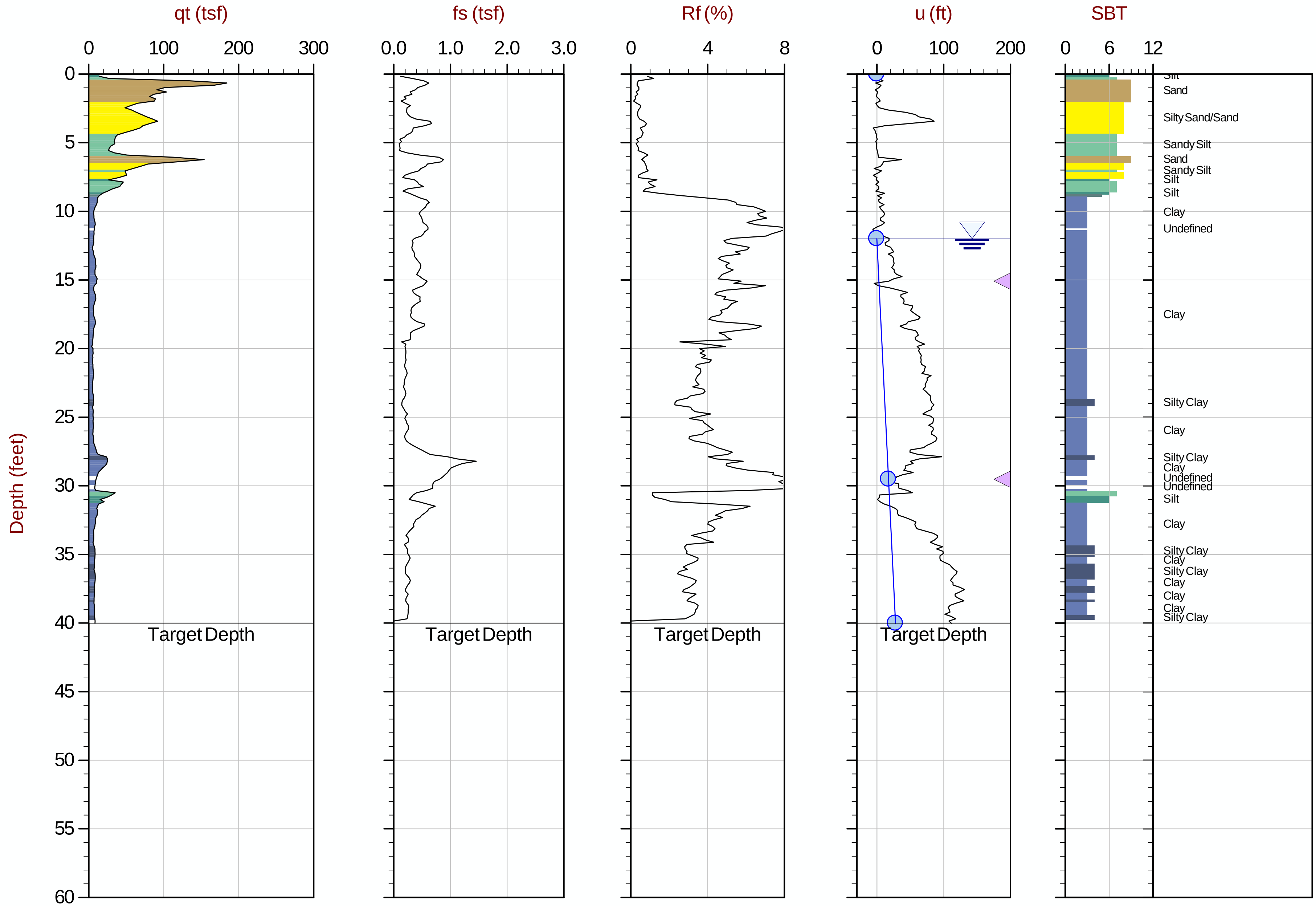
File: 15-53073_SP15.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496447m E: 274334m

Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

AECOM	Job No: 15-53073 Date: 08:19:15 14:12 Site: Edwards Power Station	Sounding: EDW-C015A Cone: 335:T1500F15U500



Max Depth: 12.200 m / 40.03 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP15A.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496435m E: 274342m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

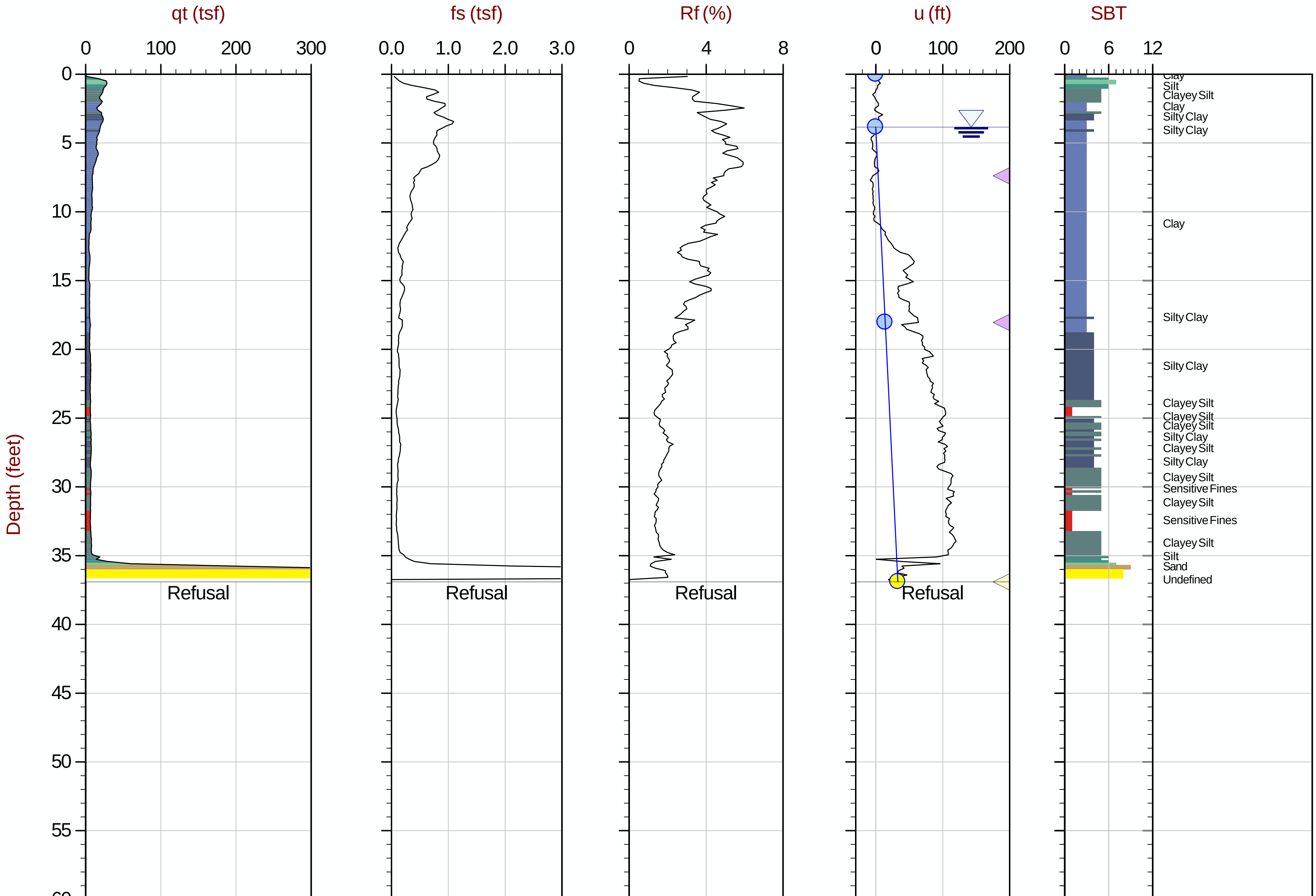
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:28:15 08:46
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C016
Cone: 374:T1500F15U500



Max Depth: 11.250 m / 36.91 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP16.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496442m E: 274308m

Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

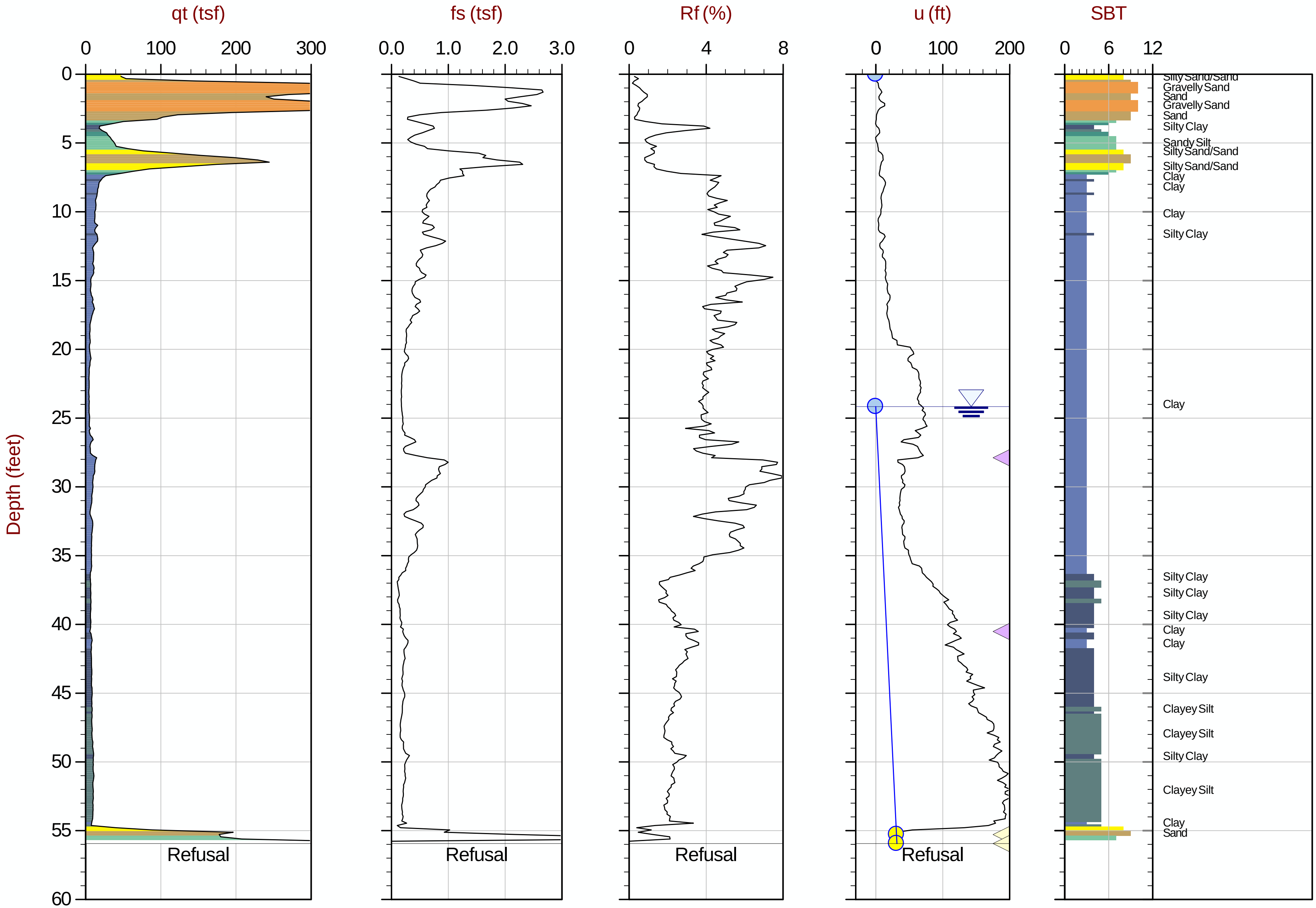
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:27:15 11:13
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C017
Cone: 340:T1500F15U500



Max Depth: 17.050 m / 55.94 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP17.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496775m E: 274137m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

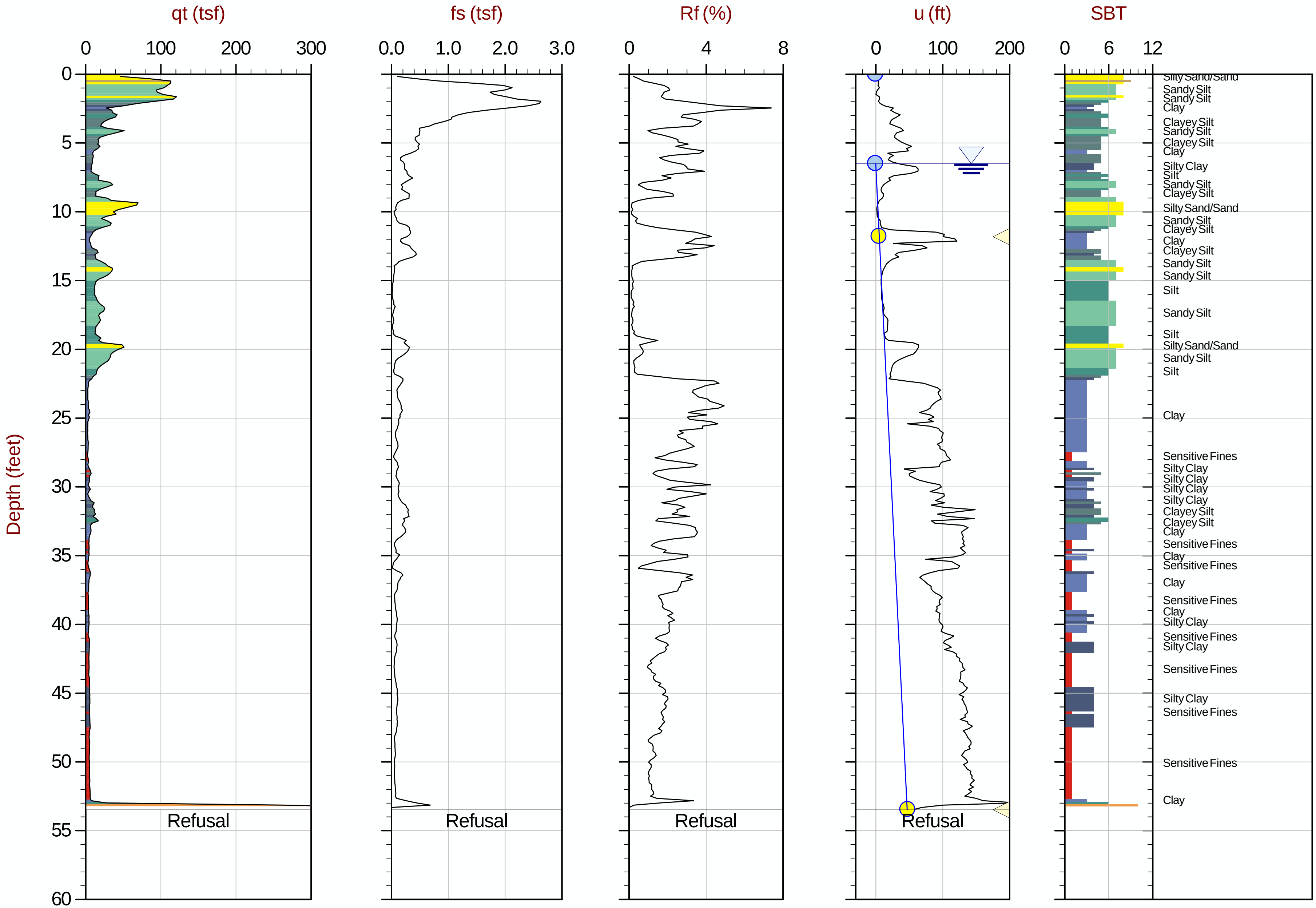
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

ConeTec

AECOM

Job No: 15-53073
Date: 08:27:15 15:23
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C019
Cone: 340:T1500F15U500



Max Depth: 16.300 m / 53.48 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP19.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496825m E: 274184m

Hydrostatic Line · Ueq · Assumed Ueq · PPD, Ueq achieved · PPD, Ueq not achieved

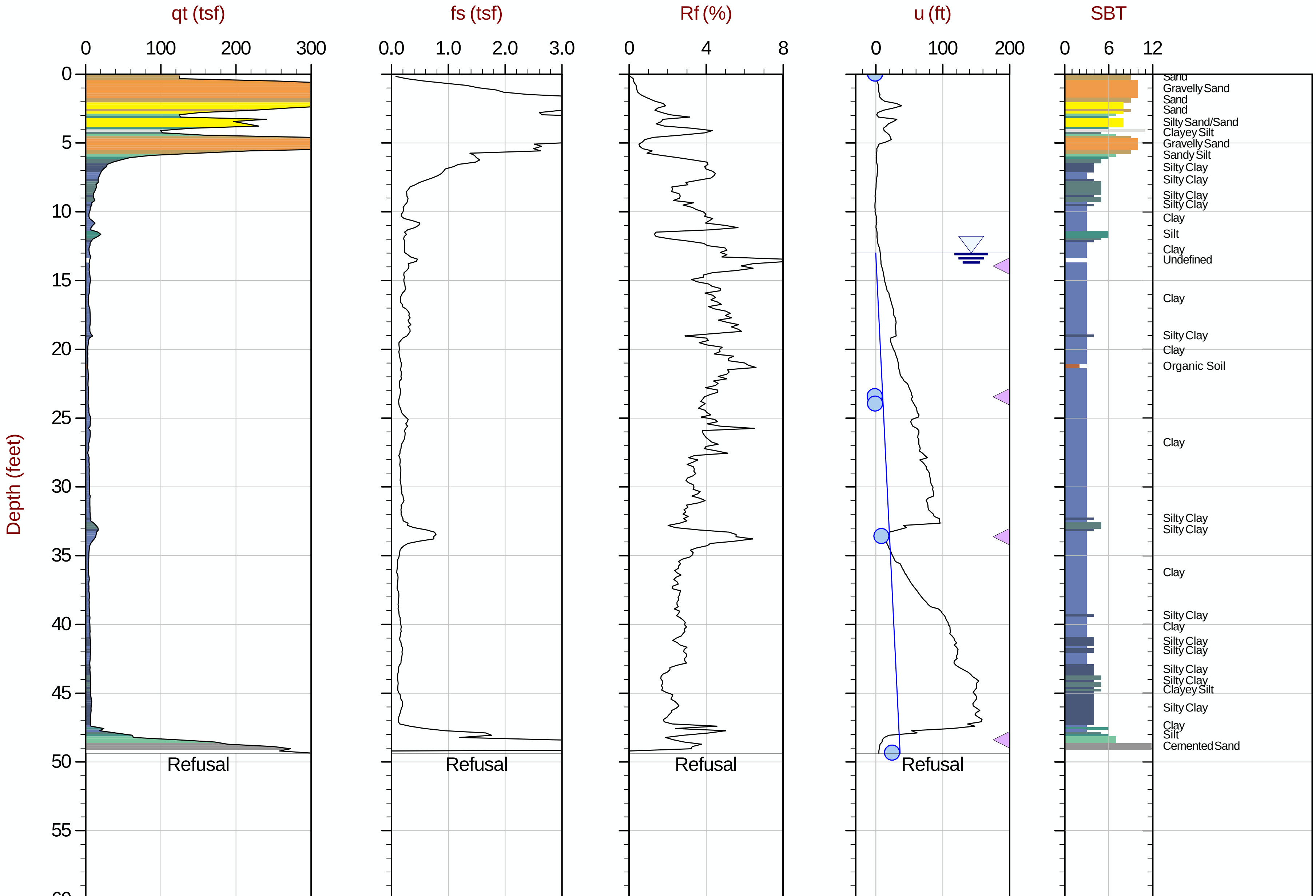
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:27:15 13:27
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C021
Cone: 340:T1500F15U500



Max Depth: 15.050 m / 49.38 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP21.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497046m E: 274071m

Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

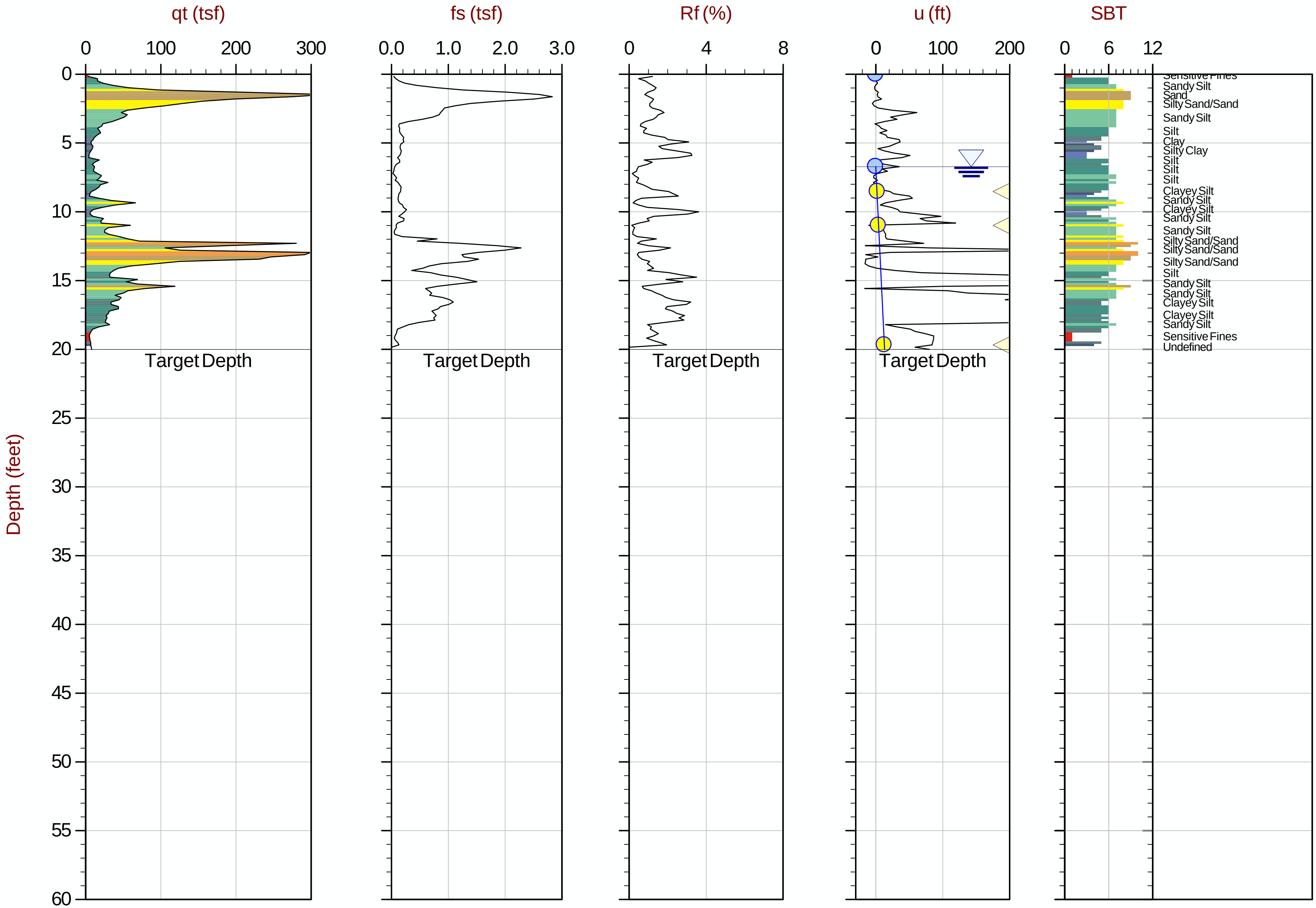
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:26:15 10:35
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C022
Cone: 374:T1500F15U500



Max Depth: 6.100 m / 20.01 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP22.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497185m E: 274108m

Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

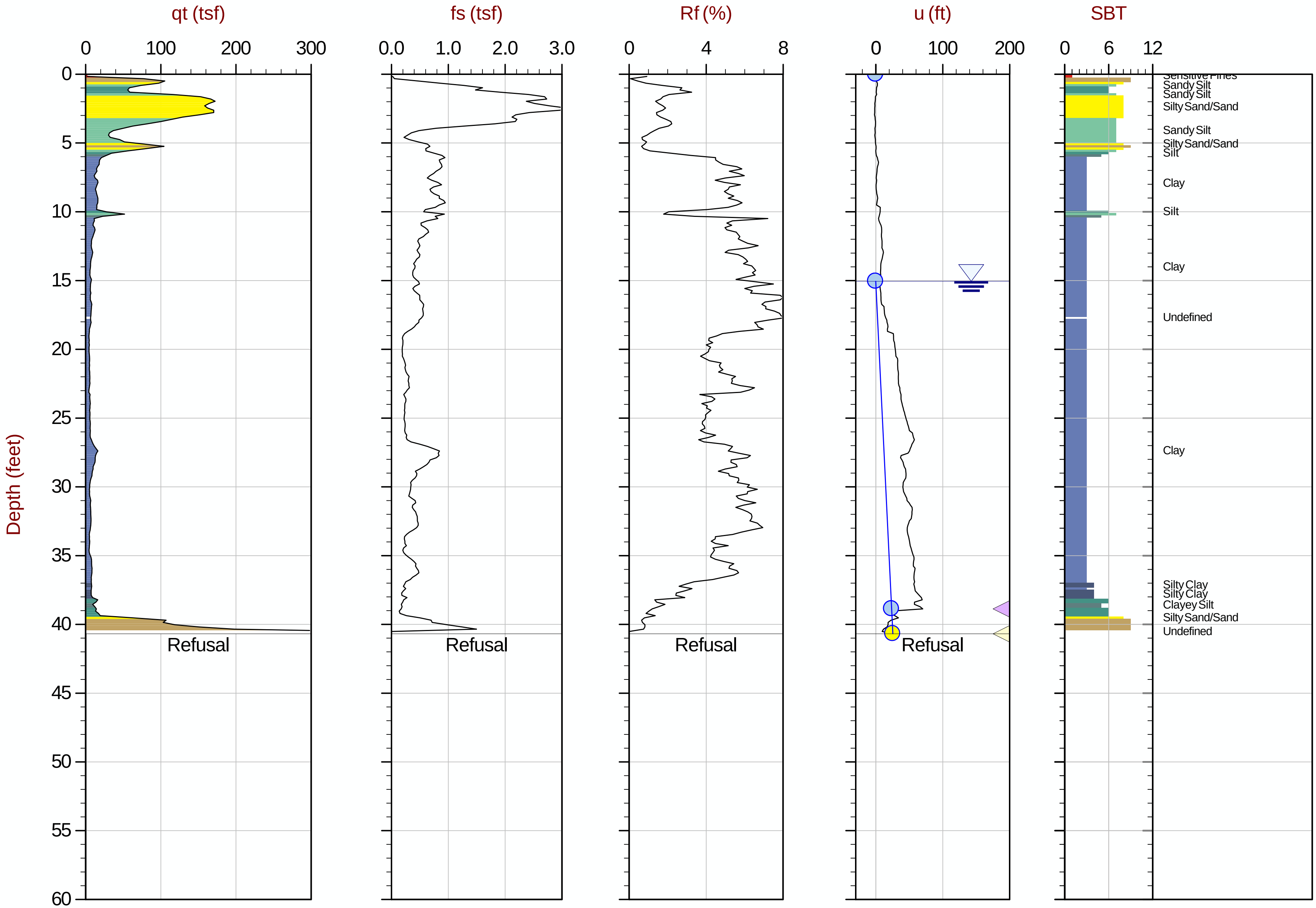
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:27:15 08:52
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C023
Cone: 340:T1500F15U500



Max Depth: 12.400 m / 40.68 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP23.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497364m E: 274147m

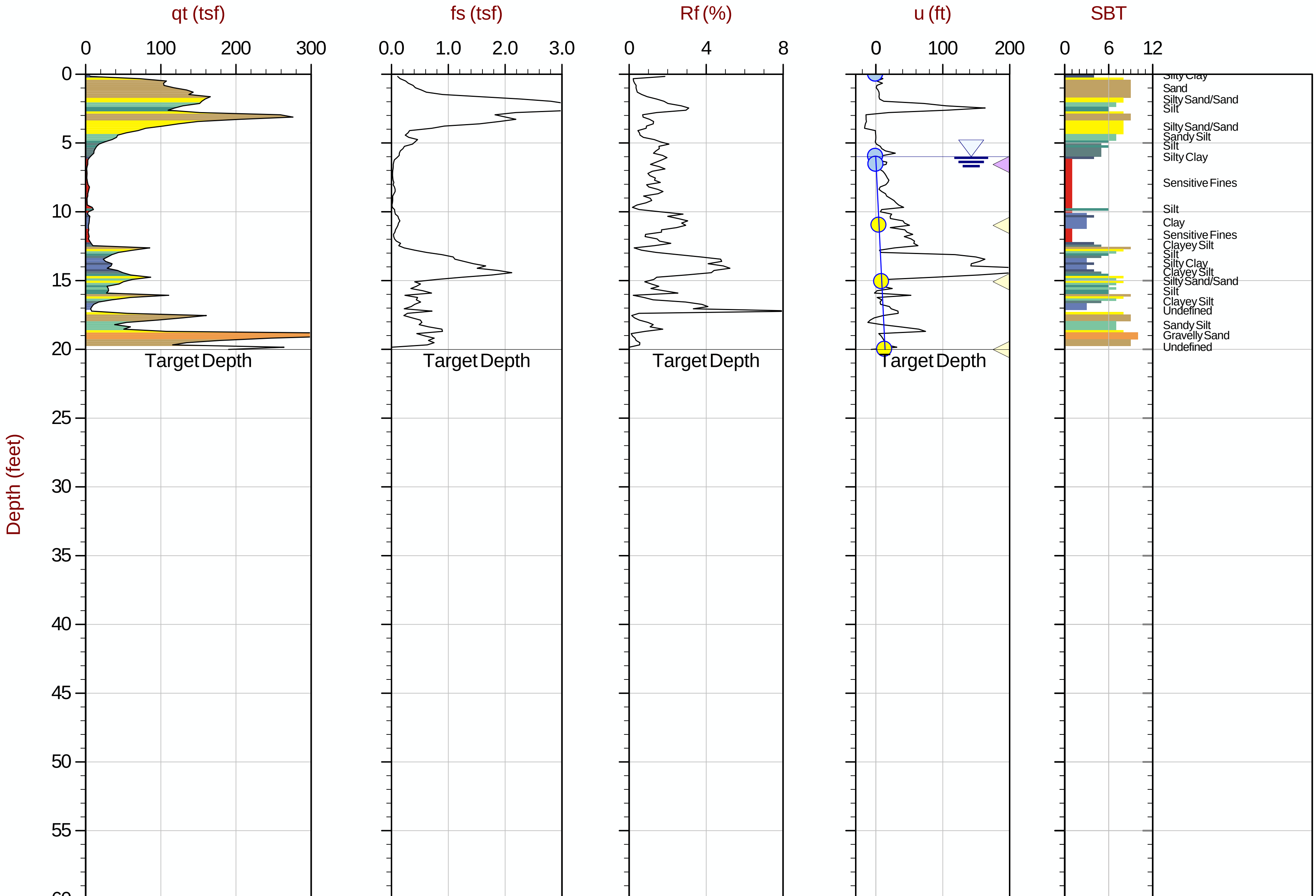
Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:25:15 13:44
Site: Edwards Power Station, Peoria, IL
Sounding: EDW-C025
Cone: 374:T1500F15U500



Max Depth: 6.100 m / 20.01 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP25.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497285m E: 274315m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

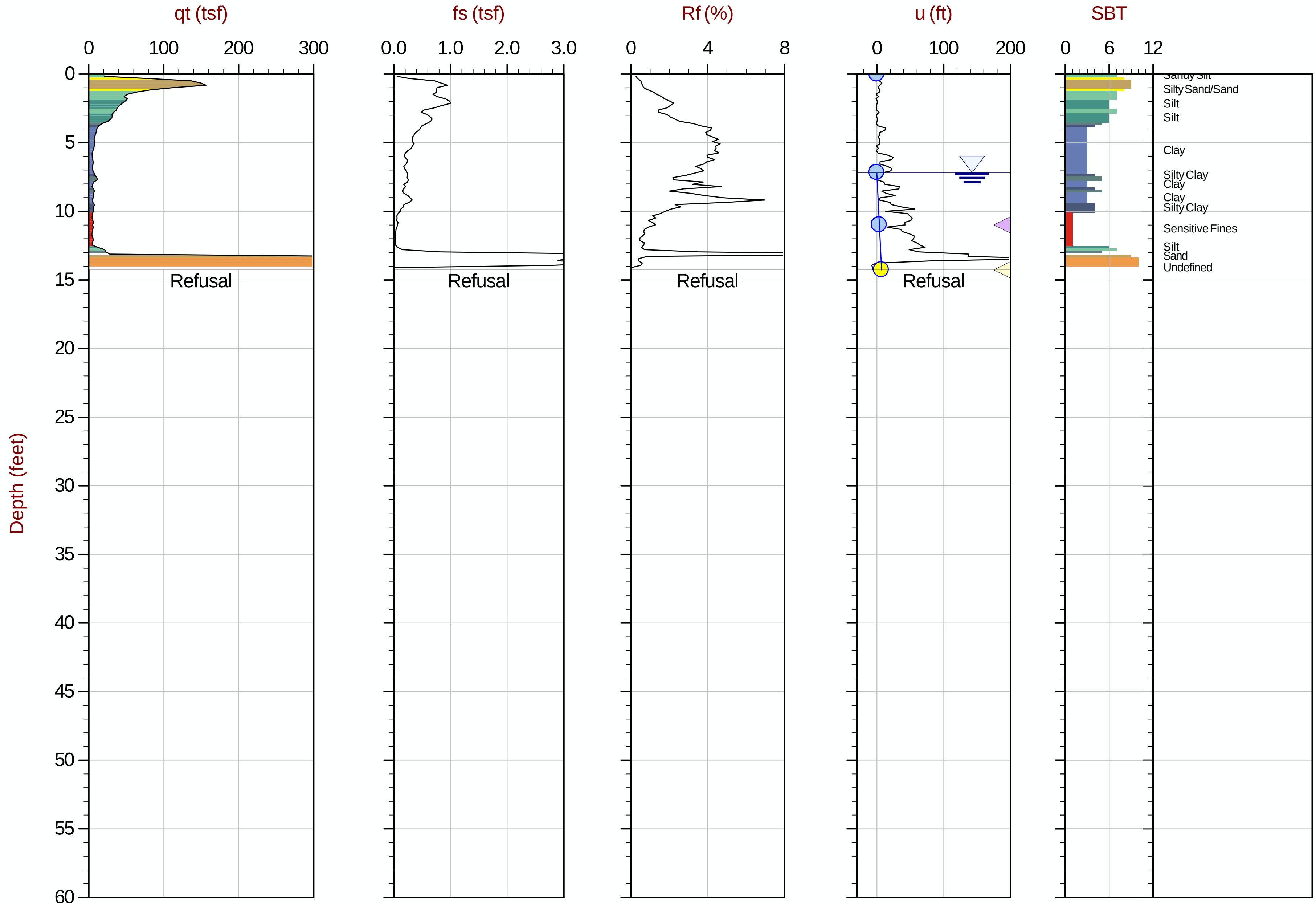
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:26:15 12:20
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C026
Cone: 374:T1500F15U500



Max Depth: 4.350 m / 14.27 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP26.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497062m E: 274334m

Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

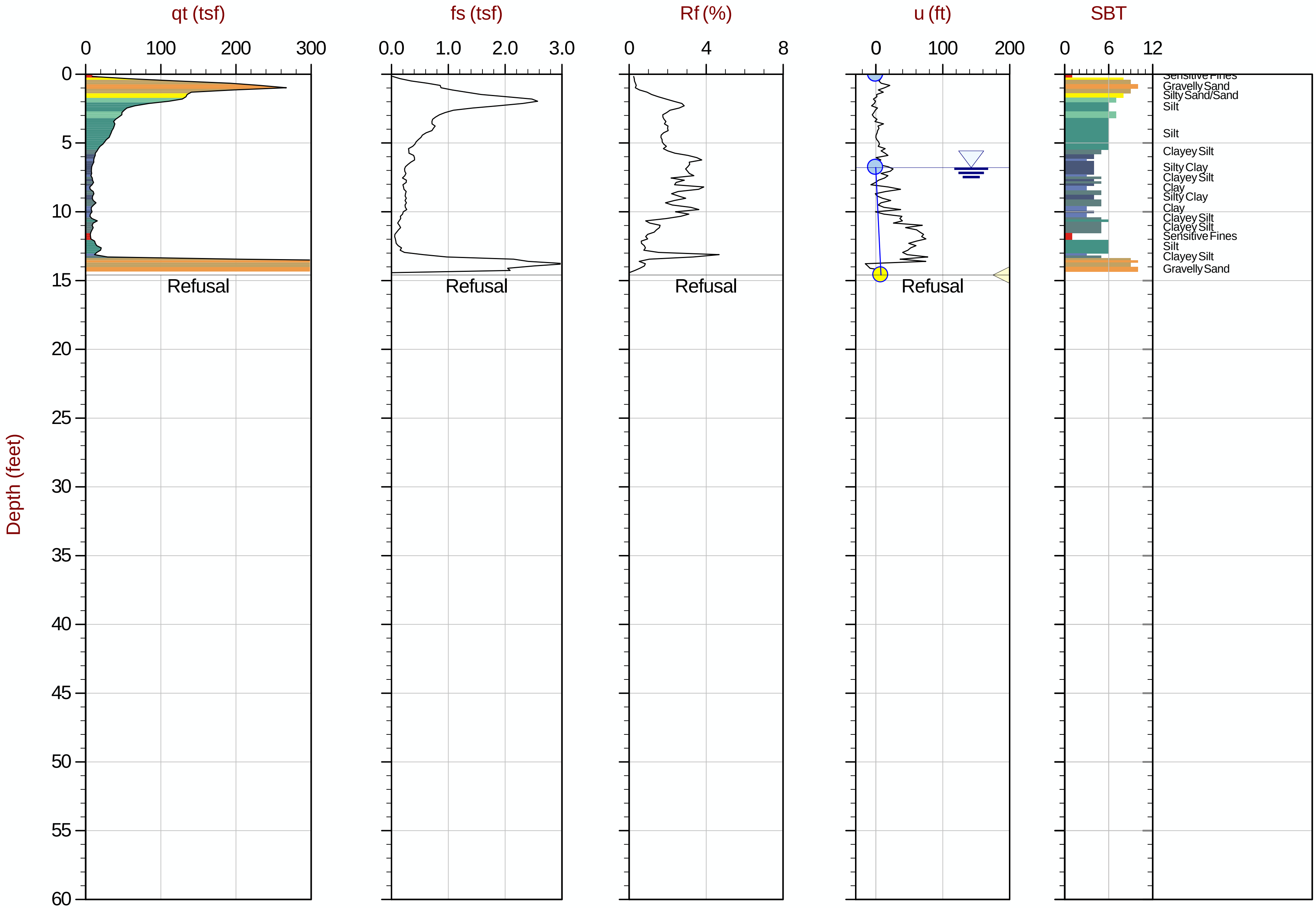
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:26:15 14:00
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C026B
Cone: 374:T1500F15U500



Max Depth: 4.450 m / 14.60 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP26B.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497064m E: 274335m

Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

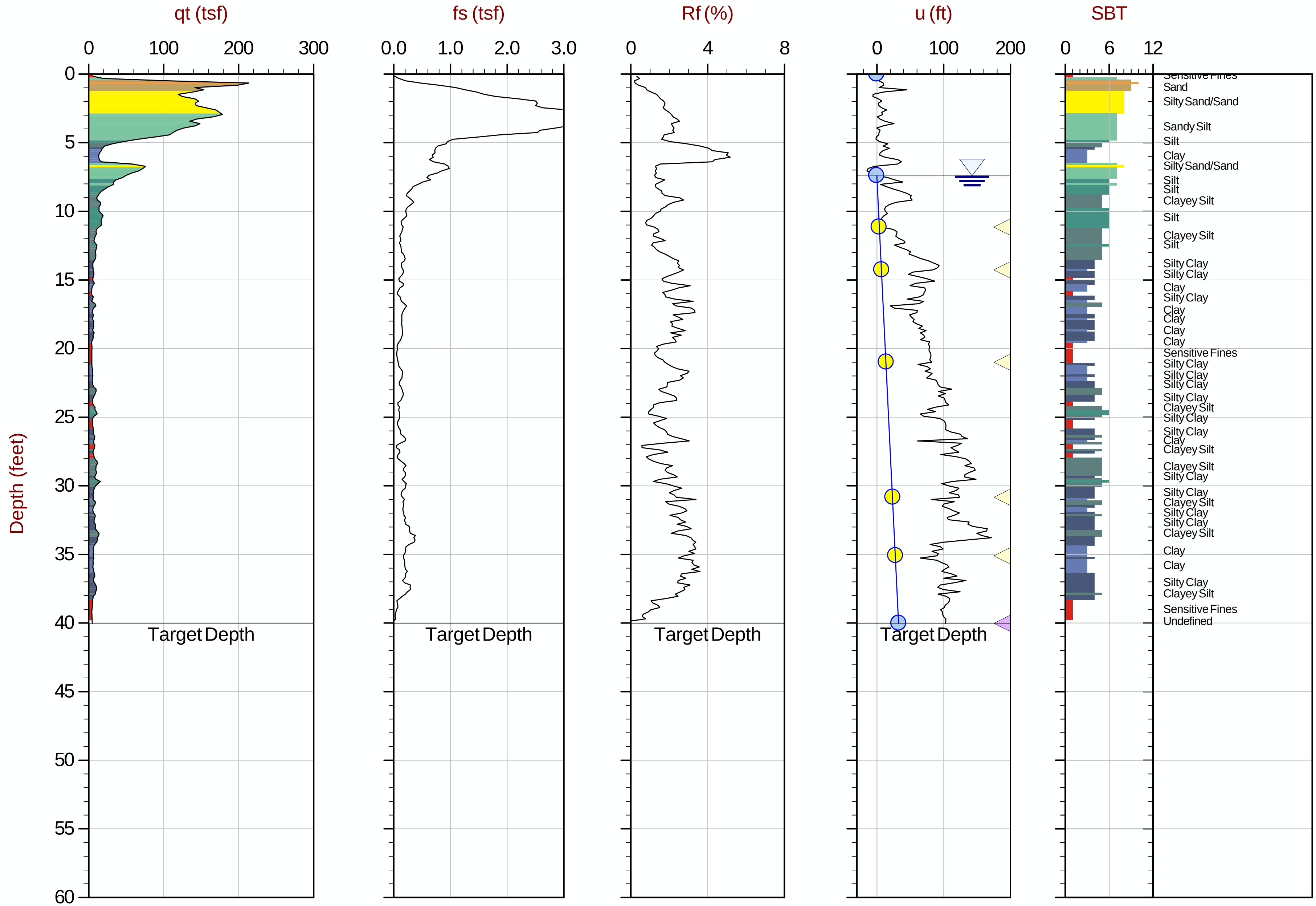
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:25:15 11:00
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C027
Cone: 374:T1500F15U500



Max Depth: 12.200 m / 40.03 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_CP27.COR

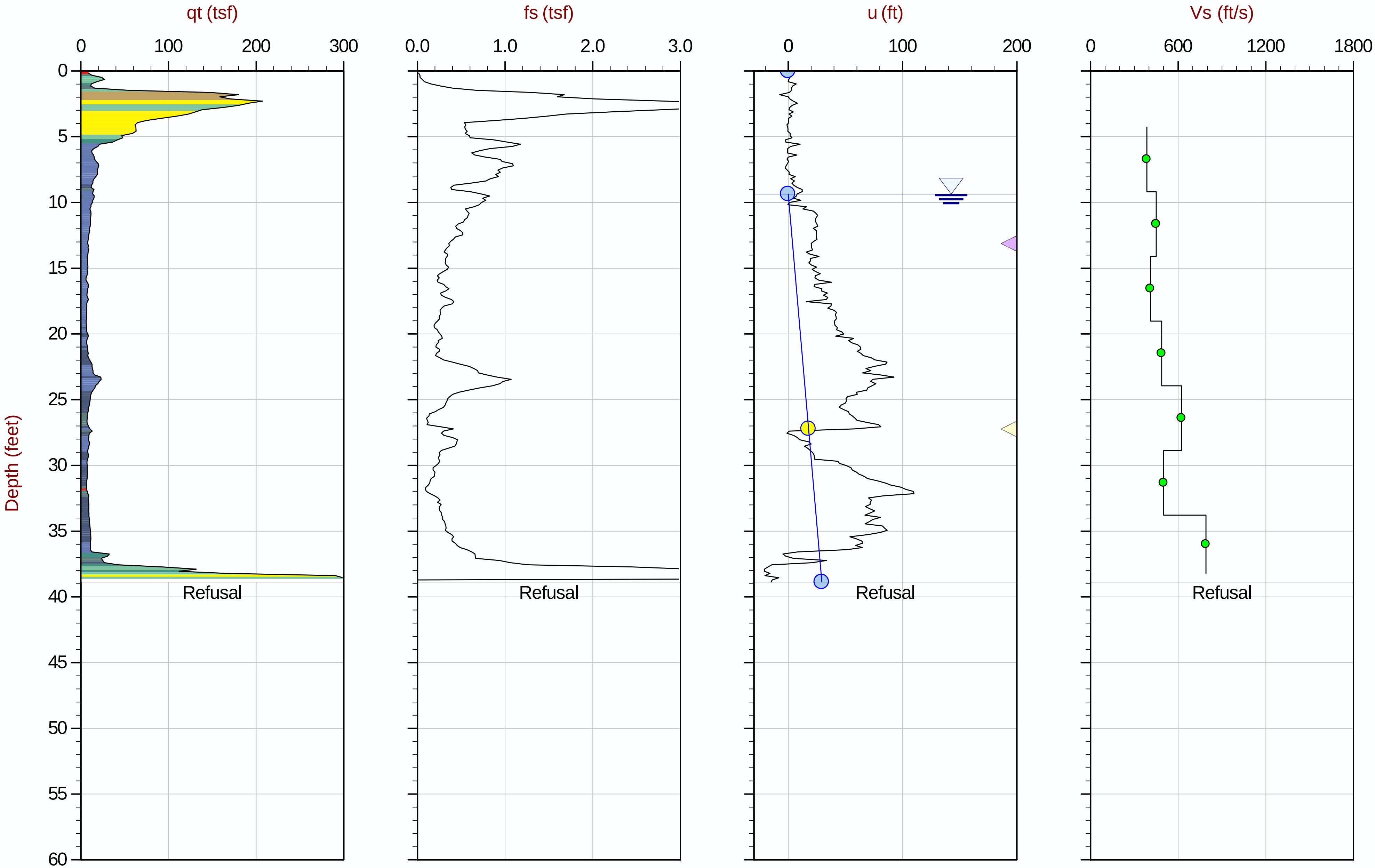
SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496687m E: 274266m

Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Seismic Cone Penetration Test Plots

Job No: 15-53073
Date: 08:19:15 13:46
Site: Edwards Power Station, Peoria, IL
Sounding: EDW-C001
Cone: 374:T1500F15U500



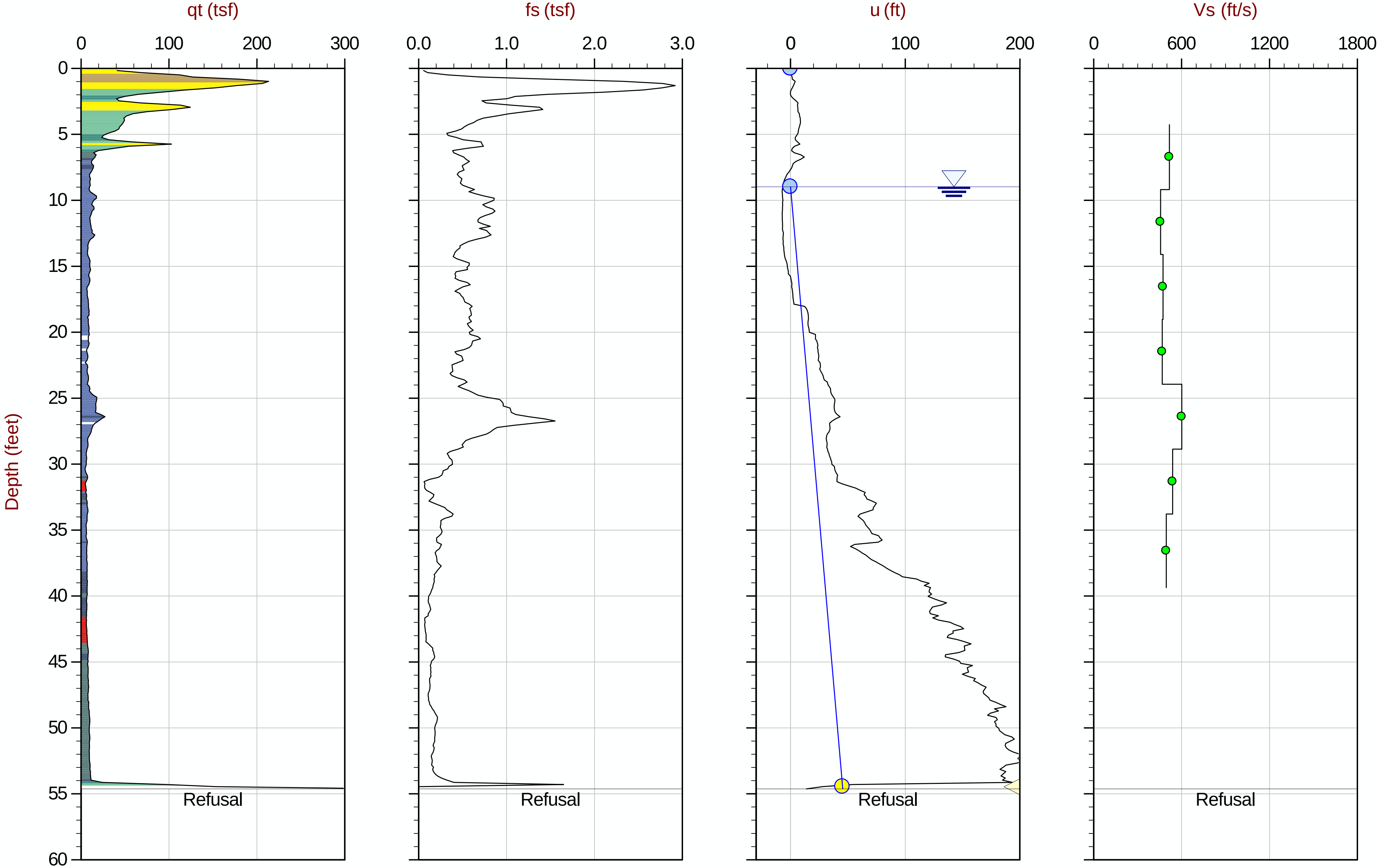
Max Depth: 11.850 m / 38.88 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point
File: 15-53073_SP01.COR
SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497502m E: 274312m

Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

AECOM

Job No: 15-53073
Date: 08:27:15 15:22
Site: Edwards Power Station, Peoria, Il
Sounding: EDW-C003
Cone: 340:T1500F15U500



Max Depth: 16.650 m / 54.63 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP03.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497325m E: 274377m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

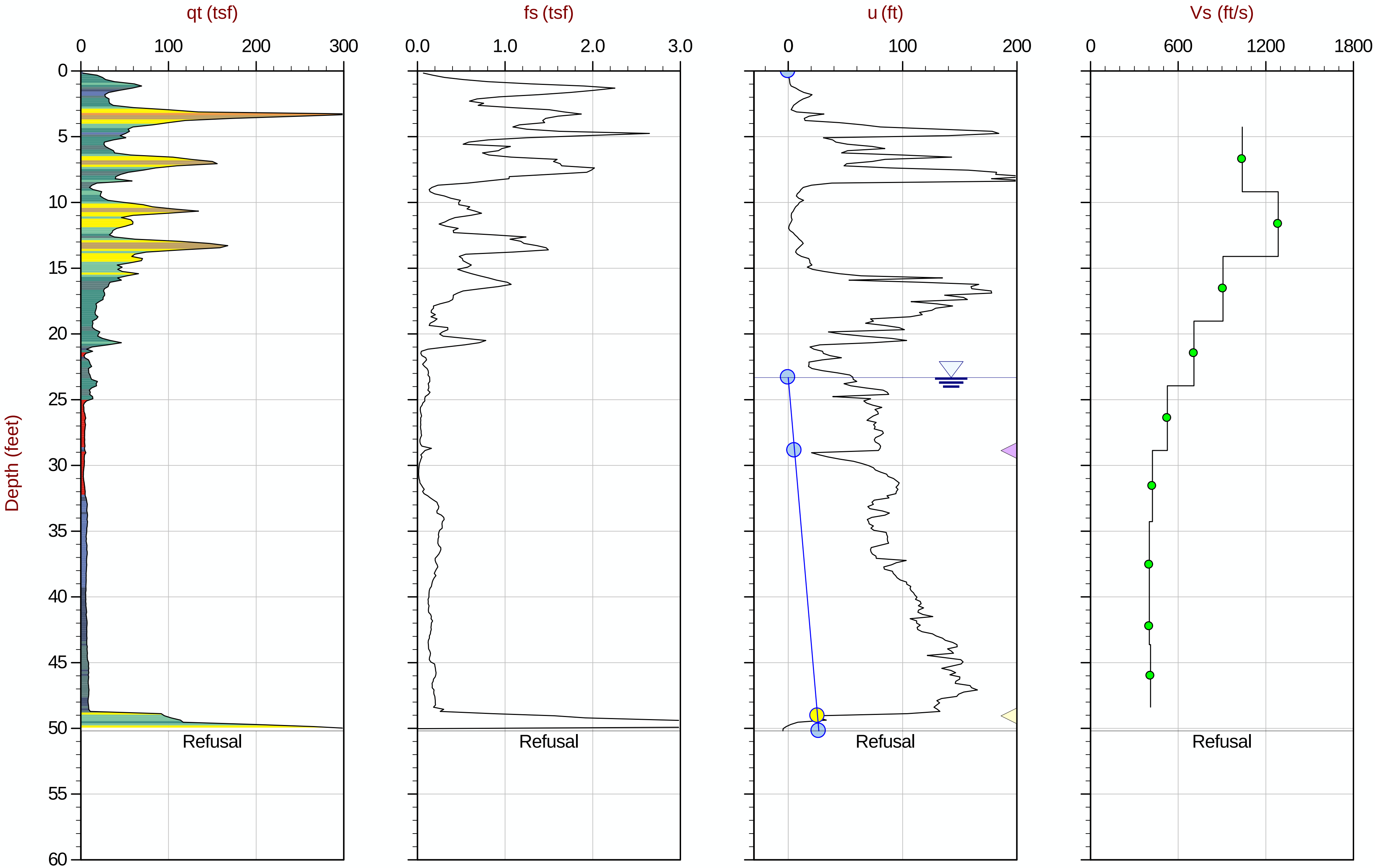
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:28:15 14:27
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C012
Cone: 340:T1500F15U500



Max Depth: 15.300 m / 50.20 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP12.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496424m E: 274524m

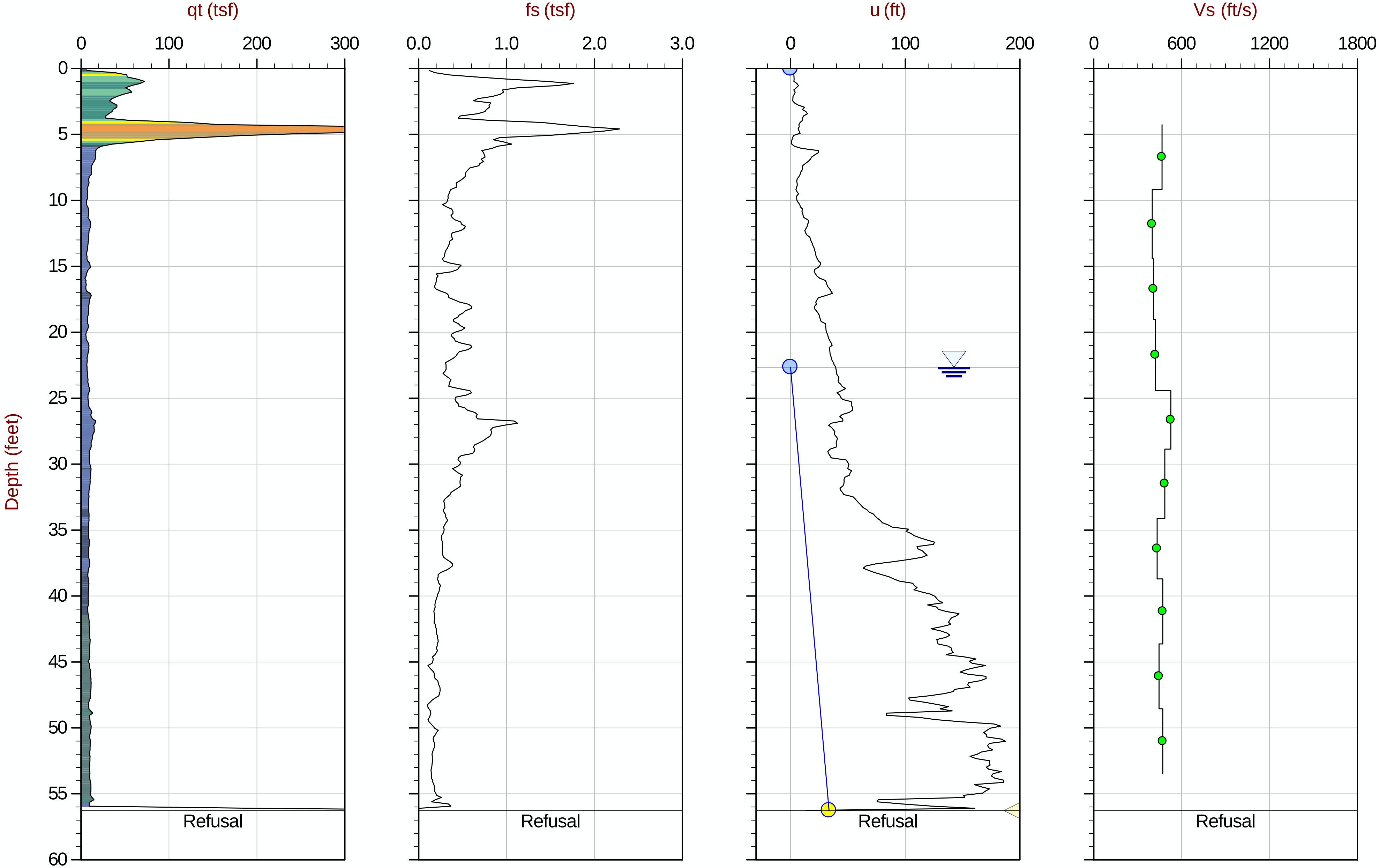
Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:28:15 08:45
Site: Edwards Power Station, Peoria, Il
Sounding: EDW-C013
Cone: 340:T1500F15U500



Max Depth: 17.150 m / 56.27 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP13.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496386m E: 274376m

Hydrostatic Line | Ueq | Assumed Ueq | PPD, Ueq achieved | PPD, Ueq not achieved

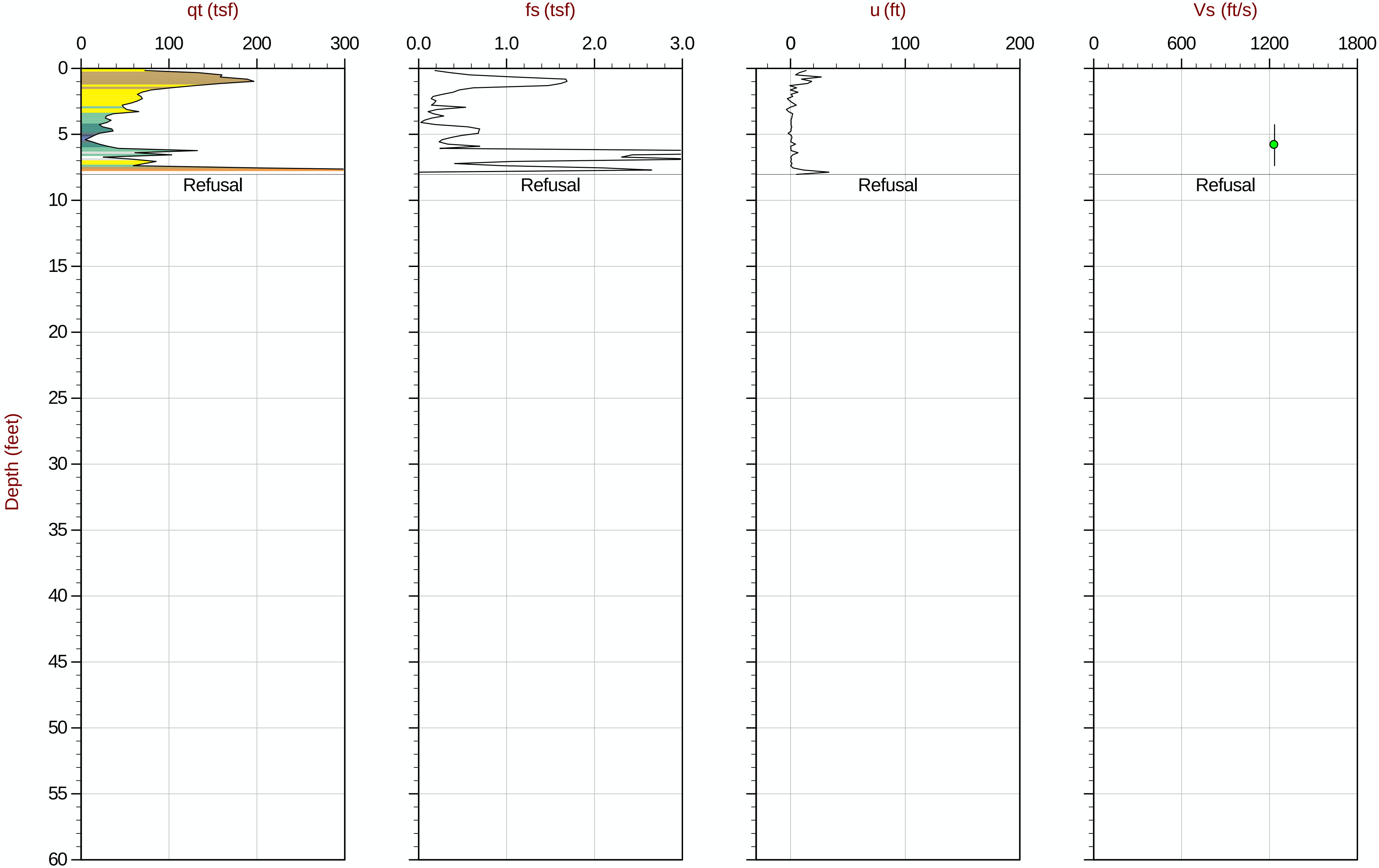
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:19:15 13:31
Site: Edwards Power Station

Sounding: EDW-C015
Cone: 335:T1500F15U500



Max Depth: 2.450 m / 8.04 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP15.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496447m E: 274334m

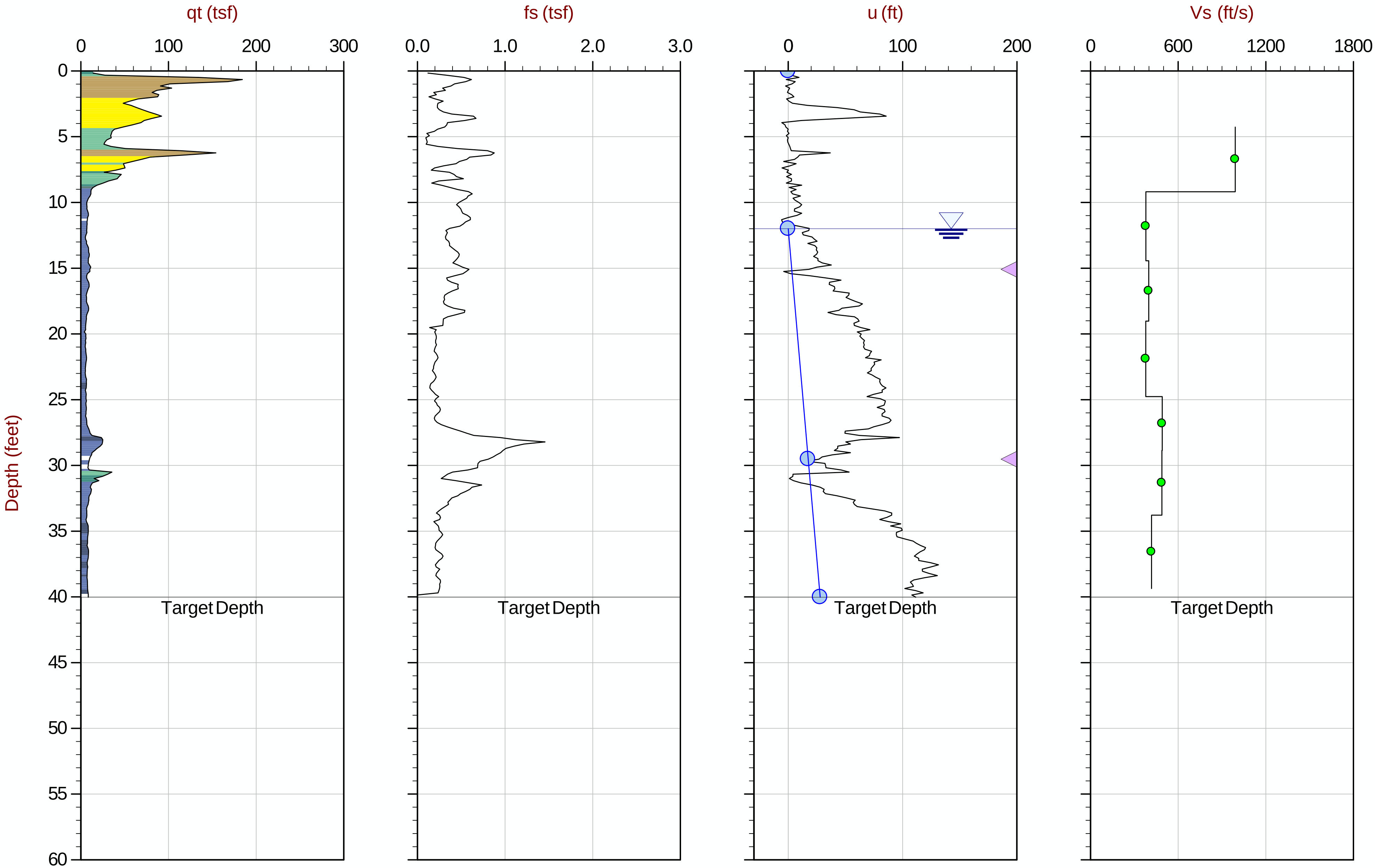
Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:19:15 14:12
Site: Edwards Power Station
Sounding: EDW-C015A
Cone: 335:T1500F15U500



Max Depth: 12.200 m / 40.03 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP15A.COR

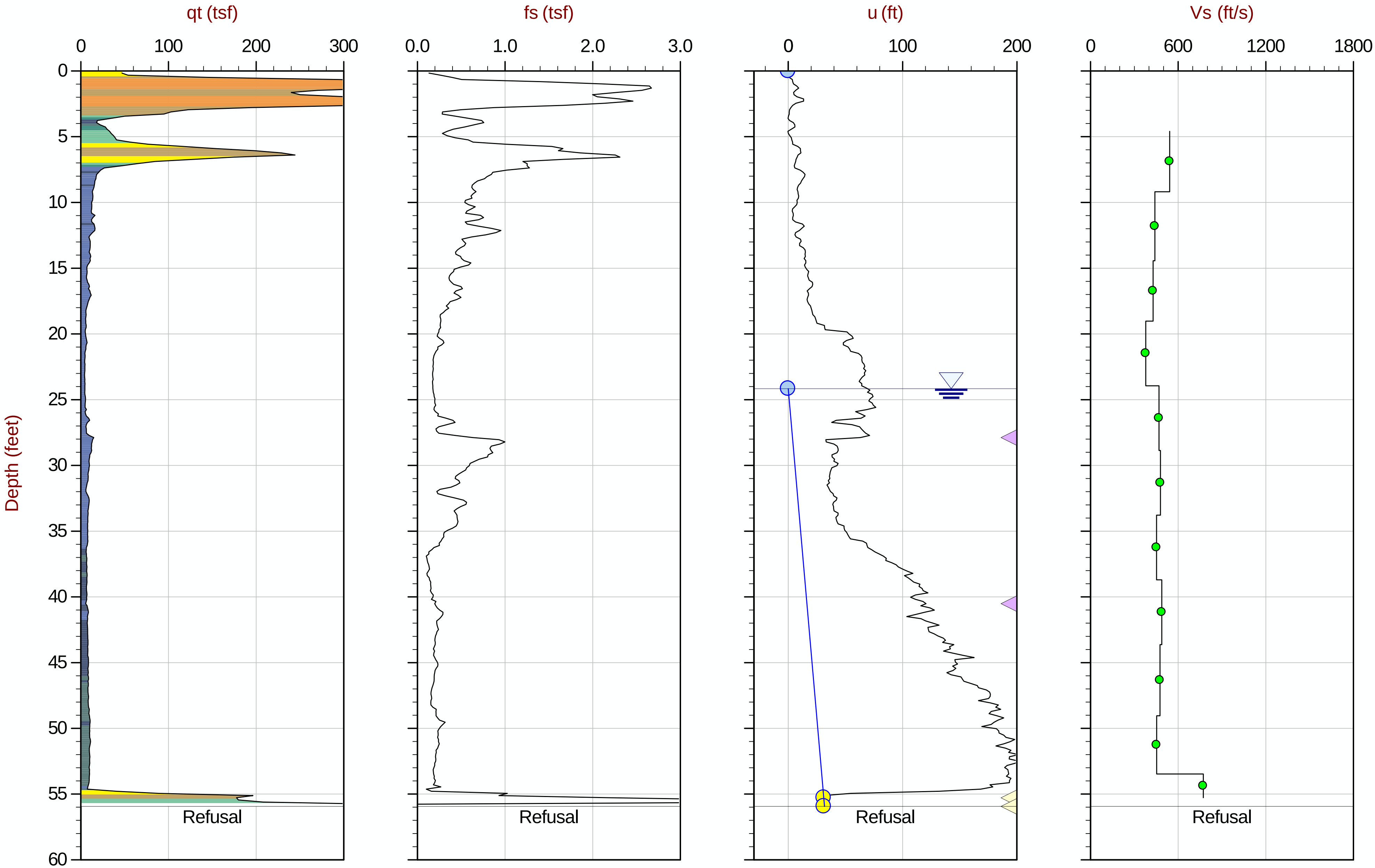
SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496435m E: 274342m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

AECOM

Job No: 15-53073
Date: 08:27:15 11:13
Site: Edwards Power Station, Peoria, Il
Sounding: EDW-C017
Cone: 340:T1500F15U500



Max Depth: 17.050 m / 55.94 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP17.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4496775m E: 274137m

Hydrostatic Line Ueq Assumed Ueq PPD, Ueq achieved PPD, Ueq not achieved

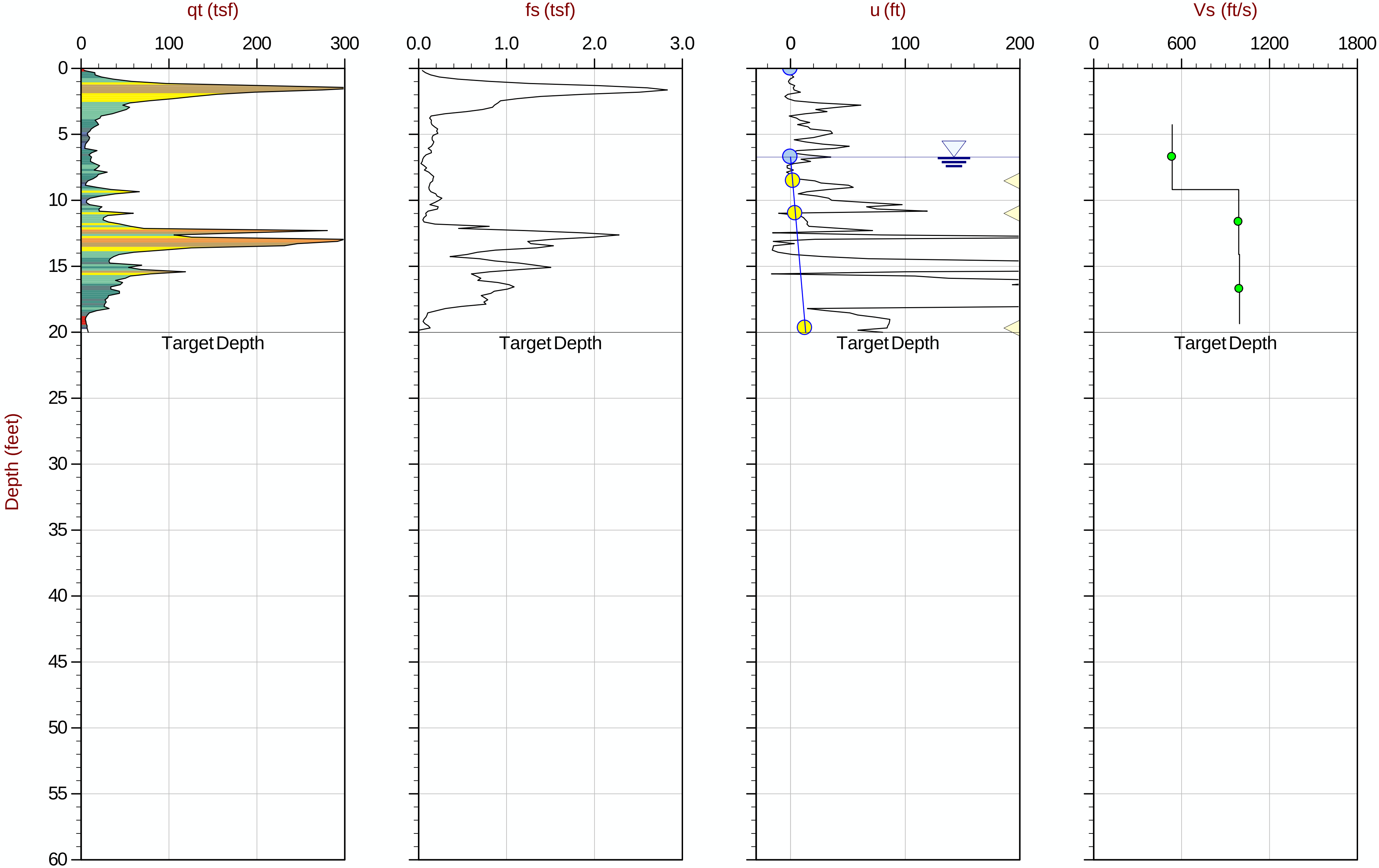
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

ConeTec

AECOM

Job No: 15-53073
Date: 08:26:15 10:35
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C022
Cone: 374:T1500F15U500



Max Depth: 6.100 m / 20.01 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP22.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497185m E: 274108m

Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

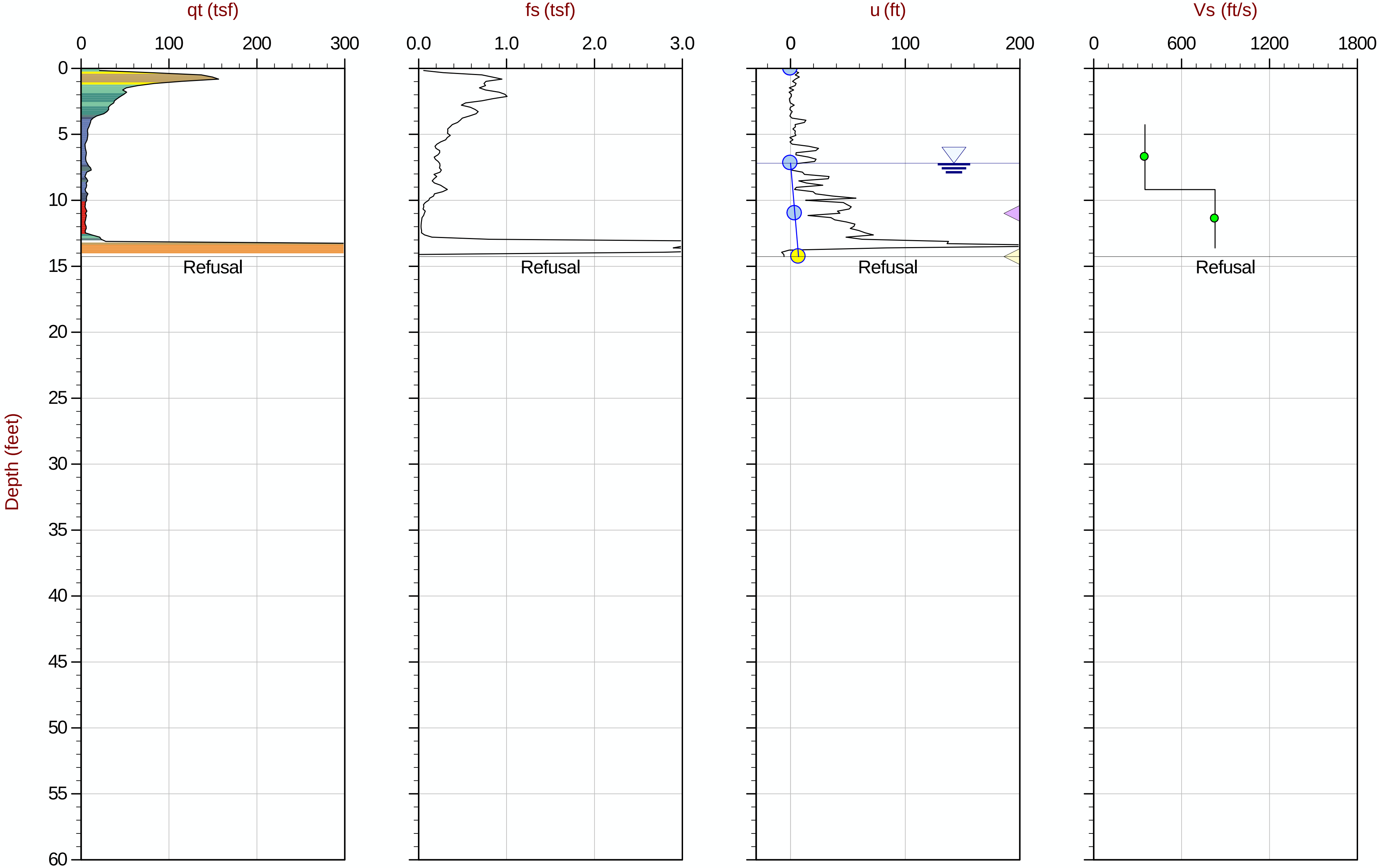
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

ConeTec

AECOM

Job No: 15-53073
Date: 08:26:15 12:20
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C026
Cone: 374:T1500F15U500



Max Depth: 4.350 m / 14.27 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP26.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497062m E: 274334m

Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

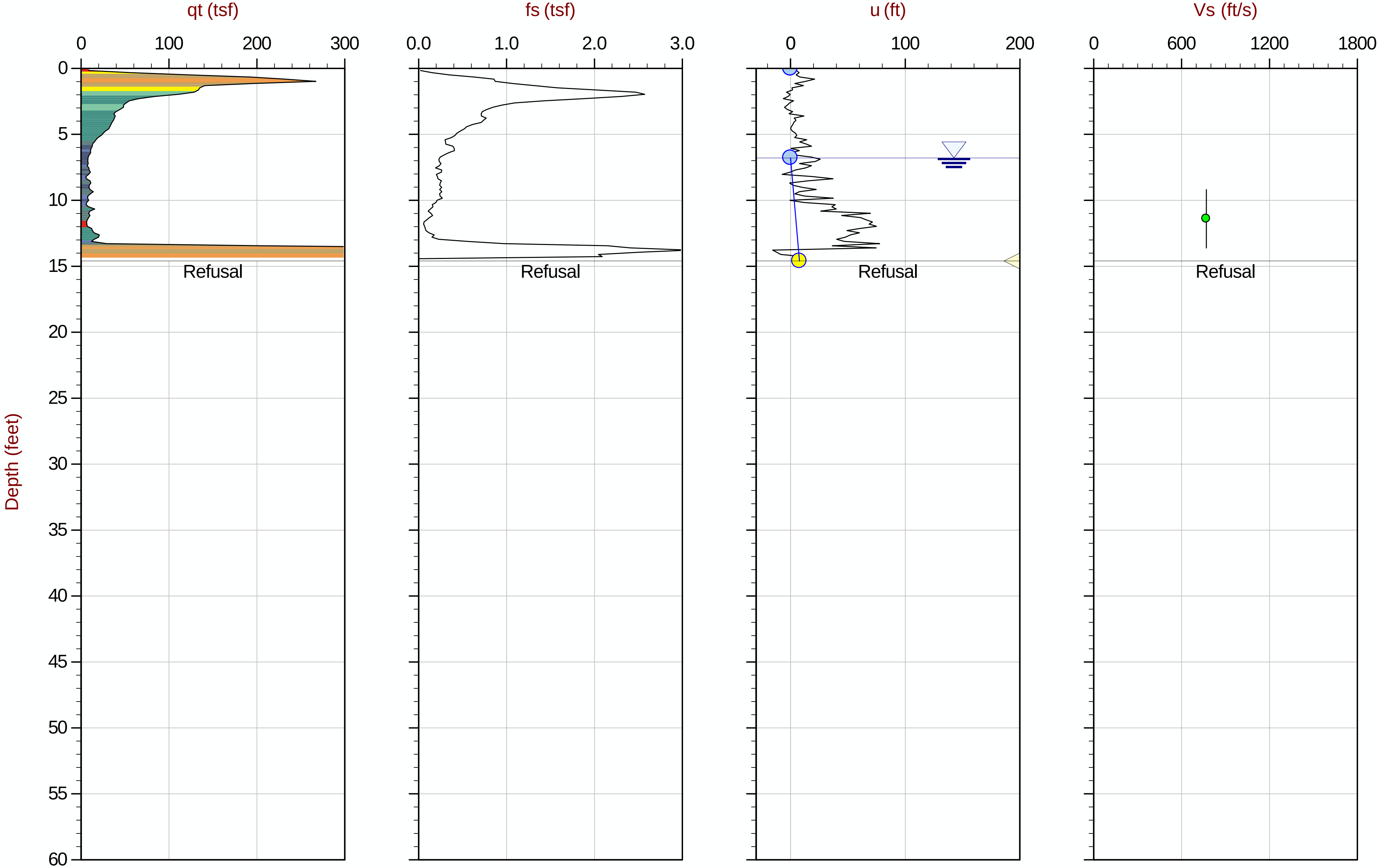
The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

CONETEC

AECOM

Job No: 15-53073
Date: 08:26:15 14:00
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C026B
Cone: 374:T1500F15U500



Max Depth: 4.450 m / 14.60 ft
Depth Inc: 0.050 m / 0.164 ft
Avg Int: Every Point

File: 15-53073_SP26B.COR

SBT: Robertson and Campanella, 1986
Coords: UTM Zone 16 N: 4497064m E: 274335m

Hydrostatic Line   Ueq   Assumed Ueq   PPD, Ueq achieved   PPD, Ueq not achieved

The reported coordinates were acquired from consumer-grade GPS equipment and are only approximate locations. The coordinates should not be used for design purposes.

Seismic Cone Penetration Test Tabular Results (Vs)

ConeTec

Job No:	15-53073	
Client:	AECOM	
Project:	Edwards Power Station	
Sounding ID:	EDW-C001	
Date:	19-Aug-2015	

Seismic Source:	Beam
Source Offset (ft):	7.21
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
4.92	4.27	8.38			
9.84	9.19	11.68	3.30	8.55	386
14.76	14.11	15.84	4.17	9.25	450
19.69	19.03	20.35	4.51	10.98	410
24.61	23.95	25.01	4.66	9.57	487
29.53	28.87	29.76	4.75	7.61	624
34.45	33.79	34.55	4.80	9.57	501
38.88	38.22	38.90	4.34	5.49	791

Job No: 15-53073
Client: AECOM
Project: Edwards Power Station
Sounding ID: EDW-C003
Date: 25-Aug-2015

Seismic Source: Beam
Source Offset (ft): 1.97
Source Depth (ft): 0.00
Geophone Offset (ft): 0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
4.92	4.27	4.70			
9.84	9.19	9.40	4.70	9.08	517
14.76	14.11	14.24	4.85	10.62	457
19.69	19.03	19.13	4.89	10.30	474
24.61	23.95	24.03	4.90	10.48	468
29.53	28.87	28.94	4.91	8.15	602
34.45	33.79	33.85	4.91	9.12	539
40.03	39.37	39.42	5.57	11.23	496

Job No:	15-53073
Client:	AECOM
Project:	Edwards Power Station
Sounding ID:	EDW-C012
Date:	28-Aug-2015

Seismic Source:	Beam
Source Offset (ft):	1.97
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
4.92	4.27	4.70			
9.84	9.19	9.40	4.70	4.52	1039
14.76	14.11	14.24	4.85	3.77	1285
19.69	19.03	19.13	4.89	5.39	907
24.61	23.95	24.03	4.90	6.92	708
29.53	28.87	28.94	4.91	9.33	526
34.94	34.28	34.34	5.40	12.74	424
41.50	40.85	40.89	6.55	16.28	403
44.29	43.64	43.68	2.79	6.92	403
49.05	48.39	48.43	4.75	11.55	411

Job No: 15-53073
Client: AECOM
Project: Edwards Power Station
Sounding ID: EDW-C013
Date: 28-Aug-2015

Seismic Source: Beam
Source Offset (ft): 1.97
Source Depth (ft): 0.00
Geophone Offset (ft): 0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
4.92	4.27	4.70			
9.84	9.19	9.40	4.70	10.06	467
15.09	14.44	14.57	5.17	12.94	400
19.69	19.03	19.13	4.56	11.16	409
25.10	24.44	24.52	5.39	12.78	422
29.53	28.87	28.94	4.42	8.39	527
34.78	34.12	34.18	5.24	10.79	486
39.37	38.71	38.76	4.59	10.58	433
44.29	43.64	43.68	4.92	10.42	472
49.21	48.56	48.60	4.92	11.04	446
54.13	53.48	53.51	4.92	10.42	472

Job No:	15-53073
Client:	AECOM
Project:	Edwards Power Station
Sounding ID:	EDW-C015
Date:	19-Aug-2015

Seismic Source:	Beam
Source Offset (ft):	1.50
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
4.92	4.27	4.52			
8.04	7.38	7.53	3.01	2.44	1235

Job No:	15-53073
Client:	AECOM
Project:	Edwards Power Station
Sounding ID:	EDW-C015A
Date:	19-Aug-2015

Seismic Source:	Beam
Source Offset (ft):	1.50
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
4.92	4.27	4.52			
9.84	9.19	9.31	4.79	4.83	991
15.09	14.44	14.51	5.21	13.73	379
19.69	19.03	19.09	4.57	11.46	399
25.43	24.77	24.82	5.73	15.15	378
29.53	28.87	28.91	4.09	8.34	491
34.45	33.79	33.83	4.92	10.05	489
40.03	39.37	39.40	5.57	13.34	418

Job No: 15-53073
Client: AECOM
Project: Edwards Power Station
Sounding ID: EDW-C017
Date: 27-Aug-2015

Seismic Source: Beam
Source Offset (ft): 1.97
Source Depth (ft): 0.00
Geophone Offset (ft): 0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
5.25	4.59	5.00			
9.84	9.19	9.40	4.40	8.11	542
15.09	14.44	14.57	5.17	11.73	441
19.69	19.03	19.13	4.56	10.62	429
24.61	23.95	24.03	4.90	12.96	378
29.53	28.87	28.94	4.91	10.47	469
34.45	33.79	33.85	4.91	10.26	479
39.37	38.71	38.76	4.91	10.87	452
44.29	43.64	43.68	4.92	10.08	488
49.70	49.05	49.09	5.41	11.37	476
54.13	53.48	53.51	4.43	9.77	453
55.94	55.28	55.32	1.80	2.33	772

Job No: 15-53073
Client: AECOM
Project: Edwards Power Station
Sounding ID: EDW-C022
Date: 26-Aug-2015

Seismic Source: Beam
Source Offset (ft): 7.21
Source Depth (ft): 0.00
Geophone Offset (ft): 0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
4.92	4.27	8.38			
9.84	9.19	11.68	3.30	6.16	536
14.76	14.11	15.84	4.17	4.21	990
20.01	19.36	20.66	4.81	4.83	996

Job No: 15-53073
Client: AECOM
Project: Edwards Power Station
Sounding ID: EDW-C026
Date: 26-Aug-2015

Seismic Source: Beam
Source Offset (ft): 7.21
Source Depth (ft): 0.00
Geophone Offset (ft): 0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
4.92	4.27	8.38			
9.84	9.19	11.68	3.30	9.43	350
14.27	13.62	15.41	3.73	4.50	829

Job No:	15-53073
Client:	AECOM
Project:	Edwards Power Station
Sounding ID:	EDW-C026B
Date:	26-Aug-2015

Seismic Source:	Beam
Source Offset (ft):	7.21
Source Depth (ft):	0.00
Geophone Offset (ft):	0.66

SCPTu SHEAR WAVE VELOCITY TEST RESULTS - Vs

Tip Depth (ft)	Geophone Depth (ft)	Ray Path (ft)	Ray Path Difference (ft)	Travel Time Interval (ms)	Interval Velocity (ft/s)
9.84	9.19	11.68			
14.27	13.62	15.41	3.73	4.85	769

Pore Pressure Dissipation Summary and

Pore Pressure Dissipation Plots

ConeTec

Job No: 15-53073
Client: AECOM
Project: Edwards Power Station, Peoria, IL
Start Date: 19-Aug-2015
End Date: 29-Aug-2015

CPTu PORE PRESSURE DISSIPATION SUMMARY

Sounding ID	File Name	Cone Area (cm^2)	Duration (s)	Test Depth (ft)	Estimated Equilibrium Pore Pressure U_{eq} (ft)	Calculated Phreatic Surface (ft)	Estimated Phreatic Surface (ft)	t_{50} [a] (s)	Assumed Rigidity Index (I_r)	c_h [b] (cm^2/min)
EDW-C001	15-53073_SP01	15	200	13.12						
EDW-C001	15-53073_SP01	15	9000	27.23	17.86	9.37		81	100	8.69
EDW-C003	15-53073_SP03	15	1020	54.46	45.49	8.98				
EDW-C005	15-53073_CP05	15	6000	37.40	30.40		7.00	3717	100	0.19
EDW-C006	15-53073_CP06	15	360	14.27						
EDW-C006	15-53073_CP06	15	7200	26.25	14.75		11.50	7114	100	0.10
EDW-C006	15-53073_CP06	15	1200	40.03						
EDW-C007	15-53073_CP07	15	600	26.90						
EDW-C007	15-53073_CP07	15	4000	51.51	42.62	8.89				
EDW-C008	15-53073_CP08	15	4800	22.15	12.15		10.00	2835	100	0.25
EDW-C008	15-53073_CP08	15	1800	33.63						
EDW-C009	15-53073_CP09	15	800	16.08	2.61	13.46				
EDW-C009	15-53073_CP09	15	600	28.38	8.49	19.89				
EDW-C010	15-53073_CP10	15	3000	12.14	9.93		2.21	1239	100	0.57
EDW-C010	15-53073_CP10	15	300	27.56	25.35	2.21				
EDW-C010	15-53073_CP10	15	600	30.02	0.00					
EDW-C011	15-53073_CP11	15	3800	24.11						
EDW-C011	15-53073_CP11	15	7500	46.42	23.96		22.47	1082	100	0.65
EDW-C011	15-53073_CP11	15	400	47.08	24.61	22.47				
EDW-C012	15-53073_SP12	15	1500	28.87	5.55		23.32	120	100	5.86
EDW-C012	15-53073_SP12	15	1000	49.05	25.73	23.32				
EDW-C013	15-53073_SP13	15	1205	56.27	33.61	22.65				
EDW-C014	15-53073_CP14	15	4000	16.08	11.16		4.91	2190	100	0.32
EDW-C014	15-53073_CP14	15	500	38.22	33.31	4.91				
EDW-C015A	15-53073_SP15A	15	2000	15.09						
EDW-C015A	15-53073_SP15A	15	10800	29.53	17.53		12.00	6095	100	0.12
EDW-C016	15-53073_CP16	15	900	7.38						
EDW-C016	15-53073_CP16	15	3600	18.04	14.20		3.85	1538	100	0.46
EDW-C016	15-53073_CP16	15	500	36.91	33.06	3.85				
EDW-C017	15-53073_SP17	15	500	27.89						
EDW-C017	15-53073_SP17	15	525	40.52						
EDW-C017	15-53073_SP17	15	600	55.28	31.11	24.17				
EDW-C017	15-53073_SP17	15	85	55.94	31.25	24.69				
EDW-C019	15-53073_CP19	15	600	11.81	5.31	6.51				
EDW-C019	15-53073_CP19	15	1500	53.48	48.16	5.31				
EDW-C021	15-53073_CP21	15	550	13.94						
EDW-C021	15-53073_CP21	15	8000	23.46	10.46		13.00	2190	100	0.32
EDW-C021	15-53073_CP21	15	12070	33.63	20.63		13.00	1449	100	0.48
EDW-C021	15-53073_CP21	15	1600	48.39						
EDW-C022	15-53073_SP22	15	300	8.53	2.39	6.14				
EDW-C022	15-53073_SP22	15	300	10.99	4.27	6.72				
EDW-C022	15-53073_SP22	15	1200	19.68	12.85	6.84				
EDW-C023	15-53073_CP23	15	4000	38.88	23.82		15.06	78	100	9.01
EDW-C023	15-53073_CP23	15	400	40.68	25.63	15.06				
EDW-C025	15-53073_CP25	15	1500	6.56	0.57		5.99	36	100	19.34

Job No: 15-53073
Client: AECOM
Project: Edwards Power Station, Peoria, IL
Start Date: 19-Aug-2015
End Date: 29-Aug-2015

CPTu PORE PRESSURE DISSIPATION SUMMARY

Sounding ID	File Name	Cone Area (cm^2)	Duration (s)	Test Depth (ft)	Estimated Equilibrium Pore Pressure U_{eq} (ft)	Calculated Phreatic Surface (ft)	Estimated Phreatic Surface (ft)	t_{50} [a] (s)	Assumed Rigidity Index (I_r)	c_h [b] (cm^2/min)
EDW-C025	15-53073_CP25	15	500	10.99	5.00	5.99				
EDW-C025	15-53073_CP25	15	500	15.09	9.03	6.06				
EDW-C025	15-53073_CP25	15	500	20.01	13.58	6.44				
EDW-C026	15-53073_SP26	15	2700	10.99	3.80		7.19	31	100	22.51
EDW-C026	15-53073_SP26	15	1100	14.27	7.08	7.19				
EDW-C026B	15-53073_SP26B	15	800	14.60	7.81	6.79				
EDW-C027	15-53073_CP27	15	500	11.15	3.75	7.40				
EDW-C027	15-53073_CP27	15	300	14.27	7.50	6.77				
EDW-C027	15-53073_CP27	15	360	21.00	14.24	6.76				
EDW-C027	15-53073_CP27	15	500	30.84	24.17	6.67				
EDW-C027	15-53073_CP27	15	500	35.10	28.47	6.63				
EDW-C027	15-53073_CP27	15	1800	40.03	33.25		6.77	1185	100	0.59
Totals	54 dissipations		1879.3 min							

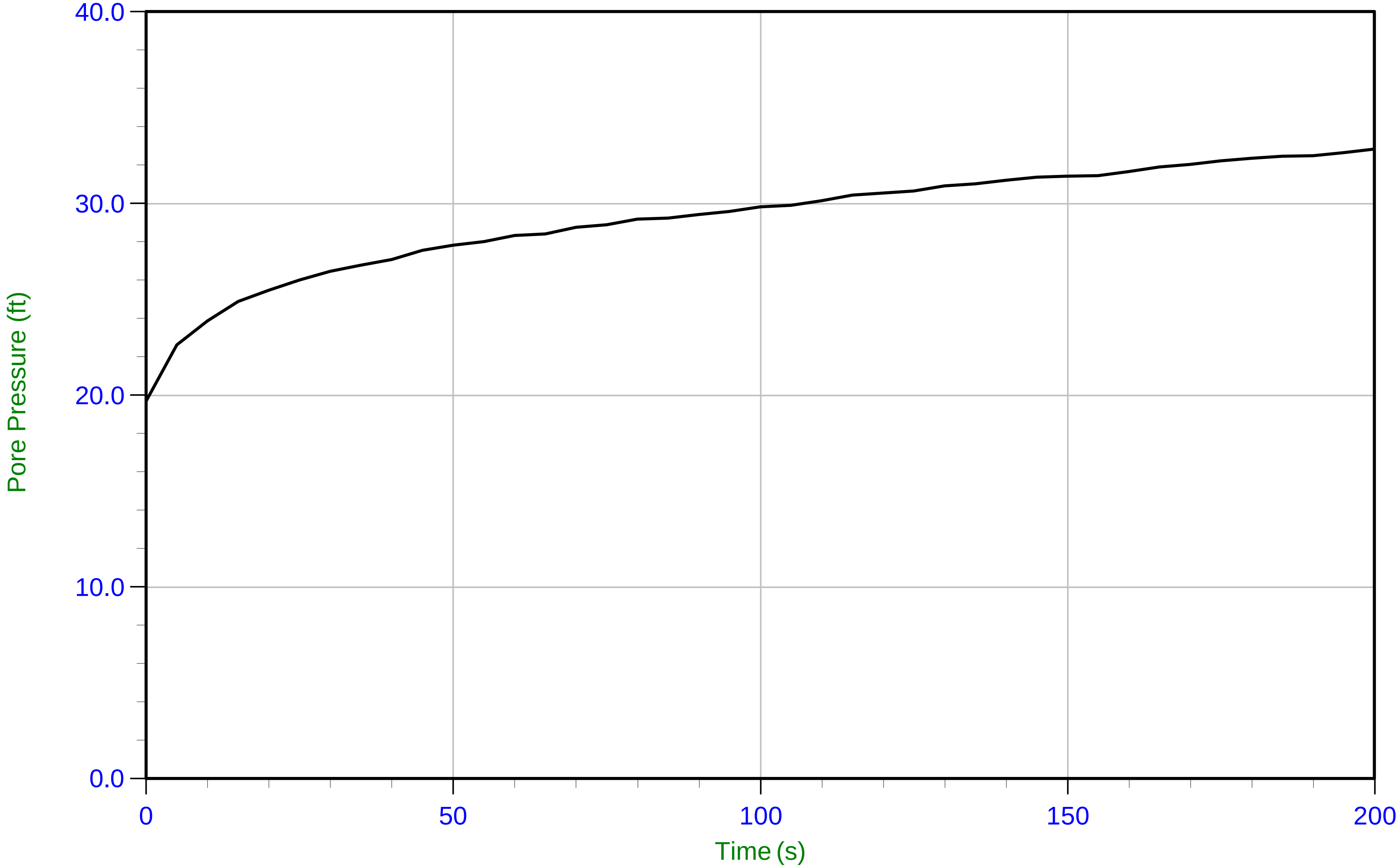
a. Time is relative to where umax occurred
b. Houlsby and Teh, 1991

CONETEC

AECOM

Job No: 15-53073
Date: 19-Aug-2015 13:46:01
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C001
Cone: 374
Cone Area: 15 sq cm

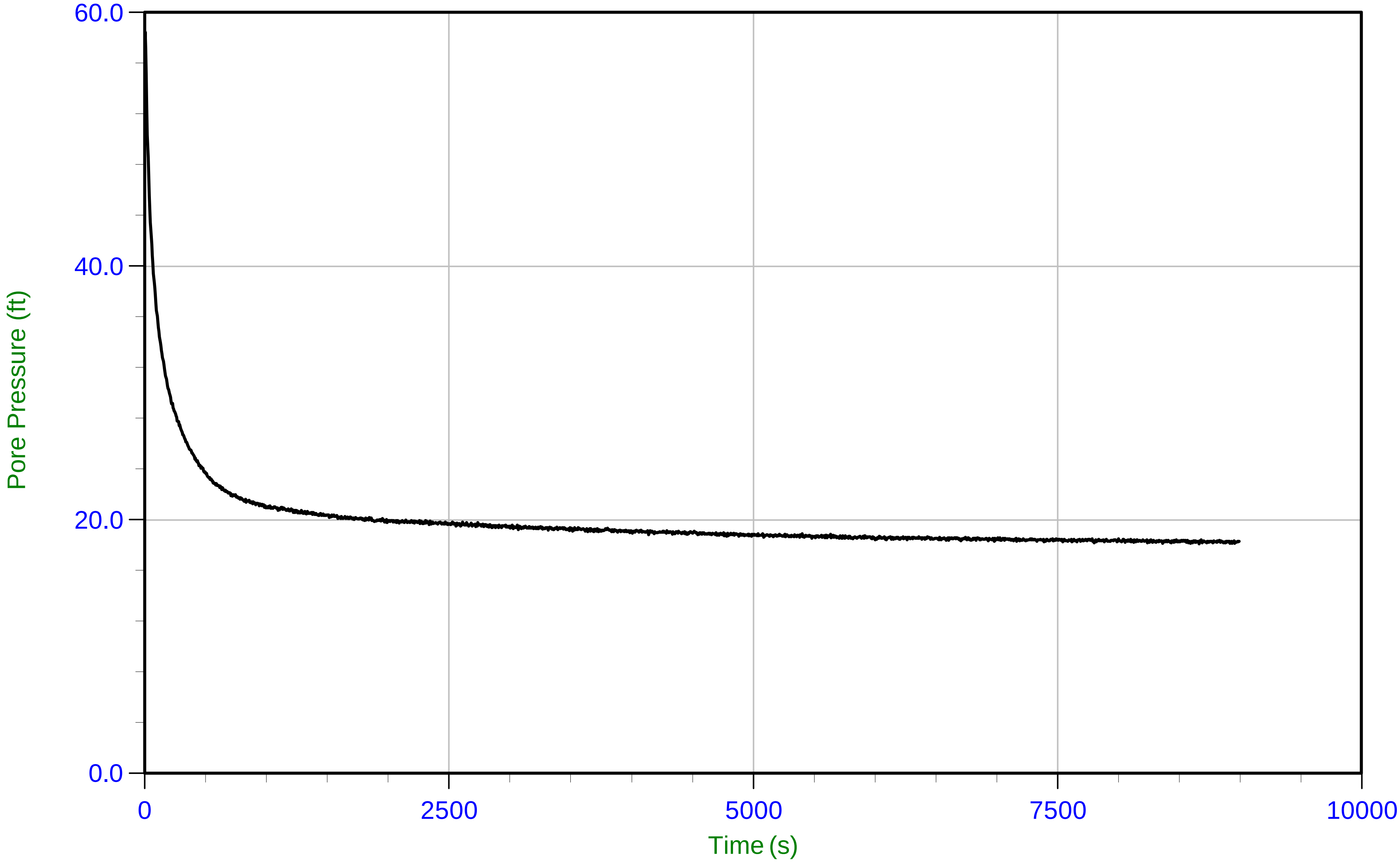


Trace Summary:

Filename: 15-53073_SP01.PPD
Depth: 4.000 m / 13.123 ft
Duration: 200.0 s

U Min: 19.7 ft
U Max: 32.8 ft

AECOM	Job No: 15-53073	Sounding: EDW-C001
	Date: 19-Aug-2015 13:46:01	Cone: 374
	Site: Edwards Power Station, Peoria, IL	Cone Area: 15 sq cm



Trace Summary:

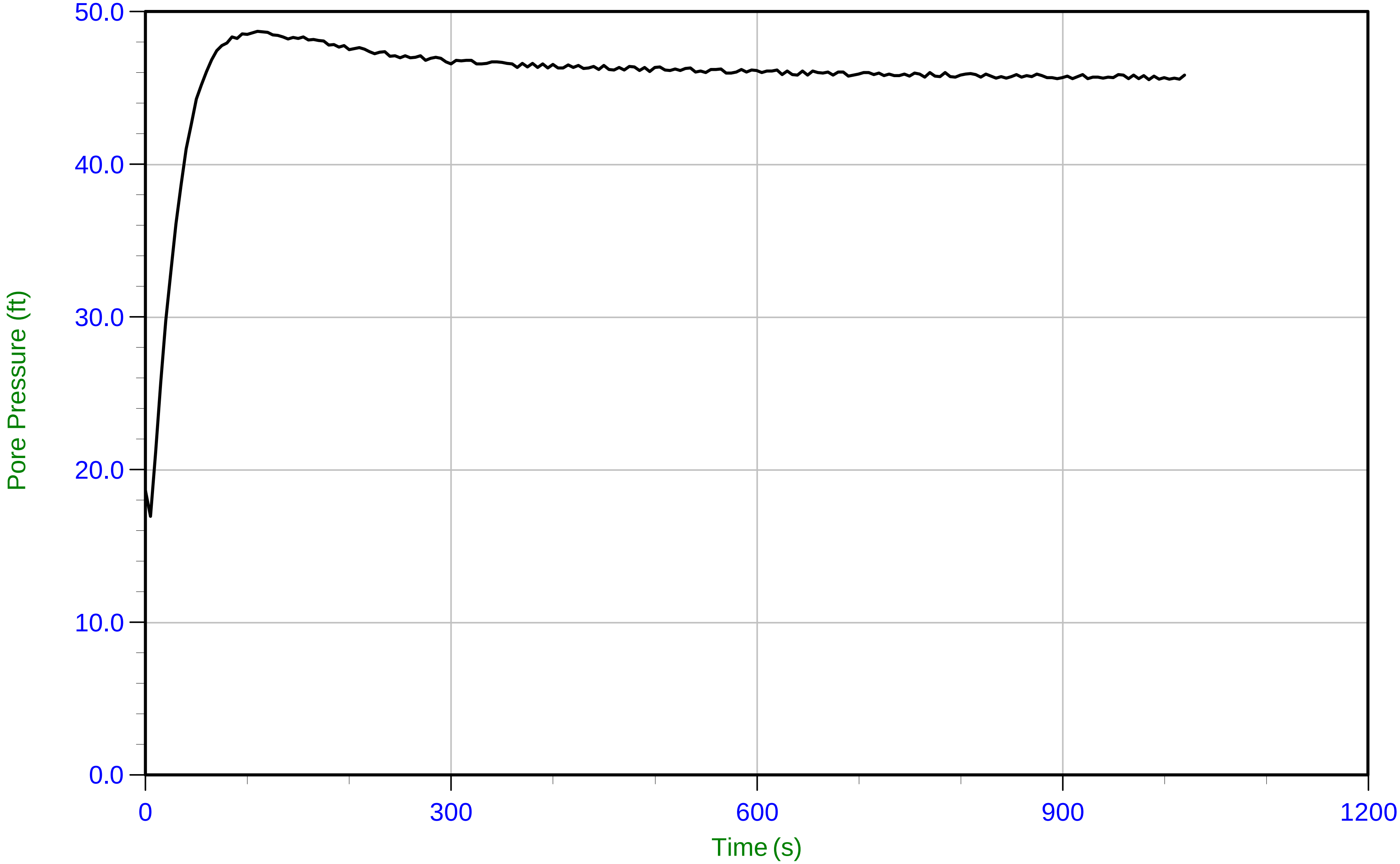
Filename: 15-53073_SP01.PPD	U Min: 18.1 ft	WT: 2.855 m / 9.367 ft	T(50): 80.8 s
Depth: 8.300 m / 27.231 ft	U Max: 58.5 ft	Ueq: 17.9 ft	Ir: 100
Duration: 9000.0 s		U(50): 38.16 ft	Ch: 8.7 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 14:27:54
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C003
Cone: AD419
Cone Area: 15 sq cm



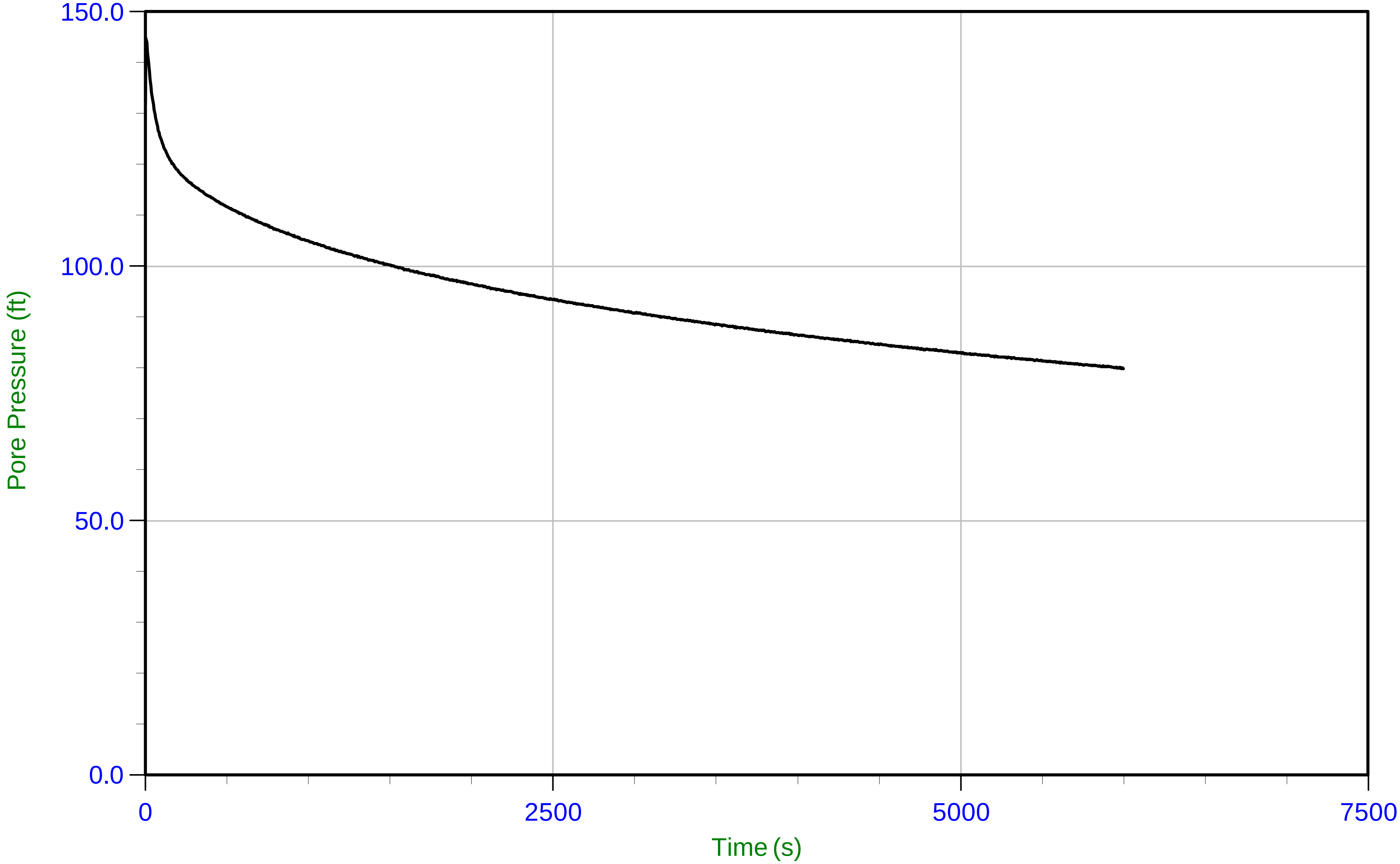
Trace Summary:

Filename: 15-53073_SP03.PPD
Depth: 16.600 m / 54.461 ft
Duration: 1020.0 s

U Min: 16.9 ft
U Max: 48.7 ft

WT: 2.736 m / 8.976 ft
Ueq: 45.5 ft

CONETEC	AECOM	Job No: 15-53073 Date: 26-Aug-2015 15:05:24 Site: Edwards Power Station, Peoria, IL	Sounding: EDW-C005 Cone: 374 Cone Area: 15 sq cm



Trace Summary:

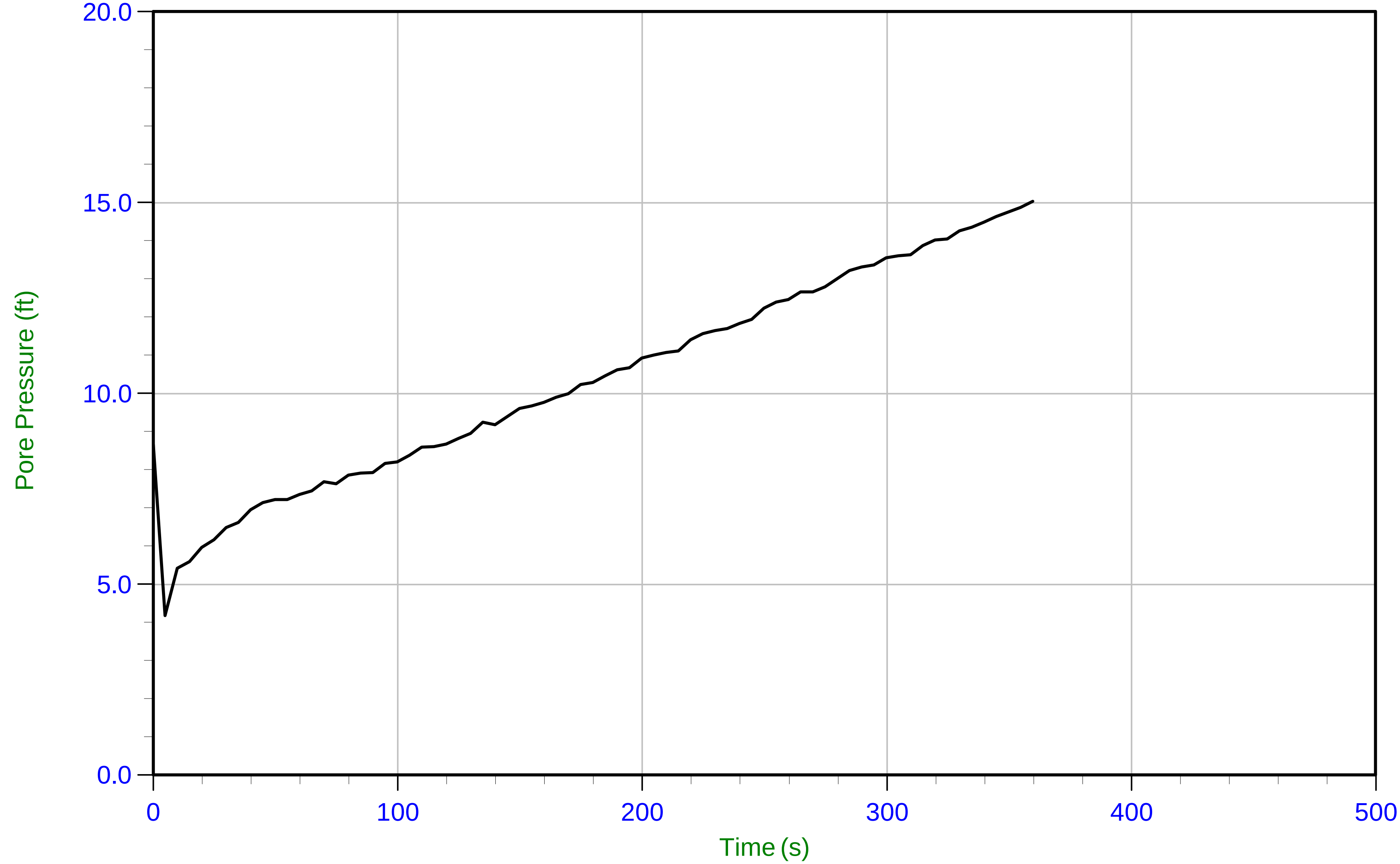
Filename: 15-53073_CP05.PPD	U Min: 79.9 ft	WT: 2.134 m / 7.001 ft	T(50): 3717.5 s
Depth: 11.400 m / 37.401 ft	U Max: 144.8 ft	Ueq: 30.4 ft	Ir: 100
Duration: 6000.0 s		U(50): 87.59 ft	Ch: 0.2 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 15:52:43
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C006
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP06.PPD
Depth: 4.350 m / 14.271 ft
Duration: 360.0 s

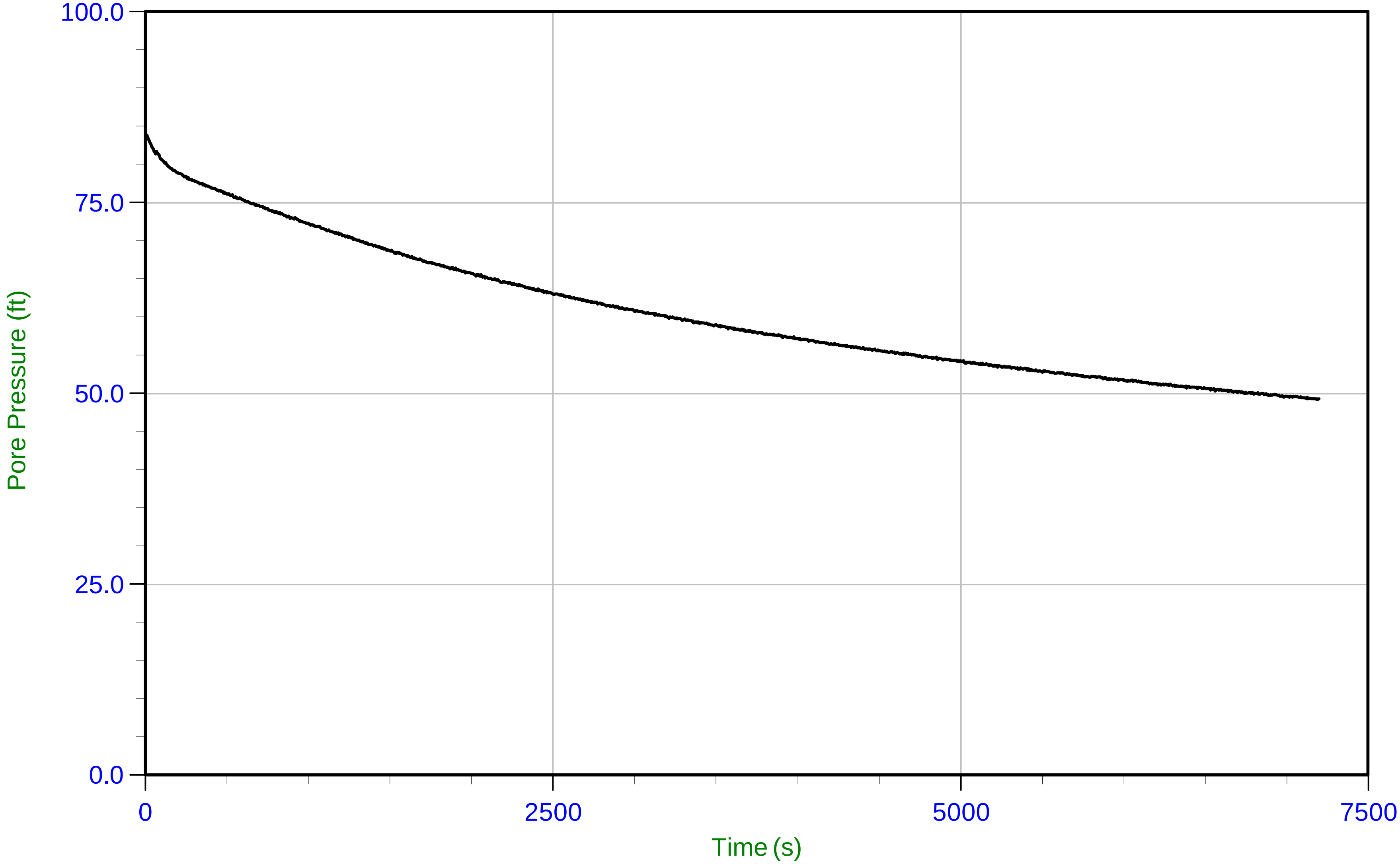
U Min: 4.2 ft
U Max: 15.0 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 15:52:43
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C006
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP06.PPD
Depth: 8.000 m / 26.246 ft
Duration: 7200.0 s

U Min: 49.2 ft
U Max: 83.8 ft

WT: 3.505 m / 11.499 ft
Ueq: 14.7 ft
U(50): 49.29 ft

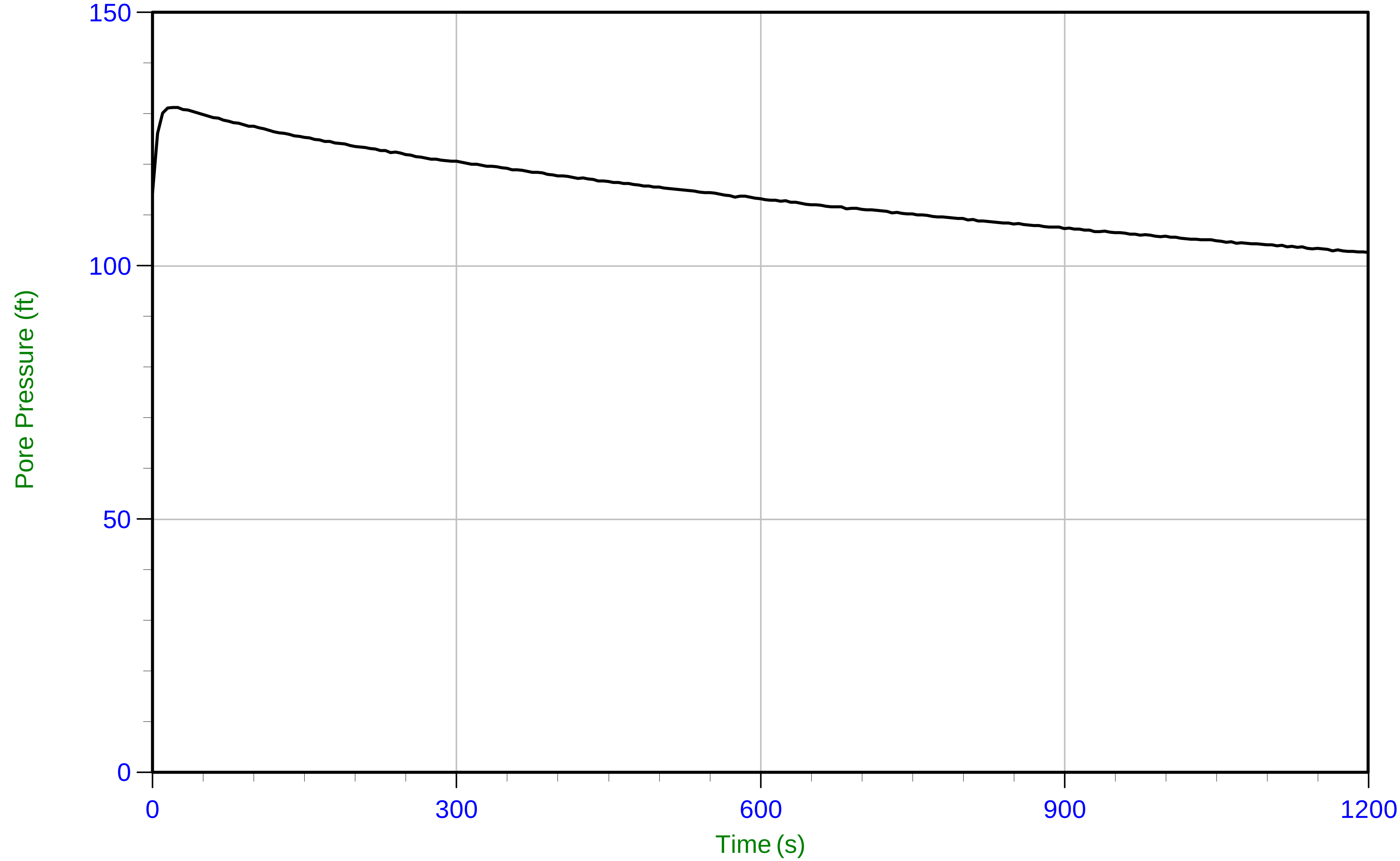
T(50): 7113.9 s
Ir: 100
Ch: 0.1 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 15:52:43
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C006
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP06.PPD
Depth: 12.200 m / 40.026 ft
Duration: 1200.0 s

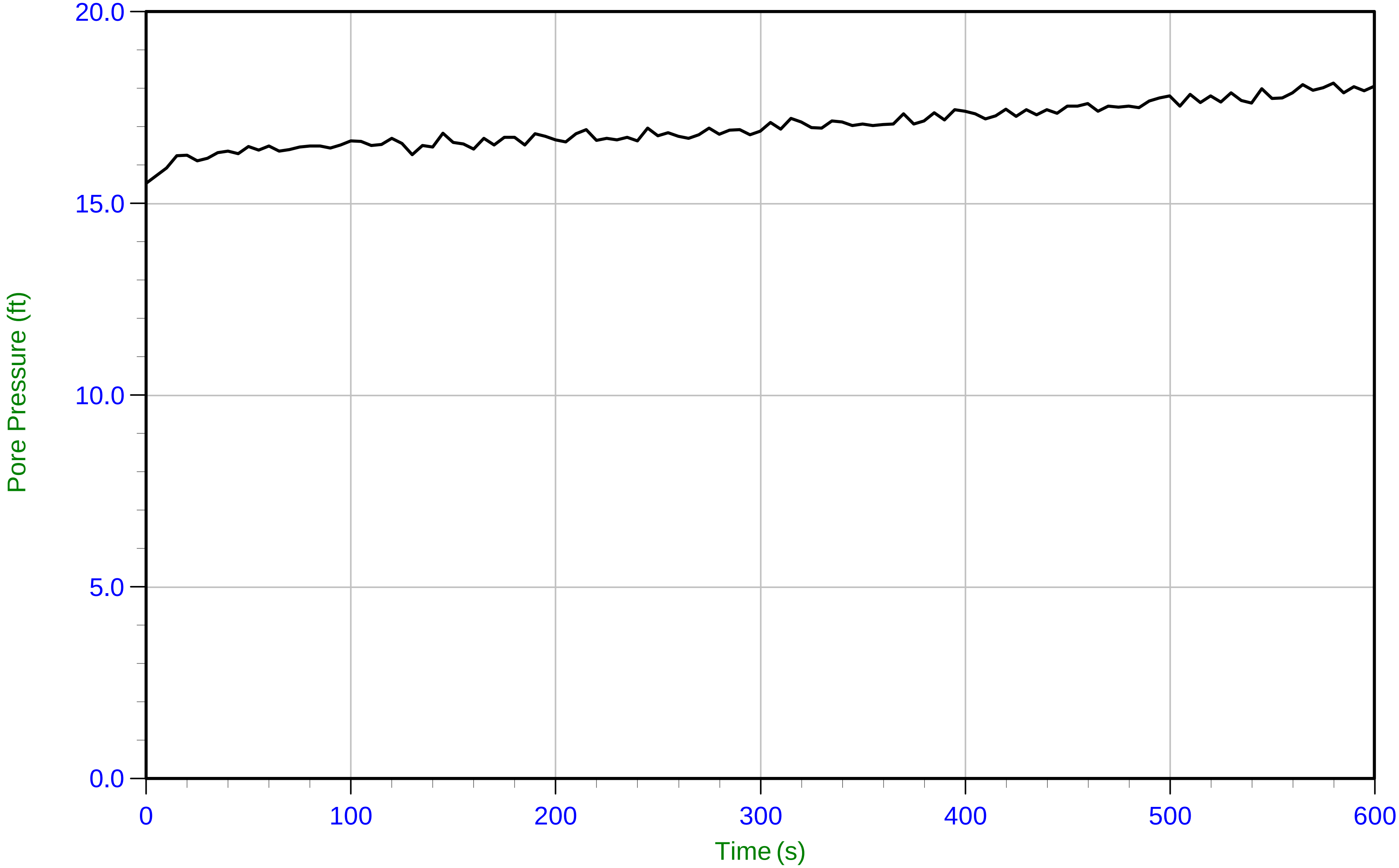
U Min: 102.7 ft
U Max: 131.3 ft

CONETEC

AECOM

Job No: 15-53073
Date: 29-Aug-2015 09:19:17
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C007
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP07.PPD
Depth: 8.200 m / 26.903 ft
Duration: 600.0 s

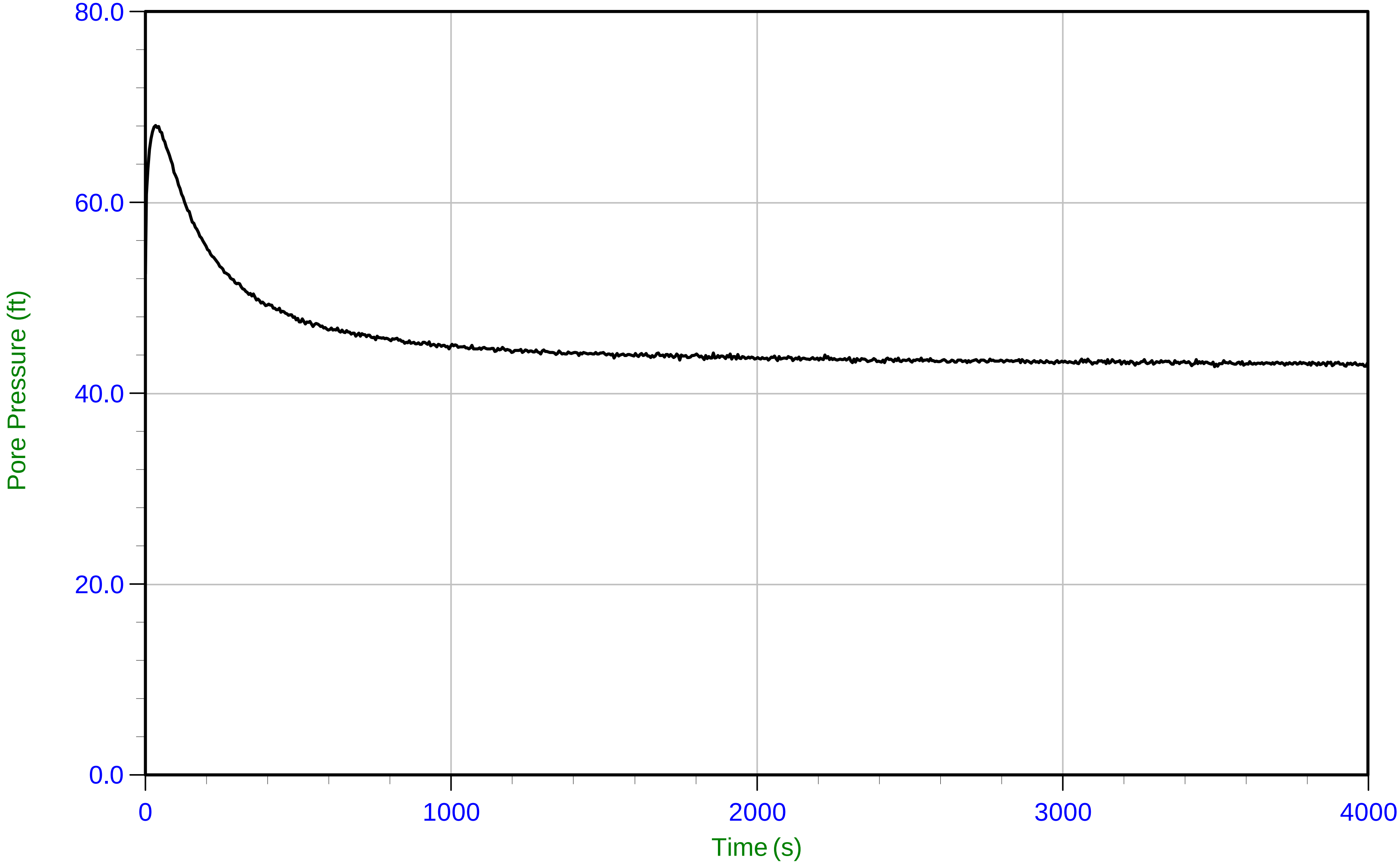
U Min: 15.5 ft
U Max: 18.1 ft

ConeTec

AECOM

Job No: 15-53073
Date: 29-Aug-2015 09:19:17
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C007
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP07.PPD
Depth: 15.700 m / 51.509 ft
Duration: 4000.0 s

U Min: 42.8 ft
U Max: 68.1 ft

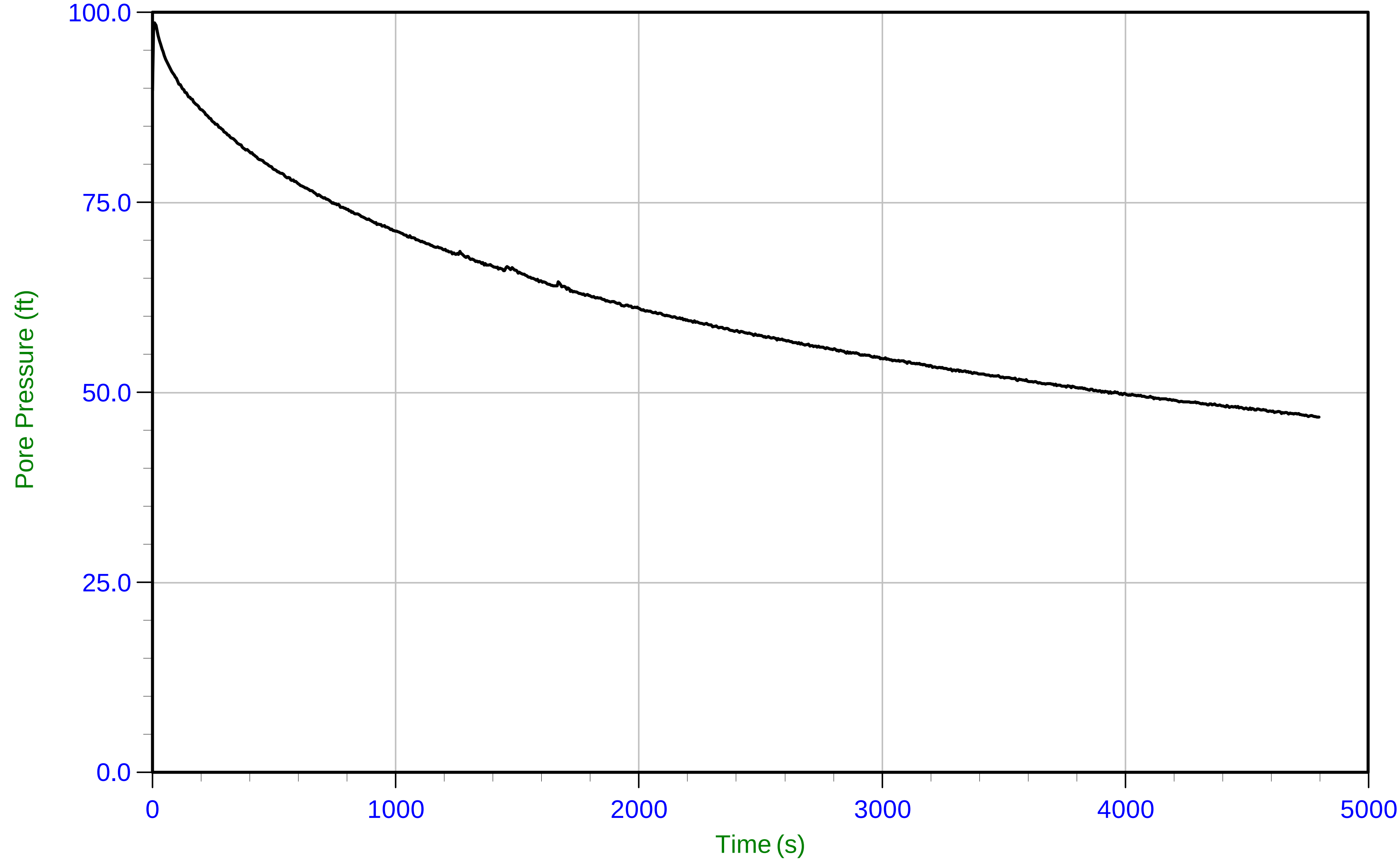
WT: 2.709 m / 8.888 ft
Ueq: 42.6 ft
U(50): 55.34 ft

T(50): 166.2 s
Ir: 100
Ch: 4.2 sq cm/min

AECOM

Job No: 15-53073
Date: 27-Aug-2015 08:50:17
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C008
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP08.PPD
Depth: 6.750 m / 22.145 ft
Duration: 4800.0 s

U Min: 46.8 ft
U Max: 98.7 ft

WT: 3.048 m / 10.000 ft
Ueq: 12.1 ft
U(50): 55.40 ft

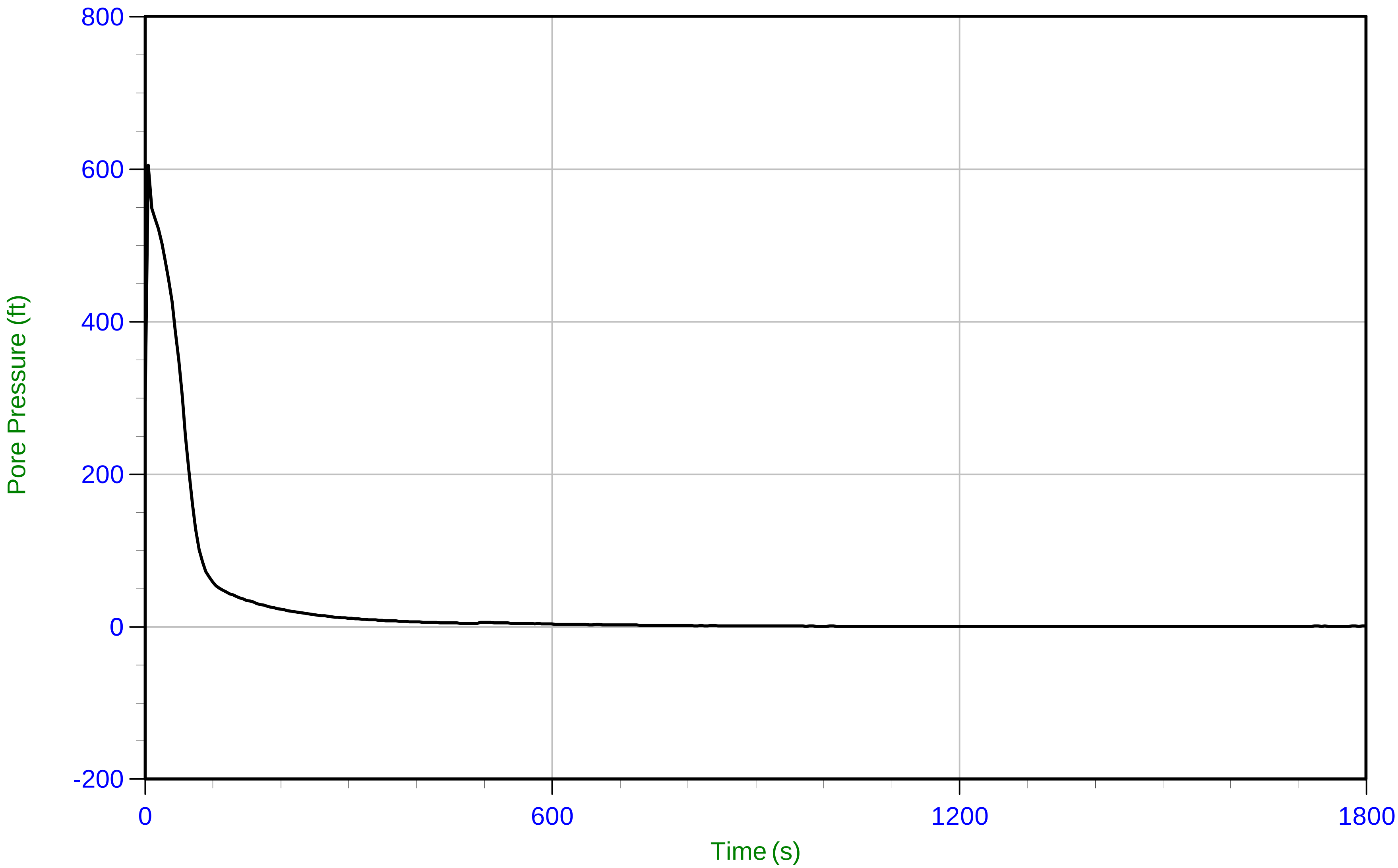
T(50): 2835.5 s
Ir: 100
Ch: 0.2 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 08:50:17
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C008
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP08.PPD
Depth: 10.250 m / 33.628 ft
Duration: 1800.0 s

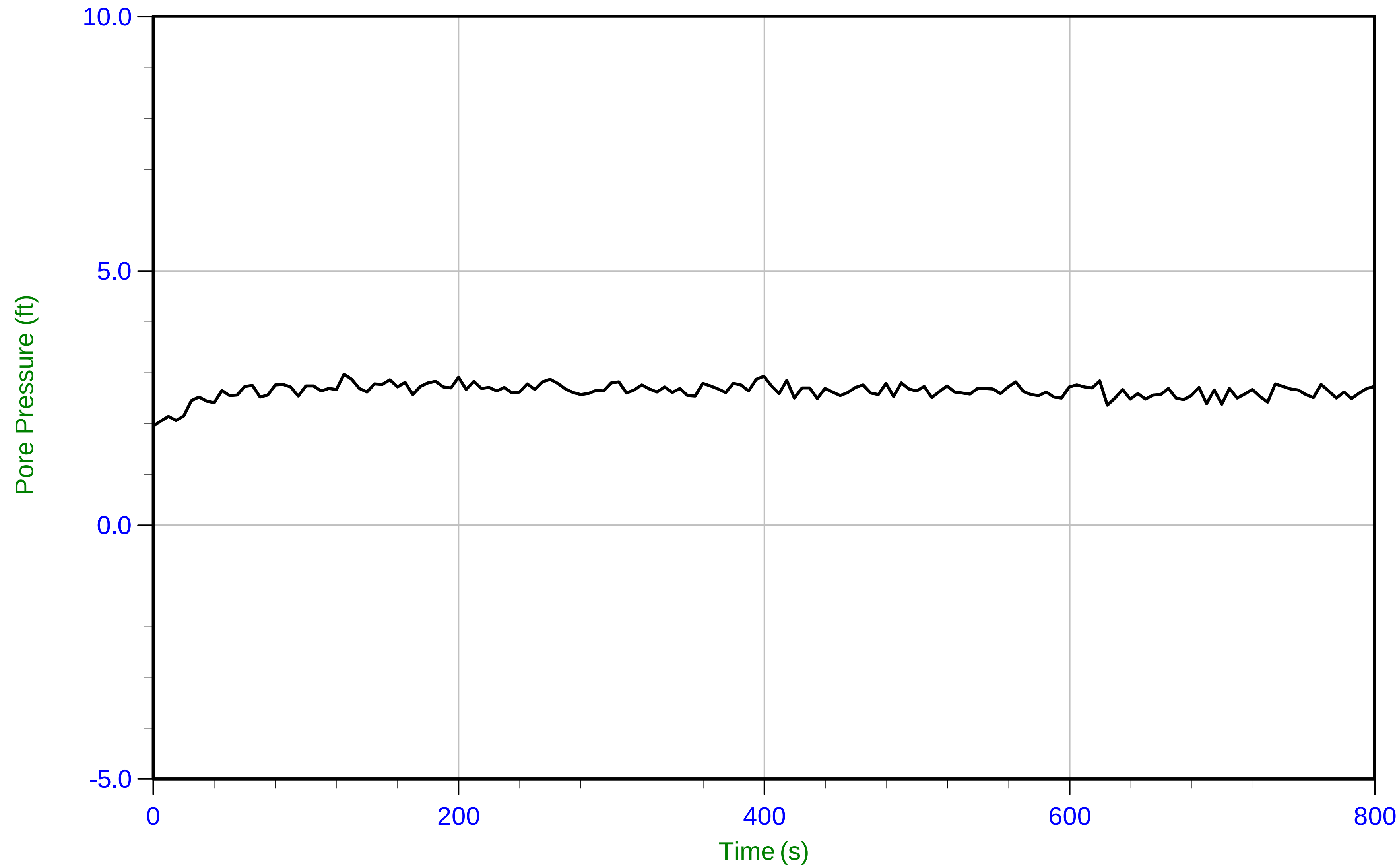
U Min: 0.1 ft
U Max: 605.2 ft

CONETEC

AECOM

Job No: 15-53073
Date: 28-Aug-2015 16:08:12
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C009
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP09.PPD
Depth: 4.900 m / 16.076 ft
Duration: 800.0 s

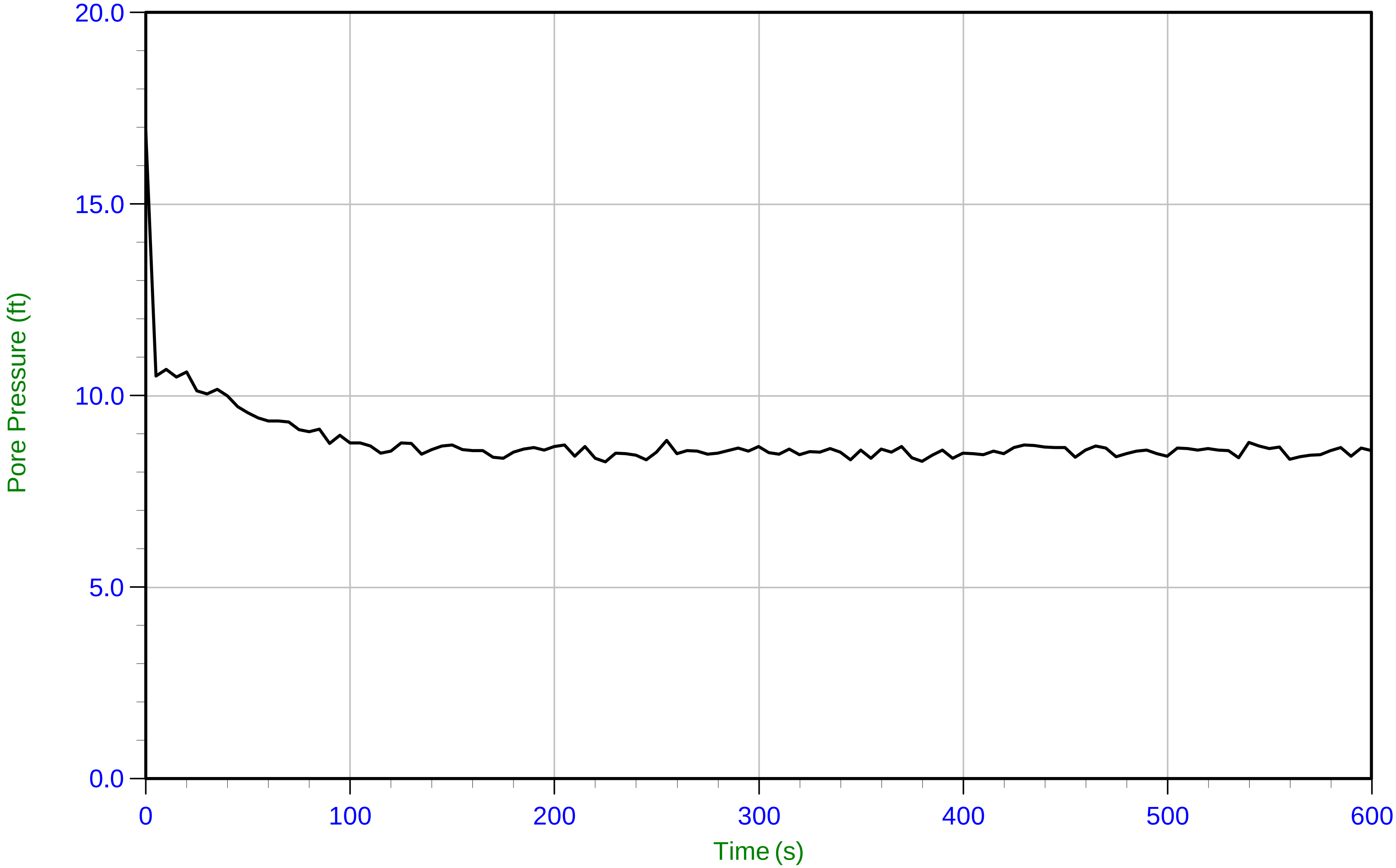
U Min: 1.9 ft
U Max: 3.0 ft

WT: 4.104 m / 13.464 ft
Ueq: 2.6 ft

AECOM

Job No: 15-53073
Date: 28-Aug-2015 16:08:12
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C009
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP09.PPD
Depth: 8.650 m / 28.379 ft
Duration: 600.0 s

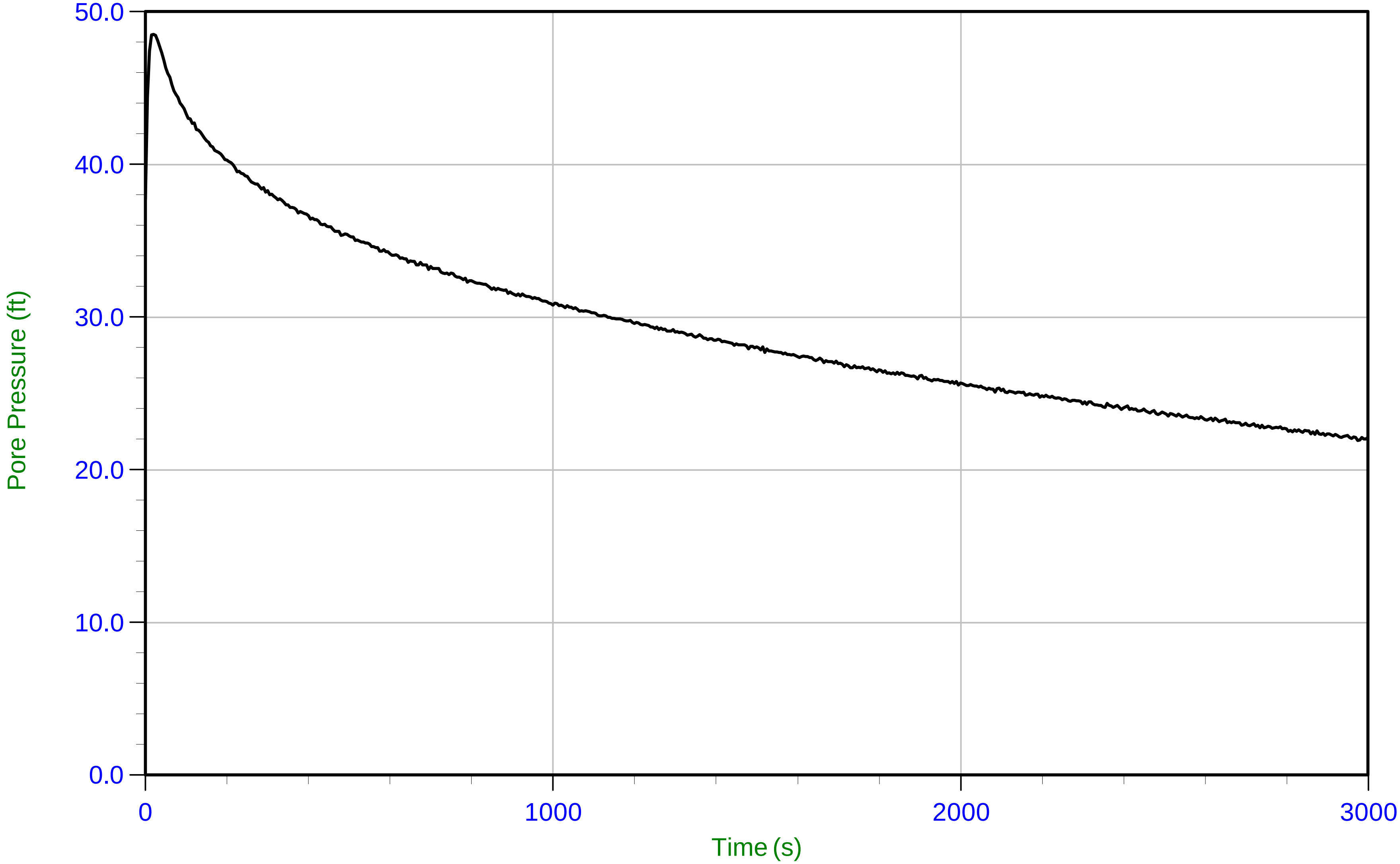
U Min: 8.3 ft
U Max: 16.9 ft

WT: 6.062 m / 19.888 ft
Ueq: 8.5 ft

CONETEC	**AECOM**

Job No: 15-53073
Date: 27-Aug-2015 12:10:38
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C010
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP10.PPD
Depth: 3.700 m / 12.139 ft
Duration: 3000.0 s

U Min: 21.9 ft
U Max: 48.5 ft

WT: 0.674 m / 2.211 ft
Ueq: 9.9 ft
U(50): 29.22 ft

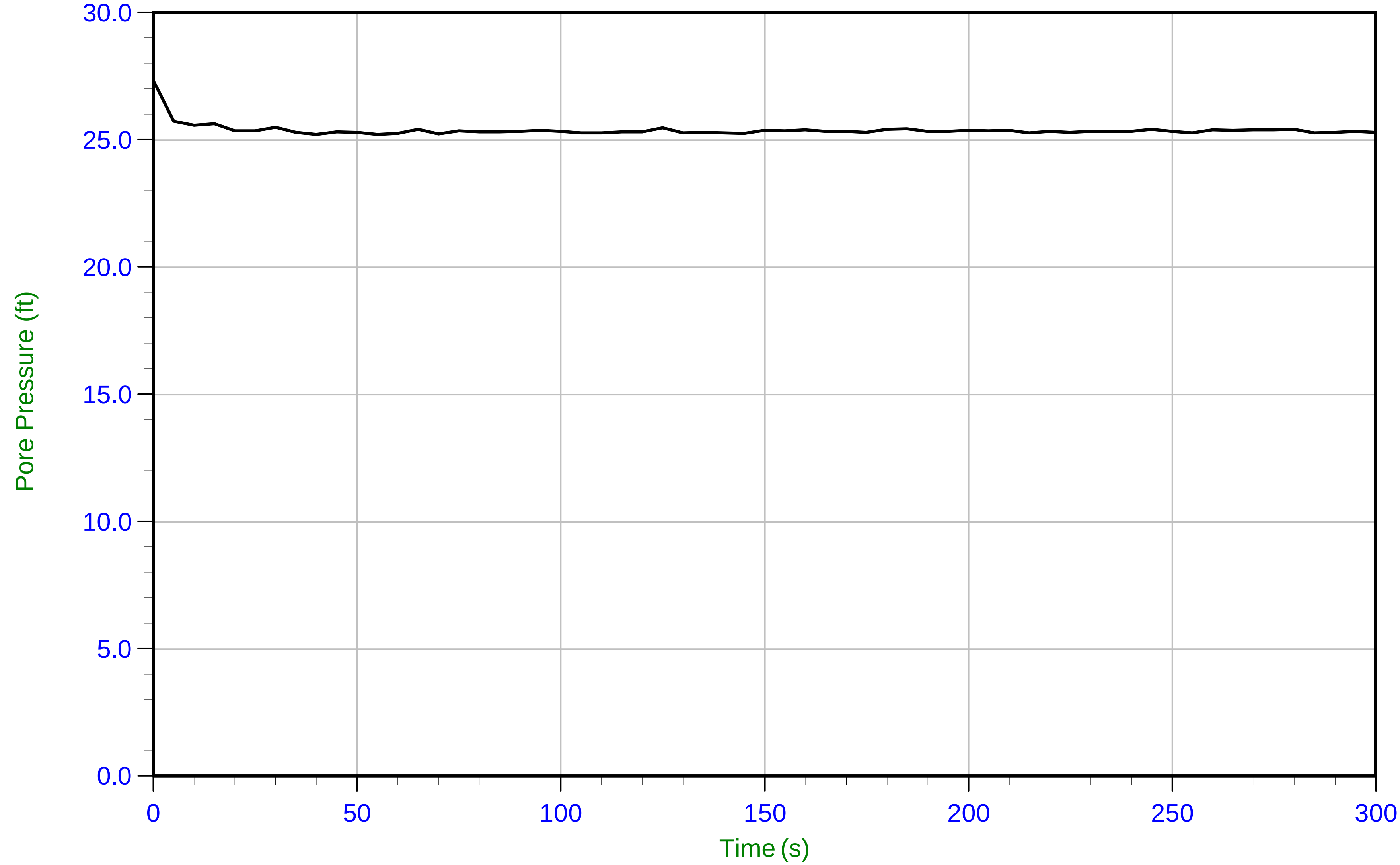
T(50): 1239.4 s
Ir: 100
Ch: 0.6 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 12:10:38
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C010
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP10.PPD
Depth: 8.400 m / 27.559 ft
Duration: 300.0 s

U Min: 25.2 ft
U Max: 27.3 ft

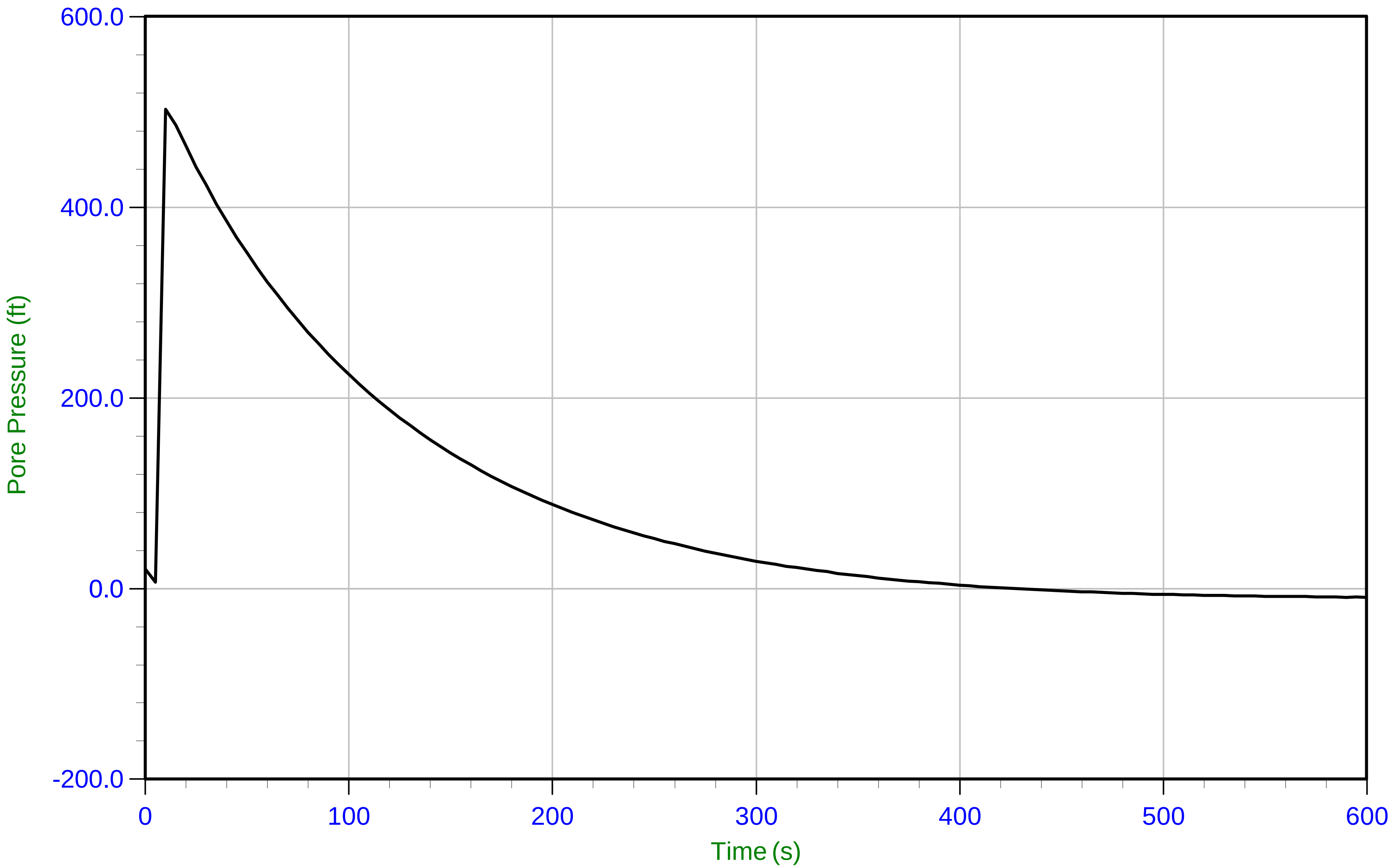
WT: 0.674 m / 2.211 ft
Ueq: 25.3 ft

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 12:10:38
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C010
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP10.PPD
Depth: 9.150 m / 30.019 ft
Duration: 600.0 s

U Min: -9.2 ft
U Max: 502.6 ft

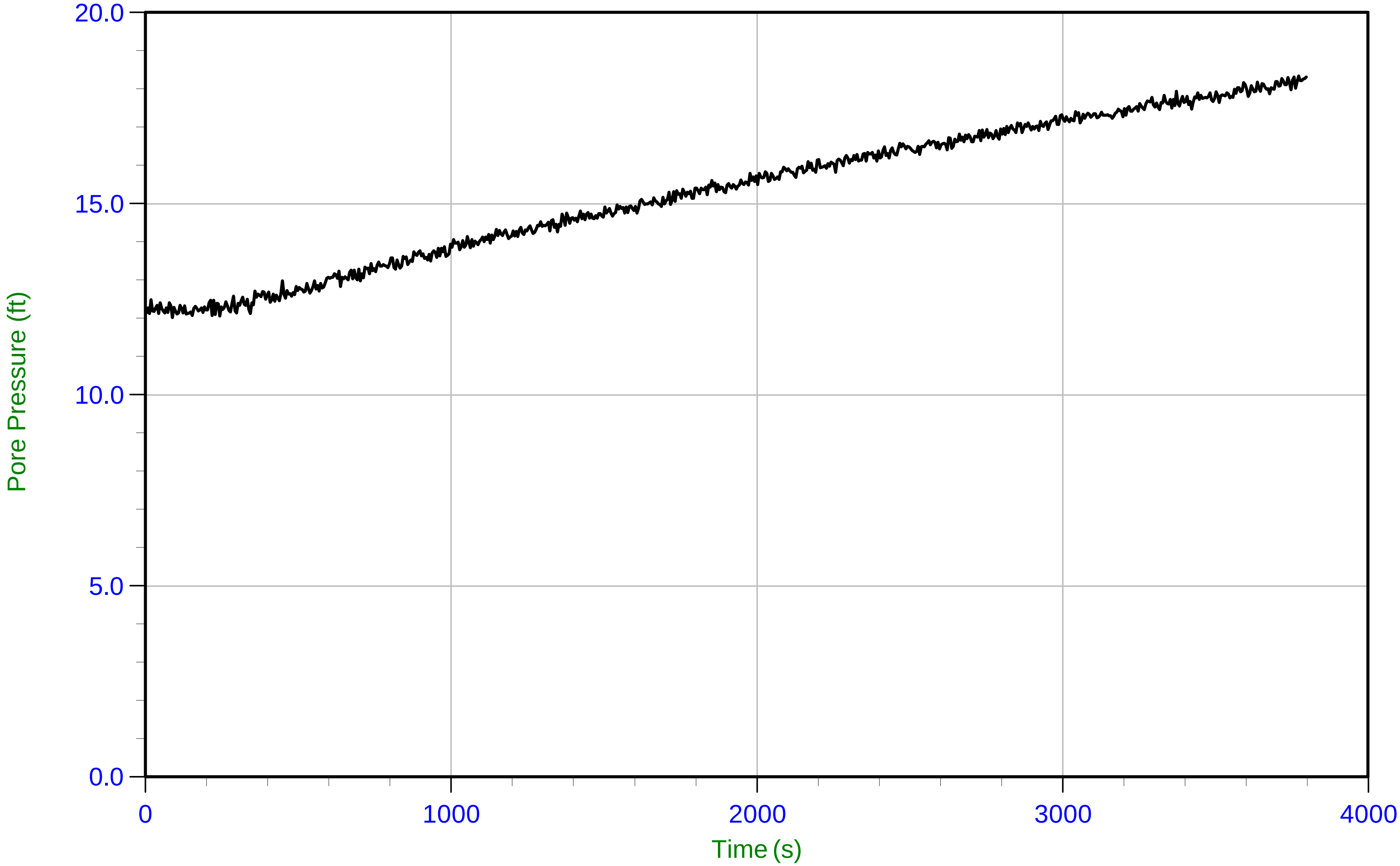
WT: 9.150 m / 30.019 ft
Ueq: 0.0 ft
U(50): 251.28 ft

T(50): 77.5 s
Ir: 100
Ch: 9.1 sq cm/min

AECOM

Job No: 15-53073
Date: 28-Aug-2015 10:19:26
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C011
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP11.PPD
Depth: 7.350 m / 24.114 ft
Duration: 3800.0 s

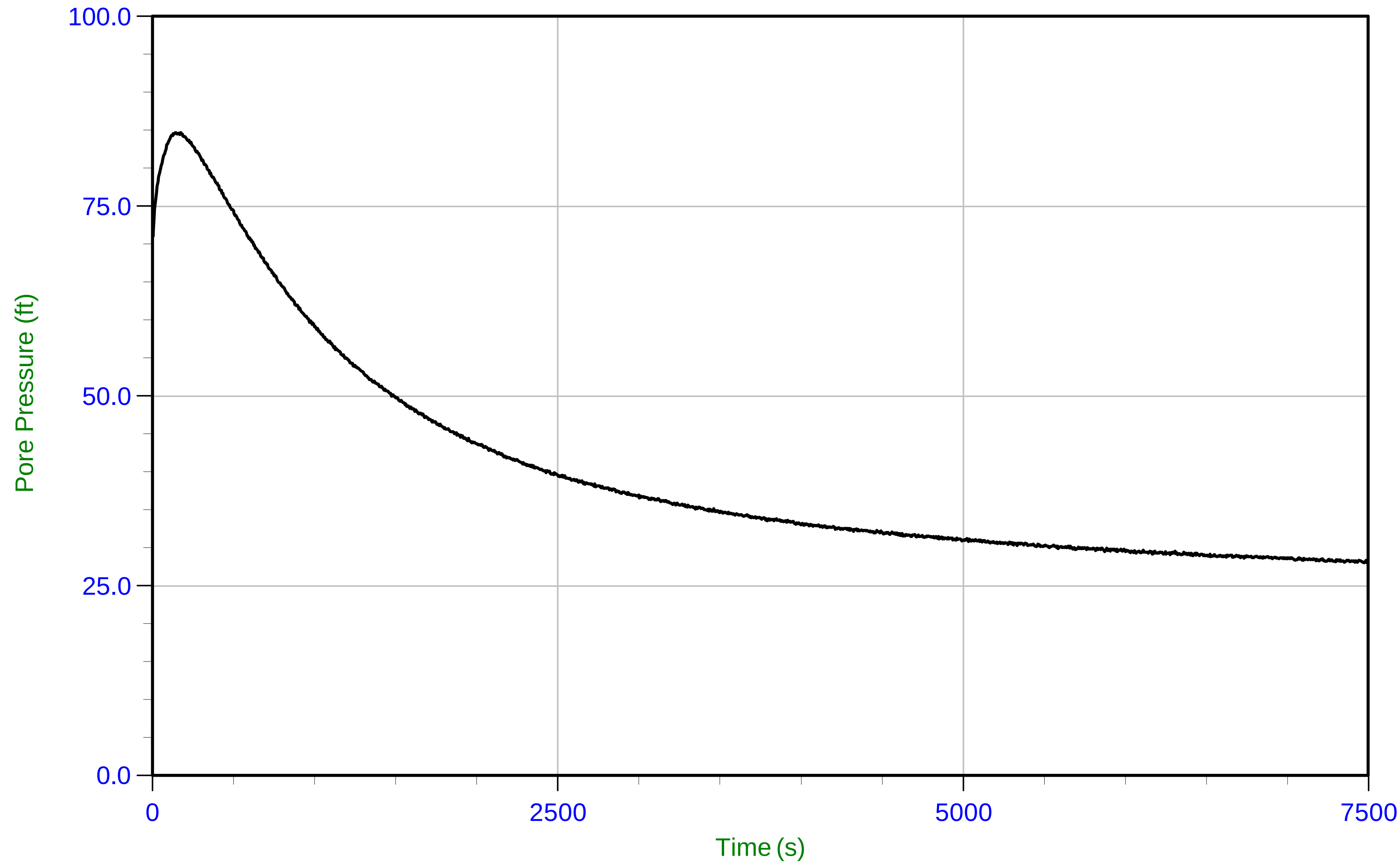
U Min: 12.0 ft
U Max: 18.3 ft

CONETEC

AECOM

Job No: 15-53073
Date: 28-Aug-2015 10:19:26
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C011
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP11.PPD
Depth: 14.150 m / 46.423 ft
Duration: 7500.0 s

U Min: 28.0 ft
U Max: 84.7 ft

WT: 6.848 m / 22.467 ft
Ueq: 24.0 ft
U(50): 54.34 ft

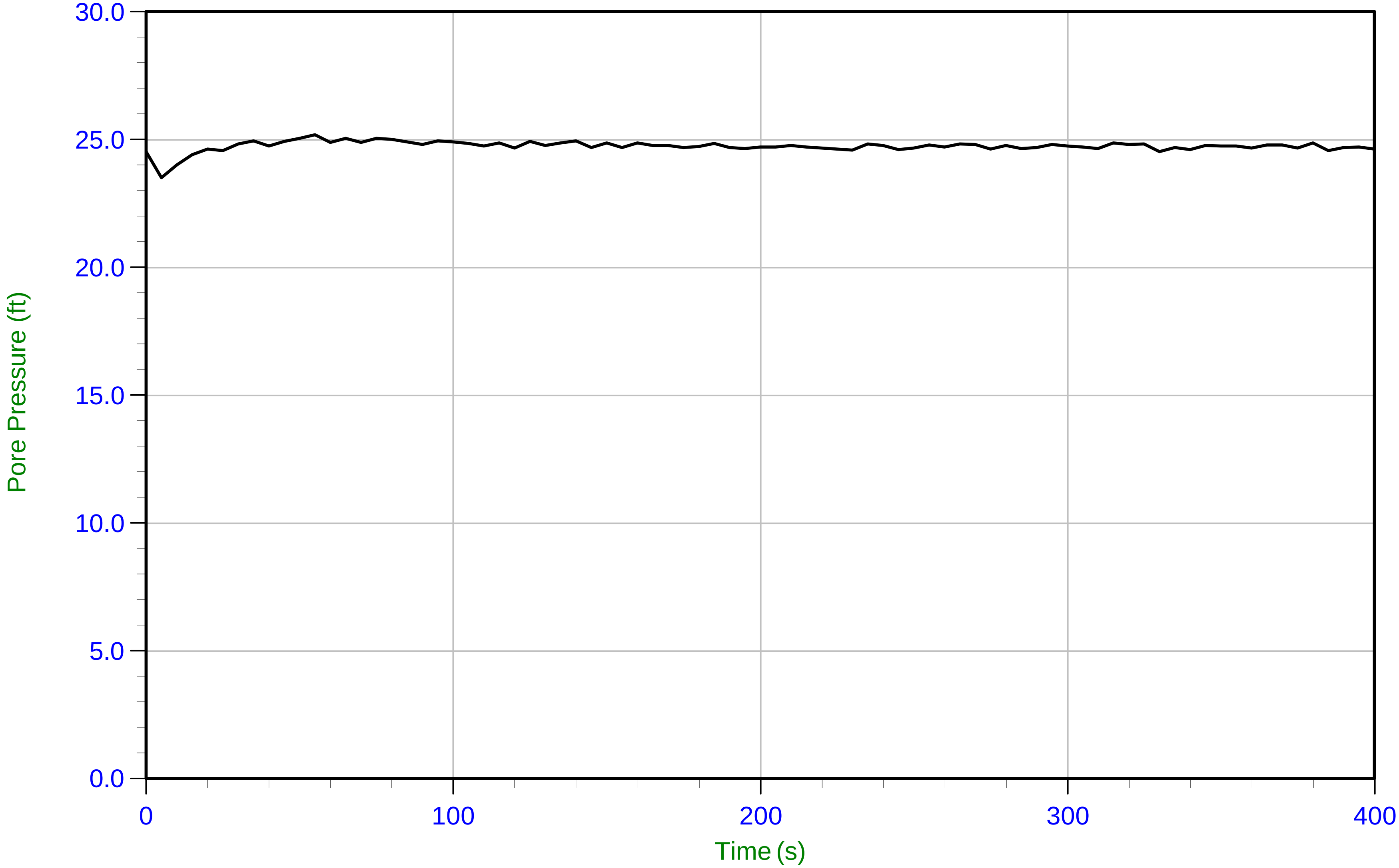
T(50): 1082.1 s
Ir: 100
Ch: 0.6 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 28-Aug-2015 10:19:26
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C011
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP11.PPD
Depth: 14.350 m / 47.079 ft
Duration: 400.0 s

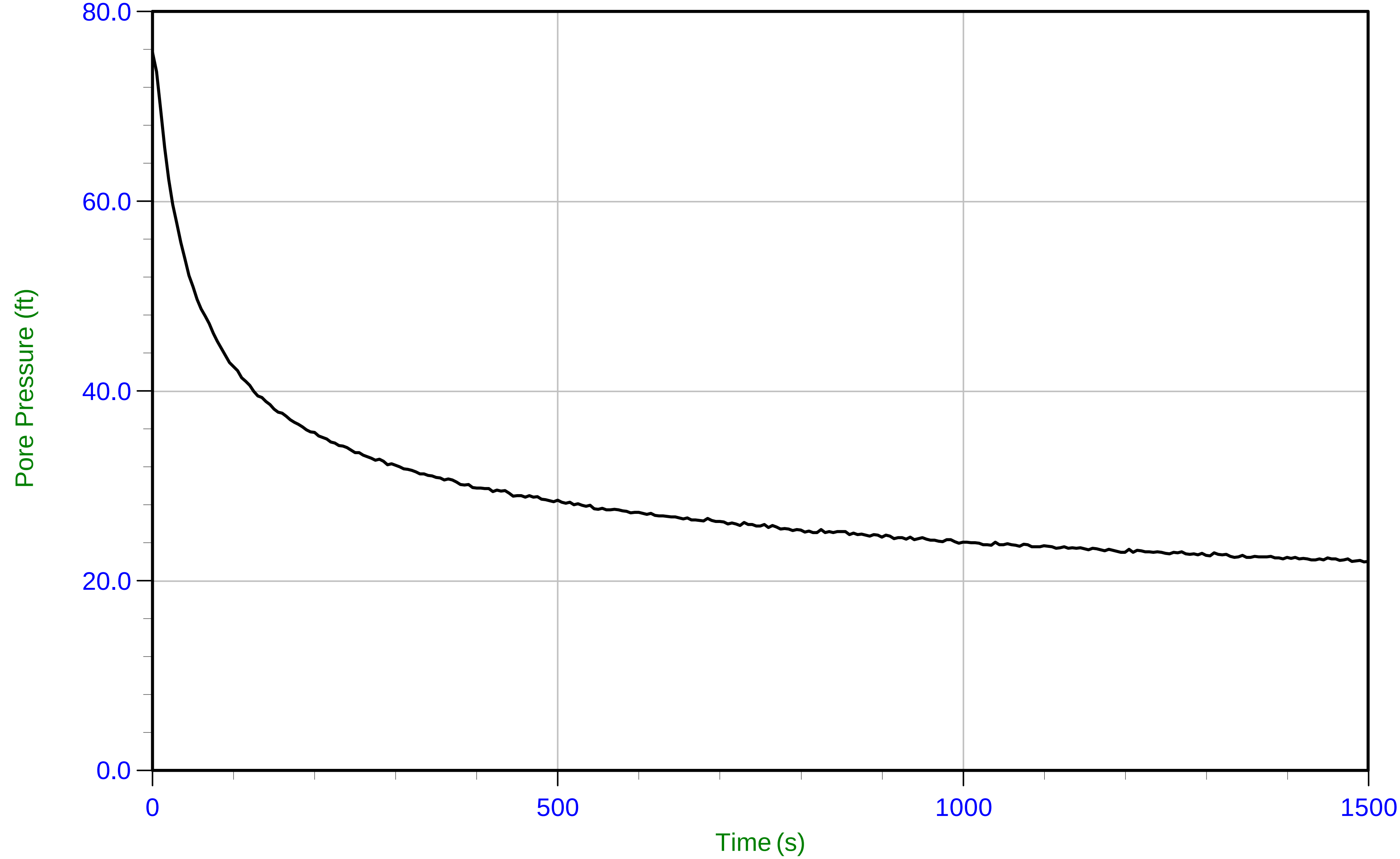
U Min: 23.5 ft
U Max: 25.2 ft

WT: 6.848 m / 22.467 ft
Ueq: 24.6 ft

ConeTec | AECOM

Job No: 15-53073
Date: 28-Aug-2015 14:27:24
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C012
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

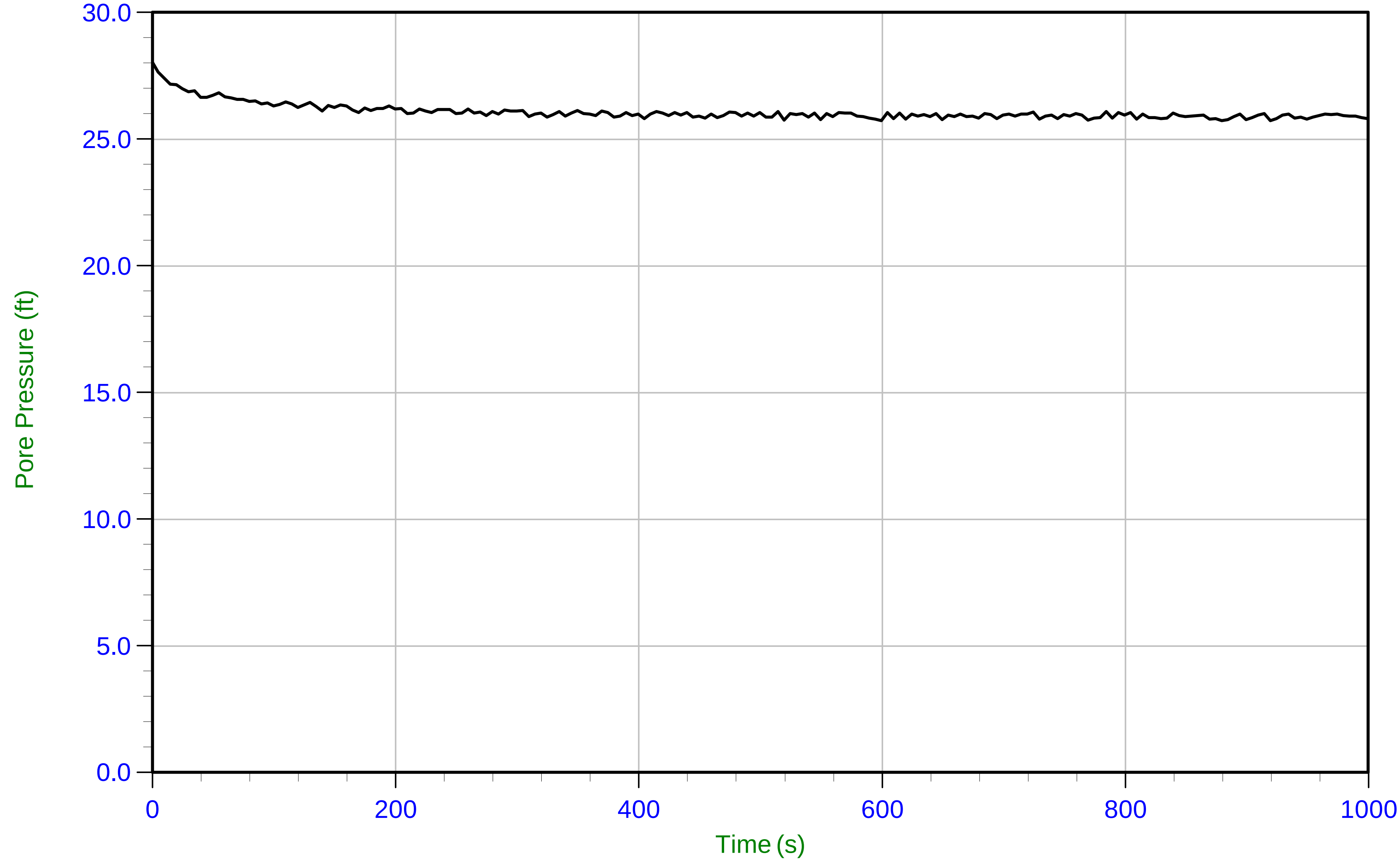
Filename: 15-53073_SP12.PPD
Depth: 8.800 m / 28.871 ft
Duration: 1500.0 s

U Min: 22.0 ft
U Max: 75.7 ft

WT: 7.108 m / 23.320 ft
Ueq: 5.6 ft
U(50): 40.63 ft

T(50): 119.8 s
Ir: 100
Ch: 5.9 sq cm/min

CONETEC	AECOM	Job No: 15-53073 Date: 28-Aug-2015 14:27:24 Site: Edwards Power Station, Peoria, Il	Sounding: EDW-C012 Cone: AD340 Cone Area: 15 sq cm



Trace Summary:

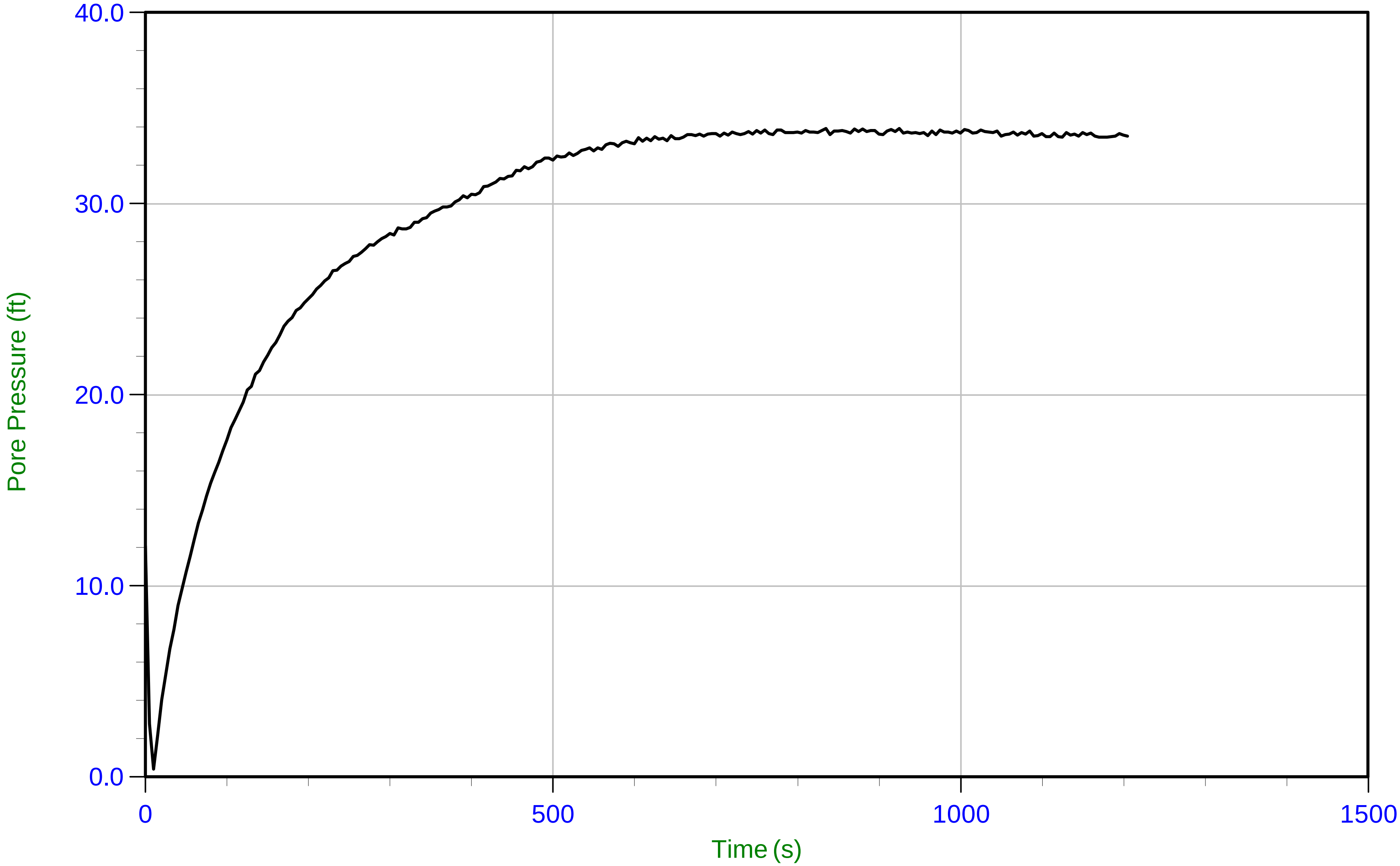
Filename: 15-53073_SP12.PPD	U Min: 25.7 ft	WT: 7.108 m / 23.320 ft
Depth: 14.950 m / 49.048 ft	U Max: 28.0 ft	Ueq: 25.7 ft
Duration: 1000.0 s		

CONETEC

AECOM

Job No: 15-53073
Date: 28-Aug-2015 08:45:02
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C013
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP13.PPD
Depth: 17.150 m / 56.266 ft
Duration: 1205.0 s

U Min: 0.4 ft
U Max: 33.9 ft

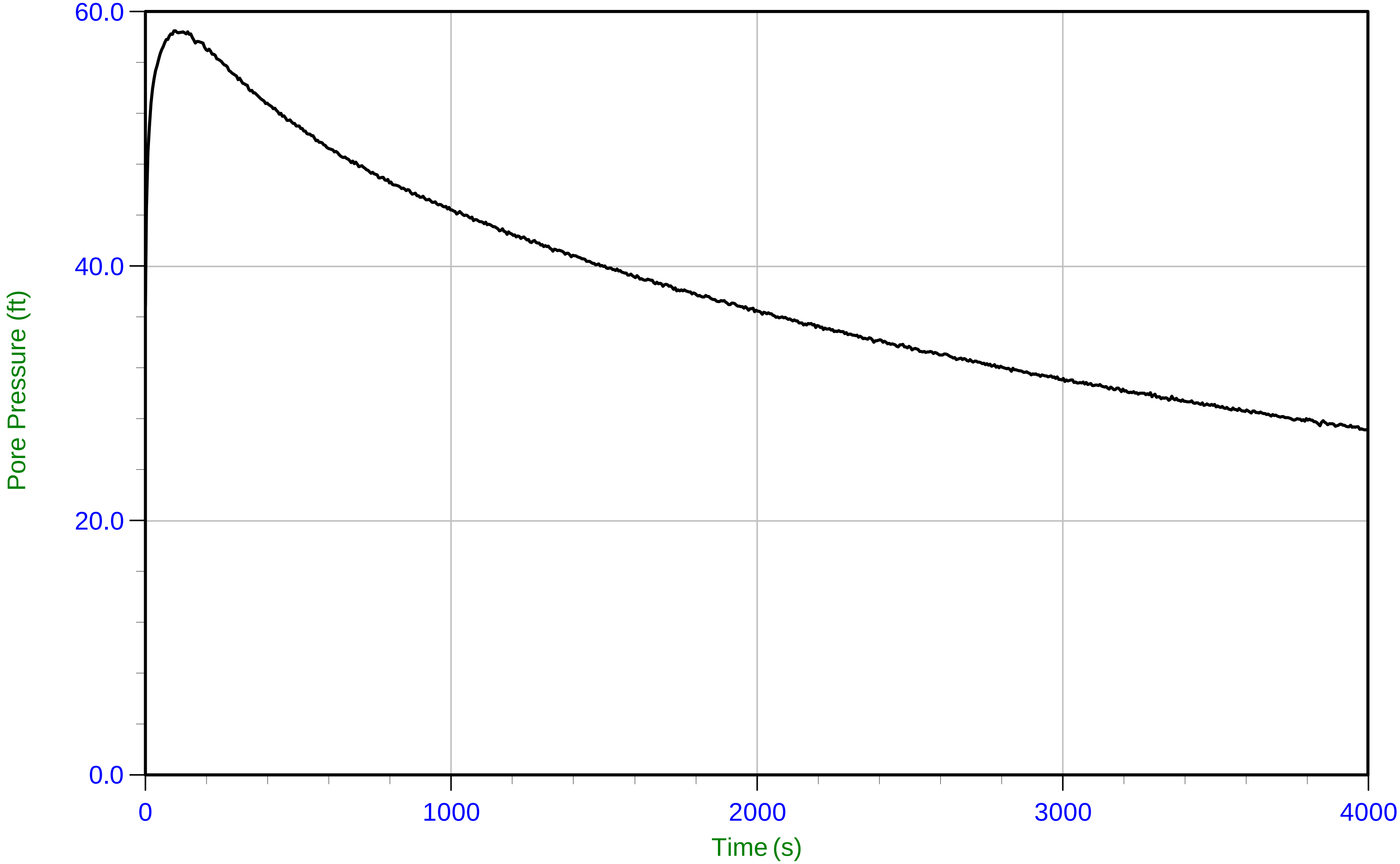
WT: 6.905 m / 22.654 ft
Ueq: 33.6 ft

ConeTec

AECOM

Job No: 15-53073
Date: 27-Aug-2015 14:29:59
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C014
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

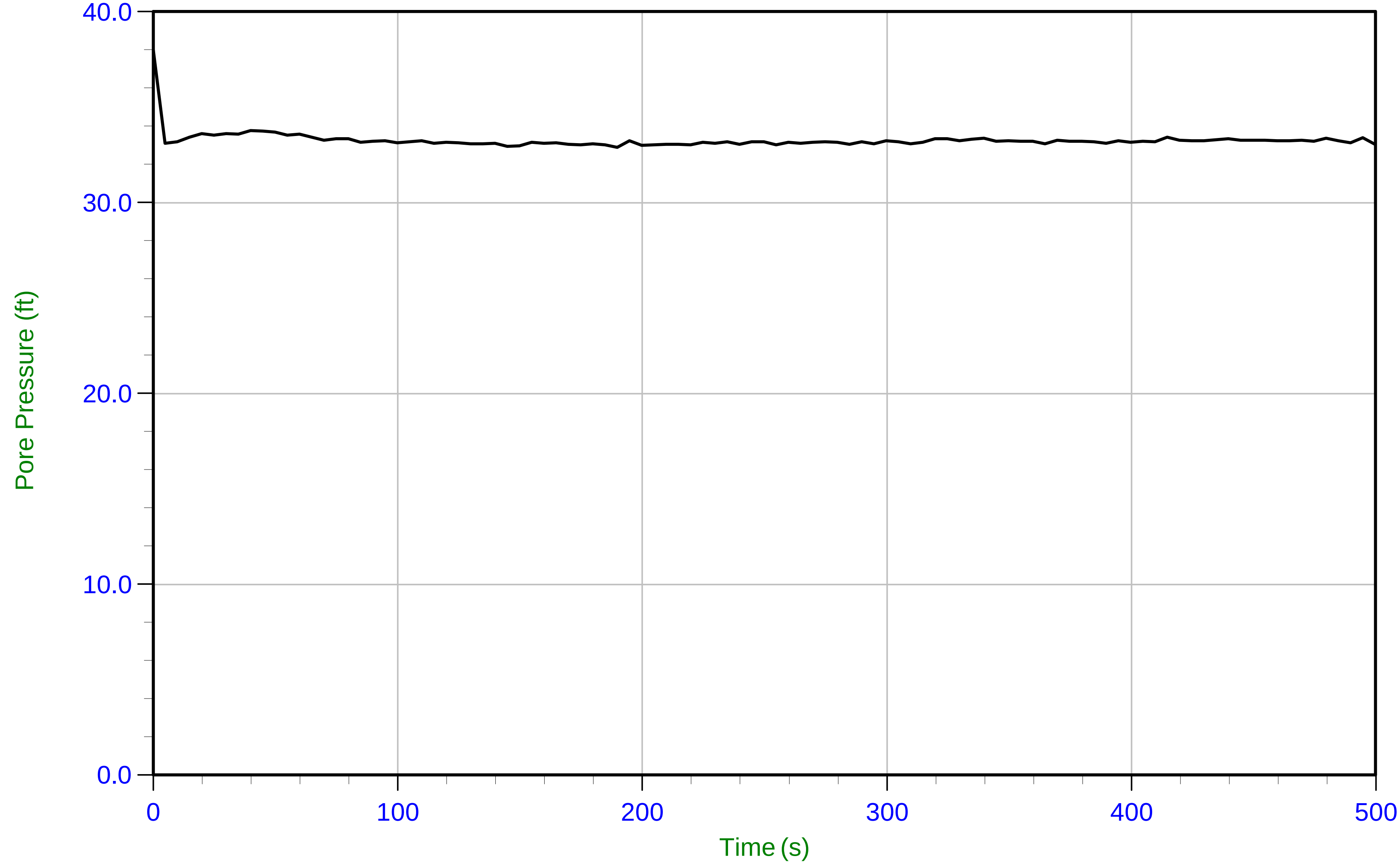
Filename: 15-53073_CP14.PPD
Depth: 4.900 m / 16.076 ft
Duration: 4000.0 s

U Min: 27.1 ft
U Max: 58.5 ft

WT: 1.498 m / 4.915 ft
Ueq: 11.2 ft
U(50): 34.84 ft

T(50): 2190.4 s
Ir: 100
Ch: 0.3 sq cm/min

AECOM	Job No: 15-53073	Sounding: EDW-C014
	Date: 27-Aug-2015 14:29:59	Cone: 374
	Site: Edwards Power Station, Peoria, IL	Cone Area: 15 sq cm



Trace Summary:

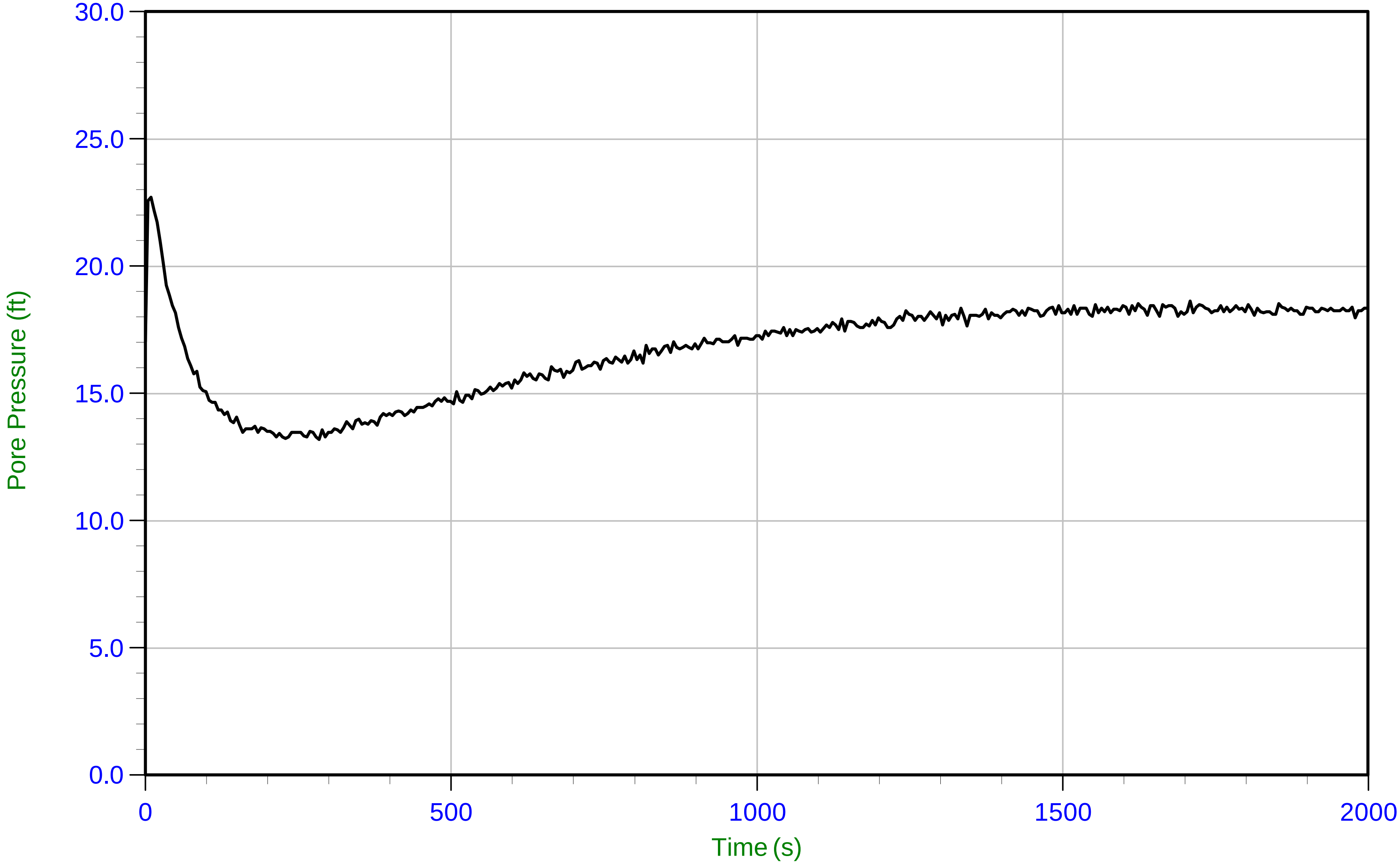
Filename: 15-53073_CP14.PPD	U Min: 32.9 ft	WT: 1.498 m / 4.915 ft
Depth: 11.650 m / 38.221 ft	U Max: 38.0 ft	Ueq: 33.3 ft
Duration: 500.0 s		

CONETEC

AECOM

Job No: 15-53073
Date: 19-Aug-2015 14:12:51
Site: Edwards Power Station

Sounding: EDW-C015A
Cone: 335
Cone Area: 15 sq cm

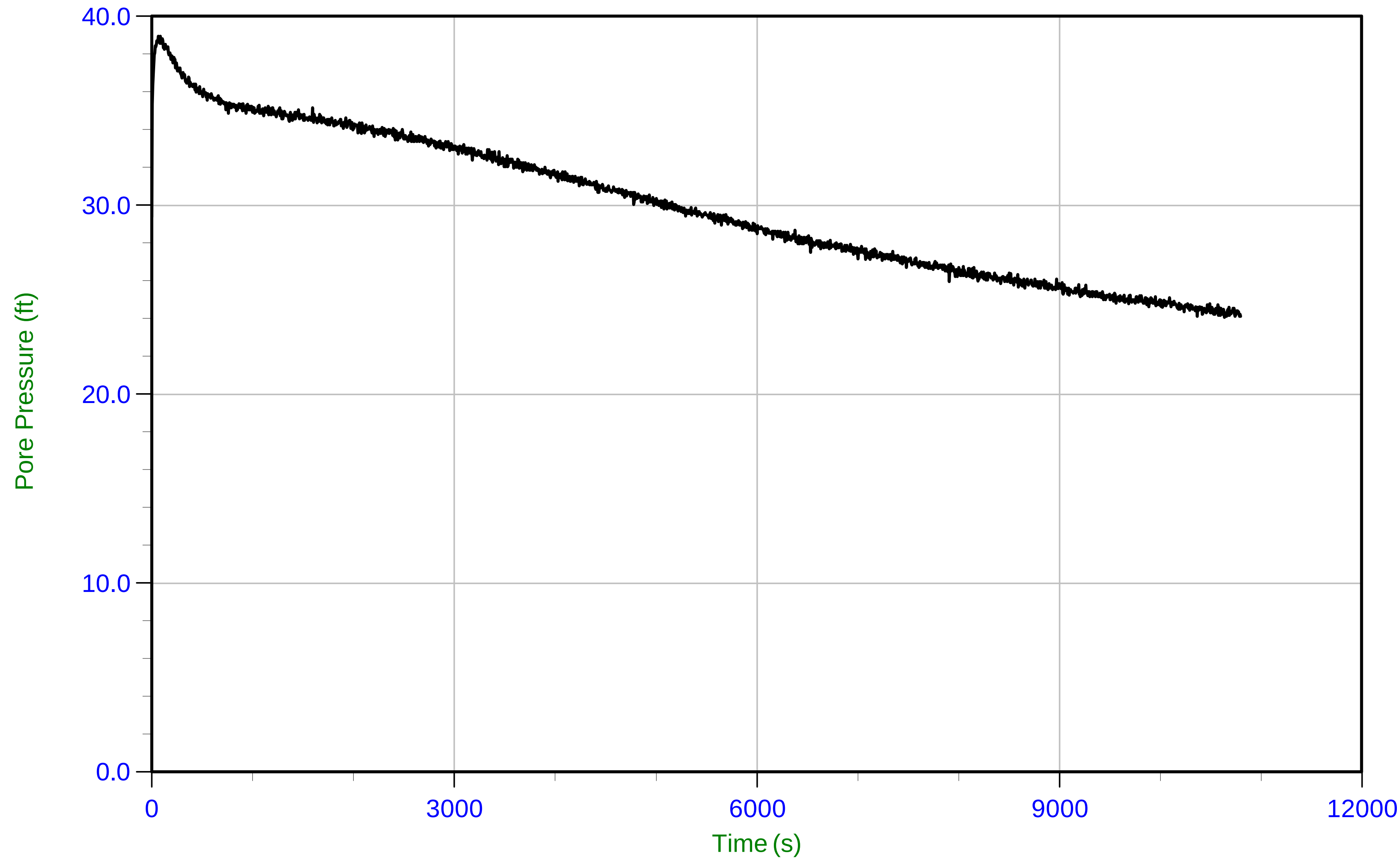


Trace Summary:

Filename: 15-53073_SP15A.PPD
Depth: 4.600 m / 15.092 ft
Duration: 2000.0 s

U Min: 13.2 ft
U Max: 22.7 ft

AECOM	Job No: 15-53073	Sounding: EDW-C015A
	Date: 19-Aug-2015 14:12:51	Cone: 335
	Site: Edwards Power Station	Cone Area: 15 sq cm



Trace Summary:

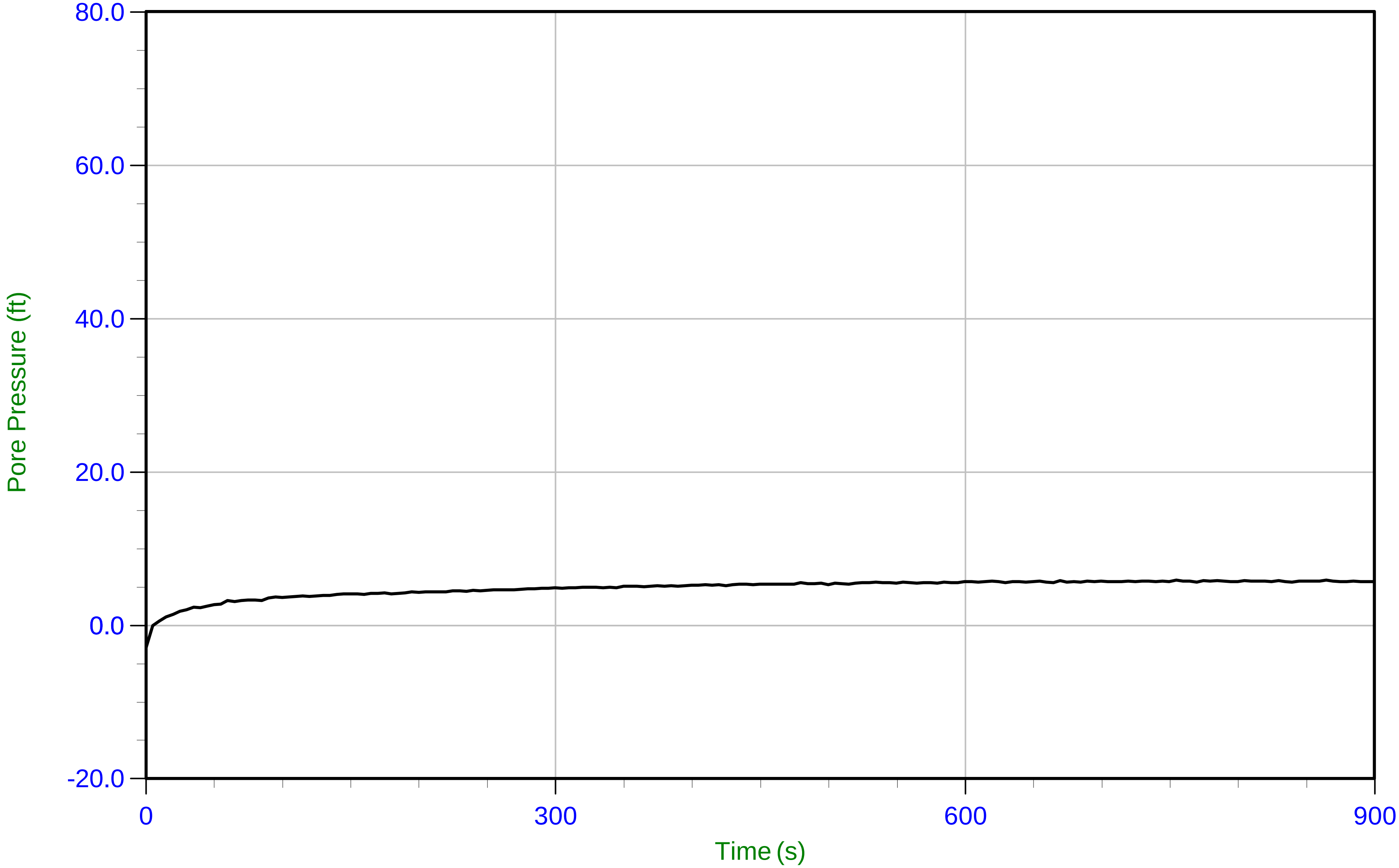
Filename: 15-53073_SP15A.PPD	U Min: 24.1 ft	WT: 3.658 m / 12.001 ft	T(50): 6094.6 s
Depth: 9.000 m / 29.527 ft	U Max: 39.0 ft	Ueq: 17.5 ft	Ir: 100
Duration: 10800.0 s		U(50): 28.24 ft	Ch: 0.1 sq cm/min

ConeTec

AECOM

Job No: 15-53073
Date: 28-Aug-2015 08:46:01
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C016
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP16.PPD
Depth: 2.250 m / 7.382 ft
Duration: 900.0 s

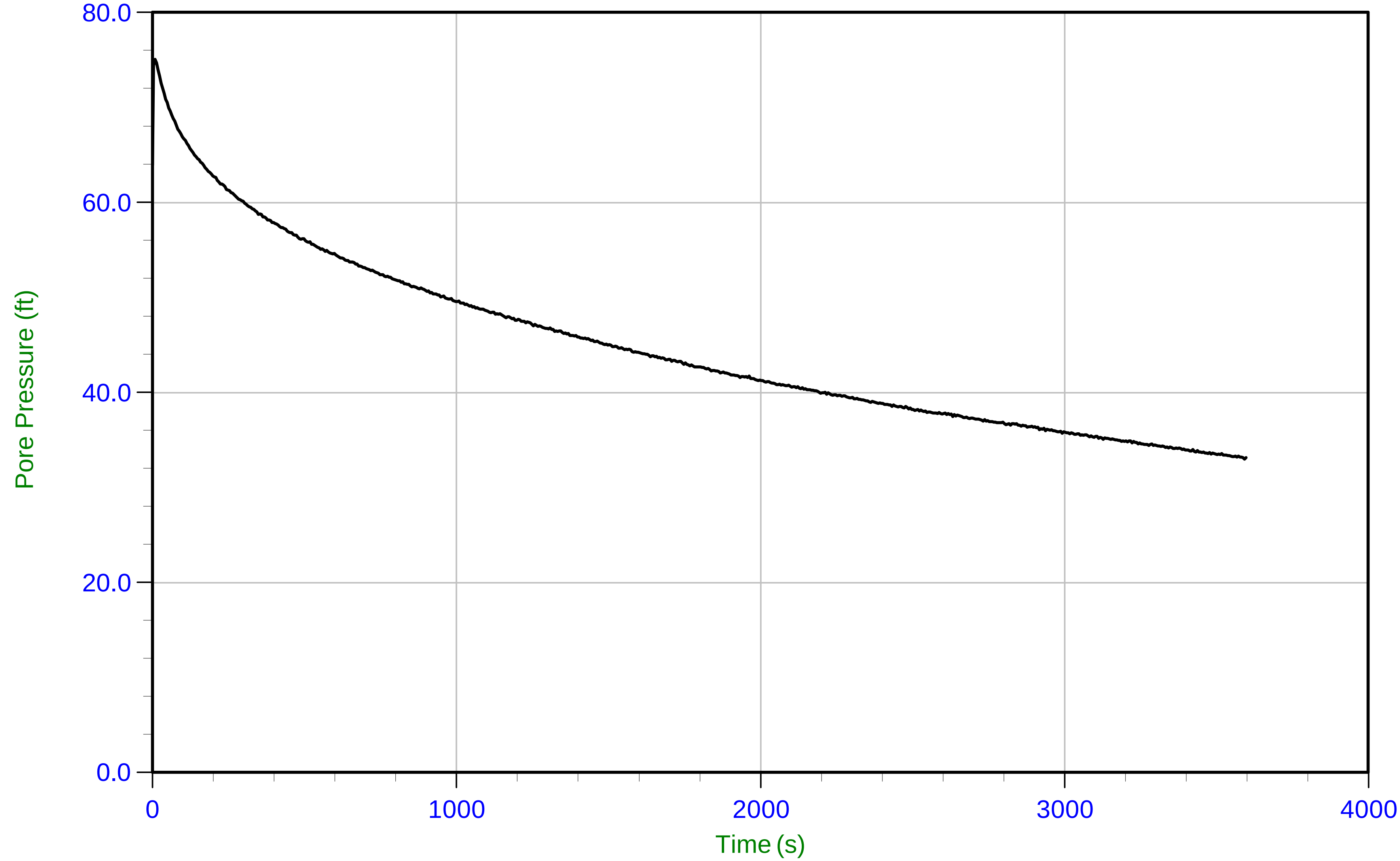
U Min: -2.9 ft
U Max: 5.9 ft

ConeTec

AECOM

Job No: 15-53073
Date: 28-Aug-2015 08:46:01
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C016
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP16.PPD
Depth: 5.500 m / 18.044 ft
Duration: 3600.0 s

U Min: 33.0 ft
U Max: 75.1 ft

WT: 1.173 m / 3.848 ft
Ueq: 14.2 ft
U(50): 44.64 ft

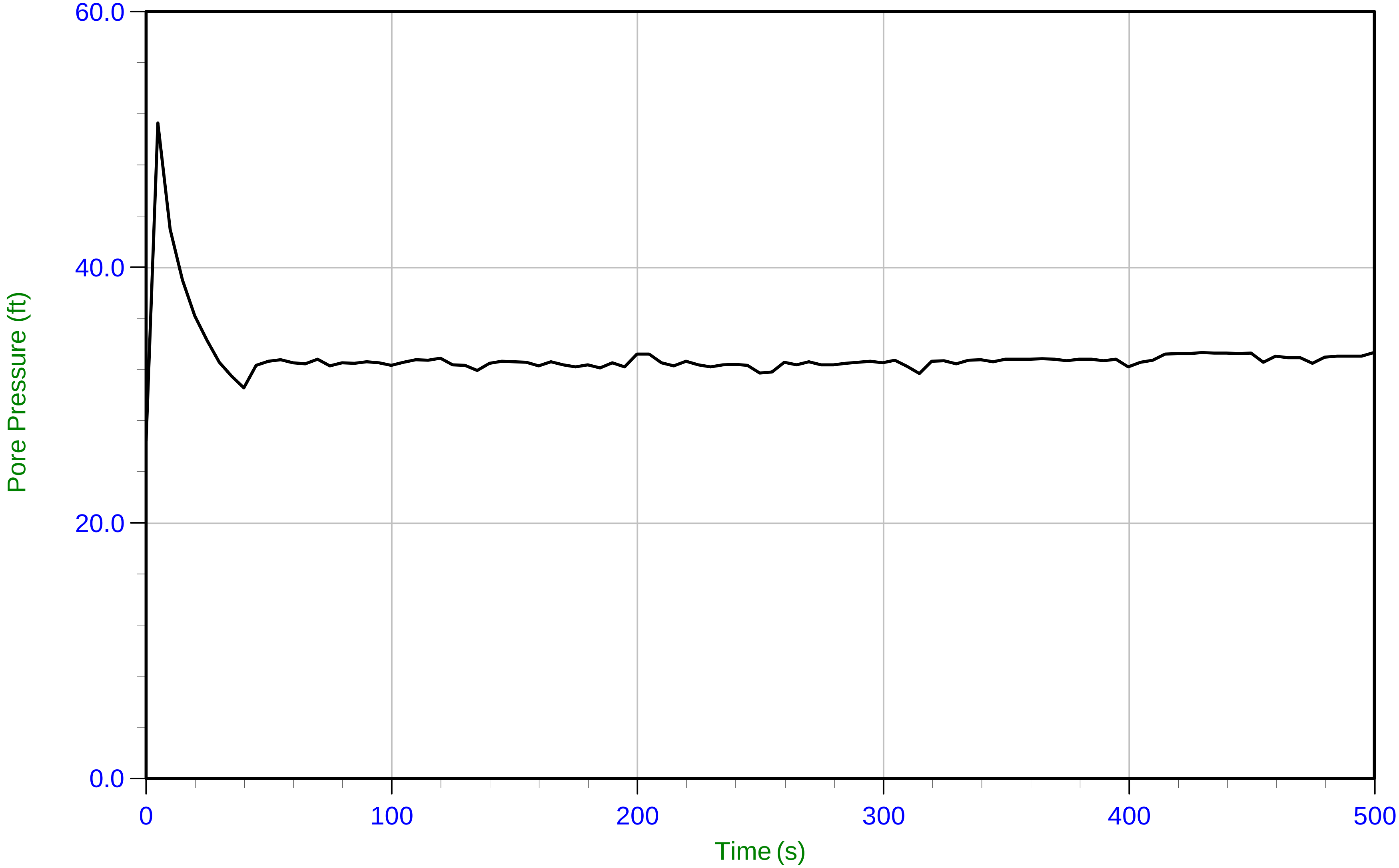
T(50): 1538.2 s
Ir: 100
Ch: 0.5 sq cm/min

ConeTec

AECOM

Job No: 15-53073
Date: 28-Aug-2015 08:46:01
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C016
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

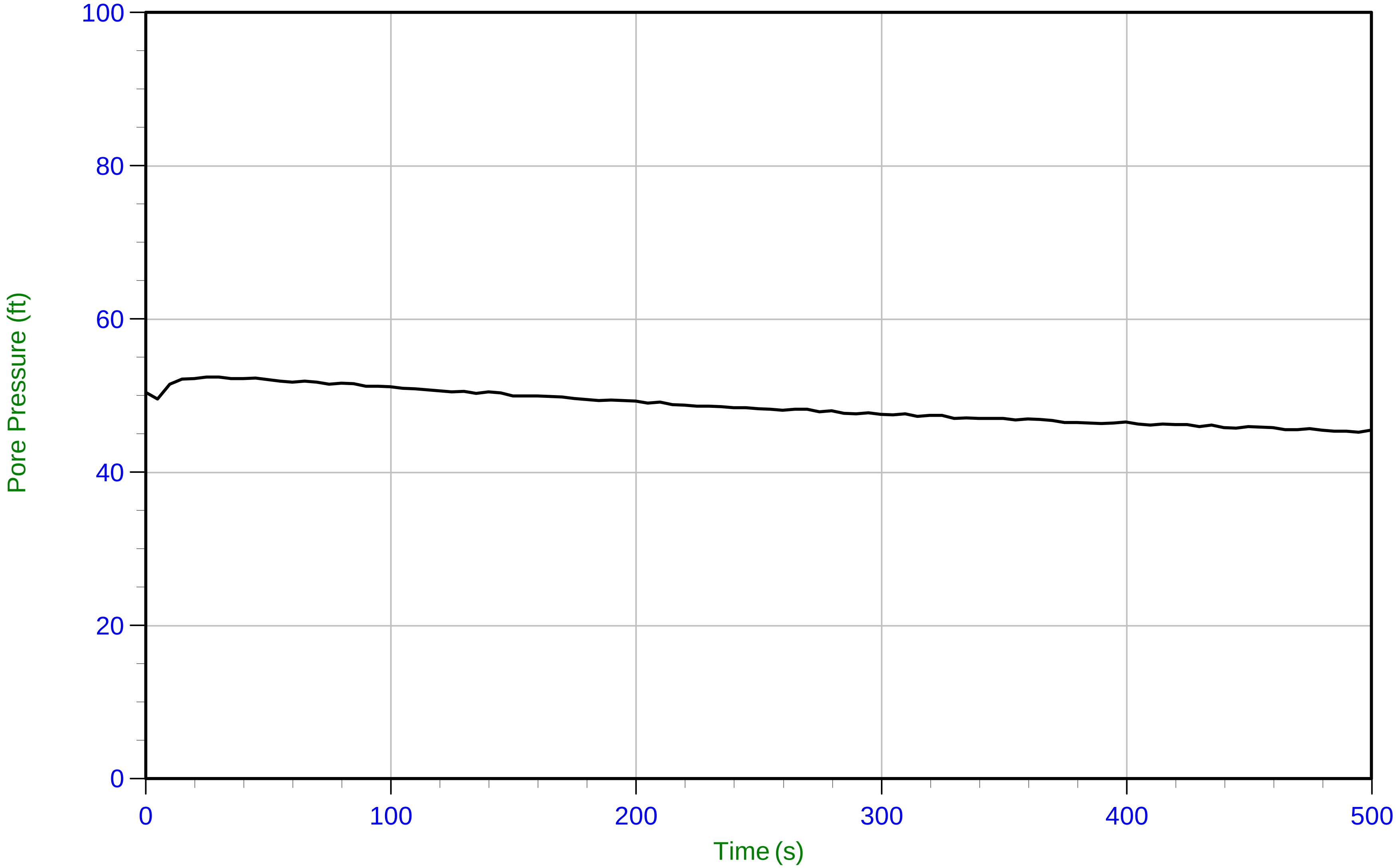
Filename: 15-53073_CP16.PPD
Depth: 11.250 m / 36.909 ft
Duration: 500.0 s

U Min: 26.4 ft
U Max: 51.3 ft

WT: 1.173 m / 3.848 ft
Ueq: 33.1 ft

ConeTec

AECOM	Job No: 15-53073	Sounding: EDW-C017
	Date: 27-Aug-2015 11:13:32	Cone: AD340
	Site: Edwards Power Station, Peoria, Il	Cone Area: 15 sq cm



Trace Summary:

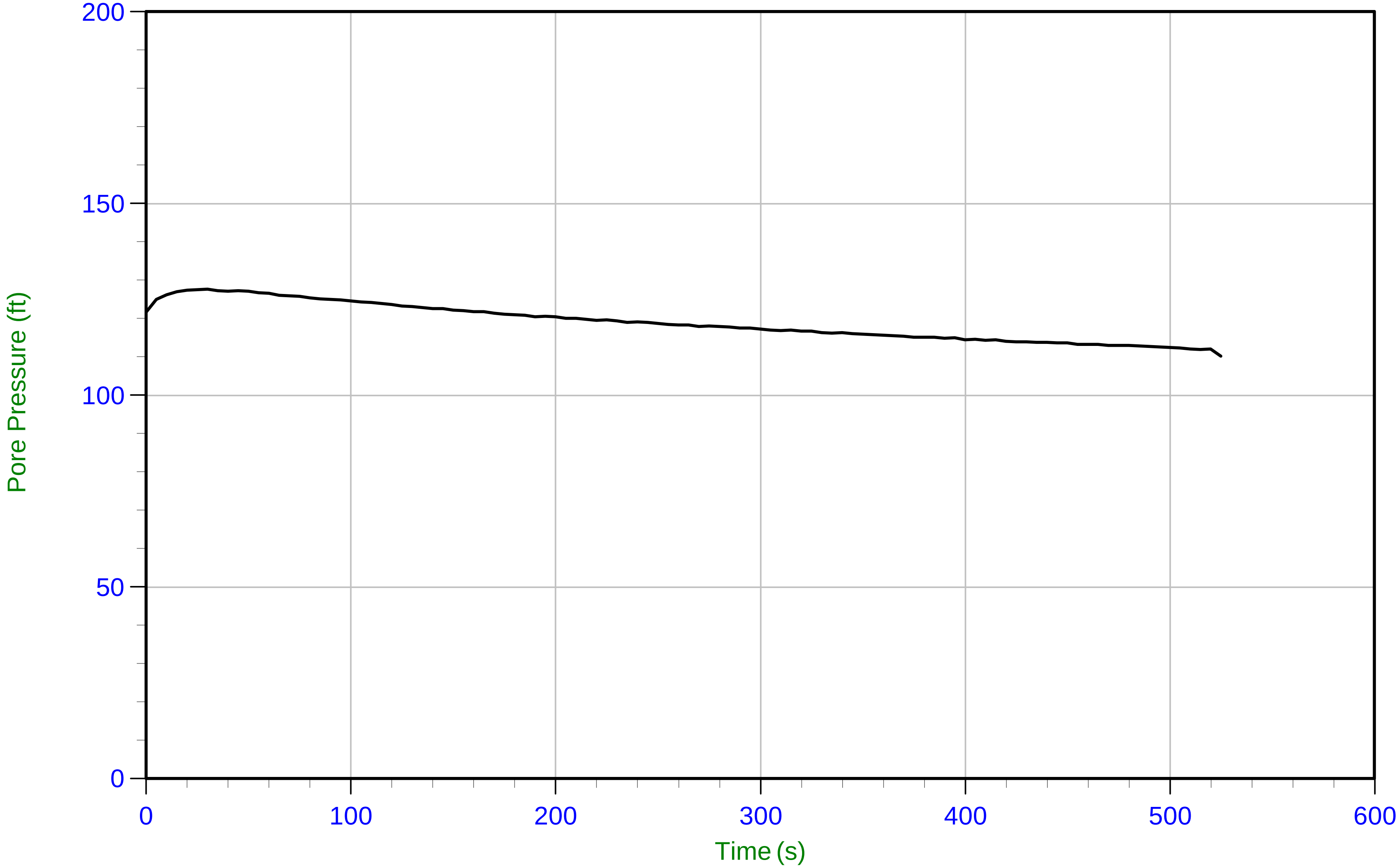
Filename: 15-53073_SP17.PPD	U Min: 45.3 ft
Depth: 8.500 m / 27.887 ft	U Max: 52.5 ft
Duration: 500.0 s	

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 11:13:32
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C017
Cone: AD340
Cone Area: 15 sq cm

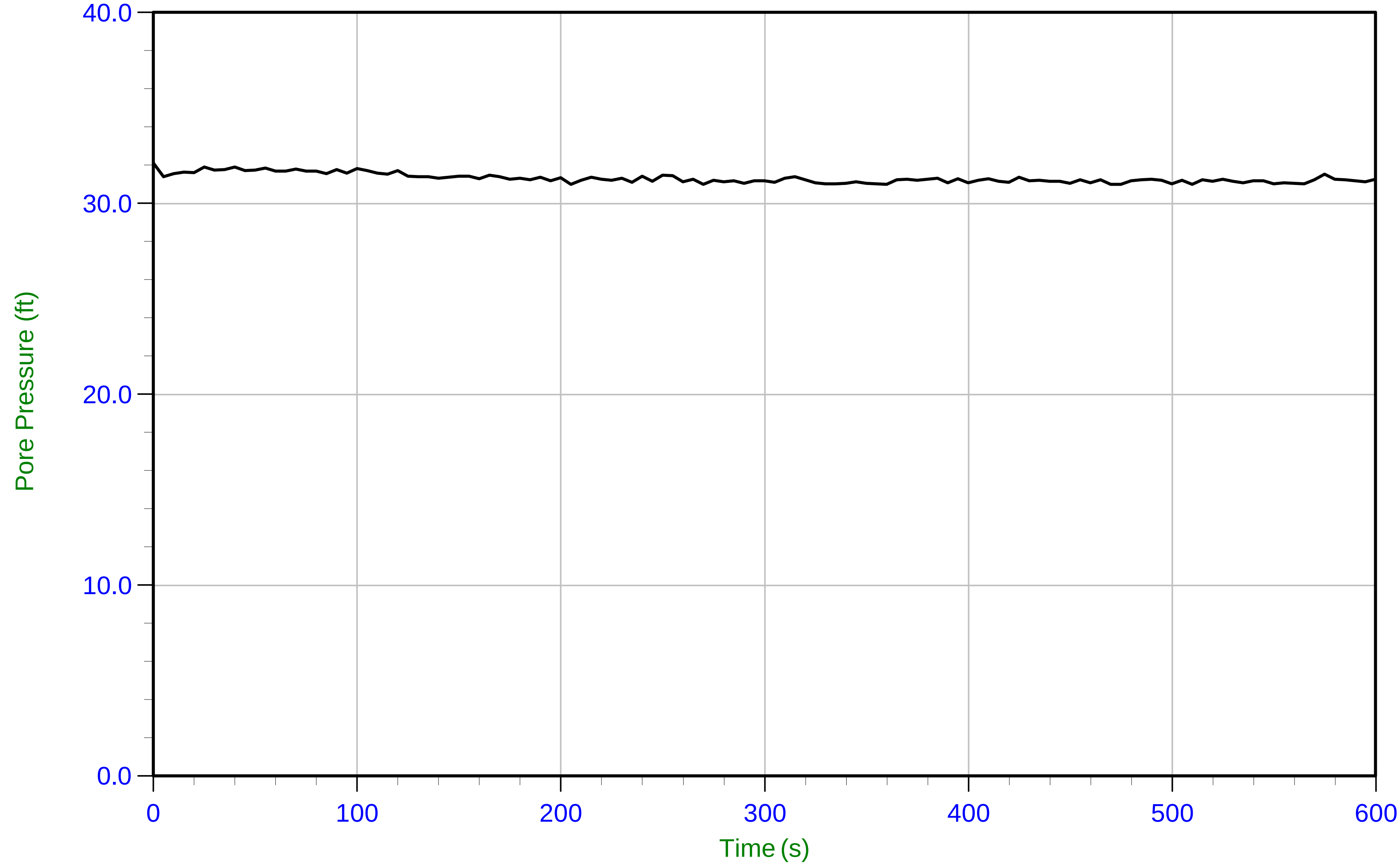


Trace Summary:

Filename: 15-53073_SP17.PPD
Depth: 12.350 m / 40.518 ft
Duration: 525.0 s

U Min: 110.3 ft
U Max: 127.7 ft

AECOM	Job No: 15-53073 Date: 27-Aug-2015 11:13:32 Site: Edwards Power Station, Peoria, Il	Sounding: EDW-C017 Cone: AD340 Cone Area: 15 sq cm



Trace Summary:

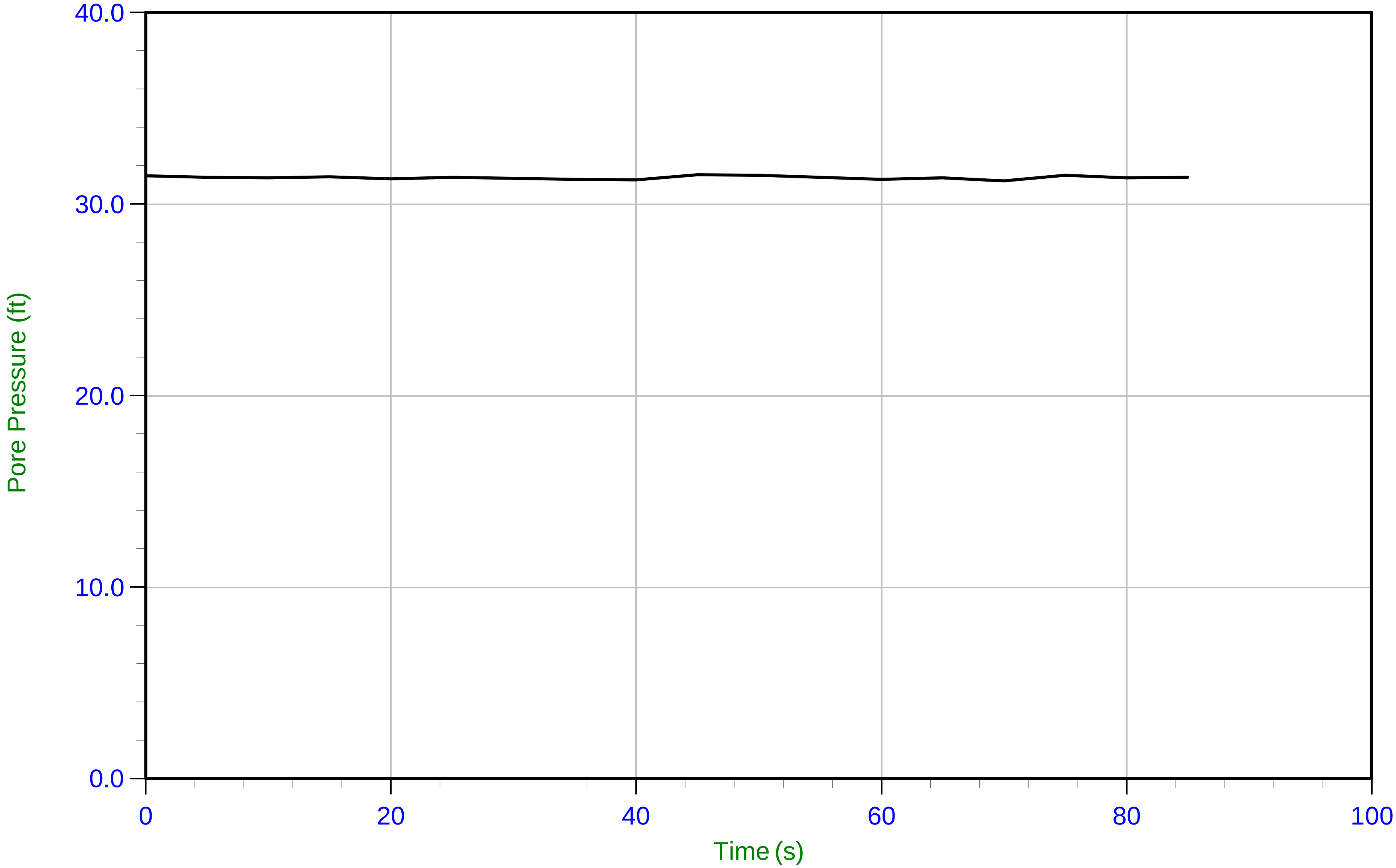
Filename: 15-53073_SP17.PPD	U Min: 31.0 ft	WT: 7.367 m / 24.170 ft
Depth: 16.850 m / 55.281 ft	U Max: 32.1 ft	Ueq: 31.1 ft
Duration: 600.0 s		

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 11:13:32
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C017
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP17.PPD
Depth: 17.050 m / 55.938 ft
Duration: 85.0 s

U Min: 31.2 ft
U Max: 31.5 ft

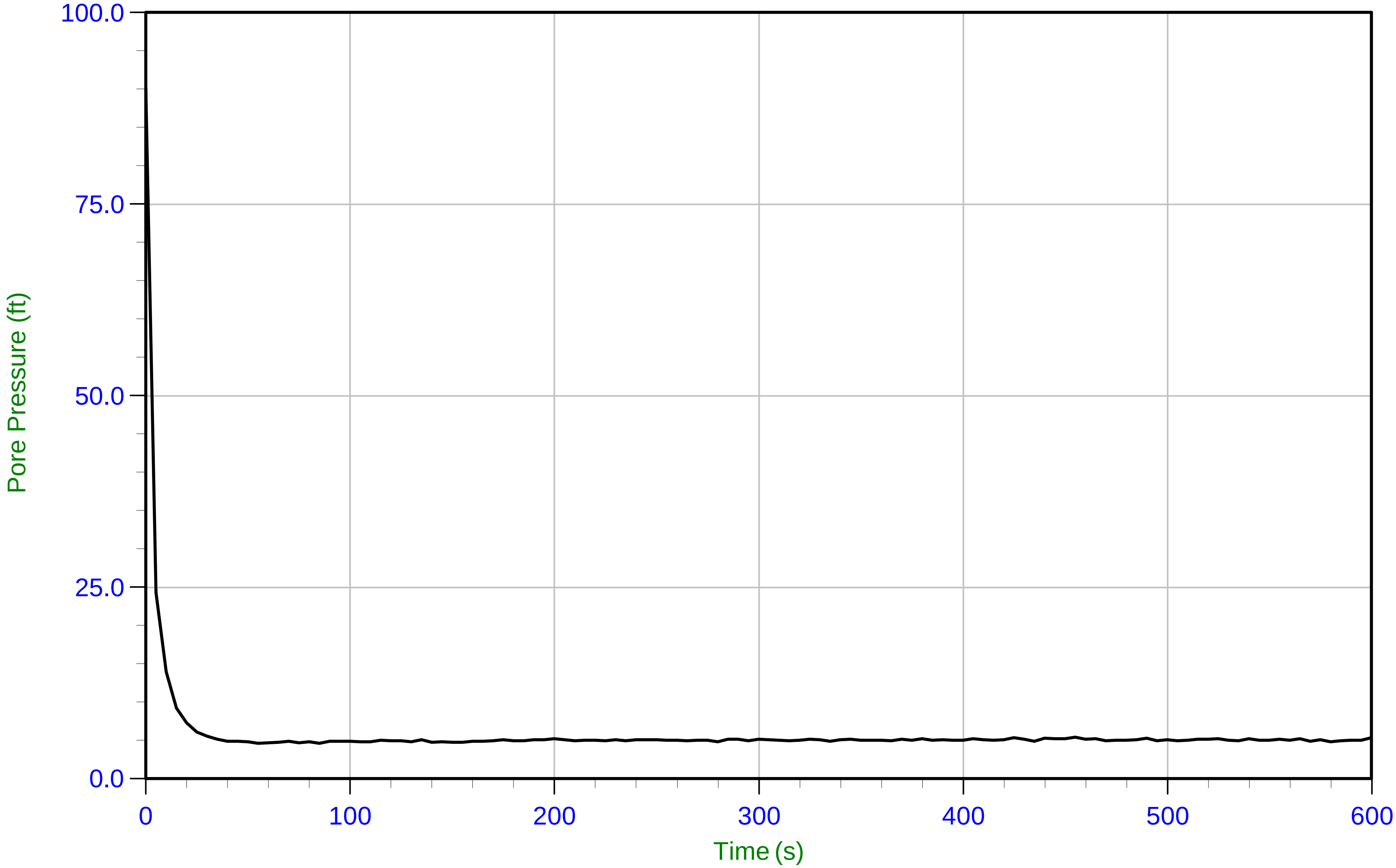
WT: 7.525 m / 24.688 ft
Ueq: 31.2 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 11:13:53
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C019
Cone: AD419
Cone Area: 15 sq cm



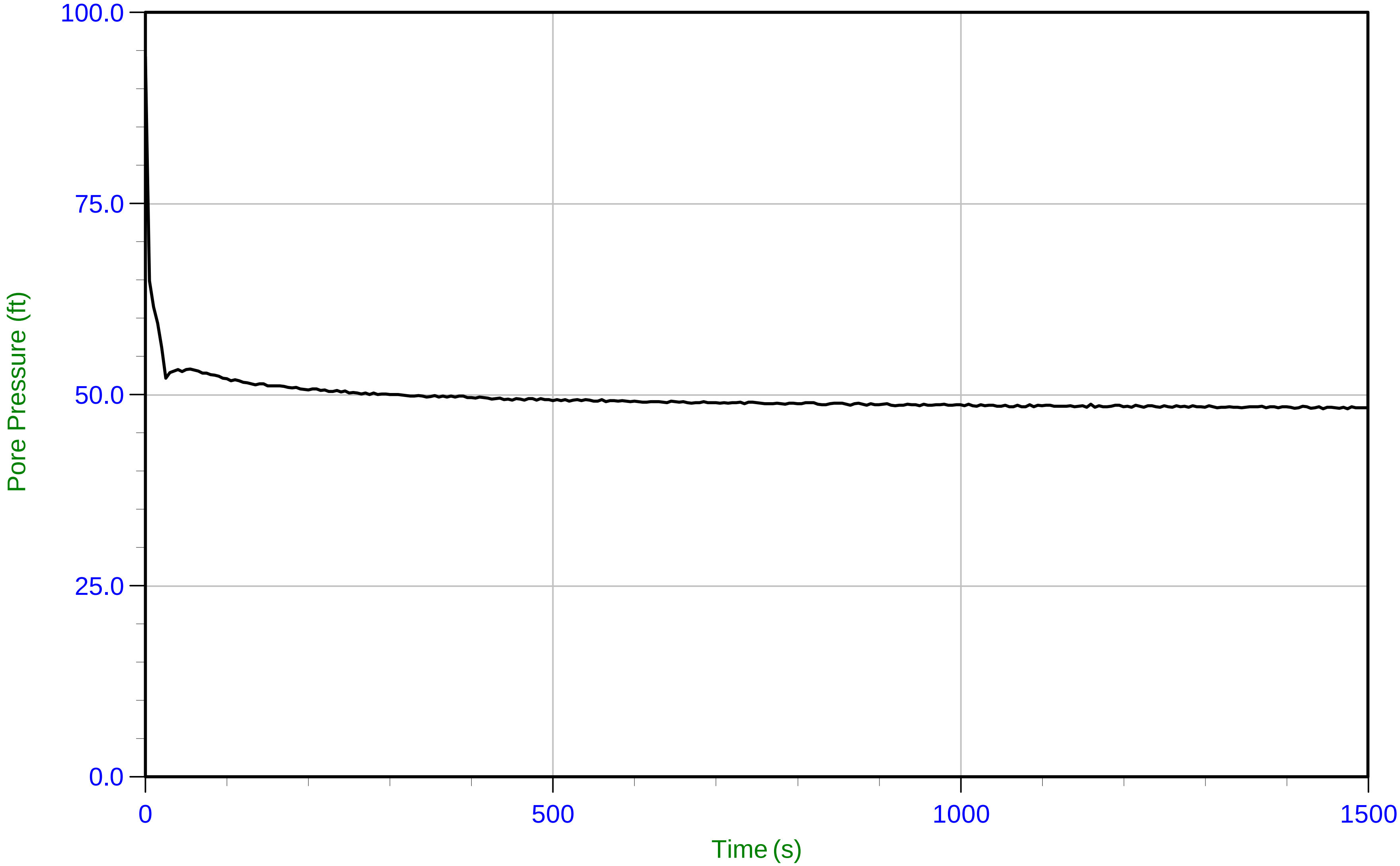
Trace Summary:

Filename: 15-53073_CP19.PPD
Depth: 3.600 m / 11.811 ft
Duration: 600.0 s

U Min: 4.7 ft
U Max: 90.3 ft

WT: 1.983 m / 6.506 ft
Ueq: 5.3 ft

CONETEC	AECOM	Job No: 15-53073 Date: 25-Aug-2015 11:13:53 Site: Edwards Power Station, Peoria, Il	Sounding: EDW-C019 Cone: AD419 Cone Area: 15 sq cm



Trace Summary:

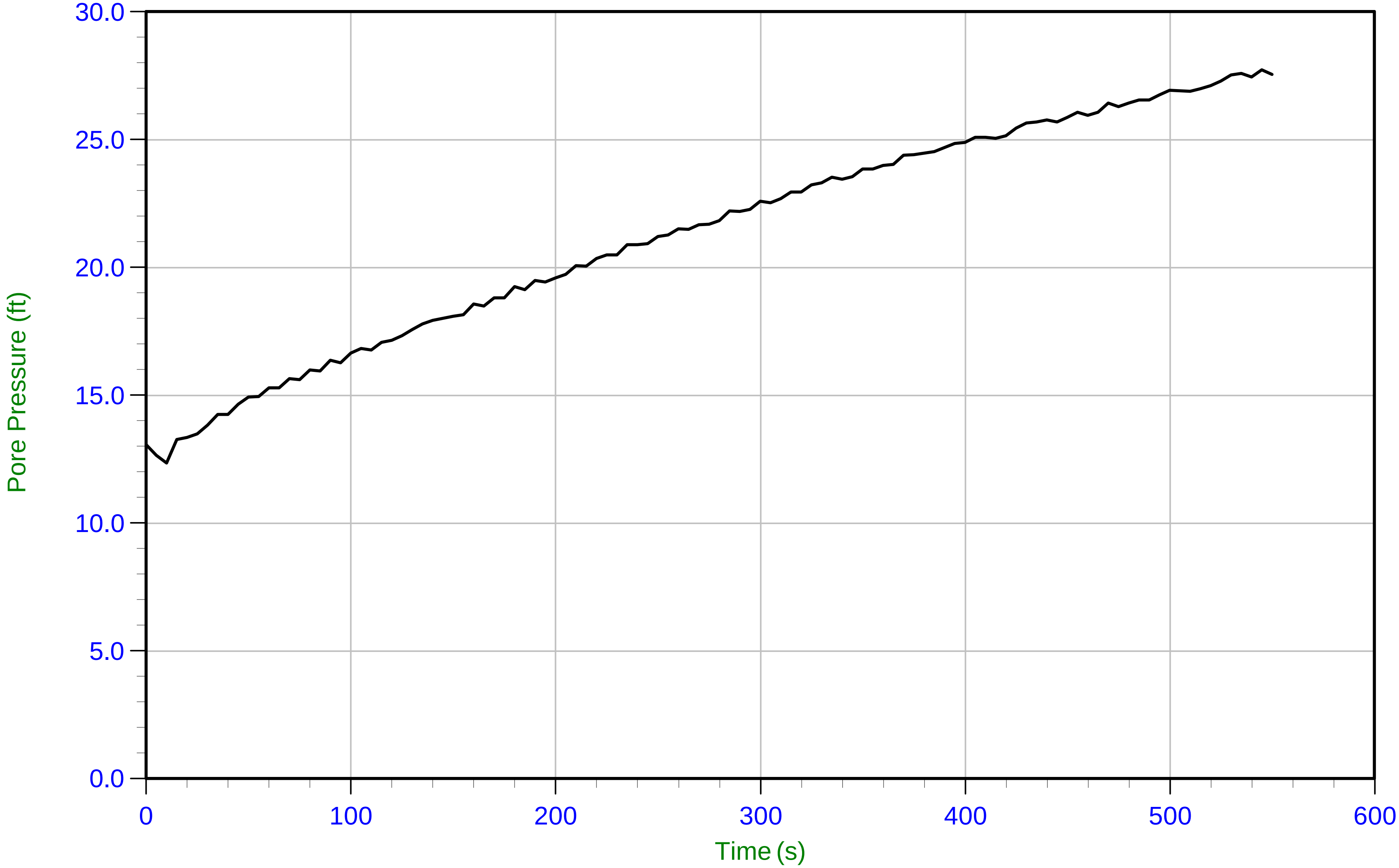
Filename: 15-53073_CP19.PPD	U Min: 48.2 ft	WT: 1.620 m / 5.315 ft
Depth: 16.300 m / 53.477 ft	U Max: 94.2 ft	Ueq: 48.2 ft
Duration: 1500.0 s		

ConeTec

AECOM

Job No: 15-53073
Date: 26-Aug-2015 10:21:35
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C021
Cone: AD419
Cone Area: 15 sq cm

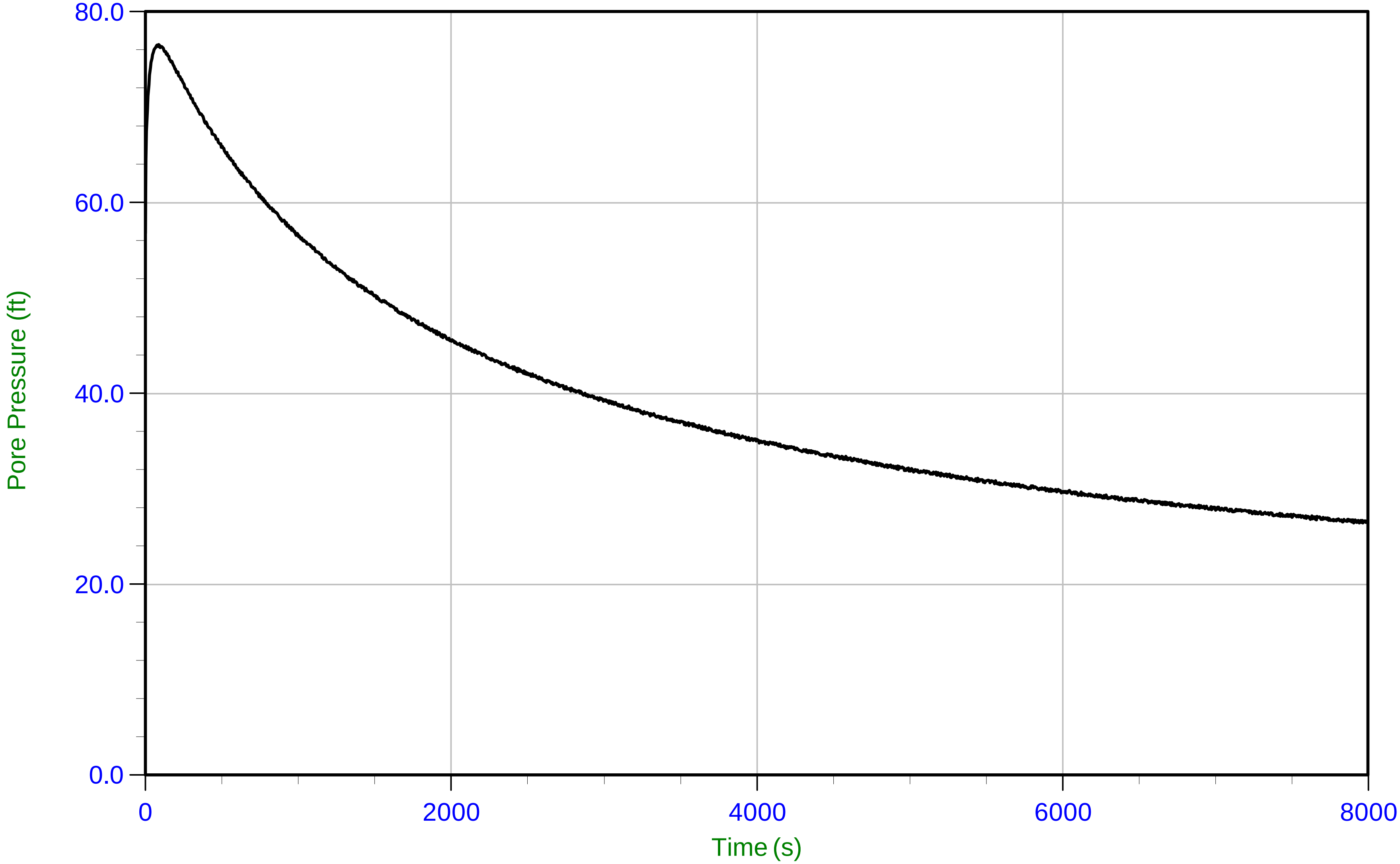


Trace Summary:

Filename: 15-53073_CP21.PPD
Depth: 4.250 m / 13.943 ft
Duration: 550.0 s

U Min: 12.4 ft
U Max: 27.7 ft

AECOM	Job No: 15-53073	Sounding: EDW-C021
	Date: 26-Aug-2015 10:21:35	Cone: AD419
	Site: Edwards Power Station, Peoria, Il	Cone Area: 15 sq cm



Trace Summary:

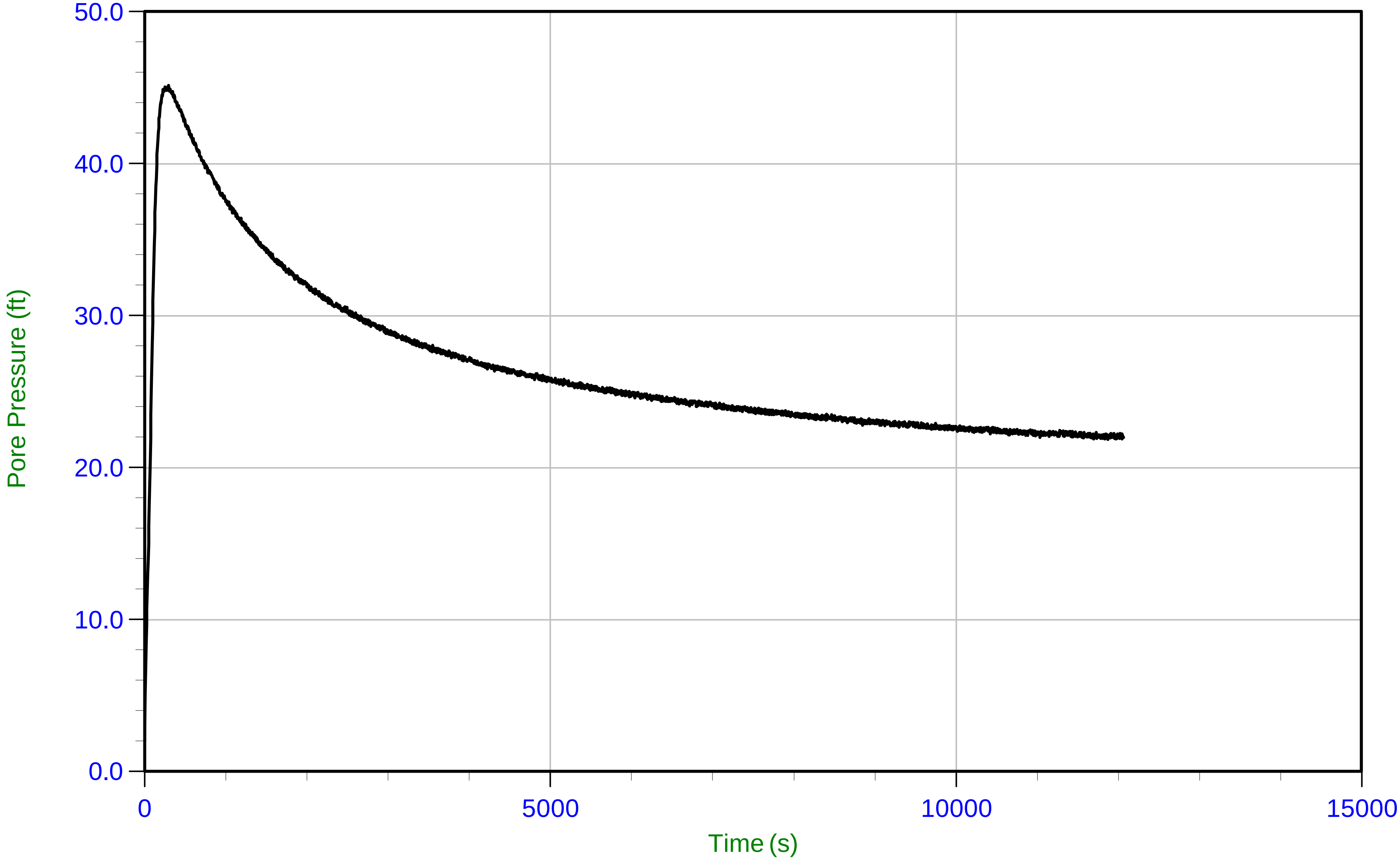
Filename: 15-53073_CP21.PPD	U Min: 26.4 ft	WT: 3.962 m / 13.000 ft	T(50): 2190.1 s
Depth: 7.150 m / 23.458 ft	U Max: 76.5 ft	Ueq: 10.5 ft	Ir: 100
Duration: 8000.0 s		U(50): 43.50 ft	Ch: 0.3 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 26-Aug-2015 10:21:35
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C021
Cone: AD419
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP21.PPD
Depth: 10.250 m / 33.628 ft
Duration: 12070.0 s

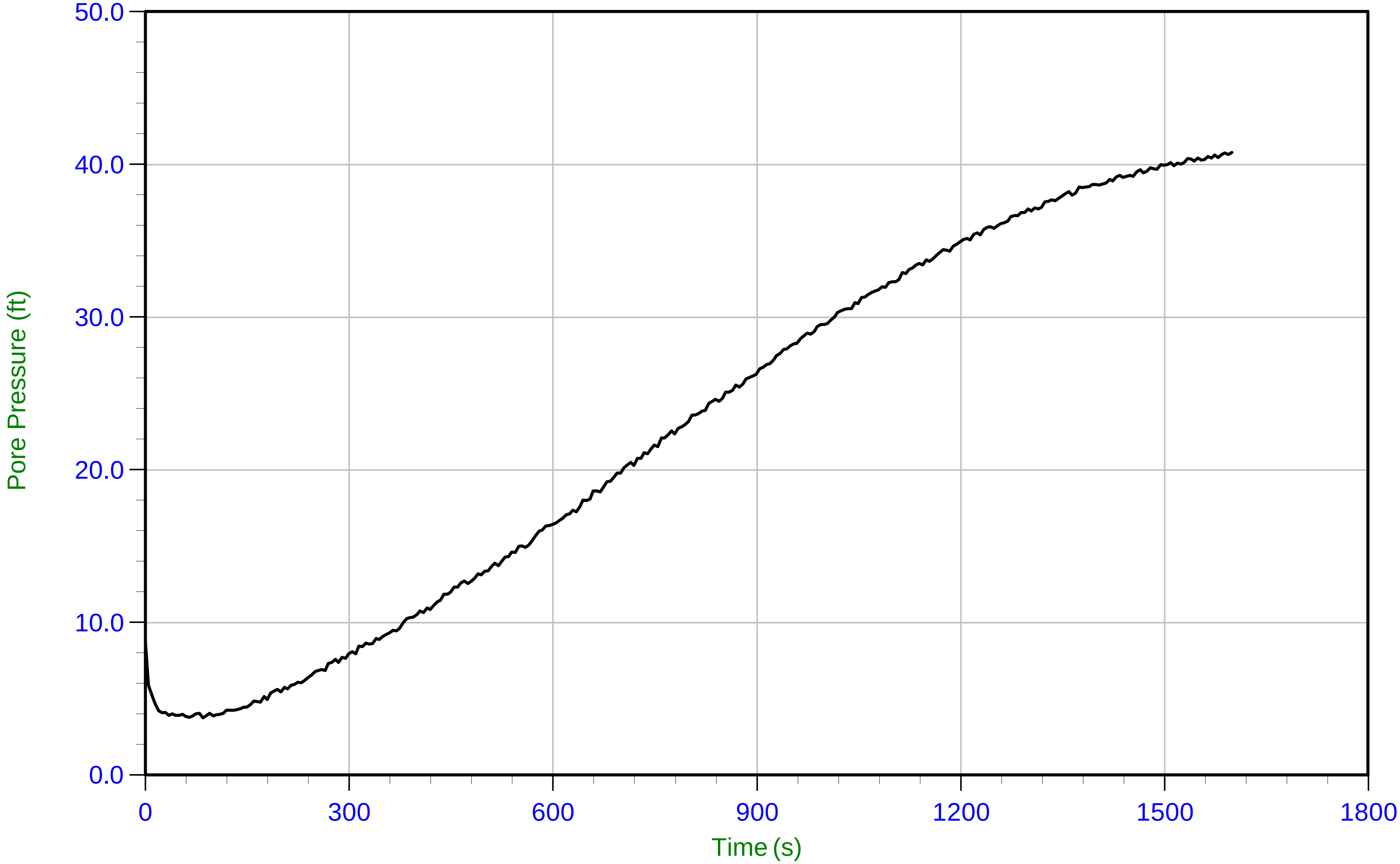
U Min: 2.0 ft
U Max: 45.1 ft

WT: 3.962 m / 13.000 ft
Ueq: 20.6 ft
U(50): 32.88 ft

T(50): 1449.3 s
Ir: 100
Ch: 0.5 sq cm/min

CONETEC	Job No: 15-53073 Date: 26-Aug-2015 10:21:35 Site: Edwards Power Station, Peoria, Il	Sounding: EDW-C021 Cone: AD419 Cone Area: 15 sq cm

AECOM



Trace Summary:

Filename: 15-53073_CP21.PPD
Depth: 14.750 m / 48.392 ft
Duration: 1600.0 s

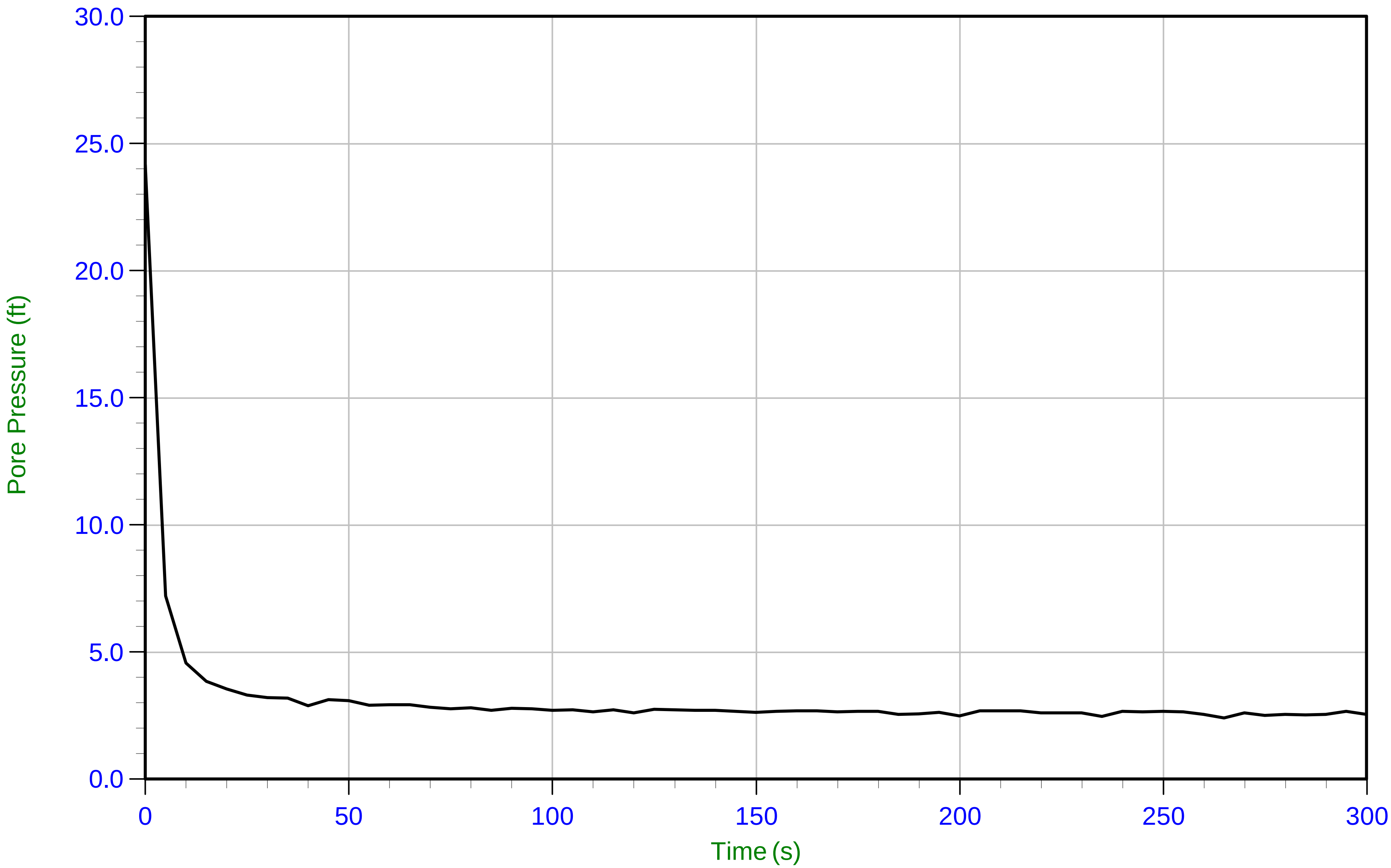
U Min: 3.8 ft
U Max: 40.8 ft

CONETEC

AECOM

Job No: 15-53073
Date: 26-Aug-2015 10:35:11
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C022
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP22.PPD
Depth: 2.600 m / 8.530 ft
Duration: 300.0 s

U Min: 2.4 ft
U Max: 24.2 ft

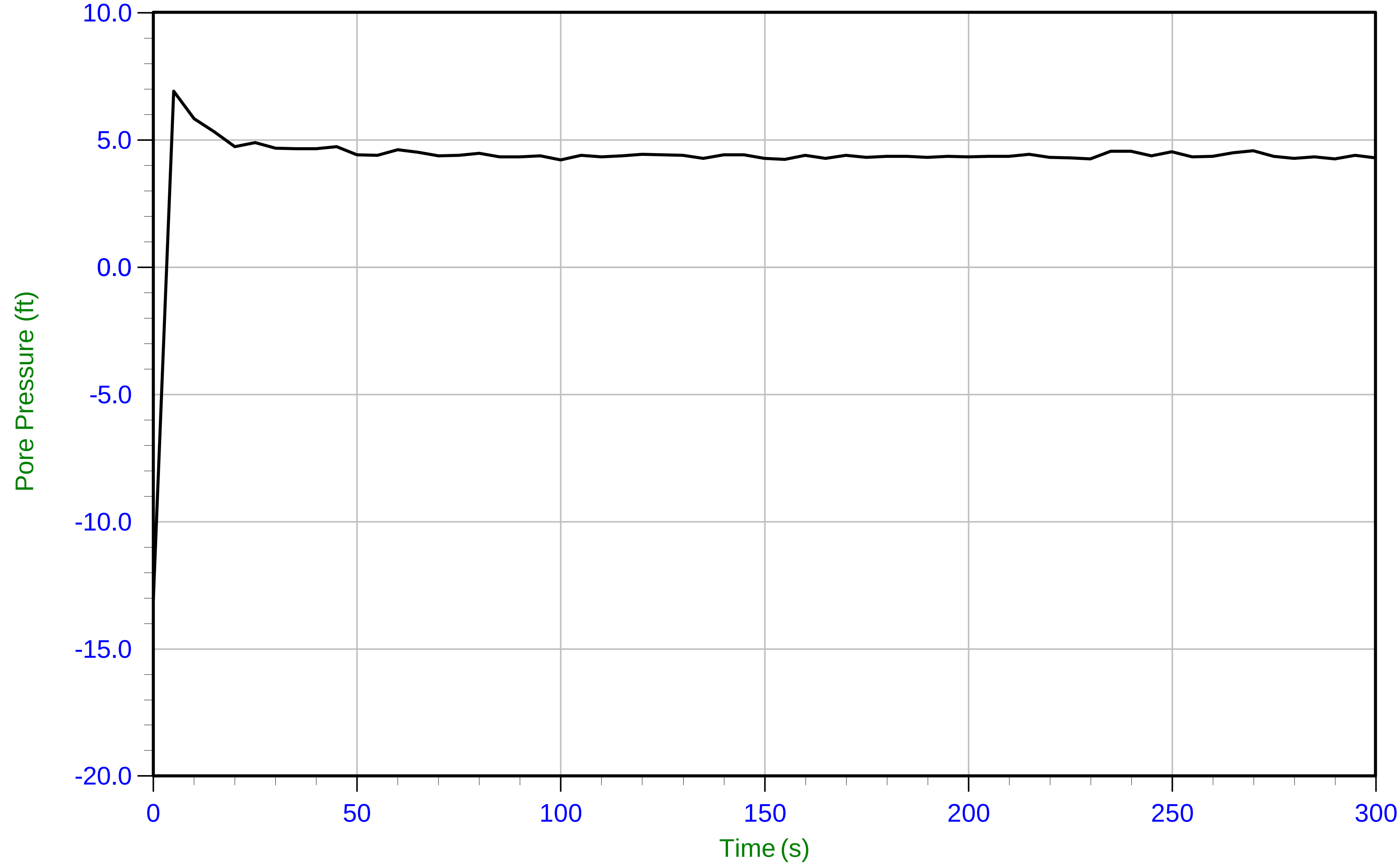
WT: 1.870 m / 6.135 ft
Ueq: 2.4 ft

CONETEC

AECOM

Job No: 15-53073
Date: 26-Aug-2015 10:35:11
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C022
Cone: 374
Cone Area: 15 sq cm



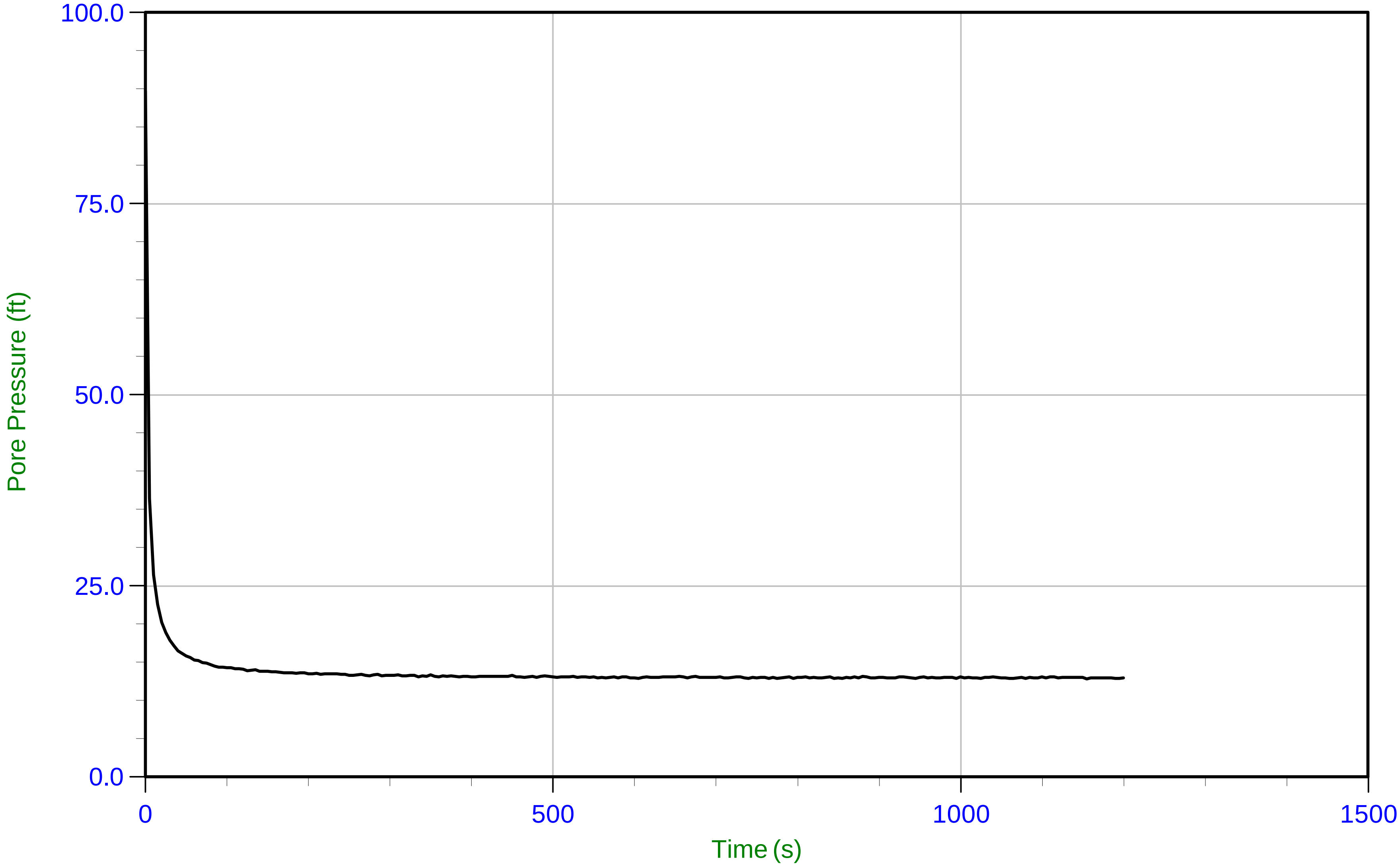
Trace Summary:

Filename: 15-53073_SP22.PPD
Depth: 3.350 m / 10.991 ft
Duration: 300.0 s

U Min: -13.1 ft
U Max: 6.9 ft

WT: 2.048 m / 6.719 ft
Ueq: 4.3 ft

AECOM	Job No: 15-53073	Sounding: EDW-C022
	Date: 26-Aug-2015 10:35:11	Cone: 374
	Site: Edwards Power Station, Peoria, IL	Cone Area: 15 sq cm



Trace Summary:

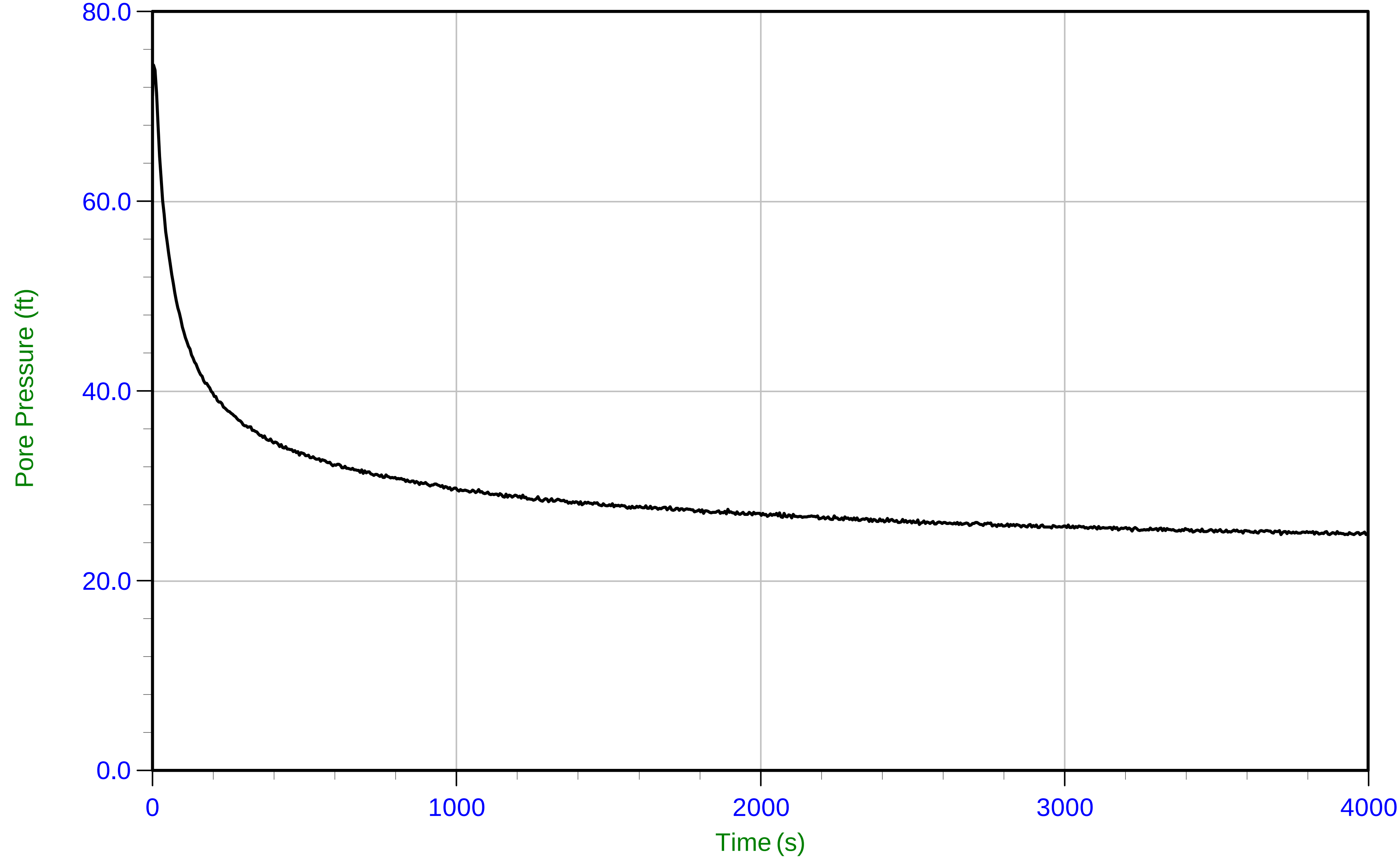
Filename: 15-53073_SP22.PPD	U Min: 12.8 ft	WT: 2.084 m / 6.837 ft
Depth: 6.000 m / 19.685 ft	U Max: 89.8 ft	Ueq: 12.8 ft
Duration: 1200.0 s		

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 08:52:49
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C023
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP23.PPD
Depth: 11.850 m / 38.877 ft
Duration: 4000.0 s

U Min: 24.9 ft
U Max: 74.4 ft

WT: 4.589 m / 15.056 ft
Ueq: 23.8 ft
U(50): 49.09 ft

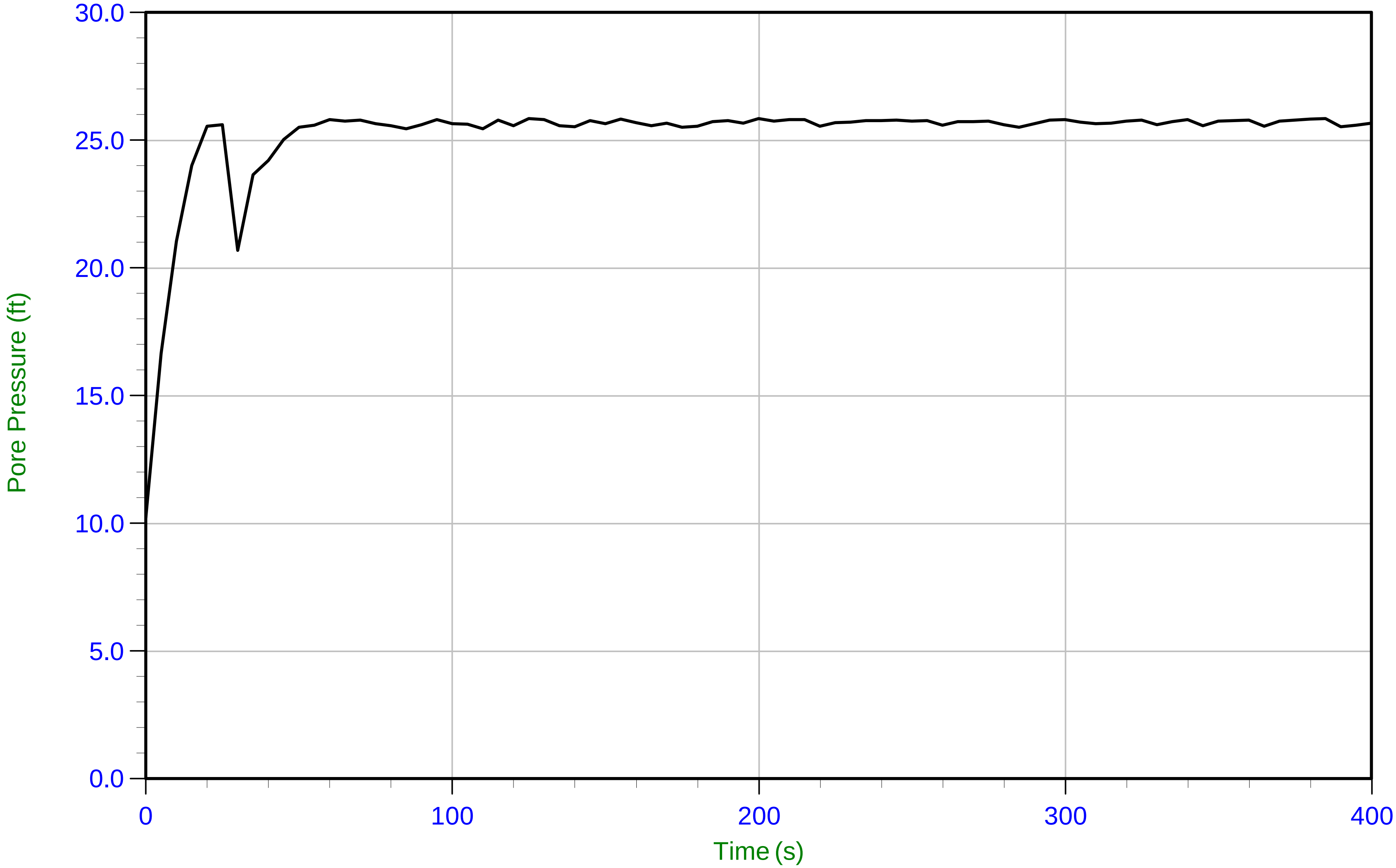
T(50): 77.9 s
Ir: 100
Ch: 9.0 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 27-Aug-2015 08:52:49
Site: Edwards Power Station, Peoria, Il

Sounding: EDW-C023
Cone: AD340
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP23.PPD
Depth: 12.400 m / 40.682 ft
Duration: 400.0 s

U Min: 10.2 ft
U Max: 25.9 ft

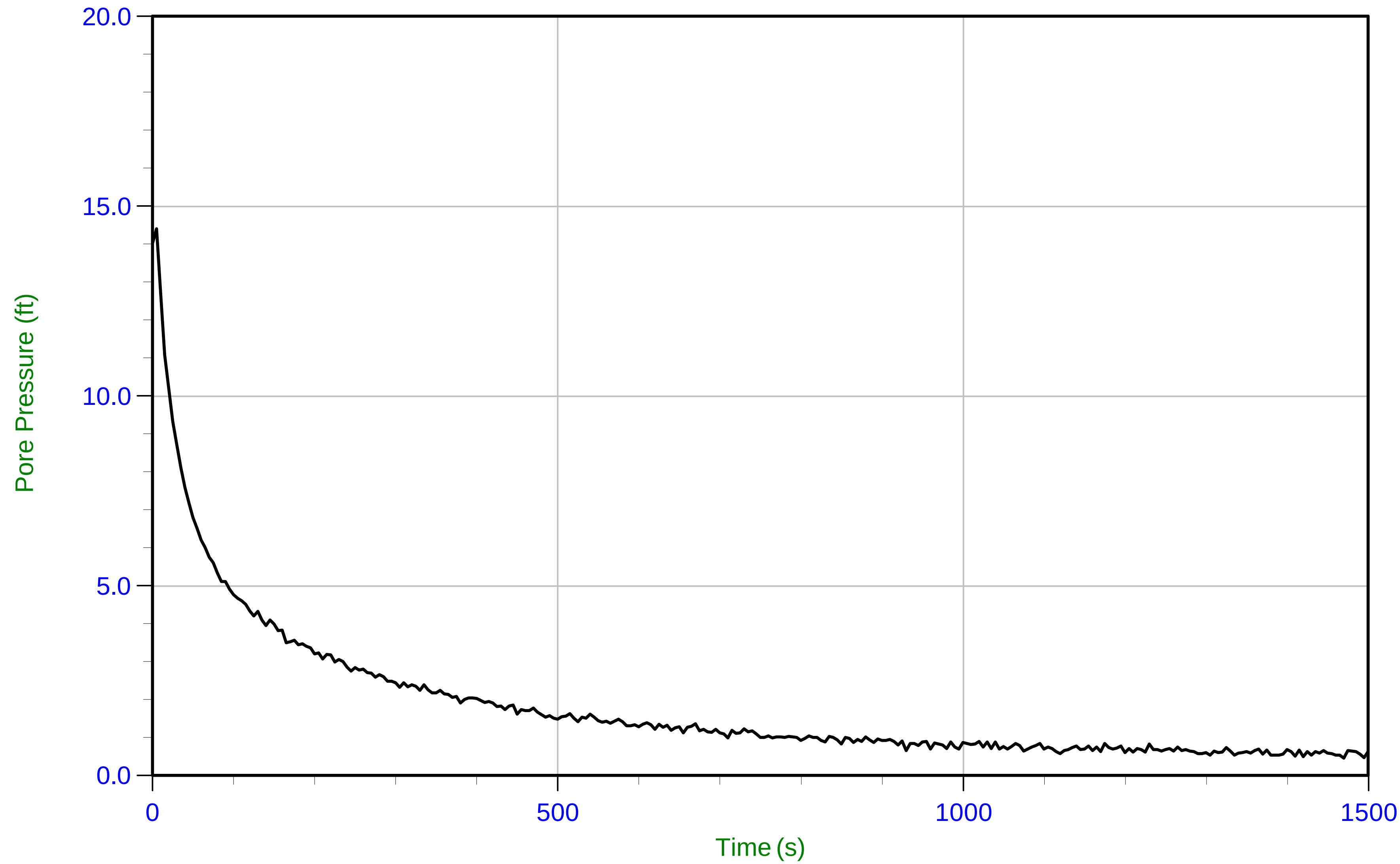
WT: 4.589 m / 15.056 ft
Ueq: 25.6 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 13:44:56
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C025
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

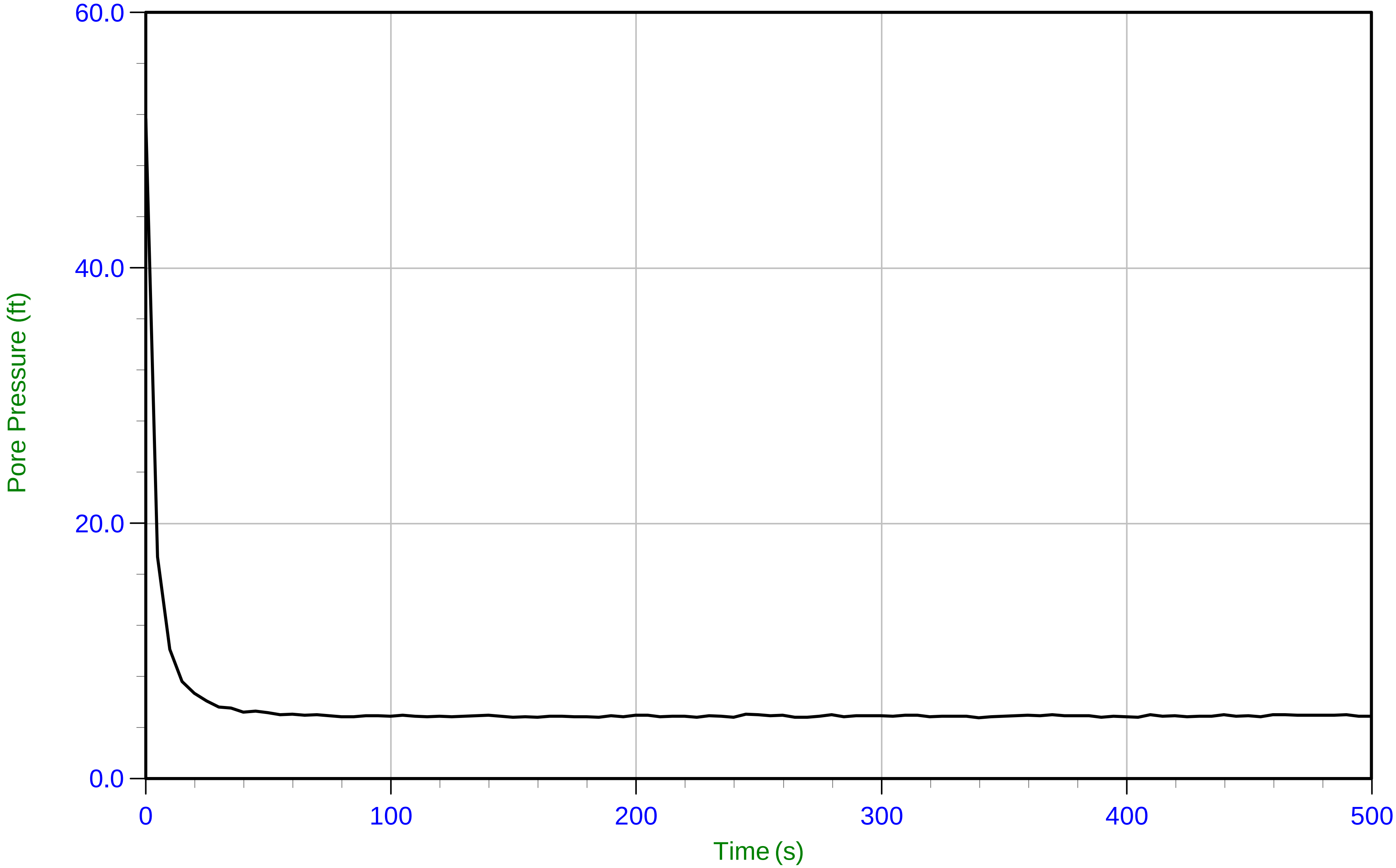
Filename: 15-53073_CP25.PPD
Depth: 2.000 m / 6.562 ft
Duration: 1500.0 s

U Min: 0.5 ft
U Max: 14.4 ft

WT: 1.826 m / 5.991 ft
Ueq: 0.6 ft
U(50): 7.49 ft

T(50): 36.3 s
Ir: 100
Ch: 19.3 sq cm/min

AECOM	Job No: 15-53073	Sounding: EDW-C025
	Date: 25-Aug-2015 13:44:56	Cone: 374
	Site: Edwards Power Station, Peoria, IL	Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP25.PPD
Depth: 3.350 m / 10.991 ft
Duration: 500.0 s

U Min: 4.8 ft
U Max: 51.7 ft

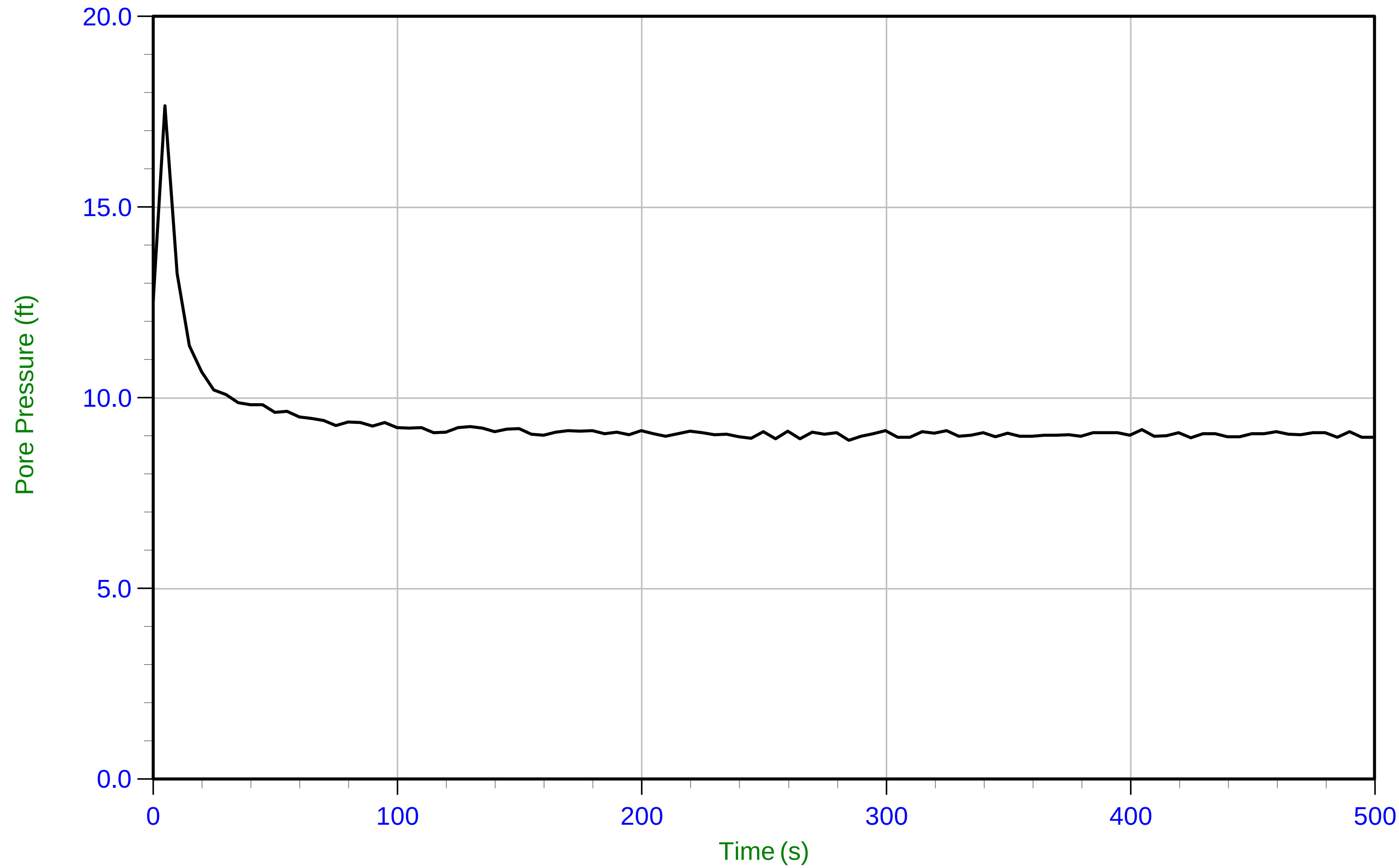
WT: 1.826 m / 5.991 ft
Ueq: 5.0 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 13:44:56
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C025
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP25.PPD
Depth: 4.600 m / 15.092 ft
Duration: 500.0 s

U Min: 8.9 ft
U Max: 17.7 ft

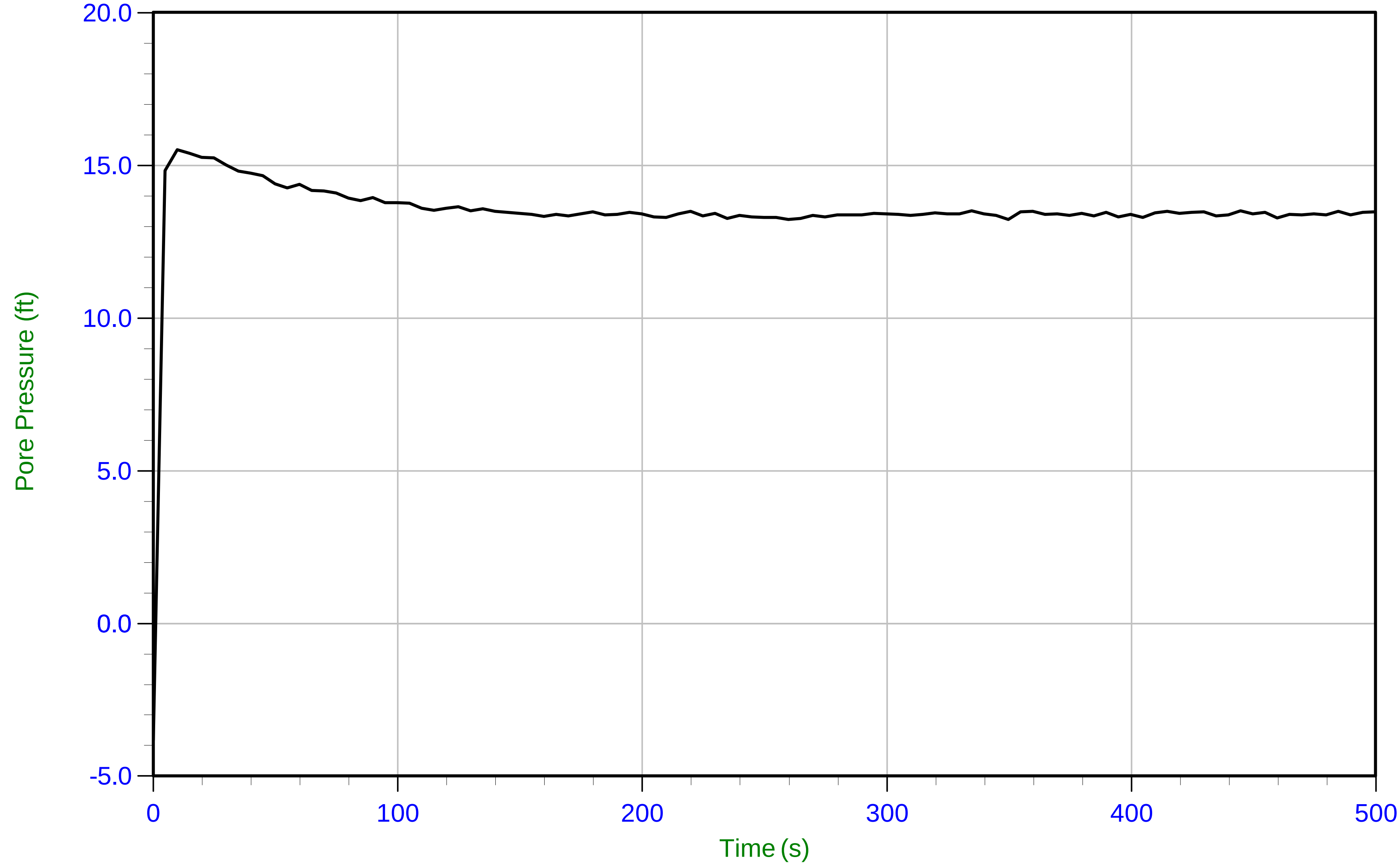
WT: 1.848 m / 6.063 ft
Ueq: 9.0 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 13:44:56
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C025
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP25.PPD
Depth: 6.100 m / 20.013 ft
Duration: 500.0 s

U Min: -3.8 ft
U Max: 15.5 ft

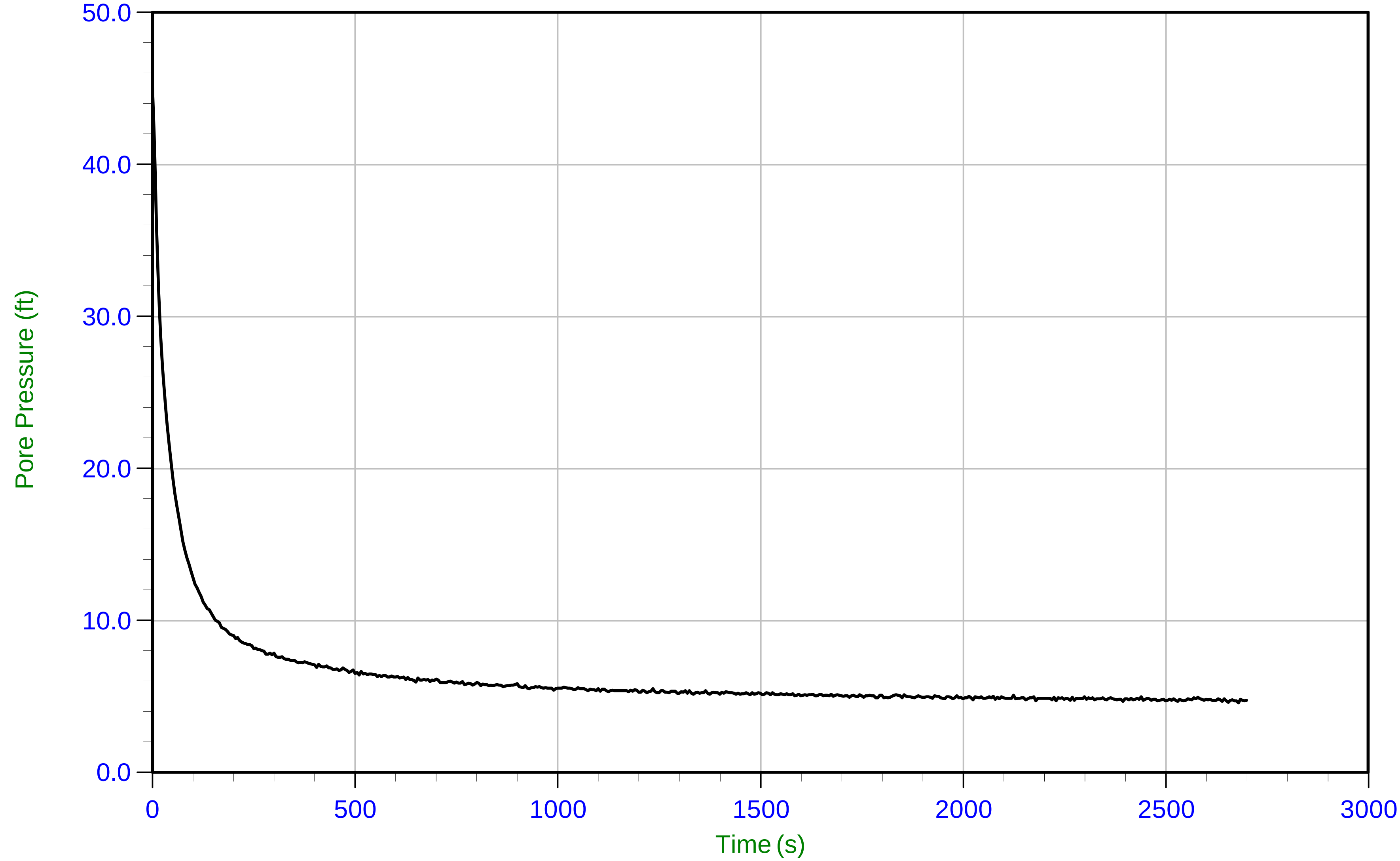
WT: 1.962 m / 6.437 ft
Ueq: 13.6 ft

CONETEC

AECOM

Job No: 15-53073
Date: 26-Aug-2015 12:20:07
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C026
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP26.PPD
Depth: 3.350 m / 10.991 ft
Duration: 2700.0 s

U Min: 4.6 ft
U Max: 45.1 ft

WT: 2.191 m / 7.188 ft
Ueq: 3.8 ft
U(50): 24.43 ft

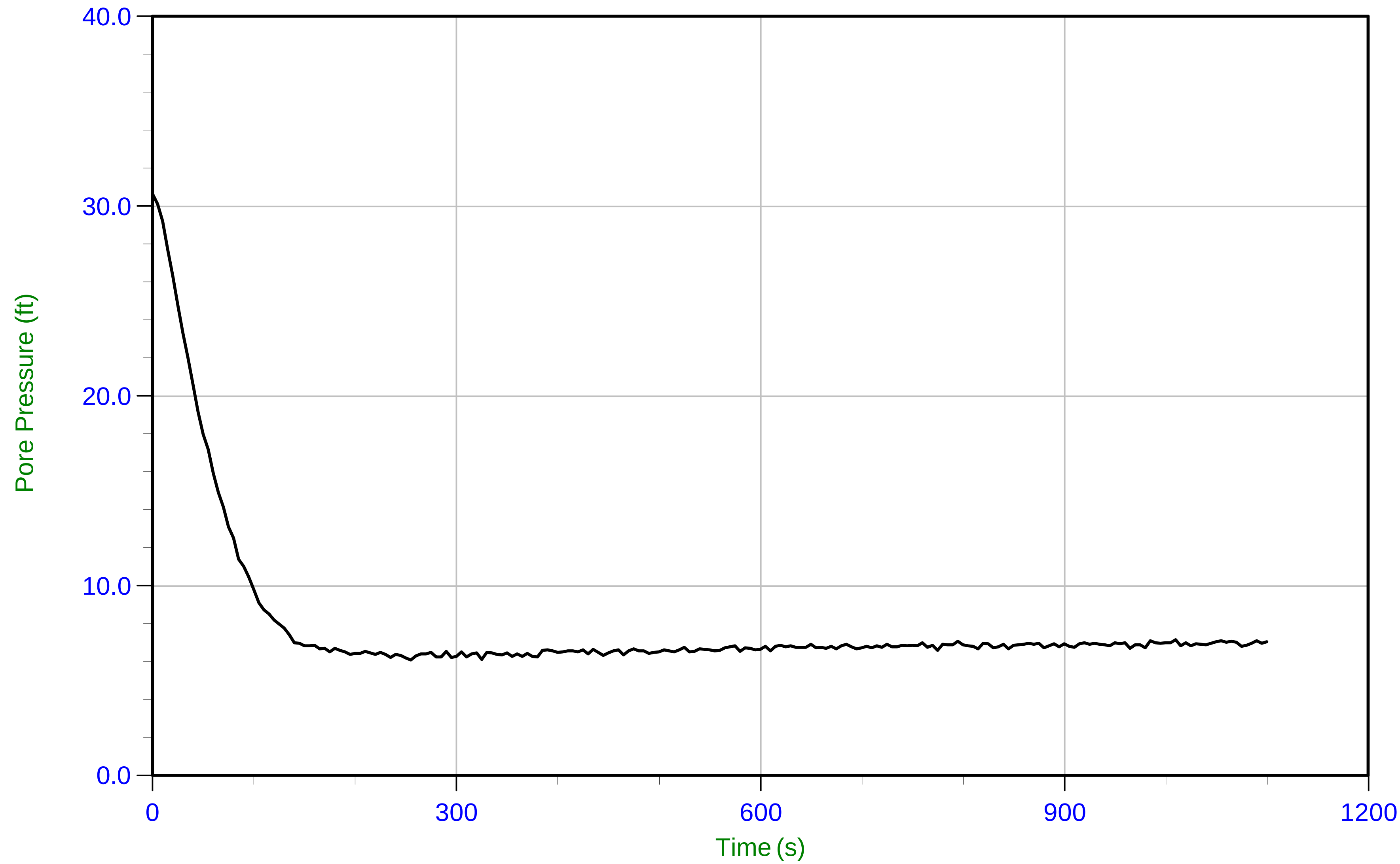
T(50): 31.2 s
Ir: 100
Ch: 22.5 sq cm/min

CONETEC

AECOM

Job No: 15-53073
Date: 26-Aug-2015 12:20:07
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C026
Cone: 374
Cone Area: 15 sq cm



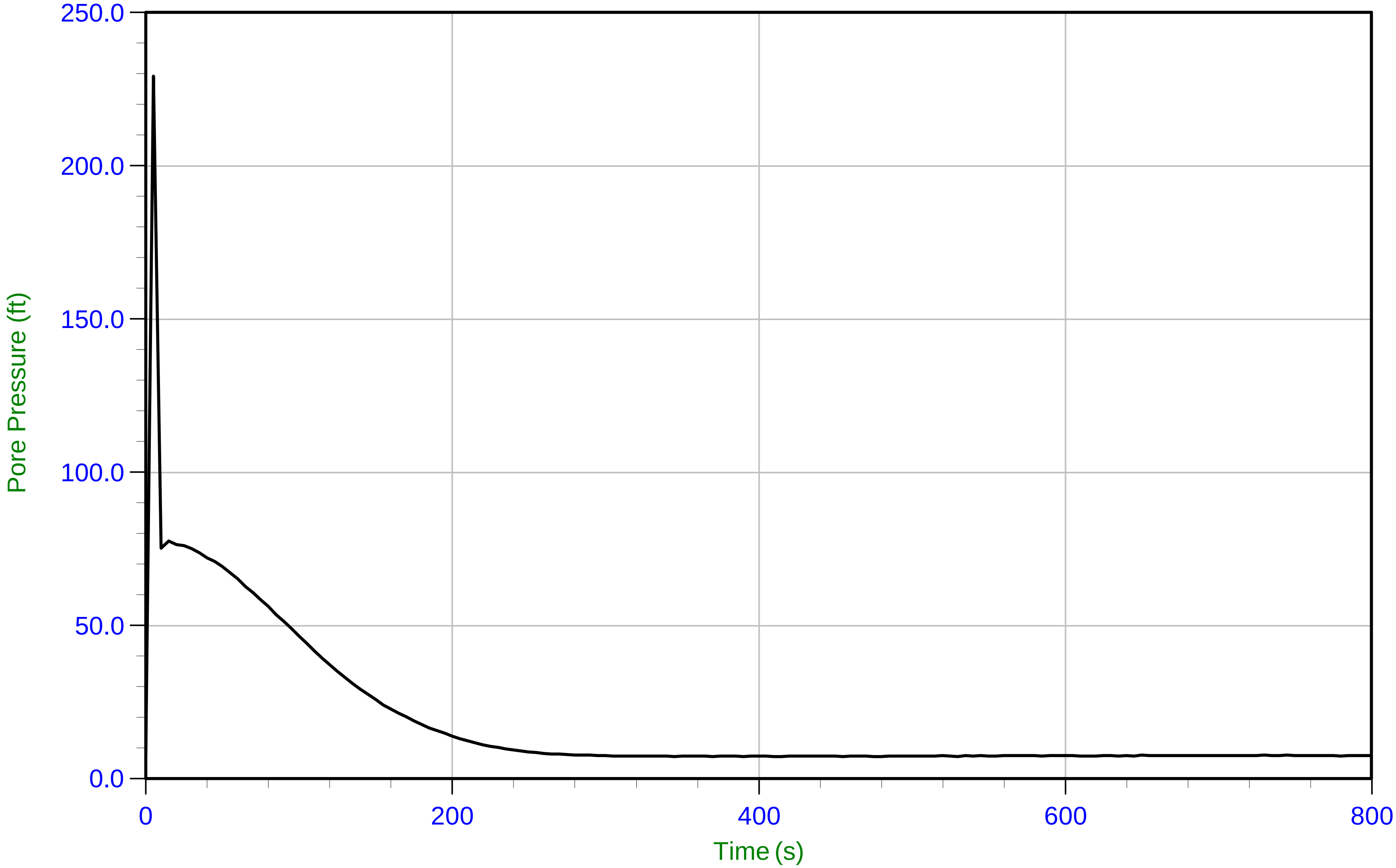
Trace Summary:

Filename: 15-53073_SP26.PPD
Depth: 4.350 m / 14.271 ft
Duration: 1100.0 s

U Min: 6.1 ft
U Max: 30.7 ft

WT: 2.191 m / 7.188 ft
Ueq: 7.1 ft

AECOM	Job No: 15-53073 Date: 26-Aug-2015 14:00:29 Site: Edwards Power Station, Peoria, IL	Sounding: EDW-C026B Cone: 374 Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_SP26B.PPD
Depth: 4.450 m / 14.600 ft
Duration: 800.0 s

U Min: 7.3 ft
U Max: 229.3 ft

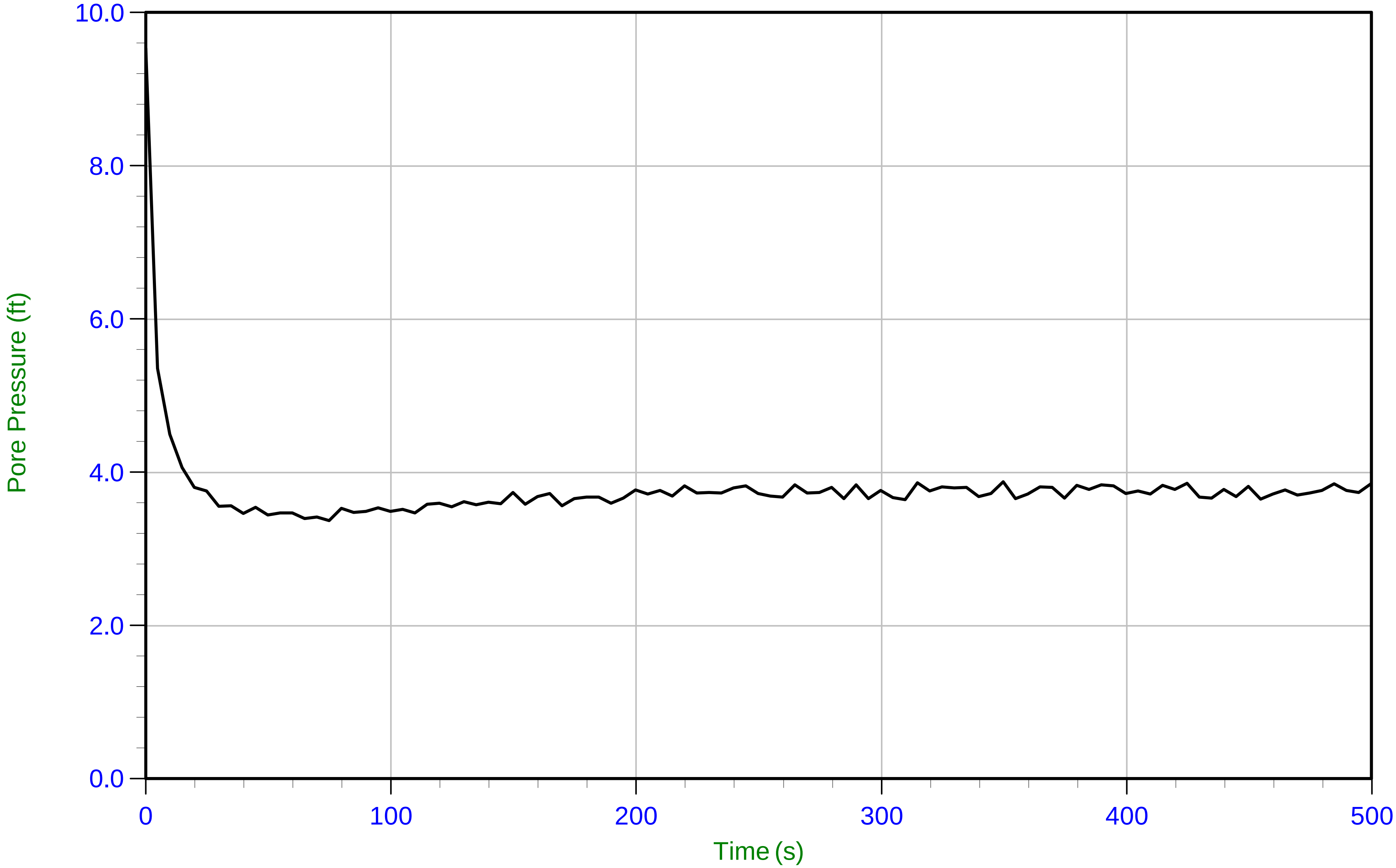
WT: 2.069 m / 6.788 ft
Ueq: 7.8 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 11:00:21
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C027
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP27.PPD
Depth: 3.400 m / 11.155 ft
Duration: 500.0 s

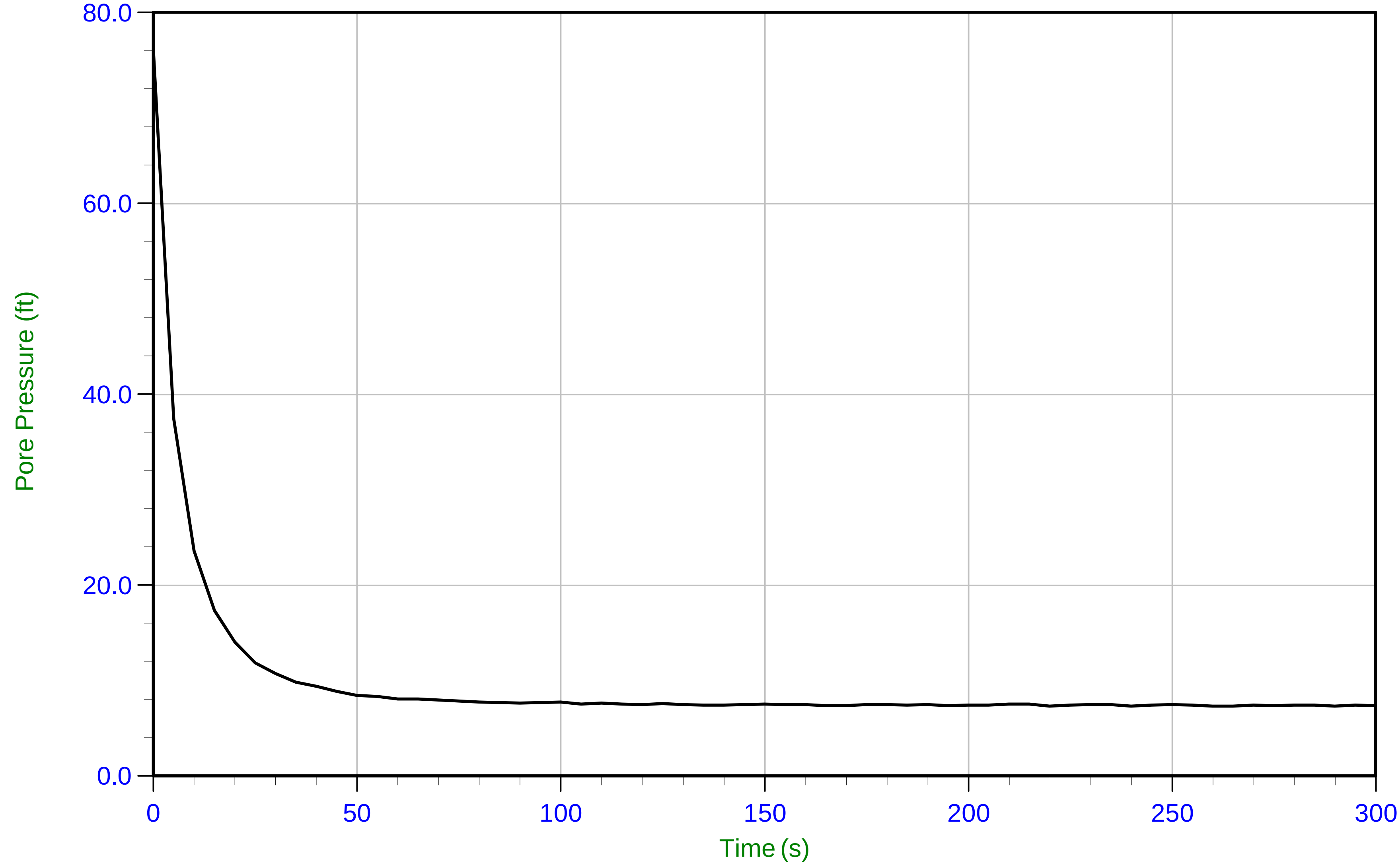
U Min: 3.4 ft
U Max: 9.5 ft

WT: 2.257 m / 7.405 ft
Ueq: 3.7 ft

ConeTec | AECOM

Job No: 15-53073
Date: 25-Aug-2015 11:00:21
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C027
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP27.PPD
Depth: 4.350 m / 14.271 ft
Duration: 300.0 s

U Min: 7.3 ft
U Max: 76.2 ft

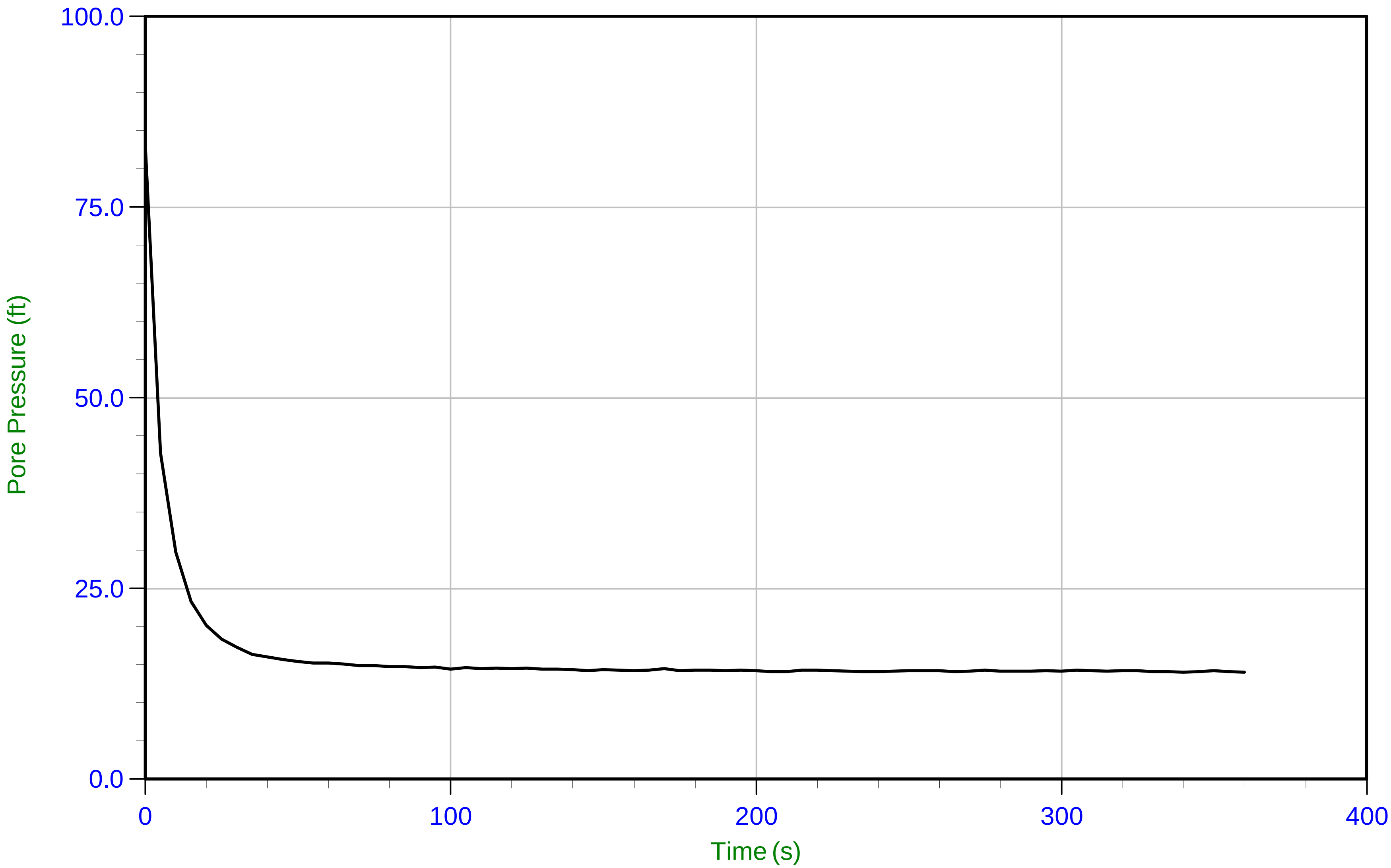
WT: 2.064 m / 6.772 ft
Ueq: 7.5 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 11:00:21
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C027
Cone: 374
Cone Area: 15 sq cm



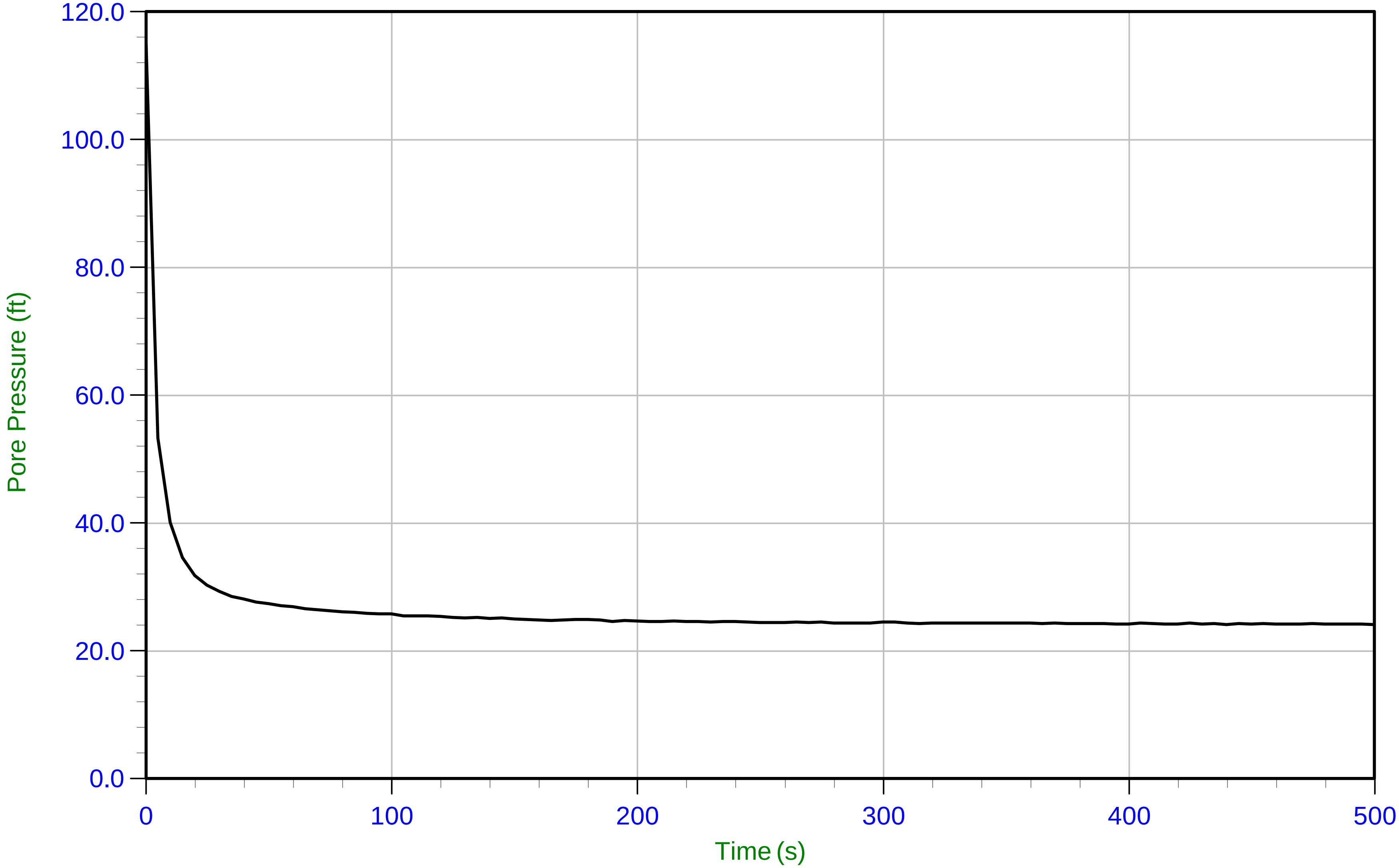
Trace Summary:

Filename: 15-53073_CP27.PPD
Depth: 6.400 m / 20.997 ft
Duration: 360.0 s

U Min: 14.0 ft
U Max: 83.3 ft

WT: 2.061 m / 6.762 ft
Ueq: 14.2 ft

AECOM	Job No: 15-53073 Date: 25-Aug-2015 11:00:21 Site: Edwards Power Station, Peoria, IL	Sounding: EDW-C027 Cone: 374 Cone Area: 15 sq cm



Trace Summary:

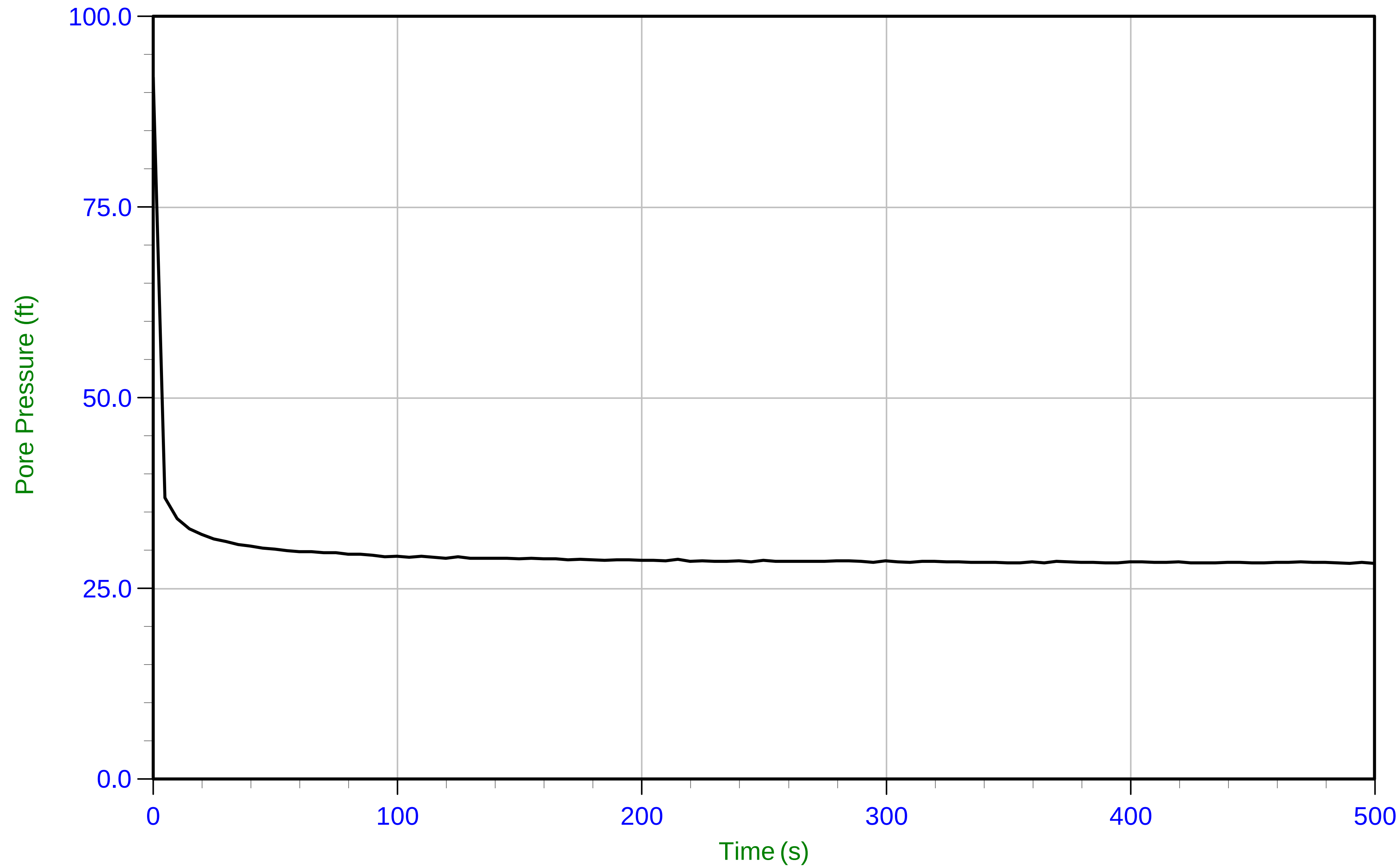
Filename: 15-53073_CP27.PPD	U Min: 24.1 ft	WT: 2.034 m / 6.673 ft
Depth: 9.400 m / 30.840 ft	U Max: 114.9 ft	Ueq: 24.2 ft
Duration: 500.0 s		

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 11:00:21
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C027
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP27.PPD
Depth: 10.700 m / 35.105 ft
Duration: 500.0 s

U Min: 28.3 ft
U Max: 92.0 ft

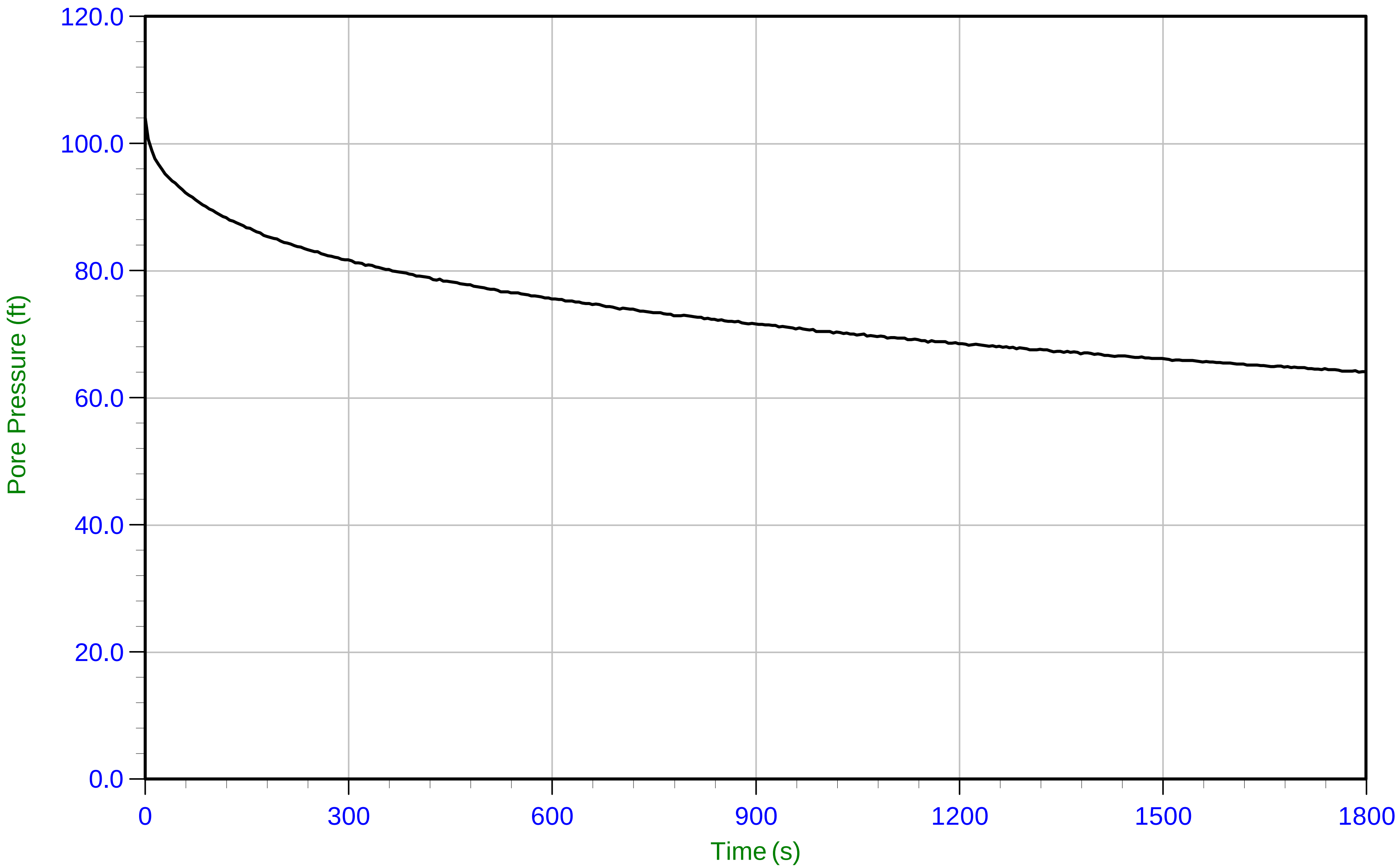
WT: 2.022 m / 6.634 ft
Ueq: 28.5 ft

CONETEC

AECOM

Job No: 15-53073
Date: 25-Aug-2015 11:00:21
Site: Edwards Power Station, Peoria, IL

Sounding: EDW-C027
Cone: 374
Cone Area: 15 sq cm



Trace Summary:

Filename: 15-53073_CP27.PPD
Depth: 12.200 m / 40.026 ft
Duration: 1800.0 s

U Min: 64.1 ft
U Max: 104.0 ft

WT: 2.064 m / 6.772 ft
Ueq: 33.3 ft
U(50): 68.65 ft

T(50): 1184.7 s
Ir: 100
Ch: 0.6 sq cm/min

Attachment E. Laboratory Test Data

LABORATORY TESTING SUMMARY

PROJECT NAME: Dynegy - Edwards Site **PROJECT NUMBER:** MR155218 **CLIENT:** AECOM

Boring Number	Sample Number	Depth	Description	USCS	WC %	Qp (tsf)	% Gravel	% Sand	% Silt	% Clay	LL	PL	PI	Specific Gravity
EDW-B002	S-1	0.0'-1.5'	FILL: OLIVE BROWN TRACE BROWN SILTY SAND WITH GRAVEL		38.4	4.50+								
EDW-B002	S-2	2.5'-4.0'	GRAY SANDY SILT		62.4	3.50								
EDW-B002	S-3	5.0'-7.0'	GREENISH GRAY SANDY SILT	MH	66.6						65	36	29	
EDW-B002	S-4	7.5'-10.0'	DARK GRAY FLY ASH		79.0		0.0	7.4	73.1	19.5				
EDW-B002	S-5	10.0'-12.0'	GRAY TO DARK GRAY VARVED FLY ASH		76.9						17	27	NP	
EDW-B002	S-6	15.0'-16.5'	DARK GRAY FLY ASH		52.5									
EDW-B002	S-7	20.0'-21.5'	DARK GRAY FLY ASH WITH SAND AND GRAVEL		67.8									
EDW-B002	S-8	25.0'-27.0'	DARK GRAY FLY ASH		63.9									2.471
EDW-B002	S-9	30.0'-30.5'	LIGHT GRAY LEAN CLAY WITH ORGANIC POCKETS		126.1	<.25								
EDW-B002	S-9A	30.5'-31.5'	BROWN TO RUST BROWN LEAN CLAY WITH SAND		31.1	0.50								
EDW-B002	S-10	35.0'-37.0'	GRAY LEAN CLAY WITH SAND	CL	31.6						36	18	18	
EDW-B002	S-11	40.0'-41.5'	GRAY LEAN CLAY		42.9	1.00								2.592
EDW-B002	S-12	45.0'-46.5'	GRAY TO DARK GRAY LEAN CLAY WITH SAND		57.7	0.75								
EDW-B002	S-13	50.0'-50.25'	GRAY SILT WITH SAND	ML	11.1	4.50+								
EDW-B003	S-1	0.0'-1.5'	FILL: DARK GRAY FLY ASH WITH SAND		44.4									2.469
EDW-B003	S-2	2.5'-4.0'	FILL: DARK GRAY FLY ASH WITH SAND		27.3	2.00								
EDW-B003	S-3	5.0'-6.5'	FILL: BROWN AND BLACK LEAN CLAY WITH SAND AND ORGANICS		37.2	1.00								
EDW-B003	S-4	7.5'-9.5'	FILL: DARK GRAY FLY ASH		55.5									
EDW-B003	S-5	10.0'-11.5'	FILL: DARK GRAY FLY ASH		50.6		2.3	19.8	56.3	21.6				
EDW-B003	S-6	15.0'-16.5'	FILL: DARK GRAY FLY ASH WITH SAND AND GRAVEL		29.7									2.772
EDW-B003	S-7	20.0'-21.5'	FILL: DARK GRAY FLY ASH WITH SAND AND GRAVEL		42.1									
EDW-B003	S-8	25.0'-27.0'	FILL: DARK GRAY FLY ASH WITH SAND		54.9									
EDW-B003	S-9	30.0'-32.0'	FILL: VERY DARK GRAY VARVED FLY ASH		71.7		0.0	20.6	66.4	13.0				
EDW-B003	S-10	35.0'-36.5'	FILL: DARK GRAY FLY ASH WITH SAND		51.9									
EDW-B003	S-10A	36.5'-37.0'	GRAY LEAN CLAY WITH ORGANIC POCKETS		43.0	2.25								
EDW-B003	S-11	40.0'-41.5'	GRAY TO BROWNISH GRAY LEAN CLAY WITH SAND		31.6	1.25								
EDW-B003	S-12	45.0'-47.0'	DARK GRAY FAT CLAY WITH SAND	CH	46.0						51	17	34	
EDW-B003	S-13	50.0'-51.5'	BROWNISH GRAY TO GREENISH GRAY LEAN CLAY WITH SAND		55.4	0.50								
EDW-B003	S-14	55.0'-55.5'	BLUISH GRAY CLAYEY SILT		23.3	3.50								
EDW-B003	S-14A	55.5'-55.92'	BLUISH GRAY SILT		9.8									
EDW-B003	S-15	60.0'-60.25'	BLUISH GRAY SILT		7.1									

LABORATORY TESTING SUMMARY

PROJECT NAME: Dynegy - Edwards Site **PROJECT NUMBER:** MR155218 **CLIENT:** AECOM

Boring Number	Sample Number	Depth	Description	USCS	WC %	Qp (tsf)	% Gravel	% Sand	% Silt	% Clay	LL	PL	PI	Specific Gravity
EDW-B004	S-1	0.0'-1.5'	FILL: DARK GRAY FLY ASH		18.9	4.50+								
EDW-B004	S-2	2.5'-3.5'	FILL: DARK GRAY FLY ASH WITH SAND		28.5	4.00								
EDW-B004	S-2A	3.5'-4.0'	BROWN TO GRAY LEAN CLAY WITH SAND - FLY ASH NOTED		20.1	3.25								
EDW-B004	S-3	5.0'-6.5'	BROWN AND GRAY LEAN CLAY		21.6	1.75								
EDW-B004	S-4	7.5'-9.0'	GRAY AND DARK GRAY LEAN CLAY WITH ORGANICS	CL	23.4	4.00	0.0	9.3	43.3	47.4	37	16	21	
EDW-B004	S-5	10.0'-11.5'	BROWN AND DARK GRAY LEAN CLAY		21.5	2.25								
EDW-B004	S-6	12.5'-14.0'	BROWN AND GRAY LEAN CLAY WITH SAND		25.4	1.25								
EDW-B004	S-7	15.0'-16.5'	DARK GRAY LEAN CLAY		25.8	2.50								
EDW-B004	S-8	20.0'-21.5'	BROWN AND GRAY LEAN CLAY WITH SAND		31.3	1.00								
EDW-B004	S-9	25.0'-26.0'	BROWN AND GRAY LEAN CLAY WITH SAND AND SAND POCKETS		23.0	1.25								
EDW-B004	S-9A	26.0'-26.5'	GRAY AND BROWN CLAYEY SAND		19.5	0.75								
EDW-B004	S-10	30.0'-31.5'	GRAYISH BROWN AND DARK GRAY LEAN CLAY WITH SAND - ORGANIC		19.7	3.75								
EDW-B004	S-11	36.0'-38.0'	BROWN AND GRAYISH BROWN LEAN CLAY WITH SAND	CL	20.1						35	17	18	
EDW-B004	S-12	40.0'-41.5'	BROWN, RUST BROWN AND GRAY LEAN CLAY		30.0	1.25								
EDW-B004	S-13	45.0'-46.0'	GRAY LEAN CLAY		39.5	1.00								
EDW-B004	S-13A	46.0'-46.5'	BROWNISH GRAY LEAN CLAY WITH SAND		35.1									
EDW-B004	S-14	50.0'-51.5'	GRAY LEAN CLAY WITH SAND		65.2	1.75								2.617
EDW-B004	S-15	55.0'-56.5'	BROWN AND BLUISH GRAY LEAN CLAY WITH SAND		33.4	1.25								
EDW-B004	S-15A	56.0'-56.5'	BLUISH GRAY SILT		13.2									
EDW-B004	S-16	60.0'-60.25'	BLUISH GRAY SOFT SHALE		8.8									
EDW-B005	S-1	0.0'-1.5'	FILL: BROWN AND DARK BROWN CLAYEY SAND WITH GRAVEL AND SILT		45.8	4.50								
EDW-B005	S-2	2.5'-4.0'	FILL: BROWN SANDY SILT WITH GRAVEL		26.0									
EDW-B005	S-3	5.0'-6.5'	FILL: BROWN SANDY SILT WITH CLAY CHUNKS	MH	50.9	3.25					61	54	7	
EDW-B005	S-4	8.5'-10.0'	FILL: BROWN SANDY SILT WITH GRAVEL		37.4	4.50+								
EDW-B005	S-5	10.0'-11.5'	FILL: LIGHT BROWN AND GRAY CLAYEY SAND WITH GRAVEL		44.3									
EDW-B005	S-6	15.0'-16.5'	FILL: BROWN SANDY SILT WITH GRAVEL		41.4									
EDW-B005	S-7	20.0'-21.5'	FILL: GRAY FLY ASH		51.1	1.75	3.1	21.3	51.7	23.9				
EDW-B005	S-8	25.0'-26.0'	FILL: BROWNISH GRAY CLAYEY SILT WITH SAND AND GRAVEL		55.3									
EDW-B005	S-8A	26.0'-27.0'	FILL: GRAY AND BLACK ORGANIC SILT	OL	47.6						44	29	15	
EDW-B005	S-9	29.0'-31.0'	FILL: DARK GRAY FLY ASH		69.3									
EDW-B005	S-10	35.0'-36.5'	GRAY AND GRAYISH BLACK LEAN CLAY WITH SAND AND ORGANICS		37.3	1.00								
EDW-B005	S-11	41.0'-43.0'	GRAY FAT CLAY SHELL - ORGANICS NOTED	CH	44.8						57	22	35	
EDW-B005	S-12	45.0'-46.5'	DARK GRAY AND GREENISH GRAY LEAN CLAY WITH SAND - ORGANICS AND SHALE NOTED		88.7	1.00								2.521
EDW-B005	S-13	50.0'-51.0'	BLUISH GRAY CLAYEY SILT		15.9	4.50+								
EDW-B005	S-14	51.0'-51.5'	BLUISH GRAY SOFT SHALE		12.8									

LABORATORY TESTING SUMMARY

PROJECT NAME: Dynergy - Edwards Site **PROJECT NUMBER:** MR155218 **CLIENT:** AECOM

Boring Number	Sample Number	Depth	Description	USCS	WC %	Qp (tsf)	% Gravel	% Sand	% Silt	% Clay	LL	PL	PI	Specific Gravity
EDW-B006	S-1	0.0'-1.5'	FILL: DARK BROWN AND DARK GRAY LEAN CLAY WITH SAND AND BRICK		26.4	2.25								
EDW-B006	S-2	2.5'-5.0'	RUST BROWN AND GRAY MOTTLED LEAN CLAY		30.1	1.25								
EDW-B006	S-3	5.0'-6.5'	GRAY AND DARK GRAY LEAN CLAY TRACE SAND	CL	24.8	2.25					48	19	29	
EDW-B006	S-4	7.5'-10.0'	GRAY AND RUST BROWN MOTTLED LEAN CLAY		26.0	2.50								
EDW-B006	S-5	10.0'-11.5'	BROWNISH GRAY LEAN CLAY		34.2	1.25								
EDW-B006	S-6	13.0'-15.0'	GRAY FAT CLAY WITH SAND	CH	31.1						62	20	42	
EDW-B006	S-7	15.0'-16.5'	BROWNISH GRAY LEAN CLAY		40.8	1.00								
EDW-B006	S-8	20.0'-21.5'	BROWN AND GRAY LEAN CLAY WITH SAND		43.4	0.75								
EDW-B006	S-9	26.0'-28.0'	DARK GRAY ORGANIC SILT	OH	76.0						72	37	35	
EDW-B006	S-10	30.0'-31.0'	GRAY LEAN CLAY WITH SAND - ORGANIC POCKETS NOTED		43.4	0.50								
EDW-B006	S-10A	31.0'-31.5'	BLUISH GRAY LEAN CLAY WITH SAND AND SILT		19.6									
EDW-B006	S-11	35.0'-35.42'	BLUISH GRAY SILT WITH SAND		14.2	3.50								
EDW-B008	S-1	0.0'-1.5'	BROWN LEAN CLAY WITH SAND AND GRAVEL		13.2	4.50+								
EDW-B008	S-2	2.5'-4.0'	DARK BROWN LEAN CLAY WITH SAND	CL	19.5	3.75					42	22	20	
EDW-B008	S-3	5.0'-6.5'	DARK GRAY AND RUST BROWN MOTTLED LEAN CLAY WITH SAND		42.3	2.00								
EDW-B008	S-4	7.5'-9.0'	BROWN AND LIGHT GRAY LEAN CLAY WITH SAND		22.8	2.00								
EDW-B008	S-5	11.0'-13.0'	BROWN AND GRAY FAT CLAY WITH SAND	CH	33.6						52	19	33	
EDW-B008	S-6	15.0'-16.5'	GRAY LEAN CLAY WITH SAND		64.6	0.50								
EDW-B008	S-7	20.0'-21.5'	BROWN AND GRAY LEAN CLAY - SHELL NOTED		44.4	0.50								
EDW-B008	S-8	24.0'-26.5'	DARK GRAY FAT CLAY SHELL - ORGANICS NOTED	CH	68.9						67	31	36	
EDW-B008	S-9	30.0'-31.5'	GRAY AND BROWNISH GRAY LEAN CLAY WITH SAND		71.4	0.50								
EDW-B008	S-10	35.0'-36.5'	GRAY LEAN CLAY WITH SAND - WOODCHIPS, ORGANICS AND SHELL NOTED		56.9	0.25								
EDW-B008	S-11	40.0'-40.33'	BLUISH GRAY SILT WITH SOFT SHALE		12.6	3.00								

LABORATORY TESTING SUMMARY

PROJECT NAME: Dynegy - Edwards Site **PROJECT NUMBER:** MR155218 **CLIENT:** AECOM

Boring Number	Sample Number	Depth	Description	USCS	WC %	Qp (tsf)	% Gravel	% Sand	% Silt	% Clay	LL	PL	PI	Specific Gravity
EDW-B010	S-1 TOP	0.0'-0.5'	FILL: BROWN SAND WITH GRAVEL		7.2									
EDW-B010	BOTTOM	0.0'-0.5'	FILL: BROWN LEAN CLAY WITH SAND AND GRAVEL		17.4	4.50+								
EDW-B010	S-1A	0.5'-1.5'	FILL: DARK GRAY FLY ASH		27.9									
EDW-B010	S-2	2.5'-3.0'	FILL: DARK GRAY FLY ASH		20.9									
EDW-B010	S-2A	3.0'-4.0'	FILL: DARK GRAY FLY ASH		30.7	4.50								
EDW-B010	S-3	5.0'-6.5'	FILL: DARK BROWN AND DARK GRAY SAND WITH GRAVEL - FLY ASH NOTED	SP	14.8		12.6	54.8	26.0	6.6				
EDW-B010	S-4	7.5'-9.0'	BROWN WITH RUST BROWN STAINS LEAN CLAY WITH SAND		22.0	3.75								
EDW-B010	S-5	10.0'-11.5'	BROWN AND RUST BROWN LEAN CLAY WITH SAND		24.0	2.00								
EDW-B010	S-6	12.5'-14.0'	BROWN LEAN CLAY		28.0	1.25								
EDW-B010	S-7	15.0'-17.0'	BROWN AND GRAY MOTTLED LEAN CLAY	CL	30.5						48	18	30	
EDW-B010	S-8	20.0'-21.5'	GRAY LEAN CLAY		32.9	0.75								
EDW-B010	S-9	25.0'-26.5'	GRAY LEAN CLAY WITH SAND		21.4	0.50								
EDW-B010	S-10	30.0'-32.0'	BLUISH GRAY LEAN CLAY	CL	30.0						40	15	25	
EDW-B010	S-11	35.0'-36.5'	BROWNISH GRAY LEAN CLAY		28.2	1.50								
EDW-B010	S-12	40.0'-41.0'	BROWN, RUST BROWN AND GRAY SILTY SAND WITH GRAVEL		17.0									
EDW-B010	S-13	45.0'-45.25'	BLUISH GRAY CLAYEY SILT - SHALE NOTED		16.4	4.50								
EDW-B011	S-1	0.0'-1.5'	FILL: DARK GRAY FLY ASH		27.7	4.50+								
EDW-B011	S-2	2.5'-4.0'	FILL: DARK GRAY AND BLACK FLY ASH - ASPHALT NOTED		16.3	4.50+								
EDW-B011	S-3	5.0'-6.5'	FILL: GRAY FLY ASH		29.4	4.50+								
EDW-B011	S-4	7.5'-9.0'	FILL: DARK GRAY FLY ASH		45.3	3.00								
EDW-B011	S-5	9.0'-11.0'	FILL: VERY DARK GRAY FLY ASH		70.0		15.5	21.3	46.0	17.2				
EDW-B011	S-6	15.0'-17.0'	FILL: DARK GRAY FLY ASH		63.2									
EDW-B011	S-7	19.5'-21.5'	FILL: GRAY FLY ASH		84.9		0.2	16.7	58.0	25.1				
EDW-B011	S-8	25.0'-27.0'	FILL: DARK GRAY FLY ASH - CLAY NOTED		74.7									2.691
EDW-B011	S-9	30.0'-32.0'	FILL: DARK GRAY FLY ASH		73.7									
EDW-B011	S-10	35.0'-37.0'	FILL: DARK GRAY FLY ASH		93.9									
EDW-B011	S-13	40.0'-41.5'	BROWN AND GRAY LEAN CLAY		47.9	1.00								
EDW-B011	S-14	45.0'-46.5'	GRAYISH BROWN FAT CLAY WITH SAND	CH	63.3	0.50					63	21	42	
EDW-B011	S-15	50.0'-51.5'	DARK GRAY AND GRAYISH BROWN LEAN CLAY		62.5	0.50								
EDW-B011	S-16	55.0'-56.5'	GRAY LEAN CLAY		52.9	0.75								
EDW-B011	S-17	60.0'-60.25'	BLUISH GRAY SOFT SHALE		9.1									

LABORATORY TESTING SUMMARY

PROJECT NAME: Dynegy - Edwards Site **PROJECT NUMBER:** MR155218 **CLIENT:** AECOM

Boring Number	Sample Number	Depth	Description	USCS	WC %	Qp (tsf)	% Gravel	% Sand	% Silt	% Clay	LL	PL	PI	Specific Gravity
EDW-B012	S-1	0.0'-1.5'	FILL: BROWN SANDY SILT WITH GRAVEL		23.0									
EDW-B012	S-2	2.5'-4.0'	FILL: DARK GRAY FLY ASH		23.8	4.50+					28	26	2	
EDW-B012	S-3	5.0'-6.5'	FILL: DARK GRAY FLY ASH		26.5		0.0	9.6	73.7	16.7				
EDW-B012	S-4	7.5'-9.0'	FILL: DARK GRAY FLY ASH		26.5	4.50								
EDW-B012	S-5	10.0'-11.0'	FILL: DARK BROWN LEAN CLAY WITH SAND - FLY ASH NOTED		24.7	3.75								
EDW-B012	S-5A	11.0'-11.5'	BROWN AND GRAYISH BROWN LEAN CLAY		24.9	2.00								
EDW-B012	S-6	12.5'-14.0'	BROWN LEAN CLAY		22.0	3.50								
EDW-B012	S-7	15.0'-16.5'	BROWN AND RUST BROWN MOTTLED LEAN CLAY	CL	24.3	3.25					48	19	29	
EDW-B012	S-8	20.0'-22.0'	BROWNISH GRAY MOTTHED LEAN CLAY WITH SAND		23.8									
EDW-B012	S-9	25.0'-26.5'	BROWNISH GRAY LEAN CLAY WITH SAND		23.2	1.25								
EDW-B012	S-10	30.0'-31.5'	BROWN AND GRAY LEAN CLAY		24.8	1.50								
EDW-B012	S-11	35.0'-36.5'	RUST BROWN AND GRAY LEAN CLAY WITH SAND		28.3	1.50								
EDW-B012	S-12	40.0'-41.5'	BLUISH GRAY AND BROWNISH GRAY LEAN CLAY		32.2	1.00								
EDW-B012	S-13	45.0'-46.5'	BROWNISH GRAY LEAN CLAY		50.2	1.25								
EDW-B012	S-14	47.0'-49.0'	DARK GRAY FAT CLAY	CH	50.8						54	20	34	
EDW-B012	S-15	49.0'-50.5'	GRAY AND BROWNISH GRAY LEAN CLAY WITH SAND		67.4	1.00								
EDW-B012	S-16	55.0'-55.5'	GRAY LEAN CLAY WITH SAND		50.5	1.75								
EDW-B012	S-16A	55.5'-56.5'	BLUISH GRAY CLAYEY SILT		15.3	4.50								
EDW-B012	S-17	60.0'-60.21'	BLUISH GRAY CLAYEY SILT		17.9	1.50								
EDW-B013	S-1	0.0'-1.5'	FILL: BROWN AND DARK BROWN LEAN CLAY WITH SAND AND GRAVEL		13.6	4.50+								
EDW-B013	S-2	2.5'-4.0'	BROWN AND GRAYISH BROWN LEAN CLAY WITH SAND		17.4	4.50+								
EDW-B013	S-3	6.0'-8.0'	BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL	CL	24.3						49	21	28	
EDW-B013	S-4	8.0'-9.5'	DARK GRAY AND RUST BROWN MOTTLED LEAN CLAY		24.3	3.00								
EDW-B013	S-5	10.0'-11.5'	DARK GRAY LEAN CLAY		25.4	2.25								
EDW-B013	S-6	15.0'-16.5'	DARK GRAY AND BROWNISH GRAY LEAN CLAY	CL	25.5	1.50					41	17	24	
EDW-B013	S-7	20.0'-21.5'	BROWN AND DARK GRAY LEAN CLAY		23.5	1.75								
EDW-B013	S-8	25.0'-26.5'	DARK BROWNISH GRAY LEAN CLAY		27.7									
EDW-B013	S-9	30.0'-31.5'	GRAY AND RUST BROWN MOTTLED SANDY LEAN CLAY		20.2	0.50								
EDW-B013	S-10	32.0'-34.0'	GRAY AND BROWN LEAN CLAY WITH SAND	CL	33.3						42	23	19	
EDW-B013	S-11	34.0'-35.5'	DARK GRAY LEAN CLAY		58.0	0.50								
EDW-B013	S-12	40.0'-41.5'	GRAY LEAN CLAY WITH SAND		54.5	1.75								
EDW-B013	S-13	45.0'-46.5'	GRAY LEAN CLAY - CALCIUM CABONATE SEAMS AND SHELL NOTED		66.2	1.25								
EDW-B013	S-3	6.0'-8.0'	BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL		20.0									

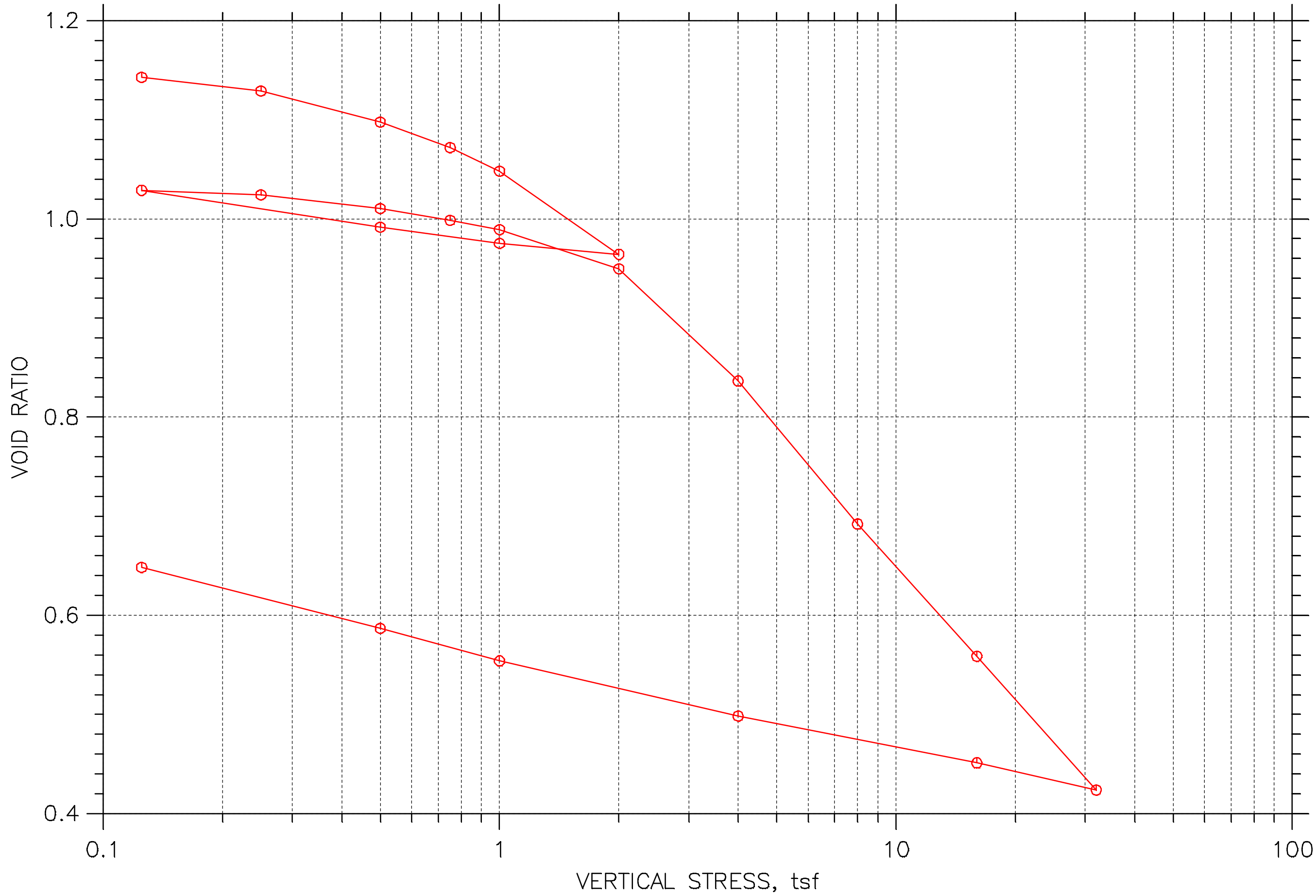
LABORATORY TESTING SUMMARY

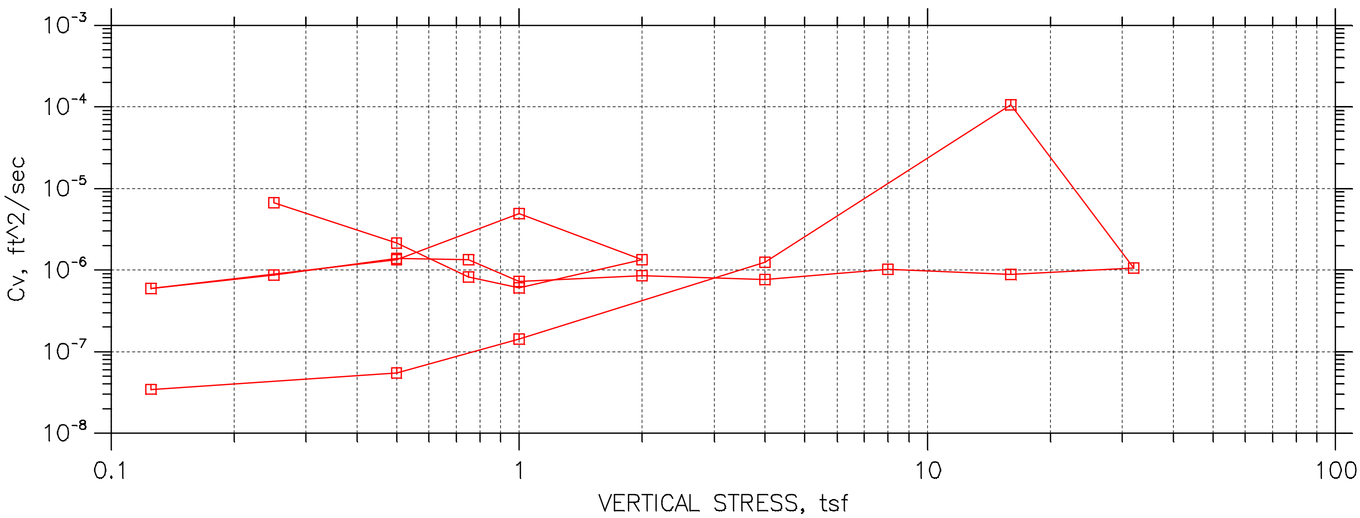
PROJECT NAME: Dynegy - Edwards Site **PROJECT NUMBER:** MR155218 **CLIENT:** AECOM

Boring Number	Sample Number	Depth	Description	USCS	WC %	Qp (tsf)	% Gravel	% Sand	% Silt	% Clay	LL	PL	PI	Specific Gravity
EDW-B014	S-1	0.0'-1.5'	FILL: DARK GRAY FLY ASH		28.2	4.00								
EDW-B014	S-2	2.5'-3.5'	FILL: DARK GRAY CLAYEY SILT - FLY ASH NOTED		40.8	1.50								
EDW-B014	S-2A	3.5'-4.0'	FILL: GRAY CLAYEY SILT WITH SAND - FLY ASH NOTED		50.0									
EDW-B014	S-4	7.0'-8.5'	FILL: GRAY SILTY SAND WITH GRAVEL - FLY ASH NOTED	SM	60.2		0.0	35.1	45.4	19.5				
EDW-B014	S-6	15.0'-17.0'	FILL: GRAY AND DARK GRAY FLY ASH		78.7	3.50								
EDW-B014	S-7	20.0'-22.5'	FILL: DARK GRAY FLY ASH		86.5	1.50								2.524
EDW-B014	S-8	25.0'-26.7'	FILL: DARK GRAY FLY ASH - CLAY NOTED		73.1									
EDW-B014	S-9	30.0'-31.5'	GRAY AND DARK GRAY LEAN CLAY - ORGANIC POCKETS NOTED		48.7									
EDW-B014	S-10	35.0'-36.7'	GRAY LEAN CLAY		31.6	0.75								
EDW-B014	S-11	40.0'-40.5'	BLUISH GRAY LEAN CLAY WITH SAND AND GRAVEL		27.3	4.00								2.719
EDW-B014	S-11A	40.5'-41.0'	BLUISH GRAY AND GREENISH GRAY SILT WITH SOFT SHALE		19.6	4.50+								
EDW-B014	S-11B	41.0'-41.5'	GRAY SOFT SHALE		10.2									
EDW-B014	S-12	45.0'-45.5'	GRAY SILT WITH SAND		14.5	4.50								
EDW-B015	S-1	0.0'-1.5'	FILL: GRAYISH BROWN SANDY SILT		54.7									
EDW-B015	S-2	2.5'-4.0'	BROWN SAND WITH GRAVEL		4.5									
EDW-B015	S-3	5.0'-6.5'	BROWN SAND WITH GRAVEL		5.4									
EDW-B015	S-4	7.5'-9.0'	BROWN SAND WITH GRAVEL		7.2									
EDW-B015	S-5	10.0'-11.5'	BROWN SAND WITH GRAVEL		6.5									
EDW-B015	S-6	13.0'-14.25'	BROWN AND GRAY GRAVEL		3.6									
EDW-B015	S-7	15.0'-16.5'	LIGHT GRAY GRAVEL WITH SAND - LIMESTONE FRAGMENTS NOTED		8.2									
EDW-B015	S-8	20.0'-21.5'	GRAY GRAVEL WITH SAND		7.8									
EDW-B015	S-9	25.0'-26.5'	LIGHT GRAY GRAVEL WITH SAND AND SILT		8.1									
EDW-B015	S-10	31.0'-33.0'	BROWN AND GRAY MOTTLED SANDY LEAN CLAY WITH GRAVEL	CL	20.2						24	13	11	
EDW-B015	S-11	35.0'-36.5'	GRAY AND DARK GRAY LEAN CLAY		33.8	1.50								
EDW-B015	S-12	37.0'-39.0'	DARK GRAY FAT CLAY	CH	41.0						66	23	43	
EDW-B015	S-13	39.0'-40.5'	BROWN AND GRAY LEAN CLAY		36.2	0.50								
EDW-B015	S-14	45.0'-46.5'	BROWN AND GRAY LEAN CLAY WITH SAND		49.4	1.00								
EDW-B015	S-15	50.0'-51.0'	GRAY LEAN CLAY		30.9	1.50								
EDW-B015	S-16	55.0'-55.5'	BLUISH GRAY SILT - SHALE NOTED		11.0	4.25								

CONSOLIDATION TEST DATA

SUMMARY REPORT





Terracon Consulting Engineers & Scientists			
	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0'' ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

Mon, 16-NOV-2015 16:59:27

CONSOLIDATION TEST DATA

Project: DYNEGY EDWARDS
Boring No.: EDW-B003
Sample No.: S-12
Test No.: EDW003S12

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 10/26/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 45.0'-47.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: DARK GRAY FAT CLAY WITH SAND CH
Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435

Estimated Specific Gravity: 2.72
Initial Void Ratio: 1.15
Final Void Ratio: 0.65

Liquid Limit: 51
Plastic Limit: 24
Plasticity Index: 27

Initial Height: 1.00 in
Specimen Diameter: 2.50 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	X-14	RING	RING	X-19
Wt. Container + Wet Soil, gm	165.03	249.08	236.35	164.81
Wt. Container + Dry Soil, gm	127.13	213.35	213.35	142.68
Wt. Container, gm	44.81	111.54	111.54	44.72
Wt. Dry Soil, gm	82.32	101.81	101.81	97.96
Water Content, %	46.04	35.09	22.59	22.59
Void Ratio	---	1.15	0.65	---
Degree of Saturation, %	---	83.18	94.86	---
Dry Unit Weight, pcf	---	79.069	103.05	---

CONSOLIDATION TEST DATA

Project: DYNEGY EDWARDS
Boring No.: EDW-B003
Sample No.: S-12
Test No.: EDW003S12

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 10/26/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 45.0'-47.0'
Elevation: ----

Terracon Consulting Engineers & Scientists

Soil Description: DARK GRAY FAT CLAY WITH SAND CH
Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435

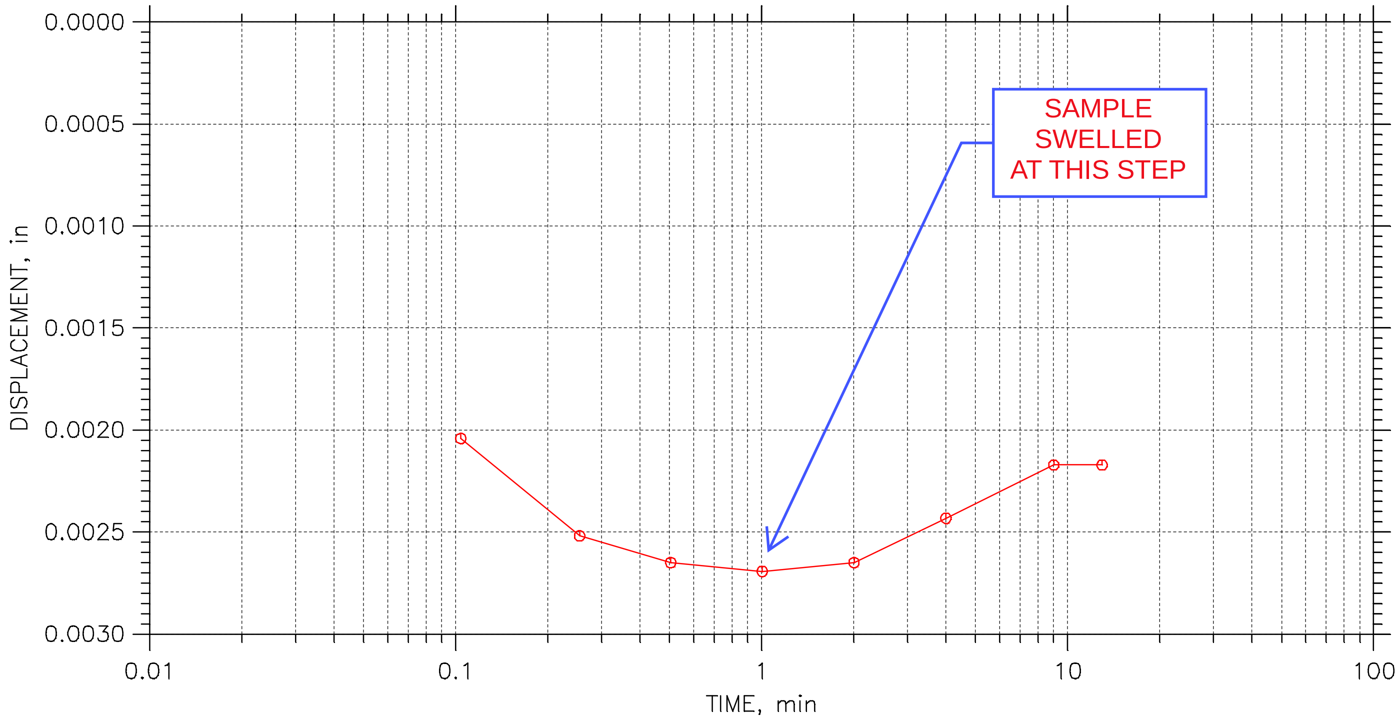
	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	T50 Fitting Sq.Rt. min	T50 Fitting Log min	Coefficient of Consolidation Sq.Rt. ft^2/sec	Coefficient of Consolidation Log ft^2/sec	Coefficient of Consolidation Ave. ft^2/sec
1	0.125	0.002172	1.143	0.22	0.0	0.0	0.00e+000	0.00e+000	0.00e+000
2	0.25	0.008644	1.129	0.87	1.0	0.6	5.41e-006	8.79e-006	6.69e-006
3	0.5	0.02315	1.098	2.32	3.9	1.2	1.42e-006	4.45e-006	2.15e-006
4	0.75	0.03518	1.072	3.53	6.5	4.7	8.27e-007	1.15e-006	9.61e-007
5	1	0.04617	1.048	4.63	8.6	0.0	6.06e-007	0.00e+000	6.06e-007
6	2	0.08522	0.964	8.54	3.7	0.0	1.33e-006	0.00e+000	1.33e-006
7	1	0.08005	0.975	8.02	1.0	0.0	4.94e-006	0.00e+000	4.94e-006
8	0.5	0.07245	0.992	7.26	3.7	0.0	1.33e-006	0.00e+000	1.33e-006
9	0.125	0.05516	1.029	5.53	8.4	0.0	5.93e-007	0.00e+000	5.93e-007
10	0.25	0.05733	1.024	5.74	5.8	0.0	8.68e-007	0.00e+000	8.68e-007
11	0.5	0.06376	1.010	6.39	3.6	0.0	1.38e-006	0.00e+000	1.38e-006
12	0.75	0.06924	0.999	6.94	3.7	0.0	1.33e-006	0.00e+000	1.33e-006
13	1	0.07358	0.989	7.37	11.4	2.0	4.29e-007	2.42e-006	7.28e-007
14	2	0.09195	0.950	9.21	8.7	2.5	5.48e-007	1.92e-006	8.53e-007
15	4	0.1446	0.836	14.49	5.8	5.7	7.57e-007	7.69e-007	7.63e-007
16	8	0.2117	0.692	21.21	3.8	3.7	1.02e-006	1.04e-006	1.03e-006
17	16	0.2736	0.559	27.42	3.8	3.6	8.62e-007	9.02e-007	8.81e-007
18	32	0.3363	0.424	33.70	2.1	3.1	1.30e-006	8.96e-007	1.06e-006
19	16	0.3237	0.451	32.43	0.0	0.0	1.05e-004	0.00e+000	1.05e-004
20	4	0.3017	0.498	30.23	2.1	0.0	1.25e-006	0.00e+000	1.25e-006
21	1	0.2758	0.554	27.64	20.3	0.0	1.42e-007	0.00e+000	1.42e-007
22	0.5	0.2611	0.586	26.16	78.7	39.4	3.86e-008	7.70e-008	5.14e-008
23	0.125	0.2322	0.648	23.27	93.5	0.0	3.45e-008	0.00e+000	3.45e-008

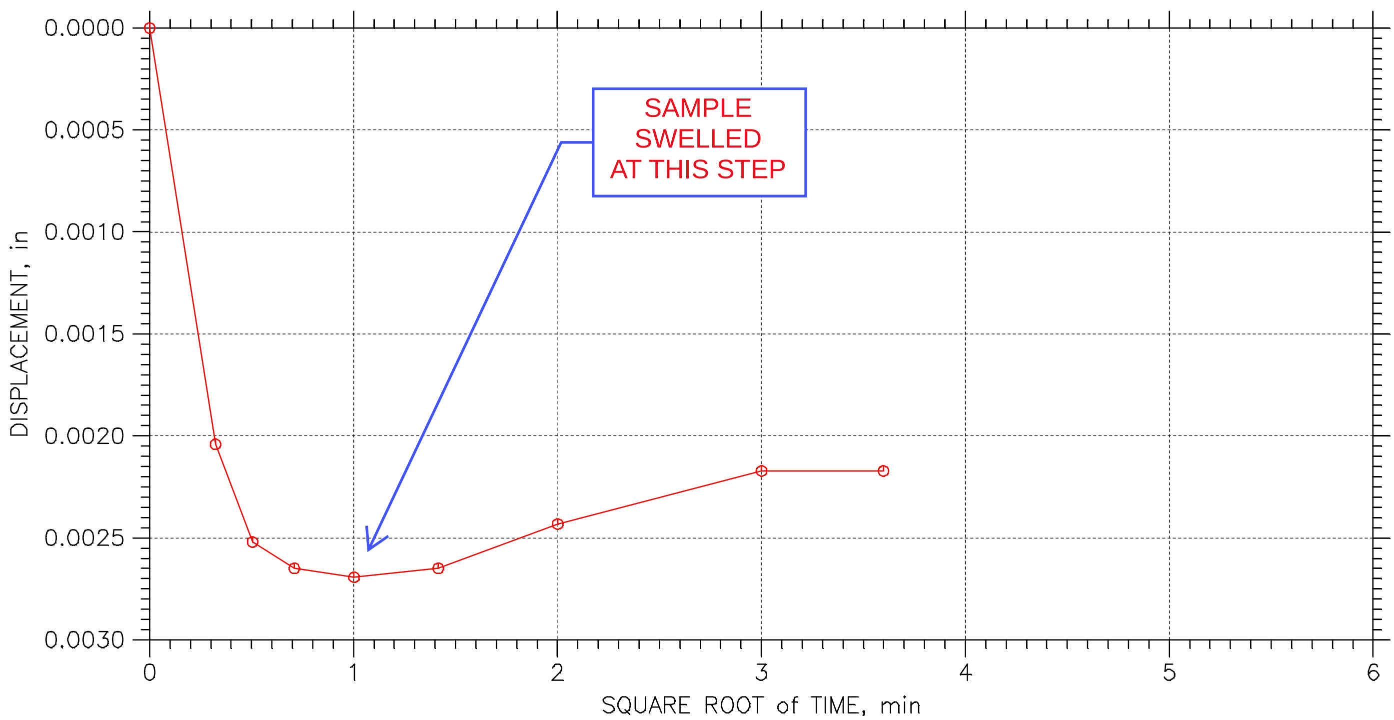
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 1 of 23

Stress: 0.125 tsf





Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0'' ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

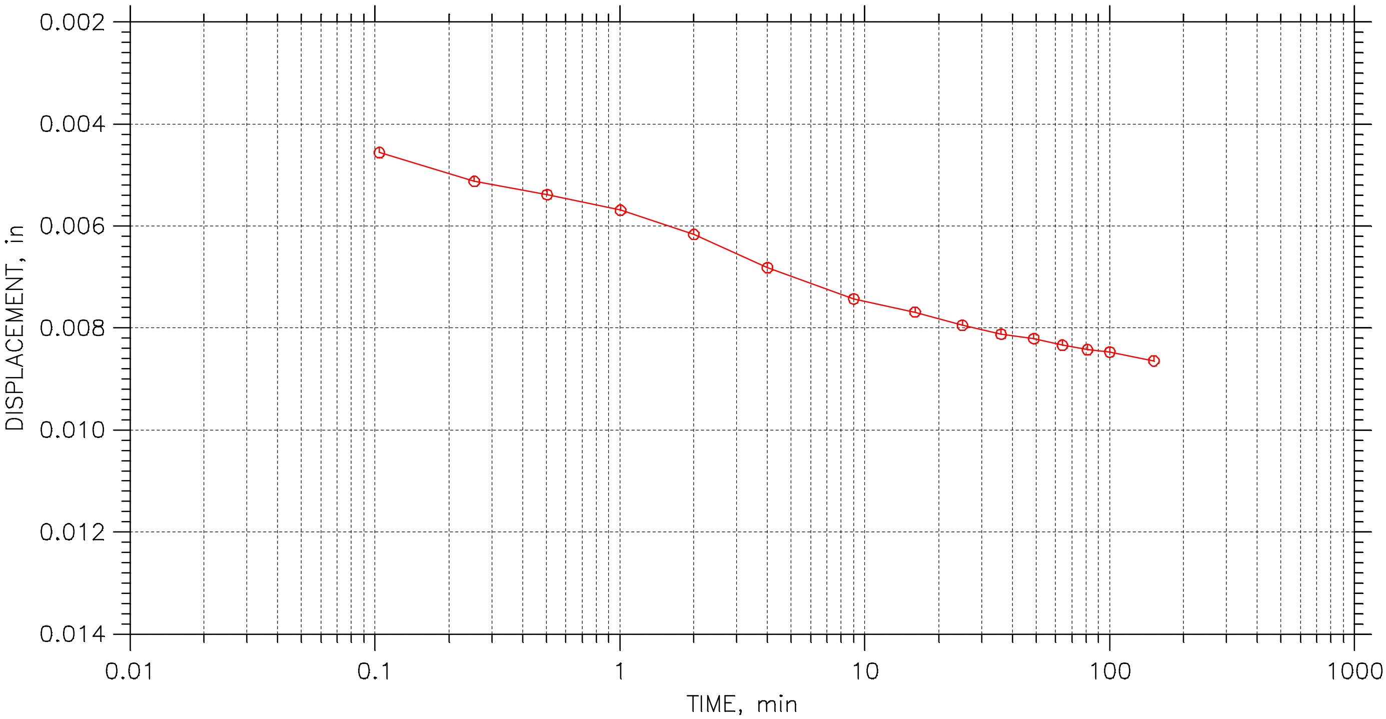
Mon, 16-NOV-2015 17:10:49

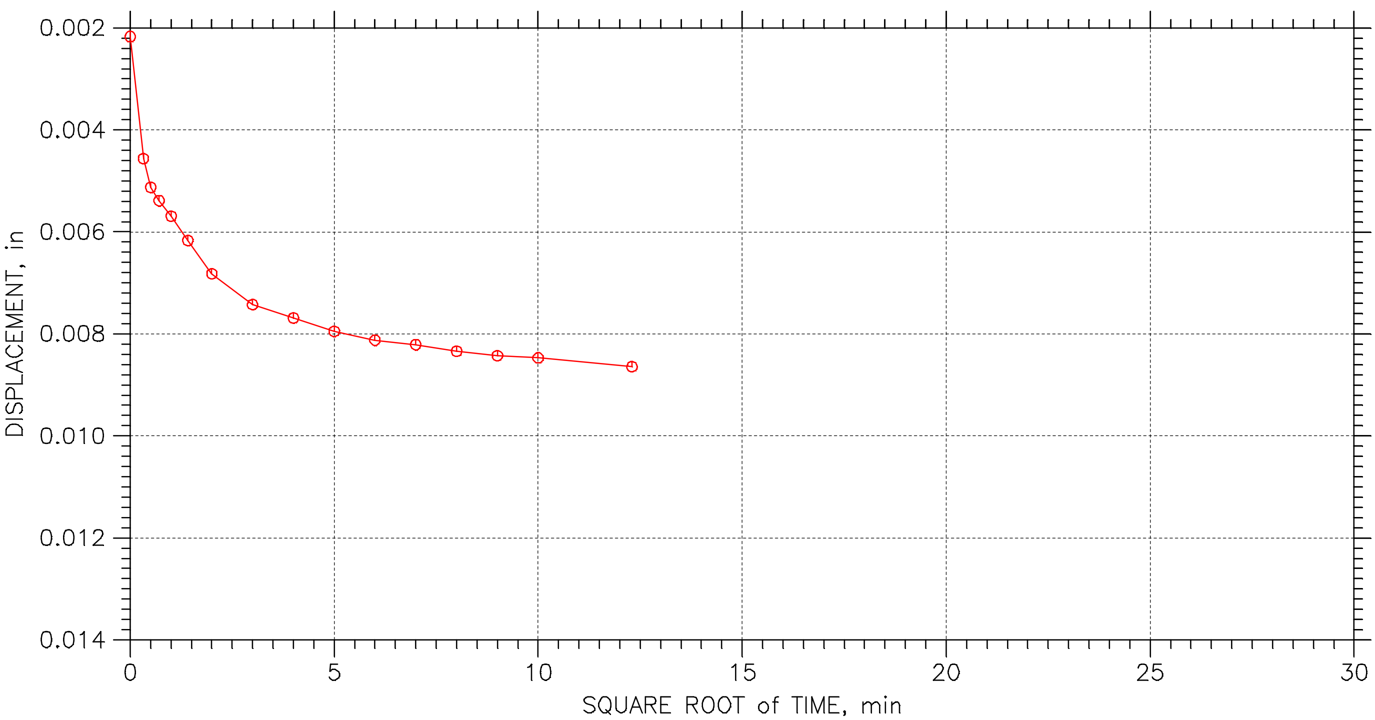
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 2 of 23

Stress: 0.25 tsf





Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

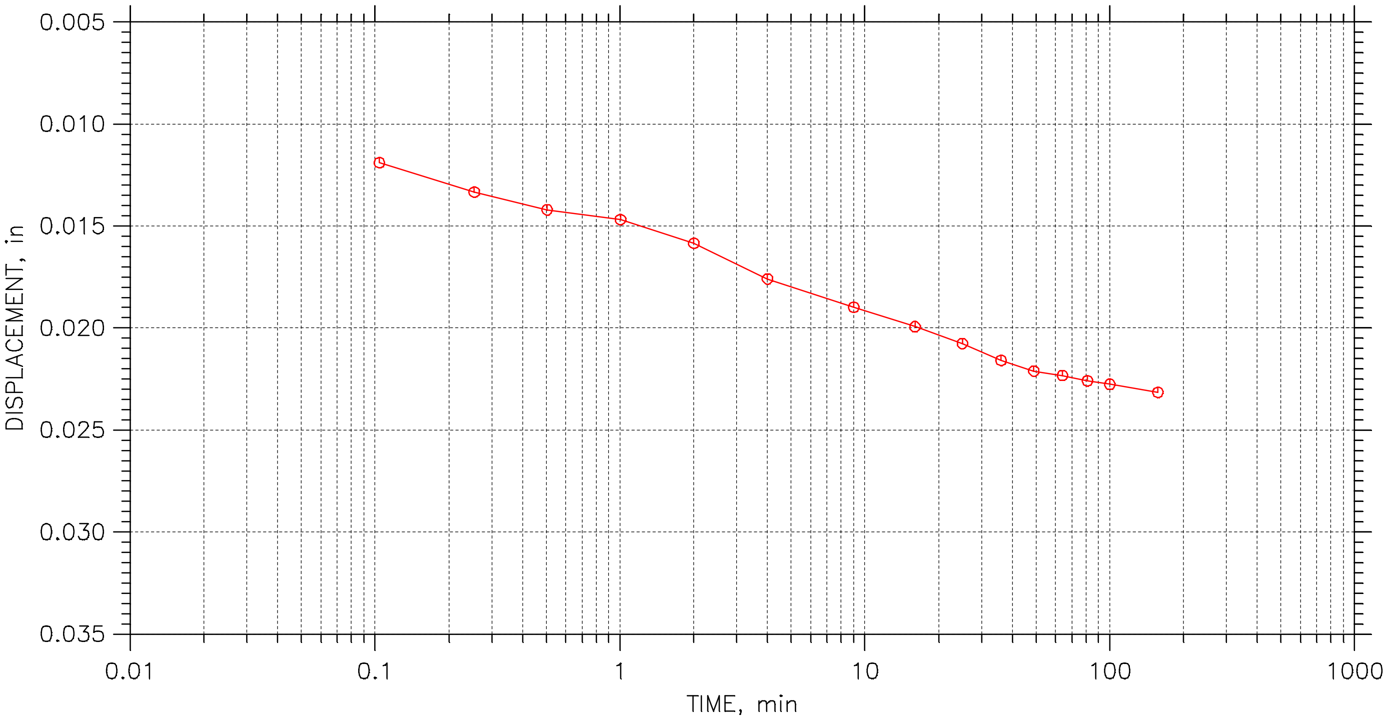
Mon, 16-NOV-2015 17:10:50

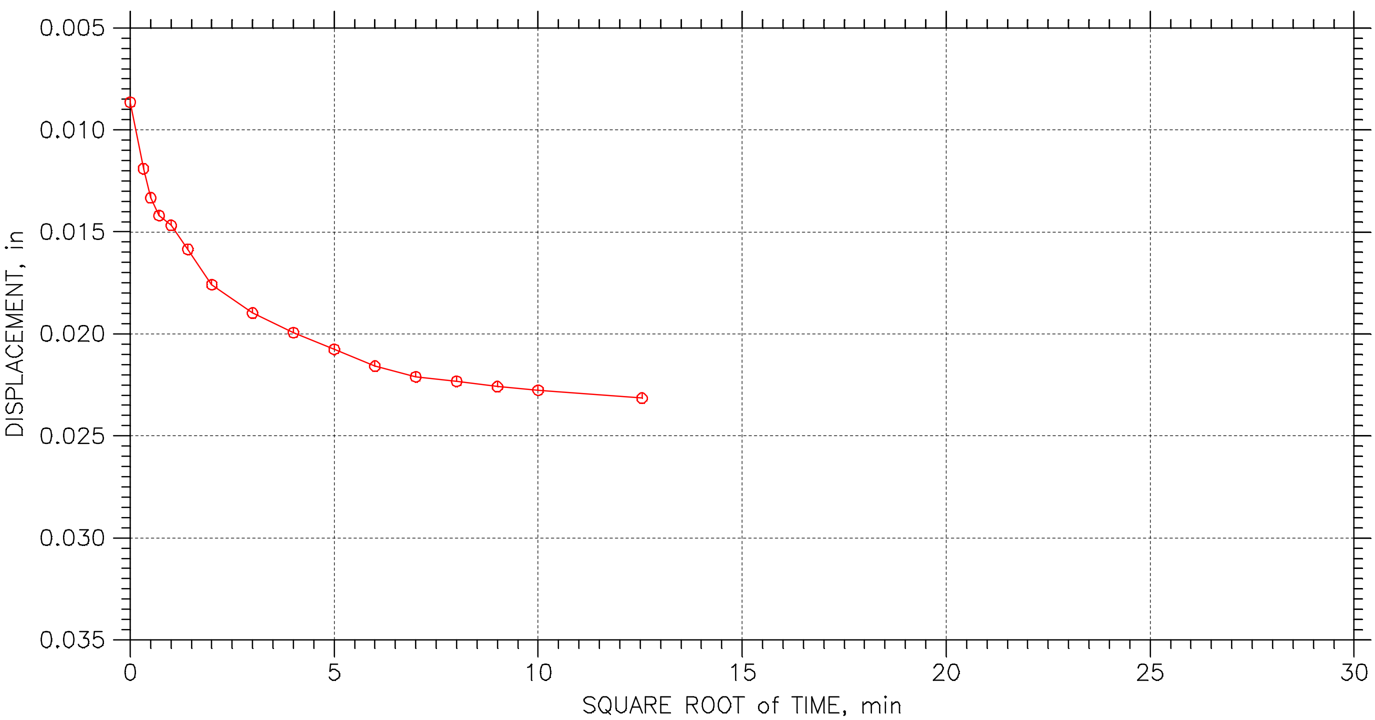
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 3 of 23

Stress: 0.5 tsf





Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0'' ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

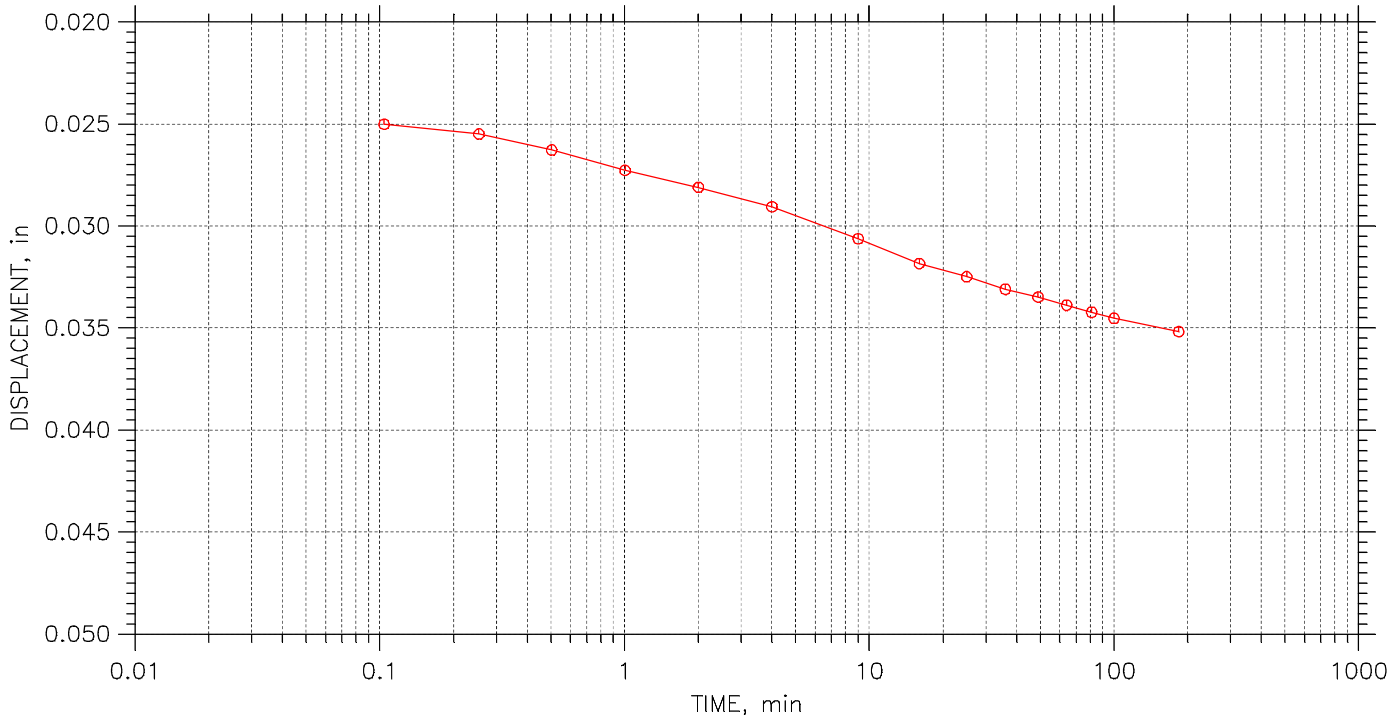
Mon, 16-NOV-2015 17:10:52

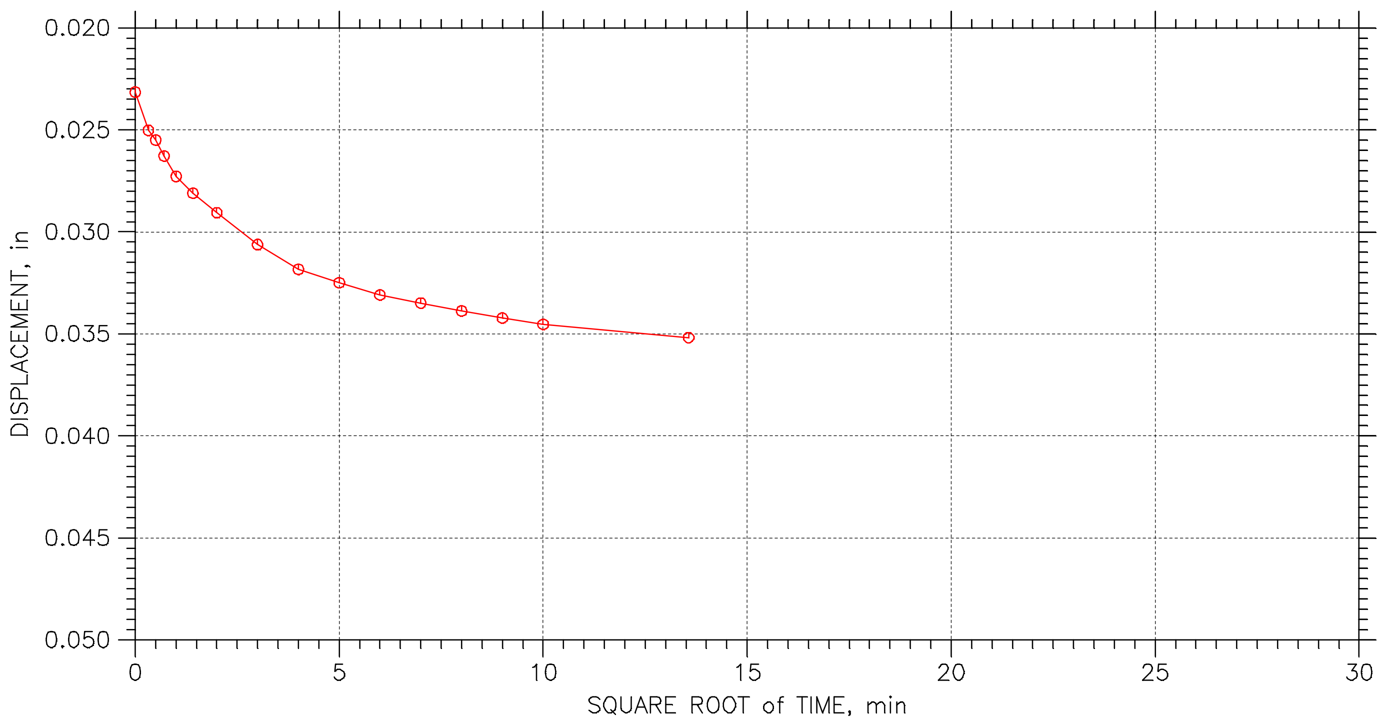
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 4 of 23

Stress: 0.75 tsf





Terracon Consulting Engineers & Scientists			
	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

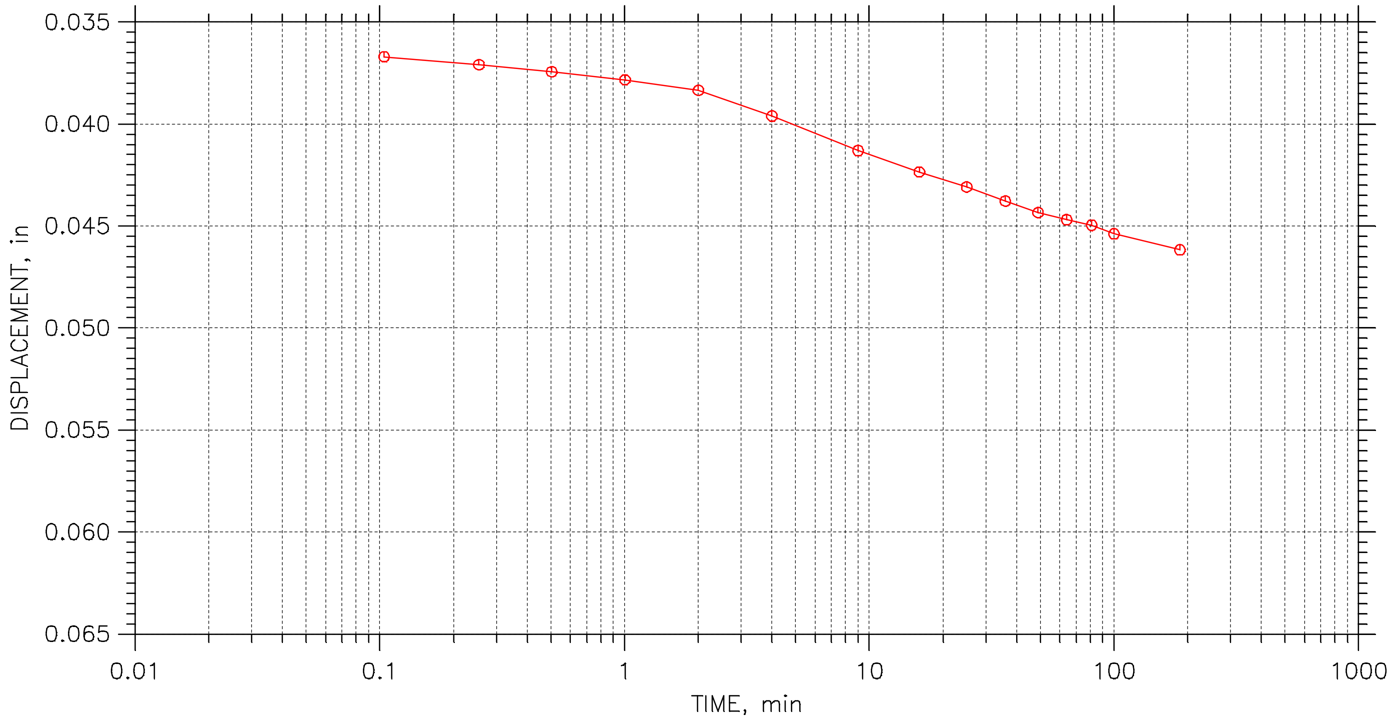
Mon, 16-NOV-2015 17:10:53

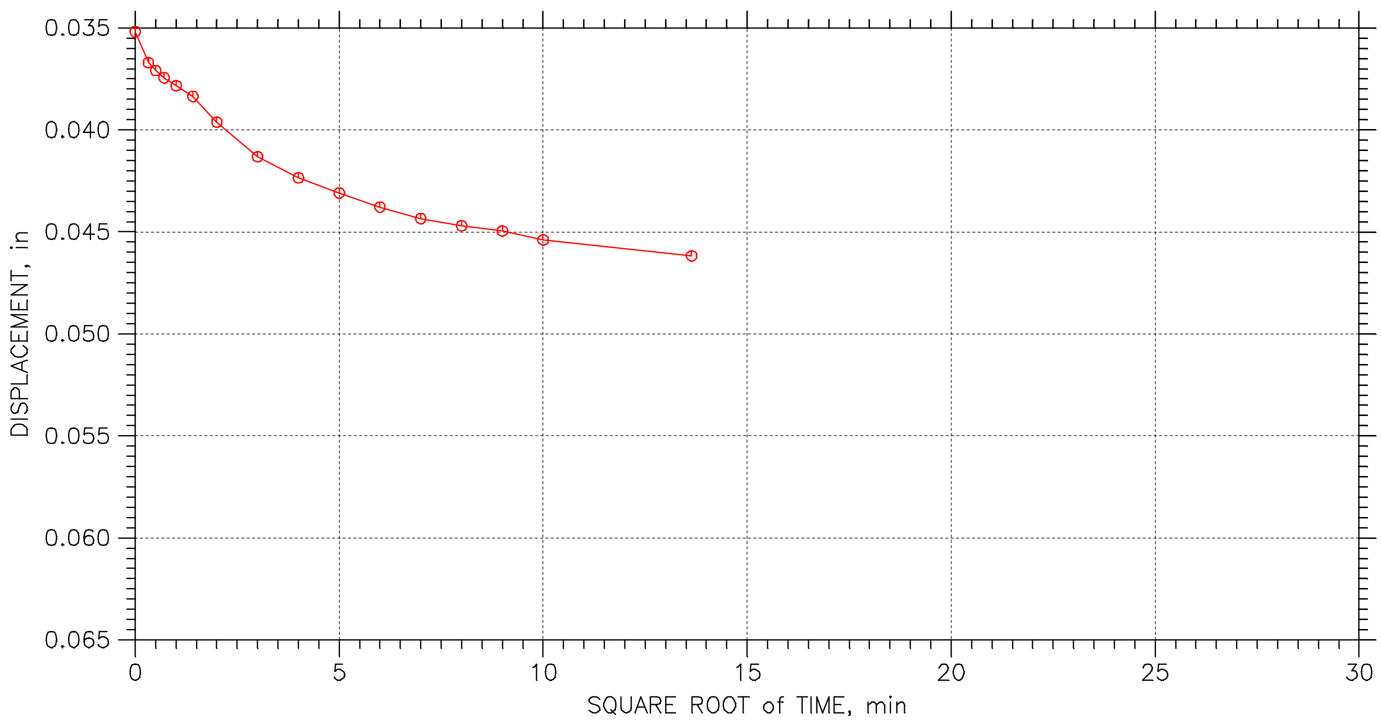
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 5 of 23

Stress: 1. tsf





Terracon Consulting Engineers & Scientists			
	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0'' ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

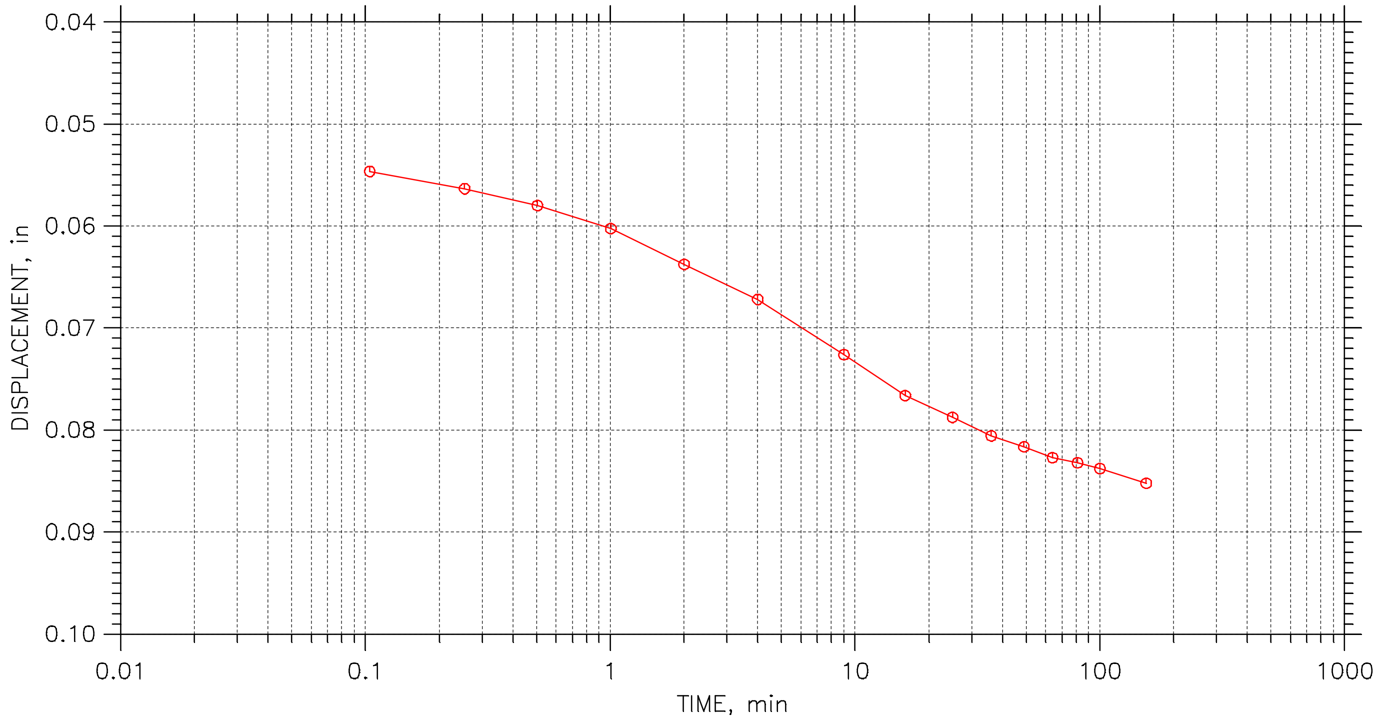
Mon, 16-NOV-2015 17:10:54

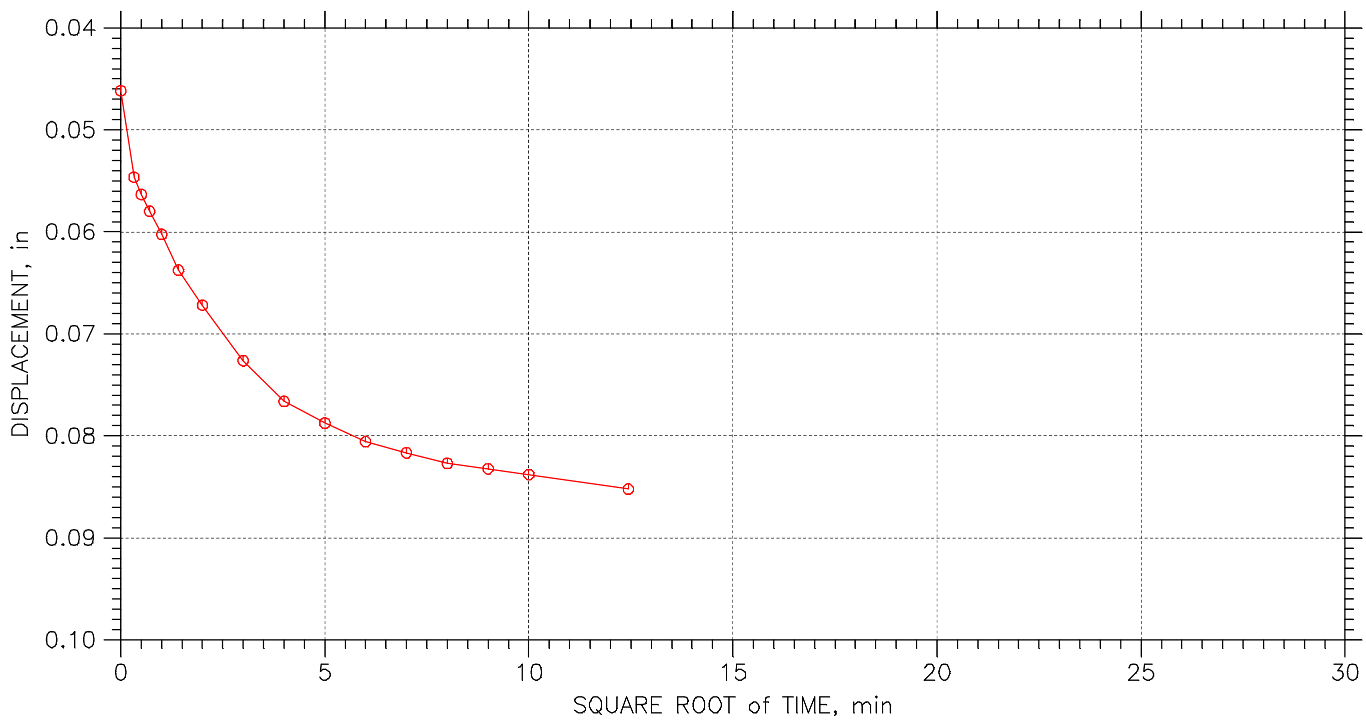
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 6 of 23

Stress: 2. tsf





Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

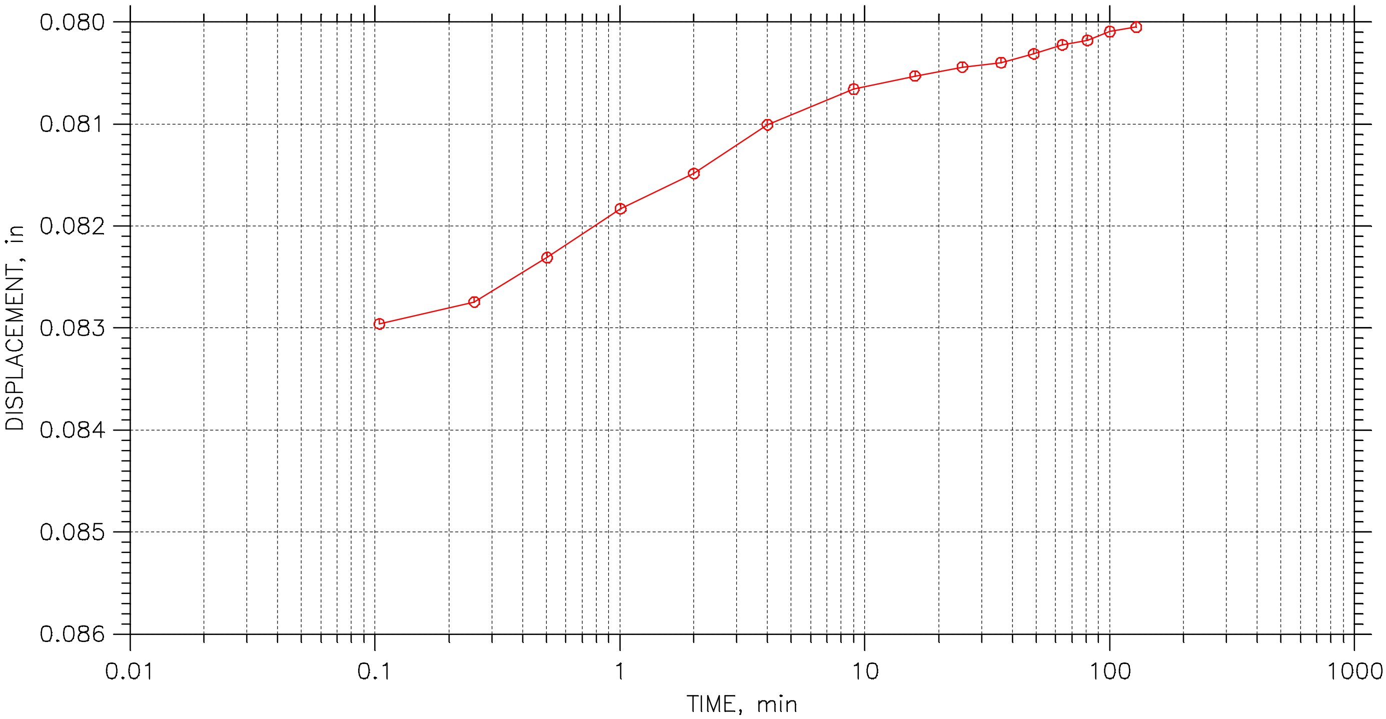
Mon, 16-NOV-2015 17:10:56

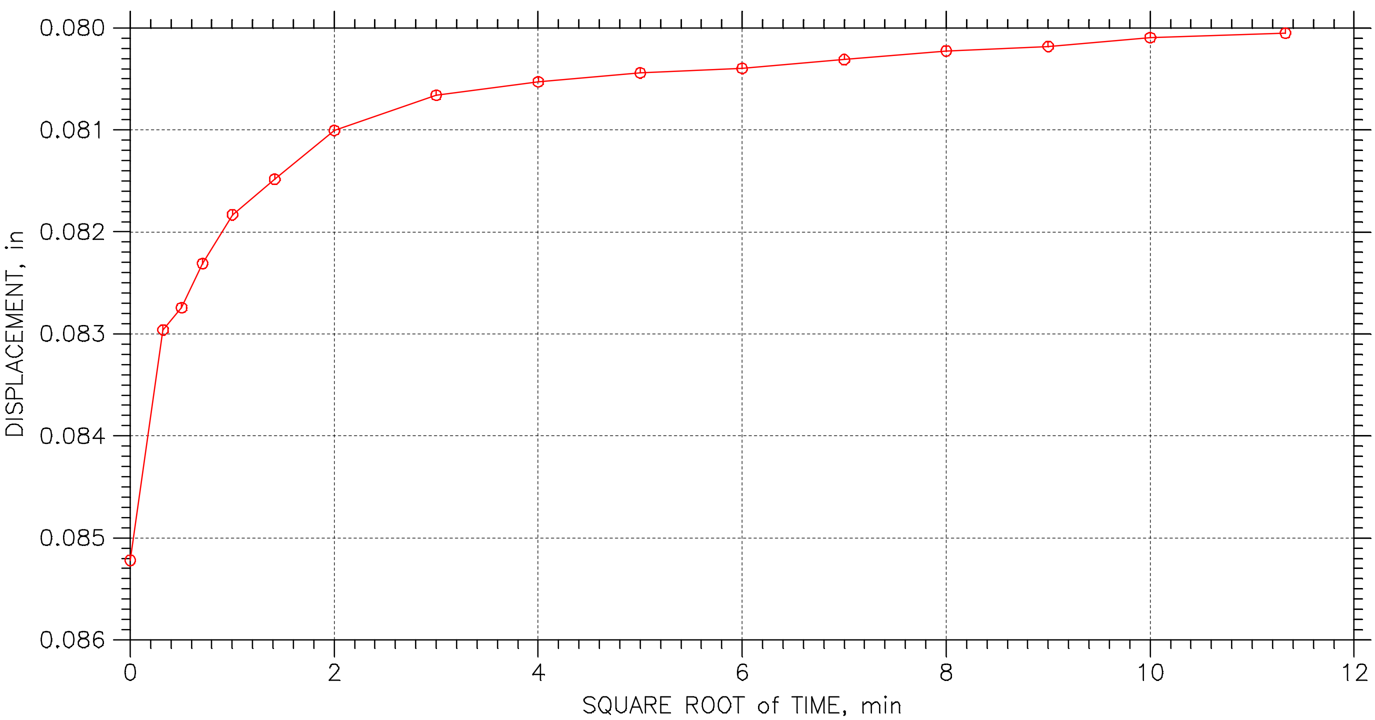
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 7 of 23

Stress: 1. tsf





Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0'' ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

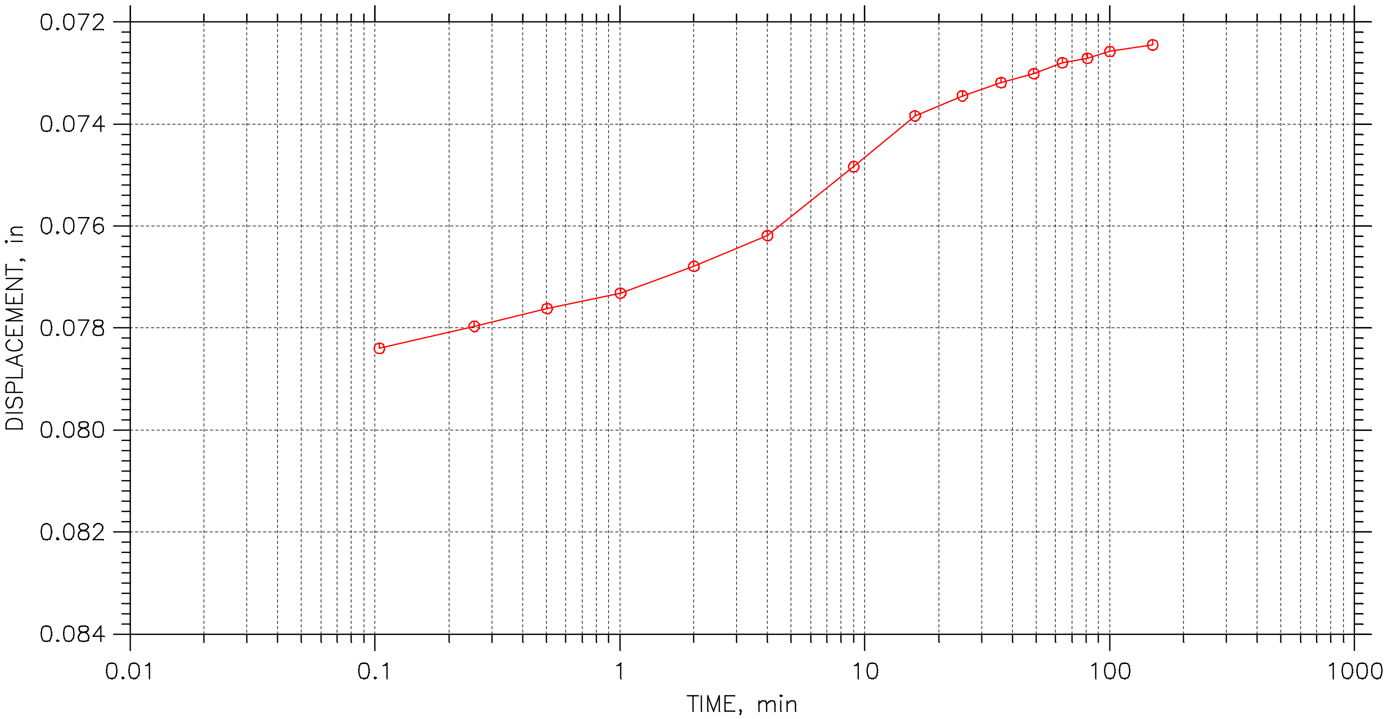
Mon, 16-NOV-2015 17:10:57

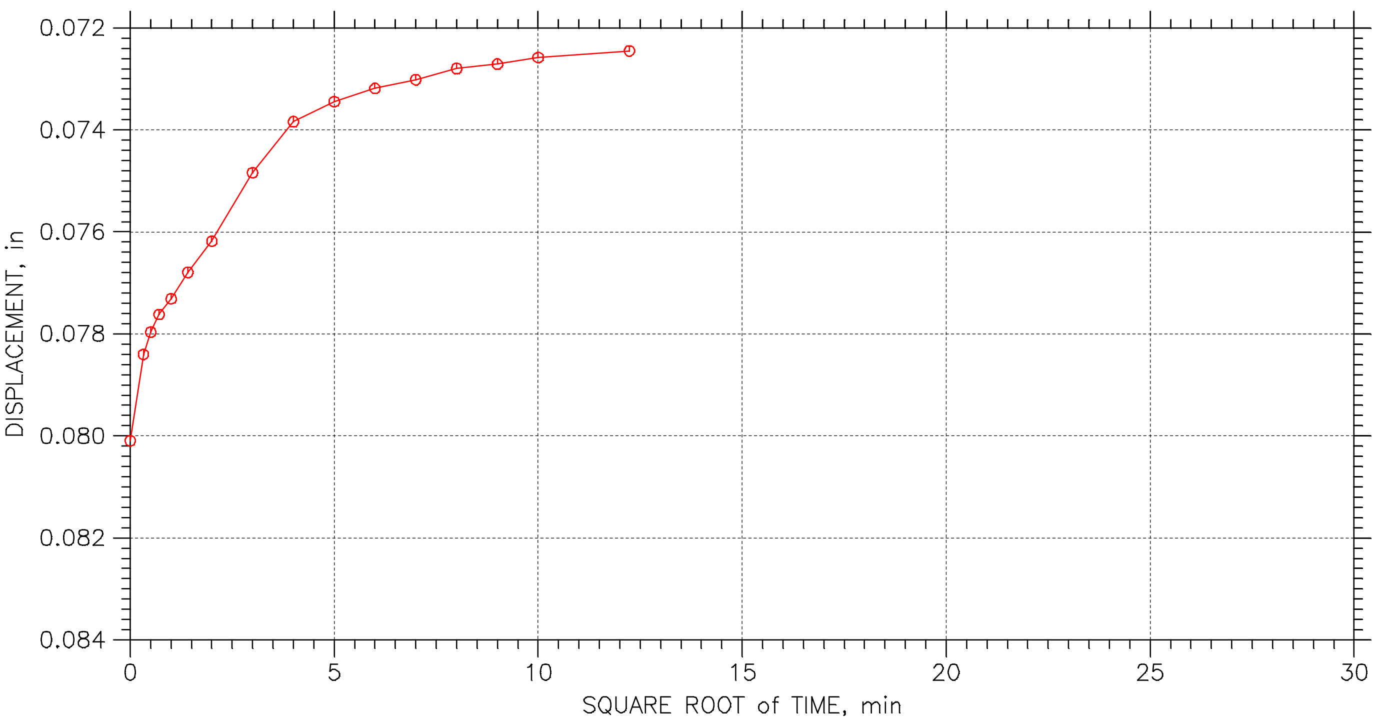
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 8 of 23

Stress: 0.5 tsf





Terracon Consulting Engineers & Scientists			
	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

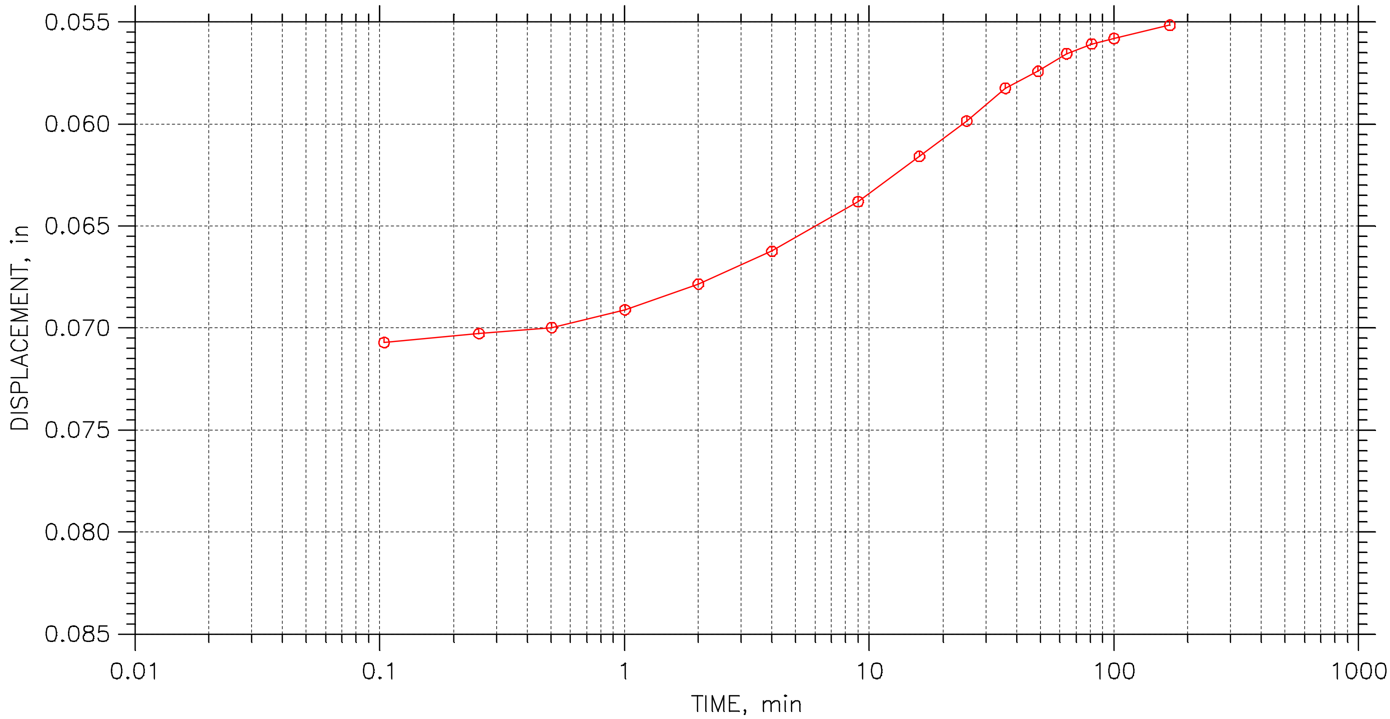
Mon, 16-NOV-2015 17:10:59

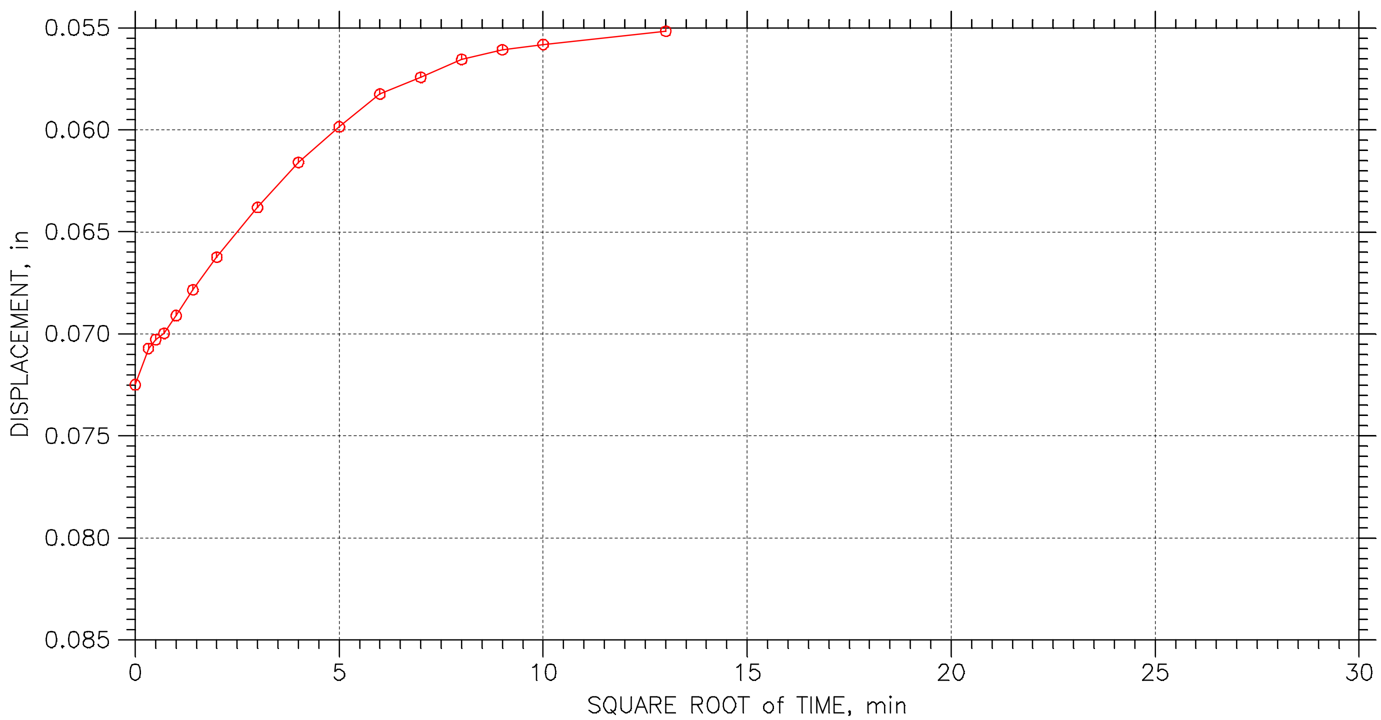
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 9 of 23

Stress: 0.125 tsf





Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0'' ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

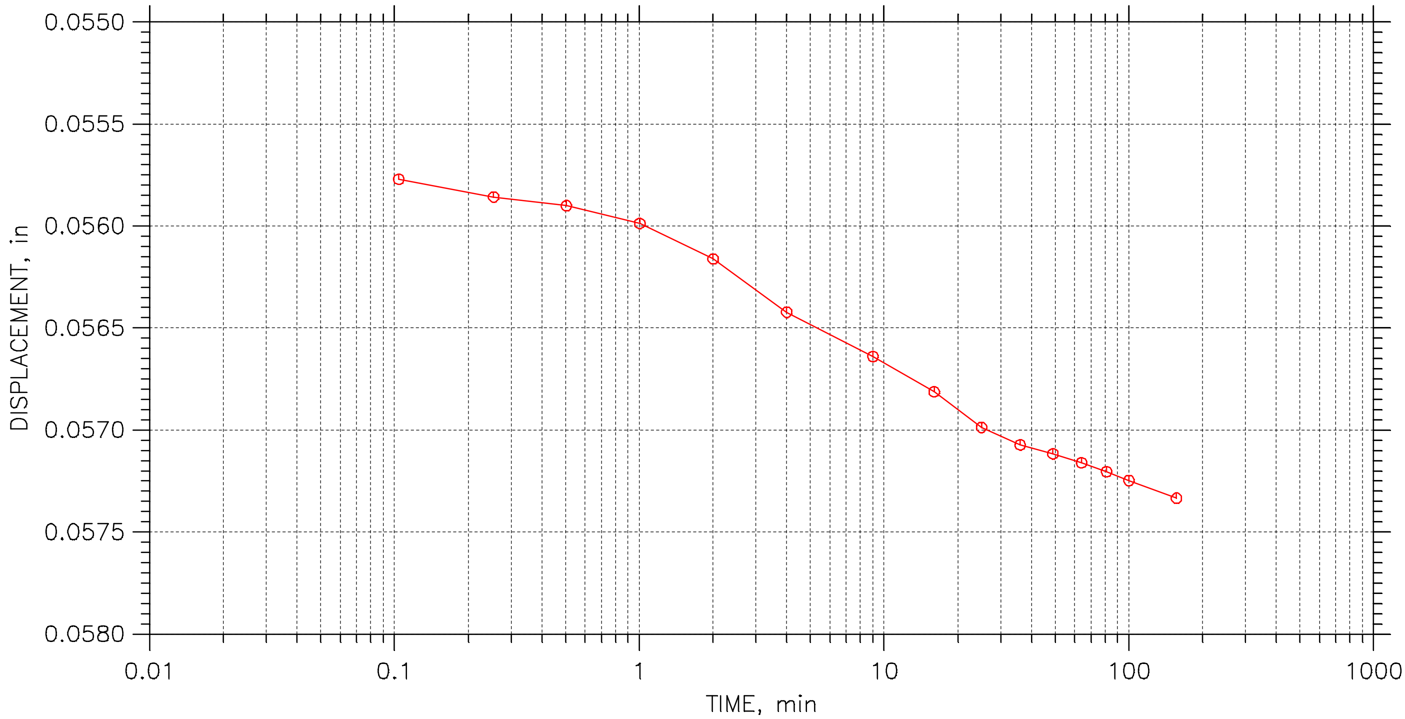
Mon, 16-NOV-2015 17:11:00

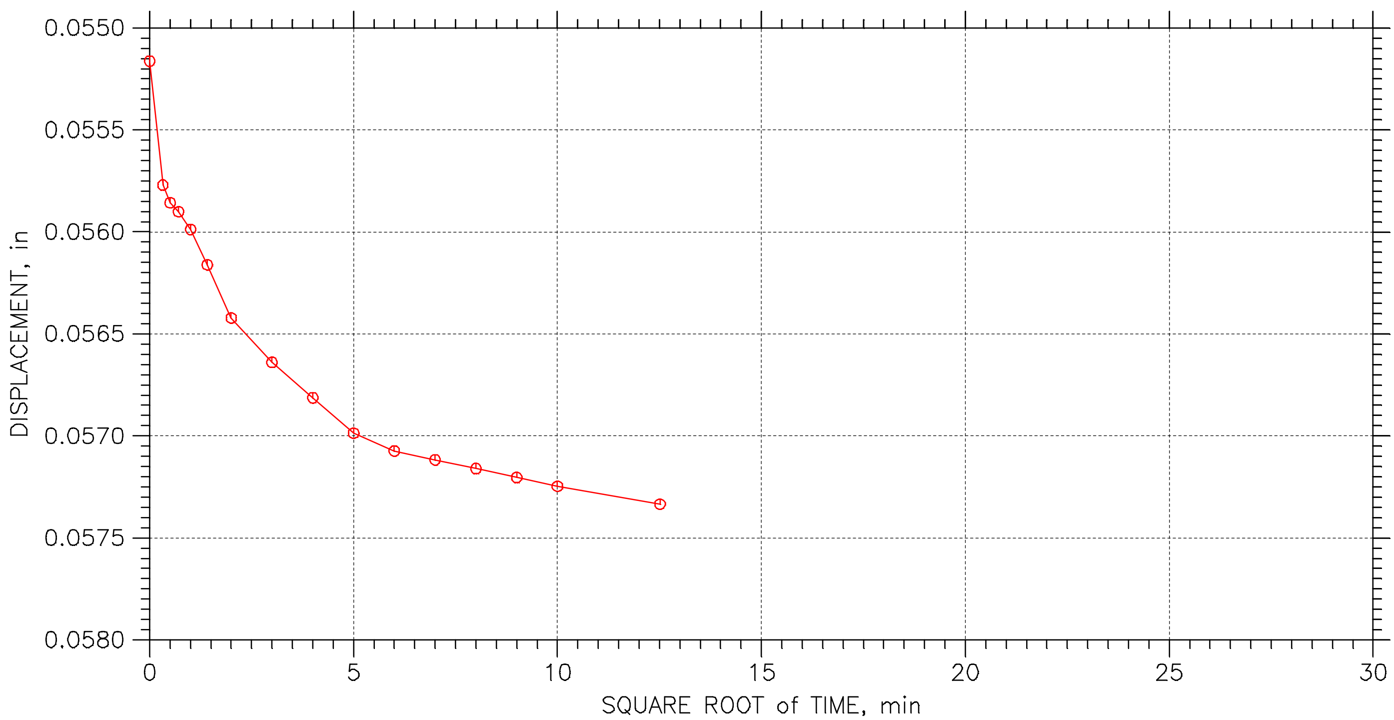
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 10 of 23

Stress: 0.25 tsf





Terracon Consulting Engineers & Scientists			
	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

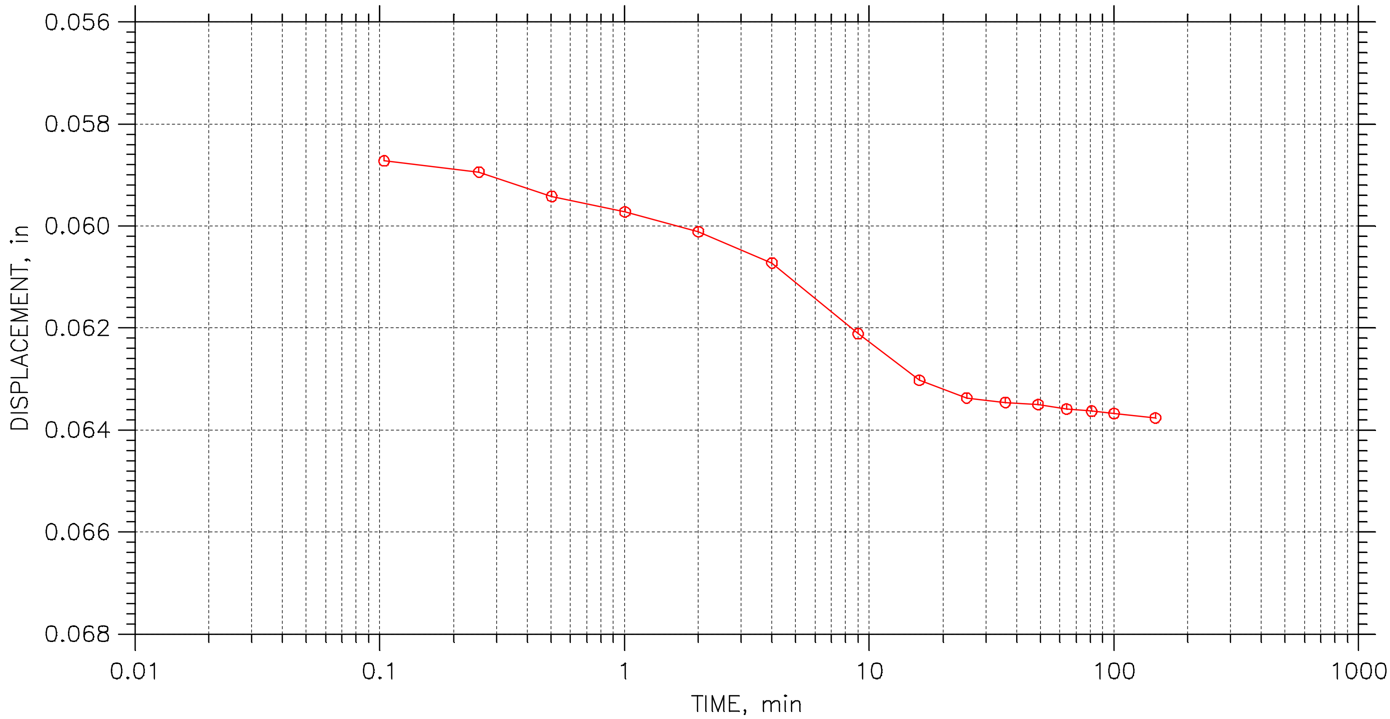
Mon, 16-NOV-2015 17:11:01

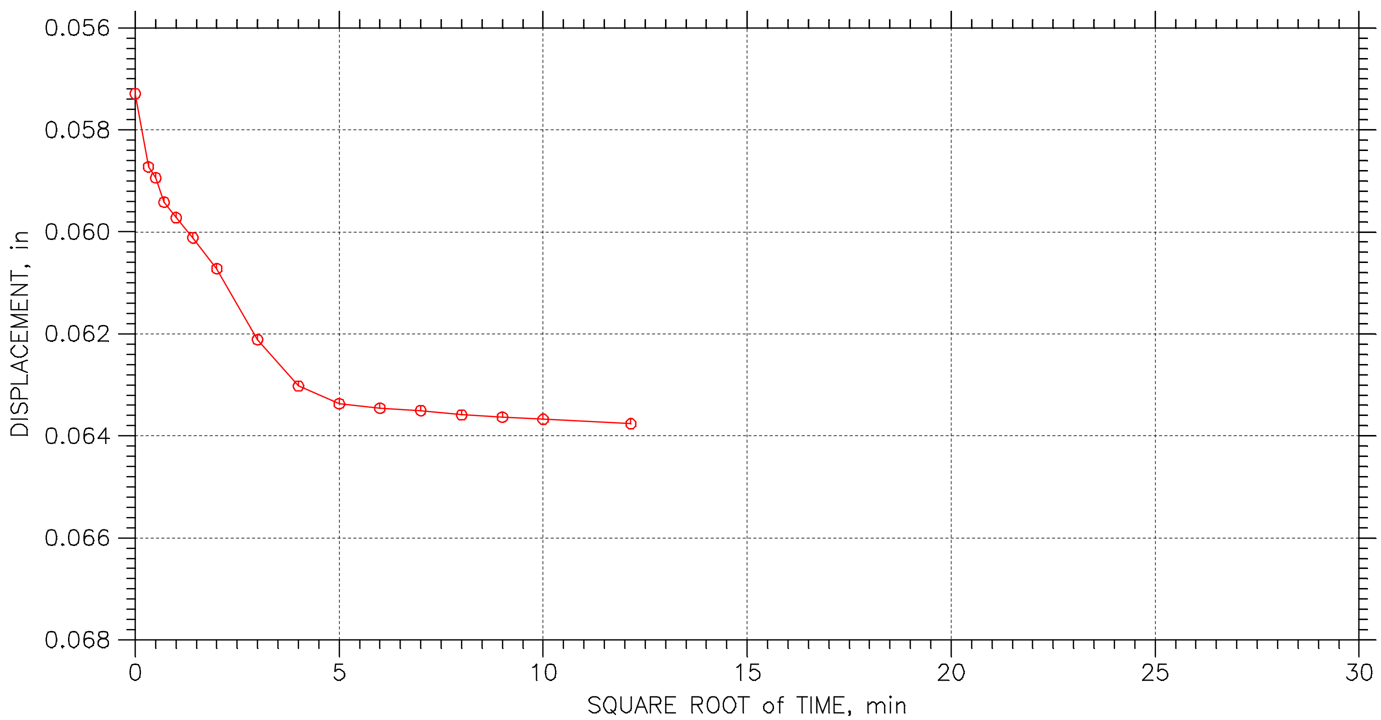
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 11 of 23

Stress: 0.5 tsf





Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0'' ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

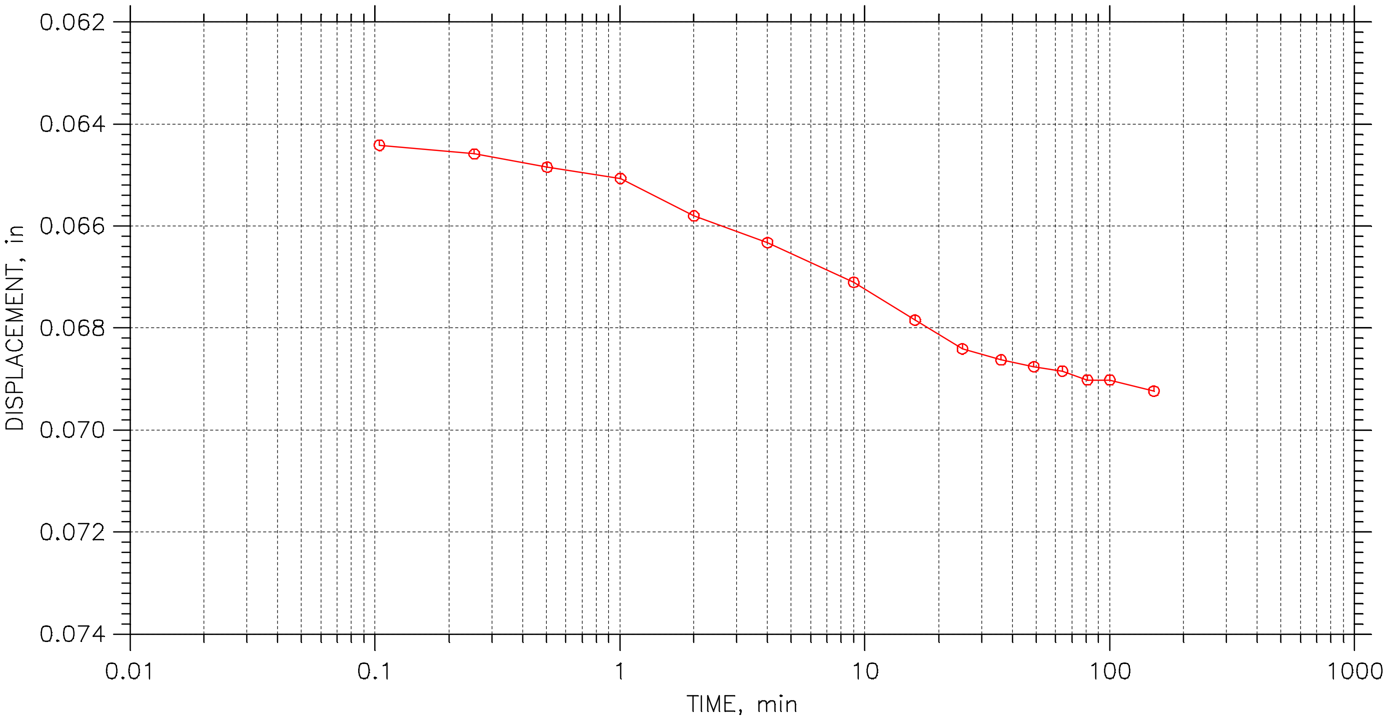
Mon, 16-NOV-2015 17:11:03

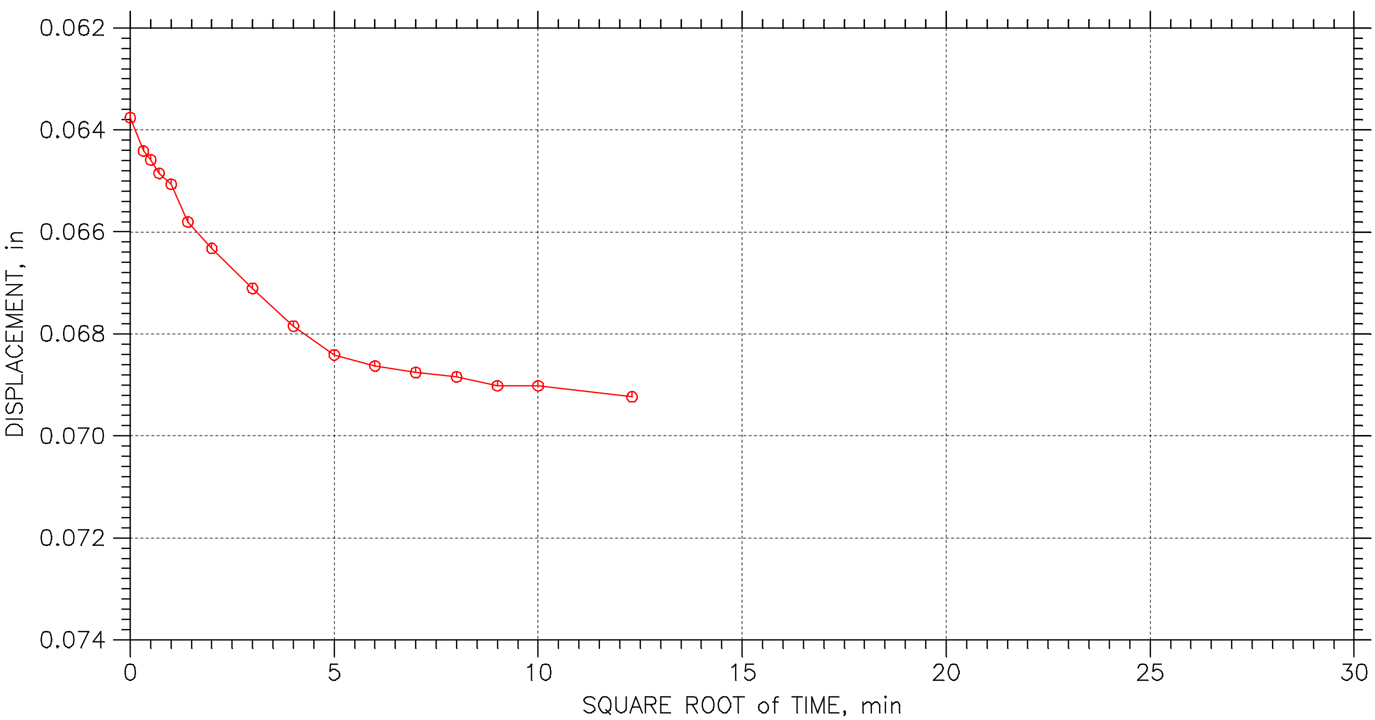
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 12 of 23

Stress: 0.75 tsf





Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0'' ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

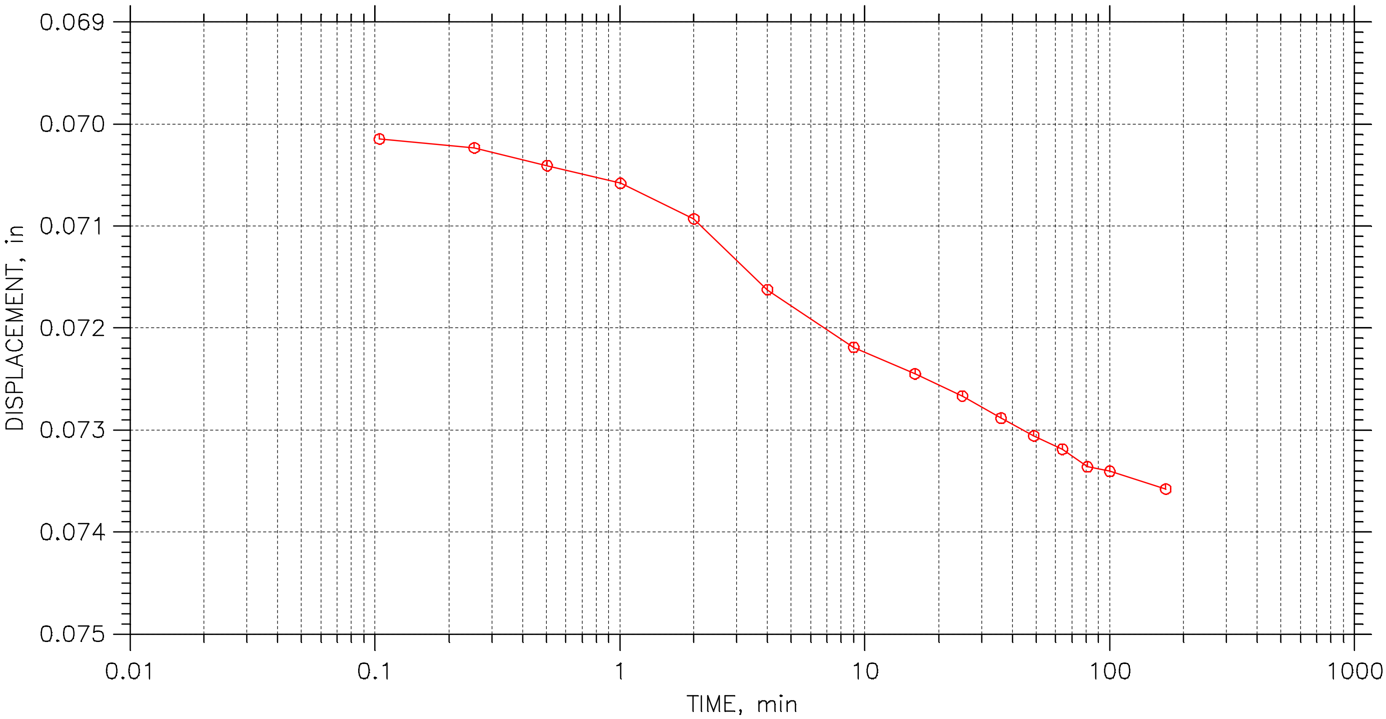
Mon, 16-NOV-2015 17:11:04

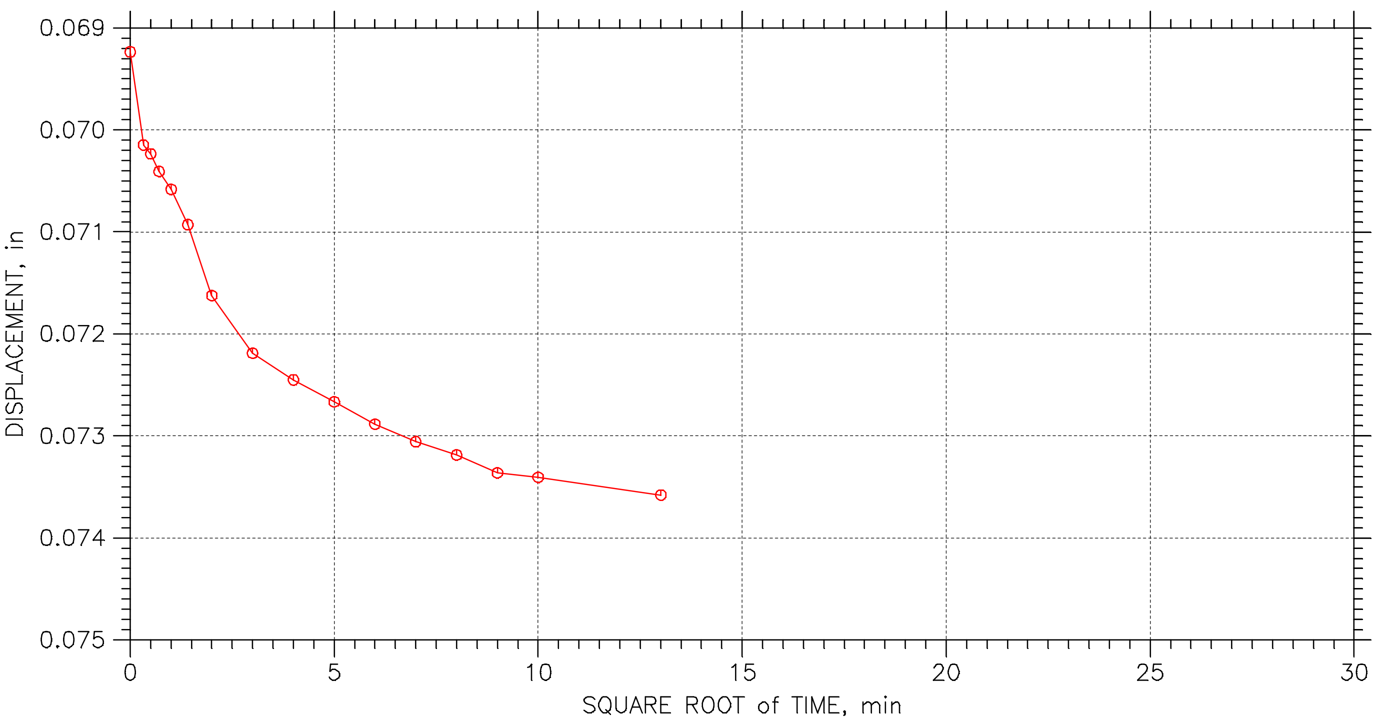
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 13 of 23

Stress: 1. tsf





Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0'' ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

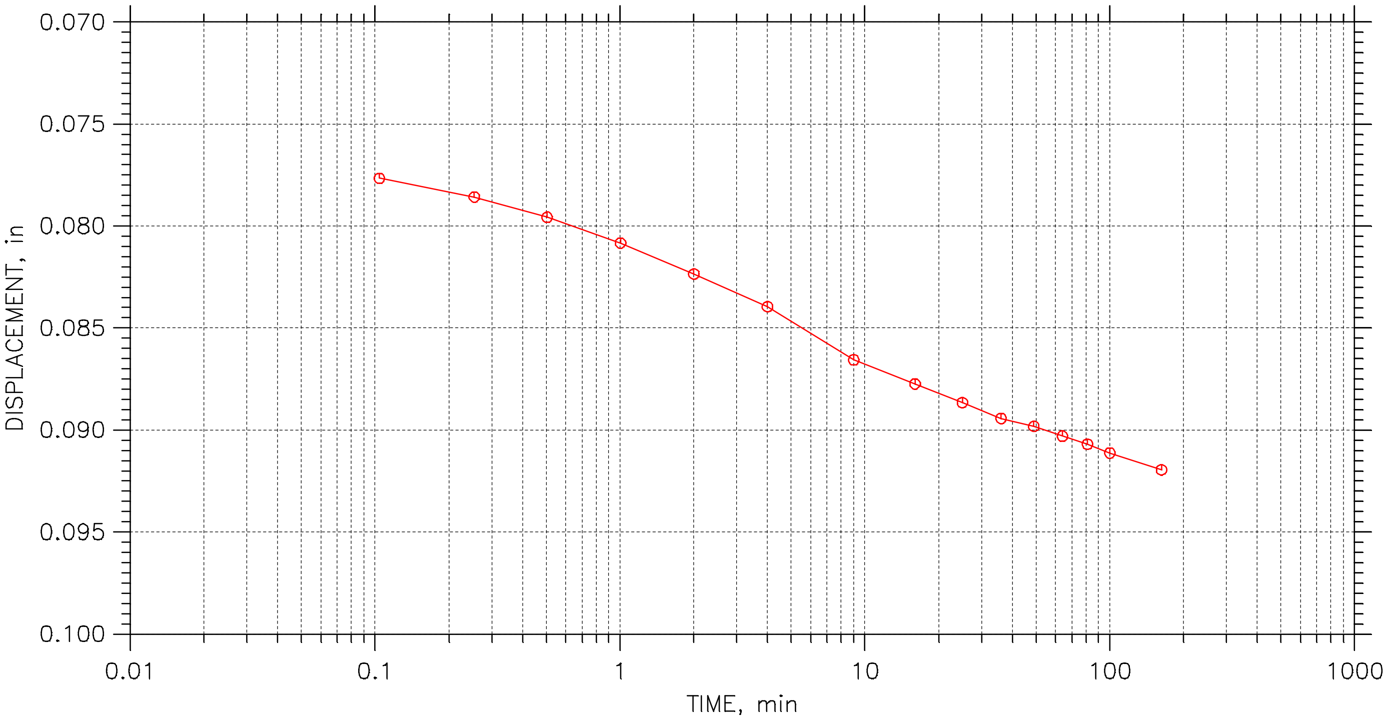
Mon, 16-NOV-2015 17:11:06

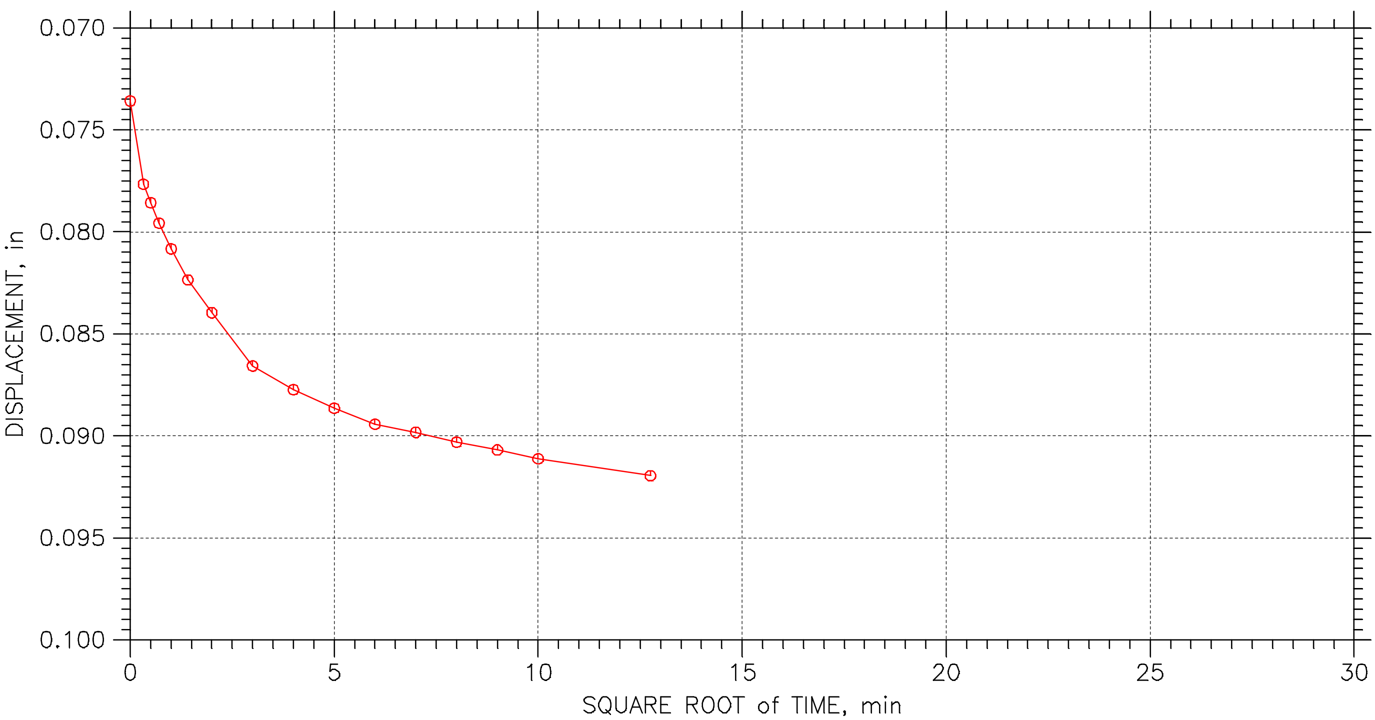
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 14 of 23

Stress: 2. tsf





Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0'' ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

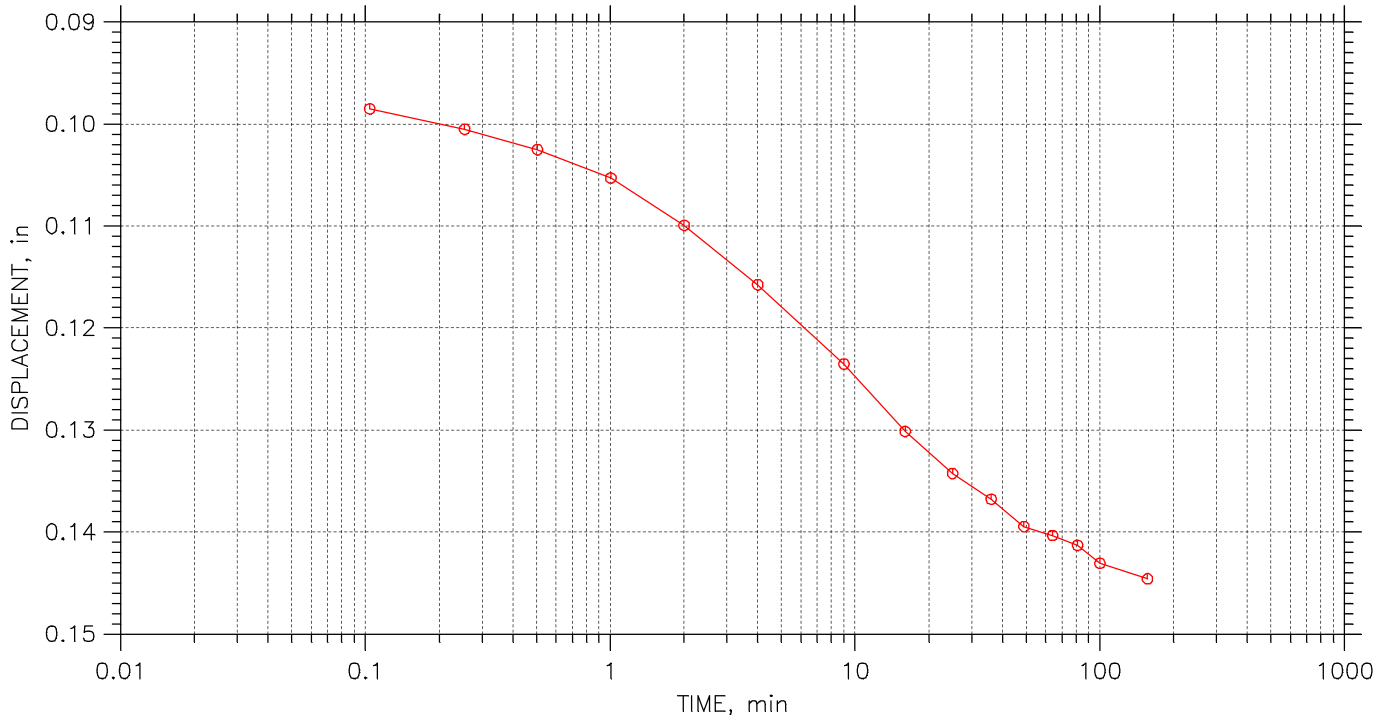
Mon, 16-NOV-2015 17:11:07

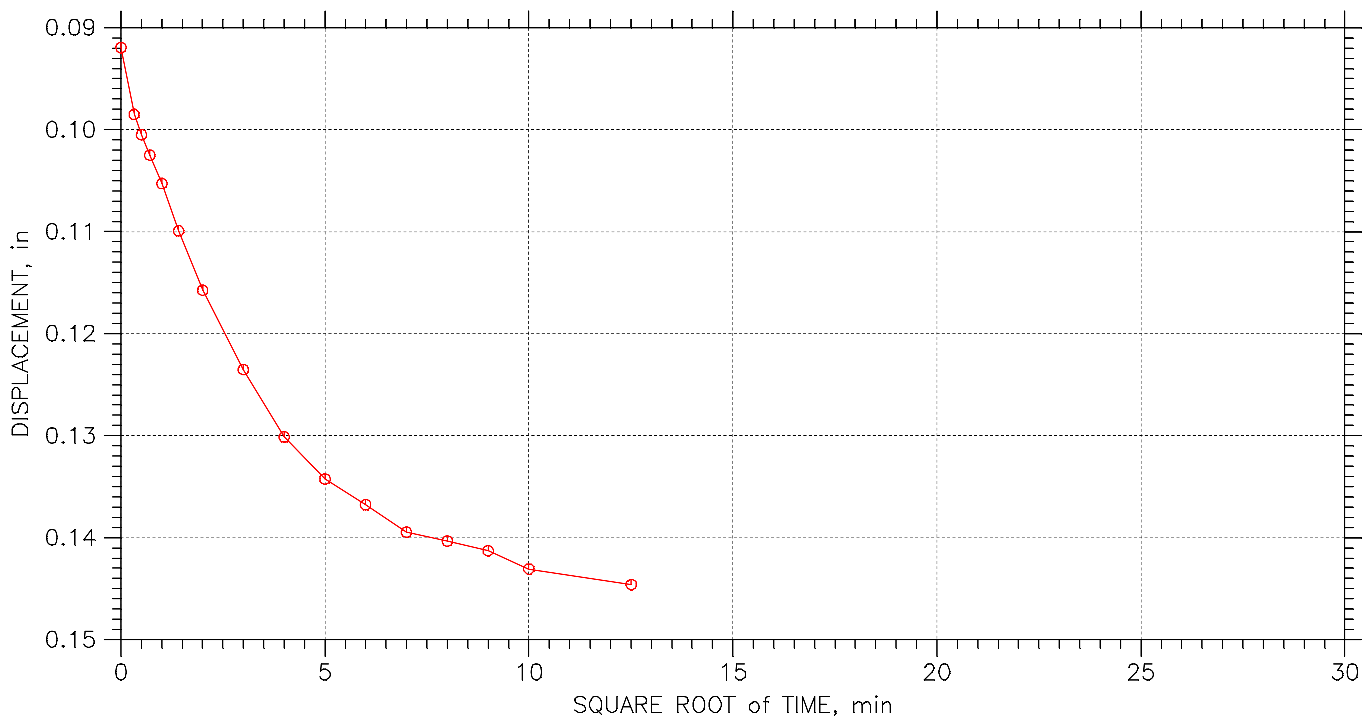
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 15 of 23

Stress: 4. tsf





Terracon Consulting Engineers & Scientists			
	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0'' ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

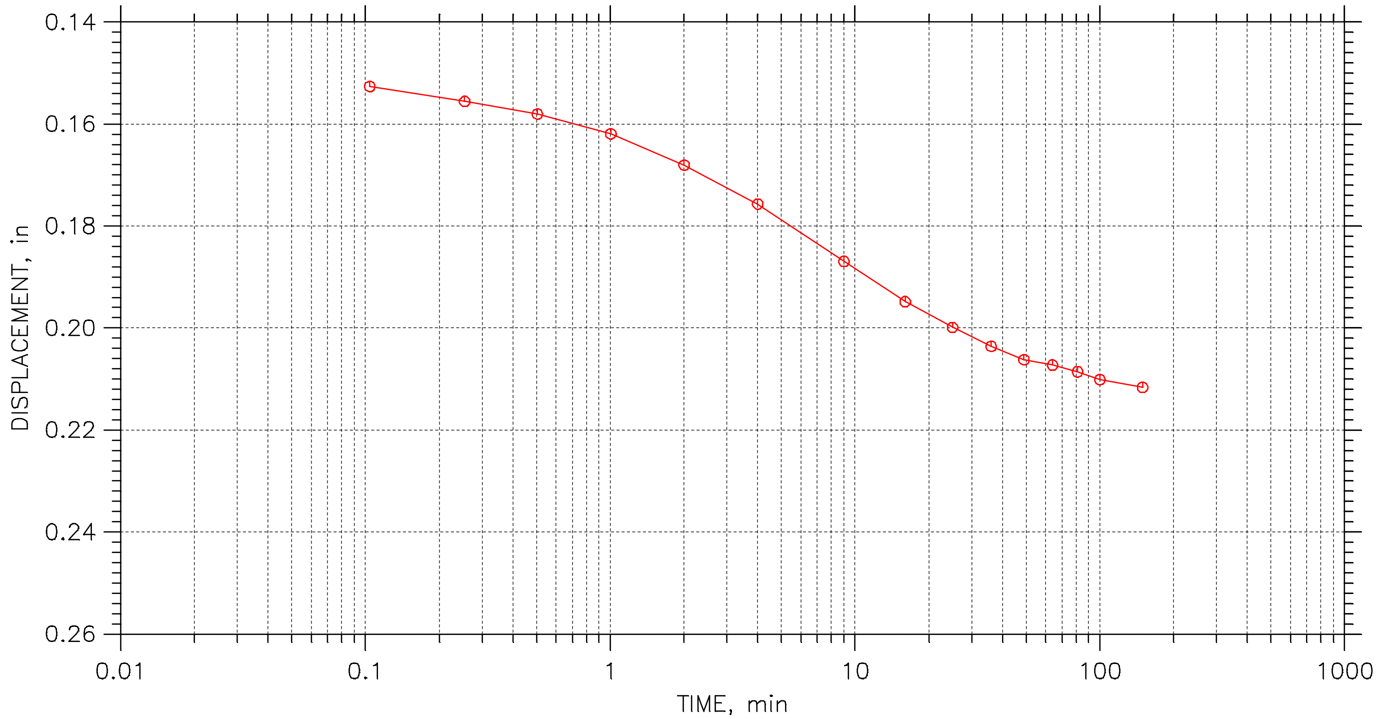
Mon, 16-NOV-2015 17:11:08

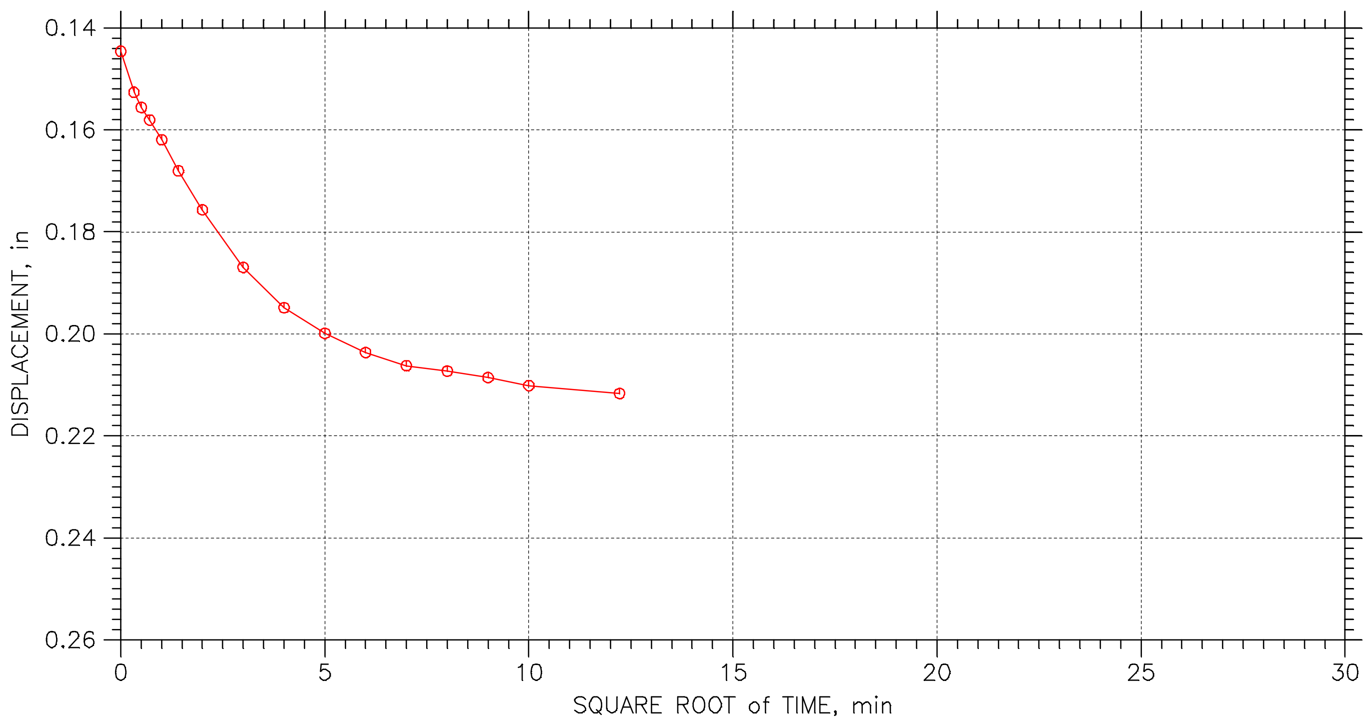
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 16 of 23

Stress: 8. tsf





Terracon Consulting Engineers & Scientists			
	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0'' ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

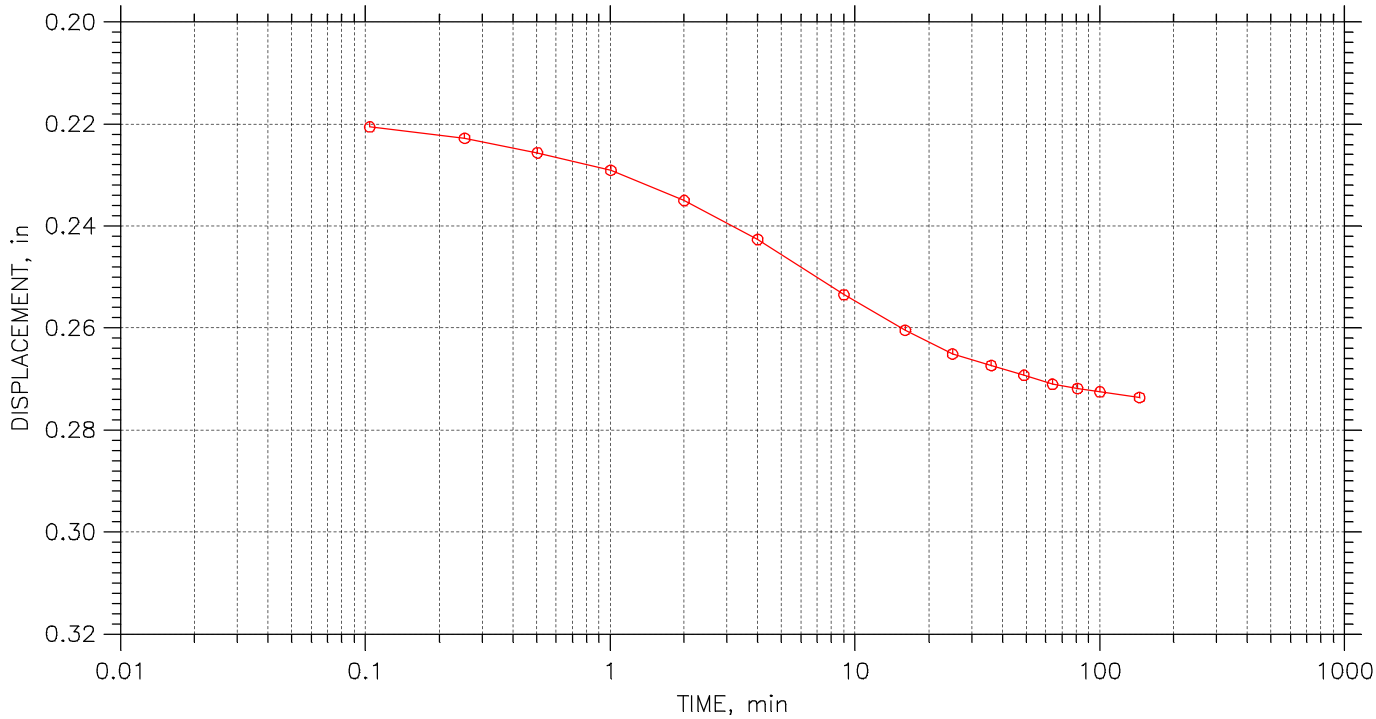
Mon, 16-NOV-2015 17:11:10

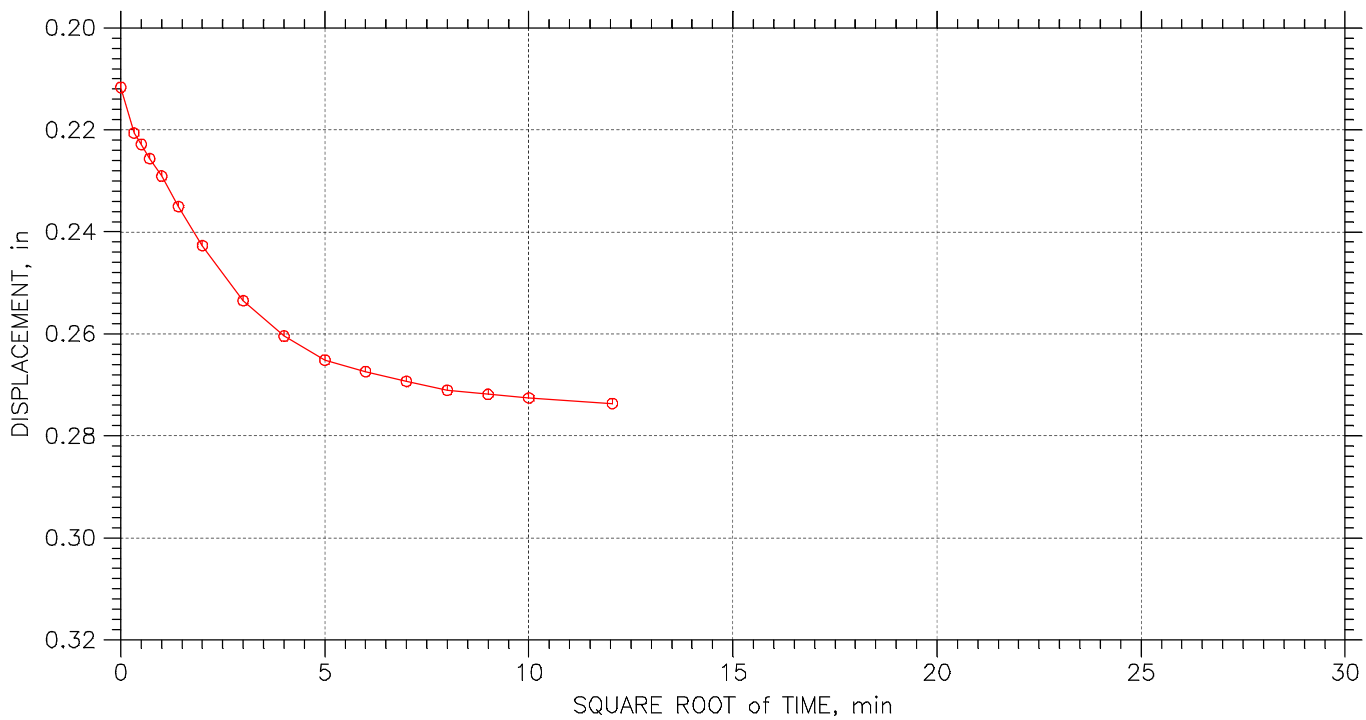
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 17 of 23

Stress: 16. tsf





Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0'' ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

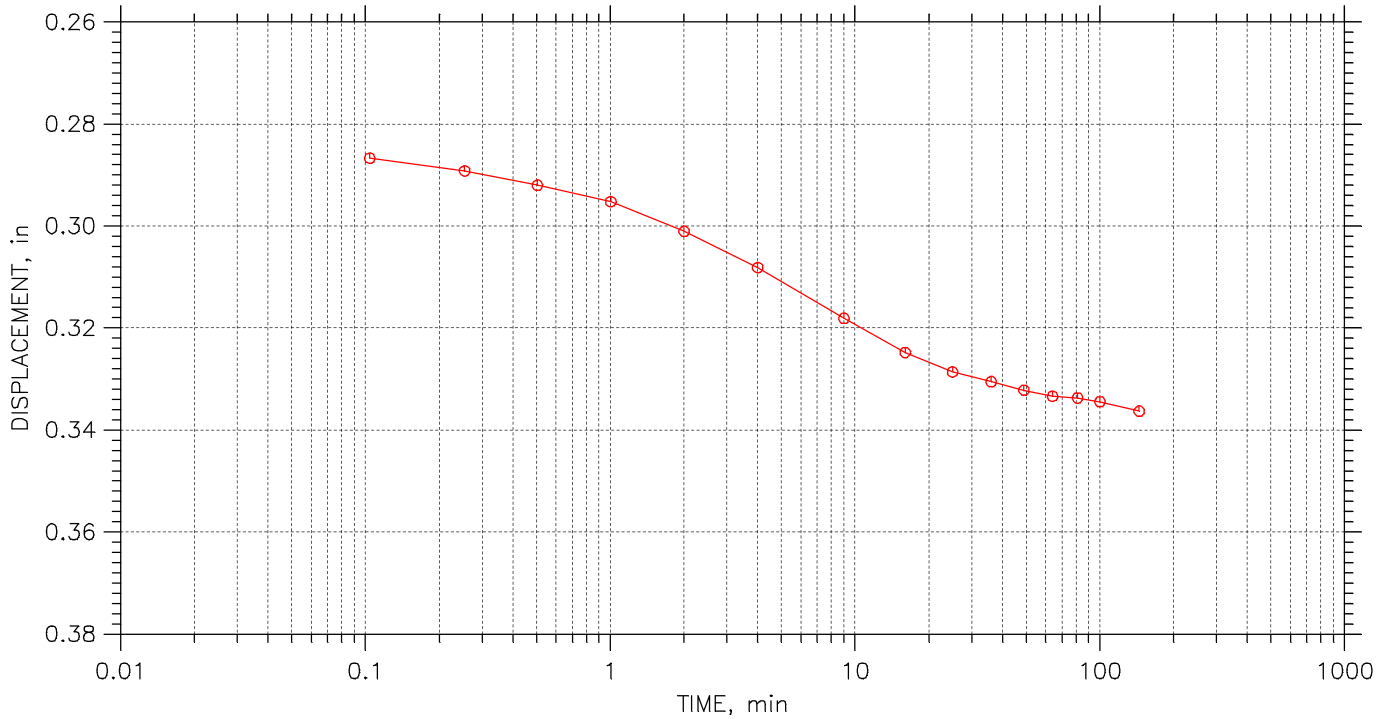
Mon, 16-NOV-2015 17:11:11

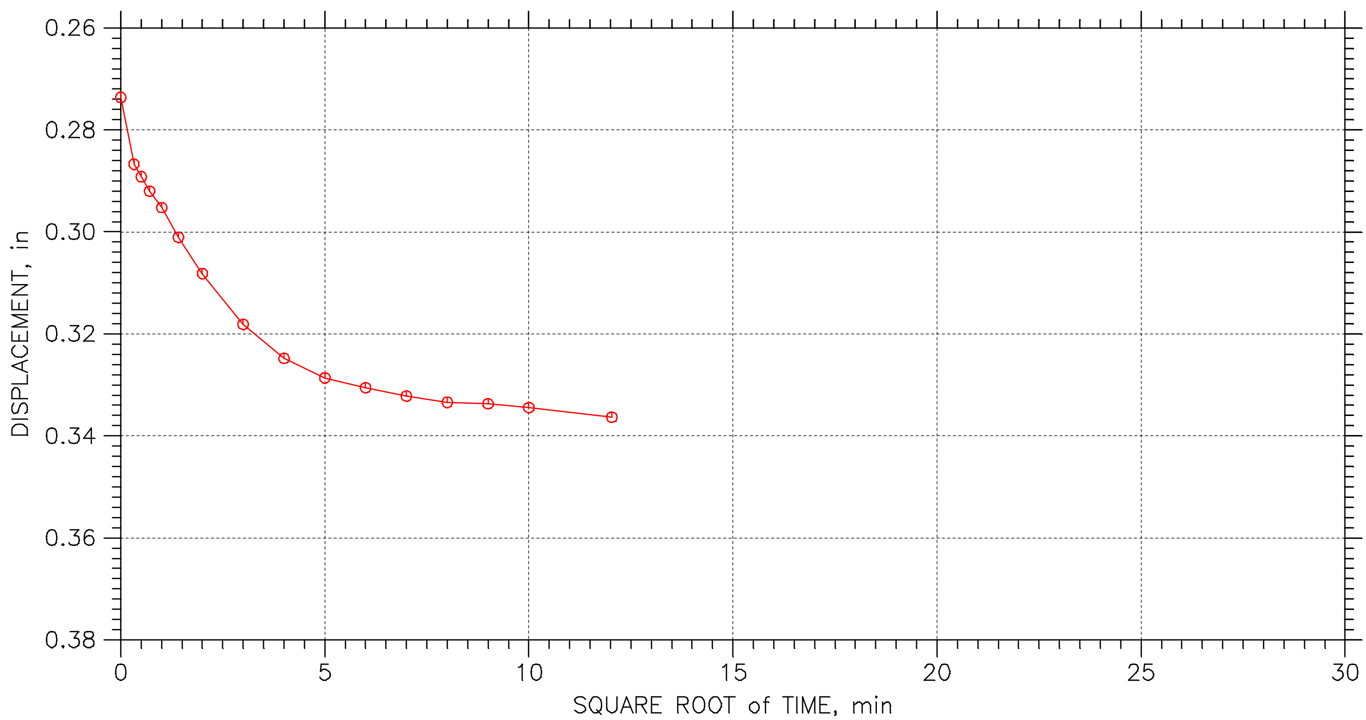
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 18 of 23

Stress: 32. tsf





Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0'' ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

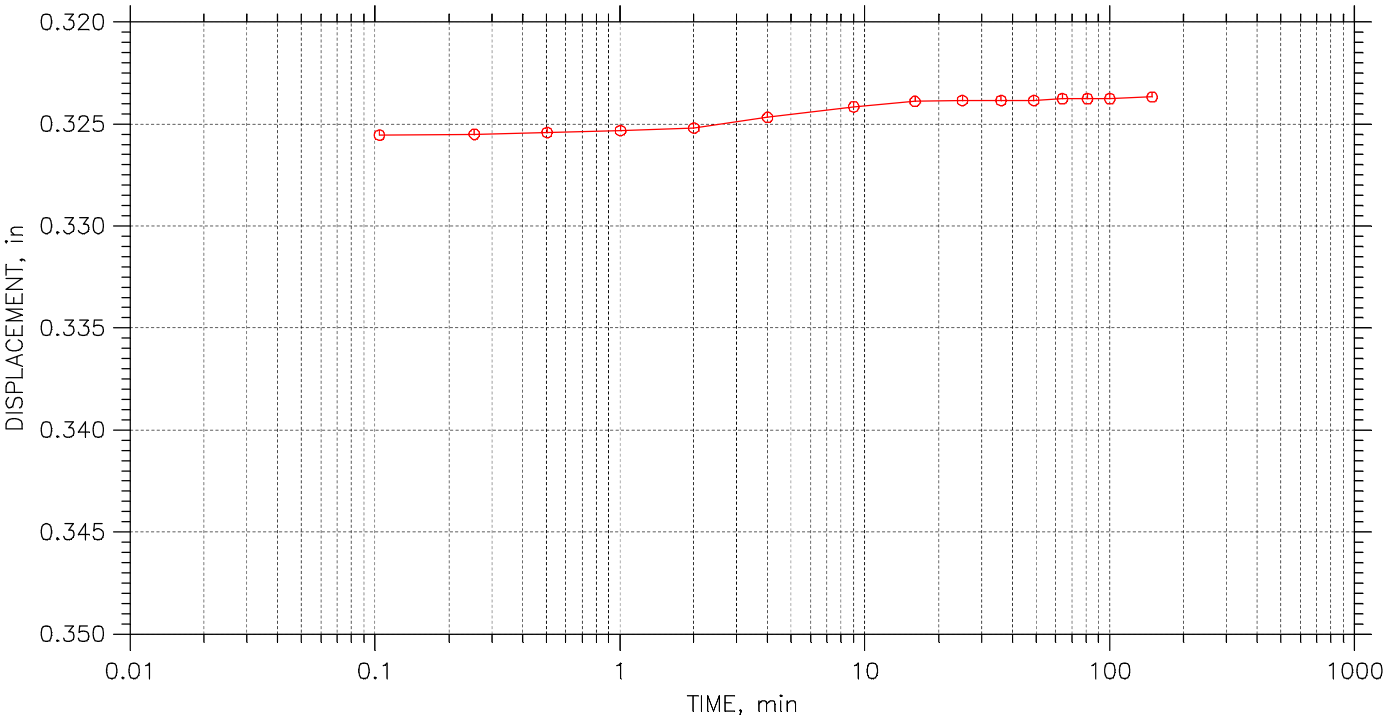
Mon, 16-NOV-2015 17:11:12

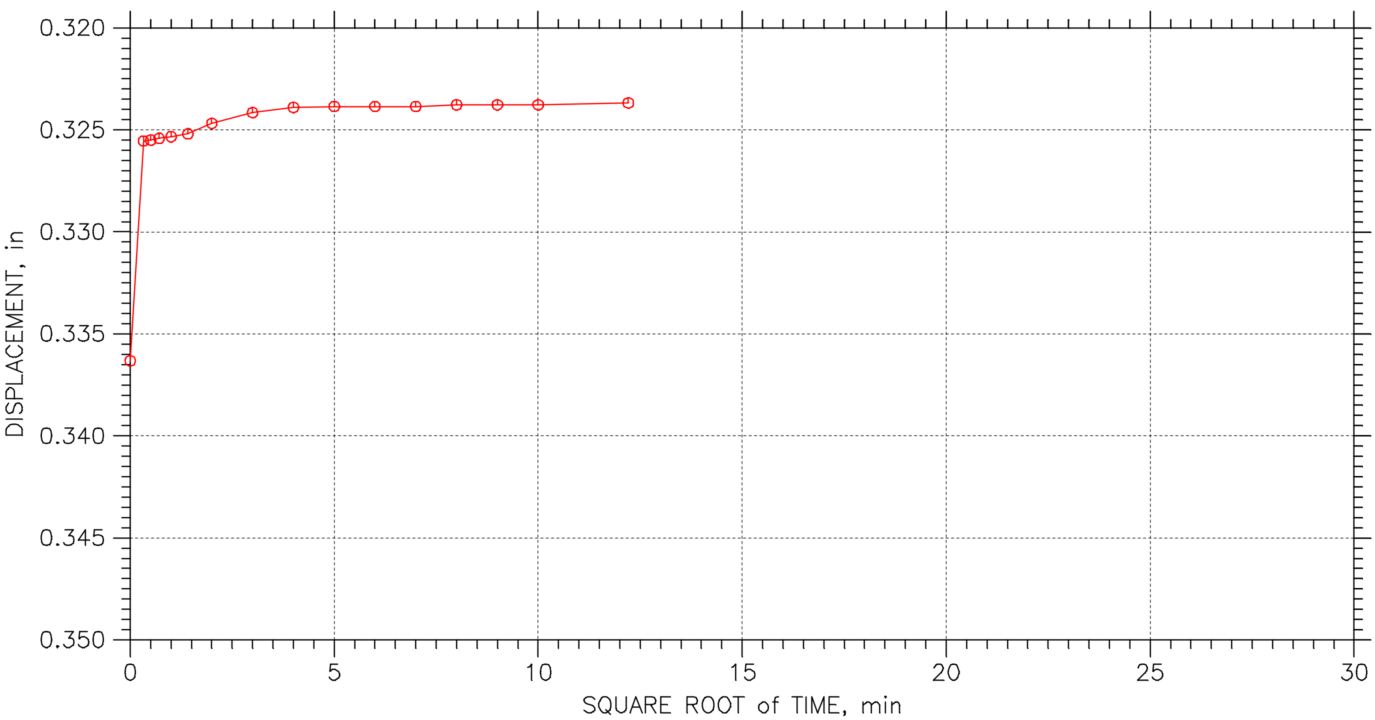
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 19 of 23

Stress: 16. tsf





Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0'' ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

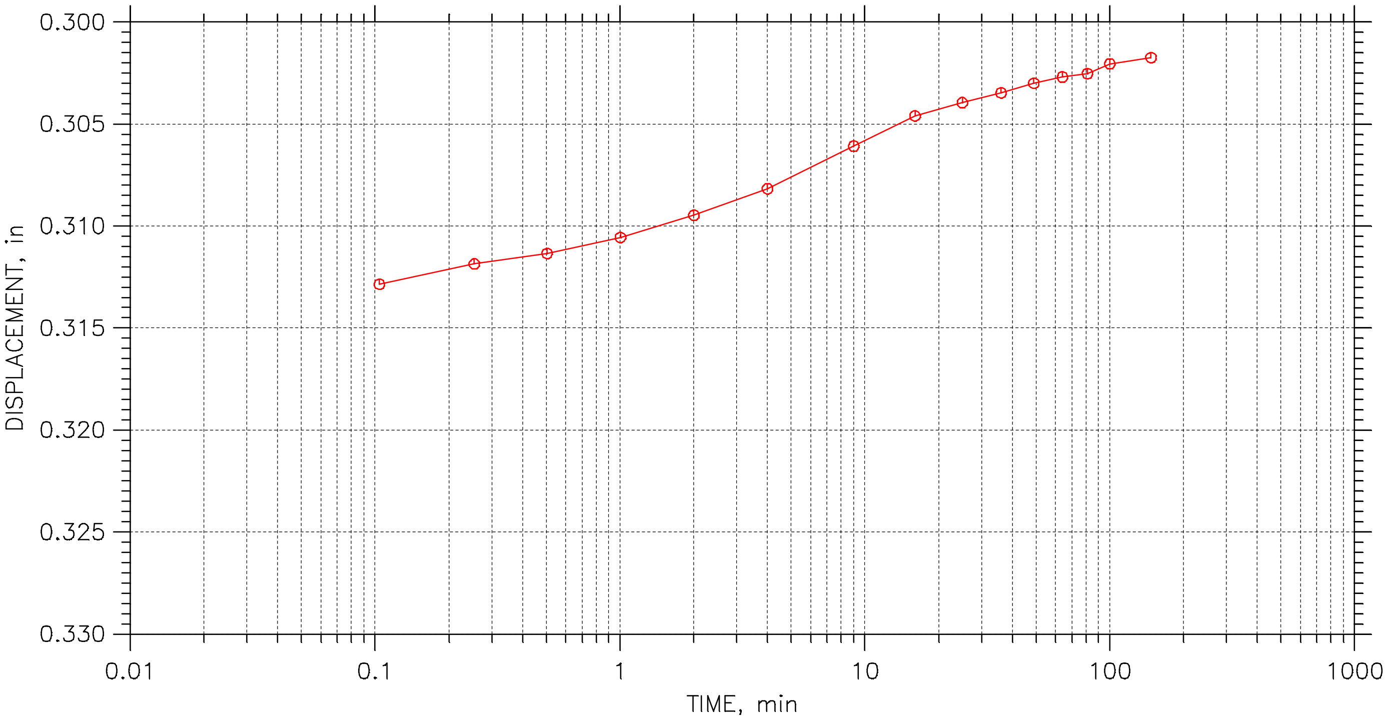
Mon, 16-NOV-2015 17:11:14

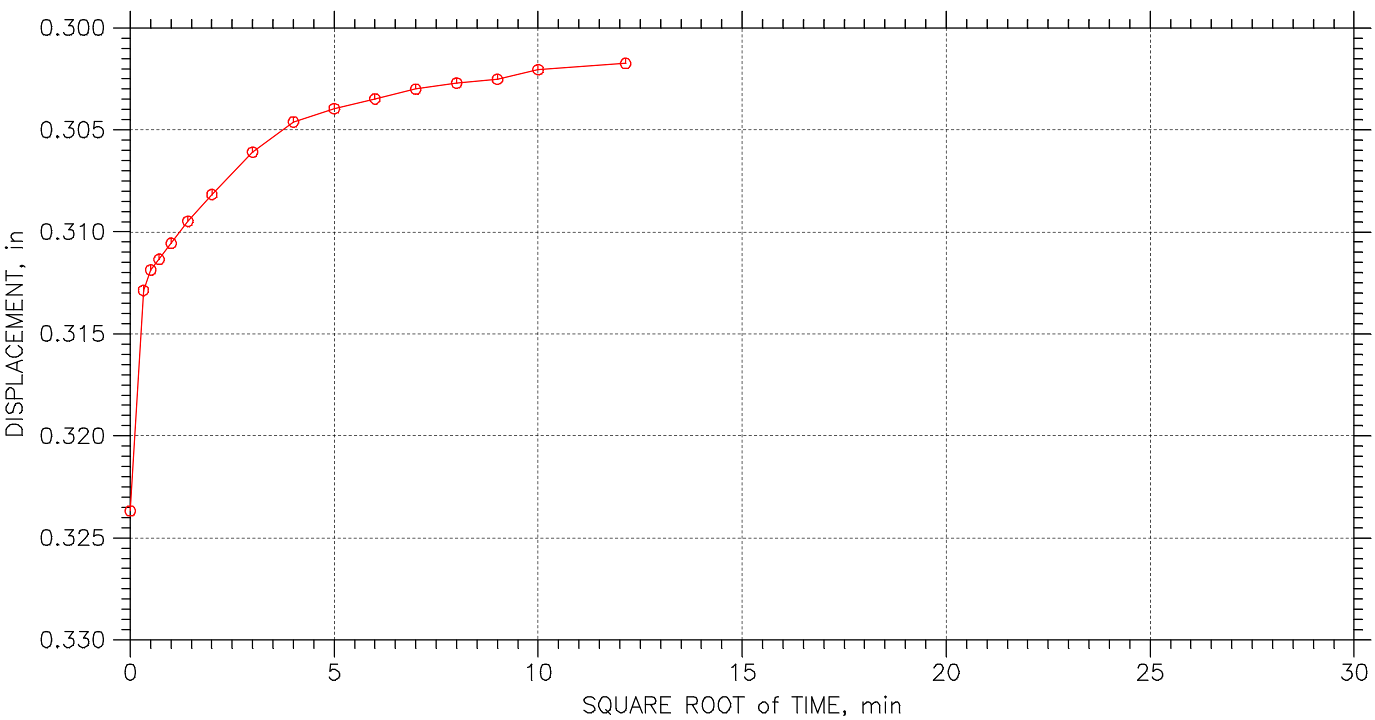
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 20 of 23

Stress: 4. tsf





Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0'' ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

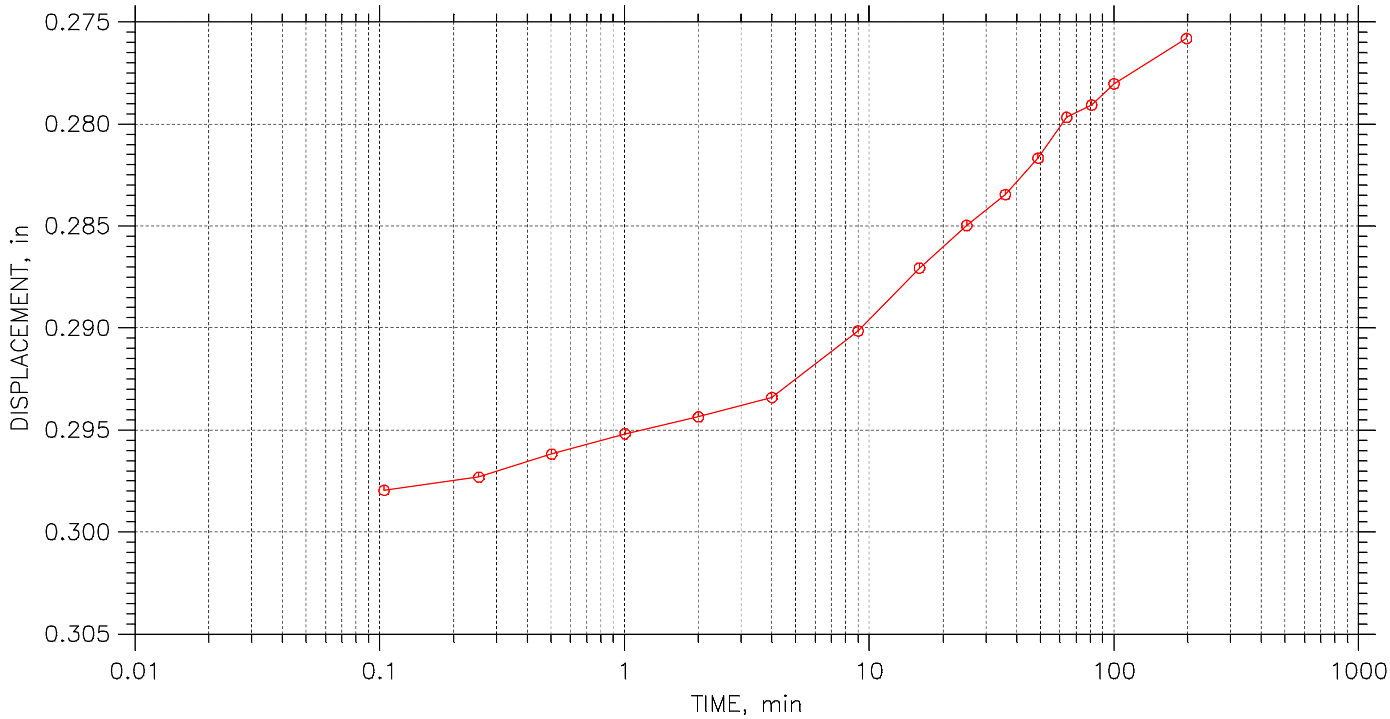
Mon, 16-NOV-2015 17:11:15

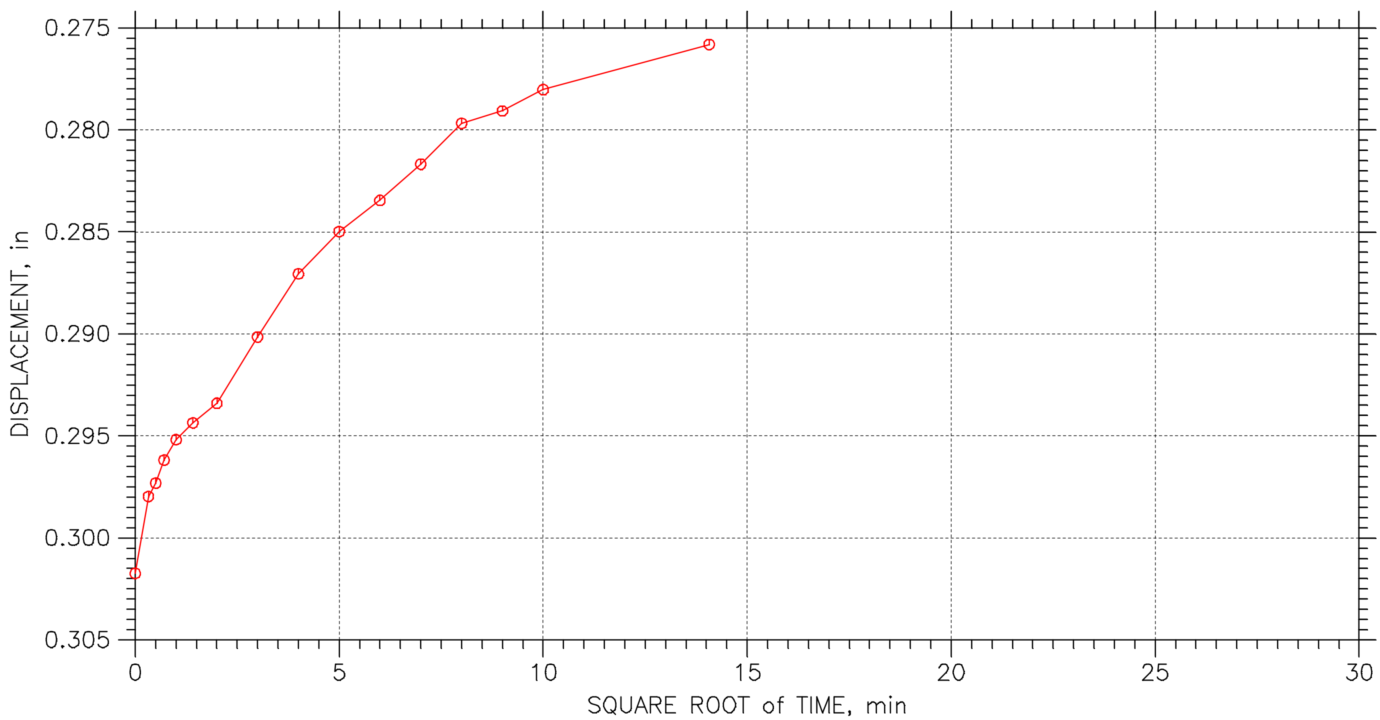
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 21 of 23

Stress: 1. tsf





Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0'' ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

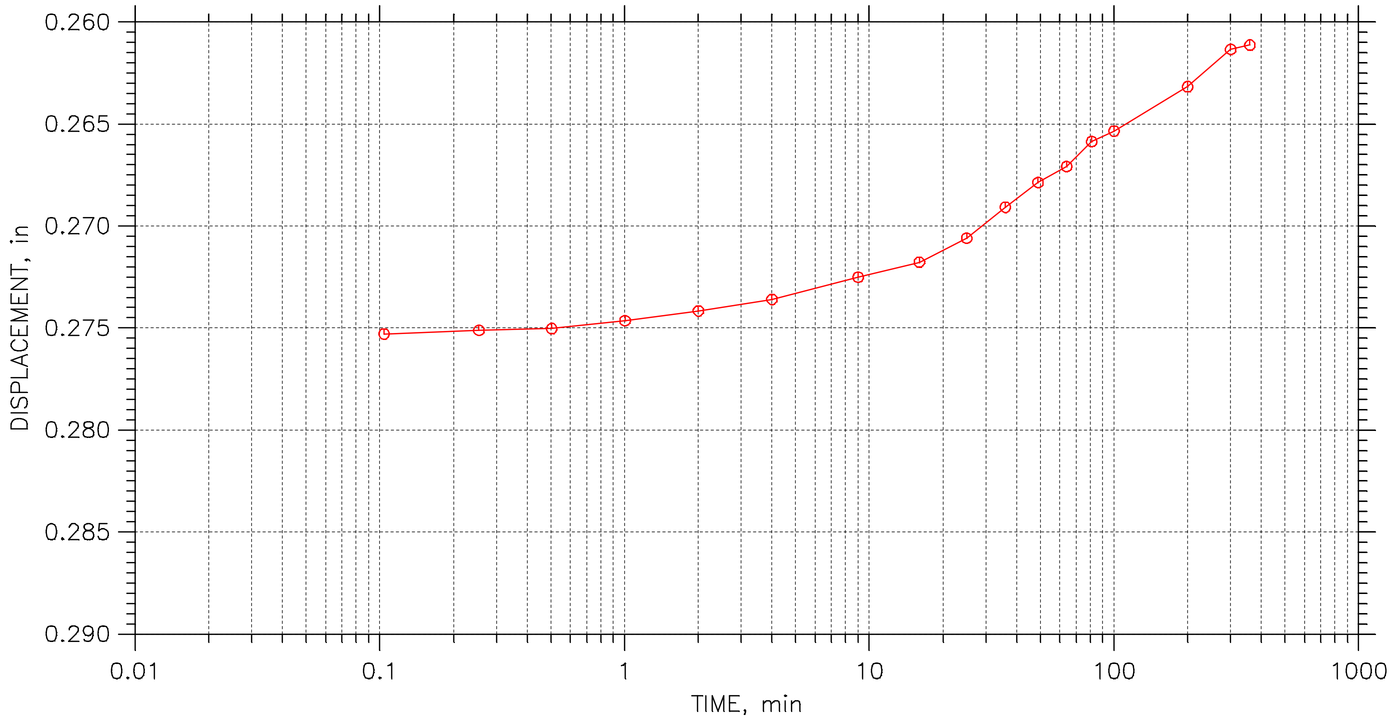
Mon, 16-NOV-2015 17:11:16

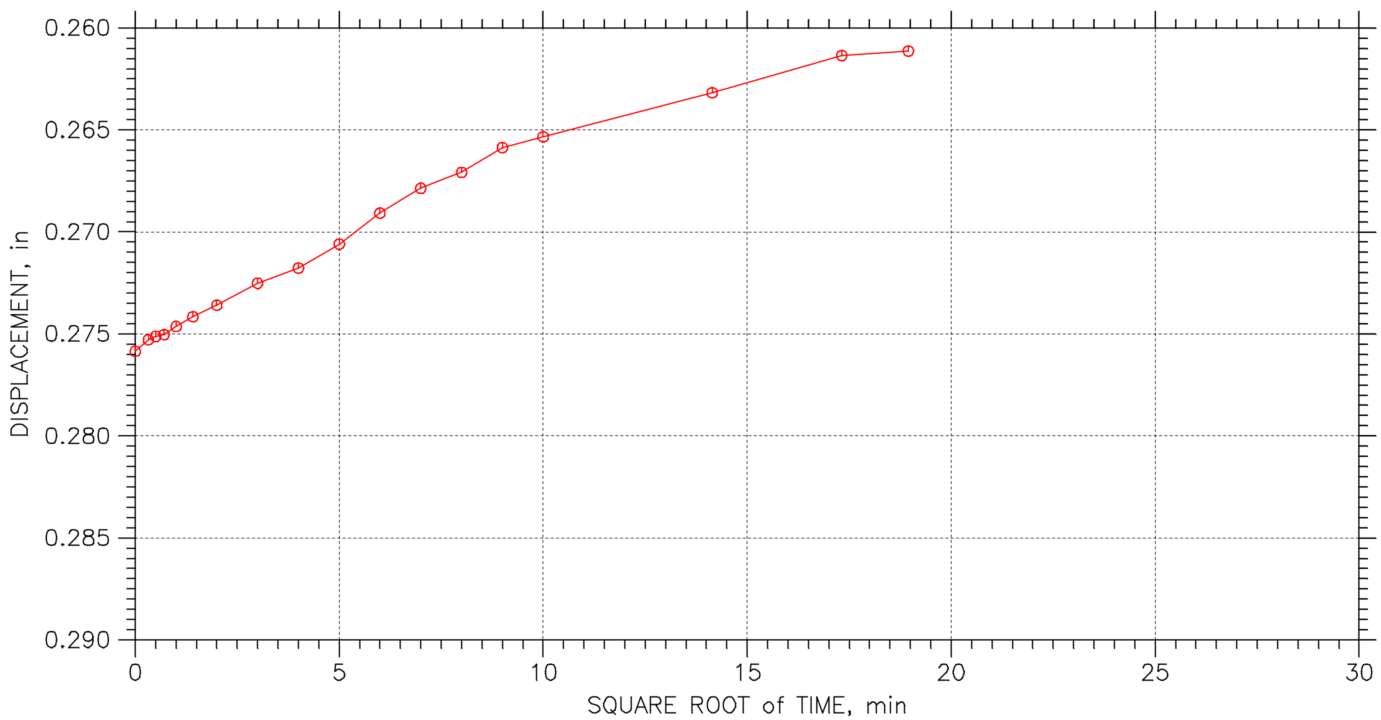
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 22 of 23

Stress: 0.5 tsf





Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0" ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

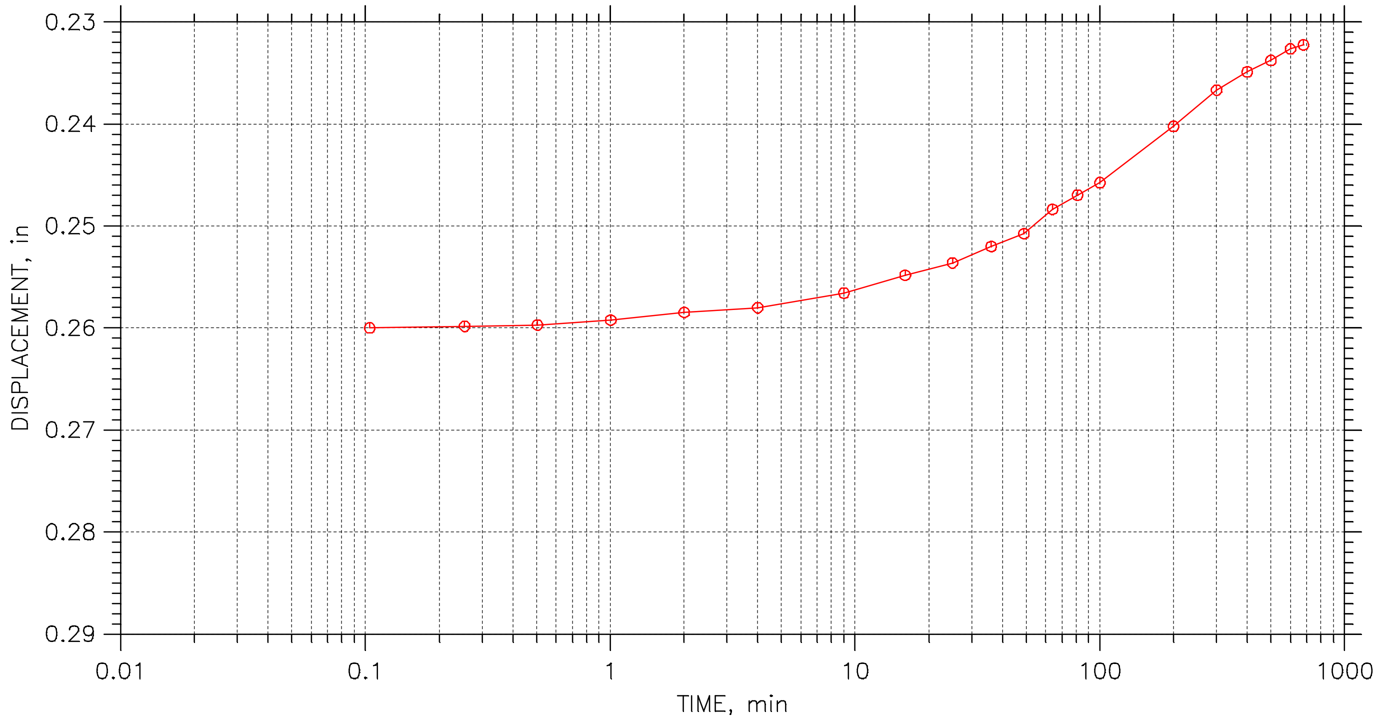
Mon, 16-NOV-2015 17:11:18

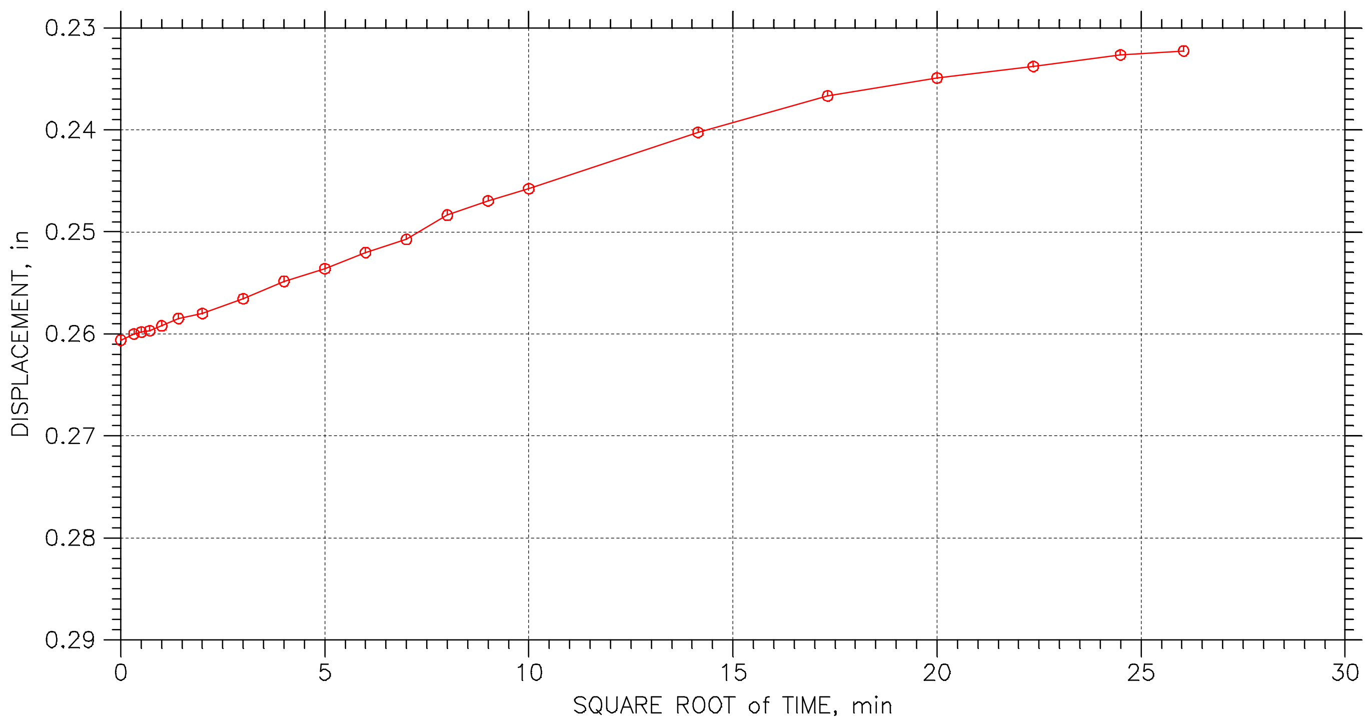
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 23 of 23

Stress: 0.125 tsf

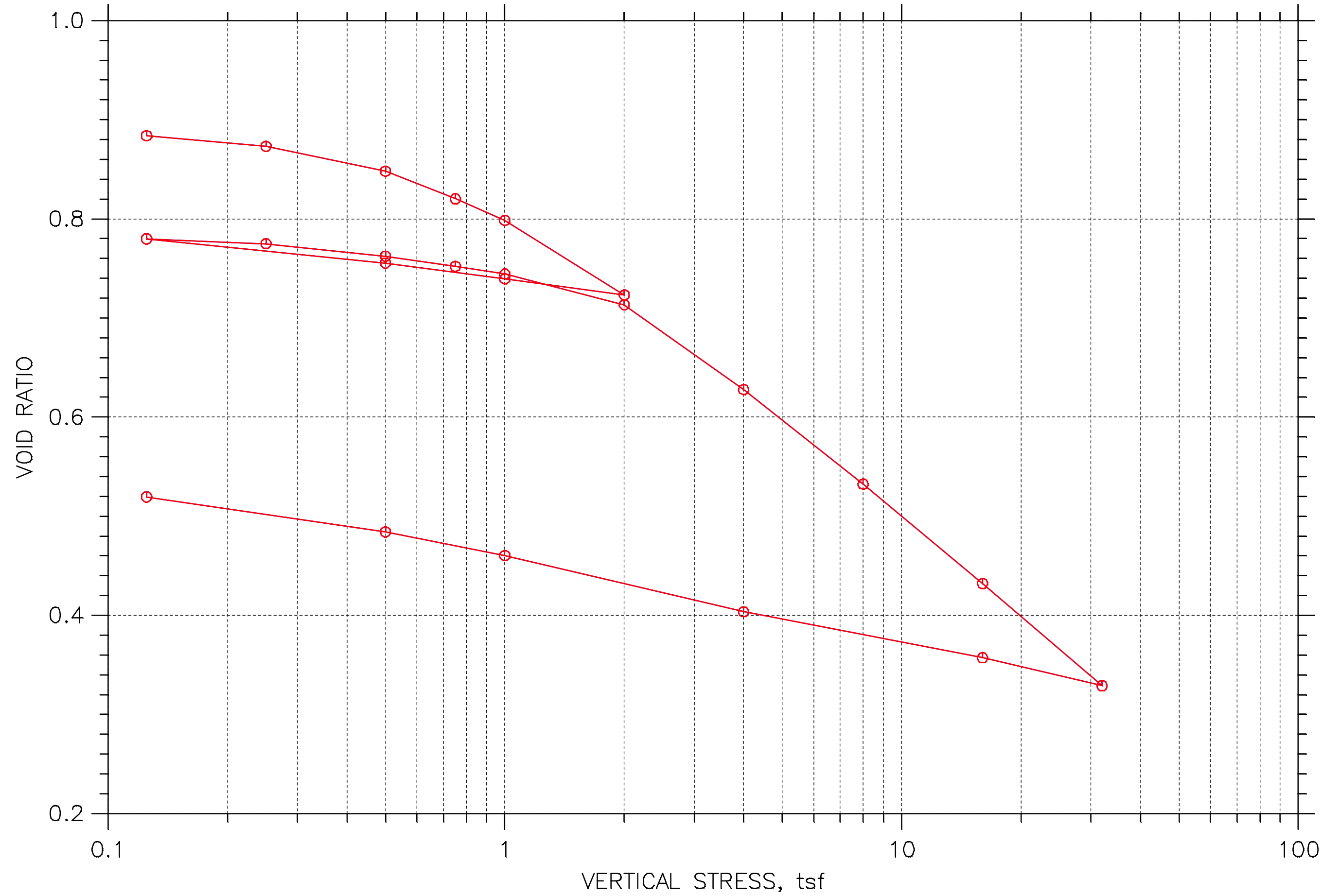


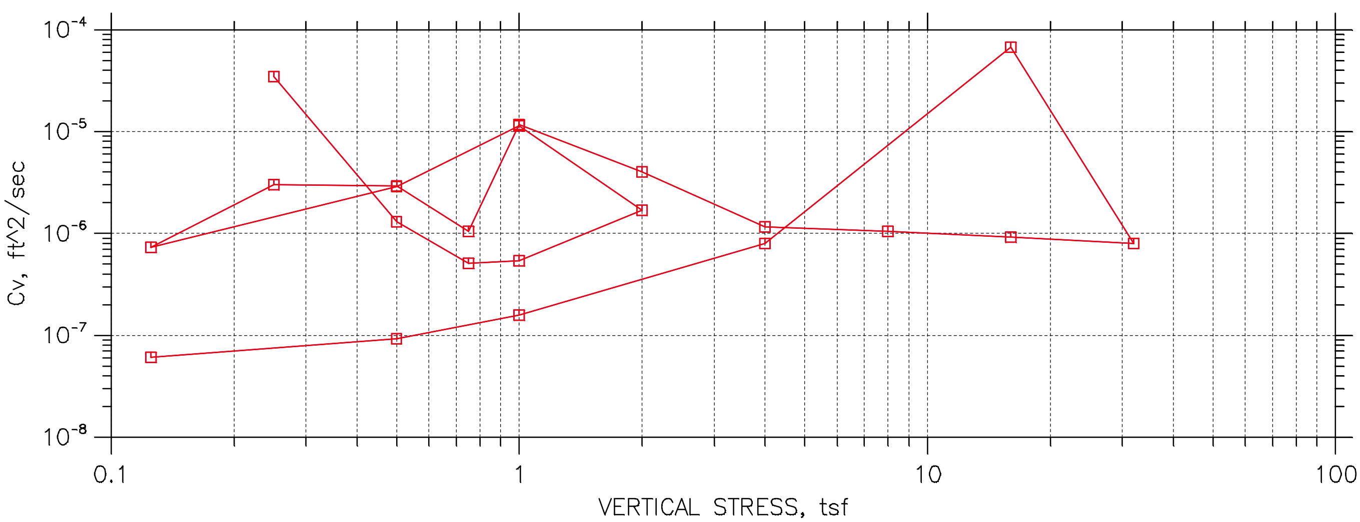


Terracon Consulting Engineers & Scientists			
	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B003	Tested By: HP	Checked By: BCM
	Sample No.: S-12	Test Date: 10/26/15	Depth: 45.0'-47.0'
	Test No.: EDW003S12	Sample Type: 3.0'' ST	Elevation: ----
	Description: DARK GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 1.1 tsf Cc = 0.445 Ccr = 0.054 TEST PERFORMED AS PER ASTM D2435		

CONSOLIDATION TEST DATA

SUMMARY REPORT





Terracon Consulting Engineers & Scientists			
	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008	Sample Type: 3.0'' ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

Mon, 16-NOV-2015 17:16:44

CONSOLIDATION TEST DATA

Project: DYNEGY EDWARDS
Boring No.: EDW-B008 S5
Sample No.: S-5
Test No.: EDWB008S5

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 10/26/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 11.0'-13.0'
Elevation: -----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWN AND GRAY FAT CLAY WITH SAND CH
Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435

Estimated Specific Gravity: 2.72
Initial Void Ratio: 0.91
Final Void Ratio: 0.52

Liquid Limit: 52
Plastic Limit: 19
Plasticity Index: 33

Initial Height: 0.75 in
Specimen Diameter: 2.49 in

	Before Consolidation		After Consolidation	
	Trimmings	Specimen+Ring	Specimen+Ring	Trimmings
Container ID	X19	RING	RING	A-8
Wt. Container + Wet Soil, gm	194.52	185.3	175.79	131.94
Wt. Container + Dry Soil, gm	156.81	159.5	159.5	115.76
Wt. Container, gm	44.78	74.3	74.3	31.14
Wt. Dry Soil, gm	112.03	85.199	85.199	84.62
Water Content, %	33.66	30.28	19.12	19.12
Void Ratio	---	0.91	0.52	---
Degree of Saturation, %	---	90.87	100.68	---
Dry Unit Weight, pcf	---	89.066	111.96	---

CONSOLIDATION TEST DATA

Project: DYNEGY EDWARDS
Boring No.: EDW-B008 S5
Sample No.: S-5
Test No.: EDWB008S5

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 10/26/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 11.0'-13.0'
Elevation: -----

Terracon Consulting Engineers & Scientists

Soil Description: BROWN AND GRAY FAT CLAY WITH SAND CH
Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435

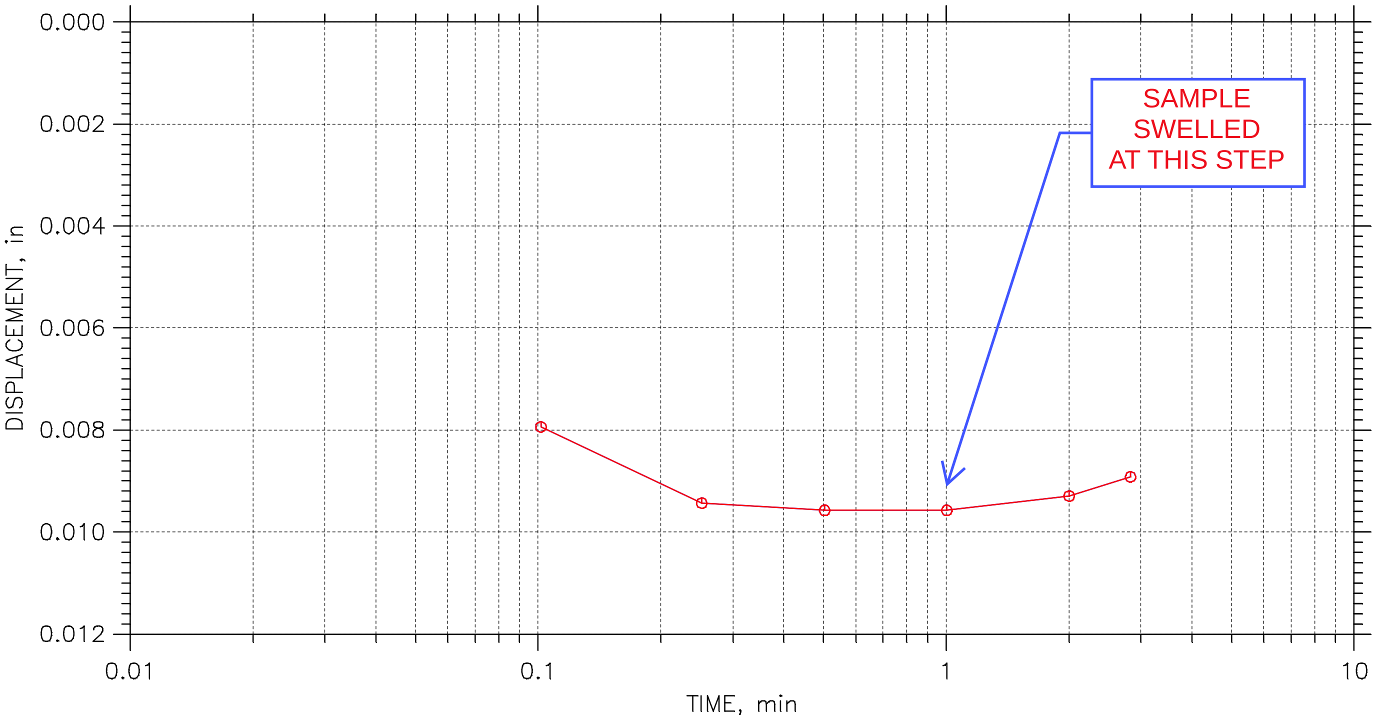
	Applied Stress tsf	Final Displacement in	Void Ratio	Strain at End %	T50 Fitting Sq.Rt. min	T50 Fitting Log min	Coefficient of Consolidation Sq.Rt. ft^2/sec	Coefficient of Consolidation Log ft^2/sec	Coefficient of Consolidation Ave. ft^2/sec
1	0.125	0.008922	0.884	1.19	0.0	0.0	0.00e+000	0.00e+000	0.00e+000
2	0.25	0.01289	0.874	1.72	0.1	0.0	3.48e-005	0.00e+000	3.48e-005
3	0.5	0.02294	0.848	3.07	1.5	0.5	2.05e-006	5.95e-006	3.05e-006
4	0.75	0.03373	0.821	4.51	5.8	0.0	5.07e-007	0.00e+000	5.07e-007
5	1	0.04241	0.798	5.67	3.8	3.2	7.58e-007	8.96e-007	8.21e-007
6	2	0.07189	0.723	9.61	2.1	1.1	1.30e-006	2.41e-006	1.69e-006
7	1	0.06554	0.739	8.76	0.2	0.0	1.15e-005	0.00e+000	1.15e-005
8	0.5	0.05914	0.756	7.91	0.9	0.0	2.88e-006	0.00e+000	2.88e-006
9	0.125	0.0497	0.780	6.64	3.7	0.0	7.35e-007	0.00e+000	7.35e-007
10	0.25	0.05157	0.775	6.89	0.9	0.0	3.01e-006	0.00e+000	3.01e-006
11	0.5	0.05657	0.762	7.56	0.9	0.0	2.94e-006	0.00e+000	2.94e-006
12	0.75	0.06059	0.752	8.10	3.9	1.3	6.94e-007	2.10e-006	1.04e-006
13	1	0.06357	0.744	8.50	0.2	0.0	1.18e-005	0.00e+000	1.18e-005
14	2	0.07577	0.713	10.13	0.9	0.4	2.80e-006	7.14e-006	4.02e-006
15	4	0.1094	0.628	14.62	2.1	0.0	1.17e-006	0.00e+000	1.17e-006
16	8	0.1468	0.532	19.63	2.1	0.0	1.04e-006	0.00e+000	1.04e-006
17	16	0.1861	0.432	24.88	2.1	0.0	9.17e-007	0.00e+000	9.17e-007
18	32	0.2266	0.329	30.29	2.1	0.0	7.97e-007	0.00e+000	7.97e-007
19	16	0.2155	0.357	28.81	0.0	0.0	6.68e-005	0.00e+000	6.68e-005
20	4	0.1974	0.403	26.38	2.1	0.0	7.97e-007	0.00e+000	7.97e-007
21	1	0.1751	0.460	23.40	11.4	0.0	1.58e-007	0.00e+000	1.58e-007
22	0.5	0.1661	0.483	22.21	8.8	0.0	2.16e-007	0.00e+000	2.16e-007
23	0.125	0.153	0.517	20.45	32.0	0.0	6.18e-008	0.00e+000	6.18e-008

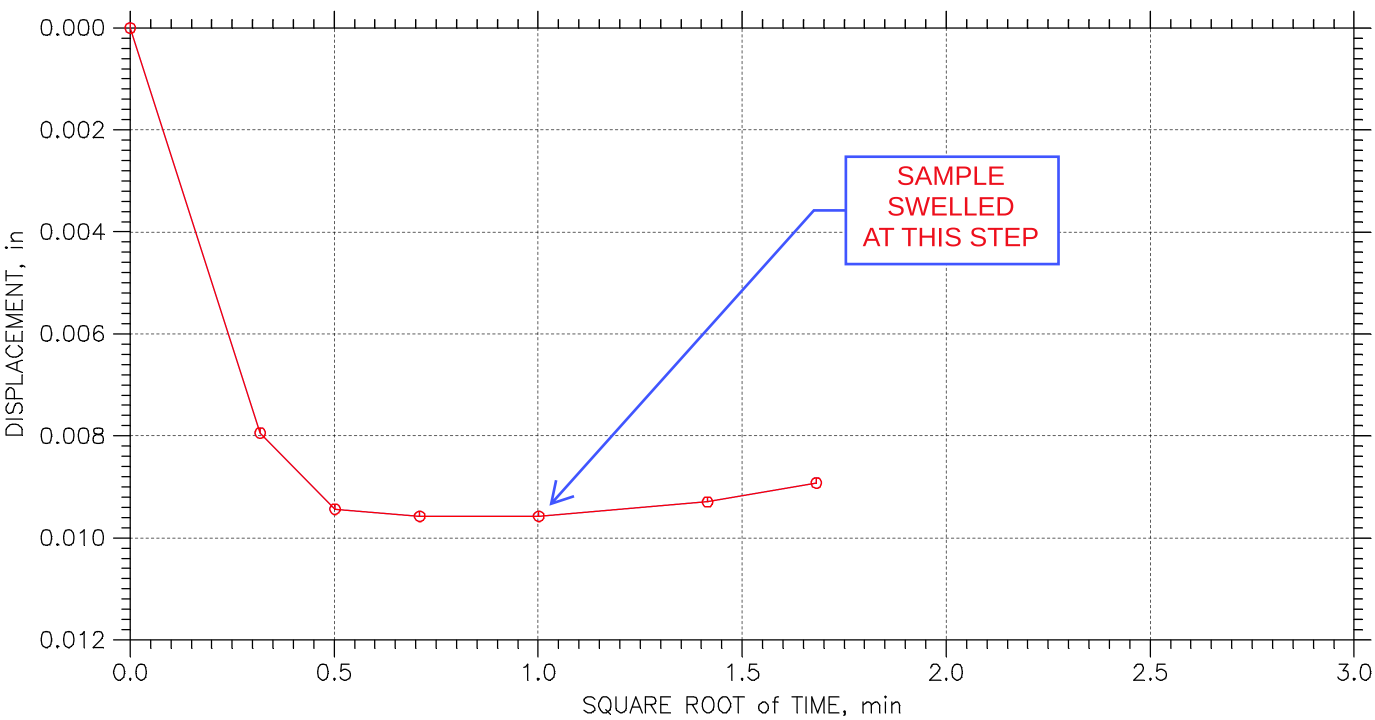
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 1 of 23

Stress: 0.125 tsf





Terracon Consulting Engineers & Scientists			
	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0'' ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

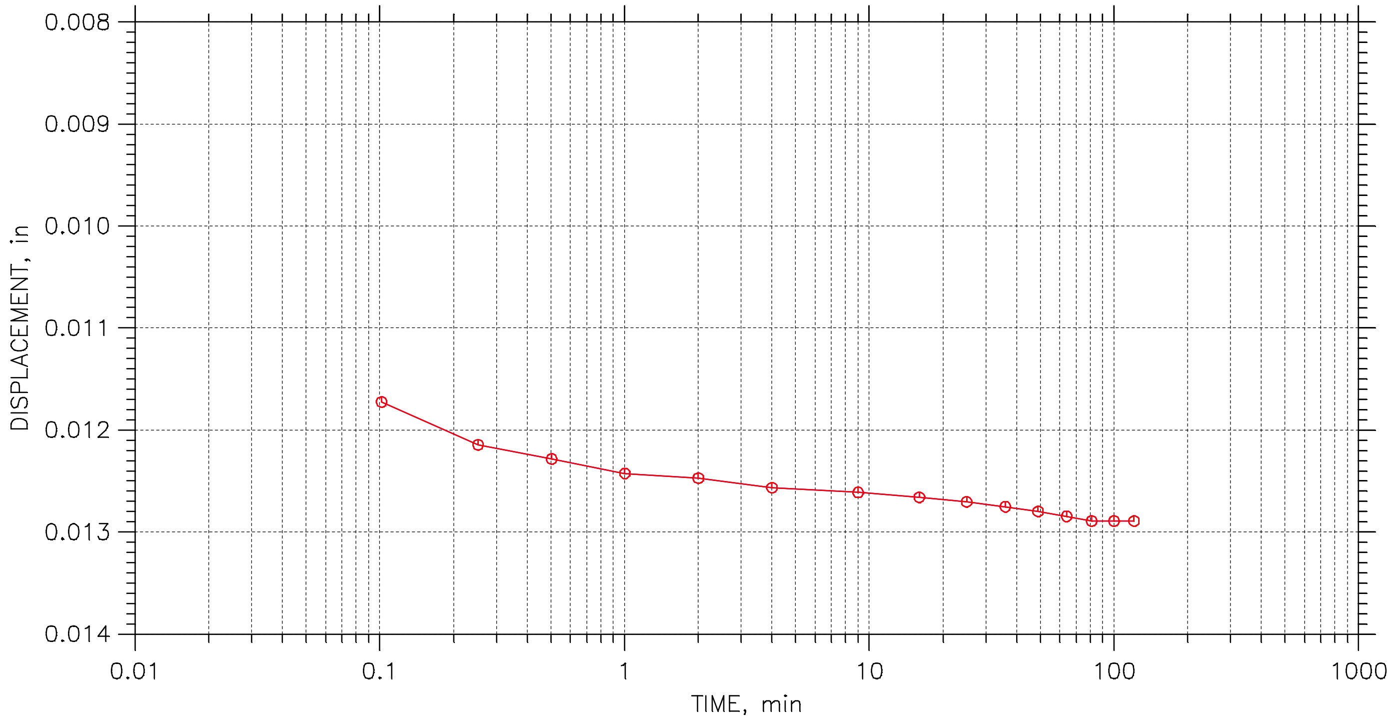
Mon, 16-NOV-2015 18:54:39

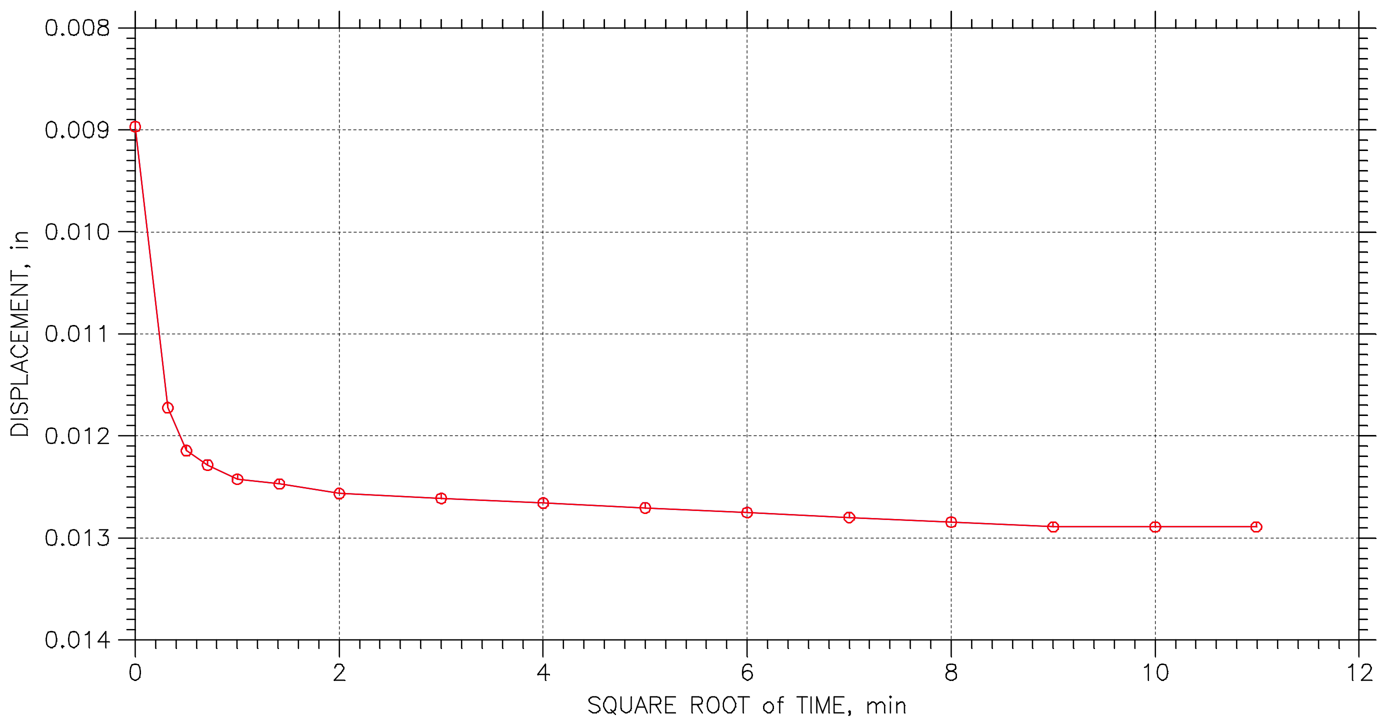
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 2 of 23

Stress: 0.25 tsf





Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0'' ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

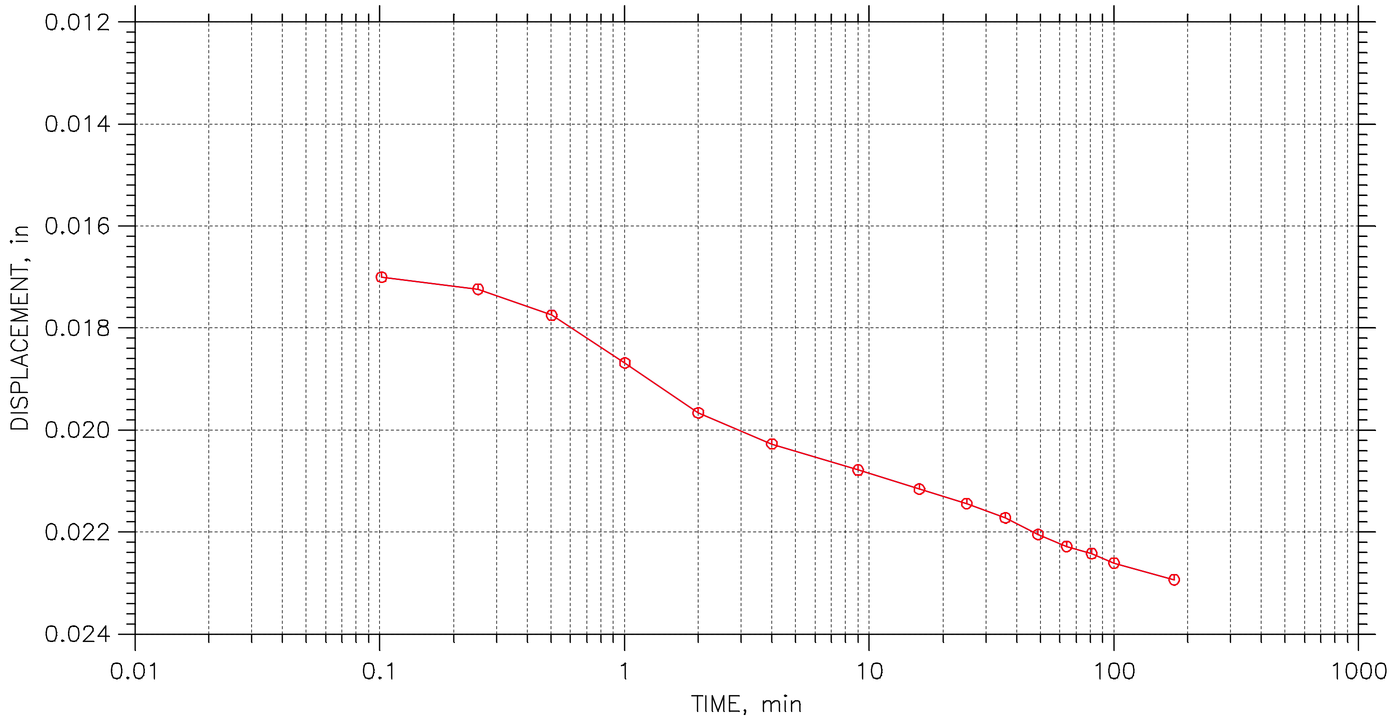
Mon, 16-NOV-2015 18:54:41

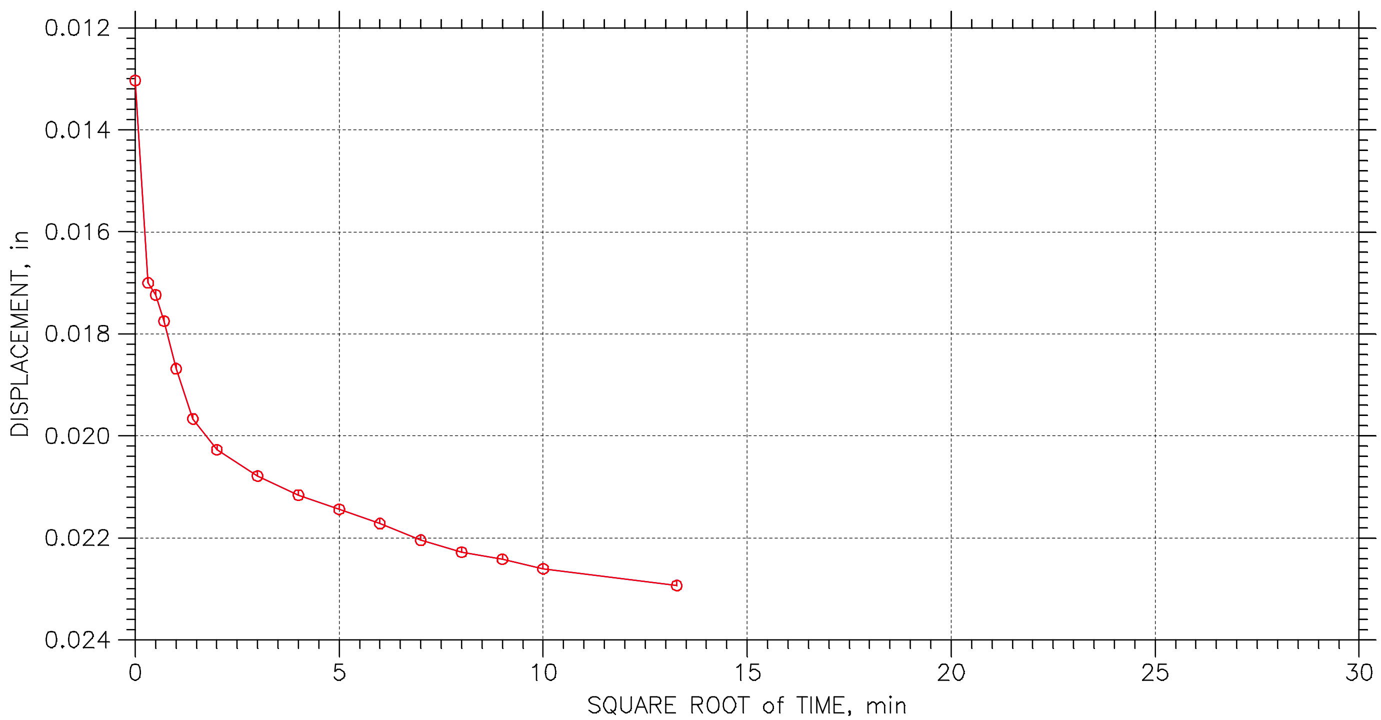
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 3 of 23

Stress: 0.5 tsf





Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0'' ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

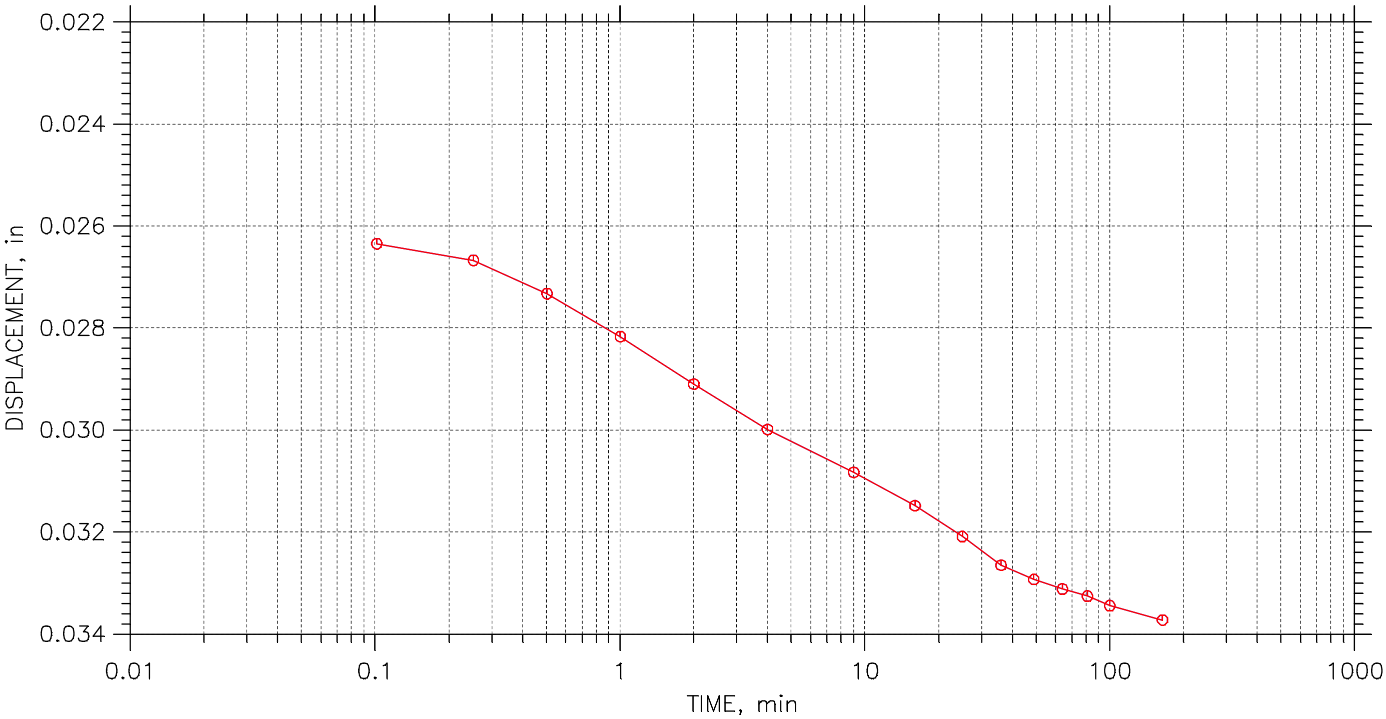
Mon, 16-NOV-2015 18:54:42

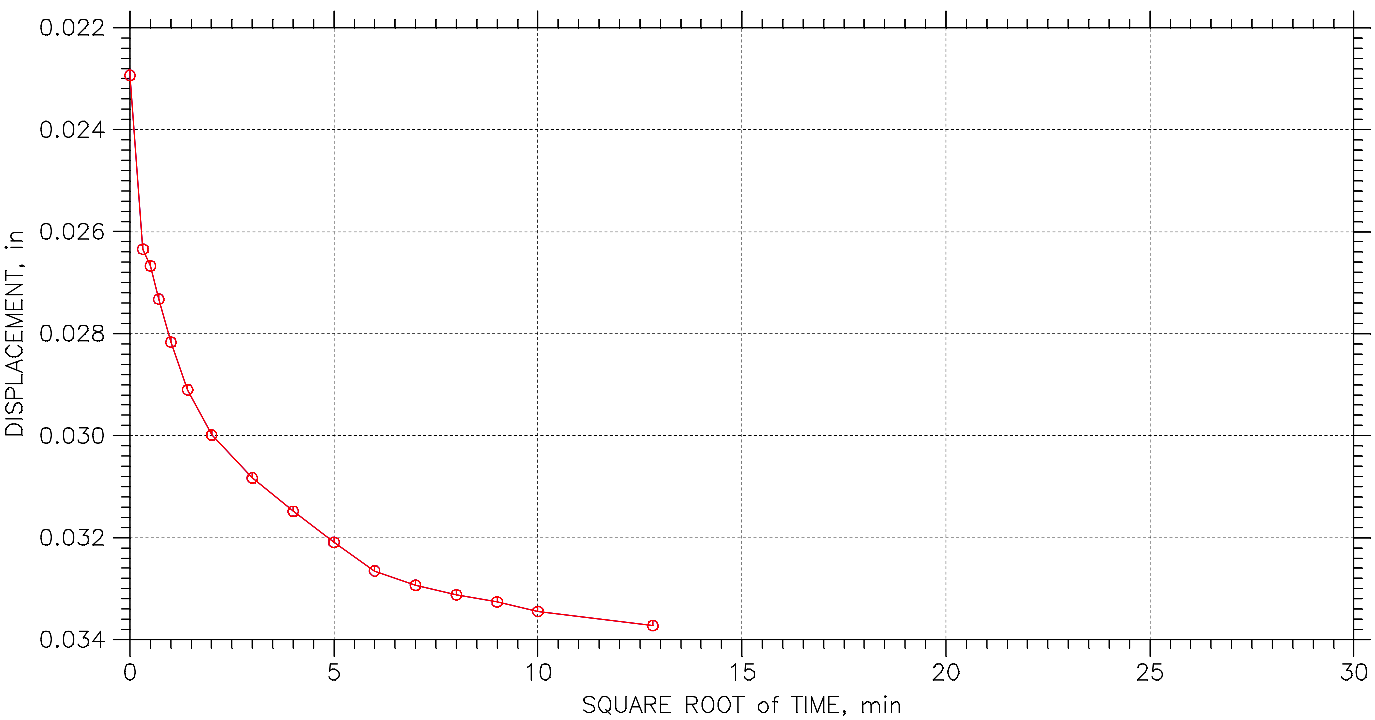
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 4 of 23

Stress: 0.75 tsf





Terracon Consulting Engineers & Scientists			
	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0'' ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

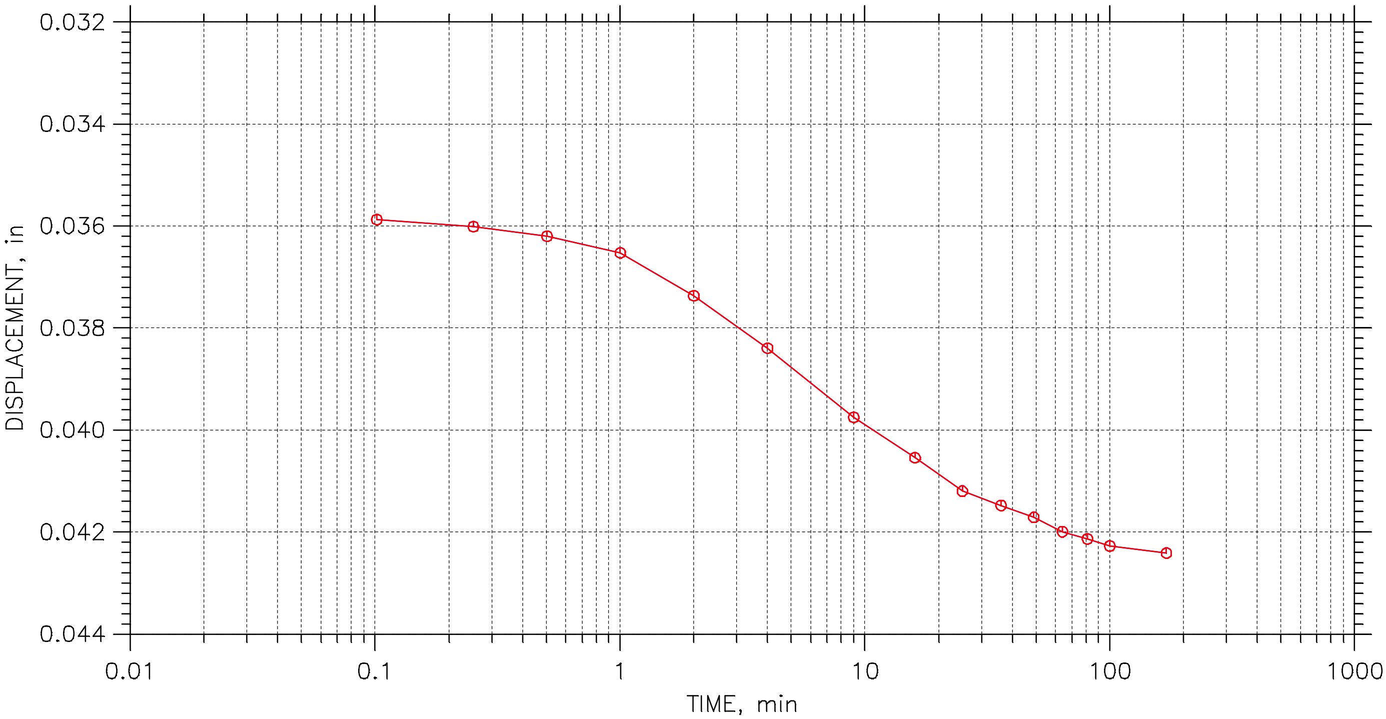
Mon, 16-NOV-2015 18:54:44

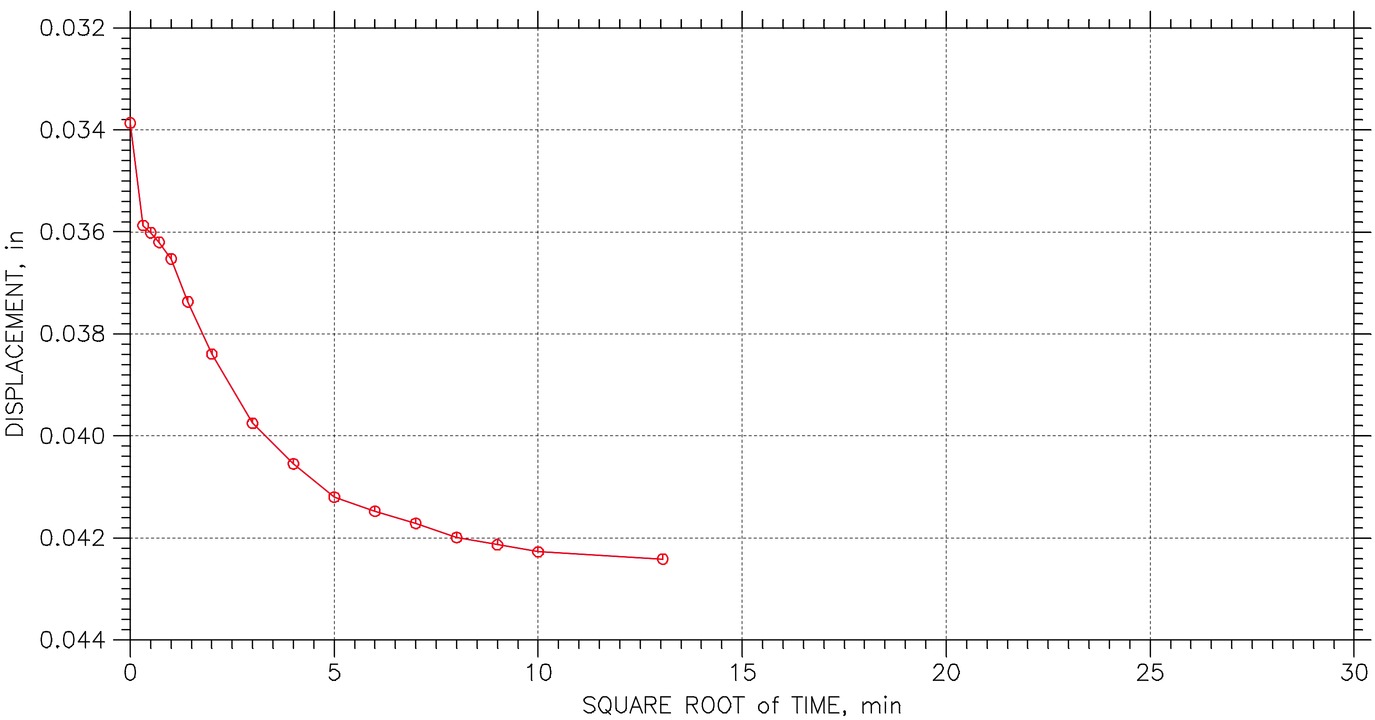
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 5 of 23

Stress: 1. tsf





Terracon Consulting Engineers & Scientists			
	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0'' ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

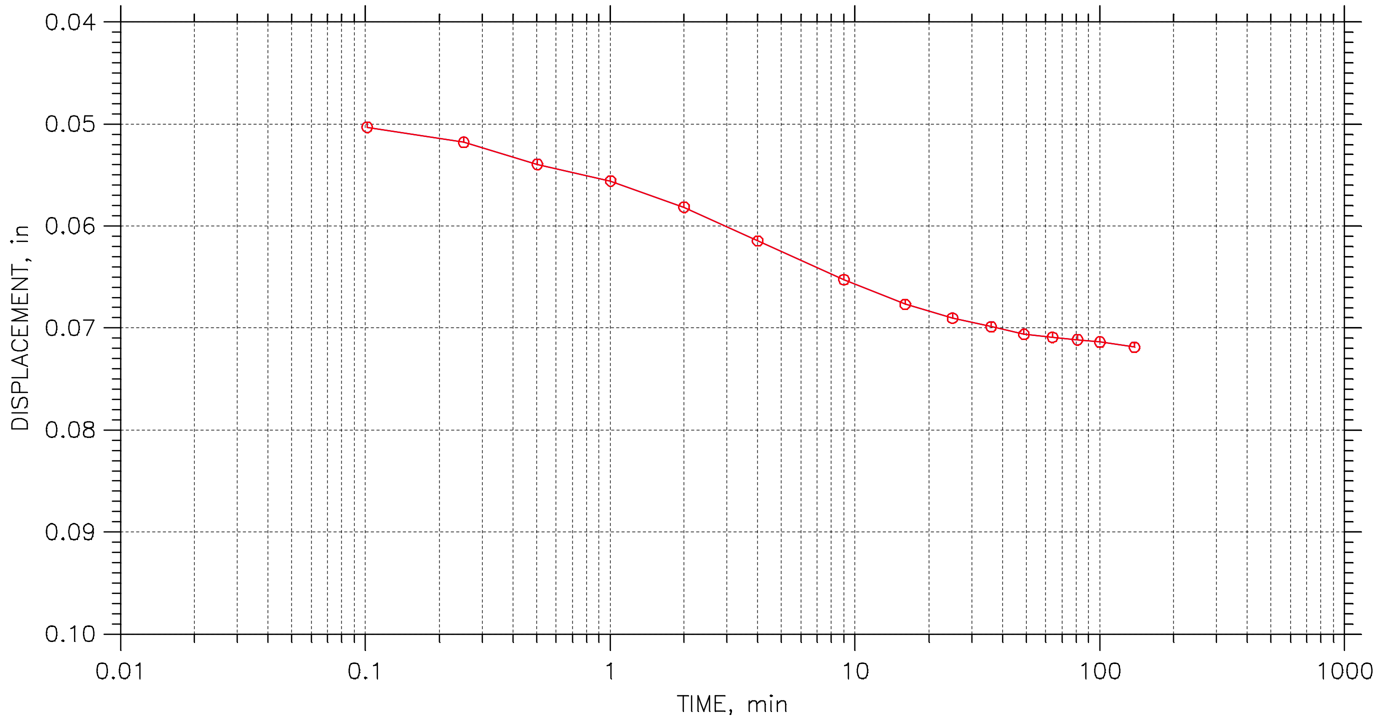
Mon, 16-NOV-2015 18:54:46

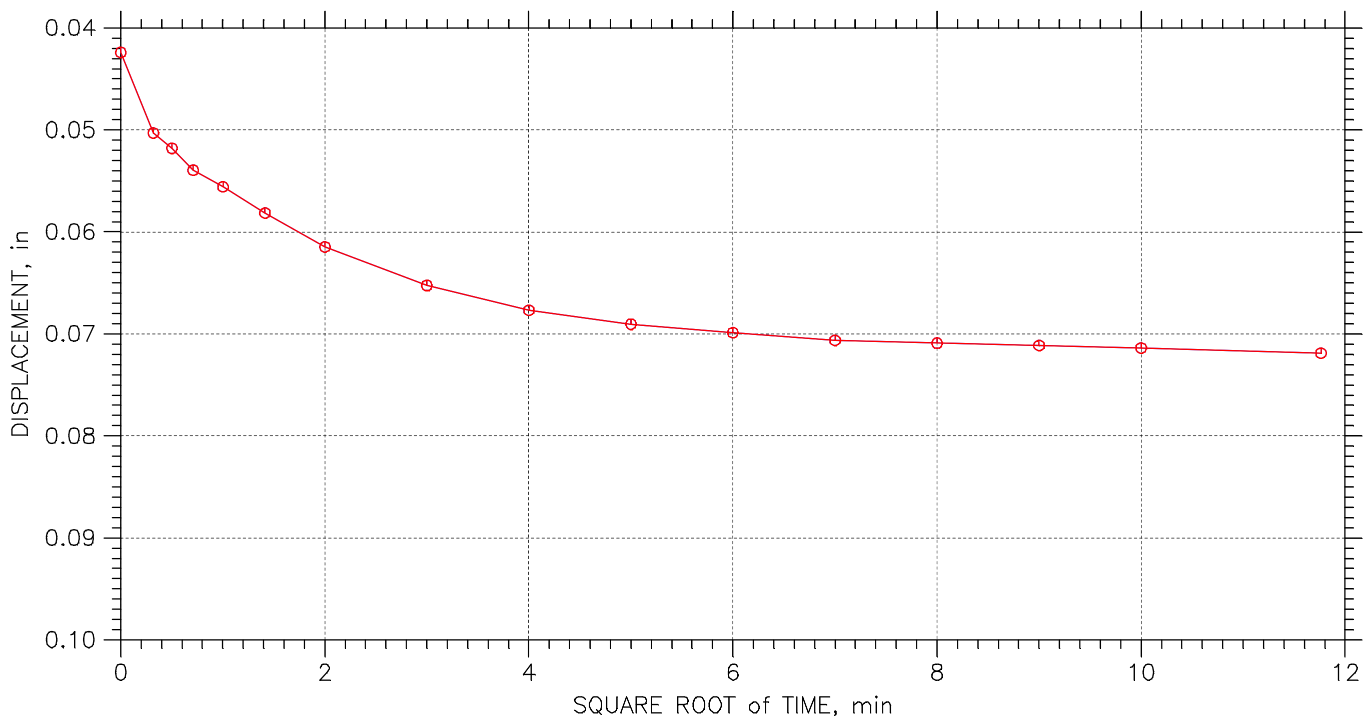
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 6 of 23

Stress: 2. tsf





Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0'' ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

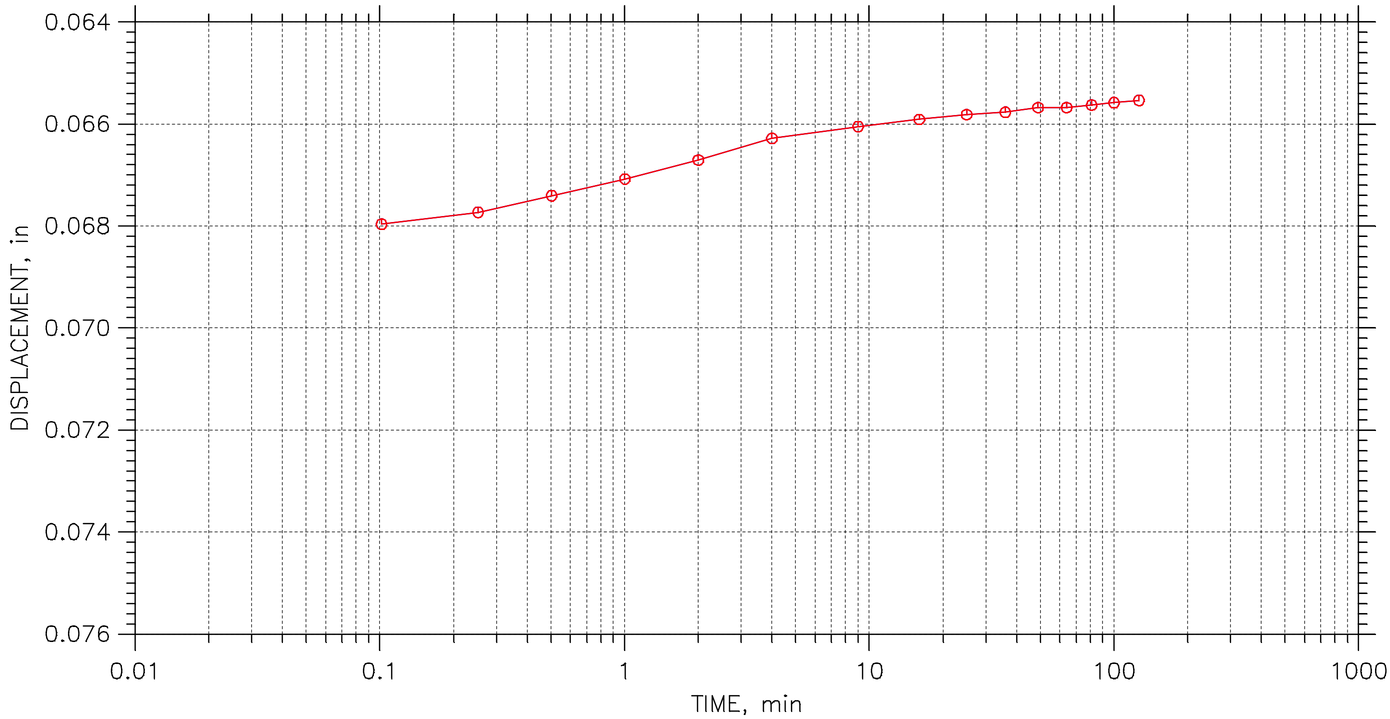
Mon, 16-NOV-2015 18:54:47

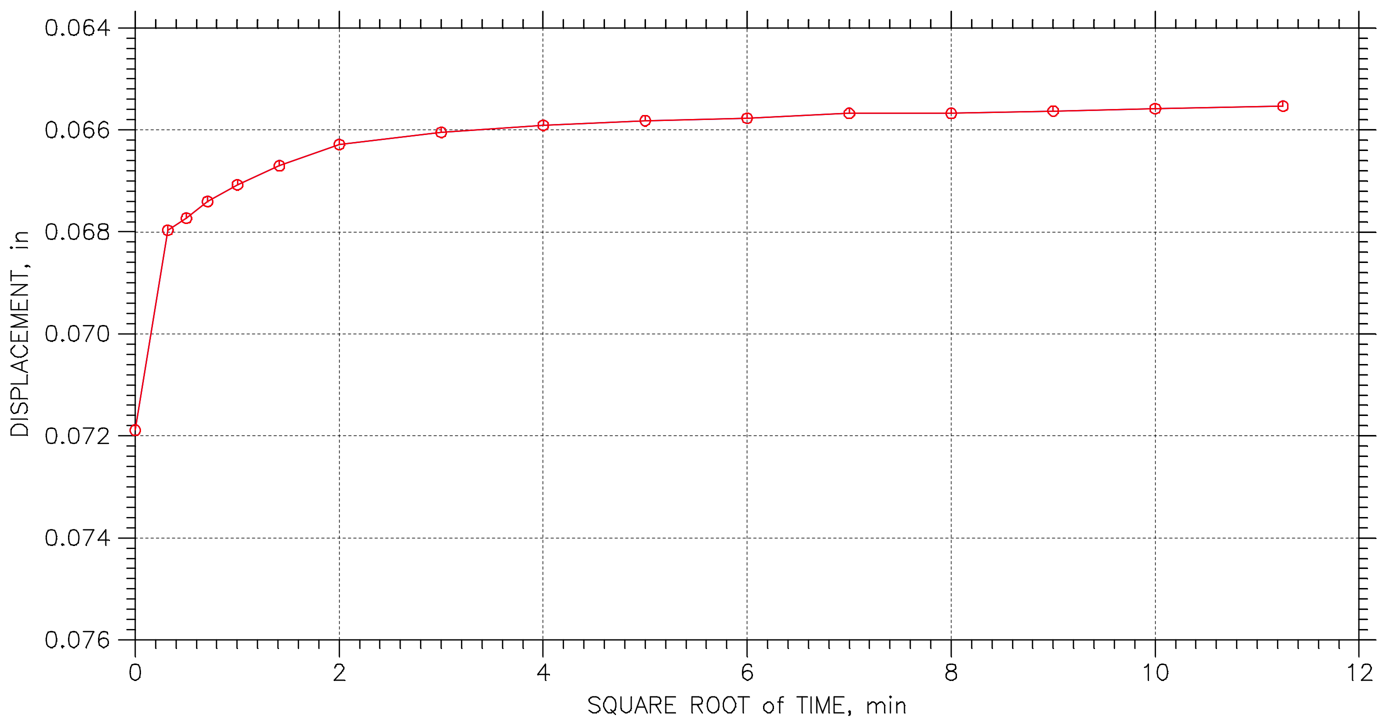
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 7 of 23

Stress: 1. tsf





Terracon Consulting Engineers & Scientists			
	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0'' ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

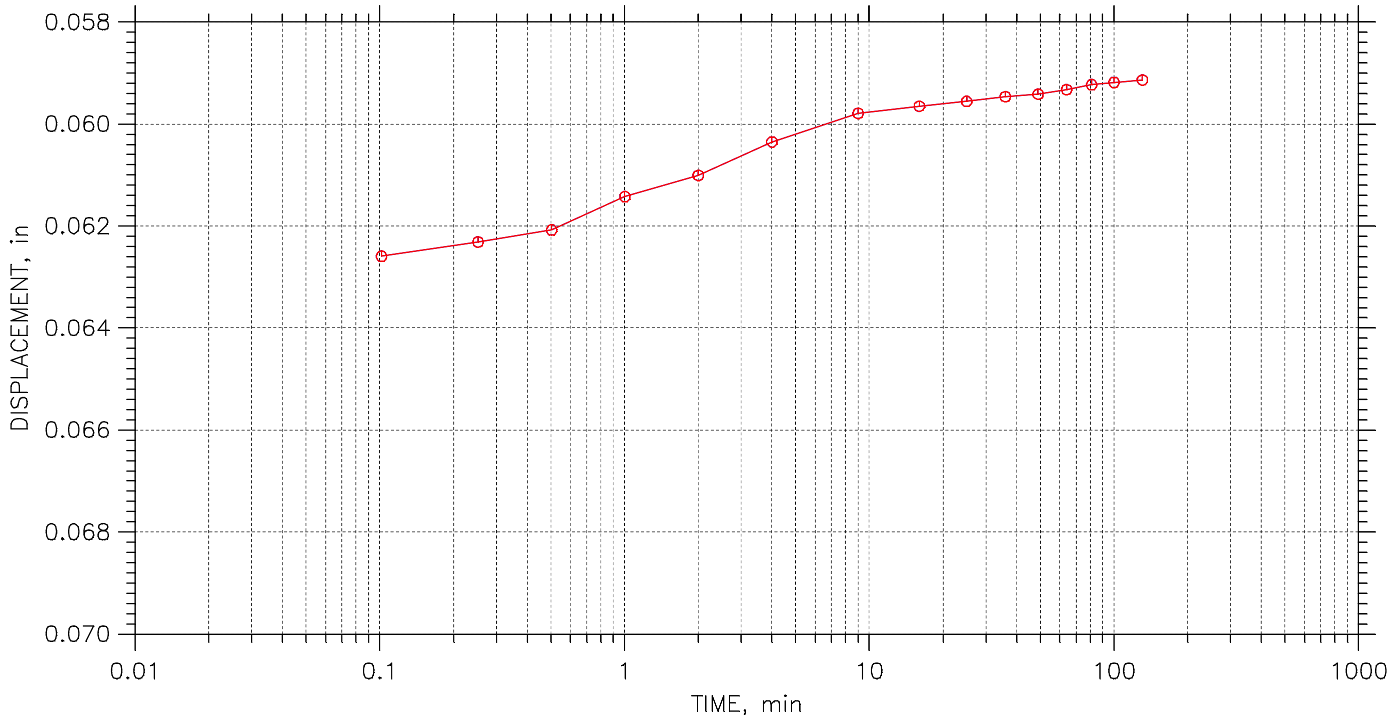
Mon, 16-NOV-2015 18:54:49

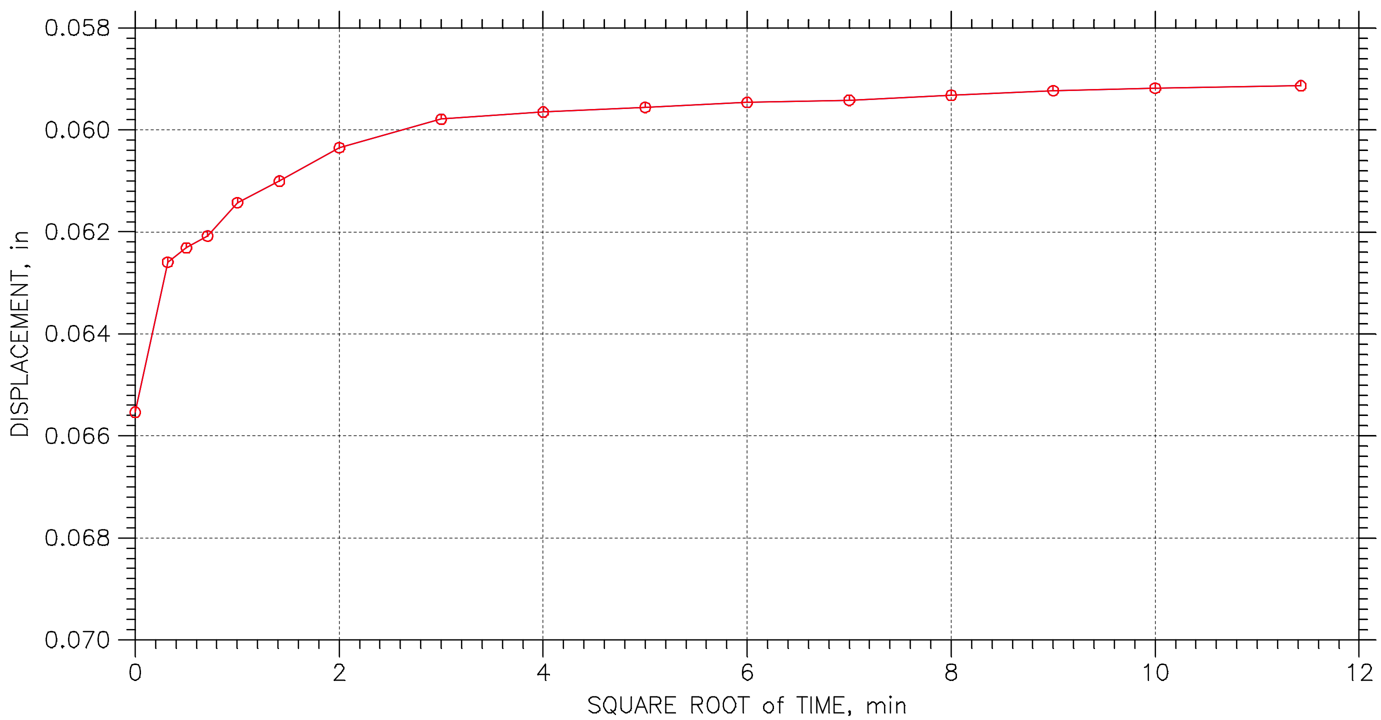
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 8 of 23

Stress: 0.5 tsf





Terracon Consulting Engineers & Scientists			
	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0'' ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

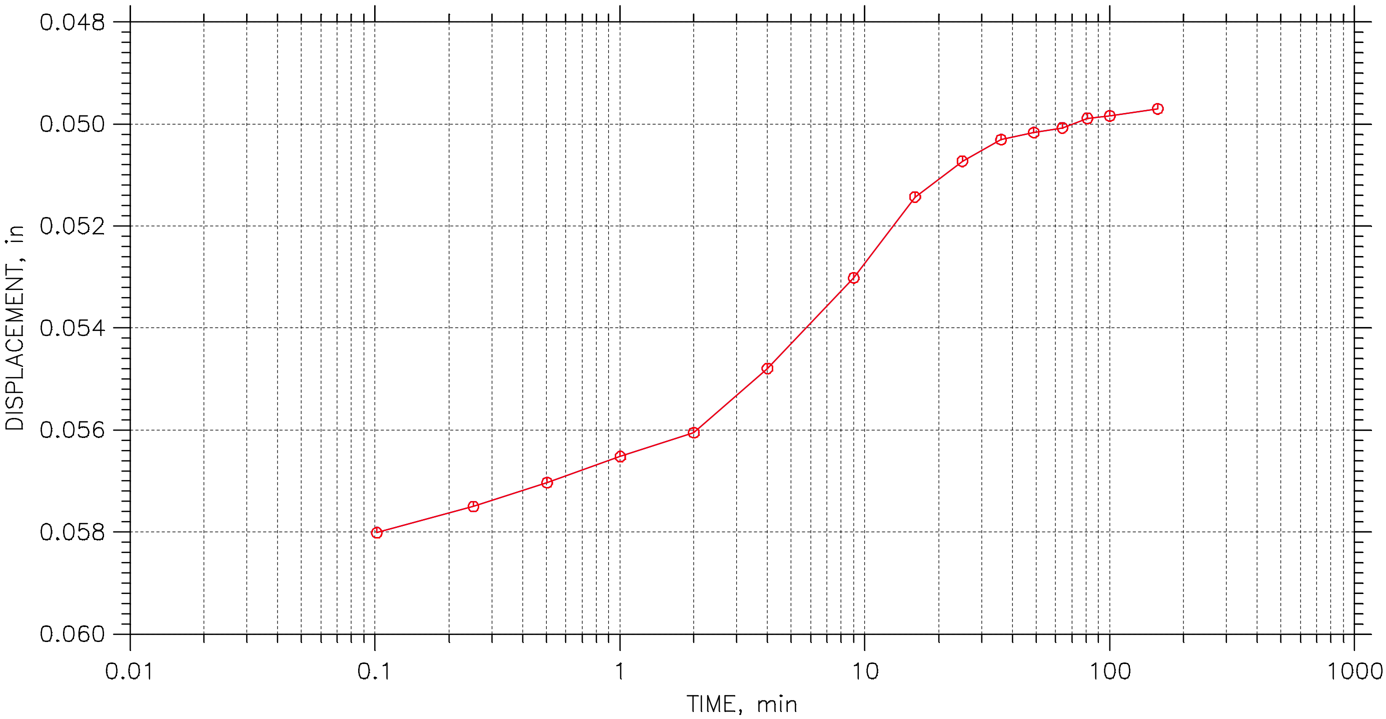
Mon, 16-NOV-2015 18:54:50

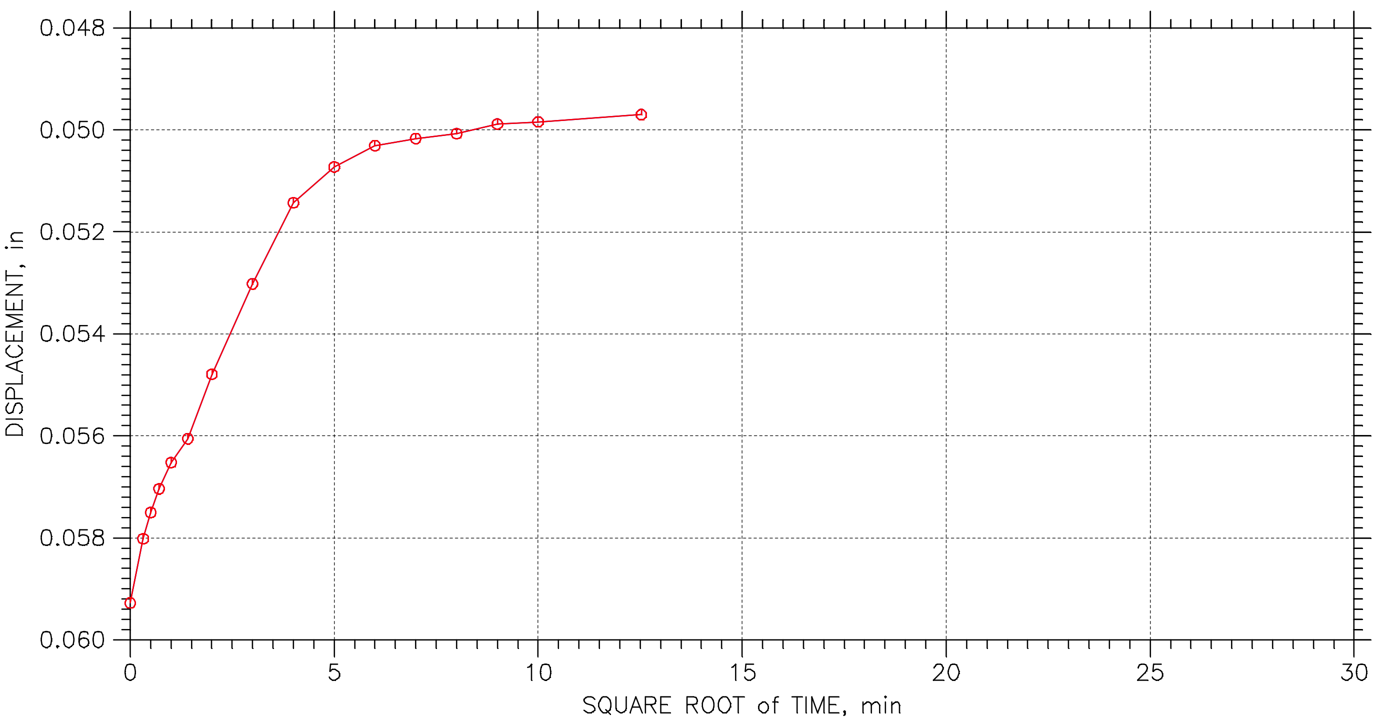
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 9 of 23

Stress: 0.125 tsf





Terracon Consulting Engineers & Scientists			
	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0'' ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

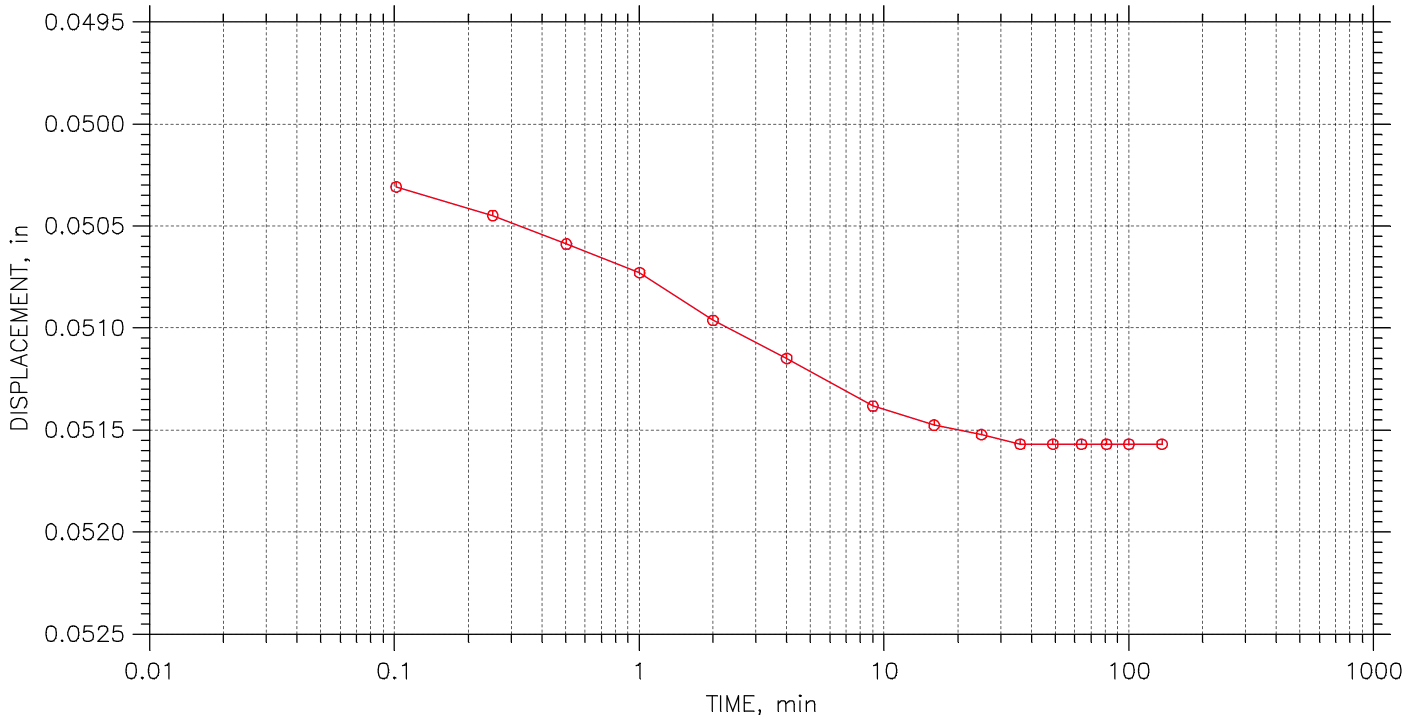
Mon, 16-NOV-2015 18:54:52

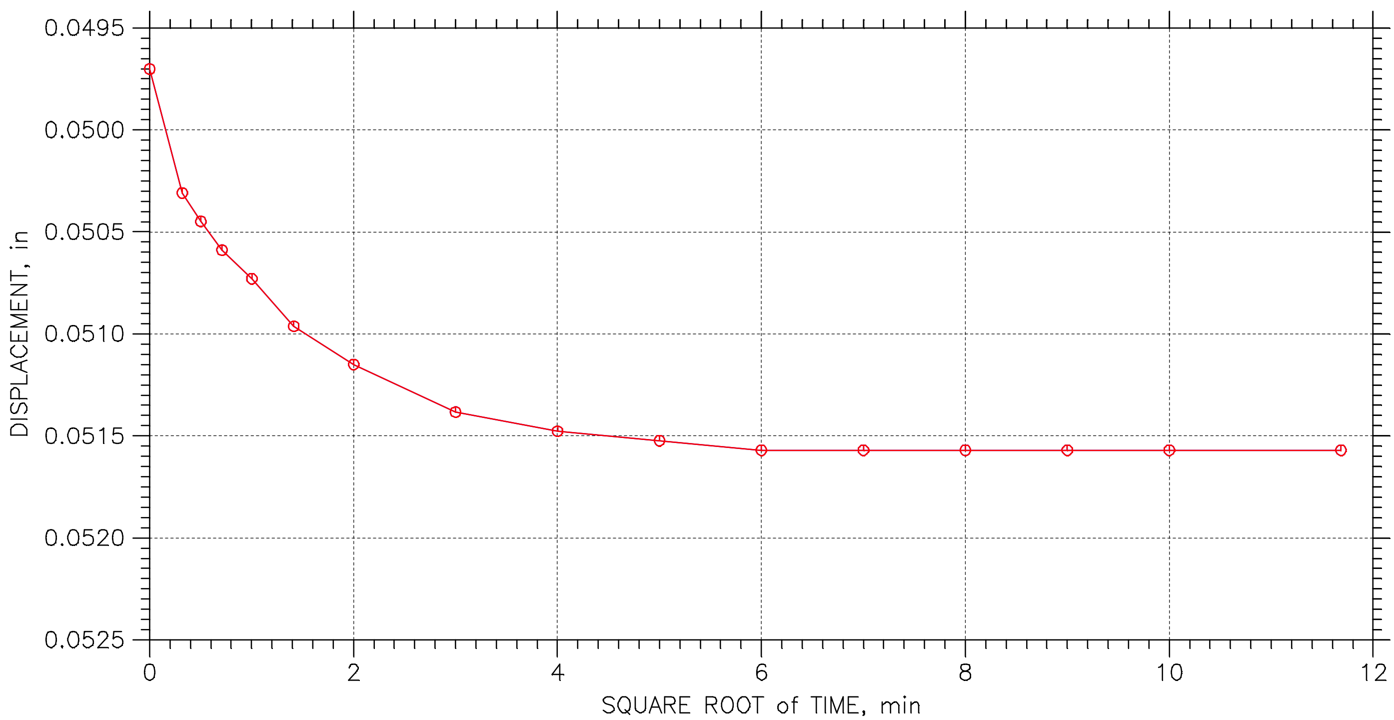
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 10 of 23

Stress: 0.25 tsf





Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0'' ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

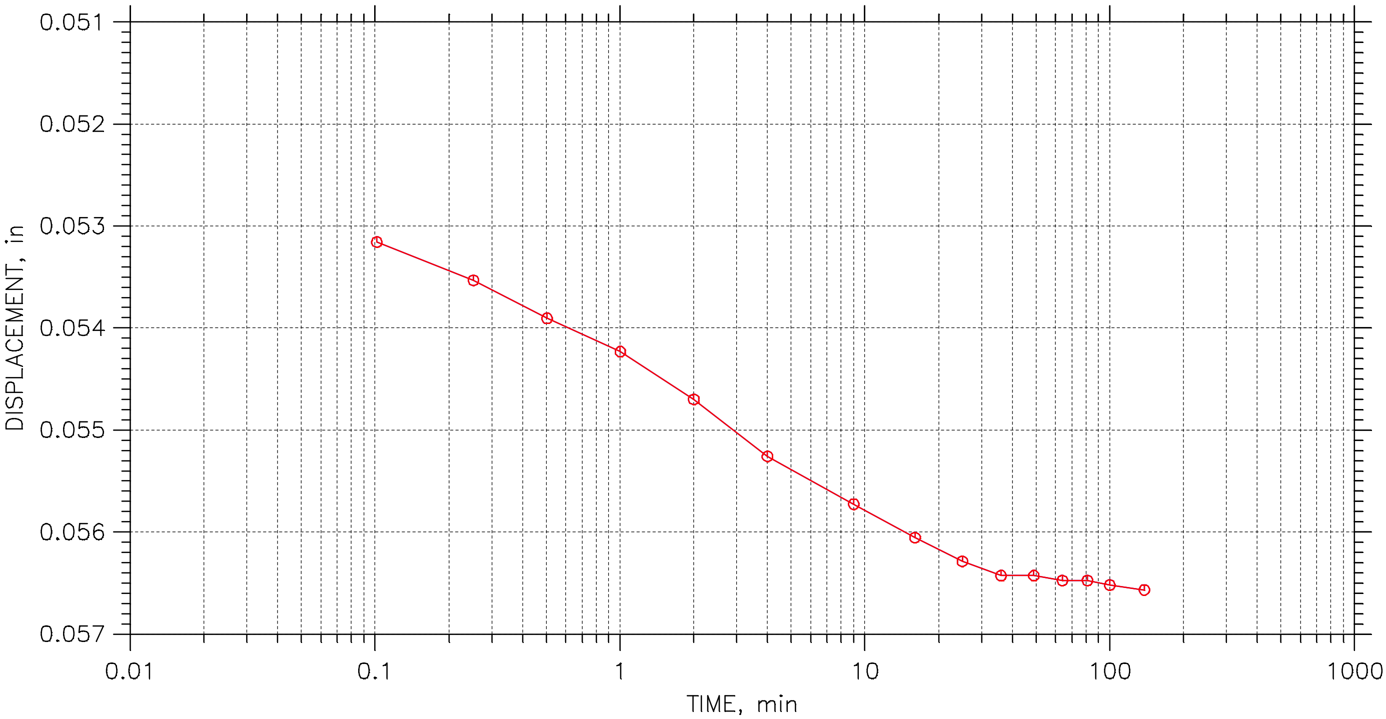
Mon, 16-NOV-2015 18:54:53

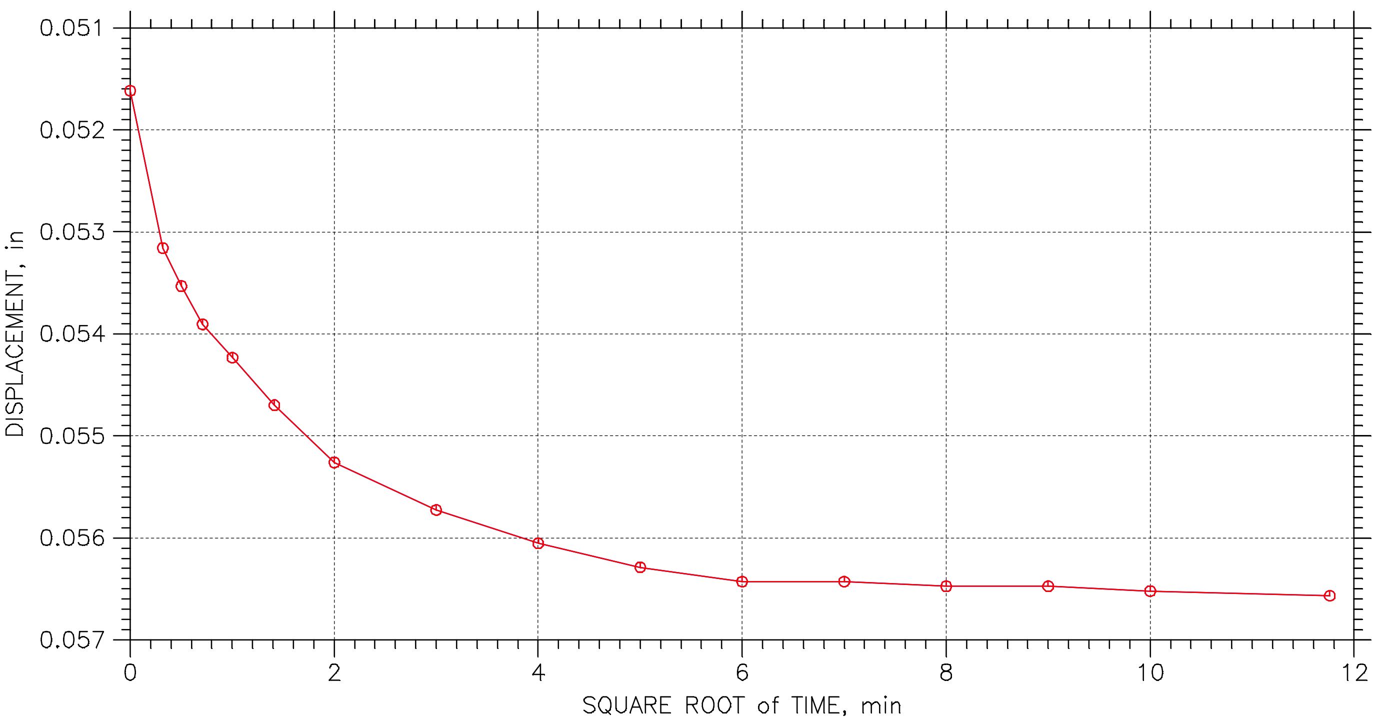
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 11 of 23

Stress: 0.5 tsf





Terracon Consulting Engineers & Scientists			
	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0'' ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

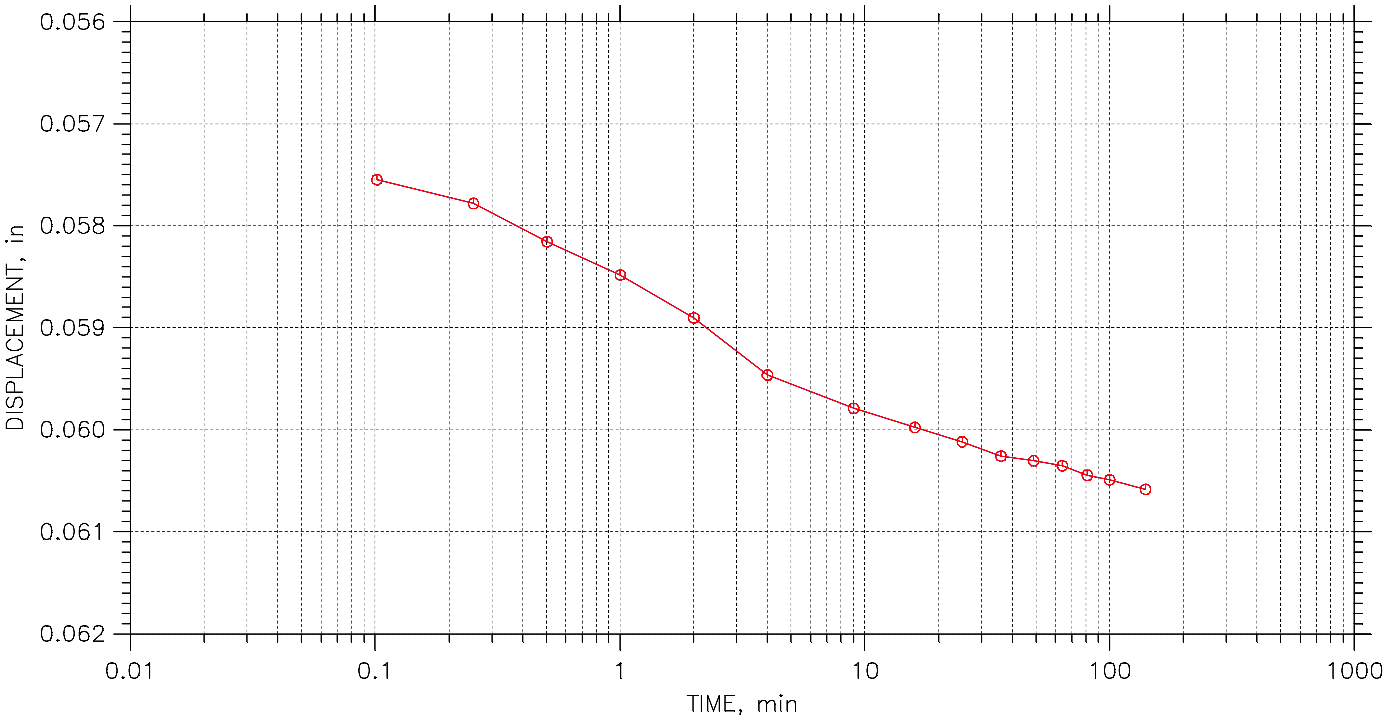
Mon, 16-NOV-2015 18:54:55

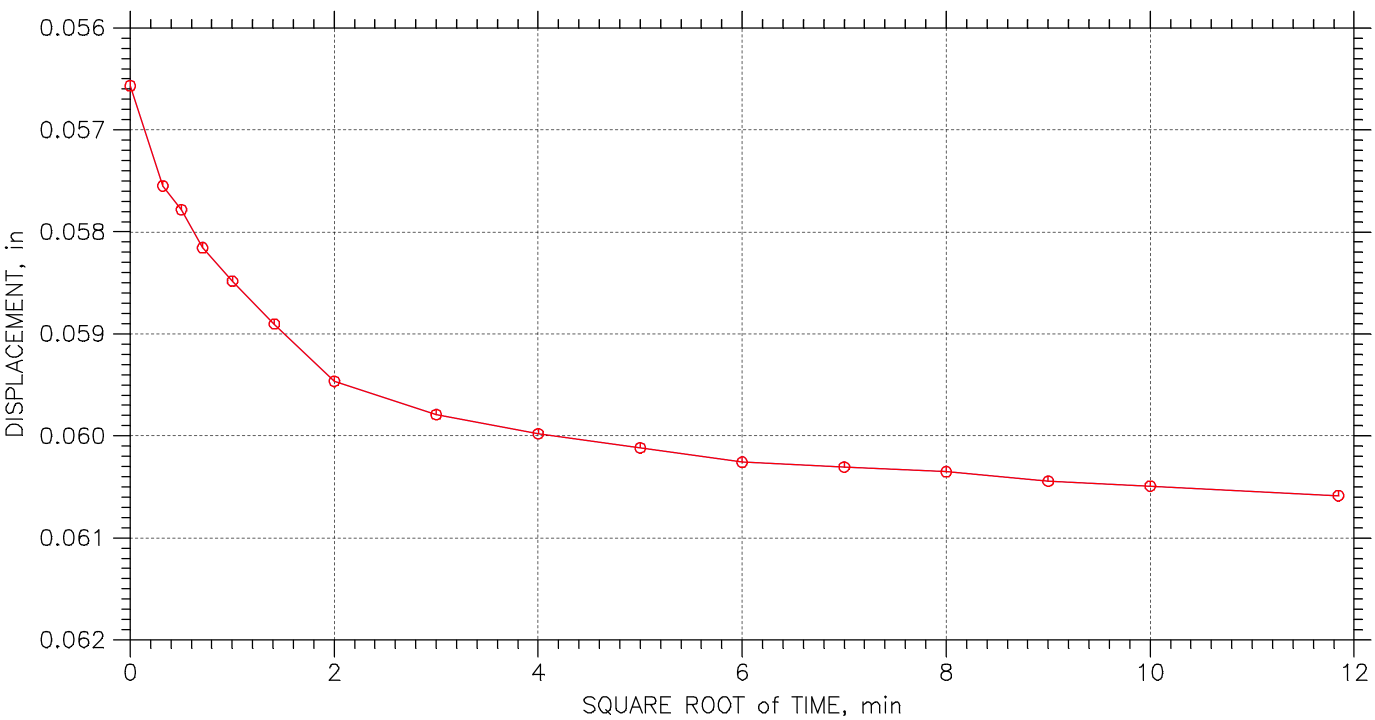
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 12 of 23

Stress: 0.75 tsf





Terracon Consulting Engineers & Scientists			
	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0'' ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

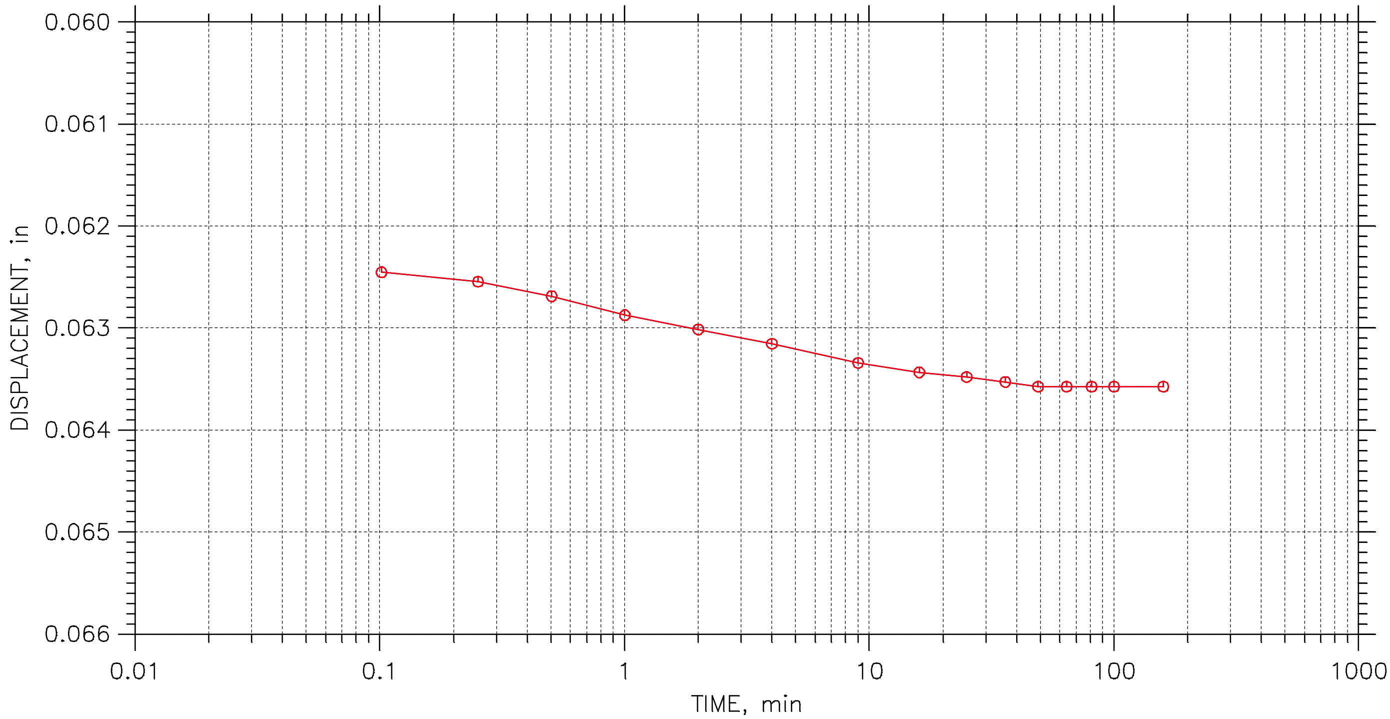
Mon, 16-NOV-2015 18:54:57

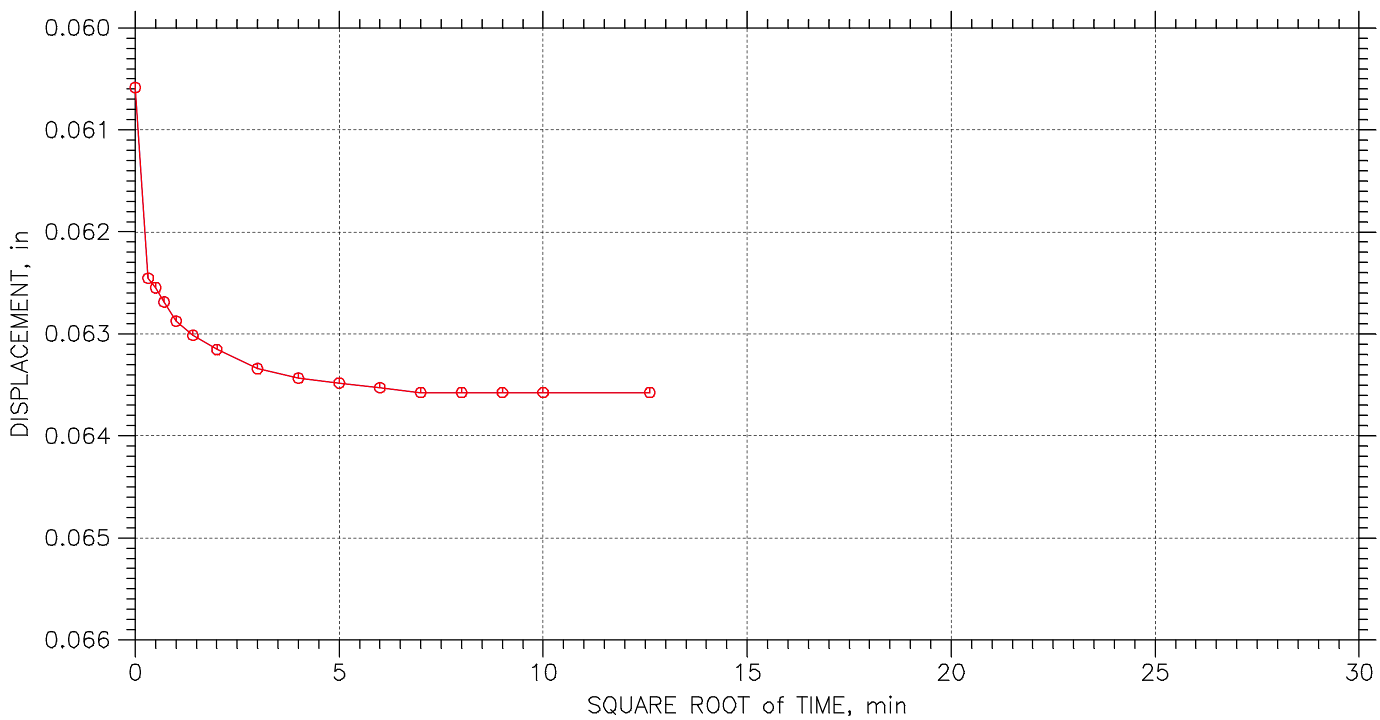
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 13 of 23

Stress: 1. tsf





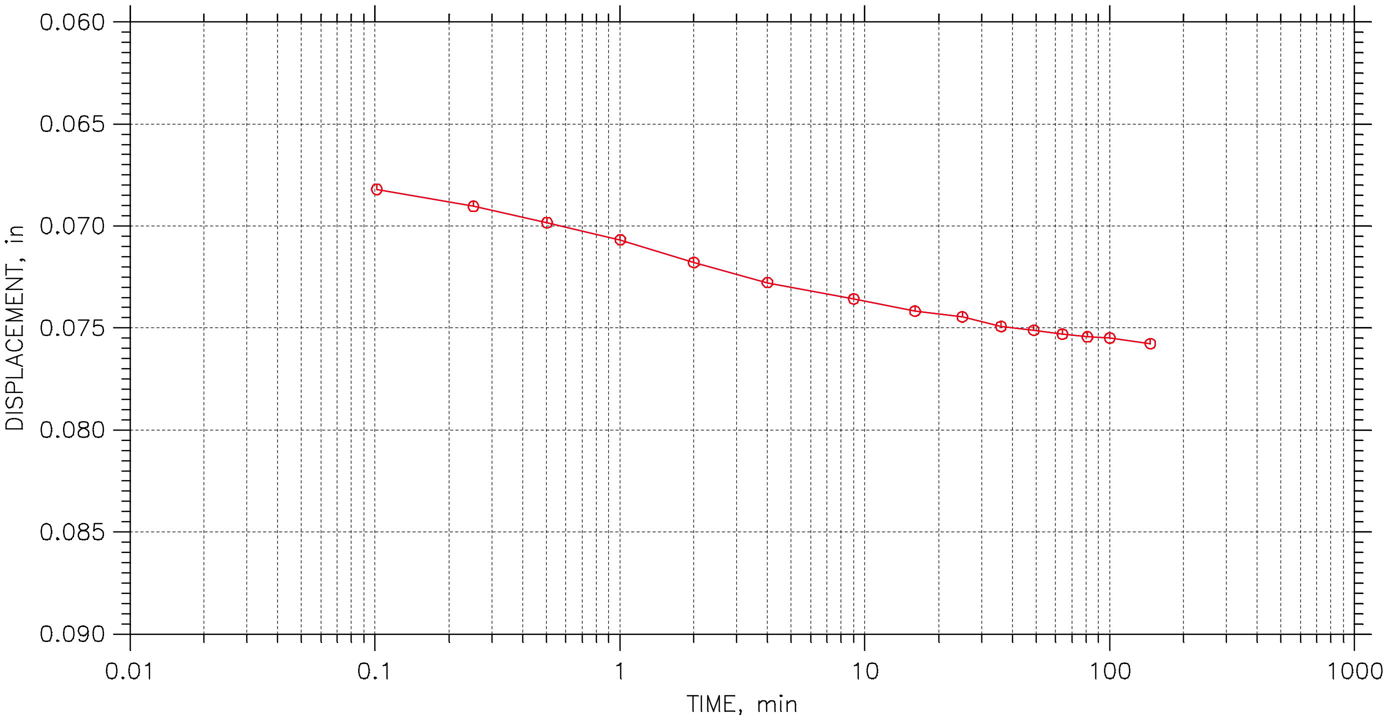
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

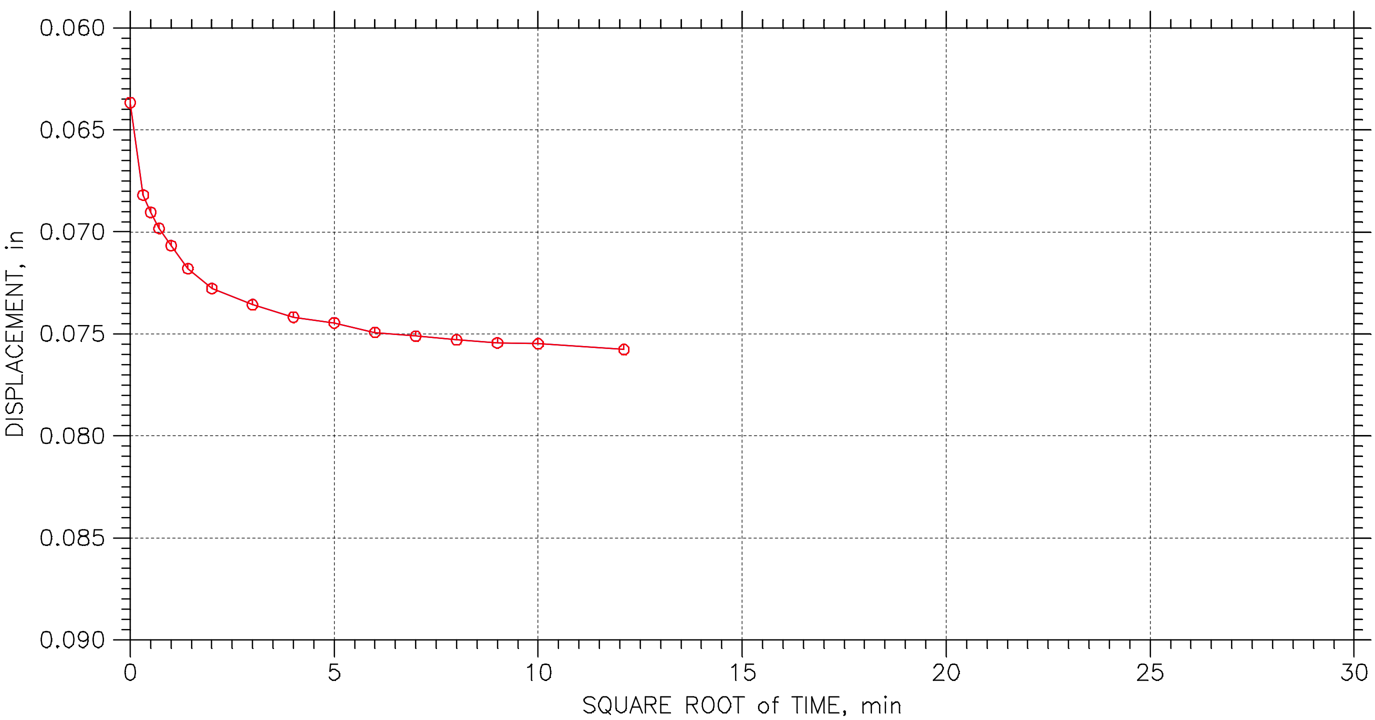
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 14 of 23

Stress: 2. tsf





Terracon Consulting Engineers & Scientists			
	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0'' ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

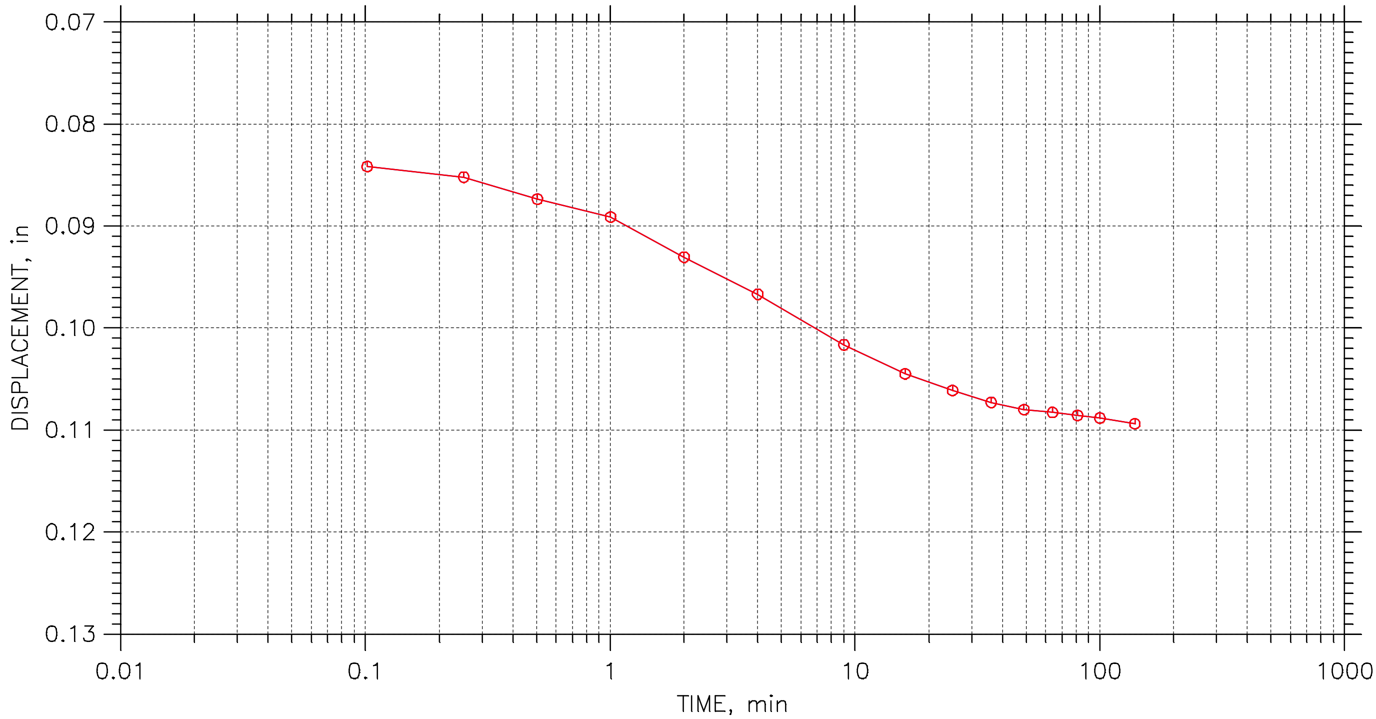
Mon, 16-NOV-2015 18:55:00

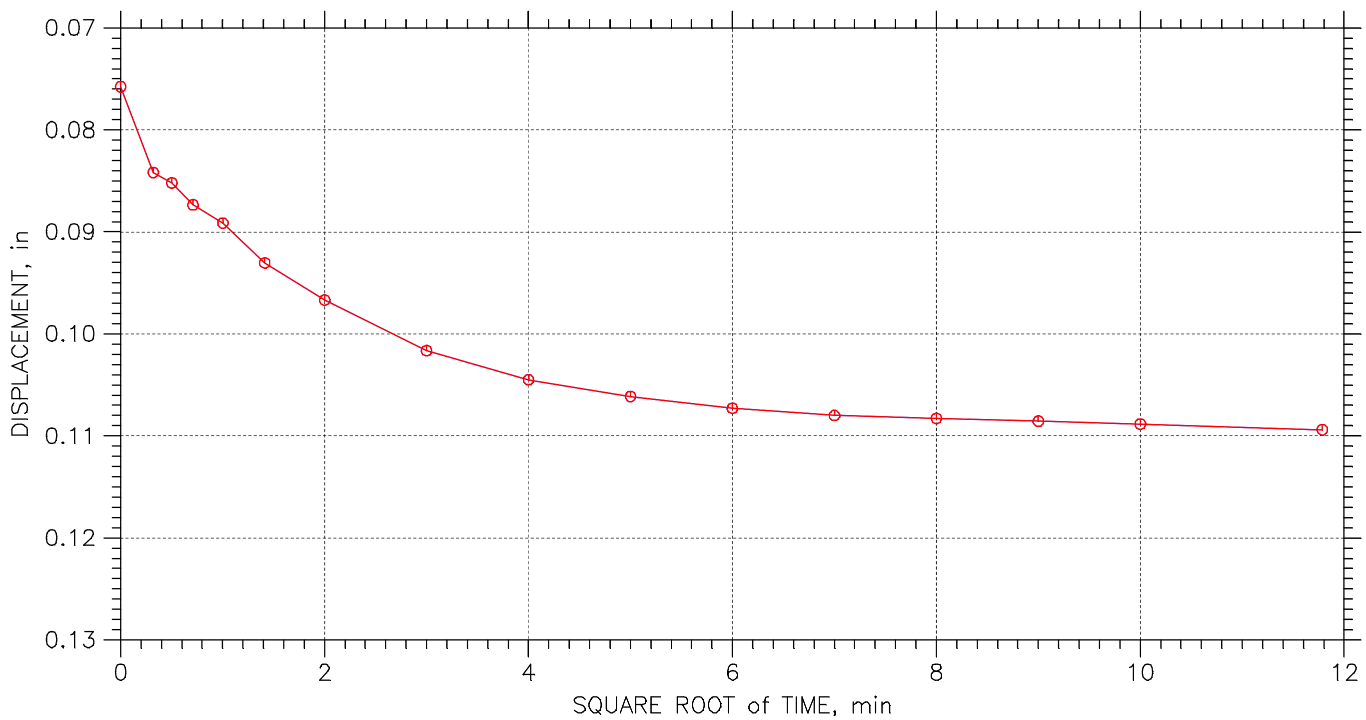
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 15 of 23

Stress: 4. tsf





Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

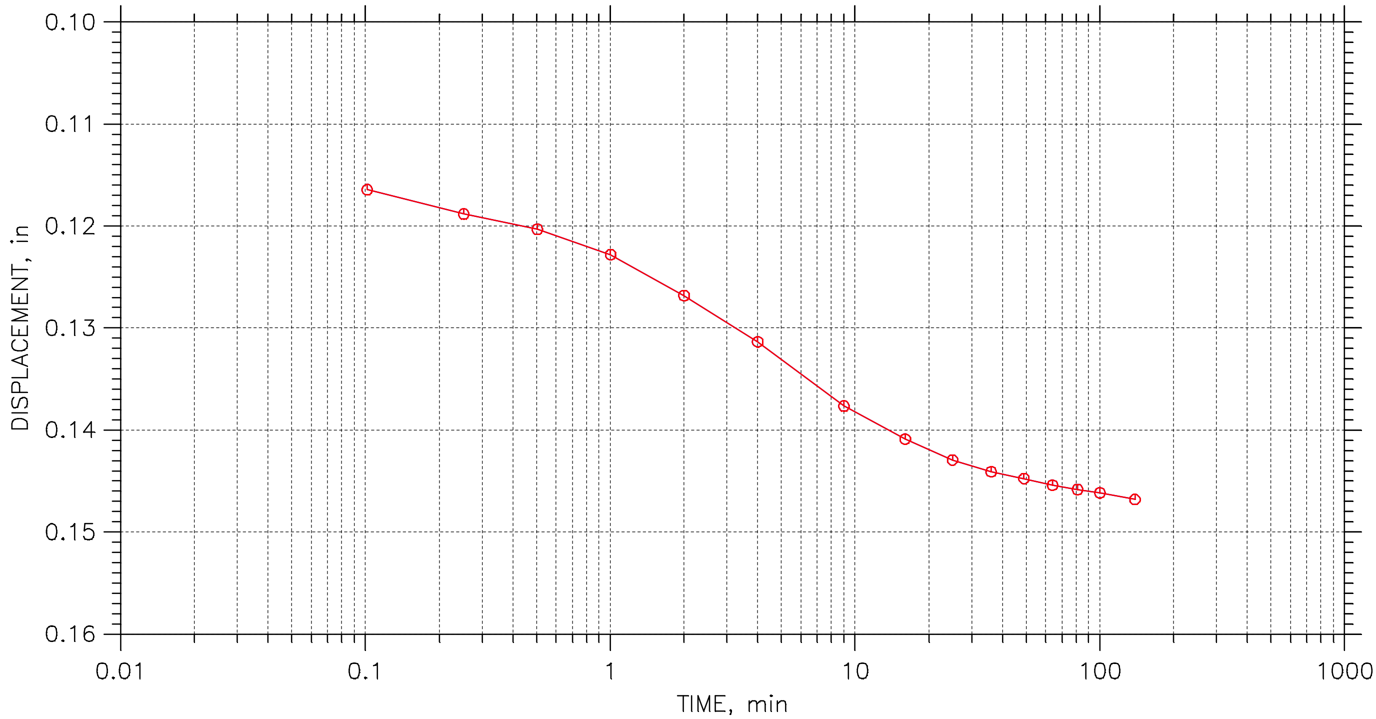
Mon, 16-NOV-2015 18:55:01

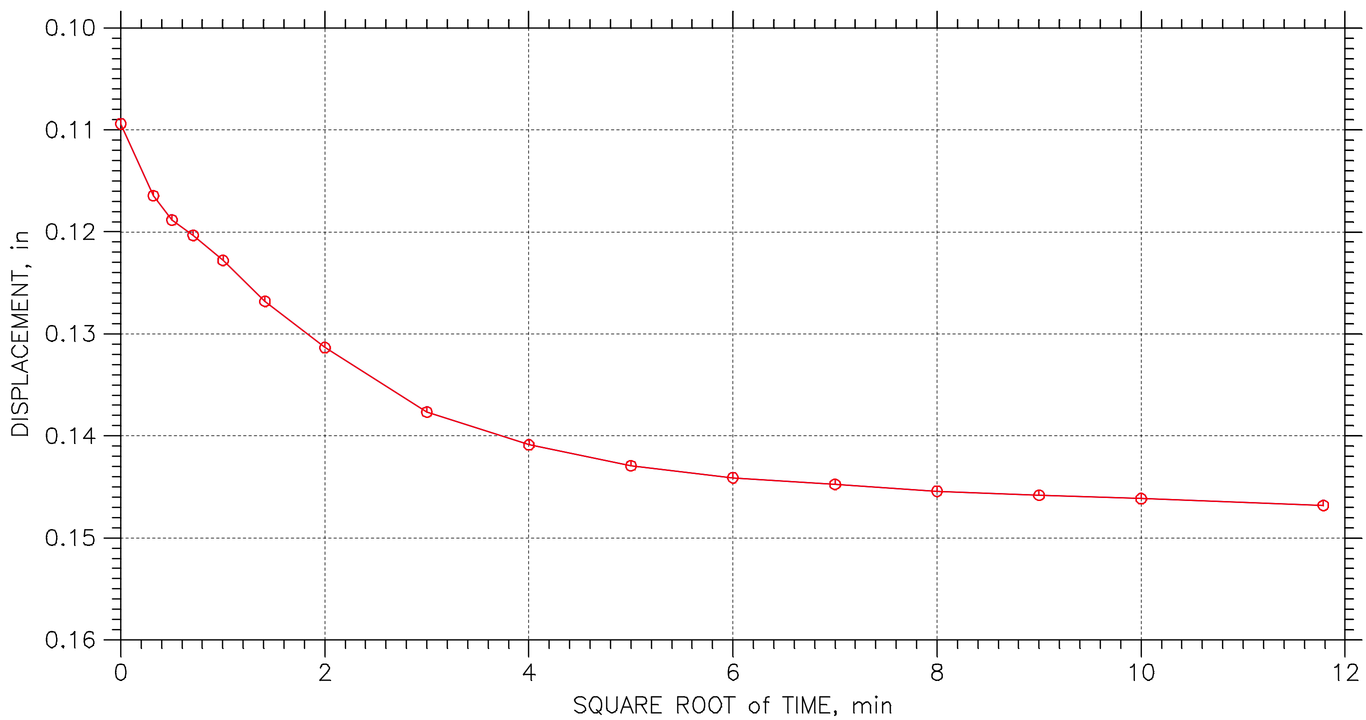
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 16 of 23

Stress: 8. tsf





Terracon Consulting Engineers & Scientists			
	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0'' ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

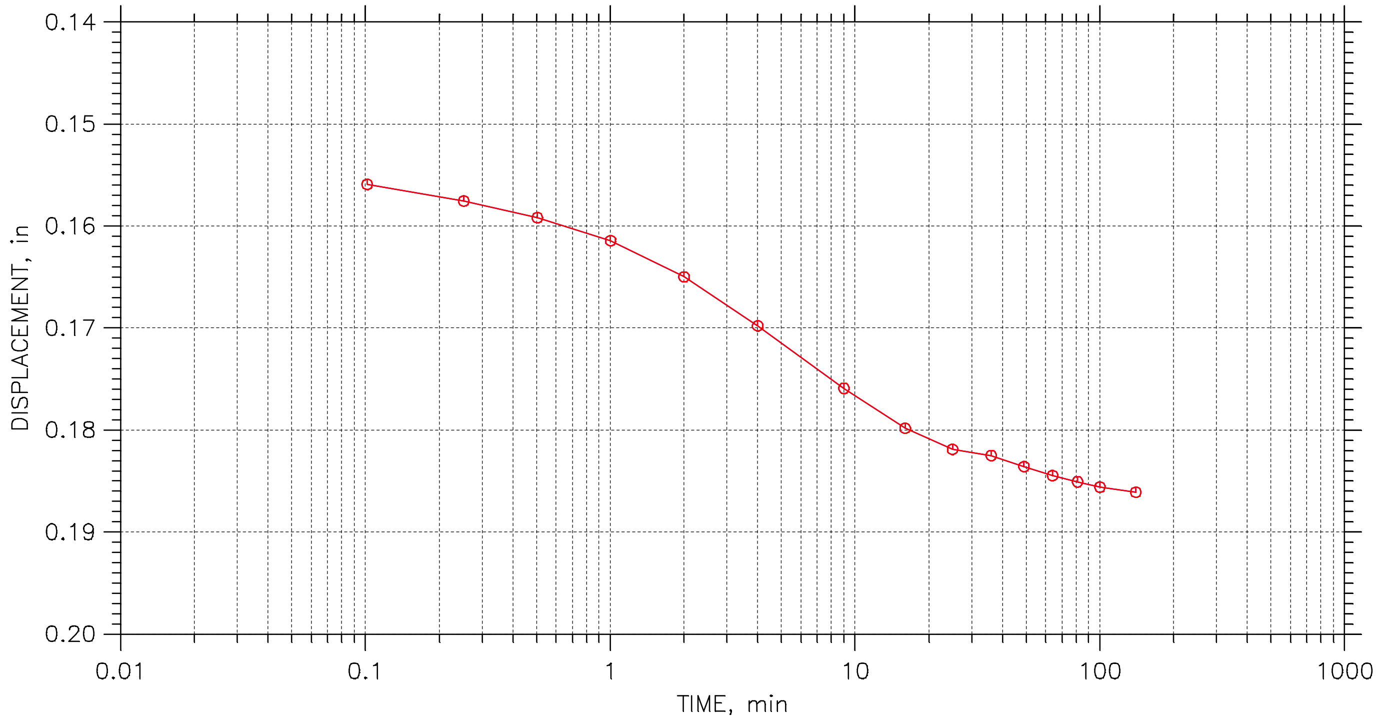
Mon, 16-NOV-2015 18:55:03

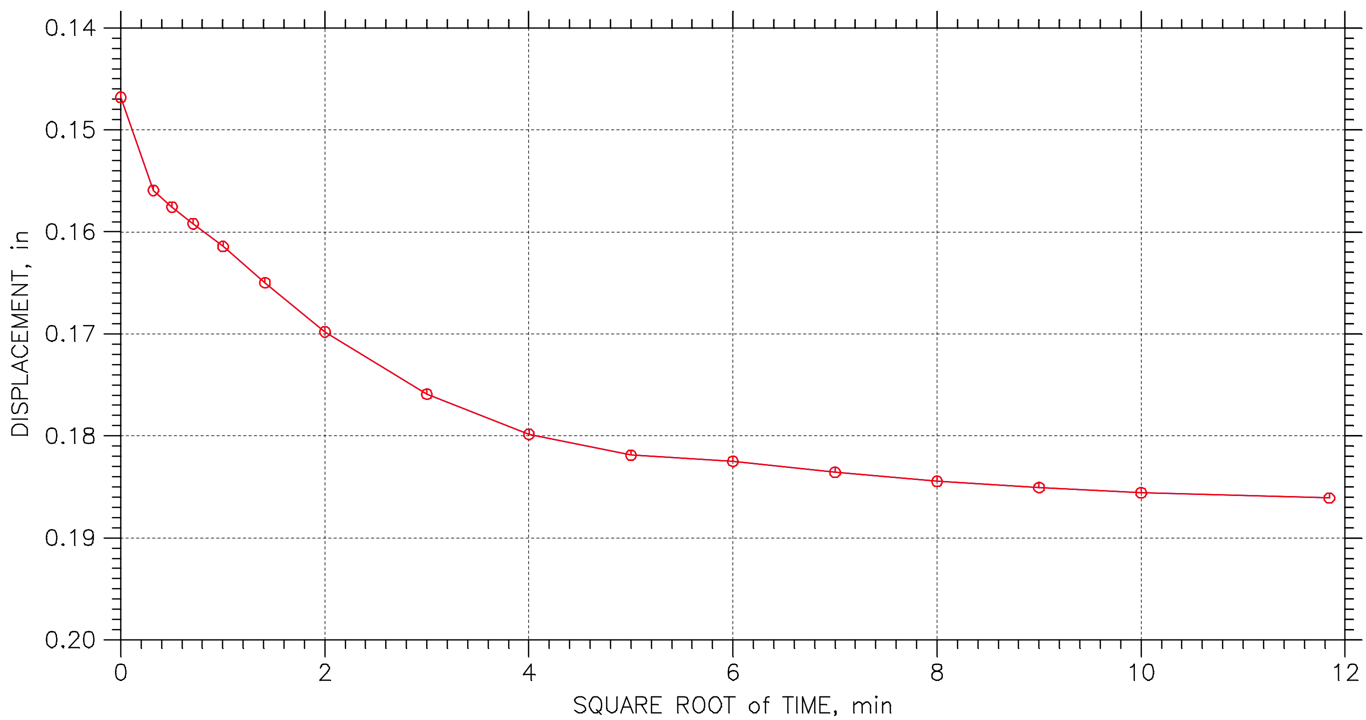
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 17 of 23

Stress: 16. tsf





Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0'' ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

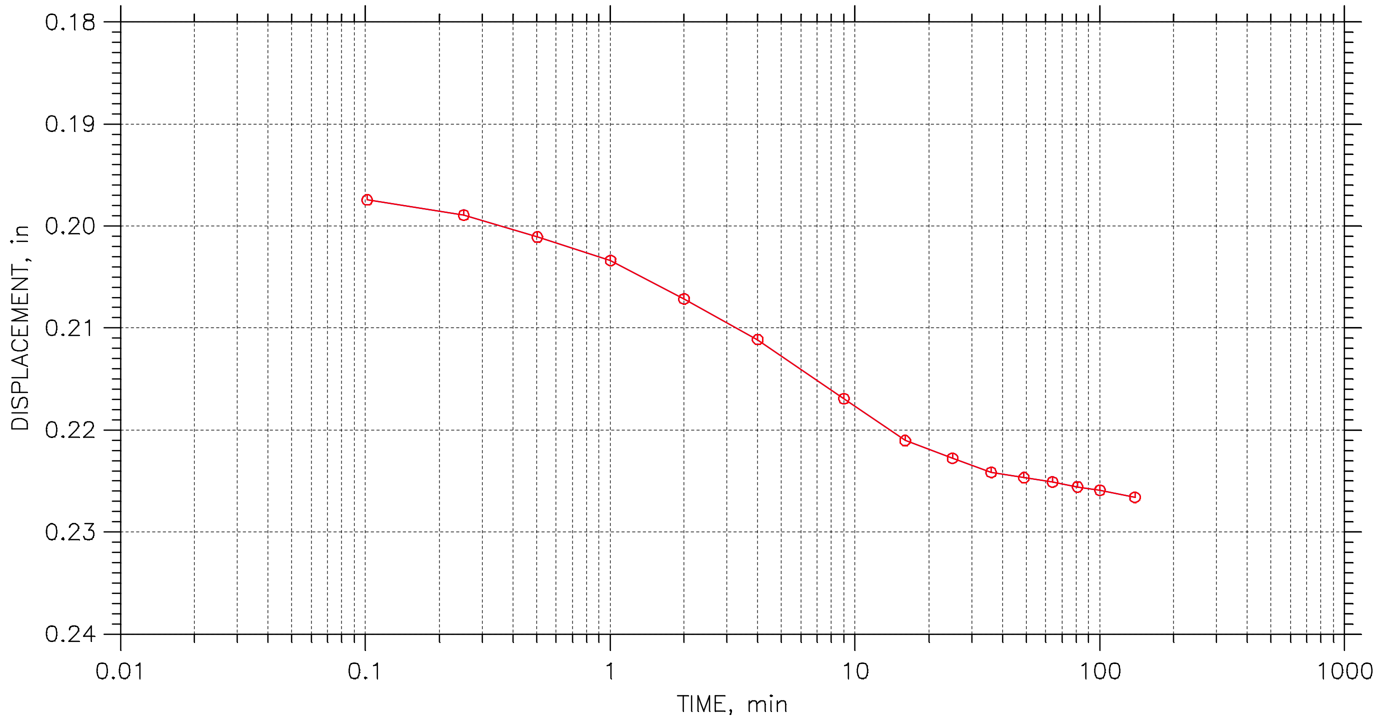
Mon, 16-NOV-2015 18:55:04

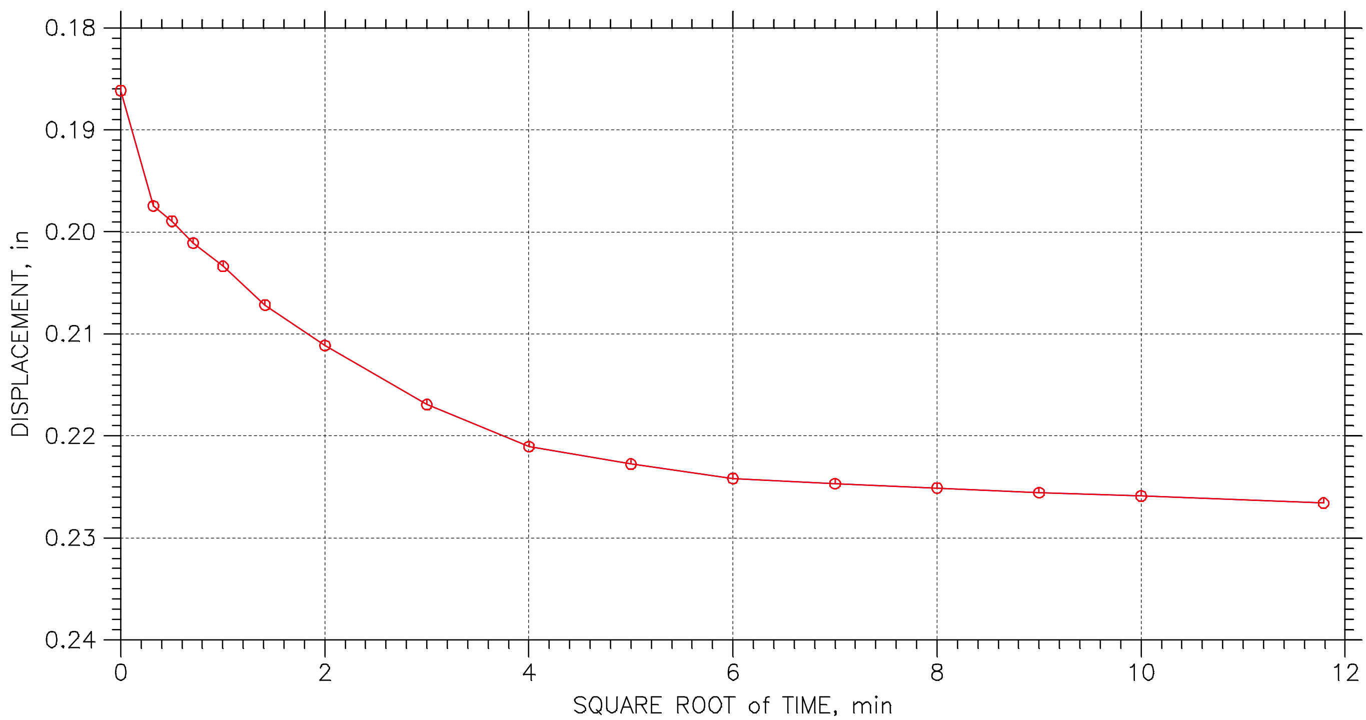
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 18 of 23

Stress: 32. tsf





Terracon Consulting Engineers & Scientists			
	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0'' ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

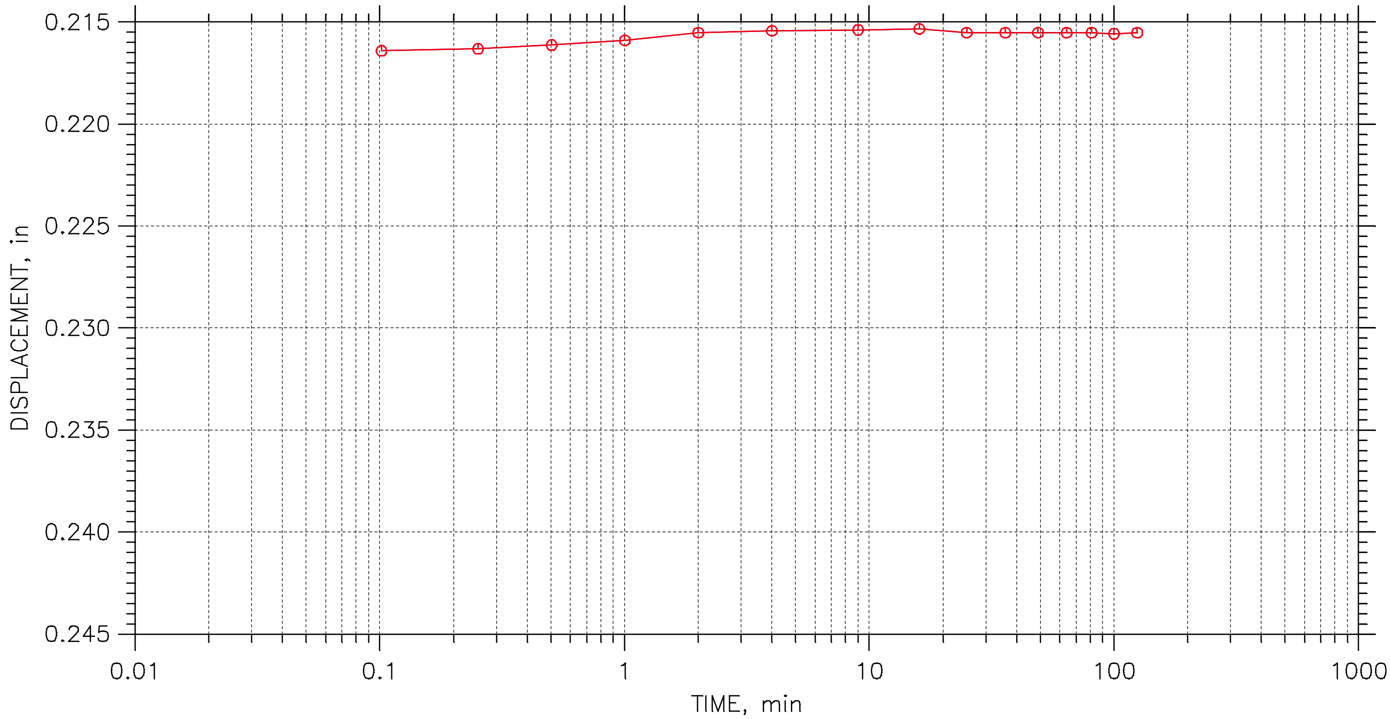
Mon, 16-NOV-2015 18:55:06

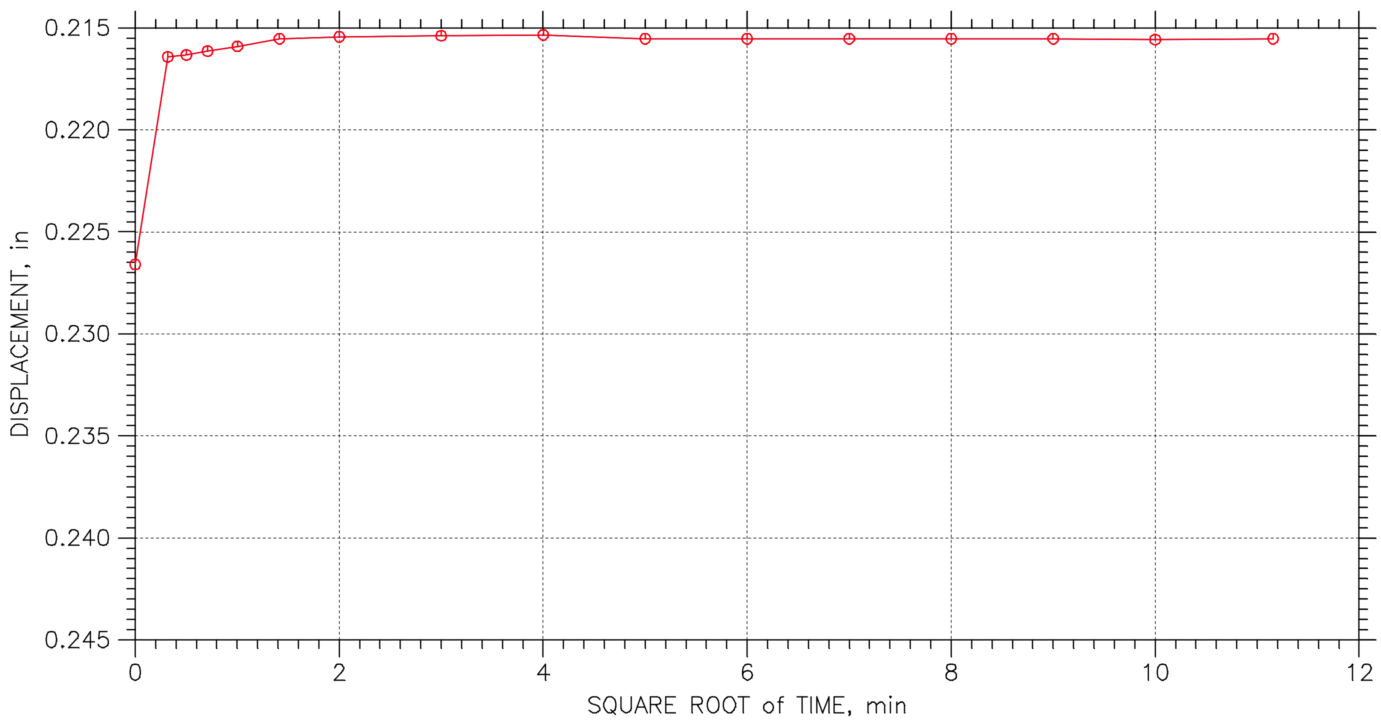
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 19 of 23

Stress: 16. tsf





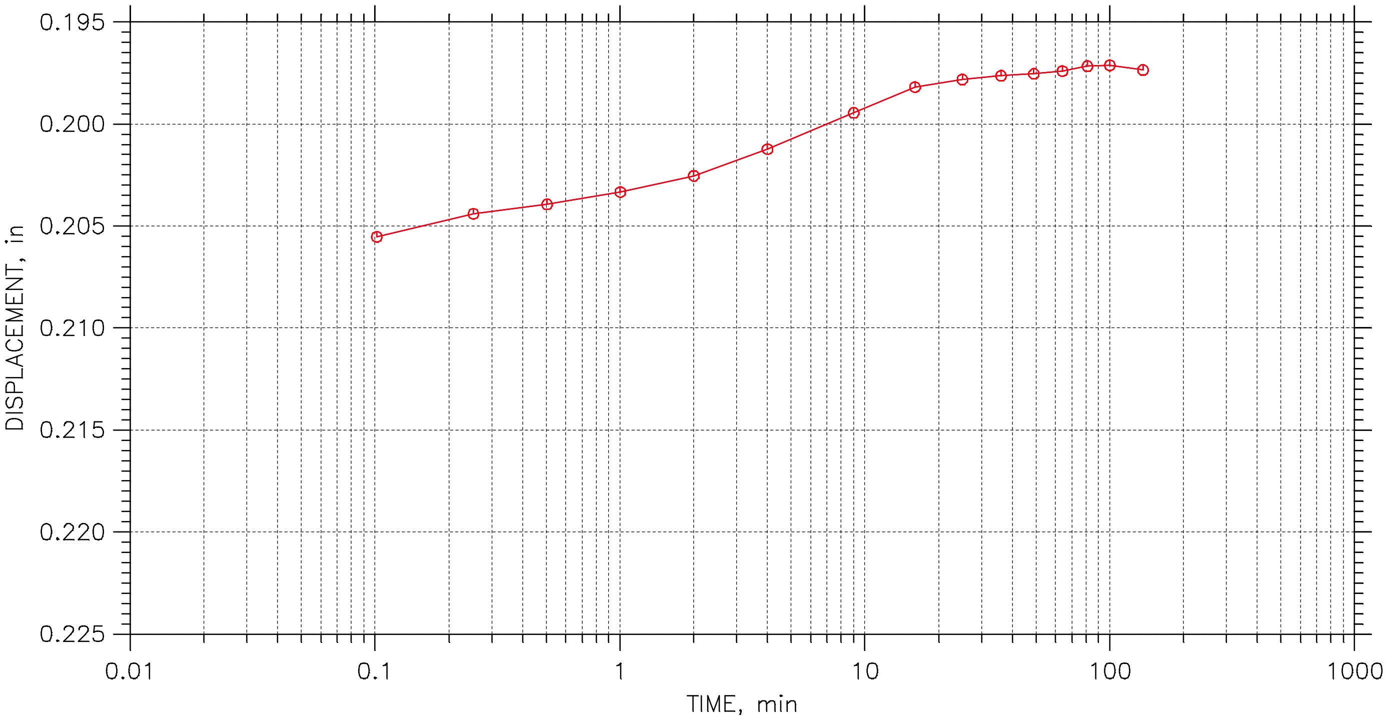
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0'' ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

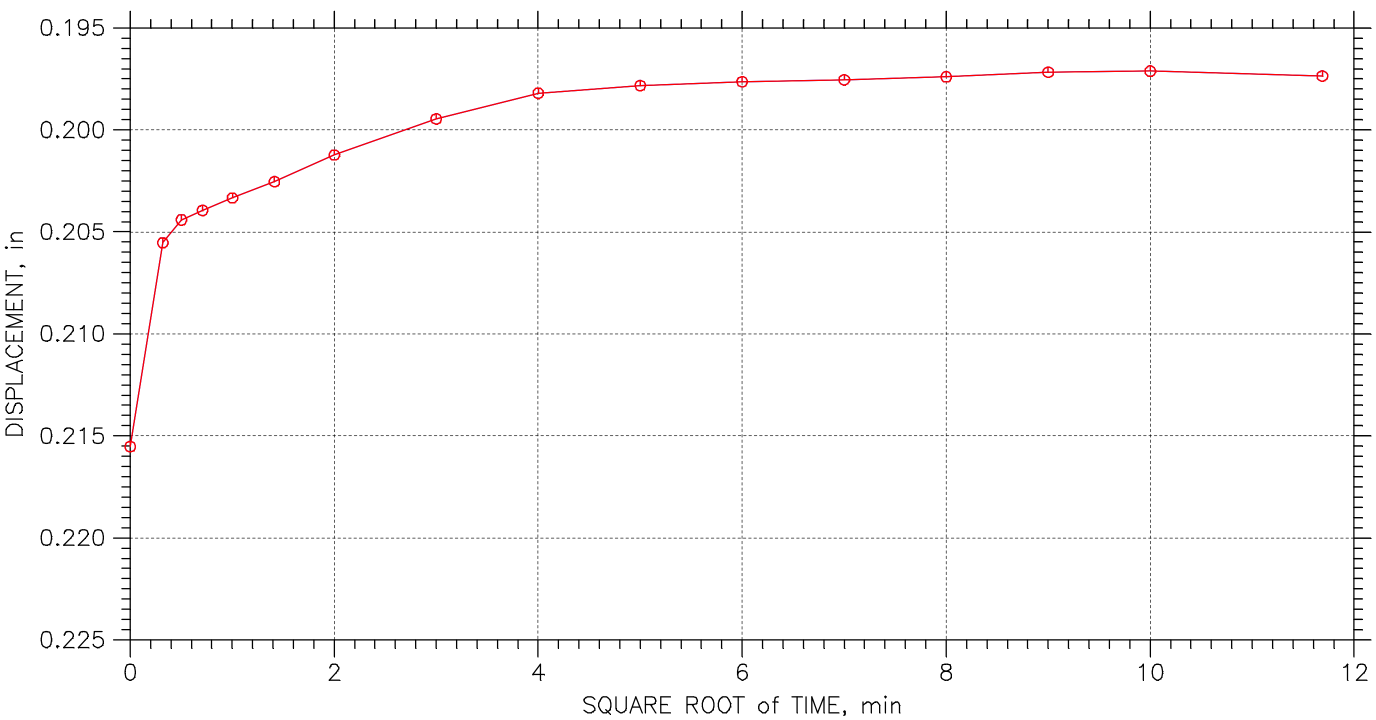
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 20 of 23

Stress: 4. tsf





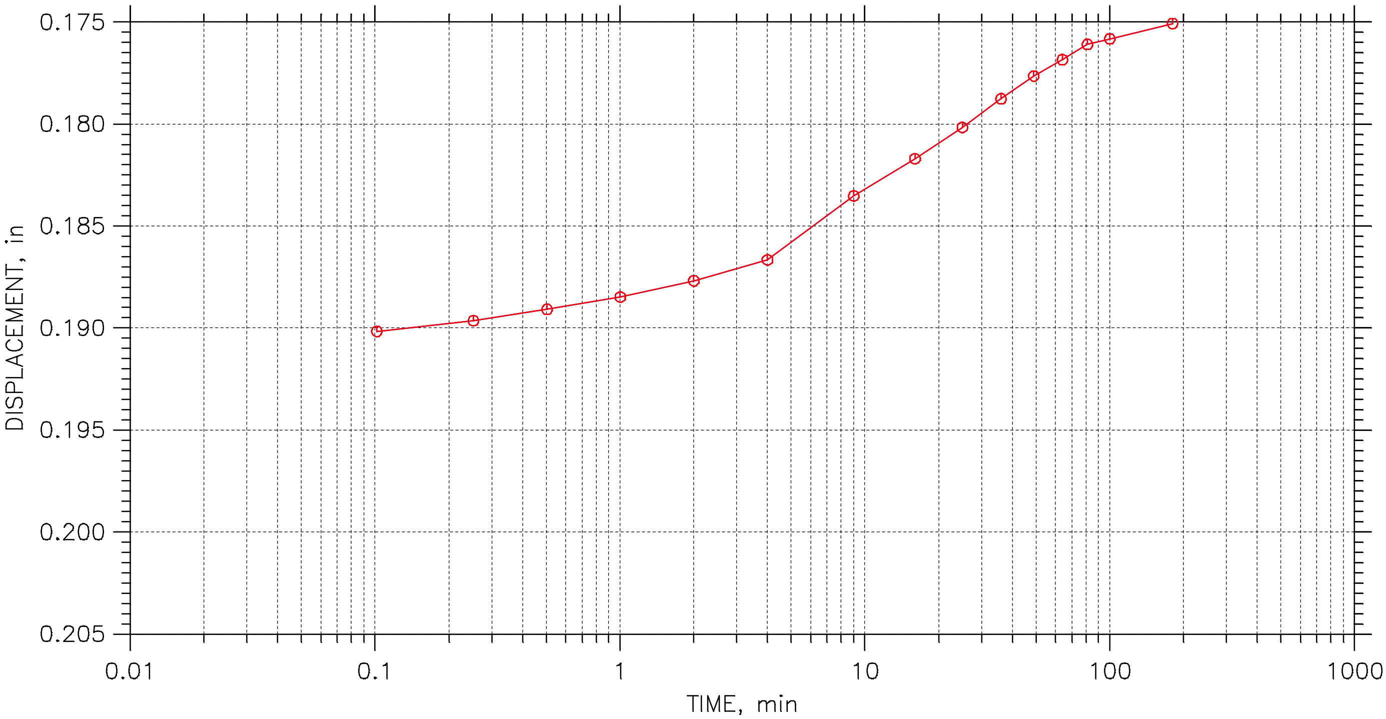
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0'' ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

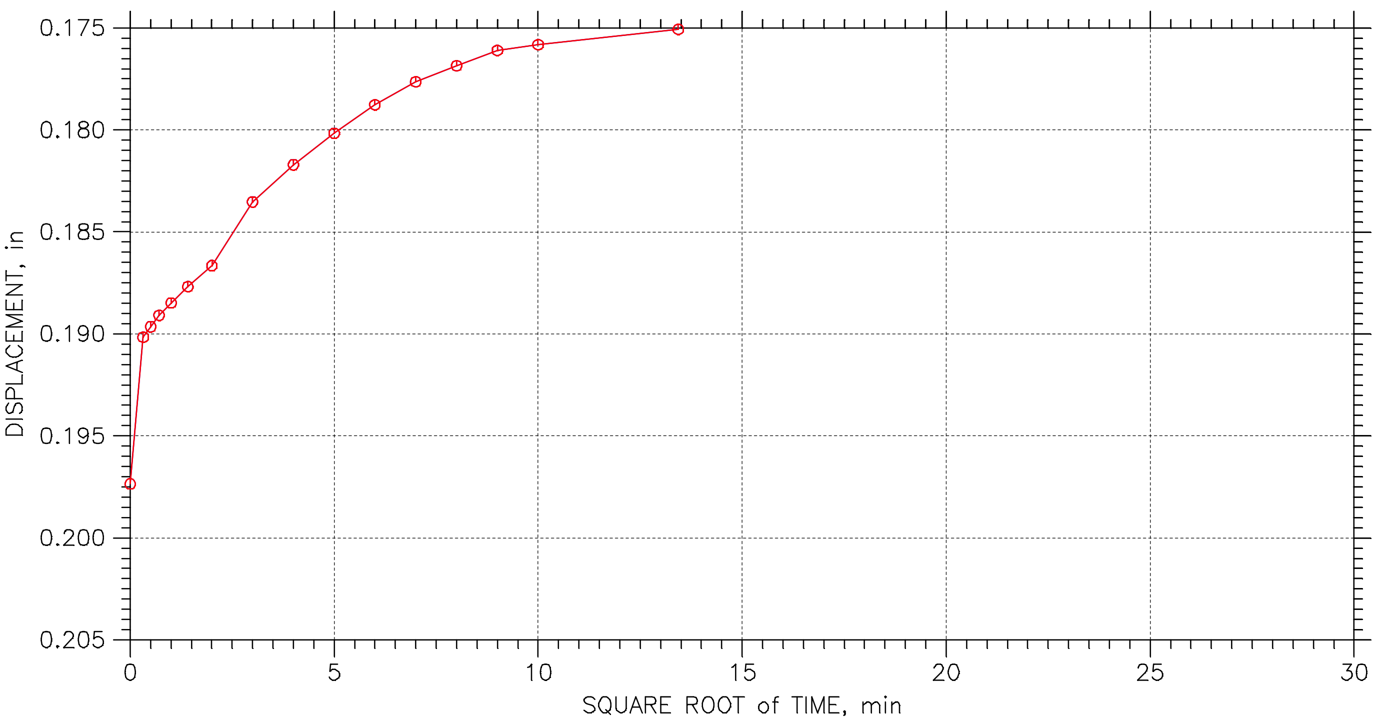
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 21 of 23

Stress: 1. tsf





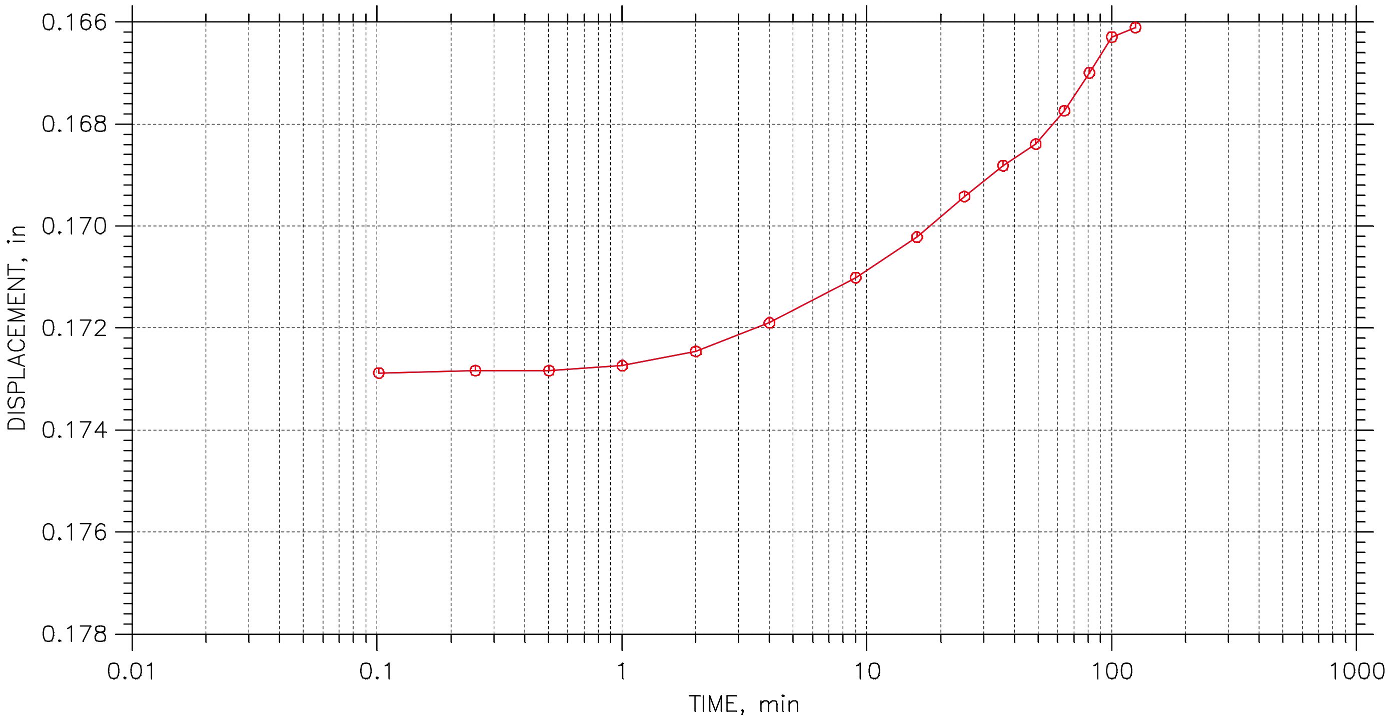
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0'' ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

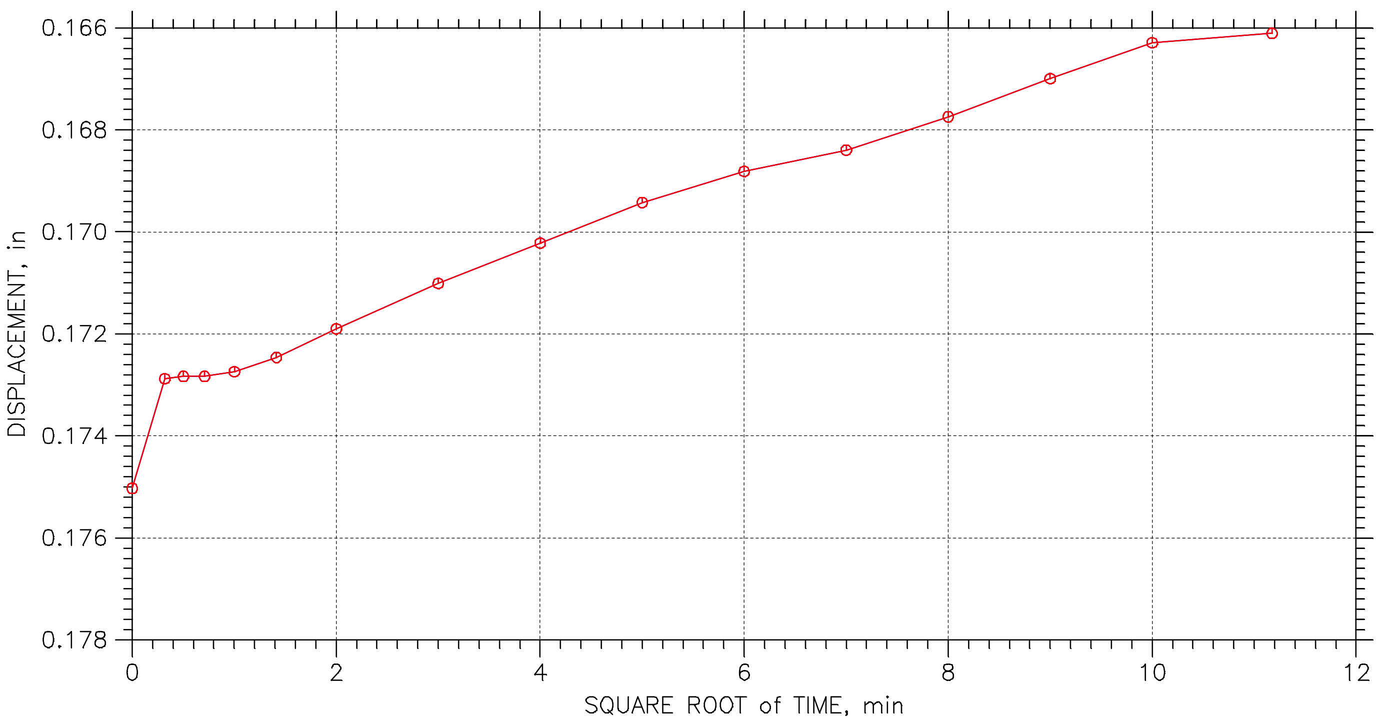
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 22 of 23

Stress: 0.5 tsf





Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0'' ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

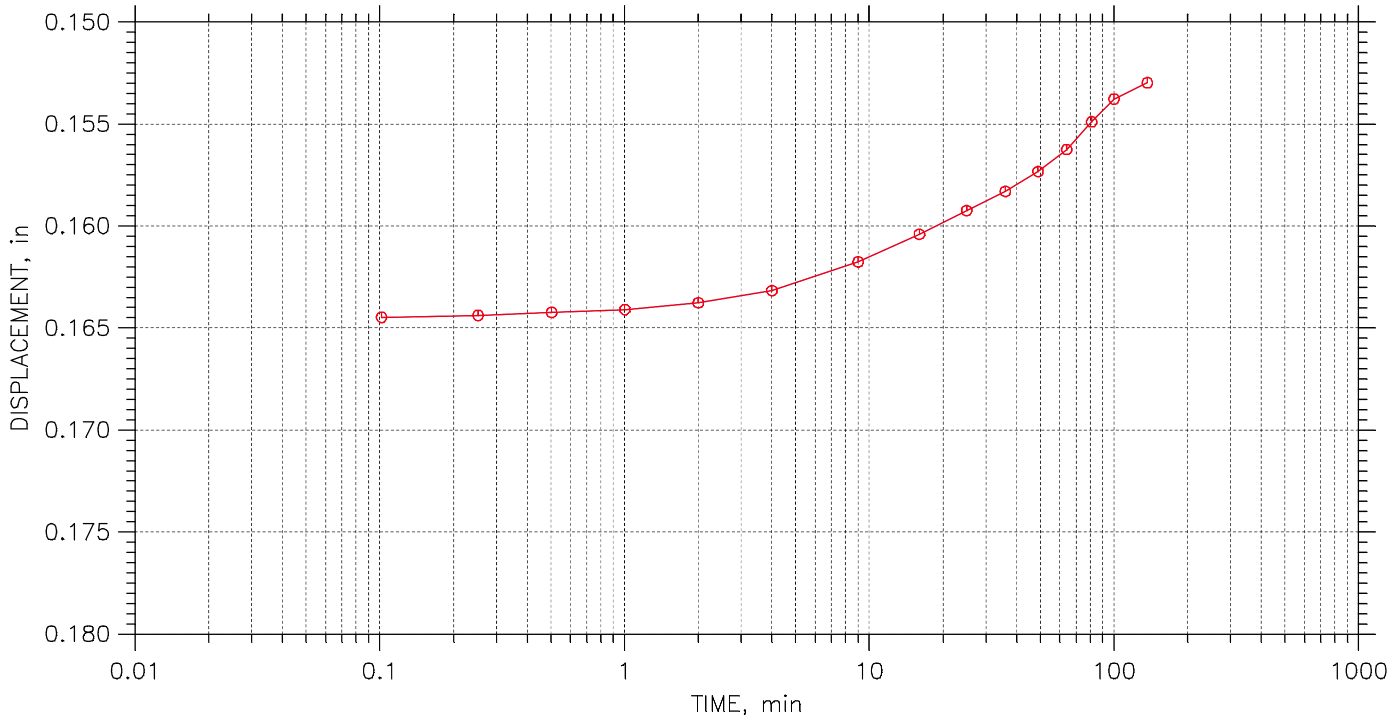
Mon, 16-NOV-2015 18:55:12

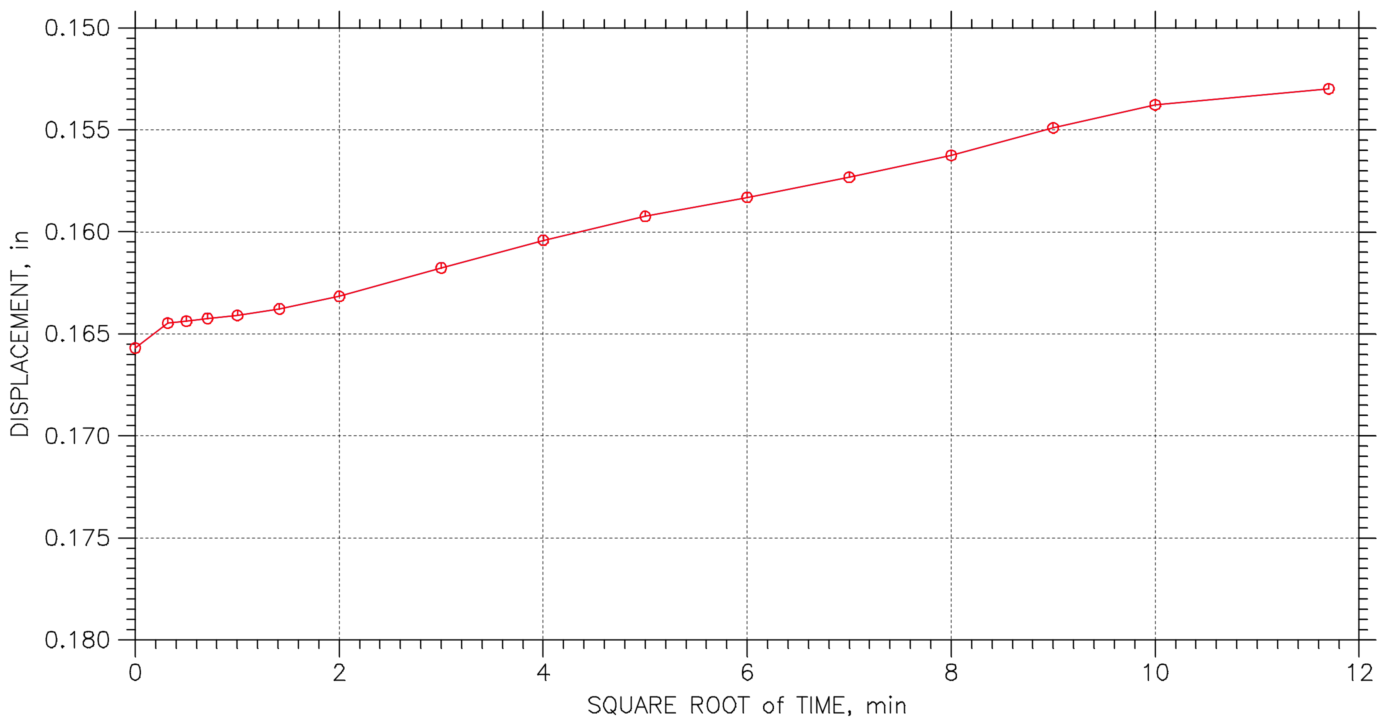
CONSOLIDATION TEST DATA

TIME CURVES

Constant Load Step: 23 of 23

Stress: 0.125 tsf



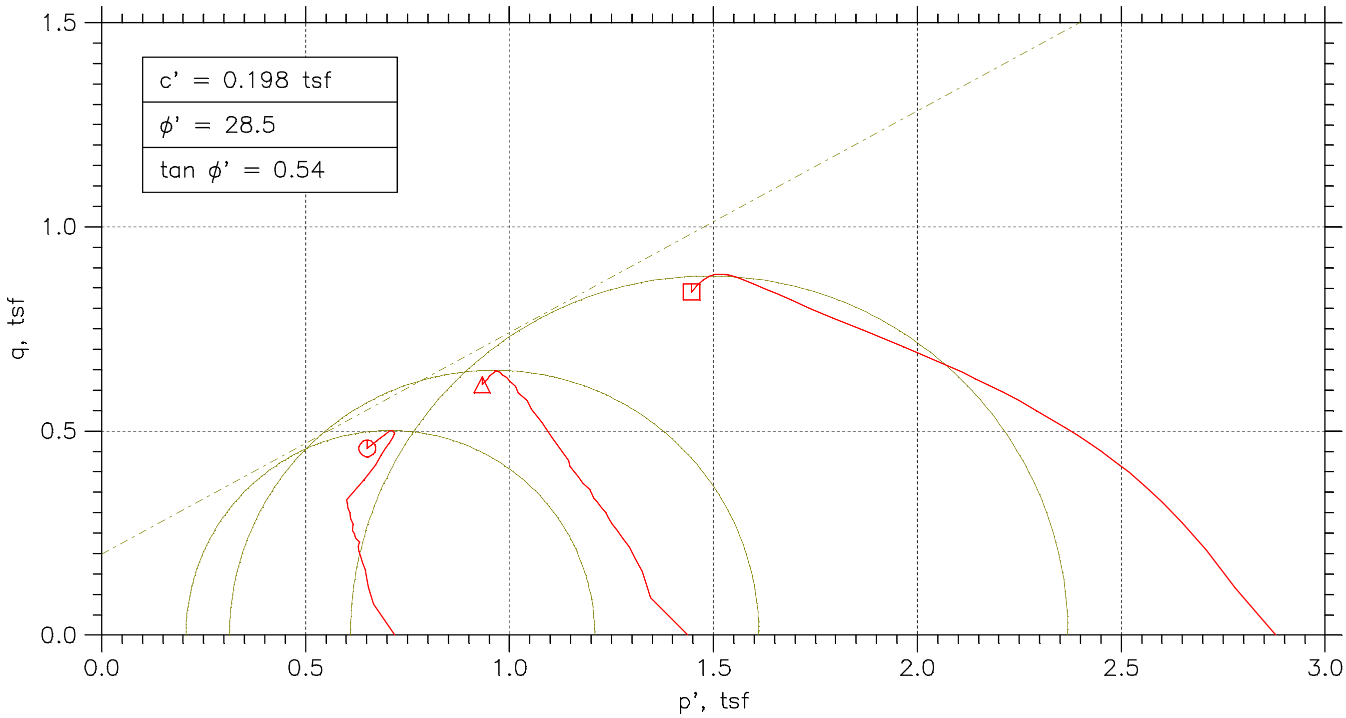


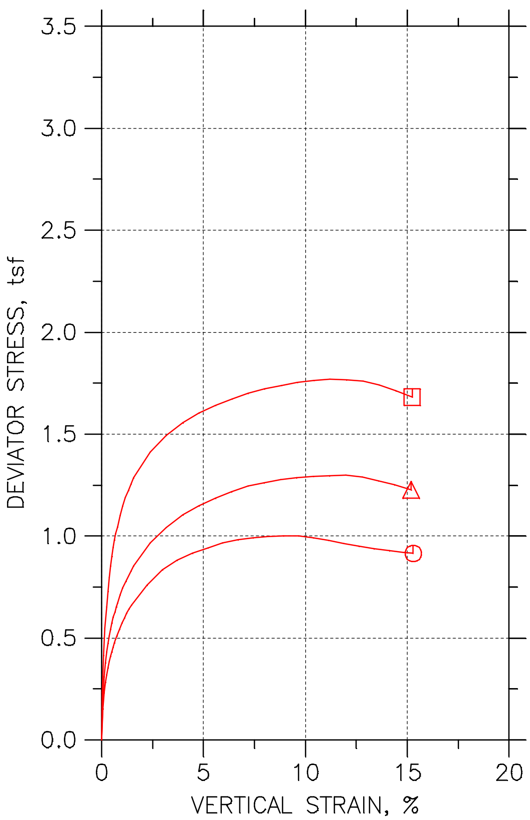
Terracon Consulting Engineers & Scientists	Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
	Boring No.: EDW-B008 S5	Tested By: HP	Checked By: BCM
	Sample No.: S-5	Test Date: 10/26/15	Depth: 11.0'-13.0'
	Test No.: EDWB008S5	Sample Type: 3.0" ST	Elevation: -----
	Description: BROWN AND GRAY FAT CLAY WITH SAND CH		
	Remarks: Pc = 0.93 tsf Cc = 0.292 Ccr = 0.037 TEST PERFORMED AS PER ASTM D2435		

Mon, 16-NOV-2015 18:55:14

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

Terracon
Consulting Engineers & Scientists





Symbol		○	△	□	
Test No.		10.0 PSI	20.0 PSI	40.0 PSI	
Initial	Diameter, in	2.8213	2.8323	2.8173	
	Height, in	6.3035	6.2161	6.1913	
	Water Content, %	75.11	79.41	77.79	
	Dry Density, pcf	54.95	52.86	53.58	
	Saturation, %	99.96	99.73	99.68	
	Void Ratio	1.9536	2.0704	2.0291	
Before Shear	Water Content, %	68.95	65.19	53.75	
	Dry Density, pcf	58.12	60.23	67.7	
	Saturation, %	100.00	100.00	100.00	
	Void Ratio	1.7926	1.6948	1.3974	
	Back Press., tsf	5.0417	5.0434	5.0421	
Minor Prin. Stress, tsf		0.71831	1.4366	2.8779	
Max. Dev. Stress, tsf		1.0023	1.2984	1.7688	
Time to Failure, min		780	900	840	
Strain Rate, %/min		0.02	0.02	0.02	
B-Value		0.96	0.99	0.95	
Estimated Specific Gravity		2.60	2.60	2.60	
Liquid Limit		72	72	72	
Plastic Limit		37	37	37	
Plasticity Index		35	35	35	

Failure Sketch

Project: DYNEGY EDWARDS	
Location: BARTONVILLE, IL	
Project No.: MR155218	
Boring No.: EDW006 S9	
Sample Type: 3.0'' ST	
Description: DARK GRAY ORGANIC SILT OH SHELL NOTED	
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.	

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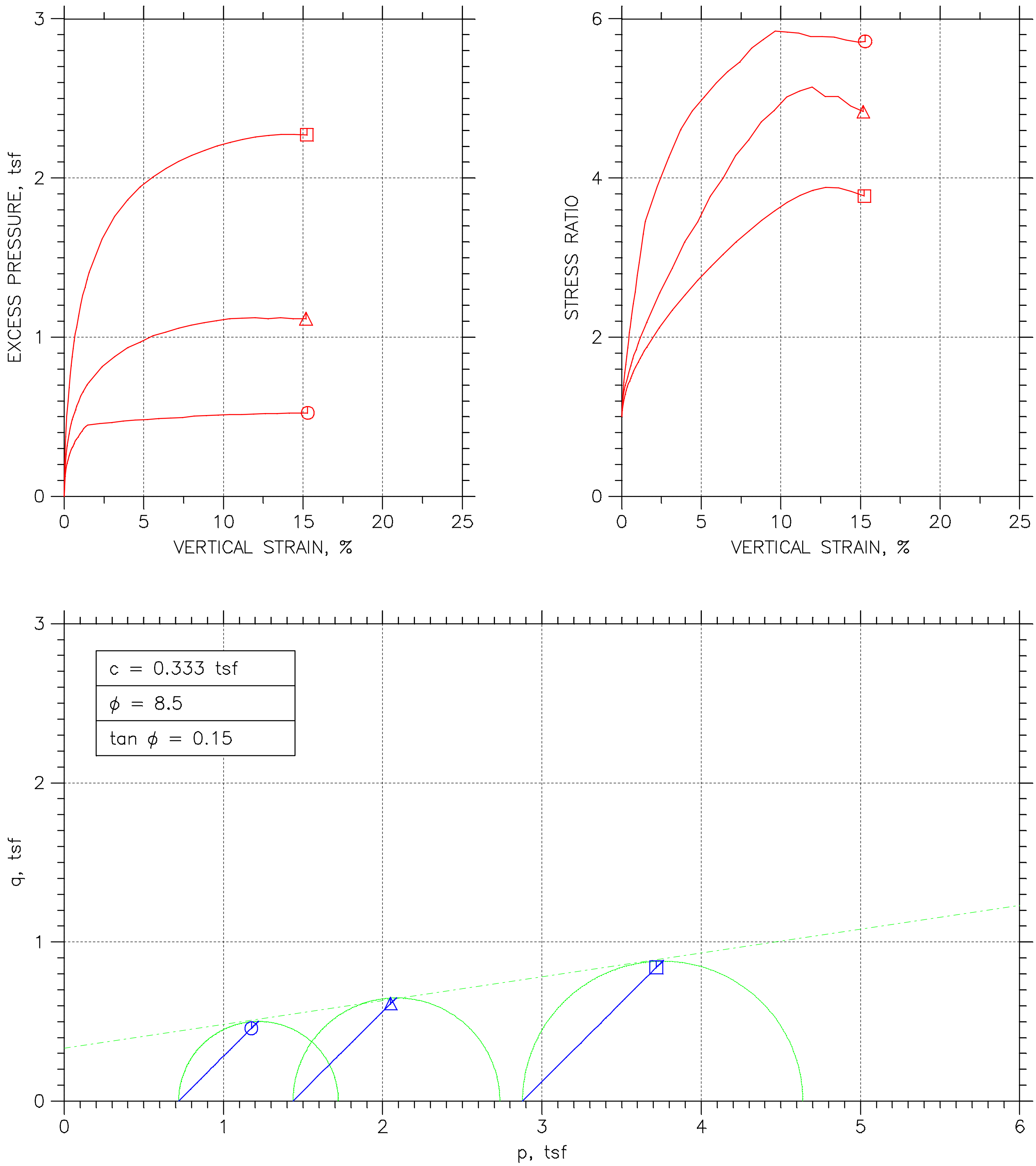
CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

Terracon
Consulting Engineers & Scientists



Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
Boring No.: EDW006 S9	Tested By: BCM	Checked By: WPQ
Sample No.: S-9	Test Date: 10/29/15	Depth: 26.0'-28.0'
Test No.: EDW006 S9	Sample Type: 3.0" ST	Elevation: ----
Description: DARK GRAY ORGANIC SILT OH SHELL NOTED		
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.		

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TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW006 S9
Sample No.: S-9
Test No.: 10.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 26.0'-28.0'
Elevation: ----

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Soil Description: DARK GRAY ORGANIC SILT OH SHELL NOTED
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.30 in
Specimen Area: 6.25 in^2
Specimen Volume: 39.41 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 72

Plastic Limit: 37

Estimated Specific Gravity: 2.60

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.2514	0	0	5.0417	5.76	5.76
2	5.0001	0.062925	6.2553	13.244	0.15244	5.17	5.76	5.9124
3	10	0.12448	6.2592	20.256	0.233	5.2217	5.76	5.993
4	15	0.18877	6.2632	24.54	0.28211	5.2513	5.76	6.0421
5	20	0.2517	6.2672	27.823	0.31965	5.2728	5.76	6.0796
6	25	0.31326	6.271	30.773	0.35331	5.2966	5.76	6.1133
7	30	0.37618	6.275	33.555	0.38502	5.3169	5.76	6.145
8	35	0.43911	6.279	35.892	0.41157	5.3355	5.76	6.1716
9	40	0.4993	6.2828	37.896	0.43428	5.3483	5.76	6.1943
10	45	0.56085	6.2866	39.843	0.45632	5.3564	5.76	6.2163
11	50	0.62241	6.2905	41.568	0.47578	5.375	5.76	6.2358
12	55	0.68534	6.2945	43.405	0.49649	5.3878	5.76	6.2565
13	60	0.74689	6.2984	44.74	0.51144	5.4	5.76	6.2714
14	70	0.87137	6.3063	47.578	0.5432	5.4145	5.76	6.3032
15	80.001	0.99586	6.3143	50.305	0.57361	5.4371	5.76	6.3336
16	90.001	1.119	6.3221	52.698	0.60015	5.4511	5.76	6.3602
17	100	1.2393	6.3298	54.645	0.62158	5.4662	5.76	6.3816
18	110	1.3625	6.3377	56.704	0.64419	5.4795	5.76	6.4042
19	120	1.4856	6.3457	58.429	0.66296	5.49	5.76	6.423
20	180	2.2256	6.3937	67.5	0.76012	5.4975	5.76	6.5201
21	240	2.9766	6.4432	74.567	0.83326	5.5045	5.76	6.5933
22	300	3.7112	6.4923	79.52	0.88187	5.5155	5.76	6.6419
23	360	4.4485	6.5424	83.304	0.91676	5.5214	5.76	6.6768
24	420	5.2009	6.5943	86.308	0.94235	5.5254	5.76	6.7024
25	480	5.9368	6.6459	89.202	0.96639	5.5295	5.76	6.7264
26	540	6.6769	6.6986	91.372	0.98211	5.5335	5.76	6.7421
27	600	7.4293	6.7531	92.93	0.99081	5.5376	5.76	6.7508
28	660	8.1638	6.8071	94.322	0.99766	5.5446	5.76	6.7577
29	720	8.9039	6.8624	95.435	1.0013	5.5486	5.76	6.7613
30	780	9.6562	6.9196	96.325	1.0023	5.5533	5.76	6.7623
31	840	10.394	6.9765	96.047	0.99124	5.555	5.76	6.7512
32	900	11.131	7.0344	95.768	0.98023	5.5568	5.76	6.7402
33	960	11.883	7.0944	94.878	0.9629	5.5585	5.76	6.7229
34	1020	12.607	7.1532	94.489	0.95107	5.5608	5.76	6.7111
35	1080	13.351	7.2146	94.043	0.93853	5.5632	5.76	6.6985
36	1140	14.11	7.2784	93.876	0.92866	5.5637	5.76	6.6887
37	1200	14.841	7.3408	93.71	0.91912	5.5649	5.76	6.6791
38	1236.6	15.291	7.3798	93.765	0.91481	5.5661	5.76	6.6748

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW006 S9
Sample No.: S-9
Test No.: 10.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 26.0'-28.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: DARK GRAY ORGANIC SILT OH SHELL NOTED
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.30 in
Specimen Area: 6.25 in^2
Specimen Volume: 39.41 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 72

Plastic Limit: 37

Estimated Specific Gravity: 2.60

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	5.76	5.76	0	0.000	0.71831	0.71831	1.000	0.71831	0
2	0.06	5.9124	5.76	0.12834	0.842	0.74242	0.58998	1.258	0.6662	0.07622
3	0.12	5.993	5.76	0.18002	0.773	0.77129	0.53829	1.433	0.65479	0.1165
4	0.19	6.0421	5.76	0.20963	0.743	0.79079	0.50868	1.555	0.64973	0.14105
5	0.25	6.0796	5.76	0.23112	0.723	0.80684	0.48719	1.656	0.64702	0.15982
6	0.31	6.1133	5.76	0.25493	0.722	0.8167	0.46338	1.762	0.64004	0.17666
7	0.38	6.145	5.76	0.27525	0.715	0.82807	0.44306	1.869	0.63556	0.19251
8	0.44	6.1716	5.76	0.29384	0.714	0.83605	0.42447	1.970	0.63026	0.20579
9	0.50	6.1943	5.76	0.30661	0.706	0.84598	0.4117	2.055	0.62884	0.21714
10	0.56	6.2163	5.76	0.31474	0.690	0.85989	0.40357	2.131	0.63173	0.22816
11	0.62	6.2358	5.76	0.33333	0.701	0.86077	0.38499	2.236	0.62288	0.23789
12	0.69	6.2565	5.76	0.3461	0.697	0.8687	0.37221	2.334	0.62045	0.24824
13	0.75	6.2714	5.76	0.3583	0.701	0.87146	0.36002	2.421	0.61574	0.25572
14	0.87	6.3032	5.76	0.37281	0.686	0.8887	0.3455	2.572	0.6171	0.2716
15	1.00	6.3336	5.76	0.39546	0.689	0.89647	0.32285	2.777	0.60966	0.28681
16	1.12	6.3602	5.76	0.4094	0.682	0.90907	0.30891	2.943	0.60899	0.30008
17	1.24	6.3816	5.76	0.4245	0.683	0.91539	0.29382	3.116	0.6046	0.31079
18	1.36	6.4042	5.76	0.43785	0.680	0.92465	0.28046	3.297	0.60255	0.3221
19	1.49	6.423	5.76	0.4483	0.676	0.93297	0.27001	3.455	0.60149	0.33148
20	2.23	6.5201	5.76	0.45585	0.600	1.0226	0.26246	3.896	0.64252	0.38006
21	2.98	6.5933	5.76	0.46282	0.555	1.0887	0.25549	4.261	0.67212	0.41663
22	3.71	6.6419	5.76	0.47386	0.537	1.1263	0.24446	4.608	0.68539	0.44094
23	4.45	6.6768	5.76	0.47966	0.523	1.1554	0.23865	4.841	0.69703	0.45838
24	5.20	6.7024	5.76	0.48373	0.513	1.1769	0.23458	5.017	0.70576	0.47118
25	5.94	6.7264	5.76	0.48779	0.505	1.1969	0.23052	5.192	0.71371	0.48319
26	6.68	6.7421	5.76	0.49186	0.501	1.2086	0.22645	5.337	0.71751	0.49106
27	7.43	6.7508	5.76	0.49592	0.501	1.2132	0.22239	5.455	0.71779	0.4954
28	8.16	6.7577	5.76	0.50289	0.504	1.2131	0.21542	5.631	0.71425	0.49883
29	8.90	6.7613	5.76	0.50696	0.506	1.2127	0.21136	5.738	0.712	0.50065
30	9.66	6.7623	5.76	0.5116	0.510	1.209	0.20671	5.849	0.70785	0.50114
31	10.39	6.7512	5.76	0.51334	0.518	1.1962	0.20497	5.836	0.70059	0.49562
32	11.13	6.7402	5.76	0.51509	0.525	1.1835	0.20323	5.823	0.69334	0.49012
33	11.88	6.7229	5.76	0.51683	0.537	1.1644	0.20148	5.779	0.68293	0.48145
34	12.61	6.7111	5.76	0.51915	0.546	1.1502	0.19916	5.775	0.6747	0.47554
35	13.35	6.6985	5.76	0.52147	0.556	1.1354	0.19684	5.768	0.6661	0.46927
36	14.11	6.6887	5.76	0.52205	0.562	1.1249	0.19626	5.732	0.66058	0.46433
37	14.84	6.6791	5.76	0.52322	0.569	1.1142	0.1951	5.711	0.65466	0.45956
38	15.29	6.6748	5.76	0.52438	0.573	1.1087	0.19393	5.717	0.65134	0.4574

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW006 S9
Sample No.: S-9
Test No.: 20.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 26.0'-28.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: DARK GRAY ORGANIC SILT OH SHELL NOTED
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.22 in
Specimen Area: 6.30 in^2
Specimen Volume: 39.16 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 72

Plastic Limit: 37

Estimated Specific Gravity: 2.60

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.3003	0	0	5.0434	6.48	6.48
2	5.0002	0.053874	6.3037	16.056	0.18339	5.2253	6.48	6.6634
3	10	0.11698	6.3077	27.272	0.3113	5.3105	6.48	6.7913
4	15	0.18163	6.3118	33.307	0.37994	5.363	6.48	6.8599
5	20	0.24782	6.316	37.862	0.43162	5.4014	6.48	6.9116
6	25	0.31247	6.3201	41.506	0.47285	5.4382	6.48	6.9528
7	30	0.3802	6.3244	44.922	0.51142	5.4714	6.48	6.9914
8	35	0.44639	6.3286	47.826	0.54411	5.5006	6.48	7.0241
9	40	0.51412	6.3329	50.502	0.57417	5.5245	6.48	7.0542
10	45	0.57876	6.337	52.95	0.60161	5.5449	6.48	7.0816
11	50	0.64649	6.3413	55.228	0.62706	5.5682	6.48	7.1071
12	55	0.71268	6.3456	57.391	0.65119	5.5898	6.48	7.1312
13	60	0.77887	6.3498	59.327	0.67271	5.6102	6.48	7.1527
14	70	0.91279	6.3584	62.857	0.71177	5.6382	6.48	7.1918
15	80.001	1.0467	6.367	65.988	0.74622	5.6732	6.48	7.2262
16	90.001	1.1791	6.3755	68.778	0.77673	5.7	6.48	7.2567
17	110	1.4485	6.3929	73.504	0.82783	5.7449	6.48	7.3078
18	120	1.5824	6.4016	75.895	0.8536	5.7619	6.48	7.3336
19	180	2.3828	6.4541	86.713	0.96734	5.8598	6.48	7.4473
20	240	3.1817	6.5074	94.171	1.0419	5.9216	6.48	7.5219
21	300	3.9805	6.5615	100.66	1.1046	5.9782	6.48	7.5846
22	360	4.7763	6.6164	105.5	1.1481	6.0115	6.48	7.6281
23	420	5.5721	6.6721	109.89	1.1858	6.0517	6.48	7.6658
24	480	6.371	6.729	113.87	1.2184	6.0739	6.48	7.6984
25	540	7.1745	6.7873	117.29	1.2442	6.1013	6.48	7.7242
26	600	7.978	6.8465	119.96	1.2616	6.1176	6.48	7.7416
27	660	8.7738	6.9063	122.35	1.2756	6.1357	6.48	7.7556
28	720	9.5758	6.9675	124.58	1.2873	6.1456	6.48	7.7673
29	780	10.378	7.0299	126.17	1.2922	6.1584	6.48	7.7722
30	840	11.177	7.0931	127.76	1.2969	6.1631	6.48	7.7769
31	900	11.976	7.1575	129.07	1.2984	6.1666	6.48	7.7784
32	960	12.787	7.224	129.36	1.2893	6.1596	6.48	7.7693
33	1020	13.584	7.2907	128.62	1.2702	6.1643	6.48	7.7502
34	1080	14.381	7.3586	127.93	1.2518	6.1596	6.48	7.7318
35	1140	15.18	7.4279	126.51	1.2263	6.1602	6.48	7.7063

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW006 S9
Sample No.: S-9
Test No.: 20.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 26.0'-28.0'
Elevation: ----

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Soil Description: DARK GRAY ORGANIC SILT OH SHELL NOTED
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.22 in
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Correction Type: Uniform

Liquid Limit: 72

Plastic Limit: 37

Estimated Specific Gravity: 2.60

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	6.48	6.48	0	0.000	1.4366	1.4366	1.000	1.4366	0
2	0.05	6.6634	6.48	0.18195	0.992	1.4381	1.2547	1.146	1.3464	0.091693
3	0.12	6.7913	6.48	0.2671	0.858	1.4808	1.1695	1.266	1.3252	0.15565
4	0.18	6.8599	6.48	0.31958	0.841	1.497	1.117	1.340	1.307	0.18997
5	0.25	6.9116	6.48	0.35807	0.830	1.5102	1.0786	1.400	1.2944	0.21581
6	0.31	6.9528	6.48	0.39482	0.835	1.5147	1.0418	1.454	1.2782	0.23642
7	0.38	6.9914	6.48	0.42806	0.837	1.52	1.0086	1.507	1.2643	0.25571
8	0.45	7.0241	6.48	0.45722	0.840	1.5235	0.97941	1.556	1.2515	0.27206
9	0.51	7.0542	6.48	0.48113	0.838	1.5297	0.9555	1.601	1.2426	0.28708
10	0.58	7.0816	6.48	0.50154	0.834	1.5367	0.93509	1.643	1.2359	0.30081
11	0.65	7.1071	6.48	0.52487	0.837	1.5388	0.91176	1.688	1.2253	0.31353
12	0.71	7.1312	6.48	0.54644	0.839	1.5414	0.89018	1.732	1.2158	0.32559
13	0.78	7.1527	6.48	0.56685	0.843	1.5425	0.86977	1.773	1.2061	0.33635
14	0.91	7.1918	6.48	0.59485	0.836	1.5535	0.84178	1.846	1.1977	0.35589
15	1.05	7.2262	6.48	0.62984	0.844	1.553	0.80679	1.925	1.1799	0.37311
16	1.18	7.2567	6.48	0.65666	0.845	1.5567	0.77996	1.996	1.1683	0.38836
17	1.45	7.3078	6.48	0.70157	0.847	1.5629	0.73506	2.126	1.149	0.41392
18	1.58	7.3336	6.48	0.71848	0.842	1.5717	0.71814	2.189	1.1449	0.4268
19	2.38	7.4473	6.48	0.81646	0.844	1.5875	0.62017	2.560	1.1038	0.48367
20	3.18	7.5219	6.48	0.87827	0.843	1.6003	0.55835	2.866	1.0793	0.52097
21	3.98	7.5846	6.48	0.93484	0.846	1.6064	0.50178	3.201	1.0541	0.55229
22	4.78	7.6281	6.48	0.96809	0.843	1.6166	0.46854	3.450	1.0426	0.57404
23	5.57	7.6658	6.48	1.0083	0.850	1.6141	0.4283	3.769	1.0212	0.5929
24	6.37	7.6984	6.48	1.0305	0.846	1.6246	0.40614	4.000	1.0153	0.6092
25	7.17	7.7242	6.48	1.0579	0.850	1.6229	0.37873	4.285	1.0008	0.6221
26	7.98	7.7416	6.48	1.0742	0.852	1.624	0.3624	4.481	0.99318	0.63078
27	8.77	7.7556	6.48	1.0923	0.856	1.6199	0.34432	4.705	0.98212	0.63779
28	9.58	7.7673	6.48	1.1022	0.856	1.6217	0.33441	4.850	0.97807	0.64366
29	10.38	7.7722	6.48	1.115	0.863	1.6138	0.32158	5.018	0.96769	0.64611
30	11.18	7.7769	6.48	1.1197	0.863	1.6138	0.31691	5.092	0.96536	0.64845
31	11.98	7.7784	6.48	1.1232	0.865	1.6118	0.31341	5.143	0.96261	0.6492
32	12.79	7.7693	6.48	1.1162	0.866	1.6097	0.32041	5.024	0.96505	0.64464
33	13.58	7.7502	6.48	1.1209	0.882	1.5859	0.31575	5.023	0.95083	0.63509
34	14.38	7.7318	6.48	1.1162	0.892	1.5722	0.32041	4.907	0.9463	0.62588
35	15.18	7.7063	6.48	1.1168	0.911	1.5461	0.31983	4.834	0.93298	0.61315

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-006 S9
Sample No.: S-9
Test No.: 40.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 26.0'-28.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: DARK GRAY ORGANIC SILT OH SHELL NOTED
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767.

Specimen Height: 6.19 in
Specimen Area: 6.23 in^2
Specimen Volume: 38.60 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 72

Plastic Limit: 37

Estimated Specific Gravity: 2.60

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.2339	0	0	5.0421	7.92	7.92
2	5.0041	0.048386	6.237	20.074	0.23173	5.2556	7.92	8.1517
3	10.004	0.10997	6.2408	35.922	0.41443	5.4179	7.92	8.3344
4	15	0.17448	6.2448	47.727	0.55027	5.5452	7.92	8.4703
5	20	0.239	6.2489	56.501	0.65101	5.6441	7.92	8.571
6	25	0.30498	6.253	63.345	0.72938	5.7261	7.92	8.6494
7	30	0.37096	6.2572	69.271	0.79709	5.7994	7.92	8.7171
8	35	0.43547	6.2612	74.094	0.85204	5.8628	7.92	8.772
9	40	0.50292	6.2655	78.366	0.90055	5.9192	7.92	8.8206
10	45	0.57036	6.2697	82.179	0.94372	5.971	7.92	8.8637
11	50	0.63781	6.274	85.44	0.98051	6.0187	7.92	8.9005
12	55	0.70379	6.2781	88.426	1.0141	6.0629	7.92	8.9341
13	60	0.77124	6.2824	91.274	1.0461	6.1059	7.92	8.9661
14	70	0.90613	6.291	96.097	1.0998	6.1781	7.92	9.0198
15	80	1.0381	6.2993	100.51	1.1488	6.2449	7.92	9.0688
16	90	1.173	6.3079	104.27	1.1902	6.3054	7.92	9.1102
17	100	1.3079	6.3166	107.4	1.2242	6.3572	7.92	9.1442
18	110	1.4398	6.325	110.34	1.256	6.4072	7.92	9.176
19	120	1.5747	6.3337	113.19	1.2867	6.4514	7.92	9.2067
20	180	2.3709	6.3853	125.22	1.412	6.6602	7.92	9.332
21	240	3.1832	6.4389	133.67	1.4947	6.801	7.92	9.4147
22	300	3.9838	6.4926	140.24	1.5552	6.9063	7.92	9.4752
23	360	4.7858	6.5473	145.66	1.6018	6.9854	7.92	9.5218
24	420	5.5951	6.6034	150.49	1.6408	7.0493	7.92	9.5608
25	480	6.3957	6.6599	154.71	1.6726	7.1017	7.92	9.5926
26	540	7.1948	6.7172	158.57	1.6997	7.1459	7.92	9.6197
27	600	8.0027	6.7762	162.01	1.7215	7.1825	7.92	9.6415
28	660	8.8047	6.8358	165.09	1.7389	7.2151	7.92	9.6589
29	720	9.6009	6.896	167.99	1.7539	7.2424	7.92	9.6739
30	780	10.406	6.958	170.42	1.7635	7.2651	7.92	9.6835
31	840	11.211	7.0211	172.49	1.7688	7.2843	7.92	9.6888
32	900	12.013	7.0851	173.91	1.7673	7.2989	7.92	9.6873
33	960	12.824	7.151	174.74	1.7594	7.3099	7.92	9.6794
34	1020	13.618	7.2167	174.37	1.7397	7.3151	7.92	9.6597
35	1080	14.419	7.2843	173.27	1.7126	7.3157	7.92	9.6326
36	1140	15.24	7.3548	171.71	1.6809	7.314	7.92	9.6009

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-006 S9
Sample No.: S-9
Test No.: 40.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 26.0'-28.0'
Elevation: ----

Terracon Consulting Engineers & Scientists

Soil Description: DARK GRAY ORGANIC SILT OH SHELL NOTED
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767.

Specimen Height: 6.19 in
Specimen Area: 6.23 in^2
Specimen Volume: 38.60 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 72

Plastic Limit: 37

Estimated Specific Gravity: 2.60

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	7.92	7.92	0	0.000	2.8779	2.8779	1.000	2.8779	0
2	0.05	8.1517	7.92	0.21346	0.921	2.8961	2.6644	1.087	2.7803	0.11587
3	0.11	8.3344	7.92	0.37573	0.907	2.9166	2.5021	1.166	2.7093	0.20721
4	0.17	8.4703	7.92	0.50311	0.914	2.925	2.3748	1.232	2.6499	0.27514
5	0.24	8.571	7.92	0.60199	0.925	2.9269	2.2759	1.286	2.6014	0.3255
6	0.30	8.6494	7.92	0.68399	0.938	2.9233	2.1939	1.332	2.5586	0.36469
7	0.37	8.7171	7.92	0.75728	0.950	2.9177	2.1206	1.376	2.5191	0.39854
8	0.44	8.772	7.92	0.82068	0.963	2.9092	2.0572	1.414	2.4832	0.42602
9	0.50	8.8206	7.92	0.8771	0.974	2.9013	2.0008	1.450	2.451	0.45028
10	0.57	8.8637	7.92	0.92886	0.984	2.8927	1.949	1.484	2.4209	0.47186
11	0.64	8.9005	7.92	0.97655	0.996	2.8818	1.9013	1.516	2.3916	0.49026
12	0.70	8.9341	7.92	1.0208	1.007	2.8712	1.8571	1.546	2.3642	0.50705
13	0.77	8.9661	7.92	1.0638	1.017	2.8601	1.8141	1.577	2.3371	0.52303
14	0.91	9.0198	7.92	1.1359	1.033	2.8418	1.7419	1.631	2.2919	0.54992
15	1.04	9.0688	7.92	1.2028	1.047	2.8238	1.6751	1.686	2.2494	0.57439
16	1.17	9.1102	7.92	1.2633	1.061	2.8048	1.6146	1.737	2.2097	0.5951
17	1.31	9.1442	7.92	1.3151	1.074	2.787	1.5628	1.783	2.1749	0.61209
18	1.44	9.176	7.92	1.3651	1.087	2.7688	1.5128	1.830	2.1408	0.62801
19	1.57	9.2067	7.92	1.4093	1.095	2.7552	1.4686	1.876	2.1119	0.64333
20	2.37	9.332	7.92	1.6181	1.146	2.6717	1.2598	2.121	1.9658	0.70598
21	3.18	9.4147	7.92	1.7588	1.177	2.6137	1.119	2.336	1.8664	0.74736
22	3.98	9.4752	7.92	1.8641	1.199	2.569	1.0137	2.534	1.7914	0.77761
23	4.79	9.5218	7.92	1.9432	1.213	2.5365	0.93464	2.714	1.7356	0.80092
24	5.60	9.5608	7.92	2.0072	1.223	2.5115	0.87066	2.885	1.6911	0.8204
25	6.40	9.5926	7.92	2.0595	1.231	2.4909	0.81832	3.044	1.6546	0.83629
26	7.19	9.6197	7.92	2.1037	1.238	2.4738	0.77411	3.196	1.6239	0.84983
27	8.00	9.6415	7.92	2.1404	1.243	2.4589	0.73747	3.334	1.5982	0.86073
28	8.80	9.6589	7.92	2.173	1.250	2.4438	0.7049	3.467	1.5743	0.86944
29	9.60	9.6739	7.92	2.2003	1.255	2.4315	0.67756	3.589	1.5545	0.87696
30	10.41	9.6835	7.92	2.223	1.261	2.4184	0.65488	3.693	1.5366	0.88174
31	11.21	9.6888	7.92	2.2422	1.268	2.4045	0.63569	3.783	1.5201	0.88442
32	12.01	9.6873	7.92	2.2567	1.277	2.3885	0.62115	3.845	1.5048	0.88367
33	12.82	9.6794	7.92	2.2678	1.289	2.3695	0.61009	3.884	1.4898	0.87969
34	13.62	9.6597	7.92	2.273	1.307	2.3445	0.60486	3.876	1.4747	0.86983
35	14.42	9.6326	7.92	2.2736	1.328	2.3169	0.60428	3.834	1.4606	0.85632
36	15.24	9.6009	7.92	2.2718	1.352	2.287	0.60602	3.774	1.4465	0.84046

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

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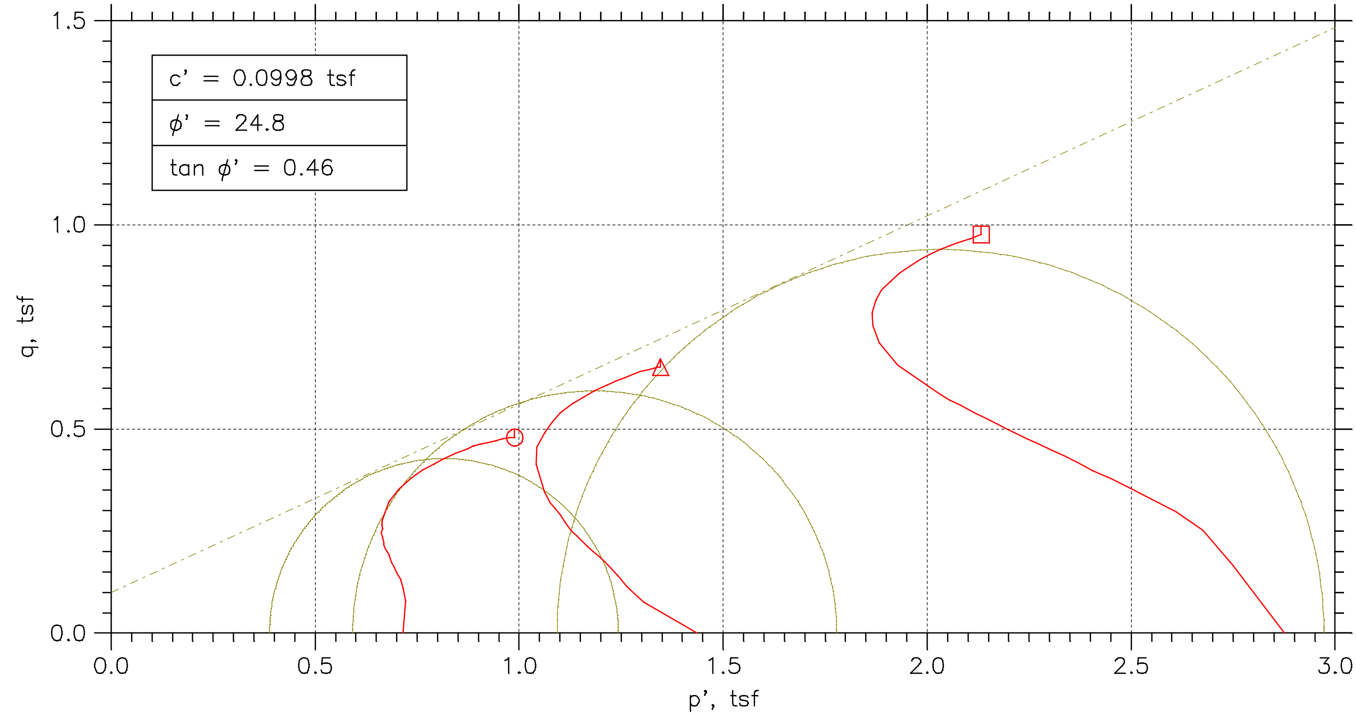

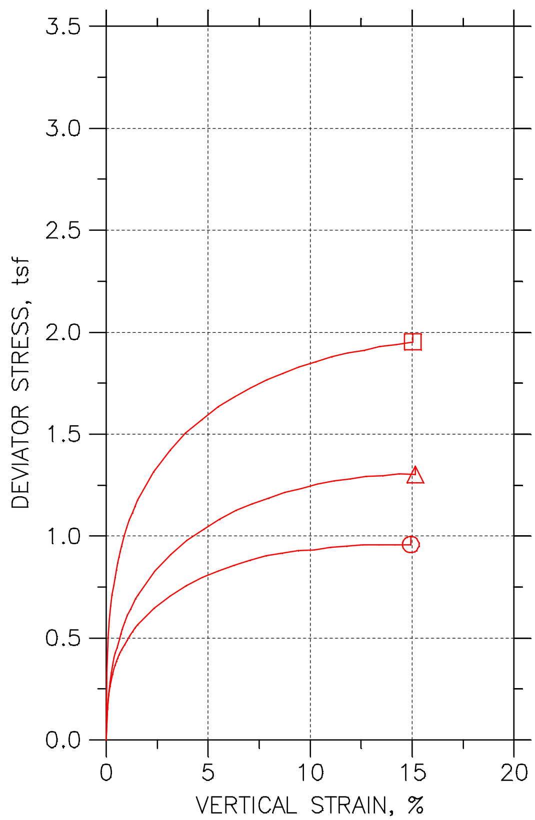

Symbol		○	△	□	
Test No.		10.0 PSI	20.0 PSI	40.0 PSI	
Initial	Diameter, in	2.8094	2.8291	2.8406	
	Height, in	5.9575	6.2256	6.276	
	Water Content, %	27.95	28.58	25.69	
	Dry Density, pcf	95.83	93.77	96.62	
	Saturation, %	98.51	95.87	92.26	
	Void Ratio	0.77188	0.81092	0.75748	
Before Shear	Water Content, %	27.39	26.71	23.87	
	Dry Density, pcf	97.31	98.35	103.	
	Saturation, %	100.00	100.00	100.00	
	Void Ratio	0.74495	0.72649	0.64936	
	Back Press., tsf	5.0452	5.044	5.045	
Minor Prin. Stress, tsf		0.71483	1.436	2.875	
Max. Dev. Stress, tsf		0.95795	1.304	1.9522	
Time to Failure, min		1140	1080	1140	
Strain Rate, %/min		0.02	0.02	0.02	
B-Value		0.95	0.97	0.95	
Estimated Specific Gravity		2.72	2.72	2.72	
Liquid Limit		48	48	48	
Plastic Limit		18	18	18	
Plasticity Index		30	30	30	

Project: DYNEGY EDWARDS
Location: BARTONVILLE, IL
Project No.: MR155218
Boring No.: EDW010 S-7
Sample Type: 3.0" ST

Failure Sketch

Description: BROWN AND GRAY MOTTLED LEAN CLAY CL

Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

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CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

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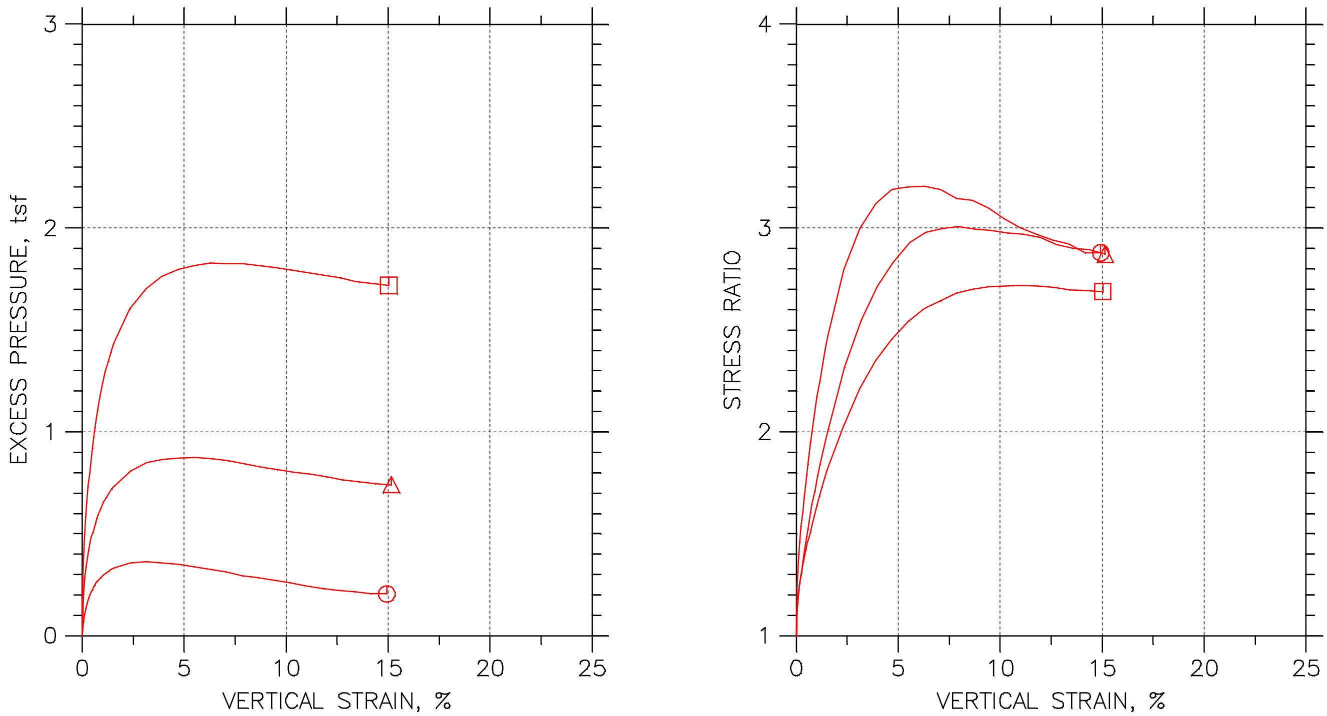

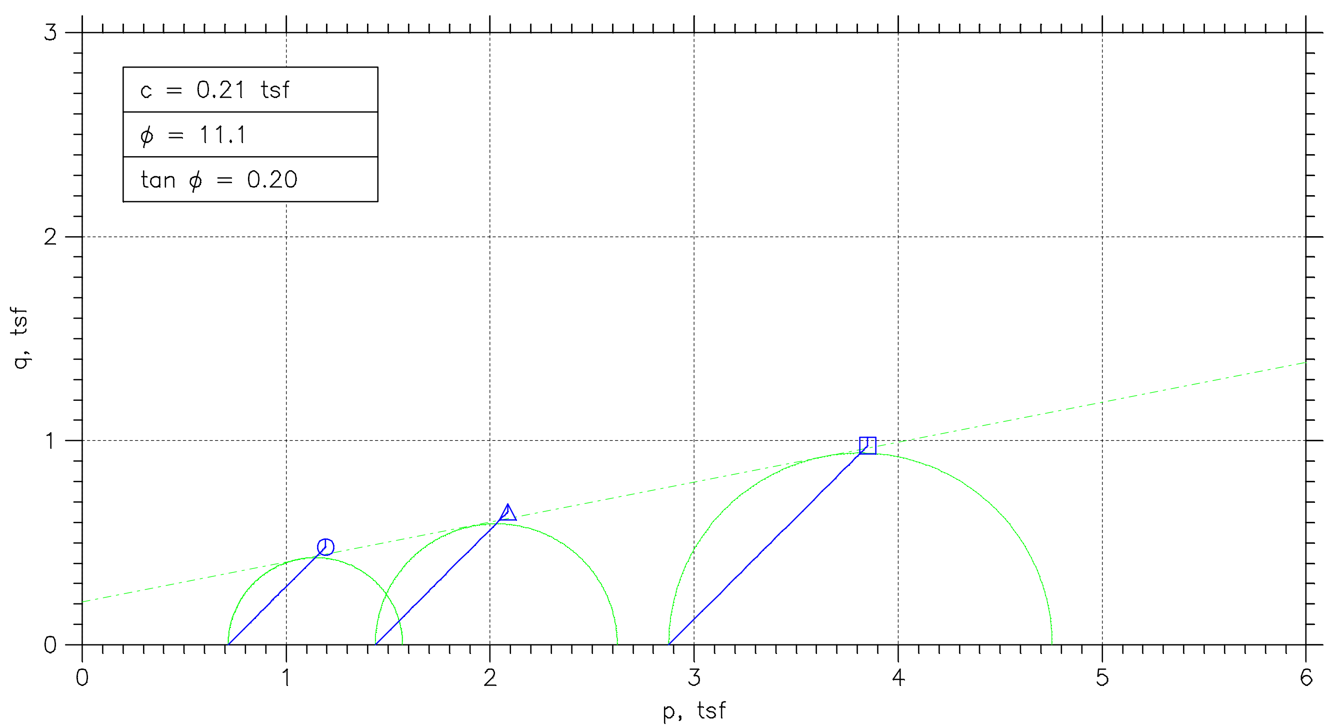

Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
Boring No.: EDW-010 S-7	Tested By: BCM	Checked By: WPQ
Sample No.: S-7	Test Date: 10/29/15	Depth: 15.0'-17.0'
Test No.: EDW-010 S-7	Sample Type: 3.0" ST	Elevation: ----
Description: BROWN AND GRAY MOTTLED LEAN CLAY CL		
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.		

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TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-010 S-7
Sample No.: S-7
Test No.: 10.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-17.0'
Elevation: ----

Soil Description: BROWN AND GRAY MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 5.96 in
Specimen Area: 6.20 in^2
Specimen Volume: 36.93 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 18

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.1991	0	0	5.0452	5.76	5.76
2	5.0041	0.056448	6.2027	13.621	0.15811	5.1172	5.76	5.9181
3	10.004	0.12013	6.2066	19.07	0.22122	5.1549	5.76	5.9812
4	15.004	0.18382	6.2106	22.767	0.26394	5.1834	5.76	6.0239
5	20	0.24895	6.2146	25.54	0.29589	5.2078	5.76	6.0559
6	25	0.31408	6.2187	27.923	0.3233	5.2287	5.76	6.0833
7	30	0.37922	6.2227	29.967	0.34673	5.2467	5.76	6.1067
8	35	0.4429	6.2267	31.669	0.36619	5.2595	5.76	6.1262
9	40	0.50948	6.2309	33.275	0.3845	5.2716	5.76	6.1445
10	45	0.57462	6.235	34.734	0.4011	5.285	5.76	6.1611
11	50	0.63975	6.2391	36.047	0.41599	5.296	5.76	6.176
12	55	0.70488	6.2432	37.312	0.43031	5.3065	5.76	6.1903
13	60	0.77001	6.2473	38.48	0.44348	5.314	5.76	6.2035
14	70	0.90028	6.2555	40.669	0.4681	5.3286	5.76	6.2281
15	80	1.032	6.2638	42.663	0.4904	5.3431	5.76	6.2504
16	90	1.1608	6.272	44.609	0.5121	5.3512	5.76	6.2721
17	100	1.2925	6.2803	46.263	0.53038	5.3622	5.76	6.2904
18	110	1.4213	6.2885	47.869	0.54807	5.3704	5.76	6.3081
19	120	1.5516	6.2969	49.377	0.56459	5.3762	5.76	6.3246
20	180	2.3404	6.3477	56.868	0.64504	5.4011	5.76	6.405
21	240	3.1249	6.3991	62.706	0.70554	5.407	5.76	6.4655
22	300	3.908	6.4513	67.717	0.75576	5.4035	5.76	6.5158
23	360	4.7026	6.5051	72.046	0.79743	5.3959	5.76	6.5574
24	420	5.4871	6.5591	75.549	0.82931	5.3831	5.76	6.5893
25	480	6.2774	6.6144	78.565	0.85521	5.3721	5.76	6.6152
26	540	7.0676	6.6706	81.63	0.88108	5.3576	5.76	6.6411
27	600	7.8492	6.7272	84.305	0.90231	5.3396	5.76	6.6623
28	660	8.6337	6.7849	86.446	0.91734	5.3303	5.76	6.6773
29	720	9.424	6.8441	88.197	0.92783	5.3175	5.76	6.6878
30	780	10.213	6.9043	89.462	0.93294	5.3036	5.76	6.6929
31	840	10.997	6.9651	91.213	0.94289	5.2891	5.76	6.7029
32	900	11.786	7.0274	92.818	0.95098	5.2769	5.76	6.711
33	960	12.572	7.0906	94.083	0.95535	5.2682	5.76	6.7154
34	1020	13.361	7.1551	95.105	0.95701	5.2618	5.76	6.717
35	1080	14.148	7.2208	95.981	0.95705	5.2502	5.76	6.717
36	1140	14.93	7.2871	96.953	0.95795	5.2502	5.76	6.7179

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-010 S-7
Sample No.: S-7
Test No.: 10.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-17.0'
Elevation: ----

Terracon Consulting Engineers & Scientists

Soil Description: BROWN AND GRAY MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 5.96 in
Specimen Area: 6.20 in^2
Specimen Volume: 36.93 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 18

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	5.76	5.76	0	0.000	0.71483	0.71483	1.000	0.71483	0
2	0.06	5.9181	5.76	0.072008	0.455	0.80093	0.64282	1.246	0.72188	0.079057
3	0.12	5.9812	5.76	0.10975	0.496	0.82629	0.60507	1.366	0.71568	0.11061
4	0.18	6.0239	5.76	0.13821	0.524	0.84056	0.57662	1.458	0.70859	0.13197
5	0.25	6.0559	5.76	0.1626	0.550	0.84812	0.55223	1.536	0.70018	0.14795
6	0.31	6.0833	5.76	0.1835	0.568	0.85462	0.53132	1.608	0.69297	0.16165
7	0.38	6.1067	5.76	0.2015	0.581	0.86005	0.51332	1.675	0.68669	0.17336
8	0.44	6.1262	5.76	0.21428	0.585	0.86674	0.50055	1.732	0.68364	0.1831
9	0.51	6.1445	5.76	0.22648	0.589	0.87285	0.48835	1.787	0.6806	0.19225
10	0.57	6.1611	5.76	0.23983	0.598	0.87609	0.475	1.844	0.67555	0.20055
11	0.64	6.176	5.76	0.25086	0.603	0.87996	0.46396	1.897	0.67196	0.208
12	0.70	6.1903	5.76	0.26132	0.607	0.88382	0.45351	1.949	0.66866	0.21515
13	0.77	6.2035	5.76	0.26887	0.606	0.88944	0.44596	1.994	0.6677	0.22174
14	0.90	6.2281	5.76	0.28338	0.605	0.89954	0.43144	2.085	0.66549	0.23405
15	1.03	6.2504	5.76	0.2979	0.607	0.90733	0.41693	2.176	0.66213	0.2452
16	1.16	6.2721	5.76	0.30603	0.598	0.9209	0.4088	2.253	0.66485	0.25605
17	1.29	6.2904	5.76	0.31707	0.598	0.92814	0.39776	2.333	0.66295	0.26519
18	1.42	6.3081	5.76	0.3252	0.593	0.9377	0.38963	2.407	0.66367	0.27403
19	1.55	6.3246	5.76	0.331	0.586	0.94841	0.38382	2.471	0.66612	0.28229
20	2.34	6.405	5.76	0.35597	0.552	1.0039	0.35885	2.797	0.68137	0.32252
21	3.12	6.4655	5.76	0.36178	0.513	1.0586	0.35305	2.998	0.70582	0.35277
22	3.91	6.5158	5.76	0.3583	0.474	1.1123	0.35653	3.120	0.73441	0.37788
23	4.70	6.5574	5.76	0.35075	0.440	1.1615	0.36408	3.190	0.7628	0.39872
24	5.49	6.5893	5.76	0.33797	0.408	1.2062	0.37686	3.201	0.79151	0.41466
25	6.28	6.6152	5.76	0.32694	0.382	1.2431	0.38789	3.205	0.8155	0.42761
26	7.07	6.6411	5.76	0.31242	0.355	1.2835	0.40241	3.190	0.84295	0.44054
27	7.85	6.6623	5.76	0.29442	0.326	1.3227	0.42041	3.146	0.87156	0.45115
28	8.63	6.6773	5.76	0.28513	0.311	1.347	0.4297	3.135	0.88837	0.45867
29	9.42	6.6878	5.76	0.27235	0.294	1.3703	0.44248	3.097	0.90639	0.46391
30	10.21	6.6929	5.76	0.25841	0.277	1.3894	0.45641	3.044	0.92288	0.46647
31	11.00	6.7029	5.76	0.2439	0.259	1.4138	0.47093	3.002	0.94238	0.47144
32	11.79	6.711	5.76	0.2317	0.244	1.4341	0.48313	2.968	0.95862	0.47549
33	12.57	6.7154	5.76	0.22299	0.233	1.4472	0.49184	2.942	0.96951	0.47768
34	13.36	6.717	5.76	0.2166	0.226	1.4552	0.49822	2.921	0.97673	0.47851
35	14.15	6.717	5.76	0.20499	0.214	1.4669	0.50984	2.877	0.98836	0.47852
36	14.93	6.7179	5.76	0.20499	0.214	1.4678	0.50984	2.879	0.98881	0.47897

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW010 S-7
Sample No.: S-7
Test No.: 20.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-17.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWN AND GRAY MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.23 in
Specimen Area: 6.29 in^2
Specimen Volume: 39.14 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 18

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.2863	0	0	5.044	6.48	6.48
2	5.0041	0.05533	6.2898	13.126	0.15025	5.2498	6.48	6.6303
3	10.004	0.11988	6.2939	19.719	0.22558	5.328	6.48	6.7056
4	15.004	0.18597	6.298	24.693	0.2823	5.381	6.48	6.7623
5	20.004	0.25206	6.3022	28.769	0.32867	5.4242	6.48	6.8087
6	25.004	0.31968	6.3065	32.245	0.36814	5.4644	6.48	6.8481
7	30.004	0.38731	6.3108	35.122	0.40071	5.4988	6.48	6.8807
8	35.004	0.45339	6.315	37.46	0.4271	5.5286	6.48	6.9071
9	40.004	0.52256	6.3193	39.617	0.45138	5.5525	6.48	6.9314
10	45.004	0.58557	6.3234	41.595	0.47362	5.5747	6.48	6.9536
11	50.004	0.65166	6.3276	43.633	0.49649	5.5991	6.48	6.9765
12	55.004	0.71775	6.3318	45.791	0.5207	5.6207	6.48	7.0007
13	60.004	0.7823	6.3359	47.769	0.54284	5.6394	6.48	7.0228
14	70.004	0.91601	6.3444	50.885	0.57747	5.6668	6.48	7.0575
15	80	1.0497	6.353	54.002	0.61202	5.6983	6.48	7.092
16	90	1.1834	6.3616	56.459	0.639	5.7228	6.48	7.119
17	110	1.4493	6.3788	61.314	0.69208	5.7642	6.48	7.1721
18	120	1.583	6.3874	63.292	0.71343	5.7776	6.48	7.1934
19	180	2.3746	6.4392	73.961	0.82699	5.8522	6.48	7.307
20	240	3.1676	6.492	82.052	0.91001	5.8919	6.48	7.39
21	300	3.9653	6.5459	89.124	0.9803	5.9077	6.48	7.4603
22	360	4.766	6.6009	94.698	1.0329	5.9158	6.48	7.5129
23	420	5.5652	6.6568	100.03	1.082	5.9193	6.48	7.562
24	480	6.366	6.7137	104.89	1.1248	5.9117	6.48	7.6048
25	540	7.1682	6.7717	108.78	1.1566	5.9012	6.48	7.6366
26	600	7.9582	6.8299	112.56	1.1866	5.8884	6.48	7.6666
27	660	8.7559	6.8896	116.22	1.2145	5.8709	6.48	7.6945
28	720	9.5582	6.9507	119.03	1.233	5.8598	6.48	7.713
29	780	10.356	7.0125	122.09	1.2535	5.8453	6.48	7.7335
30	840	11.16	7.076	124.79	1.2697	5.8353	6.48	7.7497
31	900	11.954	7.1398	127	1.2807	5.8248	6.48	7.7607
32	960	12.753	7.2052	129.22	1.2913	5.8073	6.48	7.7713
33	1020	13.56	7.2725	130.84	1.2954	5.7986	6.48	7.7754
34	1080	14.358	7.3402	132.94	1.304	5.791	6.48	7.784
35	1140	15.15	7.4087	134.02	1.3024	5.7846	6.48	7.7824

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW010 S-7
Sample No.: S-7
Test No.: 20.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-17.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWN AND GRAY MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.23 in
Specimen Area: 6.29 in^2
Specimen Volume: 39.14 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 18

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	6.48	6.48	0	0.000	1.436	1.436	1.000	1.436	0
2	0.06	6.6303	6.48	0.20586	1.370	1.3804	1.2302	1.122	1.3053	0.075127
3	0.12	6.7056	6.48	0.28401	1.259	1.3776	1.152	1.196	1.2648	0.11279
4	0.19	6.7623	6.48	0.33708	1.194	1.3813	1.099	1.257	1.2401	0.14115
5	0.25	6.8087	6.48	0.38024	1.157	1.3845	1.0558	1.311	1.2201	0.16434
6	0.32	6.8481	6.48	0.42048	1.142	1.3837	1.0156	1.362	1.1996	0.18407
7	0.39	6.8807	6.48	0.45488	1.135	1.3819	0.98116	1.408	1.1815	0.20036
8	0.45	6.9071	6.48	0.48463	1.135	1.3785	0.95142	1.449	1.165	0.21355
9	0.52	6.9314	6.48	0.50854	1.127	1.3789	0.92751	1.487	1.1532	0.22569
10	0.59	6.9536	6.48	0.5307	1.121	1.379	0.90535	1.523	1.1422	0.23681
11	0.65	6.9765	6.48	0.55519	1.118	1.3773	0.88085	1.564	1.1291	0.24825
12	0.72	7.0007	6.48	0.57677	1.108	1.38	0.85927	1.606	1.1196	0.26035
13	0.78	7.0228	6.48	0.59543	1.097	1.3834	0.84061	1.646	1.112	0.27142
14	0.92	7.0575	6.48	0.62284	1.079	1.3907	0.8132	1.710	1.1019	0.28874
15	1.05	7.092	6.48	0.65433	1.069	1.3937	0.78171	1.783	1.0877	0.30601
16	1.18	7.119	6.48	0.67883	1.062	1.3962	0.75722	1.844	1.0767	0.3195
17	1.45	7.1721	6.48	0.72023	1.041	1.4079	0.71581	1.967	1.0619	0.34604
18	1.58	7.1934	6.48	0.73365	1.028	1.4158	0.7024	2.016	1.0591	0.35672
19	2.37	7.307	6.48	0.80829	0.977	1.4547	0.62775	2.317	1.0412	0.41349
20	3.17	7.39	6.48	0.84795	0.932	1.4981	0.58809	2.547	1.0431	0.455
21	3.97	7.4603	6.48	0.8637	0.881	1.5526	0.57235	2.713	1.0625	0.49015
22	4.77	7.5129	6.48	0.87186	0.844	1.5971	0.56418	2.831	1.0806	0.51646
23	5.57	7.562	6.48	0.87536	0.809	1.6426	0.56068	2.930	1.1017	0.54098
24	6.37	7.6048	6.48	0.86778	0.771	1.6931	0.56827	2.979	1.1307	0.56242
25	7.17	7.6366	6.48	0.85728	0.741	1.7354	0.57876	2.998	1.1571	0.57831
26	7.96	7.6666	6.48	0.84445	0.712	1.7782	0.59159	3.006	1.1849	0.5933
27	8.76	7.6945	6.48	0.82695	0.681	1.8236	0.60909	2.994	1.2163	0.60726
28	9.56	7.713	6.48	0.81587	0.662	1.8532	0.62017	2.988	1.2367	0.61651
29	10.36	7.7335	6.48	0.80129	0.639	1.8883	0.63475	2.975	1.2615	0.62676
30	11.16	7.7497	6.48	0.79138	0.623	1.9144	0.64466	2.970	1.2795	0.63487
31	11.95	7.7607	6.48	0.78088	0.610	1.9359	0.65516	2.955	1.2955	0.64037
32	12.75	7.7713	6.48	0.76339	0.591	1.9639	0.67266	2.920	1.3183	0.64564
33	13.56	7.7754	6.48	0.75464	0.583	1.9768	0.6814	2.901	1.3291	0.64768
34	14.36	7.784	6.48	0.74706	0.573	1.993	0.68899	2.893	1.341	0.65199
35	15.15	7.7824	6.48	0.74064	0.569	1.9978	0.6954	2.873	1.3466	0.6512

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-010 S7
Sample No.: S-7
Test No.: 40.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-17.0'
Elevation: ----

Soil Description: BROWN AND GRAY MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.28 in
Specimen Area: 6.34 in^2
Specimen Volume: 39.77 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 18

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.3372	0	0	5.045	7.92	7.92
2	5.0034	0.036161	6.3395	29.009	0.32946	5.3353	7.92	8.2495
3	10.003	0.10125	6.3436	44.36	0.50349	5.4952	7.92	8.4235
4	15.003	0.16634	6.3477	52.512	0.59563	5.6081	7.92	8.5156
5	20.003	0.23288	6.352	58.07	0.65823	5.6994	7.92	8.5782
6	25.003	0.29942	6.3562	62.835	0.71176	5.7779	7.92	8.6318
7	30.003	0.36451	6.3604	66.964	0.75804	5.8489	7.92	8.678
8	35.003	0.43104	6.3646	70.351	0.79586	5.9111	7.92	8.7159
9	40.003	0.49758	6.3689	73.792	0.83422	5.9681	7.92	8.7542
10	45.003	0.56122	6.3729	76.915	0.86897	6.0199	7.92	8.789
11	50.003	0.62632	6.3771	79.509	0.89769	6.0658	7.92	8.8177
12	55.003	0.69141	6.3813	82.103	0.92637	6.11	7.92	8.8464
13	60.003	0.7565	6.3855	84.432	0.95202	6.1513	7.92	8.872
14	70.003	0.88523	6.3938	88.826	1.0003	6.2246	7.92	8.9203
15	80.003	1.0154	6.4022	92.637	1.0418	6.2874	7.92	8.9618
16	90.003	1.1441	6.4105	96.078	1.0791	6.3444	7.92	8.9991
17	100	1.2743	6.419	99.307	1.1139	6.3944	7.92	9.0339
18	110	1.4031	6.4273	102.17	1.1445	6.4386	7.92	9.0645
19	120	1.5318	6.4357	105.08	1.1756	6.4788	7.92	9.0956
20	180	2.3245	6.488	118.31	1.313	6.648	7.92	9.233
21	240	3.1243	6.5415	129.11	1.4211	6.7475	7.92	9.3411
22	300	3.8982	6.5942	137.9	1.5057	6.8062	7.92	9.4257
23	360	4.6923	6.6492	145.04	1.5706	6.8405	7.92	9.4906
24	420	5.4951	6.7056	152.14	1.6335	6.8615	7.92	9.5535
25	480	6.2791	6.7617	157.91	1.6814	6.8719	7.92	9.6014
26	540	7.0746	6.8196	163.31	1.7241	6.8714	7.92	9.6441
27	600	7.8702	6.8785	168.65	1.7654	6.8702	7.92	9.6854
28	660	8.6498	6.9372	173.1	1.7966	6.8621	7.92	9.7166
29	720	9.454	6.9988	177.86	1.8298	6.8516	7.92	9.7498
30	780	10.257	7.0614	181.83	1.854	6.8399	7.92	9.774
31	840	11.038	7.1234	185.96	1.8796	6.8272	7.92	9.7996
32	900	11.839	7.1882	189.4	1.8971	6.8149	7.92	9.8171
33	960	12.632	7.2534	192.47	1.9106	6.8021	7.92	9.8306
34	1020	13.412	7.3187	196.23	1.9305	6.7824	7.92	9.8505
35	1080	14.223	7.388	199.09	1.9403	6.7742	7.92	9.8603
36	1140	15.029	7.458	202.21	1.9522	6.7638	7.92	9.8722

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-010 S7
Sample No.: S-7
Test No.: 40.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-17.0'
Elevation: ----

Soil Description: BROWN AND GRAY MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.28 in
Specimen Area: 6.34 in^2
Specimen Volume: 39.77 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 18

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	7.92	7.92	0	0.000	2.875	2.875	1.000	2.875	0
2	0.04	8.2495	7.92	0.29023	0.881	2.9142	2.5847	1.127	2.7495	0.16473
3	0.10	8.4235	7.92	0.45018	0.894	2.9283	2.4248	1.208	2.6765	0.25174
4	0.17	8.5156	7.92	0.56302	0.945	2.9076	2.3119	1.258	2.6098	0.29781
5	0.23	8.5782	7.92	0.65433	0.994	2.8789	2.2206	1.296	2.5497	0.32912
6	0.30	8.6318	7.92	0.73285	1.030	2.8539	2.1421	1.332	2.498	0.35588
7	0.36	8.678	7.92	0.80381	1.060	2.8292	2.0711	1.366	2.4502	0.37902
8	0.43	8.7159	7.92	0.86604	1.088	2.8048	2.0089	1.396	2.4068	0.39793
9	0.50	8.7542	7.92	0.92304	1.106	2.7861	1.9519	1.427	2.369	0.41711
10	0.56	8.789	7.92	0.97481	1.122	2.7691	1.9001	1.457	2.3346	0.43449
11	0.63	8.8177	7.92	1.0208	1.137	2.7519	1.8542	1.484	2.303	0.44885
12	0.69	8.8464	7.92	1.065	1.150	2.7364	1.81	1.512	2.2732	0.46318
13	0.76	8.872	7.92	1.1063	1.162	2.7207	1.7687	1.538	2.2447	0.47601
14	0.89	8.9203	7.92	1.1795	1.179	2.6957	1.6954	1.590	2.1955	0.50013
15	1.02	8.9618	7.92	1.2424	1.192	2.6744	1.6326	1.638	2.1535	0.52091
16	1.14	8.9991	7.92	1.2994	1.204	2.6547	1.5756	1.685	2.1152	0.53955
17	1.27	9.0339	7.92	1.3494	1.211	2.6395	1.5256	1.730	2.0825	0.55695
18	1.40	9.0645	7.92	1.3936	1.218	2.6258	1.4814	1.773	2.0536	0.57224
19	1.53	9.0956	7.92	1.4337	1.220	2.6168	1.4412	1.816	2.029	0.58778
20	2.32	9.233	7.92	1.603	1.221	2.5849	1.272	2.032	1.9285	0.65648
21	3.12	9.3411	7.92	1.7024	1.198	2.5936	1.1725	2.212	1.8831	0.71053
22	3.90	9.4257	7.92	1.7612	1.170	2.6194	1.1138	2.352	1.8666	0.75283
23	4.69	9.4906	7.92	1.7955	1.143	2.6501	1.0795	2.455	1.8648	0.7853
24	5.50	9.5535	7.92	1.8164	1.112	2.6921	1.0585	2.543	1.8753	0.81676
25	6.28	9.6014	7.92	1.8269	1.087	2.7295	1.0481	2.604	1.8888	0.84071
26	7.07	9.6441	7.92	1.8263	1.059	2.7728	1.0486	2.644	1.9107	0.86207
27	7.87	9.6854	7.92	1.8251	1.034	2.8152	1.0498	2.682	1.9325	0.88268
28	8.65	9.7166	7.92	1.817	1.011	2.8545	1.0579	2.698	1.9562	0.89828
29	9.45	9.7498	7.92	1.8065	0.987	2.8982	1.0684	2.713	1.9833	0.91488
30	10.26	9.774	7.92	1.7949	0.968	2.9341	1.0801	2.717	2.0071	0.92701
31	11.04	9.7996	7.92	1.7821	0.948	2.9725	1.0928	2.720	2.0327	0.93981
32	11.84	9.8171	7.92	1.7699	0.933	3.0022	1.1051	2.717	2.0536	0.94857
33	12.63	9.8306	7.92	1.7571	0.920	3.0284	1.1179	2.709	2.0731	0.95528
34	13.41	9.8505	7.92	1.7373	0.900	3.0681	1.1376	2.697	2.1029	0.96525
35	14.22	9.8603	7.92	1.7292	0.891	3.086	1.1458	2.693	2.1159	0.97013
36	15.03	9.8722	7.92	1.7187	0.880	3.1084	1.1562	2.688	2.1323	0.97609

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

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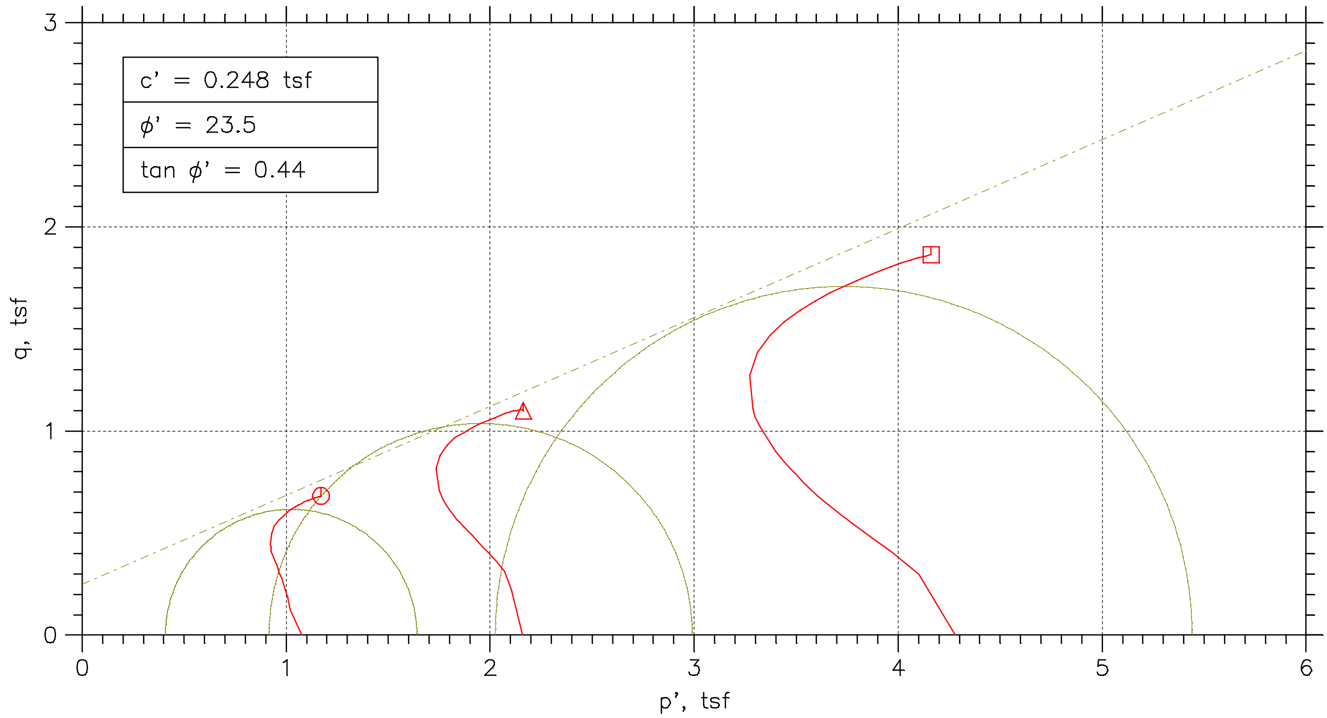

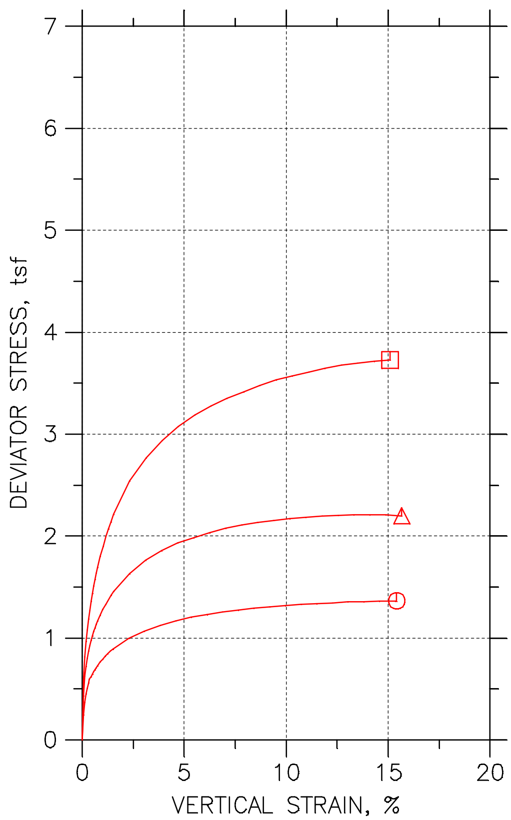

Symbol		○	△	□	
Test No.		15.0 PSI	30.0 PSI	60.0 PSI	
Initial	Diameter, in	2.8382	2.8134	2.8295	
	Height, in	6.3996	6.3425	6.2551	
	Water Content, %	31.54	29.27	28.87	
	Dry Density, pcf	87.92	91.94	94.81	
	Saturation, %	92.13	94.02	99.28	
	Void Ratio	0.93126	0.84681	0.791	
Before Shear	Water Content, %	31.86	27.59	24.62	
	Dry Density, pcf	90.97	97.01	101.7	
	Saturation, %	100.00	100.00	100.00	
	Void Ratio	0.86663	0.75044	0.66973	
	Back Press., tsf	5.0434	5.0422	5.0794	
Minor Prin. Stress, tsf		1.0766	2.1578	4.2806	
Max. Dev. Stress, tsf		1.3642	2.2082	3.7265	
Time to Failure, min		1205.9	1080	1140	
Strain Rate, %/min		0.02	0.02	0.02	
B-Value		0.97	0.98	0.96	
Estimated Specific Gravity		2.72	2.72	2.72	
Liquid Limit		48	48	48	
Plastic Limit		19	19	19	
Plasticity Index		29	29	29	
Failure Sketch					

Project: DYNEGY EDWARDS
Location: BARTONVILLE, IL
Project No.: MR155218
Boring No.: EDW-012 S-7
Sample Type: 3.0'' ST
Description: BROWN AND RUST BROWN MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

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CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

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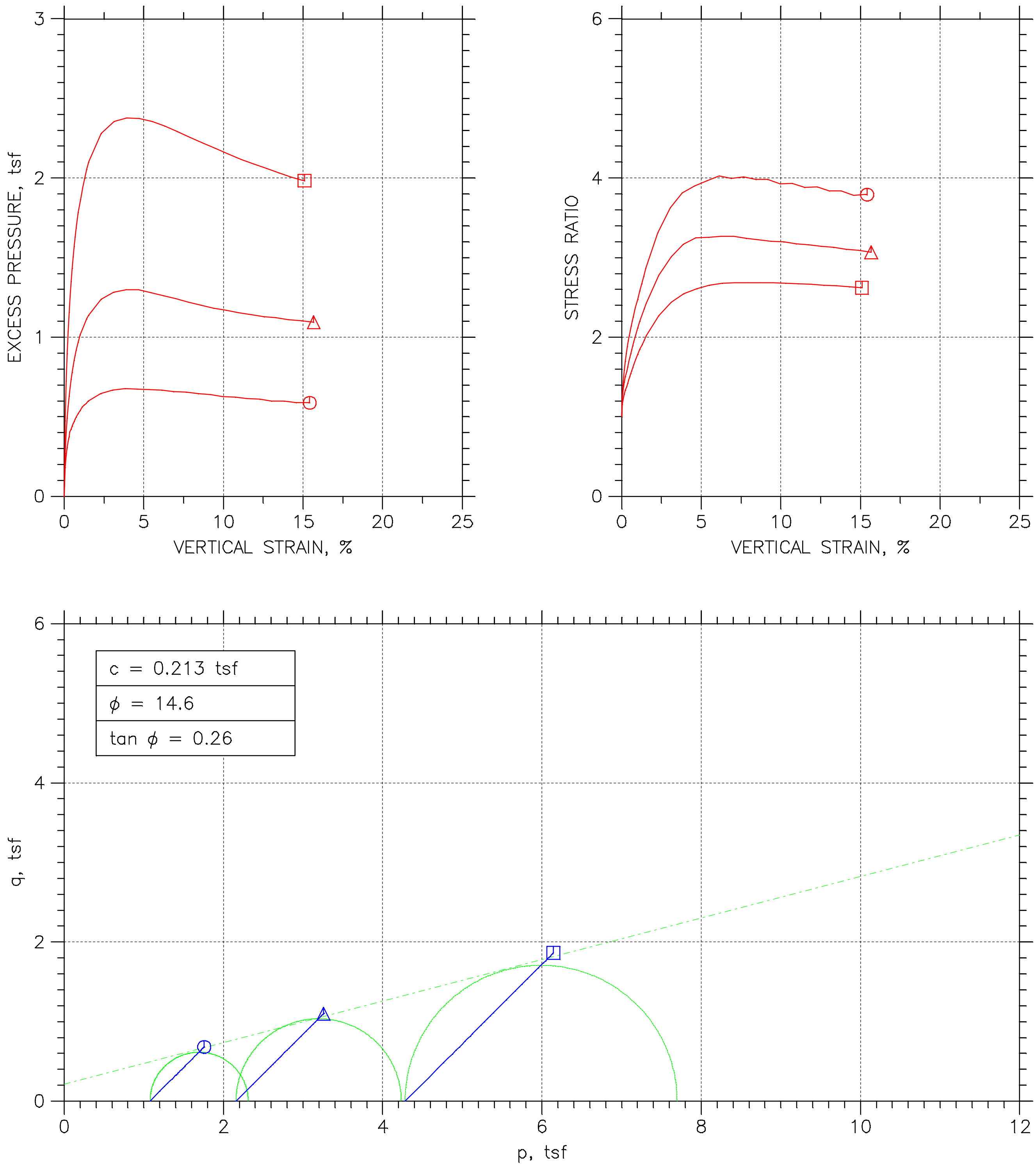

Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
Boring No.: EDW-012 S-7	Tested By: BCM	Checked By: WPQ
Sample No.: S-7	Test Date: 11/5/15	Depth: 15.0'-17.0'
Test No.: EDW-012 S-7	Sample Type: 3.0" ST	Elevation: ----
Description: BROWN AND RUST BROWN MOTTLED LEAN CLAY CL		
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.		

Mon, 16-NOV-2015 20:44:44

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-012 S-7
Sample No.: S-7
Test No.: 15.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/5/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-17.0'
Elevation: ----

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Soil Description: BROWN AND RUST BROWN MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.40 in
Specimen Area: 6.33 in^2
Specimen Volume: 40.49 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 19

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.3266	0	0	5.0434	6.12	6.12
2	5.0003	0.05234	6.3299	21.743	0.24732	5.2234	6.12	6.3673
3	10	0.11458	6.3339	32.694	0.37164	5.2995	6.12	6.4916
4	15	0.17541	6.3377	39.538	0.44917	5.3506	6.12	6.5692
5	20	0.23765	6.3417	44.908	0.50986	5.3907	6.12	6.6299
6	25	0.30131	6.3458	49.067	0.55672	5.4203	6.12	6.6767
7	30	0.36214	6.3496	52.331	0.5934	5.4476	6.12	6.7134
8	35	0.42579	6.3537	54.963	0.62285	5.4673	6.12	6.7428
9	40	0.48945	6.3577	57.122	0.64689	5.4848	6.12	6.7669
10	45	0.55452	6.3619	59.175	0.66971	5.4993	6.12	6.7897
11	50.001	0.61818	6.366	61.228	0.6925	5.5132	6.12	6.8125
12	55.001	0.68183	6.3701	62.966	0.71169	5.5283	6.12	6.8317
13	60.001	0.74549	6.3741	64.545	0.72908	5.5399	6.12	6.8491
14	70.001	0.87563	6.3825	67.599	0.76257	5.5632	6.12	6.8826
15	80.001	1.0029	6.3907	70.284	0.79184	5.5829	6.12	6.9118
16	90.001	1.1303	6.399	72.863	0.81985	5.6032	6.12	6.9398
17	100	1.259	6.4073	75.18	0.84481	5.6154	6.12	6.9648
18	110	1.3863	6.4156	77.444	0.86913	5.6276	6.12	6.9891
19	120	1.5136	6.4239	79.392	0.88984	5.6427	6.12	7.0098
20	180	2.2832	6.4745	89.553	0.99588	5.6886	6.12	7.1159
21	240	3.0499	6.5257	96.923	1.0694	5.7124	6.12	7.1894
22	300	3.8194	6.5779	102.87	1.126	5.7194	6.12	7.246
23	360	4.5847	6.6306	107.72	1.1697	5.7165	6.12	7.2897
24	420	5.35	6.6842	111.77	1.2039	5.7141	6.12	7.3239
25	480	6.1238	6.7393	115.4	1.2329	5.7124	6.12	7.3529
26	540	6.8848	6.7944	118.4	1.2547	5.7014	6.12	7.3747
27	600	7.6572	6.8512	121.14	1.2731	5.6973	6.12	7.3931
28	660	8.4239	6.9086	123.83	1.2905	5.6874	6.12	7.4105
29	720	9.1878	6.9667	126.25	1.3047	5.6822	6.12	7.4247
30	780	9.9587	7.0264	128.56	1.3174	5.67	6.12	7.4374
31	840	10.721	7.0864	130.72	1.3282	5.6671	6.12	7.4482
32	900	11.496	7.1484	132.83	1.3379	5.6561	6.12	7.4579
33	960	12.266	7.2111	134.78	1.3457	5.6538	6.12	7.4657
34	1020	13.031	7.2746	136.78	1.3537	5.6433	6.12	7.4737
35	1080	13.799	7.3394	138.3	1.3568	5.6416	6.12	7.4768
36	1140	14.57	7.4057	139.88	1.36	5.6317	6.12	7.48
37	1200	15.338	7.4728	141.57	1.364	5.6317	6.12	7.484
38	1205.9	15.418	7.4798	141.73	1.3642	5.6311	6.12	7.4842

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-012 S-7
Sample No.: S-7
Test No.: 15.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/5/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-17.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWN AND RUST BROWN MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.40 in
Specimen Area: 6.33 in^2
Specimen Volume: 40.49 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 19

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	6.12	6.12	0	0.000	1.0766	1.0766	1.000	1.0766	0
2	0.05	6.3673	6.12	0.18002	0.728	1.1439	0.89655	1.276	1.0202	0.12366
3	0.11	6.4916	6.12	0.25609	0.689	1.1921	0.82048	1.453	1.0063	0.18582
4	0.18	6.5692	6.12	0.30719	0.684	1.2185	0.76938	1.584	0.99396	0.22459
5	0.24	6.6299	6.12	0.34726	0.681	1.2392	0.72931	1.699	0.98424	0.25493
6	0.30	6.6767	6.12	0.37688	0.677	1.2564	0.69969	1.796	0.97805	0.27836
7	0.36	6.7134	6.12	0.40417	0.681	1.2658	0.6724	1.883	0.9691	0.2967
8	0.43	6.7428	6.12	0.42392	0.681	1.2755	0.65265	1.954	0.96408	0.31142
9	0.49	6.7669	6.12	0.44134	0.682	1.2821	0.63523	2.018	0.95868	0.32345
10	0.55	6.7897	6.12	0.45585	0.681	1.2904	0.62072	2.079	0.95557	0.33485
11	0.62	6.8125	6.12	0.46979	0.678	1.2993	0.60678	2.141	0.95303	0.34625
12	0.68	6.8317	6.12	0.48489	0.681	1.3034	0.59168	2.203	0.94753	0.35585
13	0.75	6.8491	6.12	0.4965	0.681	1.3091	0.58007	2.257	0.94461	0.36454
14	0.88	6.8826	6.12	0.51973	0.682	1.3194	0.55684	2.369	0.93812	0.38128
15	1.00	6.9118	6.12	0.53948	0.681	1.3289	0.53709	2.474	0.93301	0.39592
16	1.13	6.9398	6.12	0.5598	0.683	1.3366	0.51677	2.586	0.92669	0.40992
17	1.26	6.9648	6.12	0.572	0.677	1.3494	0.50457	2.674	0.92698	0.42241
18	1.39	6.9891	6.12	0.58419	0.672	1.3615	0.49238	2.765	0.92694	0.43456
19	1.51	7.0098	6.12	0.59929	0.673	1.3671	0.47728	2.864	0.9222	0.44492
20	2.28	7.1159	6.12	0.64516	0.648	1.4273	0.43141	3.308	0.92935	0.49794
21	3.05	7.1894	6.12	0.66897	0.626	1.477	0.4076	3.624	0.94229	0.53469
22	3.82	7.246	6.12	0.67594	0.600	1.5266	0.40063	3.811	0.96364	0.56301
23	4.58	7.2897	6.12	0.67304	0.575	1.5732	0.40353	3.899	0.98836	0.58483
24	5.35	7.3239	6.12	0.67072	0.557	1.6098	0.40585	3.966	1.0078	0.60197
25	6.12	7.3529	6.12	0.66897	0.543	1.6405	0.4076	4.025	1.024	0.61645
26	6.88	7.3747	6.12	0.65794	0.524	1.6733	0.41863	3.997	1.046	0.62736
27	7.66	7.3931	6.12	0.65387	0.514	1.6958	0.42269	4.012	1.0592	0.63654
28	8.42	7.4105	6.12	0.644	0.499	1.7231	0.43257	3.983	1.0778	0.64524
29	9.19	7.4247	6.12	0.63878	0.490	1.7425	0.43779	3.980	1.0902	0.65237
30	9.96	7.4374	6.12	0.62658	0.476	1.7674	0.44999	3.928	1.1087	0.6587
31	10.72	7.4482	6.12	0.62368	0.470	1.7811	0.45289	3.933	1.117	0.66409
32	11.50	7.4579	6.12	0.61264	0.458	1.8018	0.46392	3.884	1.1329	0.66893
33	12.27	7.4657	6.12	0.61032	0.454	1.8119	0.46625	3.886	1.1391	0.67284
34	13.03	7.4737	6.12	0.59987	0.443	1.8304	0.4767	3.840	1.1536	0.67687
35	13.80	7.4768	6.12	0.59813	0.441	1.8352	0.47844	3.836	1.1568	0.67838
36	14.57	7.48	6.12	0.58826	0.433	1.8483	0.48831	3.785	1.1683	0.67999
37	15.34	7.484	6.12	0.58826	0.431	1.8523	0.48831	3.793	1.1703	0.68199
38	15.42	7.4842	6.12	0.58767	0.431	1.8531	0.48889	3.790	1.171	0.68212

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-012 S-7
Sample No.: S-7
Test No.: 30.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/5/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-16.5'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWN AND RUST BROWN MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.34 in
Specimen Area: 6.22 in^2
Specimen Volume: 39.43 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 19

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.2165	0	0	5.0422	7.2	7.2
2	5	0.057327	6.2201	37.373	0.4326	5.3099	7.2	7.6326
3	10	0.11918	6.224	53.994	0.62462	5.4417	7.2	7.8246
4	15	0.18405	6.228	62.676	0.72458	5.5332	7.2	7.9246
5	20	0.24892	6.232	69.557	0.80361	5.6096	7.2	8.0036
6	25	0.31228	6.236	75.327	0.86972	5.6726	7.2	8.0697
7	30	0.37564	6.24	80.356	0.92719	5.728	7.2	8.1272
8	35	0.44202	6.2441	85.068	0.9809	5.7788	7.2	8.1809
9	40	0.50689	6.2482	88.985	1.0254	5.8225	7.2	8.2254
10	45	0.57025	6.2522	92.478	1.065	5.8616	7.2	8.265
11	50	0.6321	6.2561	95.602	1.1003	5.8972	7.2	8.3003
12	55	0.69697	6.2602	98.513	1.133	5.9298	7.2	8.333
13	60	0.76033	6.2642	101.53	1.167	5.9607	7.2	8.367
14	70	0.88856	6.2723	106.72	1.225	6.0115	7.2	8.425
15	80	1.0198	6.2806	111.69	1.2804	6.0569	7.2	8.4804
16	90	1.1496	6.2888	115.93	1.3273	6.0949	7.2	8.5273
17	110	1.412	6.3056	123.92	1.415	6.1573	7.2	8.615
18	120	1.5403	6.3138	127.47	1.4536	6.1806	7.2	8.6536
19	180	2.3247	6.3645	144.14	1.6307	6.2815	7.2	8.8307
20	240	3.1062	6.4158	156.9	1.7608	6.3252	7.2	8.9608
21	300	3.8877	6.468	167.01	1.8591	6.3415	7.2	9.0591
22	360	4.6691	6.521	175.01	1.9323	6.3398	7.2	9.1323
23	420	5.4611	6.5756	181.3	1.9852	6.32	7.2	9.1852
24	480	6.2516	6.6311	187.18	2.0324	6.3025	7.2	9.2324
25	540	7.0361	6.687	192.69	2.0747	6.2844	7.2	9.2747
26	600	7.8221	6.7441	197.24	2.1057	6.2616	7.2	9.3057
27	660	8.6005	6.8015	201.31	2.1311	6.2418	7.2	9.3311
28	720	9.391	6.8608	205.13	2.1527	6.2237	7.2	9.3527
29	780	10.177	6.9209	208.78	2.172	6.2109	7.2	9.372
30	840	10.96	6.9817	211.85	2.1847	6.1957	7.2	9.3847
31	900	11.752	7.0444	214.97	2.1972	6.1841	7.2	9.3972
32	960	12.536	7.1076	217.25	2.2007	6.1713	7.2	9.4007
33	1020	13.315	7.1714	219.79	2.2067	6.1631	7.2	9.4067
34	1080	14.104	7.2373	221.96	2.2082	6.1514	7.2	9.4082
35	1140	14.884	7.3036	223.76	2.2059	6.145	7.2	9.4059
36	1200	15.665	7.3713	225.14	2.199	6.1363	7.2	9.399

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-012 S-7
Sample No.: S-7
Test No.: 30.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/5/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-16.5'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWN AND RUST BROWN MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.34 in
Specimen Area: 6.22 in^2
Specimen Volume: 39.43 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 19

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	7.2	7.2	0	0.000	2.1578	2.1578	1.000	2.1578	0
2	0.06	7.6326	7.2	0.26768	0.619	2.3227	1.8901	1.229	2.1064	0.2163
3	0.12	7.8246	7.2	0.39948	0.640	2.3829	1.7583	1.355	2.0706	0.31231
4	0.18	7.9246	7.2	0.49104	0.678	2.3913	1.6668	1.435	2.029	0.36229
5	0.25	8.0036	7.2	0.56744	0.706	2.394	1.5904	1.505	1.9922	0.4018
6	0.31	8.0697	7.2	0.63042	0.725	2.3971	1.5274	1.569	1.9622	0.43486
7	0.38	8.1272	7.2	0.68582	0.740	2.3992	1.472	1.630	1.9356	0.4636
8	0.44	8.1809	7.2	0.73656	0.751	2.4021	1.4212	1.690	1.9117	0.49045
9	0.51	8.2254	7.2	0.7803	0.761	2.4029	1.3775	1.744	1.8902	0.5127
10	0.57	8.265	7.2	0.81937	0.769	2.4034	1.3384	1.796	1.8709	0.53249
11	0.63	8.3003	7.2	0.85495	0.777	2.4031	1.3028	1.845	1.853	0.55013
12	0.70	8.333	7.2	0.88761	0.783	2.4032	1.2702	1.892	1.8367	0.56651
13	0.76	8.367	7.2	0.91851	0.787	2.4063	1.2393	1.942	1.8228	0.58349
14	0.89	8.425	7.2	0.96925	0.791	2.4136	1.1885	2.031	1.8011	0.61251
15	1.02	8.4804	7.2	1.0147	0.792	2.4235	1.1431	2.120	1.7833	0.64022
16	1.15	8.5273	7.2	1.0526	0.793	2.4324	1.1051	2.201	1.7688	0.66363
17	1.41	8.615	7.2	1.115	0.788	2.4577	1.0427	2.357	1.7502	0.7075
18	1.54	8.6536	7.2	1.1384	0.783	2.473	1.0194	2.426	1.7462	0.7268
19	2.32	8.8307	7.2	1.2393	0.760	2.5492	0.91853	2.775	1.7339	0.81533
20	3.11	8.9608	7.2	1.283	0.729	2.6356	0.87479	3.013	1.7552	0.88039
21	3.89	9.0591	7.2	1.2993	0.699	2.7176	0.85846	3.166	1.788	0.92957
22	4.67	9.1323	7.2	1.2976	0.672	2.7925	0.86021	3.246	1.8263	0.96614
23	5.46	9.1852	7.2	1.2778	0.644	2.8652	0.88004	3.256	1.8726	0.9926
24	6.25	9.2324	7.2	1.2603	0.620	2.9299	0.89753	3.264	1.9137	1.0162
25	7.04	9.2747	7.2	1.2422	0.599	2.9903	0.91561	3.266	1.9529	1.0373
26	7.82	9.3057	7.2	1.2194	0.579	3.0441	0.93836	3.244	1.9912	1.0529
27	8.60	9.3311	7.2	1.1996	0.563	3.0893	0.95818	3.224	2.0237	1.0655
28	9.39	9.3527	7.2	1.1815	0.549	3.1289	0.97626	3.205	2.0526	1.0763
29	10.18	9.372	7.2	1.1687	0.538	3.1611	0.98909	3.196	2.0751	1.086
30	10.96	9.3847	7.2	1.1535	0.528	3.189	1.0043	3.175	2.0966	1.0924
31	11.75	9.3972	7.2	1.1419	0.520	3.2131	1.0159	3.163	2.1145	1.0986
32	12.54	9.4007	7.2	1.129	0.513	3.2295	1.0287	3.139	2.1291	1.1004
33	13.31	9.4067	7.2	1.1209	0.508	3.2436	1.0369	3.128	2.1402	1.1033
34	14.10	9.4082	7.2	1.1092	0.502	3.2567	1.0486	3.106	2.1527	1.1041
35	14.88	9.4059	7.2	1.1028	0.500	3.2608	1.055	3.091	2.1579	1.1029
36	15.67	9.399	7.2	1.0941	0.498	3.2628	1.0637	3.067	2.1633	1.0995

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-012 S-7
Sample No.: S-7
Test No.: 60.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/5/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-16.5'
Elevation: ----

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Soil Description: BROWN AND RUST BROWN MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767.

Specimen Height: 6.26 in
Specimen Area: 6.29 in^2
Specimen Volume: 39.33 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 19

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.2881	0	0	5.0794	9.36	9.36
2	5	0.055149	6.2915	52.036	0.59549	5.5563	9.36	9.9555
3	10	0.11755	6.2955	71.569	0.81852	5.8035	9.36	10.179
4	15	0.18141	6.2995	84.326	0.96381	5.9774	9.36	10.324
5	20	0.24672	6.3036	94.702	1.0817	6.1181	9.36	10.442
6	25	0.31203	6.3078	103.75	1.1843	6.2356	9.36	10.544
7	30	0.37733	6.3119	111.85	1.2759	6.3392	9.36	10.636
8	35	0.44119	6.3159	119.26	1.3596	6.4305	9.36	10.72
9	40	0.5065	6.3201	125.99	1.4353	6.5113	9.36	10.795
10	45	0.5718	6.3242	132.6	1.5097	6.5858	9.36	10.87
11	50	0.63566	6.3283	138.48	1.5755	6.6503	9.36	10.936
12	55	0.70097	6.3325	143.88	1.6359	6.7091	9.36	10.996
13	60	0.76628	6.3366	149.33	1.6968	6.7667	9.36	11.057
14	70	0.89544	6.3449	158.97	1.8039	6.8626	9.36	11.164
15	80	1.0261	6.3533	167.86	1.9023	6.9446	9.36	11.262
16	90	1.1567	6.3617	176.06	1.9927	7.0185	9.36	11.353
17	100	1.2873	6.3701	183	2.0684	7.0773	9.36	11.428
18	110	1.4165	6.3784	189.56	2.1398	7.1325	9.36	11.5
19	120	1.5471	6.3869	196.55	2.2157	7.1802	9.36	11.576
20	180	2.3351	6.4384	227.25	2.5413	7.3582	9.36	11.901
21	240	3.1261	6.491	249.54	2.768	7.4332	9.36	12.128
22	300	3.9156	6.5443	267.01	2.9376	7.4565	9.36	12.298
23	360	4.7123	6.599	281.56	3.0721	7.453	9.36	12.432
24	420	5.5149	6.6551	294.48	3.1859	7.4338	9.36	12.546
25	480	6.3087	6.7115	305.17	3.2739	7.4059	9.36	12.634
26	540	7.1069	6.7692	315.07	3.3513	7.3716	9.36	12.711
27	600	7.9066	6.8279	323.91	3.4156	7.3349	9.36	12.776
28	660	8.699	6.8872	332.28	3.4737	7.2994	9.36	12.834
29	720	9.5044	6.9485	340.75	3.5308	7.2645	9.36	12.891
30	780	10.304	7.0104	347.84	3.5725	7.2302	9.36	12.932
31	840	11.102	7.0734	354.51	3.6086	7.1977	9.36	12.969
32	900	11.898	7.1372	361.34	3.6452	7.1668	9.36	13.005
33	960	12.697	7.2026	367.64	3.675	7.1383	9.36	13.035
34	1020	13.49	7.2686	373.2	3.6967	7.1104	9.36	13.057
35	1080	14.297	7.337	378.28	3.7121	7.0837	9.36	13.072
36	1140	15.095	7.406	383.31	3.7265	7.0621	9.36	13.086

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-012 S-7
Sample No.: S-7
Test No.: 60.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/5/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 15.0'-16.5'
Elevation: ----

Soil Description: BROWN AND RUST BROWN MOTTLED LEAN CLAY CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D 4767.

Specimen Height: 6.26 in
Specimen Area: 6.29 in^2
Specimen Volume: 39.33 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 48

Plastic Limit: 19

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	9.36	9.36	0	0.000	4.2806	4.2806	1.000	4.2806	0
2	0.06	9.9555	9.36	0.47694	0.801	4.3992	3.8037	1.157	4.1015	0.29775
3	0.12	10.179	9.36	0.72413	0.885	4.375	3.5565	1.230	3.9658	0.40926
4	0.18	10.324	9.36	0.89803	0.932	4.3464	3.3826	1.285	3.8645	0.4819
5	0.25	10.442	9.36	1.0388	0.960	4.3235	3.2419	1.334	3.7827	0.54084
6	0.31	10.544	9.36	1.1563	0.976	4.3087	3.1244	1.379	3.7165	0.59215
7	0.38	10.636	9.36	1.2598	0.987	4.2967	3.0208	1.422	3.6588	0.63796
8	0.44	10.72	9.36	1.3511	0.994	4.2891	2.9295	1.464	3.6093	0.67979
9	0.51	10.795	9.36	1.432	0.998	4.2839	2.8487	1.504	3.5663	0.71764
10	0.57	10.87	9.36	1.5064	0.998	4.2839	2.7742	1.544	3.5291	0.75483
11	0.64	10.936	9.36	1.571	0.997	4.2852	2.7097	1.581	3.4974	0.78777
12	0.70	10.996	9.36	1.6297	0.996	4.2868	2.6509	1.617	3.4689	0.81795
13	0.77	11.057	9.36	1.6873	0.994	4.2901	2.5933	1.654	3.4417	0.84839
14	0.90	11.164	9.36	1.7833	0.989	4.3013	2.4974	1.722	3.3993	0.90195
15	1.03	11.262	9.36	1.8653	0.981	4.3177	2.4154	1.788	3.3665	0.95115
16	1.16	11.353	9.36	1.9391	0.973	4.3341	2.3415	1.851	3.3378	0.99633
17	1.29	11.428	9.36	1.9979	0.966	4.3511	2.2827	1.906	3.3169	1.0342
18	1.42	11.5	9.36	2.0531	0.960	4.3673	2.2275	1.961	3.2974	1.0699
19	1.55	11.576	9.36	2.1008	0.948	4.3955	2.1798	2.016	3.2877	1.1079
20	2.34	11.901	9.36	2.2788	0.897	4.5432	2.0018	2.270	3.2725	1.2707
21	3.13	12.128	9.36	2.3539	0.850	4.6947	1.9268	2.437	3.3108	1.384
22	3.92	12.298	9.36	2.3771	0.809	4.8411	1.9035	2.543	3.3723	1.4688
23	4.71	12.432	9.36	2.3736	0.773	4.9791	1.907	2.611	3.443	1.536
24	5.51	12.546	9.36	2.3544	0.739	5.1121	1.9262	2.654	3.5192	1.593
25	6.31	12.634	9.36	2.3265	0.711	5.228	1.9541	2.675	3.5911	1.6369
26	7.11	12.711	9.36	2.2922	0.684	5.3397	1.9884	2.685	3.6641	1.6756
27	7.91	12.776	9.36	2.2556	0.660	5.4407	2.0251	2.687	3.7329	1.7078
28	8.70	12.834	9.36	2.2201	0.639	5.5342	2.0606	2.686	3.7974	1.7368
29	9.50	12.891	9.36	2.1852	0.619	5.6263	2.0955	2.685	3.8609	1.7654
30	10.30	12.932	9.36	2.1509	0.602	5.7022	2.1298	2.677	3.916	1.7862
31	11.10	12.969	9.36	2.1183	0.587	5.7709	2.1623	2.669	3.9666	1.8043
32	11.90	13.005	9.36	2.0875	0.573	5.8383	2.1932	2.662	4.0158	1.8226
33	12.70	13.035	9.36	2.059	0.560	5.8967	2.2217	2.654	4.0592	1.8375
34	13.49	13.057	9.36	2.031	0.549	5.9463	2.2496	2.643	4.098	1.8484
35	14.30	13.072	9.36	2.0043	0.540	5.9885	2.2763	2.631	4.1324	1.8561
36	15.09	13.086	9.36	1.9828	0.532	6.0243	2.2979	2.622	4.1611	1.8632

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

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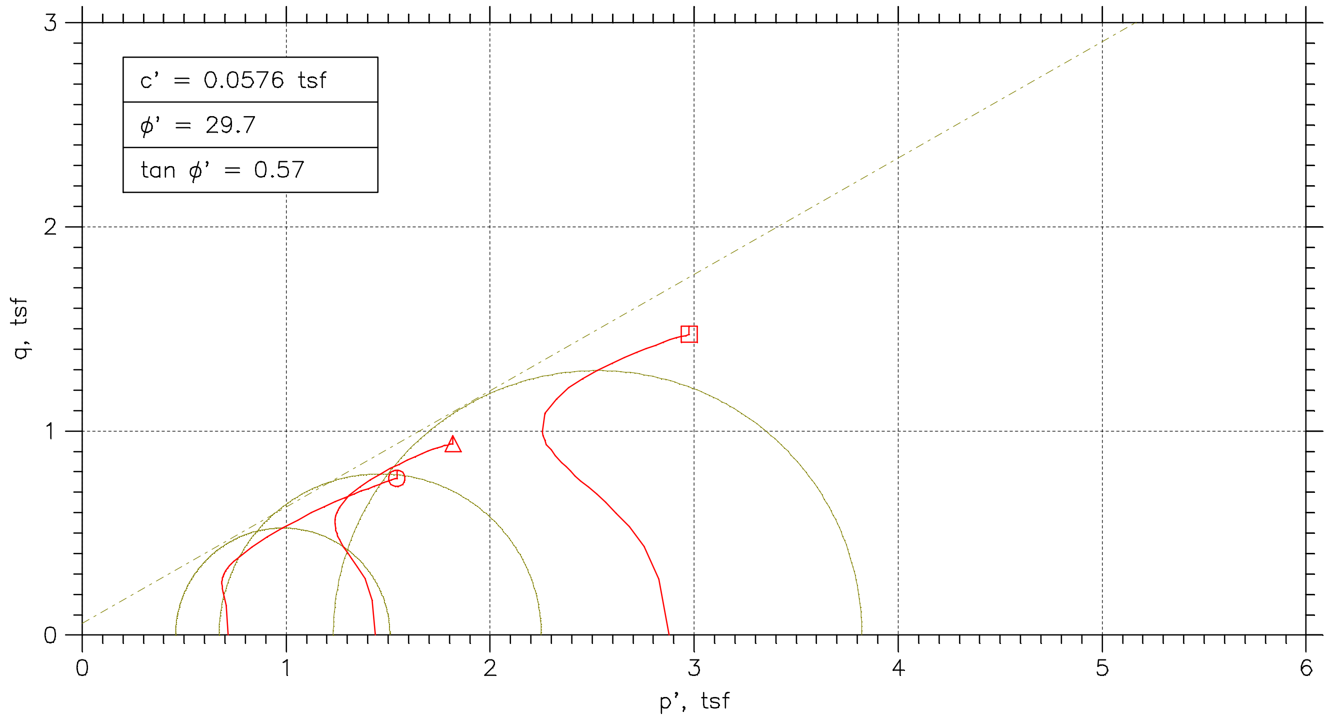
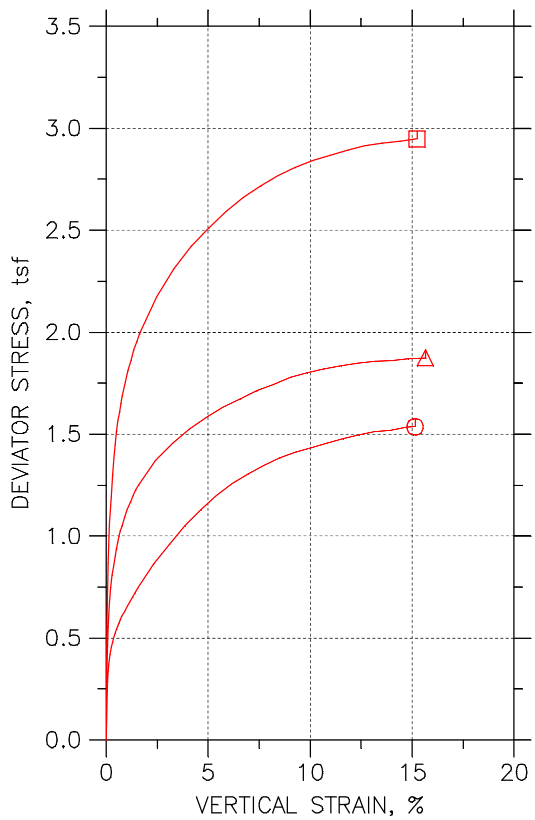
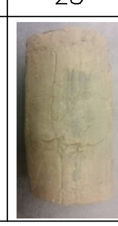




	Symbol	○	△	□	
	Test No.	10.0 PSI	20.0 PSI	40.0 PSI	
Initial	Diameter, in	2.8386	2.8571	2.8543	
Initial	Height, in	6.0421	6.0181	5.878	
Initial	Water Content, %	19.07	19.02	18.95	
Initial	Dry Density, pcf	111.5	111.3	111.5	
Initial	Saturation, %	99.28	98.47	98.47	
Initial	Void Ratio	0.52245	0.52554	0.52343	
Before Shear	Water Content, %	18.80	18.40	16.50	
Before Shear	Dry Density, pcf	112.4	113.2	117.2	
Before Shear	Saturation, %	100.00	100.00	100.00	
Before Shear	Void Ratio	0.51129	0.50044	0.4489	
Before Shear	Back Press., tsf	5.0445	5.044	5.0432	
	Minor Prin. Stress, tsf	0.71549	1.436	2.8768	
	Max. Dev. Stress, tsf	1.536	1.8745	2.9478	
	Time to Failure, min	1174.7	1140	1080	
	Strain Rate, %/min	0.02	0.02	0.02	
	B-Value	0.95	0.97	0.97	
	Estimated Specific Gravity	2.72	2.72	2.72	
	Liquid Limit	49	49	49	
	Plastic Limit	21	21	21	
	Plasticity Index	28	28	28	
	Failure Sketch				

Project: DYNEGY EDWARDS
Location: BARTONVILLE, IL
Project No.: MR155218
Boring No.: EDW-013 S3
Sample Type: 3.0'' ST
Description: BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

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CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

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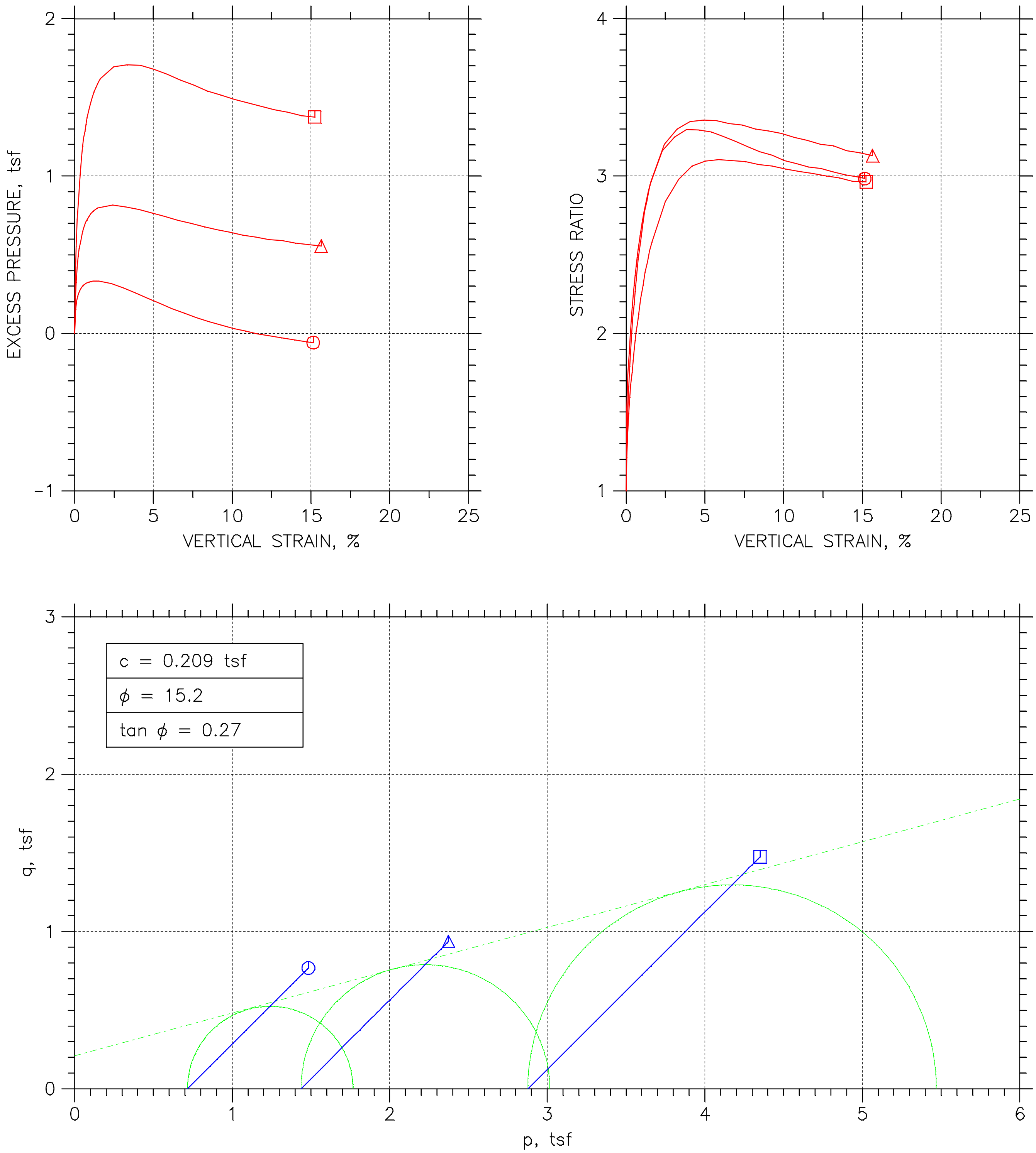

Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
Boring No.: EDW-013 S3	Tested By: BCM	Checked By: WPQ
Sample No.: S-3	Test Date: 11/4/15	Depth: 6.0'-8.0'
Test No.: EDW-013 S3	Sample Type: 3.0" ST	Elevation: -----
Description: BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL CL		
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767		

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TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-013 S3
Sample No.: S-3
Test No.: 10.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/4/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 6.0'-8.0'
Elevation: -----

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Soil Description: BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

Specimen Height: 6.04 in
Specimen Area: 6.33 in^2
Specimen Volume: 38.24 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 49

Plastic Limit: 21

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.3284	0	0	5.0445	5.76	5.76
2	5.0002	0.058512	6.3321	25.429	0.28914	5.1976	5.76	6.0491
3	10	0.12273	6.3362	32.957	0.3745	5.2511	5.76	6.1345
4	15	0.18695	6.3402	36.958	0.4197	5.2802	5.76	6.1797
5	20	0.25117	6.3443	39.959	0.45348	5.3	5.76	6.2135
6	25	0.31682	6.3485	42.381	0.48065	5.3139	5.76	6.2407
7	30	0.38104	6.3526	44.539	0.50481	5.3273	5.76	6.2648
8	35	0.44526	6.3567	46.277	0.52416	5.3372	5.76	6.2842
9	40	0.50948	6.3608	47.909	0.5423	5.3454	5.76	6.3023
10	45	0.5737	6.3649	49.488	0.55981	5.3512	5.76	6.3198
11	50	0.63935	6.3691	50.91	0.57551	5.3564	5.76	6.3355
12	55	0.70357	6.3732	52.278	0.5906	5.3617	5.76	6.3506
13	60	0.76922	6.3774	53.542	0.60448	5.3657	5.76	6.3645
14	70.001	0.89623	6.3856	55.911	0.63042	5.371	5.76	6.3904
15	80.001	1.0232	6.3938	58.175	0.6551	5.375	5.76	6.4151
16	90.001	1.1503	6.402	60.386	0.67913	5.3774	5.76	6.4391
17	100	1.2787	6.4104	62.387	0.70072	5.3779	5.76	6.4607
18	110	1.4043	6.4185	64.387	0.72227	5.3785	5.76	6.4823
19	120	1.5342	6.427	66.493	0.74491	5.3768	5.76	6.5049
20	180	2.3134	6.4783	77.602	0.86247	5.3611	5.76	6.6225
21	240	3.0926	6.5303	87.078	0.96008	5.3331	5.76	6.7201
22	300	3.8561	6.5822	96.028	1.0504	5.3023	5.76	6.8104
23	360	4.6339	6.6359	103.98	1.1282	5.268	5.76	6.8882
24	420	5.4102	6.6903	111.3	1.1977	5.2348	5.76	6.9577
25	480	6.1766	6.745	117.72	1.2566	5.2016	5.76	7.0166
26	540	6.9544	6.8014	123.3	1.3053	5.172	5.76	7.0653
27	600	7.7321	6.8587	128.09	1.3446	5.1446	5.76	7.1046
28	660	8.4985	6.9162	132.78	1.3822	5.1184	5.76	7.1422
29	720	9.2777	6.9756	136.88	1.4129	5.0975	5.76	7.1729
30	780	10.057	7.036	140.2	1.4347	5.0759	5.76	7.1947
31	840	10.819	7.0961	143.62	1.4572	5.0591	5.76	7.2172
32	900	11.602	7.159	146.99	1.4783	5.0416	5.76	7.2383
33	960	12.382	7.2227	150.1	1.4963	5.0288	5.76	7.2563
34	1020	13.151	7.2866	152.89	1.5107	5.0148	5.76	7.2707
35	1080	13.932	7.3527	155.15	1.5193	5.0032	5.76	7.2793
36	1140	14.706	7.4195	157.94	1.5327	4.9921	5.76	7.2927
37	1174.7	15.146	7.458	159.1	1.536	4.9857	5.76	7.296

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-013 S3
Sample No.: S-3
Test No.: 10.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/4/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 6.0'-8.0'
Elevation: -----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

Specimen Height: 6.04 in
Specimen Area: 6.33 in^2
Specimen Volume: 38.24 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 49

Plastic Limit: 21

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	5.76	5.76	0	0.000	0.71549	0.71549	1.000	0.71549	0
2	0.06	6.0491	5.76	0.15304	0.529	0.85158	0.56245	1.514	0.70701	0.14457
3	0.12	6.1345	5.76	0.20658	0.552	0.88341	0.50891	1.736	0.69616	0.18725
4	0.19	6.1797	5.76	0.23567	0.562	0.89951	0.47981	1.875	0.68966	0.20985
5	0.25	6.2135	5.76	0.25546	0.563	0.91352	0.46003	1.986	0.68677	0.22674
6	0.32	6.2407	5.76	0.26942	0.561	0.92672	0.44606	2.078	0.68639	0.24033
7	0.38	6.2648	5.76	0.2828	0.560	0.93749	0.43268	2.167	0.68508	0.2524
8	0.45	6.2842	5.76	0.2927	0.558	0.94695	0.42279	2.240	0.68487	0.26208
9	0.51	6.3023	5.76	0.30084	0.555	0.95694	0.41464	2.308	0.68579	0.27115
10	0.57	6.3198	5.76	0.30666	0.548	0.96863	0.40882	2.369	0.68873	0.27991
11	0.64	6.3355	5.76	0.3119	0.542	0.9791	0.40359	2.426	0.69134	0.28776
12	0.70	6.3506	5.76	0.31714	0.537	0.98895	0.39835	2.483	0.69365	0.2953
13	0.77	6.3645	5.76	0.32121	0.531	0.99875	0.39428	2.533	0.69651	0.30224
14	0.90	6.3904	5.76	0.32645	0.518	1.0195	0.38904	2.620	0.70425	0.31521
15	1.02	6.4151	5.76	0.33052	0.505	1.0401	0.38496	2.702	0.71252	0.32755
16	1.15	6.4391	5.76	0.33285	0.490	1.0618	0.38264	2.775	0.7222	0.33956
17	1.28	6.4607	5.76	0.33343	0.476	1.0828	0.38206	2.834	0.73241	0.35036
18	1.40	6.4823	5.76	0.33401	0.462	1.1037	0.38147	2.893	0.74261	0.36113
19	1.53	6.5049	5.76	0.33227	0.446	1.1281	0.38322	2.944	0.75567	0.37245
20	2.31	6.6225	5.76	0.31656	0.367	1.2614	0.39893	3.162	0.83017	0.43124
21	3.09	6.7201	5.76	0.28862	0.301	1.3869	0.42686	3.249	0.9069	0.48004
22	3.86	6.8104	5.76	0.25778	0.245	1.5081	0.4577	3.295	0.98291	0.52521
23	4.63	6.8882	5.76	0.22345	0.198	1.6202	0.49203	3.293	1.0561	0.56408
24	5.41	6.9577	5.76	0.19028	0.159	1.7229	0.5252	3.281	1.1241	0.59887
25	6.18	7.0166	5.76	0.15711	0.125	1.815	0.55837	3.250	1.1867	0.6283
26	6.95	7.0653	5.76	0.12744	0.098	1.8933	0.58805	3.220	1.2407	0.65263
27	7.73	7.1046	5.76	0.10009	0.074	1.96	0.6154	3.185	1.2877	0.67232
28	8.50	7.1422	5.76	0.073902	0.053	2.0238	0.64158	3.154	1.3327	0.69112
29	9.28	7.1729	5.76	0.052953	0.037	2.0754	0.66253	3.133	1.369	0.70643
30	10.06	7.1947	5.76	0.031423	0.022	2.1187	0.68406	3.097	1.4014	0.71734
31	10.82	7.2172	5.76	0.014548	0.010	2.1582	0.70094	3.079	1.4296	0.72862
32	11.60	7.2383	5.76	-0.0029095	-0.002	2.1967	0.7184	3.058	1.4576	0.73916
33	12.38	7.2563	5.76	-0.015711	-0.011	2.2275	0.7312	3.046	1.4793	0.74813
34	13.15	7.2707	5.76	-0.029677	-0.020	2.2559	0.74516	3.027	1.5005	0.75534
35	13.93	7.2793	5.76	-0.041315	-0.027	2.2761	0.7568	3.008	1.5164	0.75964
36	14.71	7.2927	5.76	-0.052371	-0.034	2.3005	0.76786	2.996	1.5342	0.76634
37	15.15	7.296	5.76	-0.058772	-0.038	2.3102	0.77426	2.984	1.5422	0.76798

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-013 S3
Sample No.: ----
Test No.: 20.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/4/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 6.0'-8.0'
Elevation: ----

Terracon
Consulting Engineers & Scientists

Soil Description: BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.02 in
Specimen Area: 6.41 in^2
Specimen Volume: 38.58 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 49

Plastic Limit: 21

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.4112	0	0	5.044	6.48	6.48
2	5.0001	0.036568	6.4135	30.226	0.33933	5.2282	6.48	6.8193
3	10	0.095395	6.4173	49.495	0.55532	5.3711	6.48	7.0353
4	15	0.16217	6.4216	59.764	0.67009	5.4644	6.48	7.1501
5	20	0.22895	6.4259	66.858	0.74912	5.5321	6.48	7.2291
6	25	0.29572	6.4302	72.098	0.8073	5.5828	6.48	7.2873
7	30	0.36409	6.4346	76.704	0.85828	5.6254	6.48	7.3383
8	35	0.43405	6.4391	80.568	0.90088	5.6604	6.48	7.3809
9	40	0.50082	6.4434	83.903	0.93755	5.689	6.48	7.4175
10	45	0.57078	6.448	86.92	0.97058	5.7129	6.48	7.4506
11	50	0.63756	6.4523	89.62	1.0001	5.7309	6.48	7.4801
12	55	0.70433	6.4566	92.002	1.0259	5.7496	6.48	7.5059
13	60	0.77429	6.4612	94.384	1.0518	5.7642	6.48	7.5318
14	70	0.91261	6.4702	98.513	1.0962	5.7881	6.48	7.5762
15	80.001	1.0478	6.479	101.9	1.1324	5.8068	6.48	7.6124
16	90.001	1.1861	6.4881	105.29	1.1684	5.8219	6.48	7.6484
17	100	1.3212	6.497	108.15	1.1985	5.8301	6.48	7.6785
18	110	1.4595	6.5061	110.79	1.2261	5.8394	6.48	7.7061
19	120	1.5947	6.5151	113.28	1.2519	5.8435	6.48	7.7319
20	180	2.423	6.5704	125.03	1.3702	5.8581	6.48	7.8502
21	240	3.2498	6.6265	133.87	1.4546	5.847	6.48	7.9346
22	300	4.0702	6.6832	141.44	1.5238	5.8307	6.48	8.0038
23	360	4.8969	6.7413	147.9	1.5797	5.8091	6.48	8.0597
24	420	5.7253	6.8005	154.2	1.6326	5.7863	6.48	8.1126
25	480	6.5521	6.8607	159.44	1.6733	5.763	6.48	8.1533
26	540	7.3804	6.922	164.79	1.7141	5.742	6.48	8.1941
27	600	8.2072	6.9844	169.34	1.7457	5.7204	6.48	8.2257
28	660	9.0339	7.0479	174.05	1.7781	5.7024	6.48	8.2581
29	720	9.8591	7.1124	177.97	1.8016	5.686	6.48	8.2816
30	780	10.684	7.1781	181.41	1.8196	5.6697	6.48	8.2996
31	840	11.508	7.2449	184.64	1.835	5.6563	6.48	8.315
32	900	12.335	7.3132	187.76	1.8486	5.6406	6.48	8.3286
33	960	13.166	7.3832	190.52	1.8579	5.633	6.48	8.3379
34	1020	13.991	7.4541	192.74	1.8617	5.619	6.48	8.3417
35	1080	14.821	7.5267	195.44	1.8695	5.6096	6.48	8.3495
36	1140	15.646	7.6003	197.87	1.8745	5.5997	6.48	8.3545

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-013 S3
Sample No.: ----
Test No.: 20.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/4/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 6.0'-8.0'
Elevation: ----

Soil Description: BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.02 in
Specimen Area: 6.41 in^2
Specimen Volume: 38.58 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 49

Plastic Limit: 21

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	6.48	6.48	0	0.000	1.436	1.436	1.000	1.436	0
2	0.04	6.8193	6.48	0.18429	0.543	1.5911	1.2518	1.271	1.4214	0.16966
3	0.10	7.0353	6.48	0.32717	0.589	1.6642	1.1089	1.501	1.3865	0.27766
4	0.16	7.1501	6.48	0.42048	0.627	1.6857	1.0156	1.660	1.3506	0.33504
5	0.23	7.2291	6.48	0.48812	0.652	1.697	0.94792	1.790	1.3225	0.37456
6	0.30	7.2873	6.48	0.53886	0.667	1.7045	0.89718	1.900	1.3008	0.40365
7	0.36	7.3383	6.48	0.58143	0.677	1.7129	0.85461	2.004	1.2837	0.42914
8	0.43	7.3809	6.48	0.61643	0.684	1.7205	0.81962	2.099	1.2701	0.45044
9	0.50	7.4175	6.48	0.645	0.688	1.7286	0.79104	2.185	1.2598	0.46877
10	0.57	7.4506	6.48	0.66891	0.689	1.7377	0.76713	2.265	1.2524	0.48529
11	0.64	7.4801	6.48	0.68699	0.687	1.7491	0.74905	2.335	1.2491	0.50003
12	0.70	7.5059	6.48	0.70565	0.688	1.7563	0.73039	2.405	1.2434	0.51297
13	0.77	7.5318	6.48	0.72023	0.685	1.7676	0.71581	2.469	1.2417	0.52588
14	0.91	7.5762	6.48	0.74414	0.679	1.7881	0.6919	2.584	1.24	0.54812
15	1.05	7.6124	6.48	0.7628	0.674	1.8056	0.67324	2.682	1.2394	0.5662
16	1.19	7.6484	6.48	0.77797	0.666	1.8265	0.65808	2.775	1.2423	0.58421
17	1.32	7.6785	6.48	0.78613	0.656	1.8484	0.64991	2.844	1.2492	0.59925
18	1.46	7.7061	6.48	0.79546	0.649	1.8667	0.64058	2.914	1.2536	0.61305
19	1.59	7.7319	6.48	0.79954	0.639	1.8884	0.6365	2.967	1.2625	0.62596
20	2.42	7.8502	6.48	0.81412	0.594	1.9921	0.62192	3.203	1.307	0.68508
21	3.25	7.9346	6.48	0.80304	0.552	2.0876	0.633	3.298	1.3603	0.7273
22	4.07	8.0038	6.48	0.78671	0.516	2.1731	0.64933	3.347	1.4112	0.76191
23	4.90	8.0597	6.48	0.76514	0.484	2.2506	0.67091	3.355	1.4607	0.78983
24	5.73	8.1126	6.48	0.74239	0.455	2.3262	0.69365	3.354	1.5099	0.8163
25	6.55	8.1533	6.48	0.71907	0.430	2.3903	0.71698	3.334	1.5536	0.83664
26	7.38	8.1941	6.48	0.69807	0.407	2.452	0.73797	3.323	1.595	0.85703
27	8.21	8.2257	6.48	0.67649	0.388	2.5052	0.75955	3.298	1.6324	0.87284
28	9.03	8.2581	6.48	0.65841	0.370	2.5557	0.77763	3.287	1.6667	0.88905
29	9.86	8.2816	6.48	0.64209	0.356	2.5956	0.79396	3.269	1.6948	0.90081
30	10.68	8.2996	6.48	0.62576	0.344	2.6299	0.81029	3.246	1.7201	0.90982
31	11.51	8.315	6.48	0.61234	0.334	2.6587	0.8237	3.228	1.7412	0.91748
32	12.33	8.3286	6.48	0.5966	0.323	2.688	0.83945	3.202	1.7637	0.92428
33	13.17	8.3379	6.48	0.58902	0.317	2.7049	0.84703	3.193	1.776	0.92893
34	13.99	8.3417	6.48	0.57502	0.309	2.7227	0.86102	3.162	1.7919	0.93084
35	14.82	8.3495	6.48	0.56569	0.303	2.7399	0.87036	3.148	1.8051	0.93477
36	15.65	8.3545	6.48	0.55577	0.296	2.7548	0.88027	3.129	1.8175	0.93725

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-013 S3
Sample No.: S-3
Test No.: 40.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/4/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 6.0'-8.0'
Elevation: ----

Soil Description: BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 5.88 in
Specimen Area: 6.40 in^2
Specimen Volume: 37.61 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 49

Plastic Limit: 21

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.3988	0	0	5.0432	7.92	7.92
2	5.0041	0.048179	6.4019	48.62	0.54682	5.3658	7.92	8.4668
3	10.004	0.10879	6.4058	77.205	0.86778	5.6	7.92	8.7878
4	15.004	0.17407	6.41	94.356	1.0599	5.7689	7.92	8.9799
5	20.004	0.23934	6.4142	106.47	1.1952	5.9005	7.92	9.1152
6	25.004	0.30772	6.4186	115.76	1.2985	6.0036	7.92	9.2185
7	30	0.37611	6.423	123.2	1.3811	6.0892	7.92	9.3011
8	35	0.44449	6.4274	129.5	1.4506	6.1649	7.92	9.3706
9	40	0.51287	6.4318	135	1.5113	6.2313	7.92	9.4313
10	45	0.58125	6.4362	139.57	1.5613	6.2855	7.92	9.4813
11	50	0.65119	6.4407	143.87	1.6083	6.3309	7.92	9.5283
12	55	0.72113	6.4453	147.8	1.6511	6.3746	7.92	9.5711
13	60	0.78951	6.4497	151.16	1.6874	6.413	7.92	9.6074
14	70	0.93094	6.4589	157.56	1.7563	6.4788	7.92	9.6763
15	80	1.0724	6.4682	162.96	1.814	6.5278	7.92	9.734
16	90	1.2138	6.4774	167.78	1.865	6.5767	7.92	9.785
17	100	1.3568	6.4868	172.3	1.9124	6.607	7.92	9.8324
18	110	1.4982	6.4961	176.23	1.9532	6.639	7.92	9.8732
19	120	1.6381	6.5054	179.9	1.9911	6.6605	7.92	9.9111
20	180	2.4804	6.5616	198.15	2.1743	6.7374	7.92	10.094
21	240	3.3274	6.619	212.42	2.3106	6.7514	7.92	10.231
22	300	4.176	6.6777	224.69	2.4227	6.7467	7.92	10.343
23	360	5.0277	6.7375	234.87	2.5099	6.7217	7.92	10.43
24	420	5.8747	6.7982	244.73	2.5919	6.6891	7.92	10.512
25	480	6.7264	6.8602	253.49	2.6604	6.6512	7.92	10.58
26	540	7.5718	6.923	261.25	2.717	6.6209	7.92	10.637
27	600	8.4204	6.9871	268.49	2.7667	6.5848	7.92	10.687
28	660	9.2674	7.0524	275.04	2.808	6.5598	7.92	10.728
29	720	10.122	7.1194	280.92	2.841	6.5301	7.92	10.761
30	780	10.979	7.1879	286.37	2.8685	6.5068	7.92	10.789
31	840	11.838	7.258	291.67	2.8934	6.4858	7.92	10.813
32	900	12.685	7.3284	296.55	2.9135	6.4643	7.92	10.834
33	960	13.532	7.4002	300.74	2.9261	6.4474	7.92	10.846
34	1020	14.391	7.4745	304.73	2.9354	6.4276	7.92	10.855
35	1080	15.24	7.5493	309.08	2.9478	6.4183	7.92	10.868

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-013 S3
Sample No.: S-3
Test No.: 40.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/4/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 6.0'-8.0'
Elevation: ----

Soil Description: BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 5.88 in
Specimen Area: 6.40 in^2
Specimen Volume: 37.61 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 49

Plastic Limit: 21

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	7.92	7.92	0	0.000	2.8768	2.8768	1.000	2.8768	0
2	0.05	8.4668	7.92	0.32266	0.590	3.101	2.5542	1.214	2.8276	0.27341
3	0.11	8.7878	7.92	0.55679	0.642	3.1878	2.32	1.374	2.7539	0.43389
4	0.17	8.9799	7.92	0.72569	0.685	3.211	2.1511	1.493	2.6811	0.52993
5	0.24	9.1152	7.92	0.85732	0.717	3.2147	2.0195	1.592	2.6171	0.59758
6	0.31	9.2185	7.92	0.96041	0.740	3.2149	1.9164	1.678	2.5657	0.64924
7	0.38	9.3011	7.92	1.046	0.757	3.2119	1.8308	1.754	2.5213	0.69054
8	0.44	9.3706	7.92	1.1217	0.773	3.2057	1.7551	1.827	2.4804	0.72532
9	0.51	9.4313	7.92	1.1881	0.786	3.2	1.6887	1.895	2.4443	0.75564
10	0.58	9.4813	7.92	1.2423	0.796	3.1958	1.6345	1.955	2.4152	0.78065
11	0.65	9.5283	7.92	1.2877	0.801	3.1974	1.5891	2.012	2.3932	0.80414
12	0.72	9.5711	7.92	1.3314	0.806	3.1965	1.5454	2.068	2.371	0.82554
13	0.79	9.6074	7.92	1.3698	0.812	3.1944	1.507	2.120	2.3507	0.84371
14	0.93	9.6763	7.92	1.4357	0.817	3.1975	1.4412	2.219	2.3193	0.87817
15	1.07	9.734	7.92	1.4846	0.818	3.2062	1.3922	2.303	2.2992	0.90699
16	1.21	9.785	7.92	1.5335	0.822	3.2083	1.3433	2.388	2.2758	0.93251
17	1.36	9.8324	7.92	1.5638	0.818	3.2254	1.313	2.456	2.2692	0.95619
18	1.50	9.8732	7.92	1.5958	0.817	3.2342	1.281	2.525	2.2576	0.97662
19	1.64	9.9111	7.92	1.6174	0.812	3.2506	1.2595	2.581	2.255	0.99555
20	2.48	10.094	7.92	1.6943	0.779	3.3569	1.1826	2.839	2.2697	1.0872
21	3.33	10.231	7.92	1.7082	0.739	3.4792	1.1686	2.977	2.3239	1.1553
22	4.18	10.343	7.92	1.7036	0.703	3.5959	1.1733	3.065	2.3846	1.2113
23	5.03	10.43	7.92	1.6785	0.669	3.7082	1.1983	3.095	2.4532	1.2549
24	5.87	10.512	7.92	1.6459	0.635	3.8228	1.2309	3.106	2.5269	1.296
25	6.73	10.58	7.92	1.6081	0.604	3.9292	1.2688	3.097	2.599	1.3302
26	7.57	10.637	7.92	1.5778	0.581	4.0161	1.2991	3.092	2.6576	1.3585
27	8.42	10.687	7.92	1.5417	0.557	4.1018	1.3352	3.072	2.7185	1.3833
28	9.27	10.728	7.92	1.5166	0.540	4.1682	1.3602	3.064	2.7642	1.404
29	10.12	10.761	7.92	1.4869	0.523	4.2309	1.3899	3.044	2.8104	1.4205
30	10.98	10.789	7.92	1.4636	0.510	4.2817	1.4132	3.030	2.8475	1.4343
31	11.84	10.813	7.92	1.4427	0.499	4.3276	1.4342	3.017	2.8809	1.4467
32	12.69	10.834	7.92	1.4211	0.488	4.3692	1.4557	3.001	2.9125	1.4568
33	13.53	10.846	7.92	1.4042	0.480	4.3987	1.4726	2.987	2.9357	1.463
34	14.39	10.855	7.92	1.3844	0.472	4.4278	1.4924	2.967	2.9601	1.4677
35	15.24	10.868	7.92	1.3751	0.466	4.4495	1.5017	2.963	2.9756	1.4739

CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

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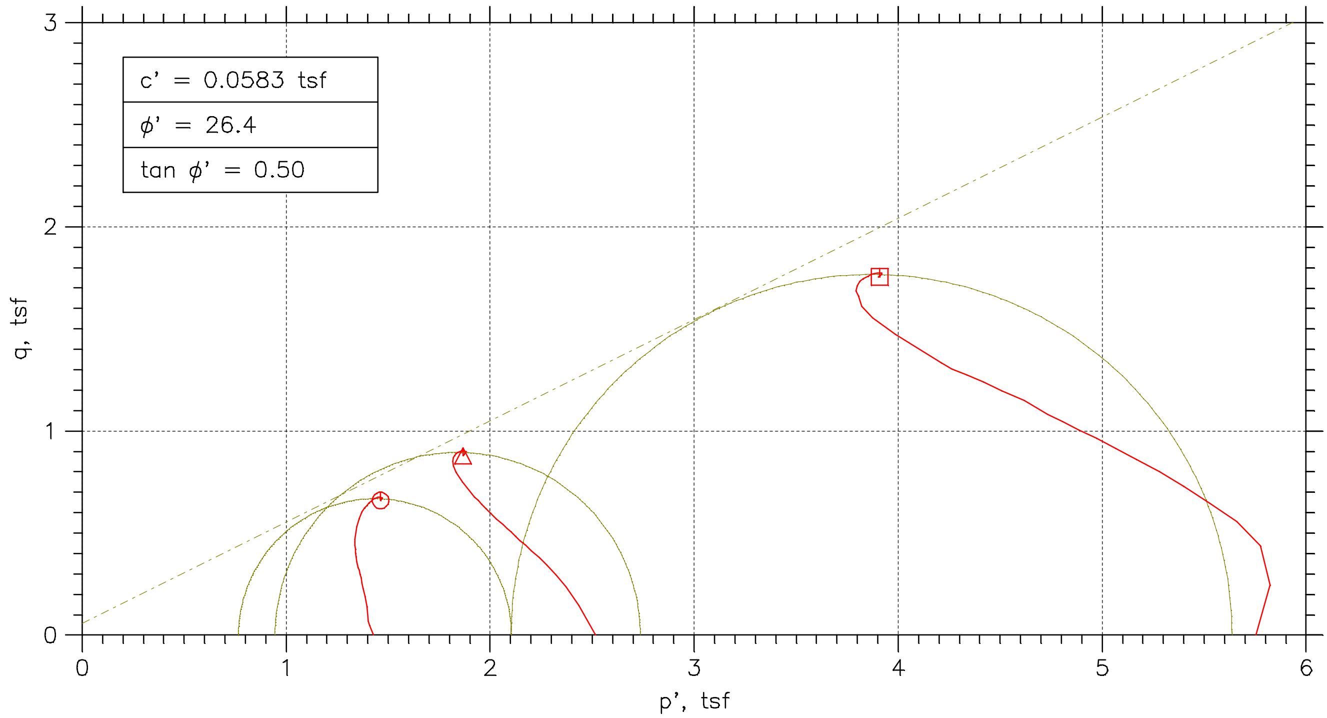

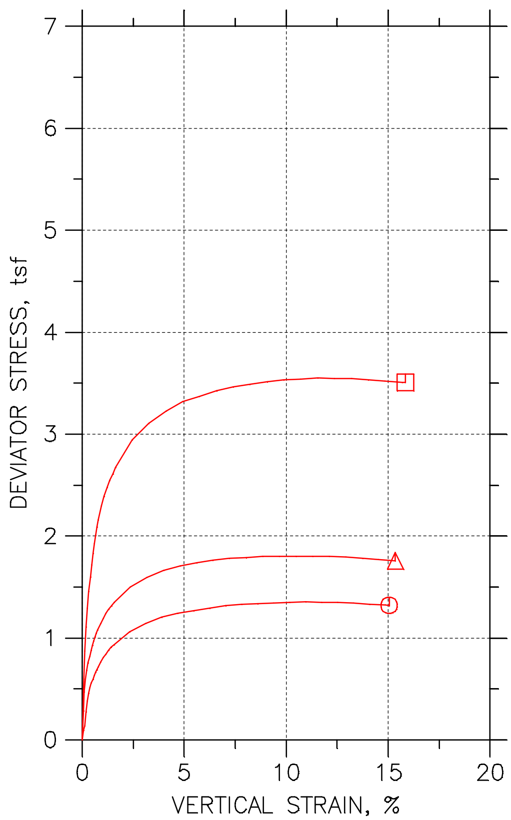

	Symbol	⦶	△	⊡	
	Test No.	20.0 PSI	40.0 PSI	80.0 PSI	
Initial	Diameter, in	2.8323	2.8394	2.8232	
Initial	Height, in	5.9835	6.1287	6.0461	
Initial	Water Content, %	35.45	32.69	30.23	
Initial	Dry Density, pcf	84.39	88.44	92.32	
Initial	Saturation, %	95.27	96.65	97.97	
Initial	Void Ratio	1.0122	0.91997	0.83931	
Before Shear	Water Content, %	27.91	28.32	23.10	
Before Shear	Dry Density, pcf	96.52	95.92	104.3	
Before Shear	Saturation, %	100.00	100.00	100.00	
Before Shear	Void Ratio	0.75927	0.7702	0.62821	
Before Shear	Back Press., tsf	5.0509	5.0422	1.4473	
	Minor Prin. Stress, tsf	1.4291	2.5178	5.7527	
	Max. Dev. Stress, tsf	1.3524	1.8029	3.5485	
	Time to Failure, min	840	780	840	
	Strain Rate, %/min	0.02	0.02	0.02	
	B-Value	0.98	0.99	0.96	
	Estimated Specific Gravity	2.72	2.72	2.72	
	Liquid Limit	42	42	42	
	Plastic Limit	23	23	23	
	Plasticity Index	19	19	19	
	Failure Sketch				

Project: DYNEGY EDWARDS

Location: BARTONVILLE, IL

Project No.: MR155218

Boring No.: EDW-013 S10

Sample Type: 3.0'' ST

Description: GRAY AND BROWN LEAN CLAY WITH SAND CL

Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

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CONSOLIDATED-UNDRAINED TRIAXIAL COMPRESSION TEST
ASTM D4767

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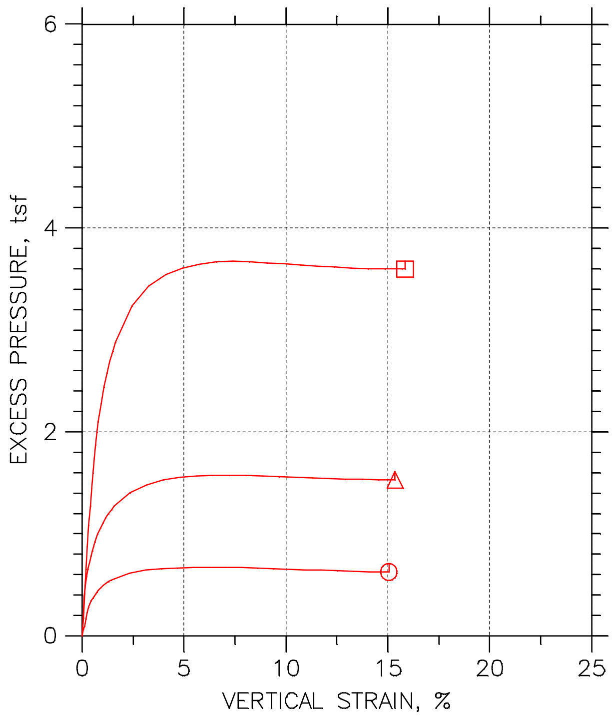

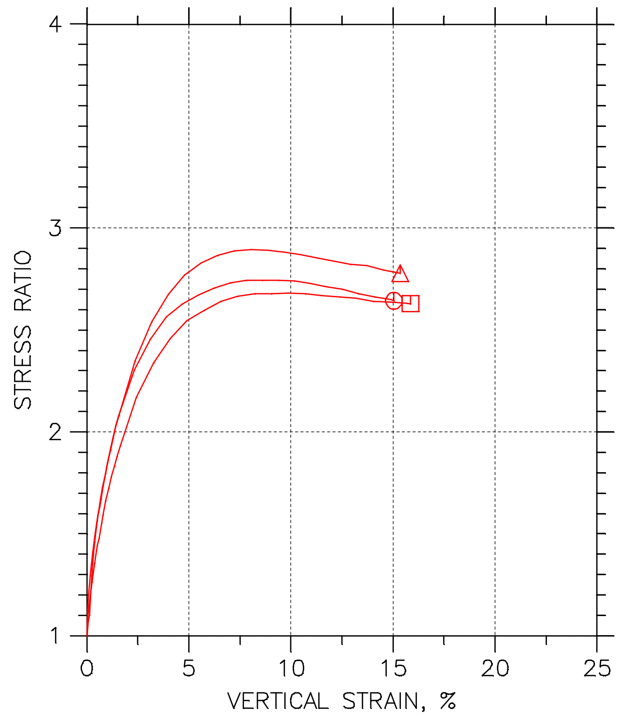

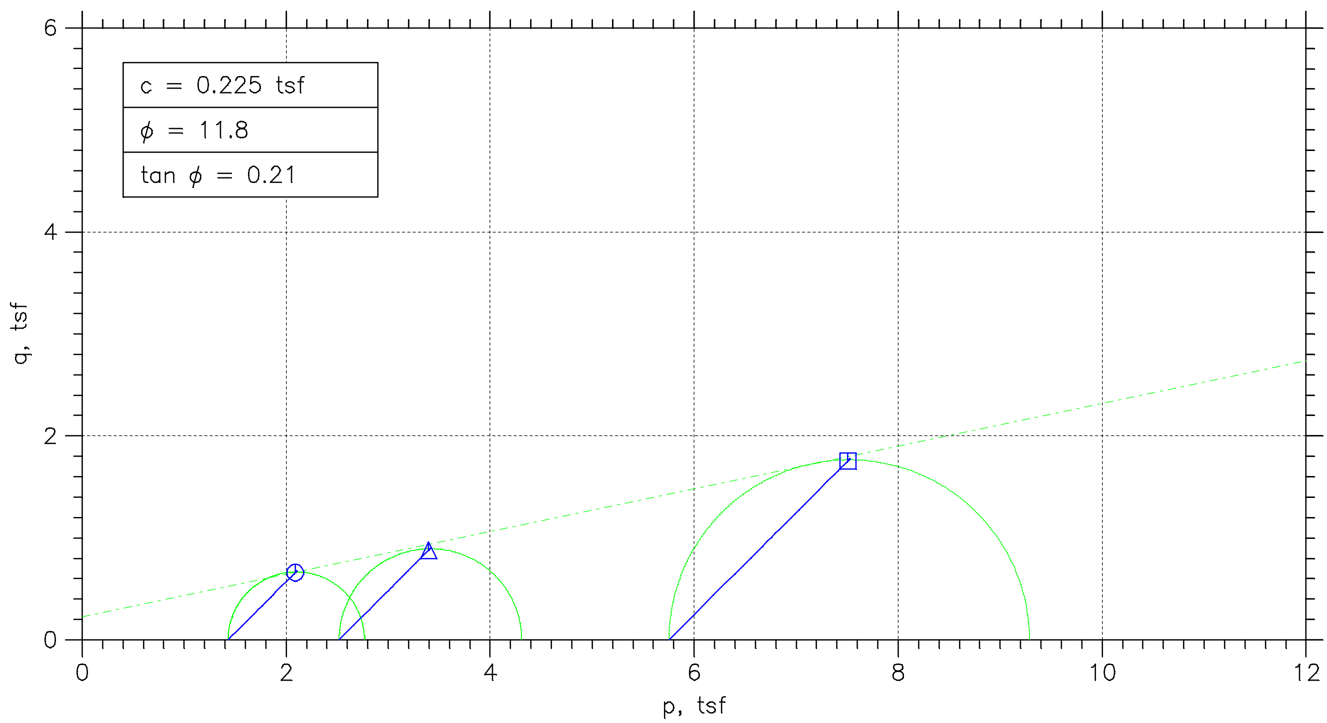

Project: DYNEGY EDWARDS	Location: BARTONVILLE, IL	Project No.: MR155218
Boring No.: EDW-013 S10	Tested By: BCM	Checked By: WPQ
Sample No.: S-10	Test Date: 10/29/15	Depth: 32.0'-34.0'
Test No.: EDW-013 S10	Sample Type: 3.0" ST	Elevation: -----
Description: GRAY AND BROWN LEAN CLAY WITH SAND CL		
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767		

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TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-013 S10
Sample No.: S-10
Test No.: 20.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 32.0'-34.0'
Elevation: -----

Soil Description: GRAY AND BROWN LEAN CLAY WITH SAND CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

Specimen Height: 5.98 in
Specimen Area: 6.30 in^2
Specimen Volume: 37.70 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 42

Plastic Limit: 23

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.3003	0	0	5.0509	6.48	6.48
2	5.0003	0.070614	6.3048	8.4452	0.096443	5.1202	6.48	6.5764
3	10	0.13546	6.3089	11.964	0.13654	5.1458	6.48	6.6165
4	15	0.19743	6.3128	24.163	0.27558	5.2208	6.48	6.7556
5	20	0.26228	6.3169	33.487	0.38169	5.2837	6.48	6.8617
6	25	0.32713	6.321	40.115	0.45693	5.3296	6.48	6.9369
7	30	0.39054	6.325	45.041	0.51272	5.364	6.48	6.9927
8	35	0.45539	6.3292	49.088	0.55842	5.3925	6.48	7.0384
9	40	0.52024	6.3333	52.665	0.59872	5.4169	6.48	7.0787
10	45	0.58653	6.3375	55.773	0.63364	5.4396	6.48	7.1136
11	50	0.6485	6.3415	58.412	0.66321	5.4594	6.48	7.1432
12	55	0.71335	6.3456	61.052	0.69272	5.4775	6.48	7.1727
13	60.001	0.7782	6.3497	63.339	0.7182	5.4932	6.48	7.1982
14	70.001	0.9079	6.3581	67.62	0.76574	5.5199	6.48	7.2457
15	80.001	1.039	6.3665	71.315	0.80652	5.5438	6.48	7.2865
16	90.001	1.1687	6.3748	74.716	0.84388	5.5636	6.48	7.3239
17	100	1.297	6.3831	77.825	0.87784	5.5816	6.48	7.3578
18	110	1.4281	6.3916	80.698	0.90905	5.5979	6.48	7.389
19	120	1.5593	6.4001	83.161	0.93555	5.6095	6.48	7.4155
20	180	2.3332	6.4508	95.243	1.063	5.6642	6.48	7.543
21	240	3.1229	6.5034	103.34	1.144	5.6945	6.48	7.624
22	300	3.904	6.5563	109.67	1.2044	5.7102	6.48	7.6844
23	360	4.6807	6.6097	114.07	1.2426	5.7172	6.48	7.7226
24	420	5.469	6.6648	117.59	1.2703	5.7201	6.48	7.7503
25	480	6.2544	6.7207	120.81	1.2943	5.7218	6.48	7.7743
26	540	7.0312	6.7768	123.8	1.3153	5.7207	6.48	7.7953
27	600	7.8223	6.835	126.21	1.3295	5.7178	6.48	7.8095
28	660	8.6063	6.8936	128.03	1.3372	5.7137	6.48	7.8172
29	720	9.3787	6.9524	129.79	1.3441	5.709	6.48	7.8241
30	780	10.17	7.0136	131.6	1.351	5.7044	6.48	7.831
31	840	10.952	7.0752	132.89	1.3524	5.6974	6.48	7.8324
32	900	11.731	7.1376	133.72	1.3488	5.6928	6.48	7.8288
33	960	12.525	7.2024	134.83	1.3478	5.6875	6.48	7.8278
34	1020	13.309	7.2675	135.53	1.3427	5.68	6.48	7.8227
35	1080	14.091	7.3337	135.65	1.3318	5.6794	6.48	7.8118
36	1140	14.882	7.4019	135.94	1.3224	5.6776	6.48	7.8024
37	1152.3	15.045	7.4161	135.89	1.3193	5.677	6.48	7.7993

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-013 S10
Sample No.: S-10
Test No.: 20.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 32.0'-34.0'
Elevation: -----

Terracon Consulting Engineers & Scientists

Soil Description: GRAY AND BROWN LEAN CLAY WITH SAND CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767

Specimen Height: 5.98 in
Specimen Area: 6.30 in^2
Specimen Volume: 37.70 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 42

Plastic Limit: 23

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	6.48	6.48	0	0.000	1.4291	1.4291	1.000	1.4291	0
2	0.07	6.5764	6.48	0.069246	0.718	1.4563	1.3598	1.071	1.4081	0.048221
3	0.14	6.6165	6.48	0.09485	0.695	1.4708	1.3342	1.102	1.4025	0.068269
4	0.20	6.7556	6.48	0.16992	0.617	1.5348	1.2592	1.219	1.397	0.13779
5	0.26	6.8617	6.48	0.23276	0.610	1.578	1.1963	1.319	1.3872	0.19084
6	0.33	6.9369	6.48	0.27873	0.610	1.6073	1.1504	1.397	1.3788	0.22846
7	0.39	6.9927	6.48	0.31306	0.611	1.6287	1.116	1.459	1.3724	0.25636
8	0.46	7.0384	6.48	0.34158	0.612	1.6459	1.0875	1.513	1.3667	0.27921
9	0.52	7.0787	6.48	0.36602	0.611	1.6618	1.0631	1.563	1.3624	0.29936
10	0.59	7.1136	6.48	0.38871	0.613	1.674	1.0404	1.609	1.3572	0.31682
11	0.65	7.1432	6.48	0.4085	0.616	1.6838	1.0206	1.650	1.3522	0.3316
12	0.71	7.1727	6.48	0.42653	0.616	1.6953	1.0025	1.691	1.3489	0.34636
13	0.78	7.1982	6.48	0.44225	0.616	1.705	0.98684	1.728	1.3459	0.3591
14	0.91	7.2457	6.48	0.46901	0.612	1.7258	0.96007	1.798	1.3429	0.38287
15	1.04	7.2865	6.48	0.49287	0.611	1.7427	0.93621	1.861	1.3395	0.40326
16	1.17	7.3239	6.48	0.51266	0.608	1.7603	0.91643	1.921	1.3384	0.42194
17	1.30	7.3578	6.48	0.5307	0.605	1.7762	0.89839	1.977	1.3373	0.43892
18	1.43	7.389	6.48	0.54699	0.602	1.7911	0.8821	2.031	1.3366	0.45452
19	1.56	7.4155	6.48	0.55863	0.597	1.806	0.87046	2.075	1.3382	0.46777
20	2.33	7.543	6.48	0.61333	0.577	1.8788	0.81576	2.303	1.3473	0.53152
21	3.12	7.624	6.48	0.64358	0.563	1.9295	0.7855	2.456	1.3575	0.57202
22	3.90	7.6844	6.48	0.6593	0.547	1.9742	0.76979	2.565	1.372	0.60219
23	4.68	7.7226	6.48	0.66628	0.536	2.0054	0.76281	2.629	1.3841	0.62128
24	5.47	7.7503	6.48	0.66919	0.527	2.0302	0.7599	2.672	1.395	0.63515
25	6.25	7.7743	6.48	0.67093	0.518	2.0524	0.75815	2.707	1.4053	0.64715
26	7.03	7.7953	6.48	0.66977	0.509	2.0747	0.75931	2.732	1.417	0.65767
27	7.82	7.8095	6.48	0.66686	0.502	2.0917	0.76222	2.744	1.427	0.66474
28	8.61	7.8172	6.48	0.66279	0.496	2.1035	0.7663	2.745	1.4349	0.66858
29	9.38	7.8241	6.48	0.65813	0.490	2.115	0.77095	2.743	1.443	0.67204
30	10.17	7.831	6.48	0.65348	0.484	2.1266	0.77561	2.742	1.4511	0.67551
31	10.95	7.8324	6.48	0.64649	0.478	2.135	0.78259	2.728	1.4588	0.67619
32	11.73	7.8288	6.48	0.64184	0.476	2.1361	0.78725	2.713	1.4617	0.67442
33	12.52	7.8278	6.48	0.6366	0.472	2.1403	0.79248	2.701	1.4664	0.67392
34	13.31	7.8227	6.48	0.62904	0.468	2.1428	0.80005	2.678	1.4714	0.67137
35	14.09	7.8118	6.48	0.62845	0.472	2.1324	0.80063	2.663	1.4665	0.66588
36	14.88	7.8024	6.48	0.62671	0.474	2.1247	0.80238	2.648	1.4636	0.66118
37	15.05	7.7993	6.48	0.62613	0.475	2.1222	0.80296	2.643	1.4626	0.65963

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-013 S10
Sample No.: S-10
Test No.: 40.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 32.0'-34.0'
Elevation: ----

Soil Description: GRAY AND BROWN LEAN CLAY WITH SAND CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.13 in
Specimen Area: 6.33 in^2
Specimen Volume: 38.81 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 42

Plastic Limit: 23

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.3319	0	0	5.0422	7.56	7.56
2	5.0001	0.049959	6.3351	25.547	0.29035	5.2708	7.56	7.8503
3	10.004	0.10929	6.3388	41.648	0.47306	5.4236	7.56	8.0331
4	15.004	0.17017	6.3427	52.381	0.59462	5.5356	7.56	8.1546
5	20.004	0.23262	6.3467	60.539	0.68679	5.6242	7.56	8.2468
6	25.004	0.29975	6.3509	67.151	0.76129	5.7006	7.56	8.3213
7	30.004	0.36533	6.3551	72.647	0.82305	5.7683	7.56	8.3831
8	35.004	0.4309	6.3593	77.585	0.87841	5.8248	7.56	8.4384
9	40.004	0.49803	6.3636	81.878	0.9264	5.8756	7.56	8.4864
10	45.004	0.56204	6.3677	85.914	0.97144	5.9211	7.56	8.5314
11	50.004	0.62761	6.3719	89.435	1.0106	5.9619	7.56	8.5706
12	55.004	0.6963	6.3763	92.698	1.0467	6.001	7.56	8.6067
13	60.004	0.76187	6.3805	95.875	1.0819	6.0371	7.56	8.6419
14	70.004	0.89614	6.3892	101.2	1.1404	6.1001	7.56	8.7004
15	80.004	1.0304	6.3978	105.97	1.1925	6.1538	7.56	8.7525
16	90.004	1.1631	6.4064	110.34	1.2401	6.201	7.56	8.8001
17	100	1.3005	6.4153	114.08	1.2803	6.2412	7.56	8.8403
18	110	1.4332	6.424	117.56	1.3176	6.2774	7.56	8.8776
19	120	1.569	6.4328	120.69	1.3509	6.3118	7.56	8.9109
20	180	2.3684	6.4855	135.2	1.501	6.4477	7.56	9.061
21	240	3.1786	6.5398	144.78	1.594	6.5241	7.56	9.154
22	300	3.9889	6.595	152.03	1.6598	6.569	7.56	9.2198
23	360	4.7976	6.651	157.53	1.7053	6.5952	7.56	9.2653
24	420	5.6095	6.7082	162	1.7387	6.6086	7.56	9.2987
25	480	6.4166	6.766	165.6	1.7622	6.6151	7.56	9.3222
26	540	7.2316	6.8255	168.65	1.779	6.6174	7.56	9.339
27	600	8.0434	6.8857	171.18	1.79	6.6145	7.56	9.35
28	660	8.8506	6.9467	173.55	1.7987	6.6092	7.56	9.3587
29	720	9.6608	7.009	175.35	1.8013	6.6022	7.56	9.3613
30	780	10.477	7.073	177.11	1.8029	6.5958	7.56	9.3629
31	840	11.286	7.1374	178.61	1.8018	6.5882	7.56	9.3618
32	900	12.099	7.2035	180.03	1.7994	6.5812	7.56	9.3594
33	960	12.914	7.2709	181.32	1.7955	6.5748	7.56	9.3555
34	1020	13.732	7.3398	181.88	1.7841	6.5766	7.56	9.3441
35	1080	14.54	7.4092	182.18	1.7703	6.5725	7.56	9.3303
36	1140	15.353	7.4804	182.61	1.7576	6.5719	7.56	9.3176

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-013 S10
Sample No.: S-10
Test No.: 40.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 32.0'-34.0'
Elevation: ----

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Soil Description: GRAY AND BROWN LEAN CLAY WITH SAND CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.13 in
Specimen Area: 6.33 in^2
Specimen Volume: 38.81 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 42

Plastic Limit: 23

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	7.56	7.56	0	0.000	2.5178	2.5178	1.000	2.5178	0
2	0.05	7.8503	7.56	0.22861	0.787	2.5795	2.2892	1.127	2.4344	0.14517
3	0.11	8.0331	7.56	0.3814	0.806	2.6094	2.1364	1.221	2.3729	0.23653
4	0.17	8.1546	7.56	0.49337	0.830	2.619	2.0244	1.294	2.3217	0.29731
5	0.23	8.2468	7.56	0.58202	0.847	2.6226	1.9358	1.355	2.2792	0.34339
6	0.30	8.3213	7.56	0.65841	0.865	2.6207	1.8594	1.409	2.24	0.38064
7	0.37	8.3831	7.56	0.72606	0.882	2.6148	1.7917	1.459	2.2033	0.41153
8	0.43	8.4384	7.56	0.78263	0.891	2.6136	1.7352	1.506	2.1744	0.43921
9	0.50	8.4864	7.56	0.83337	0.900	2.6108	1.6844	1.550	2.1476	0.4632
10	0.56	8.5314	7.56	0.87886	0.905	2.6104	1.6389	1.593	2.1247	0.48572
11	0.63	8.5706	7.56	0.91968	0.910	2.6087	1.5981	1.632	2.1034	0.50529
12	0.70	8.6067	7.56	0.95875	0.916	2.6058	1.559	1.671	2.0824	0.52336
13	0.76	8.6419	7.56	0.99491	0.920	2.6048	1.5229	1.710	2.0638	0.54095
14	0.90	8.7004	7.56	1.0579	0.928	2.6003	1.4599	1.781	2.0301	0.57021
15	1.03	8.7525	7.56	1.1115	0.932	2.5988	1.4062	1.848	2.0025	0.59626
16	1.16	8.8001	7.56	1.1588	0.934	2.5991	1.359	1.913	1.9791	0.62007
17	1.30	8.8403	7.56	1.199	0.936	2.5991	1.3188	1.971	1.9589	0.64017
18	1.43	8.8776	7.56	1.2352	0.937	2.6002	1.2826	2.027	1.9414	0.65879
19	1.57	8.9109	7.56	1.2696	0.940	2.5991	1.2482	2.082	1.9236	0.67543
20	2.37	9.061	7.56	1.4055	0.936	2.6133	1.1123	2.349	1.8628	0.7505
21	3.18	9.154	7.56	1.4819	0.930	2.6299	1.0359	2.539	1.8329	0.79698
22	3.99	9.2198	7.56	1.5268	0.920	2.6508	0.99102	2.675	1.8209	0.82991
23	4.80	9.2653	7.56	1.553	0.911	2.6701	0.96477	2.768	1.8174	0.85267
24	5.61	9.2987	7.56	1.5664	0.901	2.6901	0.95136	2.828	1.8207	0.86936
25	6.42	9.3222	7.56	1.5728	0.893	2.7072	0.94495	2.865	1.8261	0.88112
26	7.23	9.339	7.56	1.5752	0.885	2.7217	0.94261	2.887	1.8321	0.88952
27	8.04	9.35	7.56	1.5723	0.878	2.7355	0.94553	2.893	1.8405	0.89498
28	8.85	9.3587	7.56	1.567	0.871	2.7495	0.95078	2.892	1.8501	0.89937
29	9.66	9.3613	7.56	1.56	0.866	2.759	0.95778	2.881	1.8584	0.90063
30	10.48	9.3629	7.56	1.5536	0.862	2.7671	0.96419	2.870	1.8656	0.90145
31	11.29	9.3618	7.56	1.546	0.858	2.7736	0.97177	2.854	1.8727	0.90089
32	12.10	9.3594	7.56	1.539	0.855	2.7782	0.97877	2.838	1.8785	0.89971
33	12.91	9.3555	7.56	1.5326	0.854	2.7807	0.98519	2.822	1.8829	0.89775
34	13.73	9.3441	7.56	1.5344	0.860	2.7675	0.98344	2.814	1.8755	0.89205
35	14.54	9.3303	7.56	1.5303	0.864	2.7578	0.98752	2.793	1.8727	0.88516
36	15.35	9.3176	7.56	1.5297	0.870	2.7457	0.9881	2.779	1.8669	0.87881

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-013 S10
Sample No.: S-10
Test No.: 80.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 32.0'-34.0'
Elevation: ----

Soil Description: GRAY AND BROWN LEAN CLAY WITH SAND CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.05 in
Specimen Area: 6.26 in^2
Specimen Volume: 37.85 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 42

Plastic Limit: 23

Estimated Specific Gravity: 2.72

	Time min	Vertical Strain %	Corrected Area in^2	Deviator Load lb	Deviator Stress tsf	Pore Pressure tsf	Horizontal Stress tsf	Vertical Stress tsf
1	0	0	6.2601	0	0	1.4473	7.2	7.2
2	5.0002	0.057416	6.2637	42.956	0.49377	1.6232	7.2	7.6938
3	10	0.12843	6.2682	75.999	0.87297	1.8591	7.2	8.073
4	15	0.19491	6.2723	96.821	1.1114	2.0973	7.2	8.3114
5	20	0.26139	6.2765	112.87	1.2948	2.3215	7.2	8.4948
6	25	0.32939	6.2808	127.24	1.4586	2.53	7.2	8.6586
7	30	0.39436	6.2849	139.93	1.6031	2.7199	7.2	8.8031
8	35	0.46084	6.2891	150.32	1.7209	2.8923	7.2	8.9209
9	40	0.52581	6.2932	159.97	1.8302	3.0478	7.2	9.0302
10	45	0.59531	6.2976	168.57	1.9273	3.1905	7.2	9.1273
11	50	0.6633	6.3019	175.7	2.0074	3.3198	7.2	9.2074
12	55	0.7313	6.3062	183.2	2.0917	3.438	7.2	9.2917
13	60	0.79929	6.3105	189.45	2.1615	3.5452	7.2	9.3615
14	70	0.9383	6.3194	201.61	2.2971	3.7298	7.2	9.4971
15	80	1.0758	6.3282	210.37	2.3936	3.8876	7.2	9.5936
16	90.001	1.2163	6.3372	218.14	2.4784	4.0228	7.2	9.6784
17	100	1.3538	6.346	224.69	2.5493	4.1375	7.2	9.7493
18	110	1.4928	6.355	230.15	2.6075	4.2388	7.2	9.8075
19	120	1.6303	6.3639	236.18	2.6721	4.3262	7.2	9.8721
20	180	2.4432	6.4169	262.25	2.9425	4.685	7.2	10.142
21	240	3.2787	6.4723	279.34	3.1075	4.8801	7.2	10.308
22	300	4.1067	6.5282	292.25	3.2232	4.9907	7.2	10.423
23	360	4.9136	6.5836	303.47	3.3188	5.0548	7.2	10.519
24	420	5.7506	6.6421	310.87	3.3698	5.0903	7.2	10.57
25	480	6.5802	6.701	318.68	3.4241	5.1136	7.2	10.624
26	540	7.4006	6.7604	325.24	3.4638	5.1206	7.2	10.664
27	600	8.2346	6.8219	330.8	3.4913	5.1171	7.2	10.691
28	660	9.0626	6.884	336.15	3.5158	5.1061	7.2	10.716
29	720	9.877	6.9462	340.92	3.5338	5.0973	7.2	10.734
30	780	10.714	7.0113	344.8	3.5408	5.088	7.2	10.741
31	840	11.542	7.0769	348.79	3.5485	5.0746	7.2	10.749
32	900	12.361	7.1431	351.99	3.5479	5.0647	7.2	10.748
33	960	13.204	7.2124	355.4	3.5478	5.0566	7.2	10.748
34	1020	14.025	7.2813	357.18	3.5319	5.0478	7.2	10.732
35	1080	14.848	7.3517	359.59	3.5217	5.0496	7.2	10.722
36	1140	15.696	7.4256	361.69	3.507	5.049	7.2	10.707
37	1151.2	15.853	7.4395	362.53	3.5086	5.0455	7.2	10.709

TRIAXIAL TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-013 S10
Sample No.: S-10
Test No.: 80.0 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/29/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 32.0'-34.0'
Elevation: ----

Soil Description: GRAY AND BROWN LEAN CLAY WITH SAND CL
Remarks: FAILURE CRITERIA = MAXIMUM EFFECTIVE STRESS RATIO TEST PERFORMED AS PER ASTM D4767.

Specimen Height: 6.05 in
Specimen Area: 6.26 in^2
Specimen Volume: 37.85 in^3

Piston Area: 0.00 in^2
Piston Friction: 0.00 lb
Piston Weight: 0.00 lb

Filter Strip Correction: 0.00 tsf
Membrane Correction: 0.00 lb/in
Correction Type: Uniform

Liquid Limit: 42

Plastic Limit: 23

Estimated Specific Gravity: 2.72

	Vertical Strain %	Total Vertical Stress tsf	Total Horizontal Stress tsf	Excess Pore Pressure tsf	A Parameter	Effective Vertical Stress tsf	Effective Horizontal Stress tsf	Stress Ratio	Effective p tsf	q tsf
1	0.00	7.2	7.2	0	0.000	5.7527	5.7527	1.000	5.7527	0
2	0.06	7.6938	7.2	0.17589	0.356	6.0706	5.5768	1.089	5.8237	0.24688
3	0.13	8.073	7.2	0.41177	0.472	6.2139	5.3409	1.163	5.7774	0.43648
4	0.19	8.3114	7.2	0.64998	0.585	6.2141	5.1027	1.218	5.6584	0.5557
5	0.26	8.4948	7.2	0.87421	0.675	6.1733	4.8785	1.265	5.5259	0.64739
6	0.33	8.6586	7.2	1.0827	0.742	6.1286	4.67	1.312	5.3993	0.72932
7	0.39	8.8031	7.2	1.2726	0.794	6.0832	4.4801	1.358	5.2816	0.80155
8	0.46	8.9209	7.2	1.445	0.840	6.0286	4.3077	1.399	5.1682	0.86046
9	0.53	9.0302	7.2	1.6005	0.874	5.9824	4.1522	1.441	5.0673	0.9151
10	0.60	9.1273	7.2	1.7432	0.904	5.9368	4.0095	1.481	4.9731	0.96363
11	0.66	9.2074	7.2	1.8725	0.933	5.8877	3.8802	1.517	4.8839	1.0037
12	0.73	9.2917	7.2	1.9907	0.952	5.8537	3.762	1.556	4.8078	1.0459
13	0.80	9.3615	7.2	2.0979	0.971	5.8163	3.6548	1.591	4.7356	1.0807
14	0.94	9.4971	7.2	2.2825	0.994	5.7673	3.4702	1.662	4.6187	1.1485
15	1.08	9.5936	7.2	2.4403	1.020	5.7059	3.3124	1.723	4.5091	1.1968
16	1.22	9.6784	7.2	2.5755	1.039	5.6556	3.1772	1.780	4.4164	1.2392
17	1.35	9.7493	7.2	2.6902	1.055	5.6118	3.0625	1.832	4.3371	1.2746
18	1.49	9.8075	7.2	2.7915	1.071	5.5686	2.9612	1.881	4.2649	1.3037
19	1.63	9.8721	7.2	2.8789	1.077	5.5459	2.8738	1.930	4.2098	1.336
20	2.44	10.142	7.2	3.2377	1.100	5.4575	2.515	2.170	3.9863	1.4712
21	3.28	10.308	7.2	3.4328	1.105	5.4274	2.3199	2.339	3.8737	1.5538
22	4.11	10.423	7.2	3.5434	1.099	5.4325	2.2093	2.459	3.8209	1.6116
23	4.91	10.519	7.2	3.6075	1.087	5.464	2.1452	2.547	3.8046	1.6594
24	5.75	10.57	7.2	3.643	1.081	5.4794	2.1097	2.597	3.7945	1.6849
25	6.58	10.624	7.2	3.6663	1.071	5.5105	2.0864	2.641	3.7984	1.712
26	7.40	10.664	7.2	3.6733	1.060	5.5432	2.0794	2.666	3.8113	1.7319
27	8.23	10.691	7.2	3.6698	1.051	5.5742	2.0829	2.676	3.8285	1.7457
28	9.06	10.716	7.2	3.6588	1.041	5.6097	2.0939	2.679	3.8518	1.7579
29	9.88	10.734	7.2	3.65	1.033	5.6364	2.1027	2.681	3.8695	1.7669
30	10.71	10.741	7.2	3.6407	1.028	5.6528	2.112	2.677	3.8824	1.7704
31	11.54	10.749	7.2	3.6273	1.022	5.6739	2.1254	2.670	3.8996	1.7743
32	12.36	10.748	7.2	3.6174	1.020	5.6832	2.1353	2.662	3.9092	1.774
33	13.20	10.748	7.2	3.6093	1.017	5.6913	2.1434	2.655	3.9173	1.7739
34	14.02	10.732	7.2	3.6005	1.019	5.6841	2.1522	2.641	3.9181	1.766
35	14.85	10.722	7.2	3.6023	1.023	5.6721	2.1504	2.638	3.9113	1.7609
36	15.70	10.707	7.2	3.6017	1.027	5.658	2.151	2.630	3.9045	1.7535
37	15.85	10.709	7.2	3.5982	1.026	5.6631	2.1545	2.628	3.9088	1.7543

DIRECT SHEAR TEST REPORT

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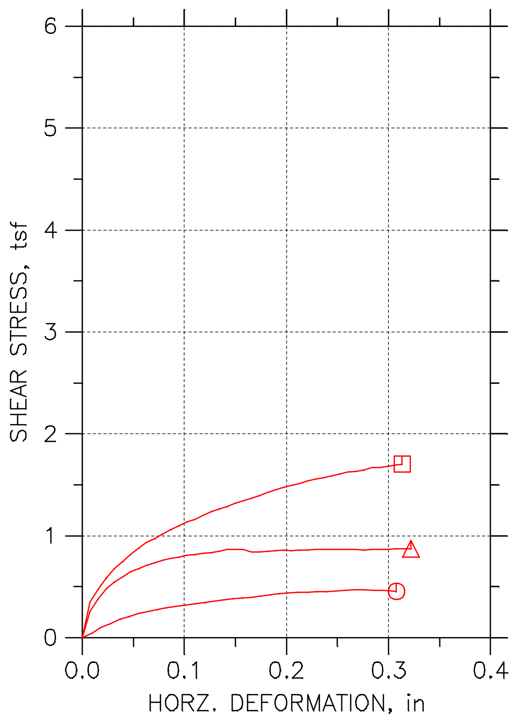

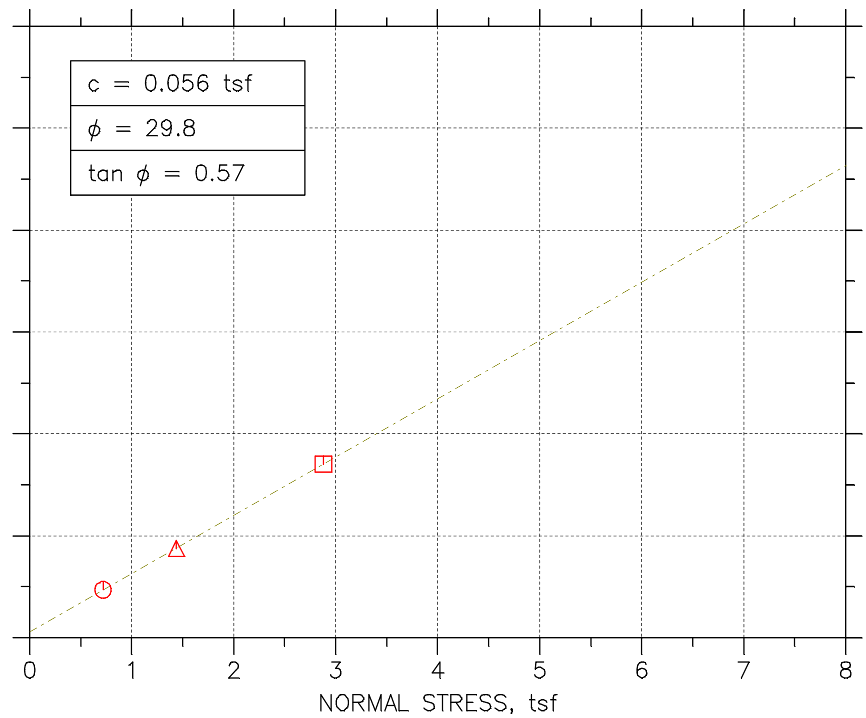

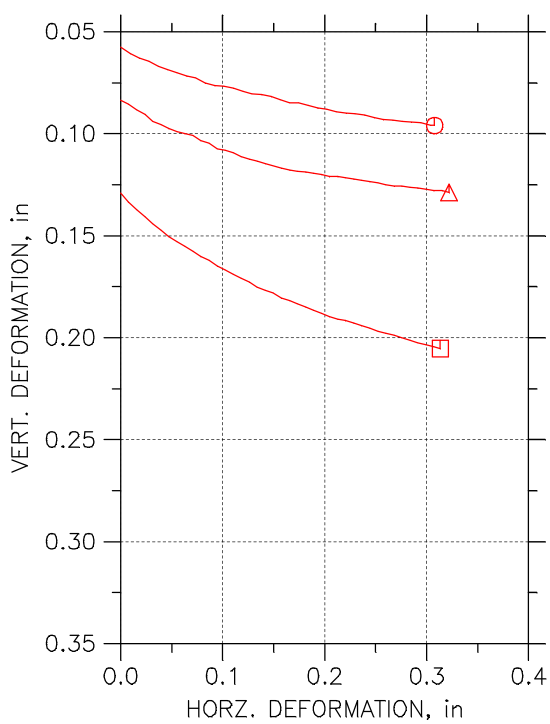

	Symbol	○	△	□
	Test No.	10 PSI	20 PSI	40 PSI
	Sample No.	S-5	S-5	S-5
	Shape	Circular	Circular	Circular
Initial	Dimension, in	2.502	2.5016	2.5035
Initial	Area, in^2	4.9165	4.9149	4.9227
Initial	Height, in	1.0098	1.0087	1.0067
Initial	Water Content, %	75.08	66.70	67.21
Initial	Dry Density, pcf	51.869	56.572	54.543
Initial	Saturation, %	97.66	99.74	94.70
Initial	Void Ratio	1.7682	1.5381	1.6325
	Consol. Height, in	0.955	0.93155	0.88124
	Consol. Void Ratio	1.6179	1.344	1.3044
Final	Water Content, %	64.90	53.10	47.20
Final	Dry Density, pcf	57.319	64.848	68.523
Final	Saturation, %	99.18	100.59	99.10
Final	Void Ratio	1.505	1.2142	1.0954
	Normal Stress, tsf	0.71991	1.4387	2.88
	Max. Shear Stress, tsf	0.47008	0.87498	1.7039
	Ult. Shear Stress, tsf	0.45479	0.87367	1.7039
	Time to Failure, min	3678.3	1181.7	1190.6
	Disp. Rate, in/min	6.49e-005	0.000267	0.000267
	Estimated Specific Gravity	2.30	2.30	2.30
	Liquid Limit	NP	NP	NP
	Plastic Limit	NP	NP	NP
	Plasticity Index	NP	NP	NP

Project: DYNEGY EDWARDS
Location: BARTONVILLE, IL
Project No.: MR155218
Boring No.: EDW-B002 S5
Sample Type: 3.0'' ST
Description: GRAY TO DARK GRAY VARVED FLY ASH
Remarks: TEST PERFORMED AS PER ASTM D3080.

DIRECT SHEAR TEST DATA

Project: DYNEGY EDWARDS
Boring No.: EDW-B002 S5
Sample No.: S-5
Test No.: 10 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/23/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 10.0'-12.0'
Elevation: ----

Soil Description: GRAY TO DARK GRAY VARVED FLY ASH
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	0.7191	0.05749	0	0
2	156.95	0.7199	0.06058	0.04248	0.009199
3	277.29	0.7199	0.06298	0.1019	0.0184
4	393.34	0.7199	0.06449	0.1405	0.0276
5	521.67	0.7199	0.06689	0.1795	0.03679
6	638.11	0.7191	0.06852	0.2096	0.04599
7	753.57	0.7199	0.07016	0.2362	0.05519
8	865.04	0.7199	0.07168	0.2577	0.06439
9	981.73	0.7199	0.07275	0.2764	0.07359
10	1096.66	0.7199	0.07502	0.2939	0.08279
11	1214.45	0.7199	0.07628	0.3104	0.09199
12	1328.38	0.7199	0.07678	0.3228	0.1012
13	1454.83	0.7199	0.07767	0.3353	0.1104
14	1573.59	0.7199	0.0793	0.3472	0.1196
15	1688.63	0.7199	0.08044	0.3596	0.1288
16	1817.30	0.7199	0.08094	0.3721	0.138
17	1955.96	0.7199	0.08183	0.3817	0.1472
18	2070.95	0.7199	0.08321	0.3902	0.1564
19	2203.51	0.7199	0.08473	0.3965	0.1656
20	2323.62	0.7199	0.08485	0.4072	0.1748
21	2452.80	0.7199	0.08599	0.4191	0.184
22	2580.16	0.7199	0.08731	0.431	0.1932
23	2700.75	0.7199	0.08813	0.4401	0.2024
24	2823.89	0.7199	0.08933	0.4463	0.2116
25	2950.56	0.7199	0.09002	0.4486	0.2208
26	3070.17	0.7199	0.09027	0.4491	0.23
27	3194.72	0.7199	0.09078	0.4514	0.2392
28	3328.14	0.7199	0.09217	0.4588	0.2483
29	3443.95	0.7191	0.09292	0.4655	0.2575
30	3554.17	0.7191	0.09343	0.4695	0.2667
31	3678.32	0.7199	0.09393	0.4701	0.2759
32	3812.79	0.7199	0.09443	0.4678	0.2851
33	3932.15	0.7199	0.09475	0.4633	0.2943
34	4054.51	0.7199	0.09576	0.4571	0.3035
35	4102.88	0.7199	0.09601	0.4548	0.3078

DIRECT SHEAR TEST DATA

Project: DYNEGY EDWARDS
Boring No.: EDW-B002 S5
Sample No.: S-5
Test No.: 20 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/23/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 10.0'-12.0'
Elevation: ----

Soil Description: GRAY TO DARK GRAY VARVED FLY ASH
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	1.438	0.08377	0	0
2	33.66	1.439	0.08551	0.2598	0.007876
3	62.53	1.439	0.08828	0.3842	0.01575
4	94.03	1.439	0.09063	0.4817	0.02363
5	123.61	1.439	0.09391	0.5451	0.0315
6	153.40	1.439	0.09565	0.5982	0.03938
7	184.06	1.439	0.09749	0.644	0.04725
8	213.02	1.439	0.09903	0.6793	0.05513
9	241.92	1.439	0.09985	0.7094	0.06301
10	271.68	1.439	0.101	0.7362	0.07088
11	302.17	1.439	0.1033	0.7611	0.07876
12	330.34	1.439	0.1047	0.7781	0.08663
13	360.65	1.439	0.1073	0.7886	0.09451
14	392.06	1.439	0.1082	0.8089	0.1024
15	421.40	1.439	0.1095	0.818	0.1103
16	448.87	1.439	0.1113	0.8259	0.1181
17	477.79	1.439	0.1125	0.8351	0.126
18	506.84	1.439	0.1134	0.8495	0.1339
19	537.40	1.439	0.1148	0.8632	0.1418
20	593.97	1.439	0.1167	0.8652	0.1575
21	623.57	1.439	0.1179	0.8429	0.1654
22	655.08	1.439	0.1184	0.8423	0.1733
23	684.47	1.439	0.1188	0.8481	0.1811
24	712.80	1.439	0.1195	0.8521	0.189
25	740.02	1.439	0.1199	0.8573	0.1969
26	771.65	1.439	0.1208	0.8567	0.2048
27	801.16	1.439	0.121	0.858	0.2126
28	830.38	1.439	0.1215	0.8625	0.2205
29	861.82	1.439	0.1222	0.8645	0.2284
30	891.86	1.439	0.1228	0.8665	0.2362
31	920.33	1.439	0.1234	0.8678	0.2441
32	947.61	1.439	0.124	0.8645	0.252
33	978.79	1.439	0.1249	0.8645	0.2599
34	1008.02	1.439	0.1256	0.8645	0.2677
35	1036.49	1.439	0.1257	0.8625	0.2756
36	1067.92	1.439	0.1262	0.8652	0.2835
37	1095.86	1.439	0.1267	0.8652	0.2914
38	1124.42	1.439	0.1273	0.8691	0.2992
39	1152.92	1.439	0.1277	0.8704	0.3071
40	1181.69	1.439	0.128	0.875	0.315
41	1207.99	1.439	0.1287	0.8737	0.322

DIRECT SHEAR TEST DATA

Project: DYNEGY EDWARDS
Boring No.: EDW-B002 S5
Sample No.: S-5
Test No.: 40 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/23/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 10.0'-12.0'
Elevation: ----

Soil Description: GRAY TO DARK GRAY VARVED FLY ASH
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	2.879	0.1292	0	0
2	34.66	2.879	0.1336	0.3516	0.007876
3	65.95	2.879	0.1374	0.4772	0.01575
4	98.49	2.879	0.1406	0.5912	0.02363
5	128.04	2.879	0.1442	0.6779	0.0315
6	157.00	2.879	0.1474	0.7496	0.03938
7	188.14	2.88	0.1504	0.8151	0.04725
8	217.44	2.88	0.1529	0.8772	0.05513
9	247.88	2.879	0.1551	0.9339	0.06301
10	276.45	2.879	0.1577	0.9701	0.07088
11	306.20	2.879	0.1601	1.017	0.07876
12	336.36	2.879	0.162	1.06	0.08663
13	366.50	2.879	0.1648	1.096	0.09451
14	397.75	2.879	0.1667	1.135	0.1024
15	427.67	2.88	0.169	1.161	0.1103
16	455.53	2.88	0.171	1.197	0.1181
17	485.04	2.879	0.1726	1.234	0.126
18	515.15	2.879	0.1753	1.262	0.1339
19	546.34	2.879	0.1769	1.285	0.1418
20	576.29	2.879	0.1782	1.317	0.1496
21	605.44	2.879	0.1806	1.346	0.1575
22	631.71	2.879	0.1819	1.367	0.1654
23	663.92	2.879	0.1834	1.395	0.1733
24	693.09	2.879	0.1851	1.423	0.1811
25	722.31	2.879	0.1865	1.447	0.189
26	753.49	2.88	0.1881	1.472	0.1969
27	783.68	2.879	0.1898	1.494	0.2048
28	812.56	2.879	0.1911	1.515	0.2126
29	840.21	2.879	0.1916	1.537	0.2205
30	873.07	2.879	0.1927	1.556	0.2284
31	901.78	2.88	0.194	1.57	0.2362
32	929.62	2.88	0.1952	1.589	0.2441
33	960.88	2.88	0.1967	1.608	0.252
34	990.19	2.88	0.1979	1.625	0.2599
35	1019.61	2.88	0.1986	1.632	0.2677
36	1048.80	2.879	0.1999	1.647	0.2756
37	1076.60	2.88	0.2013	1.668	0.2835
38	1109.68	2.88	0.2026	1.67	0.2914
39	1138.55	2.88	0.2036	1.681	0.2992
40	1167.91	2.879	0.2044	1.694	0.3071
41	1190.59	2.88	0.2054	1.704	0.3133

DIRECT SHEAR TEST REPORT

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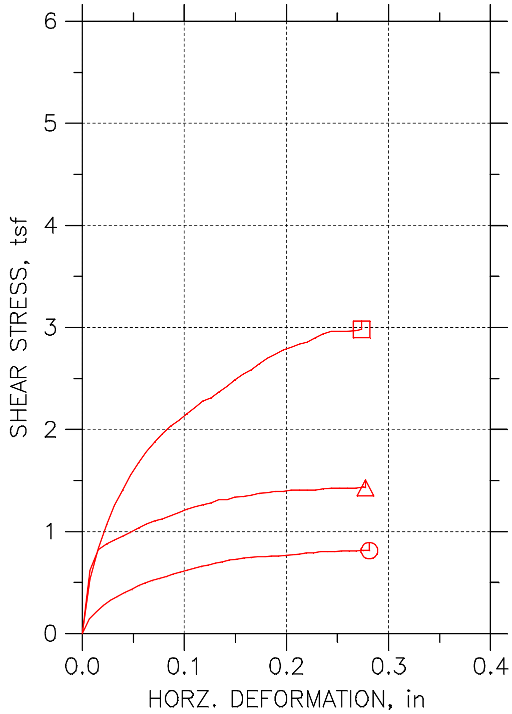

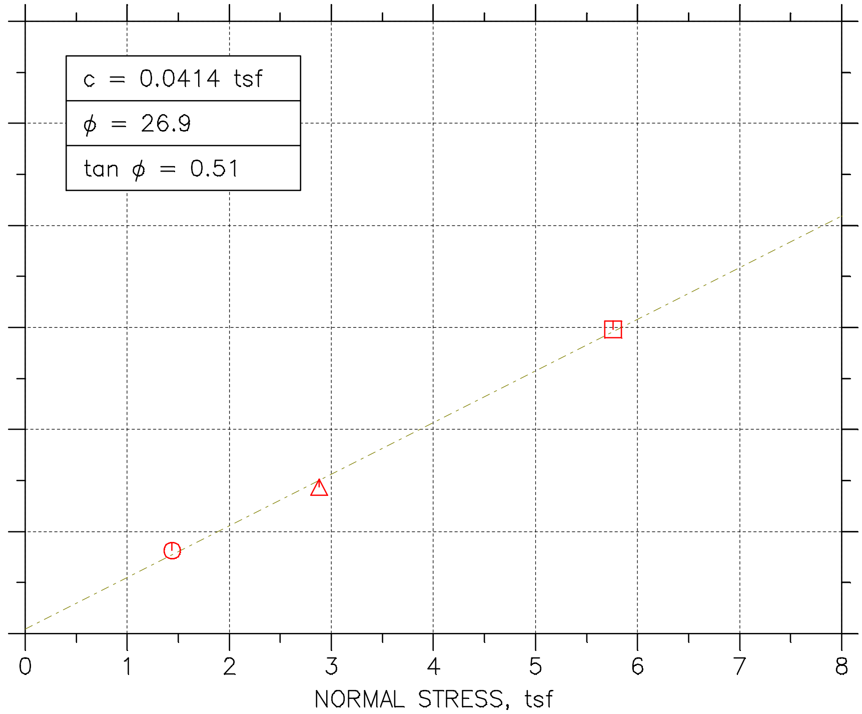

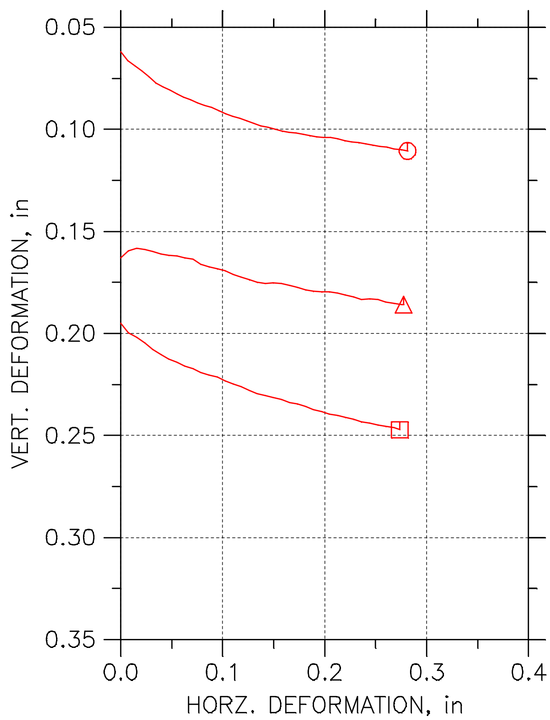

	Symbol	○	△	□	
	Test No.	20 PSI	40 PSI	80 PSI	
	Sample No.	S-9	S-9	S-9	
	Shape	Circular	Circular	Circular	
Initial	Dimension, in	2.5035	2.4988	2.4921	
Initial	Area, in^2	4.9227	4.9041	4.8779	
Initial	Height, in	1.0067	0.98937	0.99213	
Initial	Water Content, %	71.70	70.21	69.53	
Initial	Dry Density, pcf	53.119	54.563	54.248	
Initial	Saturation, %	96.83	98.97	97.11	
Initial	Void Ratio	1.7031	1.6315	1.6468	
	Consol. Height, in	0.95172	0.83719	0.8042	
	Consol. Void Ratio	1.5555	1.2268	1.1454	
Final	Water Content, %	60.80	49.80	42.70	
Final	Dry Density, pcf	59.677	67.193	72.249	
Final	Saturation, %	99.46	100.75	99.47	
Final	Void Ratio	1.406	1.1369	0.98736	
	Normal Stress, tsf	1.4396	2.8798	5.7593	
	Max. Shear Stress, tsf	0.81396	1.4353	2.9807	
	Ult. Shear Stress, tsf	0.81396	1.4289	2.9807	
	Time to Failure, min	1202.3	4163.3	1353.2	
	Disp. Rate, in/min	0.000267	6.69e-005	0.000207	
	Estimated Specific Gravity	2.30	2.30	2.30	
	Liquid Limit	NP	NP	NP	
	Plastic Limit	NP	NP	NP	
	Plasticity Index	NP	NP	NP	

Project: DYNEGY EDWARDS

Location: BARTONVILLE, IL

Project No.: MR155218

Boring No.: EDW-B003 S9

Sample Type: 3.0'' ST

Description: VERY DARK GRAY VARVED FLY ASH

Remarks: TEST PERFORMED AS PER ASTM D3080

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DIRECT SHEAR TEST DATA

Project: DYNEGY EDWARDS
Boring No.: EDW-B003 S9
Sample No.: S-9
Test No.: 20 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/23/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 30.0'-32.0'
Elevation: ----

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Soil Description: VERY DARK GRAY VARVED FLY ASH
Remarks: TEST PERFORMED AS PER ASTM D3080

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	1.438	0.06197	0	0
2	29.97	1.439	0.06626	0.1471	0.006868
3	57.78	1.439	0.06903	0.2144	0.01374
4	88.56	1.439	0.07142	0.2734	0.0206
5	120.00	1.439	0.0742	0.3261	0.02747
6	147.42	1.439	0.07741	0.3658	0.03434
7	177.07	1.44	0.07918	0.4002	0.04121
8	208.08	1.439	0.08094	0.4362	0.04807
9	237.87	1.439	0.08258	0.468	0.05494
10	268.15	1.44	0.08422	0.4952	0.06181
11	297.24	1.44	0.08555	0.5181	0.06868
12	327.37	1.439	0.08693	0.5374	0.07555
13	354.52	1.44	0.08832	0.5599	0.08241
14	388.81	1.439	0.08933	0.5859	0.08928
15	414.34	1.439	0.0909	0.6053	0.09615
16	443.05	1.44	0.09235	0.6214	0.103
17	475.44	1.44	0.09362	0.6428	0.1099
18	503.04	1.439	0.09456	0.6569	0.1168
19	531.73	1.44	0.09576	0.672	0.1236
20	563.76	1.44	0.09708	0.6908	0.1305
21	590.20	1.44	0.09841	0.7049	0.1374
22	620.48	1.439	0.09897	0.719	0.1442
23	648.48	1.44	0.09992	0.7268	0.1511
24	679.58	1.44	0.1007	0.7399	0.158
25	707.75	1.44	0.1014	0.7493	0.1648
26	736.66	1.44	0.1019	0.7503	0.1717
27	766.24	1.44	0.1026	0.754	0.1786
28	796.15	1.44	0.1031	0.7592	0.1854
29	823.23	1.439	0.1038	0.7618	0.1923
30	851.40	1.44	0.104	0.767	0.1991
31	883.03	1.44	0.1041	0.7727	0.206
32	911.21	1.44	0.1047	0.7764	0.2129
33	944.16	1.44	0.1056	0.7879	0.2197
34	971.55	1.44	0.1061	0.7936	0.2266
35	1000.34	1.44	0.1065	0.802	0.2335
36	1031.20	1.44	0.1073	0.803	0.2403
37	1059.90	1.439	0.1079	0.8067	0.2472
38	1088.96	1.44	0.1084	0.8113	0.2541
39	1119.26	1.44	0.1087	0.8108	0.2609
40	1145.99	1.44	0.1097	0.8098	0.2678
41	1177.16	1.44	0.1101	0.814	0.2747
42	1202.27	1.44	0.1106	0.814	0.2812

DIRECT SHEAR TEST DATA

Project: DYNEGY EDWARDS
Boring No.: EDW-B003 S9
Sample No.: S-9
Test No.: 40 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/23/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 30.0'-32.0'
Elevation: ----

Soil Description: VERY DARK GRAY VARVED FLY ASH
Remarks: TEST PERFORMED AS PER ASTM D3080

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	4.541	0.1631	0	0
2	165.26	2.88	0.1594	0.623	0.007876
3	285.62	2.88	0.1584	0.8242	0.01575
4	408.00	2.88	0.1589	0.8772	0.02363
5	528.28	2.88	0.1597	0.9172	0.0315
6	644.59	2.88	0.161	0.9573	0.03938
7	763.78	2.88	0.1618	0.994	0.04725
8	884.32	2.88	0.1622	1.033	0.05513
9	993.76	2.88	0.163	1.072	0.06301
10	1117.20	2.88	0.1637	1.102	0.07088
11	1235.24	2.88	0.166	1.124	0.07876
12	1344.93	2.88	0.1672	1.154	0.08663
13	1464.24	2.88	0.1684	1.183	0.09451
14	1587.75	2.88	0.1694	1.219	0.1024
15	1704.16	2.879	0.171	1.241	0.1103
16	1806.00	2.879	0.1724	1.26	0.1181
17	1919.53	2.88	0.1737	1.281	0.126
18	2040.50	2.88	0.1748	1.31	0.1339
19	2161.06	2.88	0.1757	1.312	0.1418
20	2270.85	2.88	0.1753	1.338	0.1496
21	2391.12	2.88	0.1755	1.346	0.1575
22	2509.07	2.88	0.1764	1.356	0.1654
23	2633.81	2.88	0.1773	1.373	0.1733
24	2755.77	2.88	0.1787	1.382	0.1811
25	2871.20	2.88	0.1792	1.392	0.189
26	2977.15	2.88	0.1795	1.392	0.1969
27	3107.25	2.88	0.1796	1.405	0.2048
28	3223.67	2.88	0.1804	1.408	0.2126
29	3336.47	2.88	0.1812	1.406	0.2205
30	3458.59	2.88	0.1821	1.403	0.2284
31	3580.72	2.88	0.1833	1.418	0.2362
32	3695.22	2.879	0.1829	1.425	0.2441
33	3803.01	2.88	0.1834	1.426	0.252
34	3924.20	2.88	0.1847	1.426	0.2599
35	4048.11	2.88	0.1853	1.428	0.2677
36	4163.33	2.88	0.1858	1.435	0.2756
37	4182.96	2.88	0.186	1.429	0.2775

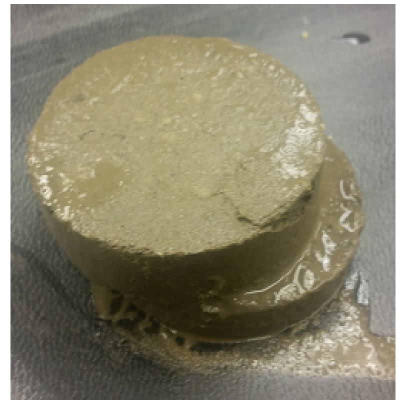
DIRECT SHEAR TEST DATA

Project: DYNEGY EDWARDS
Boring No.: EDW-B003 S9
Sample No.: S-9
Test No.: 80 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 10/23/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 30.0'-32.0'
Elevation: ----

Soil Description: VERY DARK GRAY VARVED FLY ASH
Remarks: TEST PERFORMED AS PER ASTM D3080



	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	5.757	0.195	0	0
2	58.95	5.759	0.1996	0.5335	0.007876
3	100.20	5.759	0.2019	0.8357	0.01575
4	140.38	5.759	0.2048	1.069	0.02363
5	178.98	5.759	0.2079	1.257	0.0315
6	214.75	5.759	0.2102	1.405	0.03938
7	256.36	5.759	0.2126	1.554	0.04725
8	295.19	5.759	0.2142	1.68	0.05513
9	332.54	5.759	0.216	1.784	0.06301
10	373.08	5.759	0.2174	1.879	0.07088
11	411.52	5.759	0.219	1.962	0.07876
12	450.22	5.759	0.2203	2.034	0.08663
13	487.04	5.759	0.2214	2.089	0.09451
14	524.30	5.759	0.2232	2.152	0.1024
15	562.81	5.759	0.2247	2.215	0.1103
16	600.83	5.759	0.2262	2.277	0.1181
17	638.96	5.759	0.2278	2.314	0.126
18	681.52	5.759	0.2295	2.365	0.1339
19	716.24	5.759	0.2303	2.426	0.1418
20	755.33	5.76	0.2315	2.489	0.1496
21	791.66	5.759	0.2324	2.542	0.1575
22	830.85	5.759	0.2338	2.587	0.1654
23	870.20	5.759	0.2346	2.643	0.1733
24	908.45	5.759	0.2356	2.697	0.1811
25	944.85	5.759	0.2372	2.738	0.189
26	983.52	5.759	0.2383	2.779	0.1969
27	1022.76	5.759	0.2395	2.809	0.2048
28	1059.45	5.759	0.2401	2.838	0.2126
29	1096.13	5.759	0.2411	2.858	0.2205
30	1136.62	5.759	0.2421	2.903	0.2284
31	1174.43	5.759	0.2433	2.936	0.2362
32	1210.69	5.759	0.244	2.961	0.2441
33	1248.49	5.759	0.2448	2.964	0.252
34	1288.45	5.759	0.2456	2.966	0.2599
35	1323.77	5.759	0.2462	2.967	0.2677
36	1353.20	5.759	0.2472	2.982	0.2737

DIRECT SHEAR TEST REPORT

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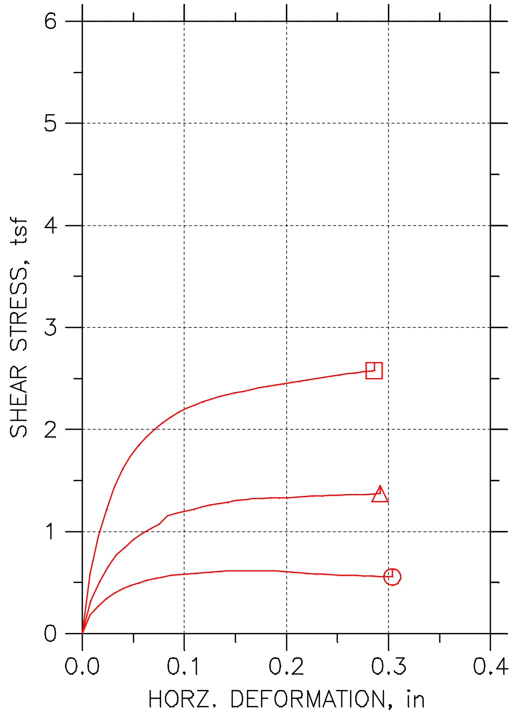

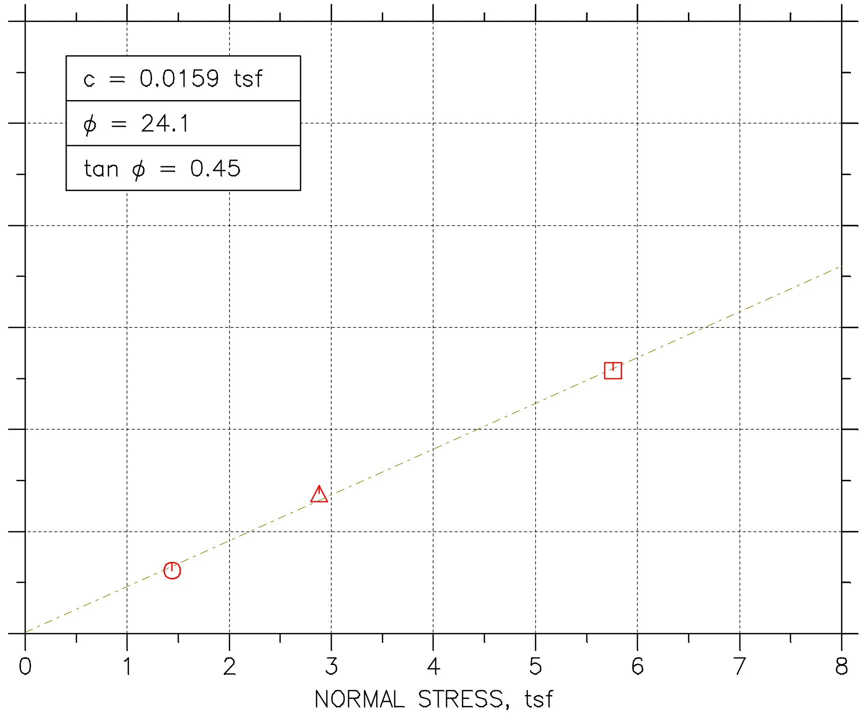

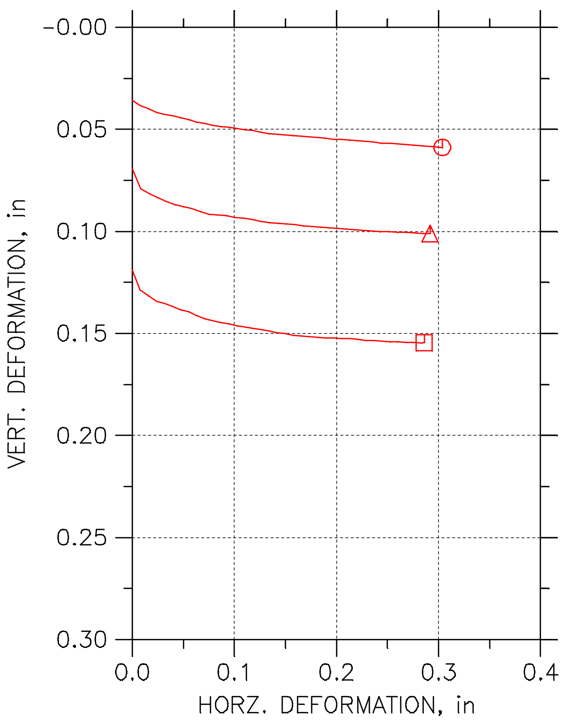

Symbol		○	△	□	
Test No.		20 PSI	40 PSI	80 PSI	
Sample No.		S-10	S-10	S-10	
Shape		Circular	Circular	Circular	
Initial	Dimension, in	2.4921	2.4996	2.4976	
	Area, in^2	4.8779	4.9072	4.8995	
	Height, in	0.99606	0.98583	0.98858	
	Water Content, %	29.91	28.99	29.10	
	Dry Density, pcf	90.515	92.188	91.834	
	Saturation, %	92.88	93.65	93.21	
	Void Ratio	0.87597	0.84192	0.84903	
Consol. Height, in		0.96227	0.91945	0.88312	
Consol. Void Ratio		0.81233	0.71789	0.65176	
Final	Water Content, %	28.10	23.40	19.70	
	Dry Density, pcf	96.208	102.73	108.85	
	Saturation, %	99.92	97.47	95.68	
	Void Ratio	0.76496	0.653	0.56003	
Normal Stress, tsf		1.4392	2.8795	5.7594	
Max. Shear Stress, tsf		0.61821	1.3715	2.5767	
Ult. Shear Stress, tsf		0.55697	1.3715	2.5767	
Time to Failure, min		793.54	1341	1400	
Disp. Rate, in/min		0.000207	0.000207	0.000207	
Estimated Specific Gravity		2.72	2.72	2.72	
Liquid Limit		40	40	40	
Plastic Limit		15	15	15	
Plasticity Index		25	25	25	

Project: DYNEGY EDWARDS

Location: BARTONVILLE, IL

Project No.: MR155218

Boring No.: EDW010 S10

Sample Type: 3.0'' ST

Description: BLUISH GRAY LEAN CLAY CL

Remarks: TEST PERFORMED AS PER ASTM D3080

Tue, 17-NOV-2015 16:39:52

DIRECT SHEAR TEST DATA

Project: DYNEGY EDWARDS
Boring No.: EDW010 S10
Sample No.: S-10
Test No.: 20 PSI

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/4/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 30.0'-32.0'
Elevation: ----

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Soil Description: BLUISH GRAY LEAN CLAY CL
Remarks: TEST PERFORMED AS PER ASTM D3080

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	1.438	0.03587	0	0
2	39.39	1.439	0.03845	0.185	0.007876
3	76.42	1.439	0.0399	0.2733	0.01575
4	116.70	1.439	0.04167	0.343	0.02363
5	155.57	1.439	0.04274	0.3971	0.0315
6	194.59	1.439	0.04325	0.439	0.03938
7	231.17	1.439	0.04419	0.4699	0.04725
8	266.54	1.439	0.04514	0.4951	0.05513
9	305.27	1.439	0.0464	0.5183	0.06301
10	340.94	1.439	0.04709	0.537	0.07088
11	379.25	1.439	0.04797	0.555	0.07876
12	423.04	1.439	0.04873	0.5699	0.08663
13	457.67	1.439	0.04905	0.5782	0.09451
14	495.80	1.439	0.04968	0.586	0.1024
15	531.98	1.439	0.05012	0.5924	0.1103
16	571.20	1.439	0.05068	0.5989	0.1181
17	608.83	1.439	0.0515	0.604	0.126
18	647.29	1.439	0.05207	0.6079	0.1339
19	683.43	1.438	0.05239	0.6124	0.1418
20	721.04	1.438	0.0527	0.615	0.1496
21	758.83	1.439	0.05295	0.6169	0.1575
22	793.54	1.439	0.05327	0.6182	0.1654
23	830.97	1.439	0.05365	0.6176	0.1733
24	869.12	1.439	0.05396	0.615	0.1811
25	906.41	1.439	0.0544	0.6124	0.189
26	945.26	1.439	0.05491	0.6073	0.1969
27	982.69	1.439	0.0551	0.6021	0.2048
28	1020.06	1.439	0.05529	0.5957	0.2126
29	1059.90	1.439	0.0556	0.5905	0.2205
30	1095.28	1.439	0.05585	0.586	0.2284
31	1131.23	1.439	0.05617	0.5821	0.2362
32	1169.64	1.439	0.05674	0.5776	0.2441
33	1209.10	1.439	0.05699	0.5731	0.252
34	1244.59	1.439	0.0573	0.5718	0.2599
35	1283.36	1.439	0.05762	0.5705	0.2677
36	1319.90	1.439	0.05775	0.5679	0.2756
37	1357.90	1.439	0.05806	0.5641	0.2835
38	1393.69	1.438	0.05838	0.5615	0.2914
39	1434.20	1.44	0.05875	0.5589	0.2992
40	1455.26	1.439	0.05894	0.557	0.3036

DIRECT SHEAR TEST DATA

Project: DYNEGY EDWARDS
Boring No.: EDW010 S10
Sample No.: S-10
Test No.: 40 PSI

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 11/4/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 30.0'-32.0'
Elevation: ----

Soil Description: BLUISH GRAY LEAN CLAY CL
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	2.879	0.06953	0	0
2	66.92	2.879	0.07899	0.3222	0.00838
3	104.04	2.88	0.0817	0.5099	0.01676
4	142.82	2.879	0.08347	0.6542	0.02514
5	185.18	2.88	0.08542	0.7741	0.03352
6	219.73	2.88	0.08681	0.8505	0.0419
7	257.69	2.88	0.08794	0.9202	0.05028
8	298.10	2.88	0.08882	0.982	0.05866
9	333.83	2.88	0.09046	1.029	0.06704
10	369.75	2.88	0.0916	1.072	0.07542
11	413.04	2.88	0.09204	1.152	0.0838
12	445.97	2.88	0.09229	1.18	0.09218
13	485.62	2.88	0.09317	1.197	0.1006
14	521.13	2.88	0.09368	1.22	0.1089
15	559.14	2.88	0.09418	1.241	0.1173
16	595.57	2.879	0.095	1.261	0.1257
17	634.46	2.88	0.09563	1.272	0.1341
18	671.61	2.88	0.0962	1.289	0.1425
19	707.68	2.88	0.09645	1.303	0.1508
20	746.34	2.88	0.0967	1.312	0.1592
21	785.27	2.879	0.09727	1.321	0.1676
22	821.12	2.88	0.09778	1.327	0.176
23	858.67	2.88	0.09796	1.33	0.1844
24	895.38	2.88	0.09834	1.334	0.1927
25	934.75	2.88	0.09866	1.333	0.2011
26	971.24	2.88	0.09891	1.337	0.2095
27	1007.72	2.88	0.09916	1.342	0.2179
28	1045.96	2.88	0.09941	1.346	0.2262
29	1084.53	2.88	0.09992	1.351	0.2346
30	1120.37	2.88	0.1001	1.354	0.243
31	1156.63	2.88	0.1002	1.357	0.2513
32	1197.77	2.88	0.1003	1.36	0.2597
33	1233.68	2.88	0.1004	1.362	0.2681
34	1272.09	2.88	0.1006	1.364	0.2765
35	1311.64	2.88	0.1009	1.369	0.2849
36	1340.99	2.88	0.1011	1.371	0.2916

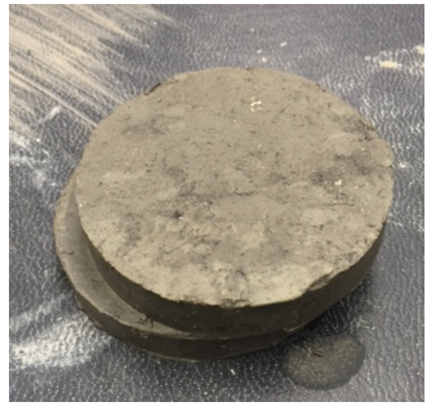
DIRECT SHEAR TEST DATA

Project: DYNEGY EDWARDS
Boring No.: EDW010 S10
Sample No.: S-10
Test No.: 80 PSI

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 11/5/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 30.0'-32.0'
Elevation: ----

Soil Description: BLUISH GRAY LEAN CLAY CL
Remarks: TEST PERFORMED AS PER ASTM D3080.



	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	5.757	0.1189	0	0
2	53.81	5.759	0.1286	0.586	0.007876
3	93.90	5.759	0.1315	0.9544	0.01575
4	132.06	5.759	0.1342	1.218	0.02363
5	171.21	5.759	0.1354	1.435	0.0315
6	211.15	5.759	0.1367	1.61	0.03938
7	250.46	5.759	0.1385	1.74	0.04725
8	288.21	5.759	0.1395	1.844	0.05513
9	324.71	5.759	0.1411	1.926	0.06301
10	364.16	5.759	0.1428	2.004	0.07088
11	401.96	5.759	0.1437	2.067	0.07876
12	438.83	5.759	0.1446	2.119	0.08663
13	478.24	5.759	0.1452	2.171	0.09451
14	515.94	5.759	0.1461	2.207	0.1024
15	554.42	5.759	0.1469	2.242	0.1103
16	590.30	5.759	0.1476	2.272	0.1181
17	626.52	5.759	0.1482	2.294	0.126
18	663.24	5.759	0.1488	2.321	0.1339
19	700.05	5.759	0.1496	2.34	0.1418
20	741.31	5.759	0.15	2.362	0.1496
21	780.69	5.759	0.1509	2.374	0.1575
22	817.38	5.759	0.1512	2.393	0.1654
23	854.69	5.759	0.1515	2.407	0.1733
24	892.50	5.759	0.1519	2.423	0.1811
25	930.62	5.759	0.1523	2.434	0.189
26	969.48	5.759	0.1523	2.444	0.1969
27	1008.12	5.759	0.1525	2.457	0.2048
28	1045.34	5.759	0.1527	2.471	0.2126
29	1083.92	5.759	0.1529	2.484	0.2205
30	1123.76	5.759	0.1533	2.499	0.2284
31	1160.12	5.759	0.1535	2.512	0.2362
32	1197.88	5.759	0.1537	2.526	0.2441
33	1240.24	5.759	0.1541	2.536	0.252
34	1277.15	5.759	0.1541	2.545	0.2599
35	1312.34	5.759	0.1543	2.556	0.2677
36	1351.46	5.759	0.1543	2.566	0.2756
37	1391.74	5.759	0.1546	2.576	0.2835
38	1399.98	5.759	0.1545	2.577	0.2859

DIRECT SHEAR TEST REPORT

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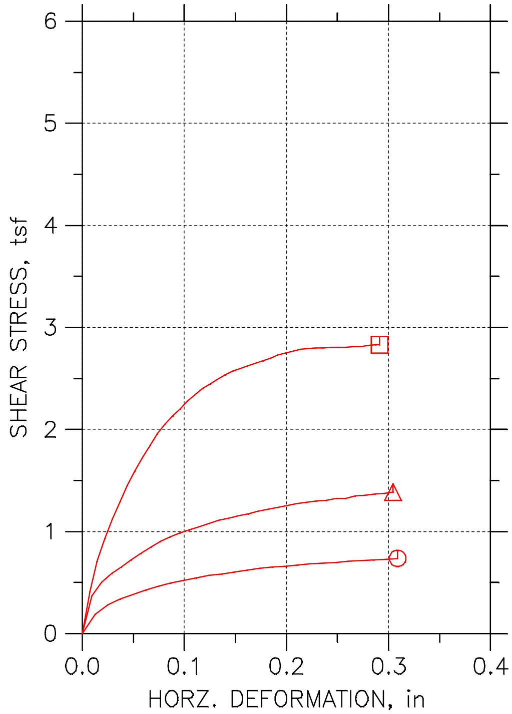

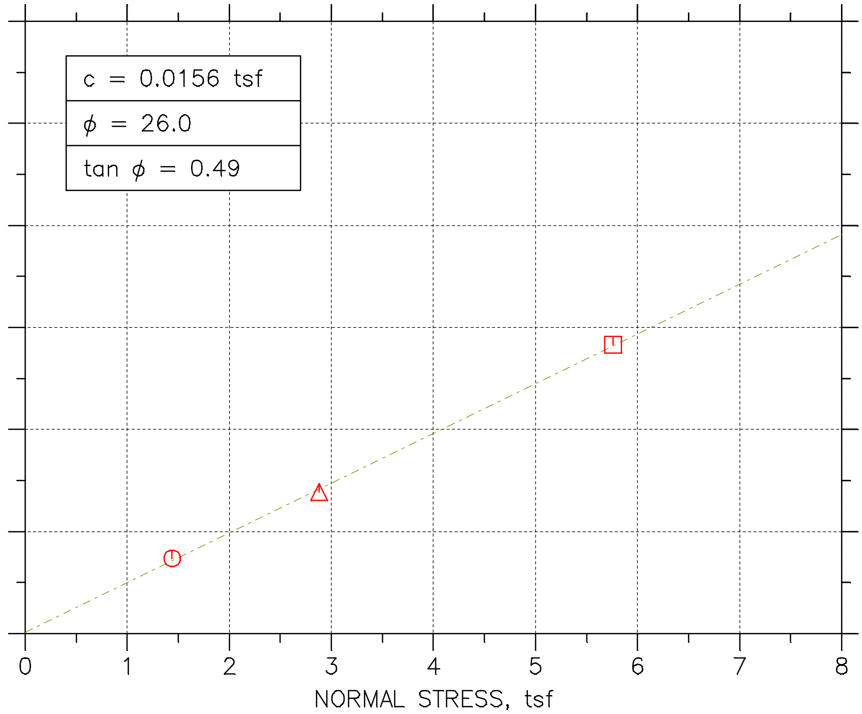

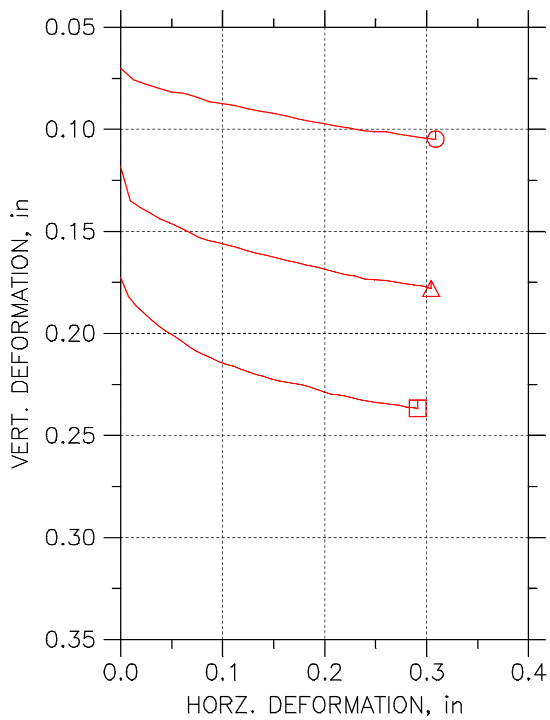

Symbol		○	△	□	
Test No.		20 PSI	40 PSI	80 PSI	
Sample No.		S-14	S-14	S-14	
Shape		Circular	Circular	Circular	
Initial	Dimension, in	2.5087	2.5067	2.502	
	Area, in^2	4.9428	4.9351	4.9165	
	Height, in	0.99961	1.0098	0.99646	
	Water Content, %	50.80	50.19	50.11	
	Dry Density, pcf	69.233	69.813	69.282	
	Saturation, %	95.13	95.32	93.94	
	Void Ratio	1.4527	1.4323	1.4509	
Consol. Height, in		0.93203	0.8987	0.83564	
Consol. Void Ratio		1.2868	1.1646	1.0554	
Final	Water Content, %	44.10	36.30	31.60	
	Dry Density, pcf	77.344	84.748	90.862	
	Saturation, %	100.34	98.38	98.93	
	Void Ratio	1.1954	1.0036	0.86882	
Normal Stress, tsf		1.4393	2.8799	5.7593	
Max. Shear Stress, tsf		0.73733	1.3874	2.8312	
Ult. Shear Stress, tsf		0.73733	1.3874	2.8312	
Time to Failure, min		961	3164.9	1365.2	
Disp. Rate, in/min		0.000207	8.85e-005	0.000232	
Estimated Specific Gravity		2.72	2.72	2.72	
Liquid Limit		54	54	54	
Plastic Limit		20	20	20	
Plasticity Index		34	34	34	

Project: DYNEGY EDWARDS	
Location: BARTONVILLE, IL	
Project No.: MR155218	
Boring No.: EDW012 S14	
Sample Type: 3.0'' ST	
Description: DARK GRAY FAT CLAY CH SHELL NOTED	
Remarks: TEST PERFORMED AS PER ASTM D3080.	

Tue, 17-NOV-2015 17:00:29

DIRECT SHEAR TEST DATA

Project: DYNEGY EDWARDS
Boring No.: EDW012 S14
Sample No.: S-14
Test No.: 20 PSI

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 11/5/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 47.0'-49.0'
Elevation: ----

Soil Description: DARK GRAY FAT CLAY CH SHELL NOTED
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	1.438	0.07004	0	0
2	47.30	1.438	0.0759	0.1909	0.01241
3	86.02	1.439	0.07811	0.2818	0.02482
4	124.31	1.439	0.07994	0.3416	0.03724
5	160.06	1.438	0.08176	0.3855	0.04965
6	200.31	1.439	0.08246	0.4281	0.06206
7	238.78	1.438	0.08441	0.4644	0.07447
8	275.86	1.439	0.08649	0.4949	0.08688
9	314.97	1.439	0.08737	0.5229	0.09929
10	355.17	1.439	0.08832	0.5477	0.1117
11	393.92	1.439	0.08977	0.5706	0.1241
12	429.38	1.439	0.09128	0.5859	0.1365
13	468.43	1.439	0.09223	0.6056	0.1489
14	506.02	1.439	0.09336	0.6215	0.1614
15	542.62	1.439	0.09481	0.6381	0.1738
16	586.75	1.439	0.09614	0.6521	0.1862
17	618.29	1.439	0.09721	0.6616	0.1986
18	656.28	1.438	0.09828	0.6718	0.211
19	696.76	1.439	0.09935	0.682	0.2234
20	732.98	1.439	0.1005	0.6915	0.2358
21	769.67	1.439	0.1012	0.6998	0.2482
22	812.59	1.439	0.1013	0.7093	0.2606
23	848.00	1.439	0.1026	0.7151	0.2731
24	887.83	1.438	0.1033	0.724	0.2855
25	924.52	1.438	0.1043	0.731	0.2979
26	961.00	1.439	0.1048	0.7373	0.3088

DIRECT SHEAR TEST DATA

Project: DYNEGY EDWARDS
Boring No.: EDW012 S14
Sample No.: S-14
Test No.: 40 PSI

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 11/7/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 47.0'-49.0'
Elevation: ----

Soil Description: DARK GRAY FAT CLAY CH SHELL NOTED
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	2.879	0.1185	0	0
2	372.53	2.88	0.1351	0.3735	0.009556
3	468.99	2.88	0.1381	0.5003	0.01911
4	564.01	2.88	0.141	0.5902	0.02867
5	651.75	2.88	0.144	0.656	0.03822
6	744.20	2.88	0.1459	0.7228	0.04778
7	835.68	2.879	0.1481	0.7865	0.05733
8	925.97	2.88	0.1505	0.8454	0.06689
9	1018.05	2.88	0.1529	0.9026	0.07645
10	1104.25	2.88	0.1545	0.9476	0.086
11	1195.15	2.88	0.1556	0.9882	0.09556
12	1289.11	2.88	0.1568	1.019	0.1051
13	1376.20	2.88	0.158	1.049	0.1147
14	1467.76	2.88	0.1596	1.082	0.1242
15	1560.82	2.88	0.1608	1.11	0.1338
16	1648.67	2.88	0.1618	1.132	0.1433
17	1734.35	2.88	0.1631	1.153	0.1529
18	1827.14	2.88	0.1642	1.177	0.1624
19	1925.93	2.88	0.1651	1.202	0.172
20	2006.92	2.88	0.1663	1.219	0.1816
21	2105.98	2.88	0.1673	1.236	0.1911
22	2191.37	2.88	0.1688	1.253	0.2007
23	2278.65	2.88	0.1698	1.274	0.2102
24	2368.36	2.88	0.1711	1.289	0.2198
25	2452.94	2.88	0.1719	1.301	0.2293
26	2544.63	2.88	0.1735	1.308	0.2389
27	2629.18	2.88	0.1737	1.323	0.2485
28	2720.25	2.88	0.1741	1.327	0.2579
29	2813.74	2.88	0.1747	1.347	0.2675
30	2902.90	2.88	0.1755	1.353	0.2771
31	2995.72	2.88	0.1763	1.367	0.2866
32	3085.70	2.879	0.177	1.376	0.2962
33	3164.86	2.88	0.178	1.387	0.3043

DIRECT SHEAR TEST DATA

Project: DYNEGY EDWARDS
Boring No.: EDW012 S14
Sample No.: S-14
Test No.: 80 PSI

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 11/9/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 47.0'-49.0'
Elevation: ----

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Soil Description: DARK GRAY FAT CLAY CH SHELL NOTED
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	5.758	0.1729	0	0
2	39.55	5.758	0.1819	0.4139	0.007372
3	77.10	5.759	0.1863	0.7122	0.01474
4	112.99	5.759	0.1897	0.9304	0.02212
5	148.81	5.759	0.193	1.122	0.02949
6	184.76	5.759	0.1961	1.293	0.03686
7	219.25	5.759	0.1988	1.448	0.04423
8	256.03	5.759	0.2008	1.596	0.0516
9	290.21	5.759	0.2034	1.726	0.05897
10	325.35	5.759	0.2062	1.846	0.06635
11	362.78	5.759	0.2083	1.96	0.07372
12	397.12	5.759	0.2103	2.054	0.08109
13	429.34	5.759	0.2121	2.132	0.08846
14	462.52	5.759	0.2137	2.205	0.09583
15	499.06	5.759	0.215	2.279	0.1032
16	532.30	5.759	0.2162	2.34	0.1106
17	569.81	5.76	0.2177	2.403	0.1179
18	598.74	5.759	0.2187	2.447	0.1253
19	633.77	5.759	0.2199	2.494	0.1327
20	670.11	5.759	0.2209	2.537	0.1401
21	703.89	5.759	0.2224	2.574	0.1474
22	737.17	5.759	0.2233	2.6	0.1548
23	771.57	5.759	0.2238	2.622	0.1622
24	805.68	5.759	0.2246	2.647	0.1696
25	841.96	5.759	0.2251	2.675	0.1769
26	874.04	5.759	0.226	2.7	0.1843
27	910.30	5.759	0.2273	2.727	0.1917
28	942.84	5.759	0.2287	2.746	0.199
29	977.11	5.759	0.2297	2.769	0.2064
30	1011.86	5.759	0.2302	2.785	0.2137
31	1046.27	5.759	0.2307	2.794	0.2211
32	1078.57	5.759	0.2316	2.801	0.2285
33	1111.99	5.759	0.2326	2.8	0.2359
34	1147.40	5.759	0.2332	2.803	0.2432
35	1179.32	5.759	0.2338	2.804	0.2506
36	1216.60	5.759	0.2341	2.806	0.258
37	1246.79	5.759	0.2347	2.809	0.2653
38	1278.72	5.759	0.2353	2.814	0.2727
39	1316.44	5.759	0.236	2.823	0.2801
40	1349.92	5.759	0.2364	2.829	0.2875
41	1365.24	5.759	0.2367	2.831	0.2913

DIRECT SHEAR TEST REPORT

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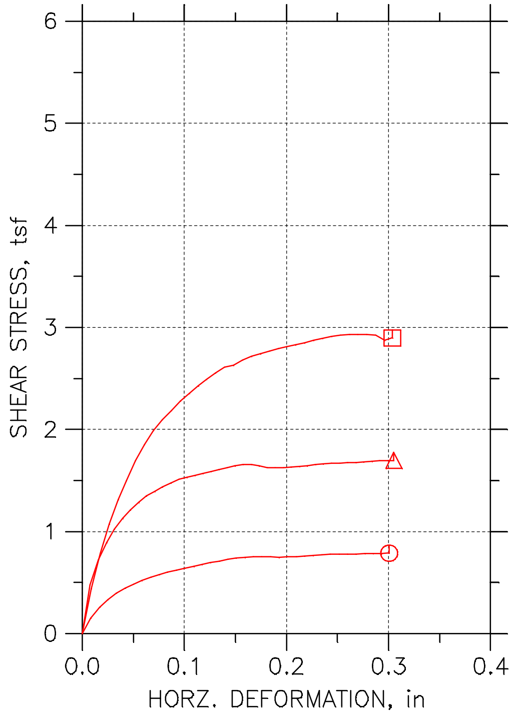
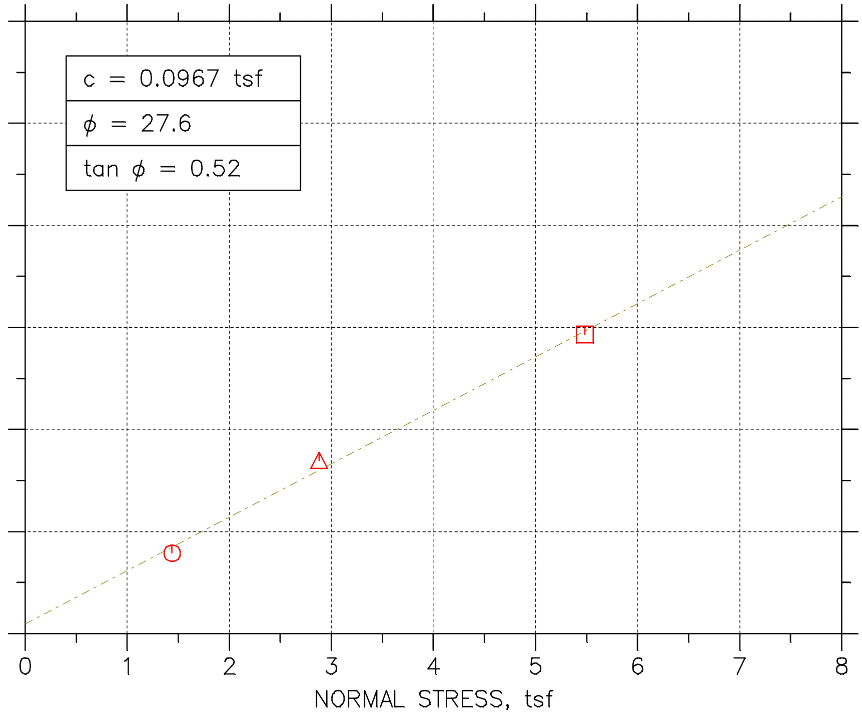
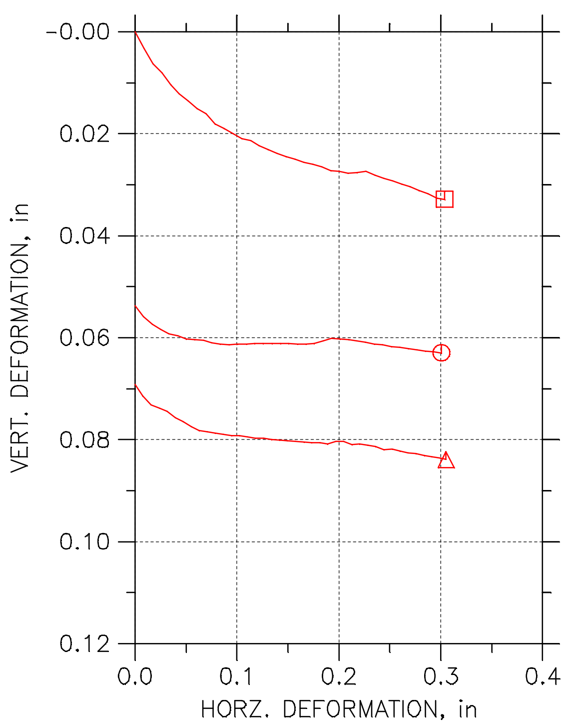






	Symbol	○	△	□	
	Test No.	20 PSI	40 PSI	80 PSI	
	Sample No.	S-10	S-10	S-10	
	Shape	Circular	Circular	Circular	
Initial	Dimension, in	2.498	2.5	2.5087	
Initial	Area, in^2	4.901	4.9087	4.9431	
Initial	Height, in	0.98898	0.99252	0.99606	
Initial	Water Content, %	20.30	20.20	20.70	
Initial	Dry Density, pcf	101.54	100.62	99.218	
Initial	Saturation, %	85.50	83.10	82.20	
Initial	Void Ratio	0.62921	0.64421	0.66738	
	Consol. Height, in	0.94144	0.9279	0.99606	
	Consol. Void Ratio	0.5509	0.53717	0.66738	
Final	Water Content, %	19.10	18.60	22.80	
Final	Dry Density, pcf	108.45	109.91	102.6	
Final	Saturation, %	96.32	97.56	98.66	
Final	Void Ratio	0.52546	0.50521	0.61241	
	Normal Stress, tsf	1.4396	2.8794	5.4854	
	Max. Shear Stress, tsf	0.78821	1.6963	2.9302	
	Ult. Shear Stress, tsf	0.78821	1.6963	2.8965	
	Time to Failure, min	1242.6	1357.2	1031.5	
	Disp. Rate, in/min	0.000232	0.000232	0.000232	
	Estimated Specific Gravity	2.65	2.65	2.65	
	Liquid Limit	24	24	24	
	Plastic Limit	13	13	13	
	Plasticity Index	11	11	11	

Project: DYNEGY EDWARDS

Location: BARTONVILLE, IL

Project No.: MR155218

Boring No.: EDW015 S10

Sample Type: 3.0'' ST

Description: BROWN AND GRAY MOTTLED SANDY LEAN CLAY WITH GRAVEL CL

Remarks: TEST PERFORMED AS PER ASTM D3080.

Tue, 17-NOV-2015 17:37:38

DIRECT SHEAR TEST DATA

Project: DYNEGY EDWARDS
Boring No.: EDW015 S10
Sample No.: S-10
Test No.: 20 PSI

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 11/10/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 31.0'-33.0'
Elevation: ----

Soil Description: BROWN AND GRAY MOTTLED SANDY LEAN CLAY WITH GRAVEL CL
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	1.439	0.05371	0	0
2	53.95	1.44	0.05592	0.1498	0.00838
3	89.12	1.439	0.05743	0.2586	0.01676
4	121.56	1.439	0.05838	0.3313	0.02514
5	157.67	1.44	0.05919	0.3949	0.03352
6	194.41	1.44	0.05957	0.4472	0.0419
7	229.85	1.44	0.0602	0.4865	0.05028
8	262.66	1.44	0.06033	0.5204	0.05866
9	296.74	1.44	0.06052	0.5501	0.06704
10	331.66	1.44	0.06102	0.577	0.07542
11	364.35	1.44	0.06128	0.6007	0.0838
12	395.09	1.44	0.06134	0.6201	0.09218
13	431.13	1.44	0.06121	0.6417	0.1006
14	466.24	1.44	0.06121	0.6611	0.1089
15	499.12	1.44	0.06109	0.6772	0.1173
16	531.39	1.44	0.06109	0.6939	0.1257
17	565.38	1.44	0.06115	0.7106	0.1341
18	600.22	1.44	0.06115	0.7257	0.1425
19	633.76	1.44	0.06115	0.7381	0.1508
20	668.19	1.44	0.06121	0.7478	0.1592
21	702.22	1.44	0.06121	0.7543	0.1676
22	736.72	1.44	0.06115	0.7553	0.176
23	772.13	1.439	0.06058	0.7521	0.1844
24	804.93	1.44	0.06008	0.7494	0.1927
25	838.10	1.44	0.06027	0.751	0.2011
26	873.29	1.44	0.06033	0.7548	0.2095
27	907.96	1.44	0.06058	0.7613	0.2179
28	940.97	1.44	0.06083	0.7661	0.2262
29	974.96	1.44	0.06121	0.771	0.2346
30	1009.21	1.44	0.0614	0.7758	0.243
31	1042.51	1.44	0.06178	0.7769	0.2513
32	1073.94	1.439	0.06191	0.778	0.2597
33	1112.13	1.44	0.06216	0.7801	0.2681
34	1143.69	1.44	0.06241	0.7823	0.2765
35	1177.31	1.44	0.0626	0.785	0.2849
36	1213.76	1.44	0.06273	0.7861	0.2932
37	1242.60	1.44	0.06298	0.7882	0.3006

DIRECT SHEAR TEST DATA

Project: DYNEGY EDWARDS
Boring No.: EDW015 S10
Sample No.: S-10
Test No.: 40 PSI

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 11/10/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 31.0'-33.0'
Elevation: ----

Soil Description: BROWN AND GRAY MOTTLED SANDY LEAN CLAY WITH GRAVEL CL
Remarks: TEST PERFORMED AS PER ASTM D3080.

	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	2.887	0.06916	0	0
2	81.09	2.879	0.07142	0.4785	0.007876
3	117.60	2.879	0.07313	0.7219	0.01575
4	151.97	2.879	0.07376	0.8898	0.02363
5	186.66	2.879	0.07439	1.023	0.0315
6	221.15	2.879	0.07571	1.129	0.03938
7	253.83	2.879	0.07647	1.211	0.04725
8	289.37	2.879	0.07741	1.288	0.05513
9	323.30	2.879	0.07823	1.347	0.06301
10	356.53	2.879	0.07849	1.394	0.07088
11	391.02	2.879	0.07867	1.439	0.07876
12	424.56	2.879	0.07893	1.477	0.08663
13	459.98	2.879	0.07918	1.51	0.09451
14	492.86	2.879	0.07924	1.534	0.1024
15	523.80	2.879	0.07943	1.552	0.1103
16	556.72	2.879	0.07968	1.571	0.1181
17	588.93	2.879	0.07975	1.588	0.126
18	622.51	2.879	0.08	1.607	0.1339
19	657.43	2.879	0.08006	1.626	0.1418
20	692.69	2.879	0.08025	1.644	0.1496
21	724.45	2.879	0.08031	1.655	0.1575
22	759.66	2.879	0.08044	1.658	0.1654
23	791.34	2.88	0.08057	1.646	0.1733
24	825.40	2.879	0.08063	1.628	0.1811
25	858.43	2.879	0.08082	1.623	0.189
26	892.73	2.879	0.08031	1.623	0.1969
27	926.40	2.879	0.08038	1.63	0.2048
28	958.76	2.879	0.08101	1.635	0.2126
29	993.58	2.879	0.08088	1.643	0.2205
30	1027.07	2.879	0.08113	1.655	0.2284
31	1059.32	2.88	0.08132	1.662	0.2362
32	1094.50	2.879	0.08195	1.667	0.2441
33	1128.29	2.879	0.08189	1.671	0.252
34	1161.15	2.879	0.08227	1.676	0.2599
35	1194.98	2.879	0.08258	1.676	0.2677
36	1230.64	2.879	0.08271	1.684	0.2756
37	1263.56	2.879	0.08315	1.688	0.2835
38	1294.95	2.879	0.0834	1.693	0.2914
39	1331.25	2.879	0.08365	1.694	0.2992
40	1357.24	2.879	0.08391	1.696	0.3052

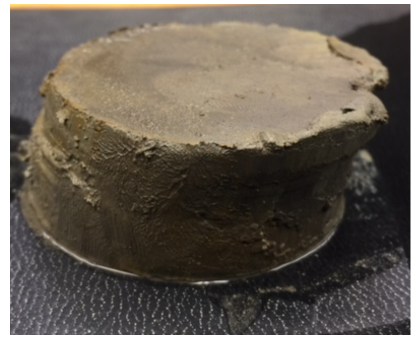
DIRECT SHEAR TEST DATA

Project: DYNEGY EDWARDS
Boring No.: EDW015 S10
Sample No.: S-10
Test No.: 80 PSI

Location: BARTONVILLE, IL
Tested By: HP
Test Date: 11/12/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: BCM
Depth: 31.0'-33.0'
Elevation: ----

Soil Description: BROWN AND GRAY MOTTLED SANDY LEAN CLAY WITH GRAVEL CL
Remarks: TEST PERFORMED AS PER ASTM D3080.



	Elapsed Time min	Vertical Stress tsf	Vertical Displacement in	Horizontal Stress tsf	Horizontal Displacement in
1	0.00	5.485	0	0	0
2	36.40	5.485	0.003256	0.437	0.008716
3	71.32	5.485	0.006327	0.7826	0.01743
4	106.78	5.485	0.008001	1.076	0.02615
5	141.55	5.485	0.01042	1.313	0.03486
6	173.06	5.485	0.01219	1.499	0.04358
7	209.72	5.485	0.01358	1.693	0.05229
8	245.51	5.485	0.01507	1.854	0.06101
9	279.22	5.485	0.0161	1.987	0.06973
10	314.35	5.485	0.01805	2.098	0.07844
11	349.53	5.485	0.01898	2.187	0.08716
12	383.30	5.485	0.02	2.276	0.09587
13	415.59	5.485	0.02093	2.352	0.1046
14	449.70	5.485	0.0214	2.428	0.1133
15	485.17	5.485	0.02242	2.494	0.122
16	517.51	5.485	0.02317	2.551	0.1307
17	556.85	5.485	0.02382	2.612	0.1395
18	584.89	5.485	0.02447	2.627	0.1482
19	618.32	5.485	0.02503	2.678	0.1569
20	654.74	5.485	0.02568	2.719	0.1656
21	687.22	5.485	0.02596	2.742	0.1743
22	720.44	5.485	0.02652	2.766	0.183
23	755.56	5.485	0.02726	2.793	0.1917
24	788.89	5.485	0.02735	2.81	0.2005
25	823.96	5.485	0.02782	2.83	0.2092
26	856.37	5.485	0.02763	2.851	0.2179
27	893.08	5.485	0.02735	2.874	0.2266
28	925.58	5.485	0.02819	2.893	0.2353
29	960.00	5.485	0.02875	2.911	0.244
30	995.06	5.485	0.02931	2.924	0.2527
31	1031.53	5.485	0.02987	2.93	0.2614
32	1062.43	5.485	0.03042	2.929	0.2701
33	1097.75	5.486	0.03117	2.929	0.2789
34	1131.93	5.485	0.03182	2.926	0.2876
35	1165.06	5.485	0.03266	2.877	0.2963
36	1194.80	5.485	0.03284	2.897	0.3037

HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

Terracon
Consulting Engineers & Scientists

Laboratory Services Group 750 Corporate Woods Parkway Vernon Hills, Illinois 60061 Phone:(847) 793-0306 Fax:(847) 793-0309

TERRACON PROJECT NO.: **MR155218** **11/17/2015**
PROJECT NAME: **DYNEGY - EDWARDS SITE**
CLIENT: **AECOM**
LOCATION : **BARTONVILLE, IL**

SUMMARY OF TEST RESULTS

BORING NO.	EDW-B002
SAMPLE NO.	S-5
DEPTH:	10.0'-12.0'
CLASSIFICATION	GRAY TO DARK GRAY VARVED FLY ASH

	INITIAL	FINAL
DRY UNIT WEIGHT (pcf)	55.9	59.7
WATER CONTENT (%)	66.4	60.8
DIAMETER (cm)	7.218	7.030
LENGTH (cm)	8.678	8.558
HYDRAULIC GRADIENT (MAXIMUM)	10.87	
PERCENT SATURATION	100.0	
HYDRAULIC CONDUCTIVITY k (cm/sec)	9.19E-05	

SAMPLE PHOTO

(Percent saturation calculation is based on final measurements and an estimated specific gravity.)

Deaired water was used as the liquid permeant.

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Consulting Engineers & Scientists

HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

Laboratory Services Group 750 Corporate Woods Parkway Vernon Hills, Illinois 60061 Phone:(847) 793-0306 Fax:(847) 793-0309

TERRACON PROJECT NO.:	**MR155218**	**11/17/2015**
PROJECT NAME:	**DYNEGY - EDWARDS SITE**	
CLIENT:	**AECOM**	
LOCATION :	**BARTONVILLE, IL**	

SUMMARY OF TEST RESULTS

BORING NO.	EDW-B003
SAMPLE NO.	S-9
DEPTH:	30.0'-32.0'
CLASSIFICATION	VERY DARK GRAY VARVED FLY ASH

	INITIAL	FINAL
DRY UNIT WEIGHT (pcf)	53.2	59.3
WATER CONTENT (%)	71.2	61.7
DIAMETER (cm)	7.206	6.968
LENGTH (cm)	8.429	8.091

SAMPLE PHOTO

HYDRAULIC GRADIENT (MAXIMUM)	11.19
PERCENT SATURATION	100.2
HYDRAULIC CONDUCTIVITY k (cm/sec)	6.79E-05

(Percent saturation calculation is based on final measurements and an estimated specific gravity.)

Deaired water was used as the liquid permeant.

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HYDRAULIC CONDUCTIVITY DETERMINATION
ASTM D 5084, METHOD C
RISING TAILWATER LEVEL

Laboratory Services Group 750 Corporate Woods Parkway Vernon Hills, Illinois 60061 Phone:(847) 793-0306 Fax:(847) 793-0309

TERRACON PROJECT NO.:	**MR155218**	**11/17/2015**
PROJECT NAME:	**DYNEGY - EDWARDS SITE**	
CLIENT:	**AECOM**	
LOCATION :	**BARTONVILLE, IL**	

SUMMARY OF TEST RESULTS

BORING NO.	EDW-B004
SAMPLE NO.	S-11
DEPTH:	36.0'-38.0'
CLASSIFICATION	BROWN AND GRAYISH BROWN LEAN CLAY WITH SAND CL

	INITIAL	FINAL
DRY UNIT WEIGHT (pcf)	111.1	113.9
WATER CONTENT (%)	19.3	18.0
DIAMETER (cm)	7.117	7.074
LENGTH (cm)	8.145	8.042

SAMPLE PHOTO

HYDRAULIC GRADIENT (MAXIMUM)	20.21
PERCENT SATURATION	100.5
HYDRAULIC CONDUCTIVITY k (cm/sec)	7.20E-07

(Percent saturation calculation is based on final measurements and an estimated specific gravity.)

Deaired water was used as the liquid permeant.

UNCONFINED COMPRESSION TEST REPORT

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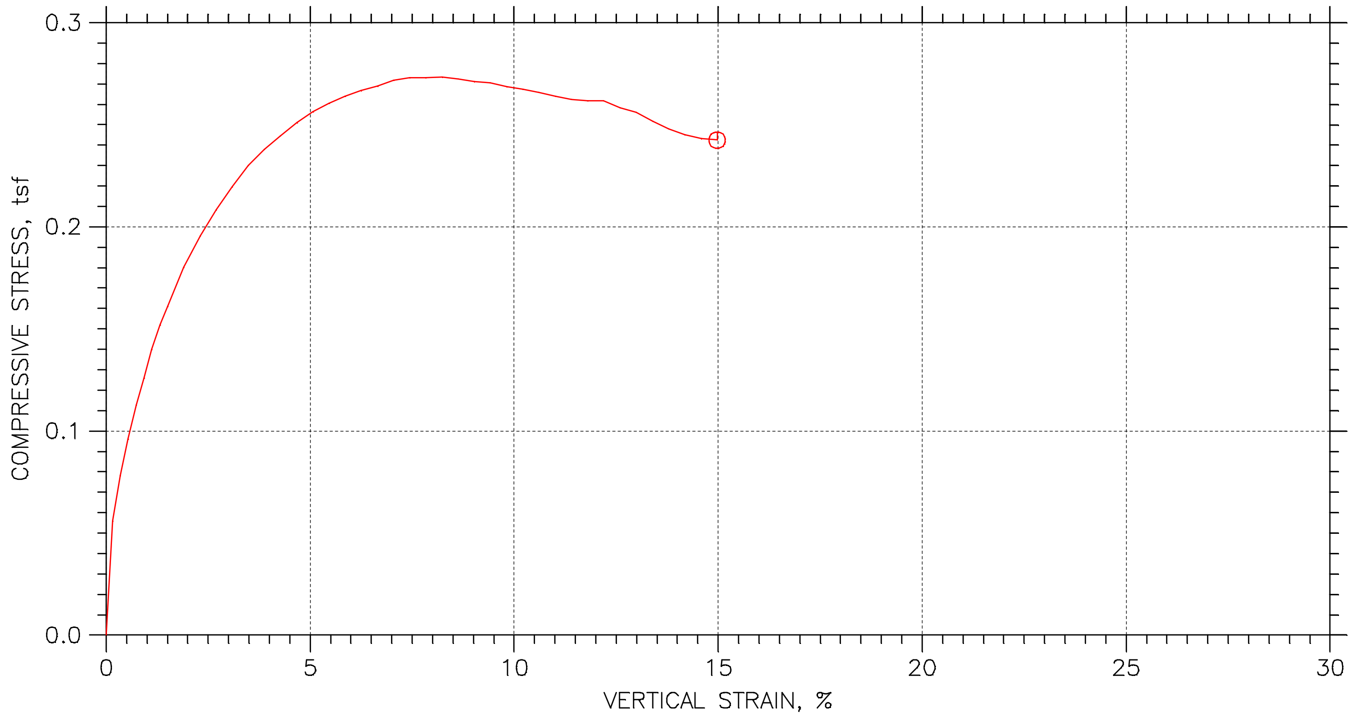
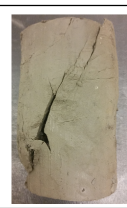


Symbol		⊕			
Test No.		EDW-002 S10			
Initial	Diameter, in	2.8118			
	Height, in	5.9587			
	Water Content, %	29.48			
	Dry Density, pcf	93.81			
	Saturation, %	98.98			
	Void Ratio	0.81002			
Unconfined Compressive Strength, tsf		0.27347			
Undrained Shear Strength, tsf		0.13673			
Time to Failure, min		10.5			
Strain Rate, %/min		1			
Estimated Specific Gravity		2.72			
Liquid Limit		36			
Plastic Limit		18			
Plasticity Index		18			
Failure Sketch					

Project: DYNEGY EDWARDS
Location: BARTONVILLE, IL
Project No.: MR155199
Boring No.: EDW-002 S10
Sample Type: 3.0'' ST
Description: GRAY LEAN CLAY WITH SAND CL
Remarks: TEST PERFORMED AS PER ASTM D 2166.

UNCONFINED COMPRESSION TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-002 S10
Sample No.: S-10
Test No.: EDW-002 S10

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/17/15
Sample Type: 3.0" ST

Project No.: MR155199
Checked By: WPQ
Depth: 35.0'-37.0'
Elevation: -----

Soil Description: GRAY LEAN CLAY WITH SAND CL
Remarks: TEST PERFORMED AS PER ASTM D 2166.

Specimen Height: 5.96 in
Specimen Area: 6.21 in^2
Specimen Volume: 37.00 in^3

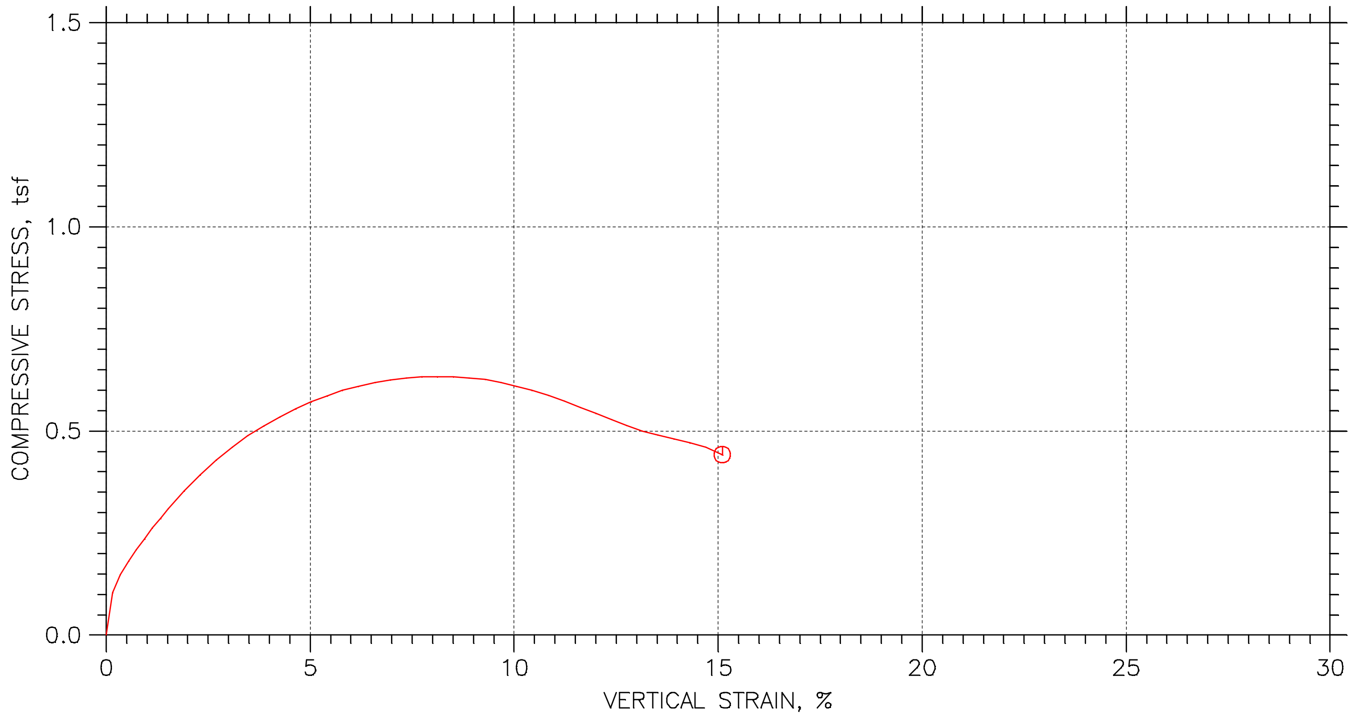
Liquid Limit: 36
Plastic Limit: 18
Estimated Specific Gravity: 2.72

Cap Mass: 0 gm

	Time min	Axial Displacement in	Axial Strain %	Load lb	Corrected Area in^2	Vertical Stress tsf	Shear Stress tsf
1	0	0	0	0	6.2096	0	0
2	0.25007	0.0091325	0.15326	4.8253	6.2191	0.055864	0.027932
3	0.50007	0.020663	0.34678	6.7659	6.2312	0.078179	0.039089
4	0.75007	0.032286	0.54184	8.3394	6.2434	0.096171	0.048086
5	1.0001	0.043725	0.73381	9.808	6.2555	0.11289	0.056444
6	1.2501	0.055348	0.92887	10.962	6.2678	0.12592	0.062961
7	1.5001	0.066879	1.1224	12.221	6.2801	0.14011	0.070054
8	1.7501	0.078318	1.3144	13.27	6.2923	0.15184	0.075919
9	2.0001	0.089941	1.5094	14.109	6.3047	0.16112	0.080561
10	2.5001	0.11346	1.9042	15.84	6.3301	0.18016	0.090082
11	3.0001	0.13708	2.3005	17.256	6.3558	0.19548	0.097739
12	3.5001	0.1606	2.6953	18.462	6.3816	0.2083	0.10415
13	4.0001	0.18413	3.09	19.564	6.4076	0.21983	0.10991
14	4.5001	0.20756	3.4833	20.56	6.4337	0.23009	0.11504
15	5.0001	0.23108	3.878	21.347	6.4601	0.23792	0.11896
16	5.5001	0.2546	4.2728	22.029	6.4867	0.24451	0.12225
17	6.0001	0.27822	4.6691	22.71	6.5137	0.25103	0.12552
18	6.5001	0.30183	5.0654	23.287	6.5409	0.25634	0.12817
19	7.0001	0.32536	5.4602	23.759	6.5682	0.26045	0.13022
20	7.5001	0.34897	5.8565	24.179	6.5959	0.26394	0.13197
21	8.0001	0.37249	6.2513	24.546	6.6236	0.26682	0.13341
22	8.5001	0.39602	6.6461	24.861	6.6517	0.2691	0.13455
23	9.0001	0.41972	7.0439	25.228	6.6801	0.27191	0.13596
24	9.5001	0.44343	7.4418	25.438	6.7088	0.273	0.1365
25	10	0.46686	7.835	25.543	6.7375	0.27296	0.13648
26	10.5	0.49039	8.2298	25.7	6.7664	0.27347	0.13673
27	11	0.51372	8.6215	25.7	6.7954	0.2723	0.13615
28	11.5	0.53734	9.0178	25.7	6.825	0.27112	0.13556
29	12	0.56114	9.4172	25.753	6.8551	0.27048	0.13524
30	12.5	0.58503	9.8182	25.7	6.8856	0.26873	0.13437
31	13	0.60874	10.216	25.7	6.9161	0.26755	0.13377
32	13.5	0.63235	10.612	25.648	6.9468	0.26582	0.13291
33	14	0.65588	11.007	25.595	6.9776	0.26411	0.13205
34	14.5	0.67912	11.397	25.543	7.0083	0.26241	0.13121
35	15	0.70274	11.794	25.595	7.0398	0.26178	0.13089
36	15.5	0.72654	12.193	25.7	7.0718	0.26166	0.13083
37	16	0.75043	12.594	25.49	7.1043	0.25834	0.12917
38	16.5	0.77414	12.992	25.385	7.1368	0.2561	0.12805
39	17	0.79784	13.39	25.071	7.1696	0.25177	0.12589
40	17.5	0.82155	13.788	24.808	7.2026	0.24799	0.124
41	18	0.84517	14.184	24.651	7.2359	0.24529	0.12264
42	18.5	0.86887	14.582	24.546	7.2696	0.24311	0.12156
43	19	0.8924	14.976	24.599	7.3034	0.2425	0.12125

Terracon
Consulting Engineers & Scientists

UNCONFINED COMPRESSION TEST REPORT



Symbol		⏀			
Test No.		EDWB003S12			
Initial	Diameter, in	2.8343			
	Height, in	6.0811			
	Water Content, %	41.57			
	Dry Density, pcf	79.31			
	Saturation, %	99.09			
	Void Ratio	1.141			
Unconfined Compressive Strength, tsf		0.63249			
Undrained Shear Strength, tsf		0.31624			
Time to Failure, min		10.504			
Strain Rate, %/min		1			
Estimated Specific Gravity		2.72			
Liquid Limit		51			
Plastic Limit		17			
Plasticity Index		34			
Failure Sketch					

Project: DYNEGY EDWARDS
Location: BARTONVILLE, IL
Project No.: MR155218
Boring No.: EDW-003 S12
Sample Type: 3.0'' ST
Description: DARK GRAY FAT CLAY WITH SAND CH
Remarks: TEST PERFORMED AS PER ASTM D2166.

Mon, 16-NOV-2015 21:57:54

UNCONFINED COMPRESSION TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-003 S12
Sample No.: S-12
Test No.: EDWB003S12

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/13/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 45.0'-47.0'
Elevation: -----

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Soil Description: DARK GRAY FAT CLAY WITH SAND CH
Remarks: TEST PERFORMED AS PER ASTM D2166.

Specimen Height: 6.08 in
Specimen Area: 6.31 in^2
Specimen Volume: 38.37 in^3

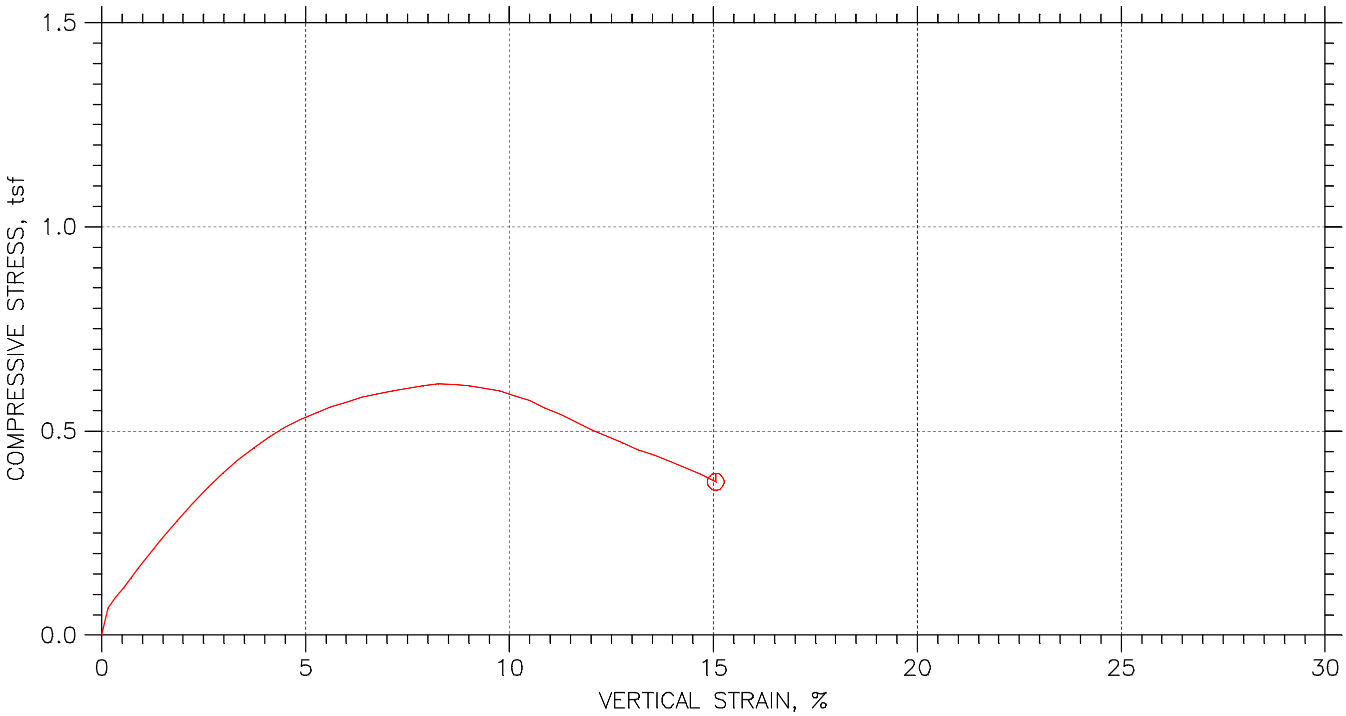
Liquid Limit: 51
Plastic Limit: 17
Estimated Specific Gravity: 2.72

Cap Mass: 0 gm

	Time min	Axial Displacement in	Axial Strain %	Load lb	Corrected Area in^2	Vertical Stress tsf	Shear Stress tsf
1	0	0	0	0	6.3091	0	0
2	0.25402	0.0096859	0.15928	9.0737	6.3192	0.10339	0.051693
3	0.50402	0.021401	0.35193	13.007	6.3314	0.14792	0.07396
4	0.75402	0.033117	0.54458	15.945	6.3436	0.18097	0.090485
5	1.004	0.044924	0.73875	18.515	6.356	0.20973	0.10486
6	1.254	0.056824	0.93444	20.927	6.3686	0.23659	0.1183
7	1.504	0.068816	1.1316	23.235	6.3813	0.26216	0.13108
8	1.754	0.080808	1.3288	25.385	6.3941	0.28585	0.14293
9	2.004	0.092893	1.5276	27.536	6.407	0.30944	0.15472
10	2.504	0.11678	1.9205	31.522	6.4326	0.35282	0.17641
11	3.004	0.14058	2.3118	35.246	6.4584	0.39293	0.19646
12	3.504	0.1642	2.7002	38.55	6.4842	0.42806	0.21403
13	4.004	0.18754	3.084	41.592	6.5099	0.46002	0.23001
14	4.504	0.21115	3.4723	44.319	6.536	0.48822	0.24411
15	5.004	0.23505	3.8652	46.732	6.5628	0.5127	0.25635
16	5.504	0.25885	4.2565	48.935	6.5896	0.53468	0.26734
17	6.004	0.28246	4.6449	50.981	6.6164	0.55477	0.27739
18	6.504	0.30571	5.0272	52.764	6.643	0.57188	0.28594
19	7.004	0.32905	5.4109	54.285	6.67	0.58598	0.29299
20	7.504	0.35248	5.7962	55.753	6.6973	0.59938	0.29969
21	8.0041	0.37637	6.1891	56.96	6.7253	0.6098	0.3049
22	8.5041	0.40026	6.582	58.061	6.7536	0.61899	0.30949
23	9.0041	0.42388	6.9704	58.848	6.7818	0.62477	0.31238
24	9.5041	0.44721	7.3542	59.53	6.8099	0.6294	0.3147
25	10.004	0.47018	7.7319	60.054	6.8378	0.63235	0.31618
26	10.504	0.49343	8.1141	60.316	6.8662	0.63249	0.31624
27	11.004	0.51723	8.5055	60.526	6.8956	0.63198	0.31599
28	11.504	0.54121	8.8999	60.631	6.9255	0.63035	0.31517
29	12.004	0.56511	9.2928	60.474	6.9554	0.626	0.313
30	12.504	0.58835	9.6751	60.002	6.9849	0.6185	0.30925
31	13.004	0.61151	10.056	59.372	7.0145	0.60943	0.30471
32	13.504	0.63484	10.44	58.691	7.0445	0.59986	0.29993
33	14.004	0.65874	10.833	57.746	7.0756	0.58762	0.29381
34	14.504	0.68281	11.228	56.593	7.1071	0.57332	0.28666
35	15.004	0.70689	11.624	55.334	7.1389	0.55807	0.27904
36	15.504	0.73023	12.008	54.127	7.1701	0.54353	0.27177
37	16.004	0.7532	12.386	52.816	7.201	0.52809	0.26404
38	16.504	0.77598	12.761	51.505	7.2319	0.51278	0.25639
39	17.004	0.79904	13.14	50.456	7.2635	0.50015	0.25007
40	17.504	0.82266	13.528	49.669	7.2961	0.49015	0.24507
41	18.004	0.84637	13.918	48.987	7.3292	0.48124	0.24062
42	18.504	0.86998	14.306	48.201	7.3624	0.47138	0.23569
43	19.004	0.89341	14.692	47.257	7.3956	0.46007	0.23003
44	19.504	0.91666	15.074	45.736	7.4289	0.44326	0.22163
45	19.538	0.91823	15.1	45.631	7.4312	0.44211	0.22106

UNCONFINED COMPRESSION TEST REPORT

Terracon
Consulting Engineers & Scientists



Symbol		①			
Test No.		EDWB004S11			
Initial	Diameter, in	2.8217			
Initial	Height, in	6.2535			
Initial	Water Content, %	19.25			
Initial	Dry Density, pcf	111.4			
Initial	Saturation, %	99.83			
Initial	Void Ratio	0.52451			
Unconfined Compressive Strength, tsf		0.61504			
Undrained Shear Strength, tsf		0.30752			
Time to Failure, min		11.004			
Strain Rate, %/min		1			
Estimated Specific Gravity		2.72			
Liquid Limit		35			
Plastic Limit		17			
Plasticity Index		18			
Failure Sketch					

Project: DYNEGY EDWARDS
Location: BARTONVILLE, IL
Project No.: MR155218
Boring No.: EDW-004 S11
Sample Type: 3.0'' ST
Description: BROWN AND GRAYISH BROWN LEAN CLAY WITH SAND CL
Remarks: TEST PERFORMED AS PER ASTM D 2166.

Mon, 16-NOV-2015 22:03:56

UNCONFINED COMPRESSION TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-004 S11
Sample No.: S-11
Test No.: EDWB004S11

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/13/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 36.0'-38.0'
Elevation: -----

Soil Description: BROWN AND GRAYISH BROWN LEAN CLAY WITH SAND CL
Remarks: TEST PERFORMED AS PER ASTM D 2166.

Specimen Height: 6.25 in
Specimen Area: 6.25 in^2
Specimen Volume: 39.10 in^3

Liquid Limit: 35
Plastic Limit: 17
Estimated Specific Gravity: 2.72

Cap Mass: 0 gm

	Time min	Axial Displacement in	Axial Strain %	Load lb	Corrected Area in^2	Vertical Stress tsf	Shear Stress tsf
1	0	0	0	0	6.2531	0	0
2	0.25398	0.0096859	0.15489	5.717	6.2628	0.065724	0.032862
3	0.50398	0.021494	0.3437	8.0772	6.2747	0.092683	0.046341
4	0.75398	0.033117	0.52957	10.07	6.2864	0.11534	0.057668
5	1.004	0.04474	0.71543	12.221	6.2982	0.1397	0.069852
6	1.254	0.056363	0.9013	14.319	6.31	0.16338	0.081691
7	1.504	0.068078	1.0886	16.469	6.322	0.18756	0.093782
8	1.754	0.079701	1.2745	18.567	6.3339	0.21106	0.10553
9	2.004	0.091601	1.4648	20.665	6.3461	0.23446	0.11723
10	2.504	0.1154	1.8454	24.808	6.3707	0.28038	0.14019
11	3.004	0.13929	2.2274	28.637	6.3956	0.32239	0.1612
12	3.504	0.16291	2.6051	32.256	6.4204	0.36173	0.18087
13	4.004	0.18652	2.9827	35.56	6.4454	0.39724	0.19862
14	4.504	0.20977	3.3544	38.707	6.4702	0.43074	0.21537
15	5.004	0.2332	3.7291	41.382	6.4953	0.45872	0.22936
16	5.504	0.257	4.1097	43.952	6.5211	0.48528	0.24264
17	6.004	0.2808	4.4903	46.313	6.5471	0.50931	0.25465
18	6.504	0.30442	4.8679	48.201	6.5731	0.52798	0.26399
19	7.004	0.32794	5.244	49.827	6.5992	0.54363	0.27182
20	7.504	0.35128	5.6172	51.4	6.6253	0.55859	0.27929
21	8.004	0.37462	5.9904	52.606	6.6516	0.56944	0.28472
22	8.504	0.39832	6.3696	53.97	6.6785	0.58184	0.29092
23	9.004	0.42221	6.7516	55.019	6.7059	0.59073	0.29537
24	9.504	0.44601	7.1322	55.911	6.7334	0.59785	0.29893
25	10.004	0.46945	7.5069	56.802	6.7606	0.60494	0.30247
26	10.504	0.4926	7.8771	57.537	6.7878	0.61031	0.30515
27	11.004	0.51594	8.2503	58.219	6.8154	0.61504	0.30752
28	11.504	0.53928	8.6235	58.323	6.8433	0.61364	0.30682
29	12.004	0.56298	9.0026	58.323	6.8718	0.61109	0.30555
30	12.504	0.58678	9.3832	58.009	6.9006	0.60525	0.30263
31	13.004	0.6104	9.7608	57.537	6.9295	0.59783	0.29891
32	13.504	0.63355	10.131	56.593	6.9581	0.5856	0.2928
33	14.004	0.65671	10.501	55.701	6.9868	0.574	0.287
34	14.504	0.68014	10.876	54.18	7.0162	0.55599	0.278
35	15.004	0.70394	11.257	52.869	7.0463	0.54022	0.27011
36	15.504	0.72783	11.639	51.295	7.0768	0.52188	0.26094
37	16.004	0.75163	12.019	49.669	7.1074	0.50317	0.25158
38	16.504	0.77515	12.395	48.306	7.1379	0.48726	0.24363
39	17.004	0.79867	12.772	46.889	7.1687	0.47094	0.23547
40	17.504	0.82229	13.149	45.368	7.1998	0.45369	0.22685
41	18.004	0.84655	13.537	44.319	7.2322	0.44122	0.22061
42	18.504	0.87081	13.925	43.008	7.2648	0.42625	0.21312
43	19.004	0.89489	14.31	41.592	7.2974	0.41037	0.20519
44	19.504	0.91832	14.685	40.071	7.3294	0.39363	0.19682
45	20.004	0.94157	15.057	38.393	7.3615	0.3755	0.18775

UNCONFINED COMPRESSION TEST REPORT

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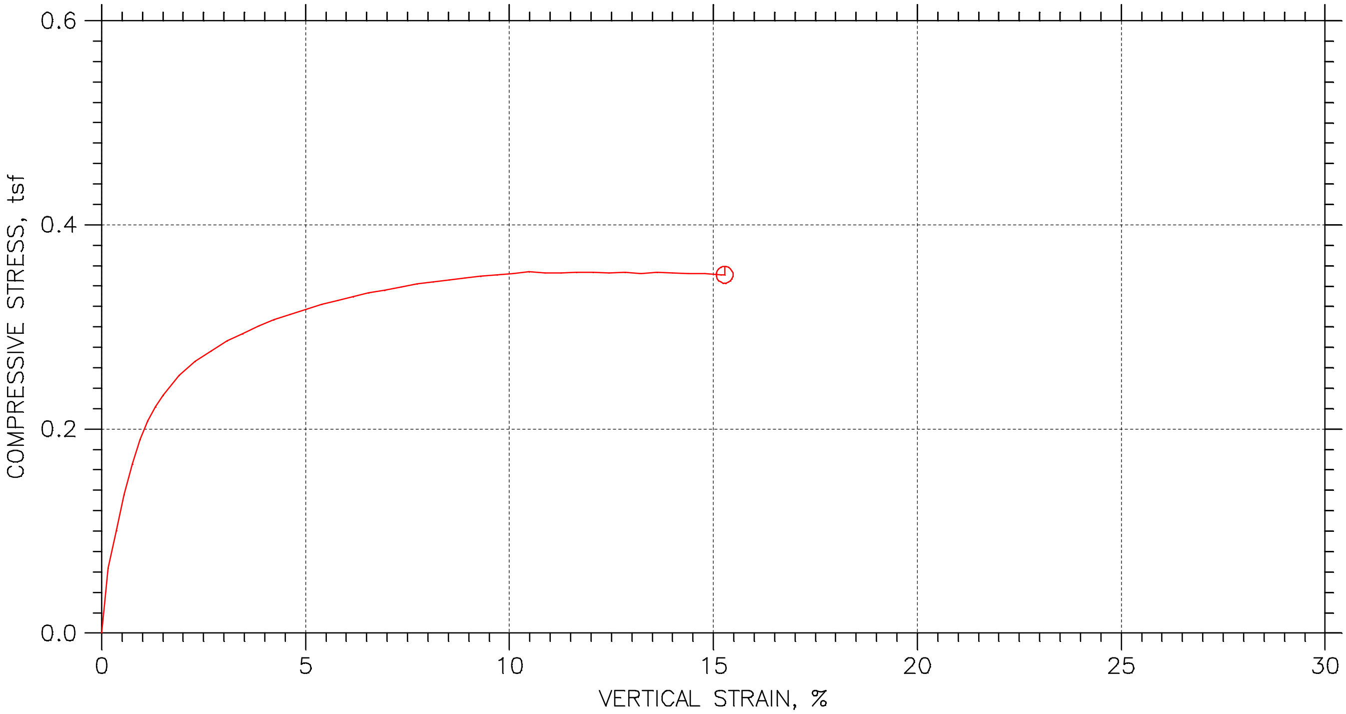

Symbol		⏀			
Test No.		EDWB008S5			
Initial	Diameter, in	2.8047			
	Height, in	6.0665			
	Water Content, %	33.59			
	Dry Density, pcf	88.9			
	Saturation, %	100.40			
	Void Ratio	0.91009			
Unconfined Compressive Strength, tsf		0.35399			
Undrained Shear Strength, tsf		0.177			
Time to Failure, min		13.504			
Strain Rate, %/min		1			
Estimated Specific Gravity		2.72			
Liquid Limit		52			
Plastic Limit		19			
Plasticity Index		33			
Failure Sketch					

Project: DYNEGY EDWARDS
Location: BARTONVILLE, IL
Project No.: MR155218
Boring No.: EDW-008 S5
Sample Type: 3.0'' ST
Description: BROWN AND GRAY FAT CLAY WITH SAND CH
Remarks: TEST PERFORMED AS PER ASTM D2166.

Mon, 16-NOV-2015 22:08:24

UNCONFINED COMPRESSION TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-008 S5
Sample No.: S-5
Test No.: EDWB008S5

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/13/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 11.0'-13.0'
Elevation: -----

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Soil Description: BROWN AND GRAY FAT CLAY WITH SAND CH
Remarks: TEST PERFORMED AS PER ASTM D2166.

Specimen Height: 6.07 in
Specimen Area: 6.18 in^2
Specimen Volume: 37.48 in^3

Liquid Limit: 52
Plastic Limit: 19
Estimated Specific Gravity: 2.72

Cap Mass: 0 gm

	Time min	Axial Displacement in	Axial Strain %	Load lb	Corrected Area in^2	Vertical Stress tsf	Shear Stress tsf
1	0	0	0	0	6.1783	0	0
2	0.254	0.0097782	0.16118	5.4547	6.1883	0.063465	0.031732
3	0.504	0.021678	0.35734	8.6541	6.2005	0.10049	0.050246
4	0.754	0.033578	0.55349	11.696	6.2127	0.13555	0.067774
5	1.004	0.045293	0.74661	14.319	6.2248	0.16562	0.082809
6	1.254	0.057009	0.93972	16.417	6.2369	0.18952	0.094758
7	1.504	0.068632	1.1313	18.042	6.249	0.20788	0.10394
8	1.754	0.080255	1.3229	19.301	6.2611	0.22195	0.11098
9	2.004	0.091878	1.5145	20.298	6.2733	0.23296	0.11648
10	2.504	0.11512	1.8977	22.081	6.2978	0.25244	0.12622
11	3.004	0.13865	2.2854	23.392	6.3228	0.26638	0.13319
12	3.504	0.16245	2.6778	24.389	6.3483	0.27661	0.1383
13	4.004	0.18615	3.0685	25.333	6.3739	0.28616	0.14308
14	4.504	0.20949	3.4533	26.067	6.3993	0.29329	0.14664
15	5.004	0.23274	3.8364	26.854	6.4248	0.30094	0.15047
16	5.504	0.25608	4.2212	27.483	6.4506	0.30676	0.15338
17	6.004	0.27969	4.6104	28.06	6.4769	0.31193	0.15596
18	6.504	0.30368	5.0058	28.637	6.5039	0.31702	0.15851
19	7.004	0.32748	5.3981	29.214	6.5309	0.32207	0.16104
20	7.504	0.35091	5.7843	29.686	6.5576	0.32594	0.16297
21	8.004	0.37406	6.166	30.158	6.5843	0.32978	0.16489
22	8.504	0.39731	6.5492	30.63	6.6113	0.33358	0.16679
23	9.004	0.42092	6.9384	30.997	6.639	0.33617	0.16808
24	9.504	0.445	7.3353	31.417	6.6674	0.33927	0.16963
25	10.004	0.46917	7.7337	31.837	6.6962	0.34232	0.17116
26	10.504	0.49315	8.1291	32.151	6.725	0.34422	0.17211
27	11.004	0.51658	8.5153	32.466	6.7534	0.34613	0.17307
28	11.504	0.53992	8.9	32.781	6.7819	0.34802	0.17401
29	12.004	0.56363	9.2908	33.095	6.8111	0.34985	0.17492
30	12.504	0.5878	9.6892	33.358	6.8412	0.35107	0.17554
31	13.004	0.61206	10.089	33.62	6.8716	0.35227	0.17613
32	13.504	0.63614	10.486	33.935	6.9021	0.35399	0.177
33	14.004	0.65966	10.874	33.987	6.9321	0.35301	0.1765
34	14.504	0.68309	11.26	34.092	6.9623	0.35256	0.17628
35	15.004	0.70661	11.648	34.354	6.9928	0.35372	0.17686
36	15.504	0.7305	12.042	34.459	7.0241	0.35322	0.17661
37	16.004	0.75467	12.44	34.564	7.0561	0.35269	0.17634
38	16.504	0.77875	12.837	34.774	7.0882	0.35322	0.17661
39	17.004	0.80255	13.229	34.826	7.1203	0.35216	0.17608
40	17.504	0.8258	13.612	35.088	7.1518	0.35325	0.17662
41	18.004	0.84923	13.999	35.193	7.184	0.35272	0.17636
42	18.504	0.87293	14.389	35.298	7.2168	0.35216	0.17608
43	19.004	0.89719	14.789	35.456	7.2506	0.35208	0.17604
44	19.504	0.92127	15.186	35.508	7.2846	0.35096	0.17548
45	19.621	0.92671	15.276	35.56	7.2923	0.35111	0.17555

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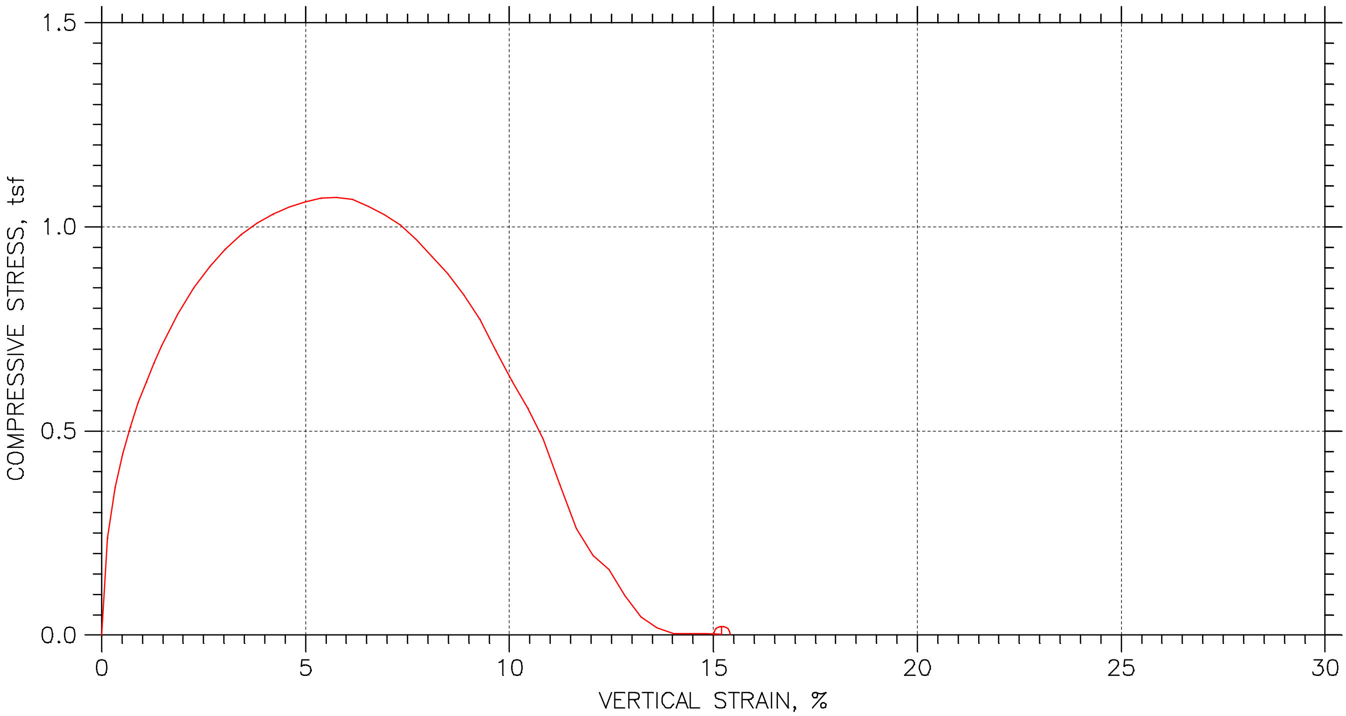
UNCONFINED COMPRESSION TEST REPORT



Symbol		⏀			
Test No.		EDWB015S12			
Initial	Diameter, in	2.8217			
	Height, in	6.061			
	Water Content, %	41.01			
	Dry Density, pcf	79.76			
	Saturation, %	98.82			
	Void Ratio	1.1289			
Unconfined Compressive Strength, tsf		1.0722			
Undrained Shear Strength, tsf		0.53609			
Time to Failure, min		7.5002			
Strain Rate, %/min		1			
Estimated Specific Gravity		2.72			
Liquid Limit		66			
Plastic Limit		23			
Plasticity Index		43			
Failure Sketch					

Project: DYNEGY EDWARDS
Location: BARTONVILLE, IL
Project No.: MR155218
Boring No.: EDW-015 S12
Sample Type: 3.0" ST
Description: DARK GRAY FAT CLAY CH
Remarks: TEST PERFORMED AS PER ASTM D 2166.

Mon, 16-NOV-2015 22:13:27

UNCONFINED COMPRESSION TEST

Project: DYNEGY EDWARDS
Boring No.: EDW-015 S12
Sample No.: S-12
Test No.: EDWB015S12

Location: BARTONVILLE, IL
Tested By: BCM
Test Date: 11/13/15
Sample Type: 3.0" ST

Project No.: MR155218
Checked By: WPQ
Depth: 37.0'-39.0'
Elevation: -----

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Soil Description: DARK GRAY FAT CLAY CH
Remarks: TEST PERFORMED AS PER ASTM D 2166.

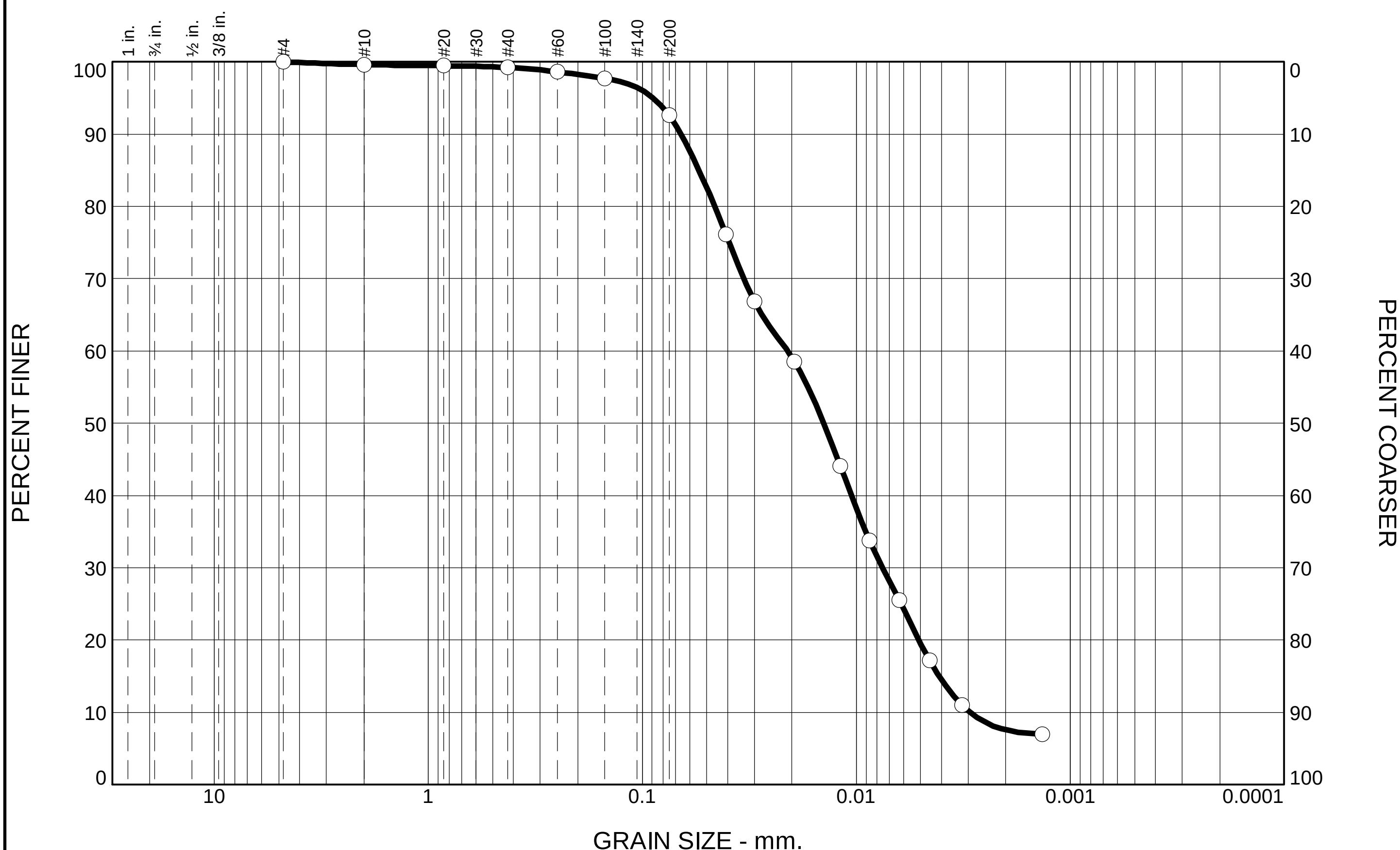
Specimen Height: 6.06 in
Specimen Area: 6.25 in^2
Specimen Volume: 37.90 in^3

Liquid Limit: 66
Plastic Limit: 23
Estimated Specific Gravity: 2.72

Cap Mass: 0 gm

	Time min	Axial Displacement in	Axial Strain %	Load lb	Corrected Area in^2	Vertical Stress tsf	Shear Stress tsf
1	0	0	0	0	6.2531	0	0
2	0.25015	0.0088557	0.14611	20.683	6.2623	0.2378	0.1189
3	0.50015	0.02011	0.33179	31.44	6.2739	0.3608	0.1804
4	0.75015	0.031548	0.52051	38.87	6.2858	0.44523	0.22261
5	1.0002	0.042987	0.70924	44.692	6.2978	0.51094	0.25547
6	1.2502	0.05461	0.90101	49.96	6.31	0.57006	0.28503
7	1.5002	0.066141	1.0913	54.506	6.3221	0.62075	0.31038
8	1.7502	0.077949	1.2861	58.665	6.3346	0.6668	0.3334
9	2.0002	0.089664	1.4794	62.547	6.347	0.70952	0.35476
10	2.5002	0.11346	1.872	69.644	6.3724	0.78689	0.39344
11	3.0002	0.13726	2.2647	75.633	6.398	0.85113	0.42556
12	3.5002	0.16069	2.6513	80.512	6.4234	0.90246	0.45123
13	4.0002	0.18385	3.0333	84.615	6.4487	0.94473	0.47236
14	4.5002	0.20728	3.4199	88.164	6.4745	0.98043	0.49021
15	5.0002	0.23089	3.8095	91.158	6.5008	1.0096	0.50482
16	5.5002	0.25497	4.2067	93.543	6.5277	1.0318	0.51588
17	6.0002	0.27905	4.604	95.428	6.5549	1.0482	0.5241
18	6.5002	0.30266	4.9936	96.98	6.5818	1.0609	0.53045
19	7.0002	0.32582	5.3756	98.2	6.6084	1.0699	0.53496
20	7.5002	0.34915	5.7607	98.81	6.6354	1.0722	0.53609
21	8.0002	0.37277	6.1503	98.755	6.6629	1.0672	0.53358
22	8.5002	0.39685	6.5475	97.535	6.6912	1.0495	0.52475
23	9.0002	0.42074	6.9417	96.149	6.7196	1.0302	0.51511
24	9.5002	0.44445	7.3329	94.097	6.7479	1.004	0.502
25	10	0.46769	7.7164	91.214	6.776	0.96922	0.48461
26	10.5	0.49085	8.0984	87.72	6.8042	0.92824	0.46412
27	11	0.51428	8.485	84.061	6.8329	0.88577	0.44289
28	11.5	0.53798	8.8761	79.514	6.8622	0.83428	0.41714
29	12	0.56215	9.2749	74.135	6.8924	0.77444	0.38722
30	12.5	0.58614	9.6706	67.093	6.9226	0.69782	0.34891
31	13	0.60966	10.059	60.162	6.9525	0.62304	0.31152
32	13.5	0.63291	10.442	53.897	6.9822	0.55578	0.27789
33	14	0.65652	10.832	46.854	7.0127	0.48106	0.24053
34	14.5	0.6806	11.229	36.153	7.0441	0.36953	0.18476
35	15	0.70532	11.637	25.617	7.0766	0.26064	0.13032
36	15.5	0.72986	12.042	19.296	7.1092	0.19543	0.097714
37	16	0.75366	12.435	15.969	7.1411	0.16101	0.080505
38	16.5	0.77773	12.832	9.5372	7.1736	0.095723	0.047862
39	17	0.80181	13.229	4.3805	7.2065	0.043765	0.021883
40	17.5	0.82543	13.619	1.7744	7.239	0.017648	0.0088241
41	18	0.8496	14.017	0.44359	7.2725	0.0043917	0.0021958
42	18.5	0.87404	14.421	0.38814	7.3068	0.0038247	0.0019123
43	19	0.89802	14.816	0.33269	7.3408	0.0032632	0.0016316
44	19.5	0.92164	15.206	0.16635	7.3745	0.0016241	0.00081206

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.4	0.4	6.6	73.1	19.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.6		
#20	99.5		
#40	99.2		
#60	98.6		
#100	97.7		
#200	92.6		

* (no specification provided)

DARK GRAY FLY ASH

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0659 D_{85}= 0.0543 D_{60}= 0.0210
D_{50}= 0.0142 D_{30}= 0.0075 D_{15}= 0.0041
D_{10}= 0.0029 C_u= 7.16 C_c= 0.92

Classification

USCS= AASHTO=

Remarks

F.M.=0.05

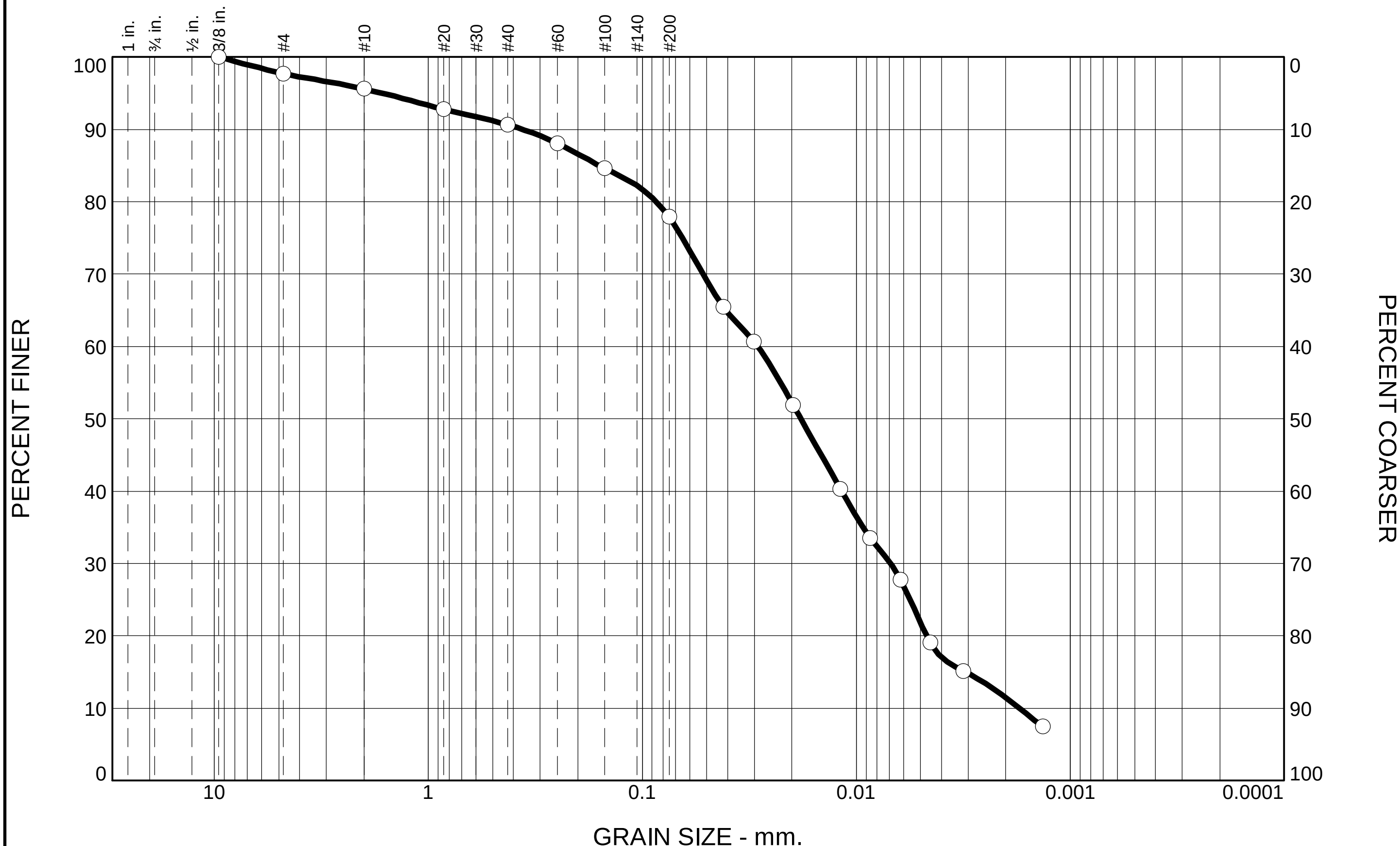
Source of Sample: EDW-B002 **Depth:** 7.5'-10.0'
Sample Number: S-4 **Date:** 11-5-15

Terracon

Client: DYNEGY
Project: DYNEGY - EDWARDS SITE
Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	2.3	2.1	5.0	12.7	56.3	21.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	97.7		
#10	95.6		
#20	92.8		
#40	90.6		
#60	88.1		
#100	84.6		
#200	77.9		

* (no specification provided)

FILL: DARK GRAY FLY ASH

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.3632 D_{85}= 0.1593 D_{60}= 0.0290
D_{50}= 0.0181 D_{30}= 0.0069 D_{15}= 0.0031
D_{10}= 0.0017 C_u= 16.81 C_c= 0.96

Classification

USCS= AASHTO=

Remarks

F.M.=0.47

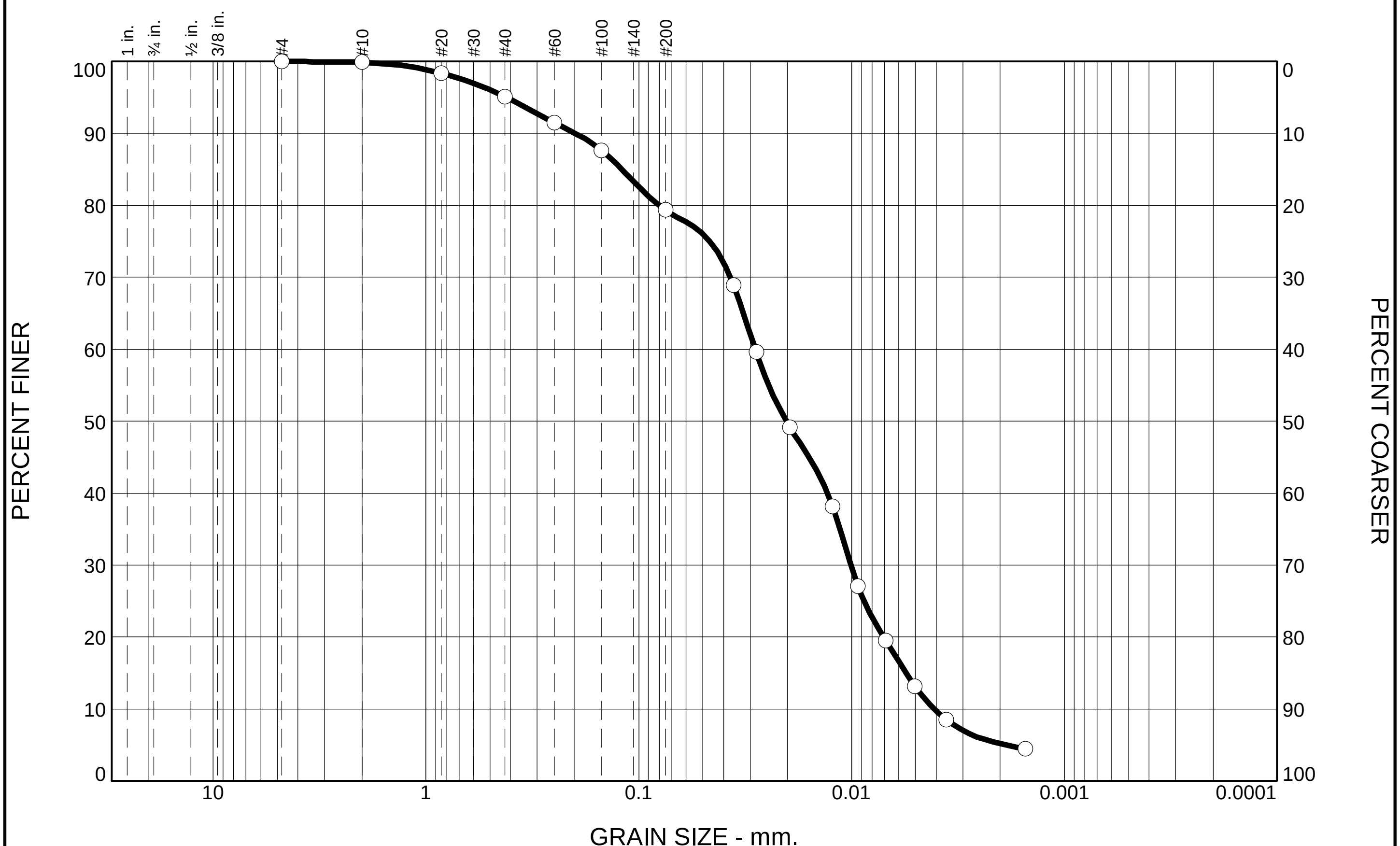
Source of Sample: EDW-B003 **Depth:** 10.0'-11.5'
Sample Number: S-5 **Date:** 11-5-15

Terracon

Client: DYNEGY
Project: DYNEGY - EDWARDS SITE
Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	4.8	15.7	66.4	13.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	98.4		
#40	95.1		
#60	91.5		
#100	87.6		
#200	79.4		

* (no specification provided)

FILL: VERY DARK GRAY VARVED FLY ASH

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1981 D_{85}= 0.1202 D_{60}= 0.0284
D_{50}= 0.0203 D_{30}= 0.0101 D_{15}= 0.0056
D_{10}= 0.0041 C_u= 6.92 C_c= 0.87

Classification

USCS= AASHTO=

Remarks

F.M.=0.23

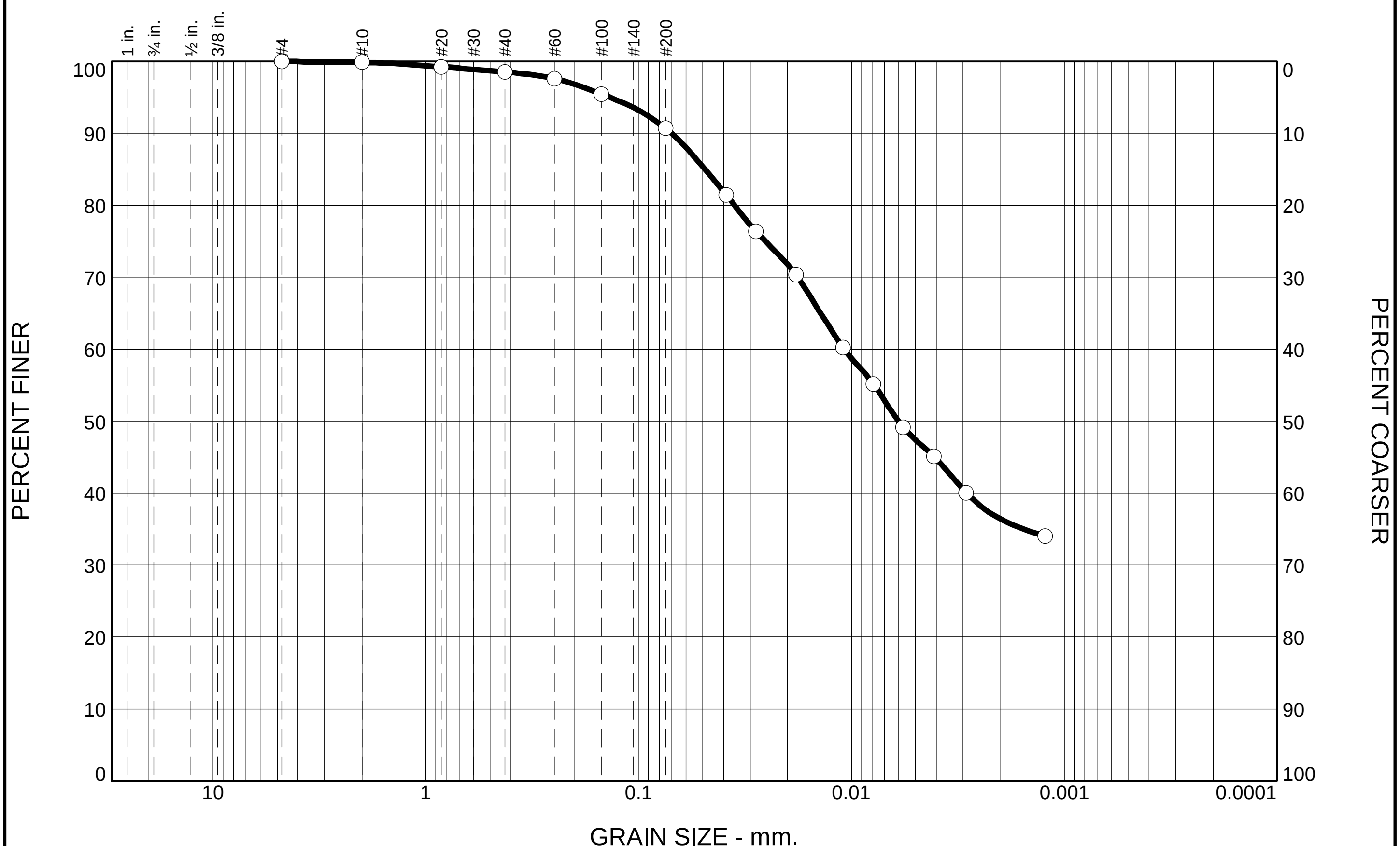
Source of Sample: EDW-B003 **Depth:** 30.0'-32.0'
Sample Number: S-9
Date: 11-5-15

Terracon

Client: DYNEGY
Project: DYNEGY - EDWARDS SITE
Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.1	1.4	7.8	43.3	47.4

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.9		
#20	99.3		
#40	98.5		
#60	97.6		
#100	95.5		
#200	90.7		

* (no specification provided)

GRAY AND DARK GRAY LEAN CLAY WITH ORGANICS

Atterberg Limits

PL= 16 LL= 37 PI= 21

Coefficients

D_{90}= 0.0702 D_{85}= 0.0486 D_{60}= 0.0108
D_{50}= 0.0060 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(19)

Remarks

F.M.=0.08

Source of Sample: EDW-B004 **Depth:** 7.5'-9.0'
Sample Number: S-4

Date: 11-5-15

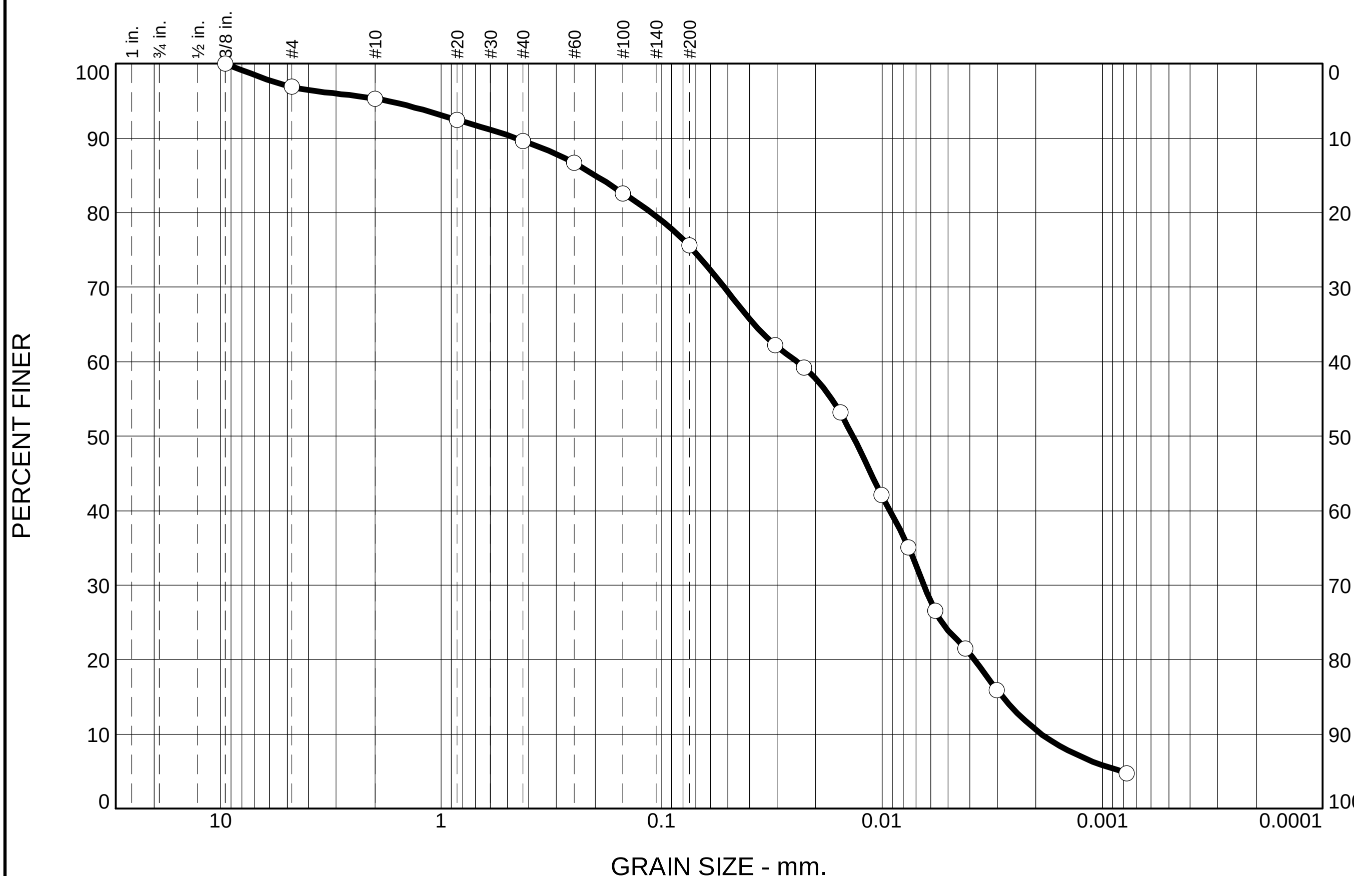
Terracon

Client: DYNEGY
Project: DYNEGY - EDWARDS SITE

Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	3.1	1.6	5.6	14.1	51.7	23.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	96.9		
#10	95.3		
#20	92.5		
#40	89.7		
#60	86.7		
#100	82.6		
#200	75.6		

* (no specification provided)

FILL: GRAY FLY ASH

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.4580 D_{85}= 0.1999 D_{60}= 0.0244
D_{50}= 0.0136 D_{30}= 0.0065 D_{15}= 0.0028
D_{10}= 0.0019 C_u= 12.93 C_c= 0.91

Classification

USCS= AASHTO=

Remarks

F.M.=0.52

Source of Sample: EDW-B005 **Depth:** 20.0'-21.5'
Sample Number: S-7

Date: 11-13-15

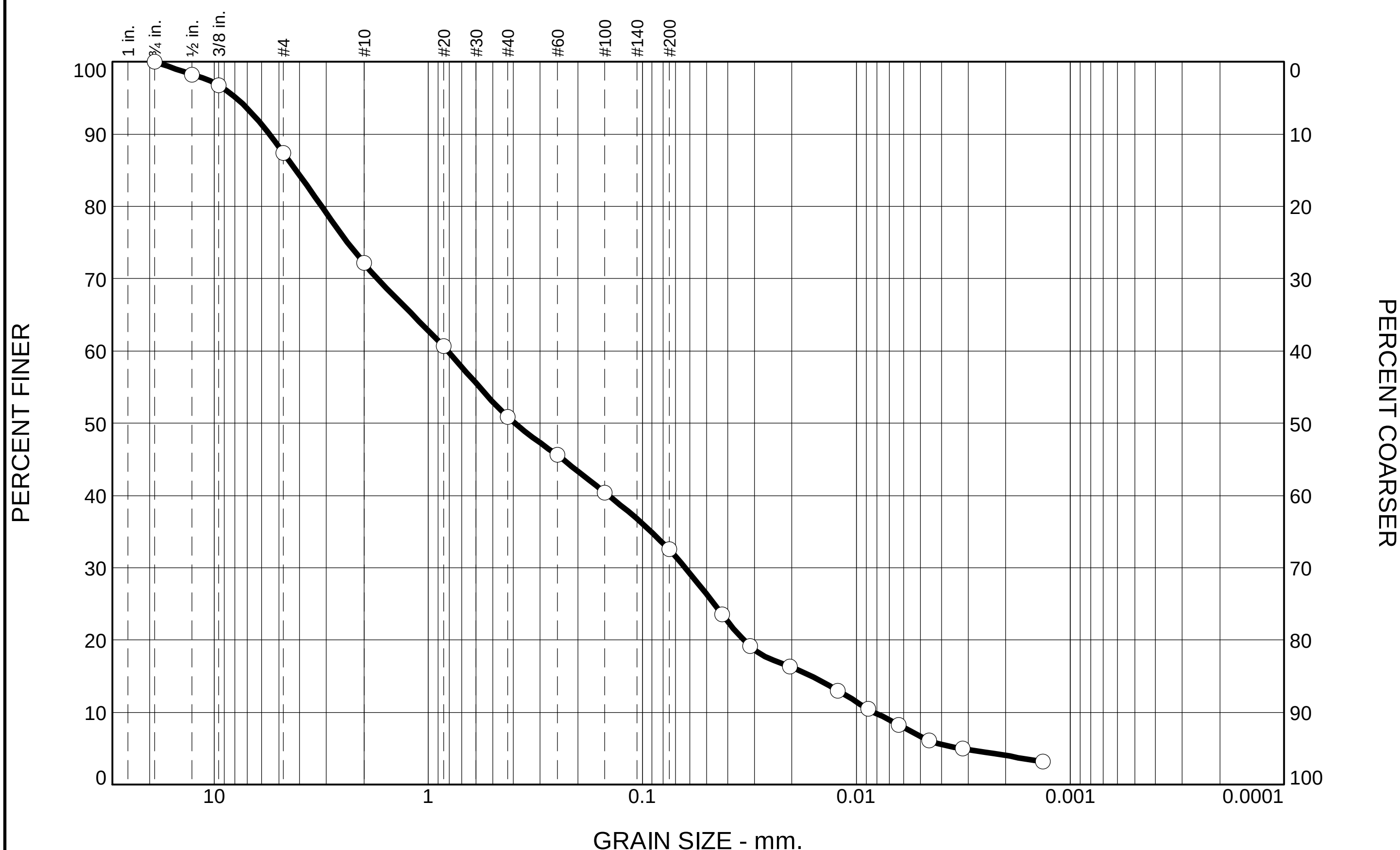
Terracon

Client: DYNEGY
Project: DYNEGY - EDWARDS SITE

Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



%+3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	12.6	15.3	21.2	18.3	26.0	6.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.75	100.0		
.5	98.2		
.375	96.7		
#4	87.4		
#10	72.1		
#20	60.6		
#40	50.9		
#60	45.6		
#100	40.4		
#200	32.6		

* (no specification provided)

FILL: DARK BROWN AND DARK GRAY SAND WITH GRAVEL - FLY ASH NOTED

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 5.5350 D_{85}= 4.1471 D_{60}= 0.8124
D_{50}= 0.3943 D_{30}= 0.0630 D_{15}= 0.0162
D_{10}= 0.0082 C_u= 98.50 C_c= 0.59

Classification

USCS= SP AASHTO=

Remarks

F.M.=2.33

Source of Sample: EDW-B010 **Depth:** 5.0'-6.5'
Sample Number: S-3

Date: 11-5-15

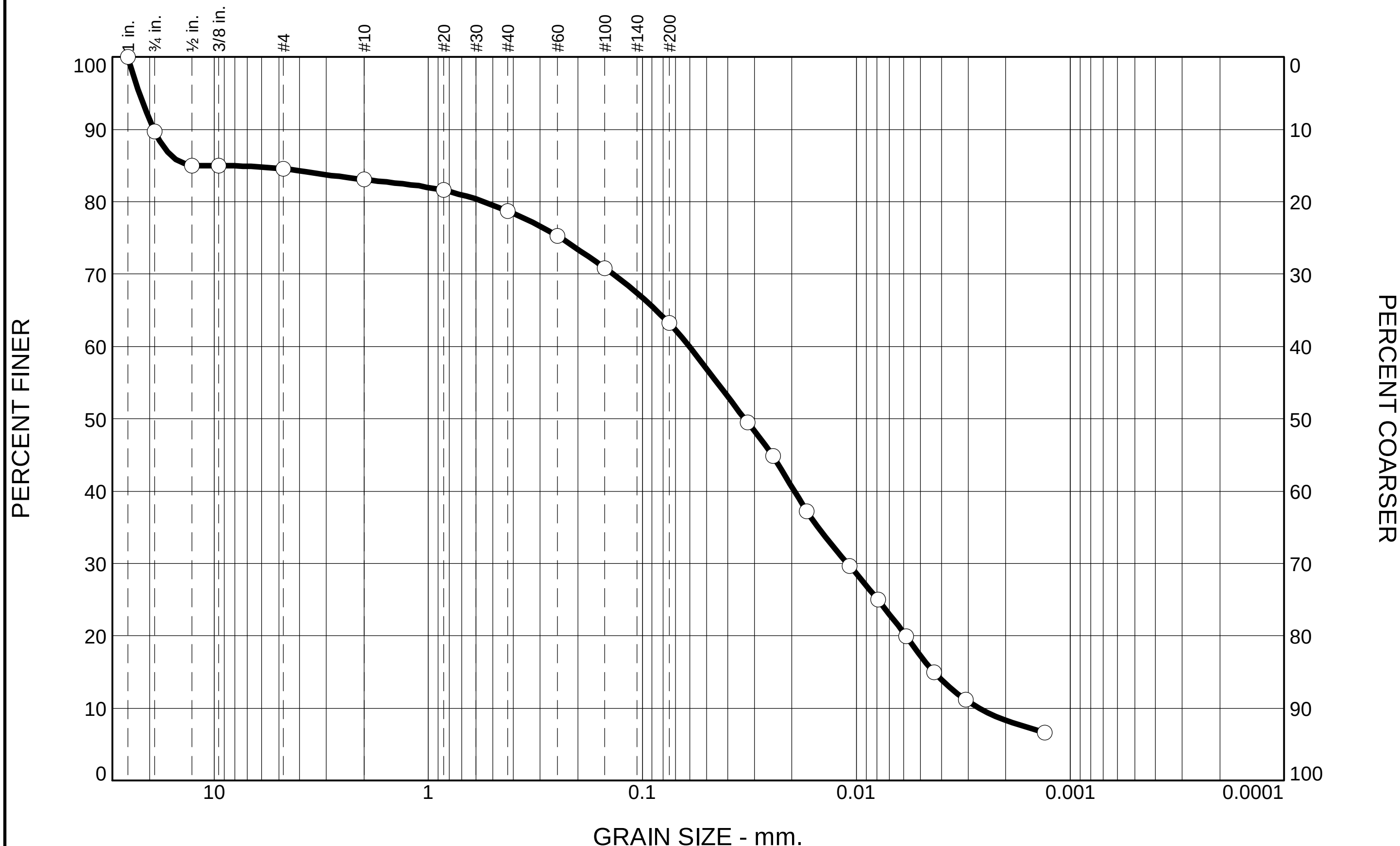
Terracon

Client: DYNEGY
Project: DYNEGY - EDWARDS SITE

Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	10.3	5.2	1.4	4.4	15.5	46.0	17.2

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
1	100.0		
.75	89.7		
.5	85.0		
.375	85.0		
#4	84.5		
#10	83.1		
#20	81.6		
#40	78.7		
#60	75.3		
#100	70.8		
#200	63.2		

* (no specification provided)

FILL: VERY DARK GRAY FLY ASH

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 19.2789 D_{85}= 8.9744 D_{60}= 0.0604
D_{50}= 0.0333 D_{30}= 0.0110 D_{15}= 0.0043
D_{10}= 0.0027 C_u= 22.70 C_c= 0.75

Classification

USCS= AASHTO=

Remarks

F.M.=1.47

Source of Sample: EDW-B011 **Depth:** 9.0'-11.0'
Sample Number: S-5

Date: 11-12-15

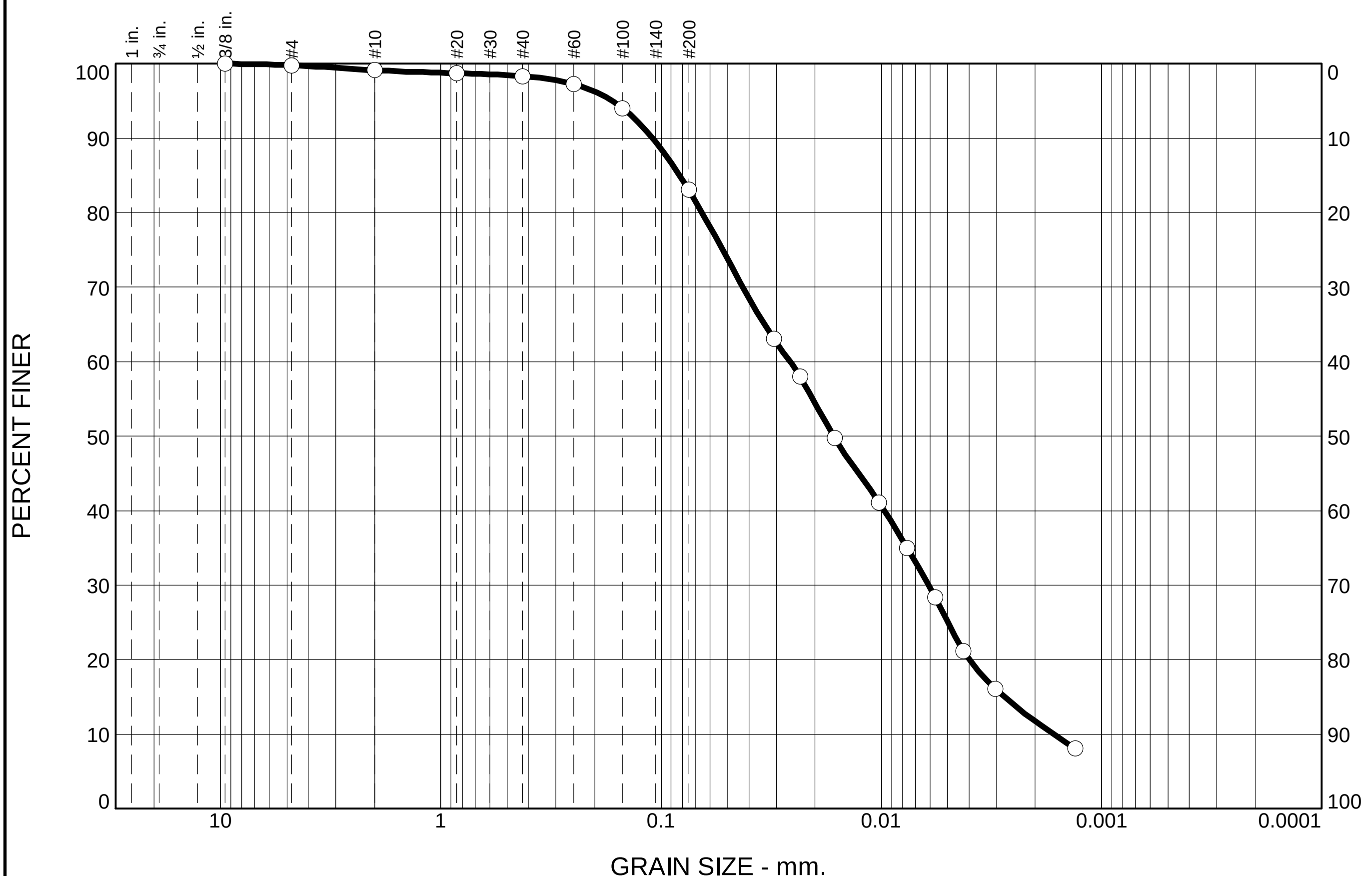
Terracon

Client: DYNEGY
Project: DYNEGY - EDWARDS SITE

Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.2	0.7	0.8	15.2	58.0	25.1

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
.375	100.0		
#4	99.8		
#10	99.1		
#20	98.7		
#40	98.3		
#60	97.3		
#100	94.0		
#200	83.1		

* (no specification provided)

FILL: GRAY FLY ASH

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1094 D_{85}= 0.0823 D_{60}= 0.0260
D_{50}= 0.0165 D_{30}= 0.0061 D_{15}= 0.0028
D_{10}= 0.0017 C_u= 15.75 C_c= 0.87

Classification

USCS= AASHTO=

Remarks

F.M.=0.12

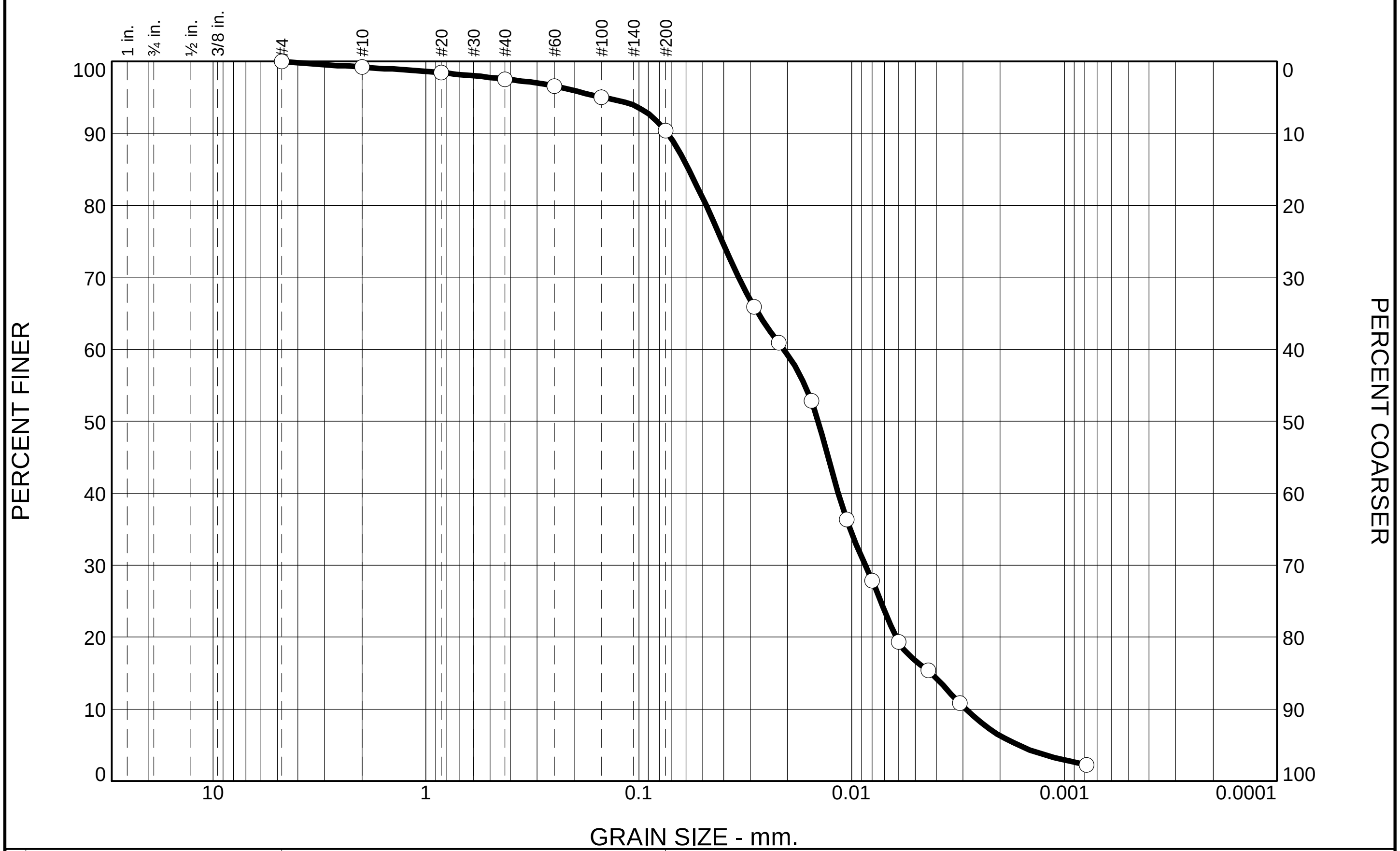
Source of Sample: EDW-B011 **Depth:** 19.5'-21.5'
Sample Number: S-7
Date: 11-11-15

Terracon

Client: DYNEGY
Project: DYNEGY - EDWARDS SITE
Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.8	1.6	7.2	73.7	16.7

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.2		
#20	98.4		
#40	97.6		
#60	96.6		
#100	95.1		
#200	90.4		

* (no specification provided)

FILL: DARK GRAY FLY ASH

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.0732 D_{85}= 0.0581 D_{60}= 0.0208
D_{50}= 0.0144 D_{30}= 0.0086 D_{15}= 0.0042
D_{10}= 0.0029 C_u= 7.17 C_c= 1.22

Classification

USCS= AASHTO=

Remarks

F.M.=0.12

Source of Sample: EDW-B012 **Depth:** 5.0'-6.5'
Sample Number: S-3

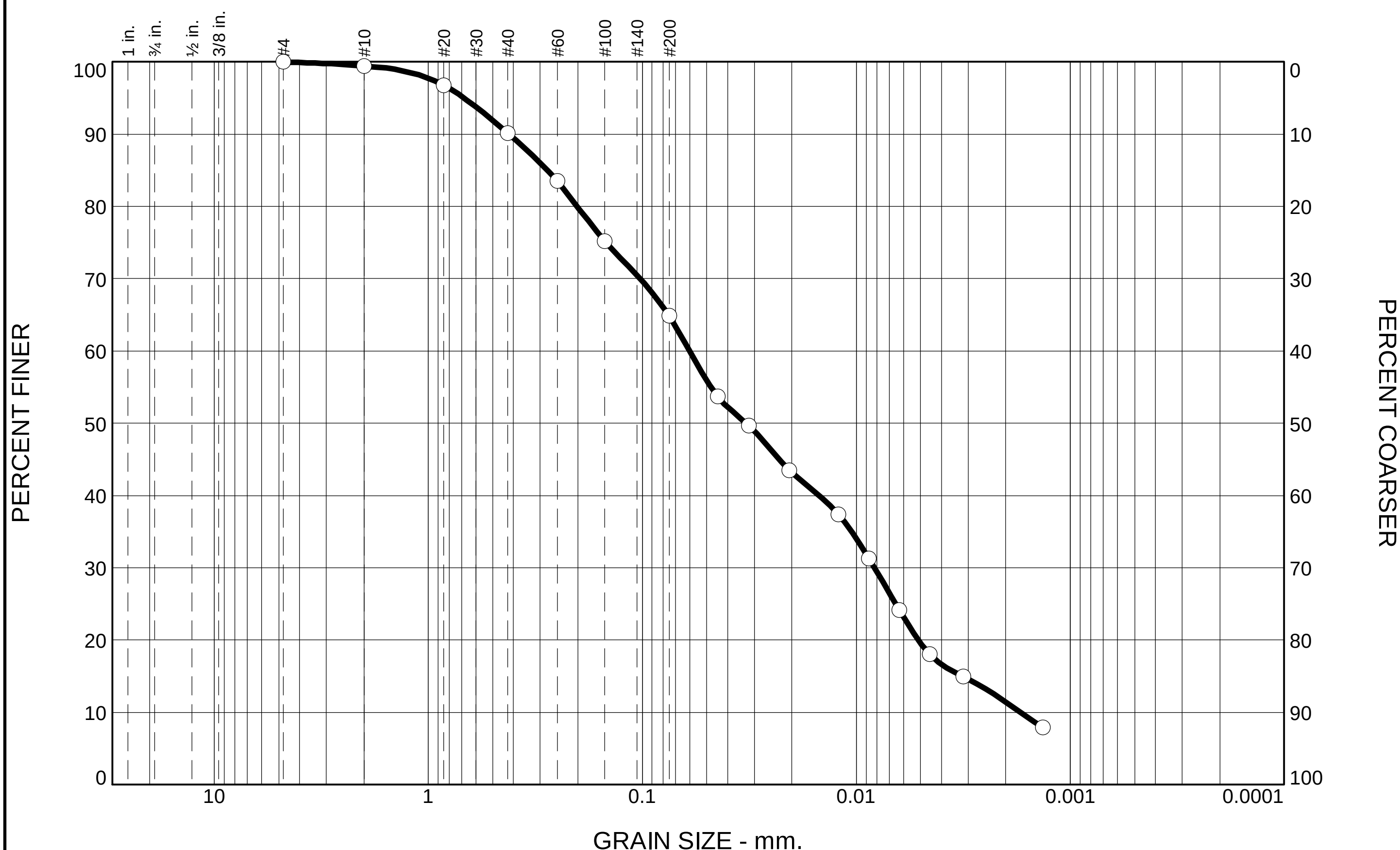
Date: 11-13-15

Terracon

Client: DYNEGY
Project: DYNEGY - EDWARDS SITE
Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

PARTICLE SIZE ANALYSIS OF SOILS ASTM D422



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.6	9.3	25.2	45.4	19.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
#4	100.0		
#10	99.4		
#20	96.8		
#40	90.1		
#60	83.5		
#100	75.2		
#200	64.9		

* (no specification provided)

FILL: GRAY SILTY SAND WITH GRAVEL - FLY ASH NOTED

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.4213 D_{85}= 0.2775 D_{60}= 0.0602
D_{50}= 0.0328 D_{30}= 0.0082 D_{15}= 0.0032
D_{10}= 0.0017 C_u= 35.34 C_c= 0.66

Classification

USCS= SM AASHTO=

Remarks

F.M.=0.47

Source of Sample: EDW-B014 **Depth:** 7.0'-8.5'
Sample Number: S-4

Date: 11-5-15

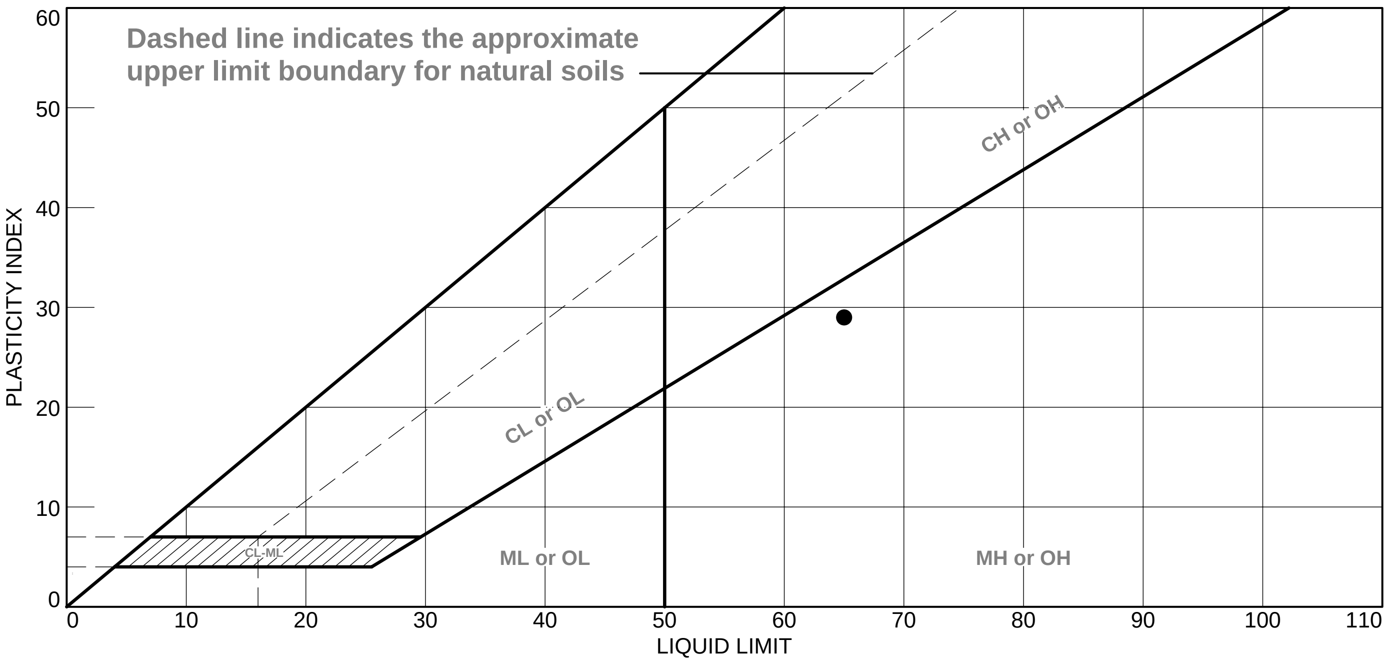
Terracon

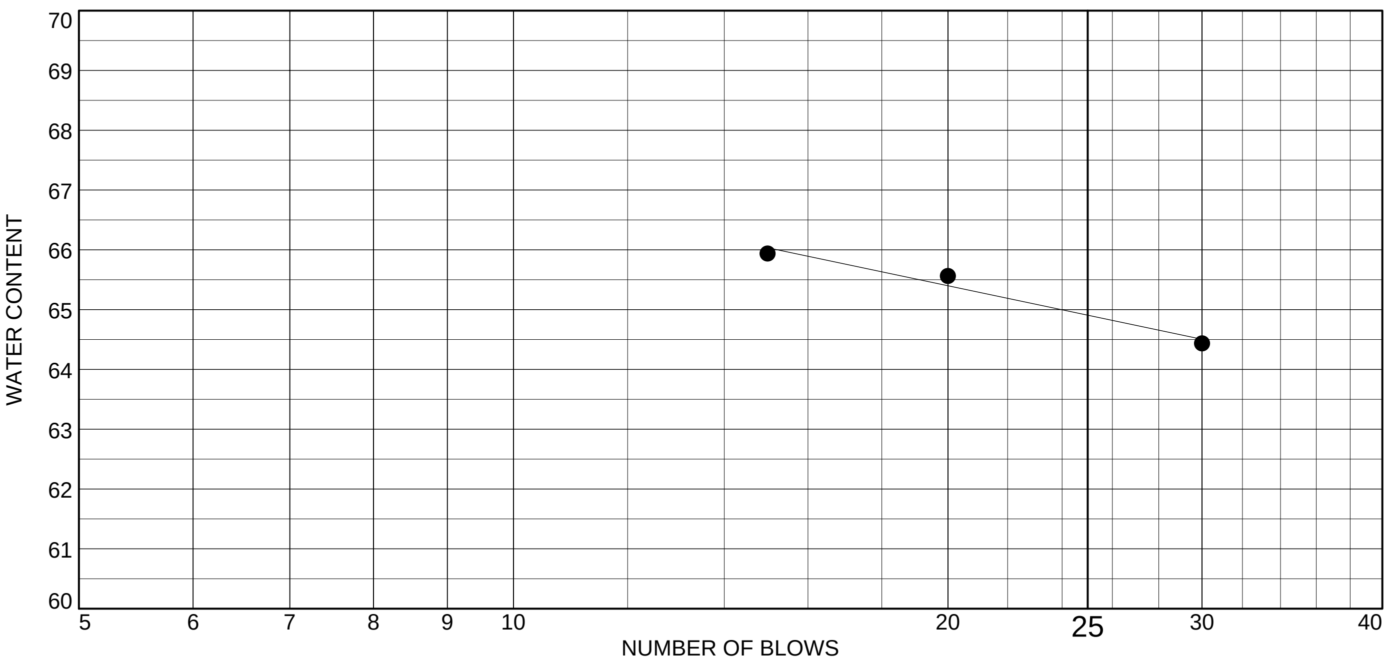
Client: DYNEGY
Project: DYNEGY - EDWARDS SITE

Project No: MR155218 **Figure**

Tested By: SJH **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GREENISH GRAY SANDY SILT	65	36	29			MH

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

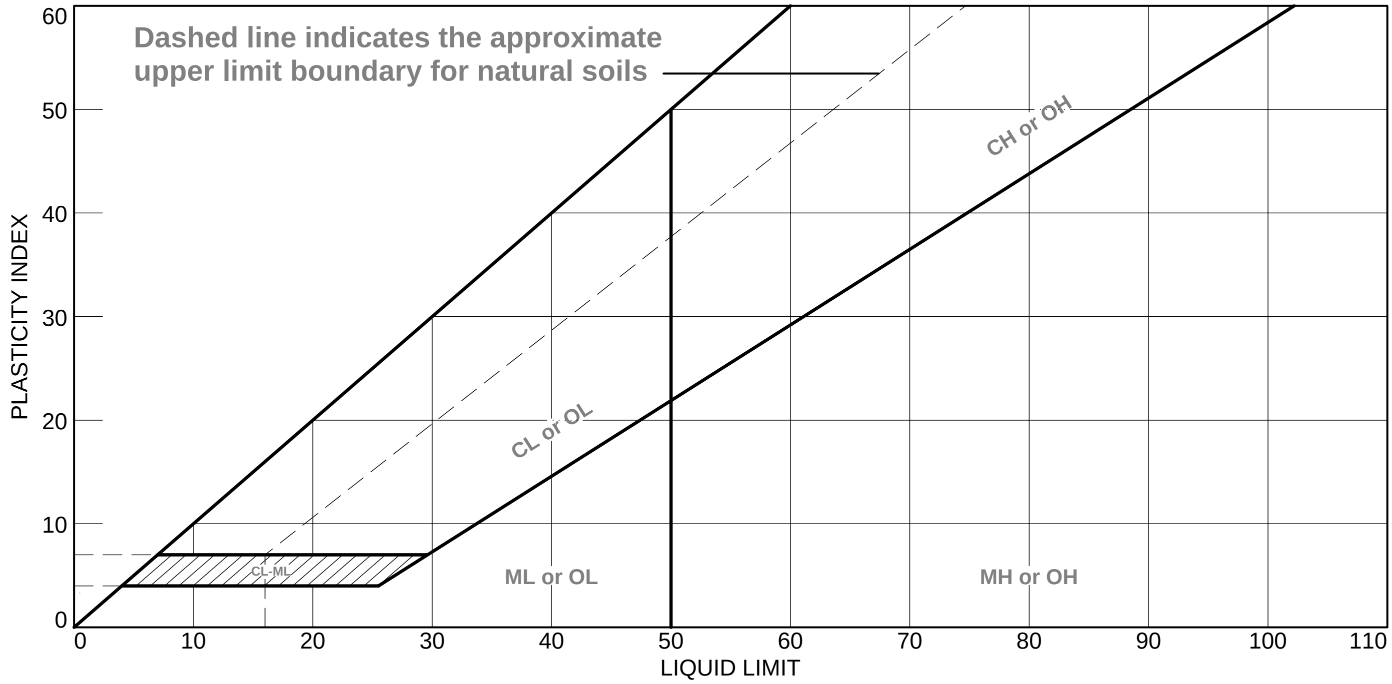
Source of Sample: EDW-B002 **Depth:** 5.0'-7.0'
Sample Number: S-3

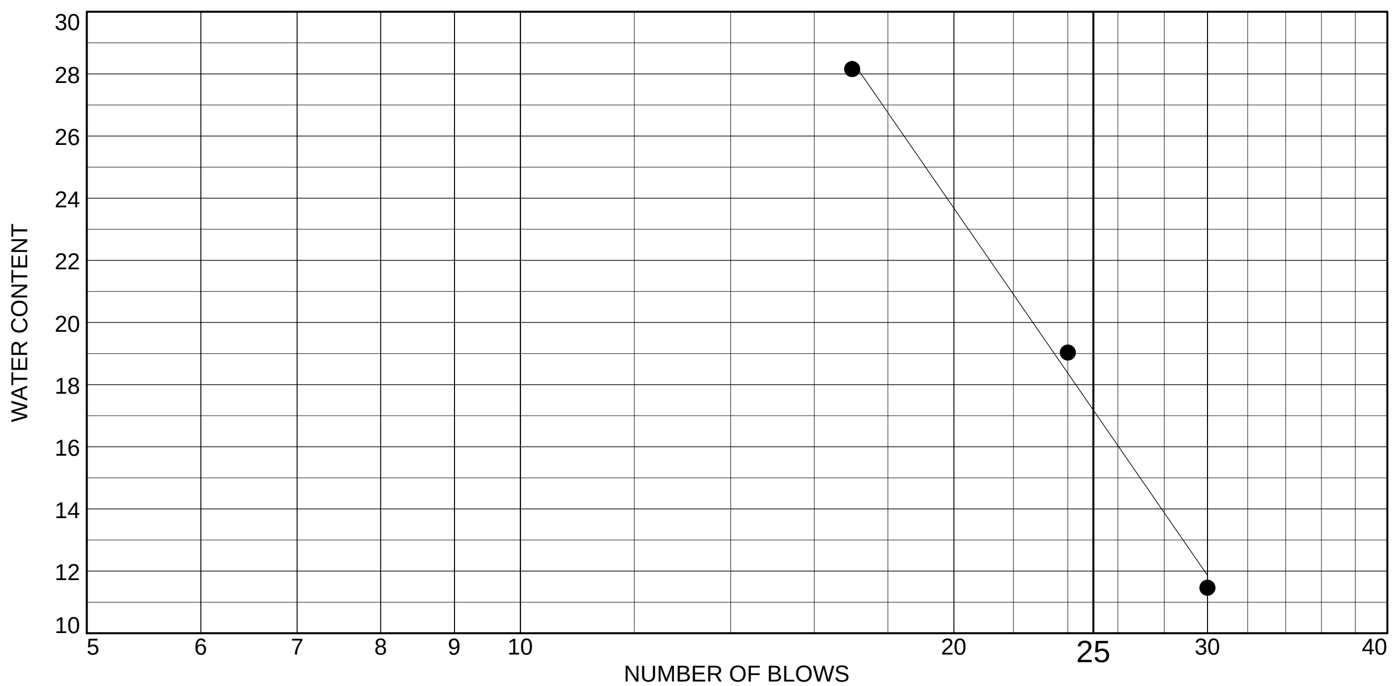
Remarks:
● SHELL NOTED

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAY TO DARK GRAY FLY ASH	17	27	NP			

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

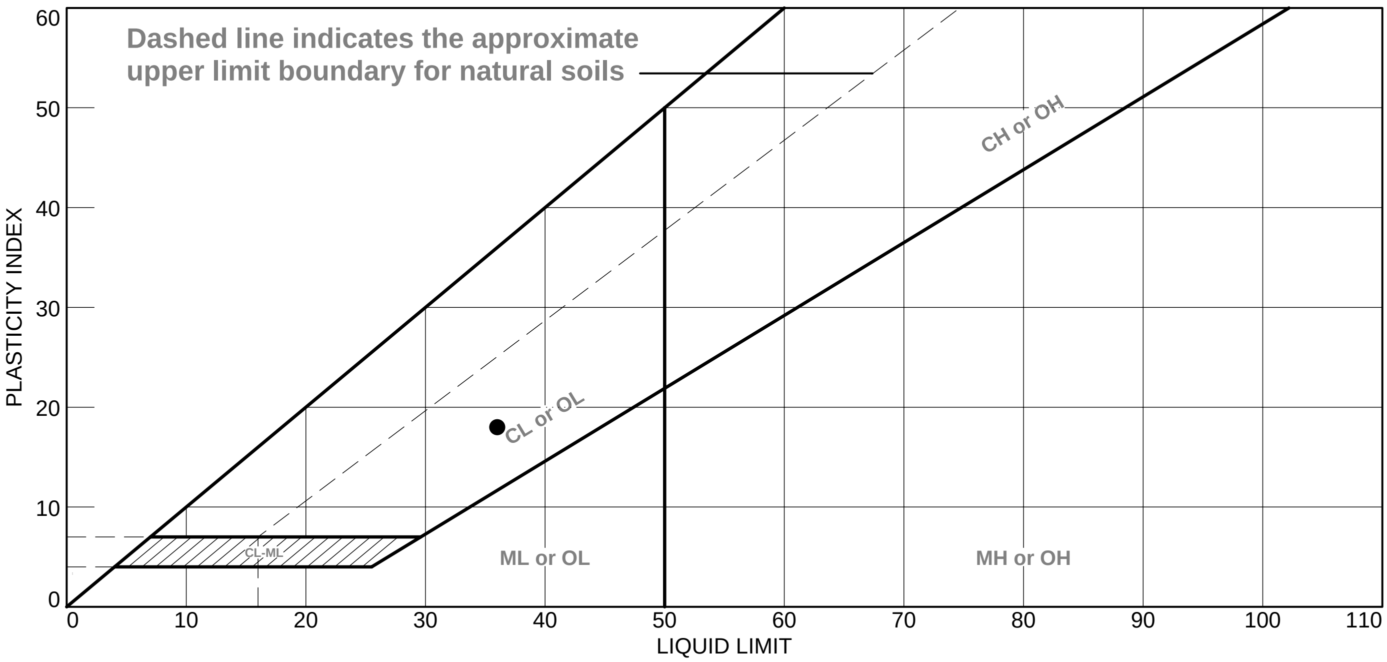
Source of Sample: EDW-B002 **Depth:** 10.0'-12.0'
Sample Number: S-5

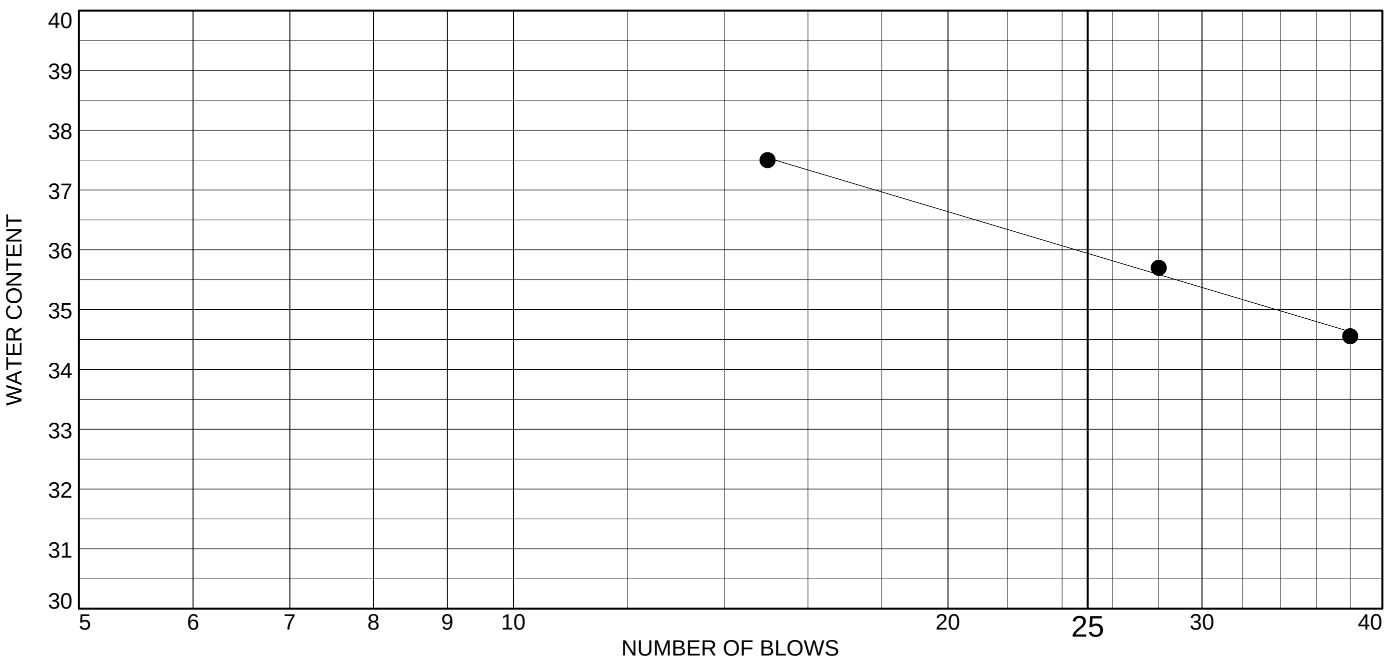
Terracon

Remarks:

Figure

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAY LEAN CLAY WITH SAND	36	18	18			CL

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B002 **Depth:** 35.0'-37.0'
Sample Number: S-10

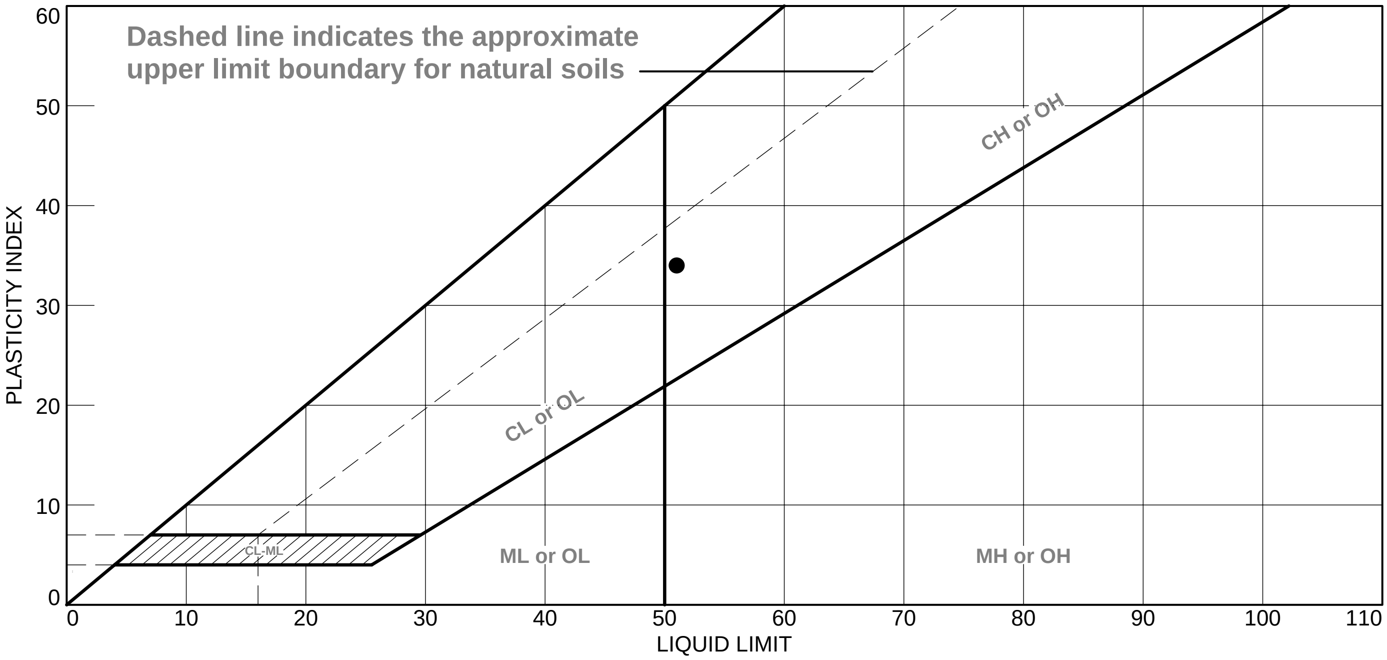
Terracon

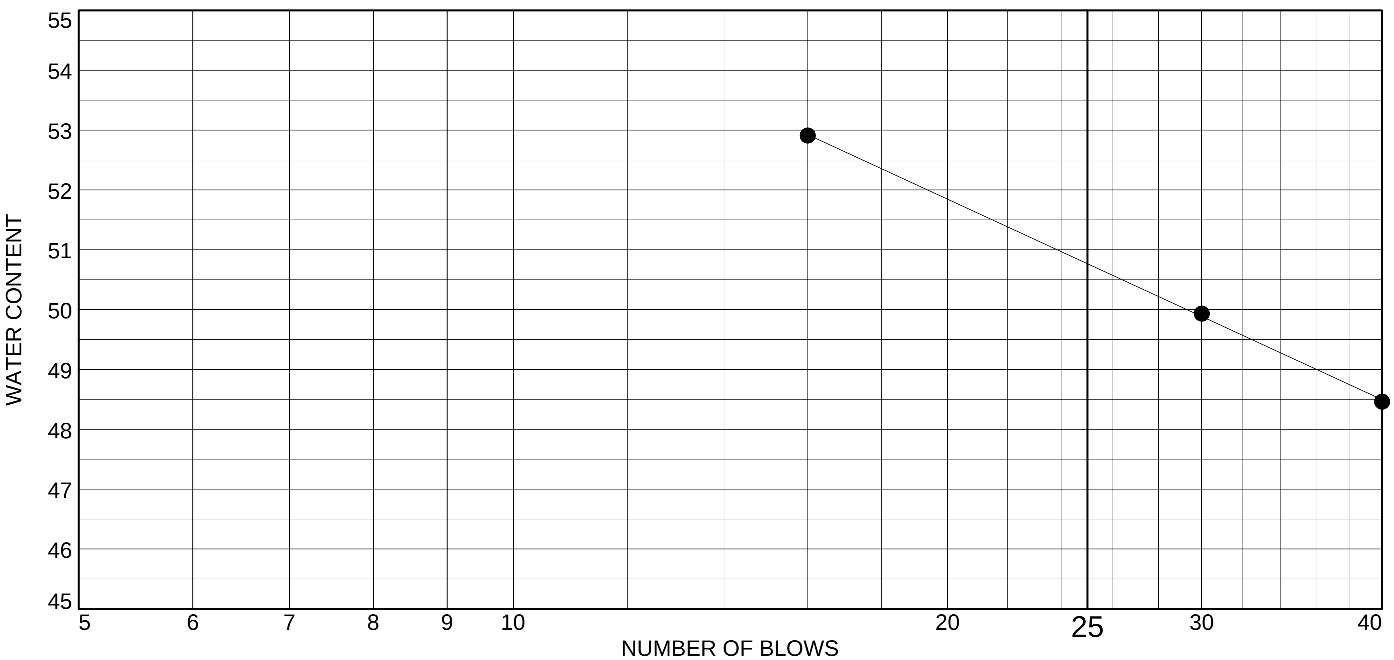
Remarks:

Figure

Tested By: SJH **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	DARK GRAY FAT CLAY WITH SAND	51	17	34			CH

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B003 **Depth:** 45.0'-47.0'
Sample Number: S-12

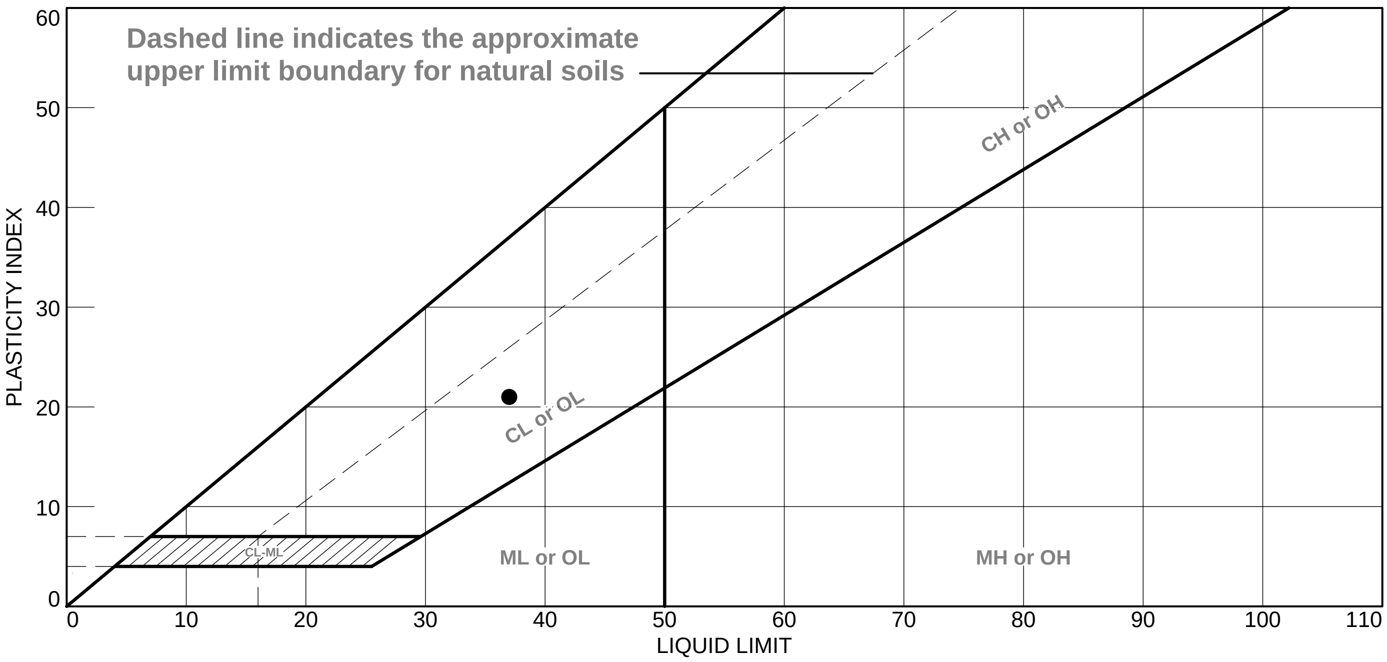
Terracon

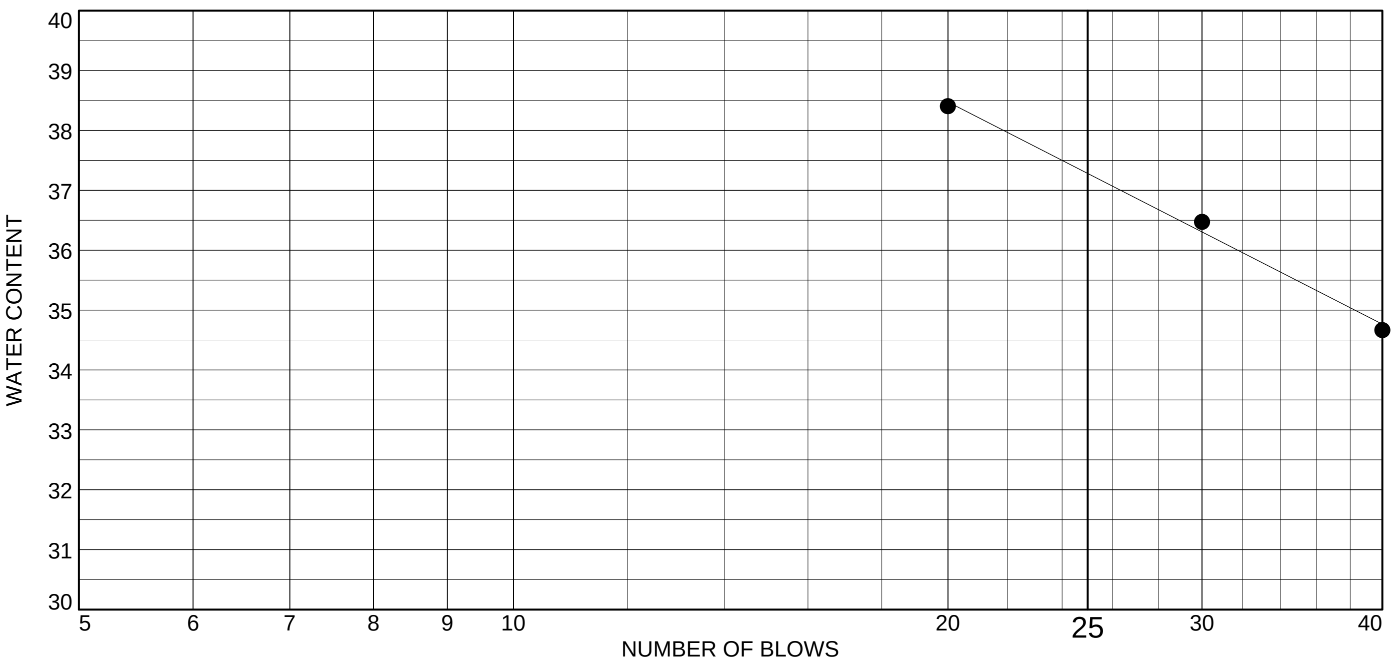
Remarks:

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAY AND DARK GRAY LEAN CLAY WITH ORGANICS	37	16	21	98.5	90.7	CL

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B004 **Depth:** 7.5'-9.0'
Sample Number: S-4

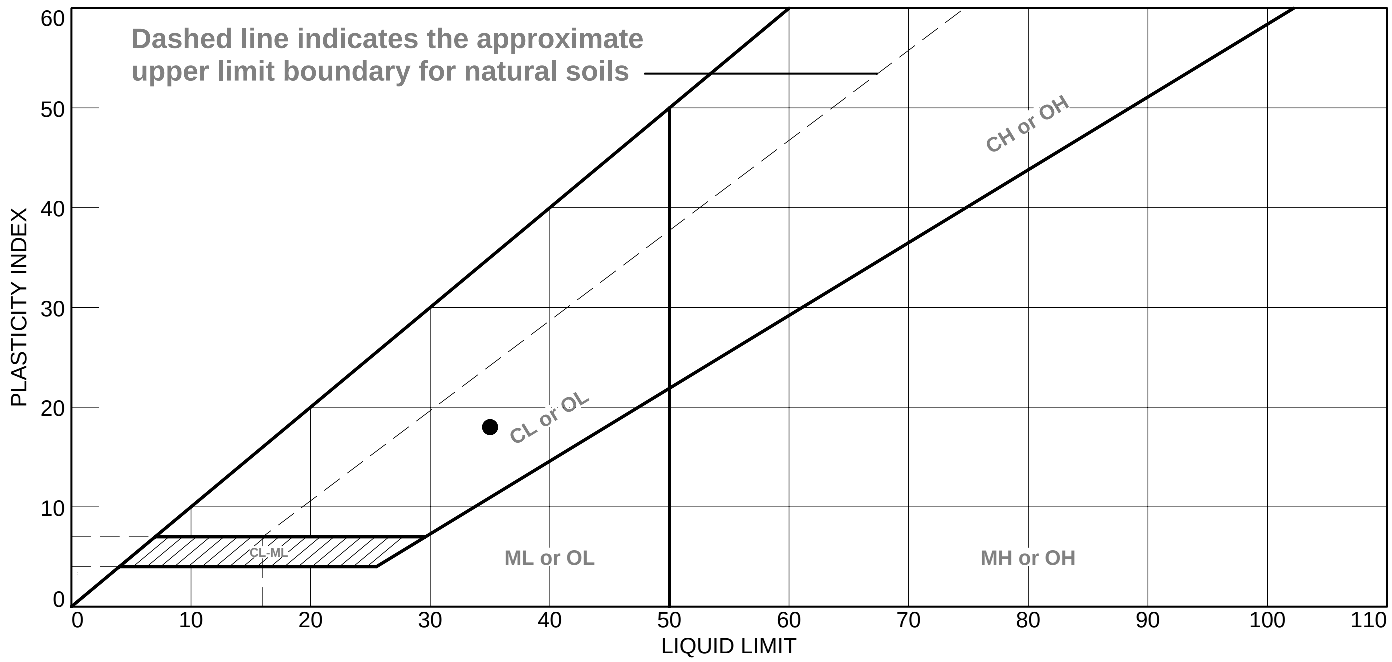
Terracon

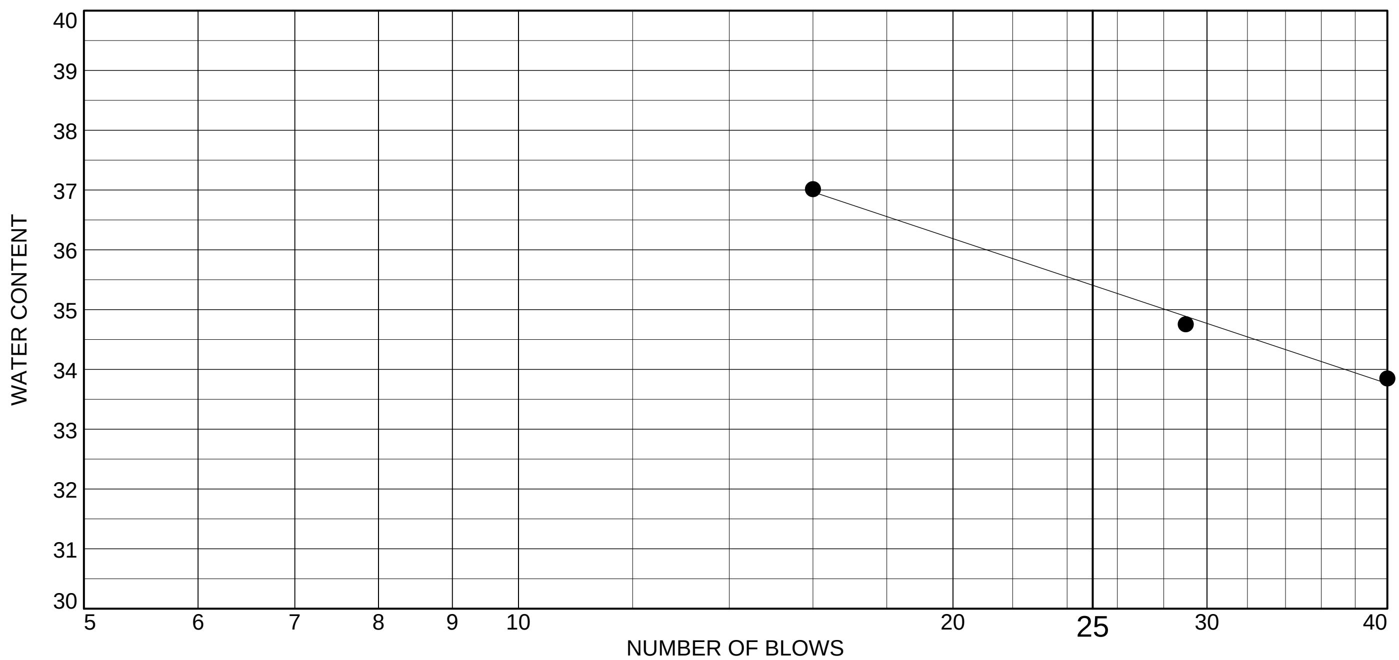
Remarks:

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	BROWN AND GRAYISH BROWN LEAN CLAY WITH SAND	35	17	18			CL

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B004 **Depth:** 36.0'-38.0'
Sample Number: S-11

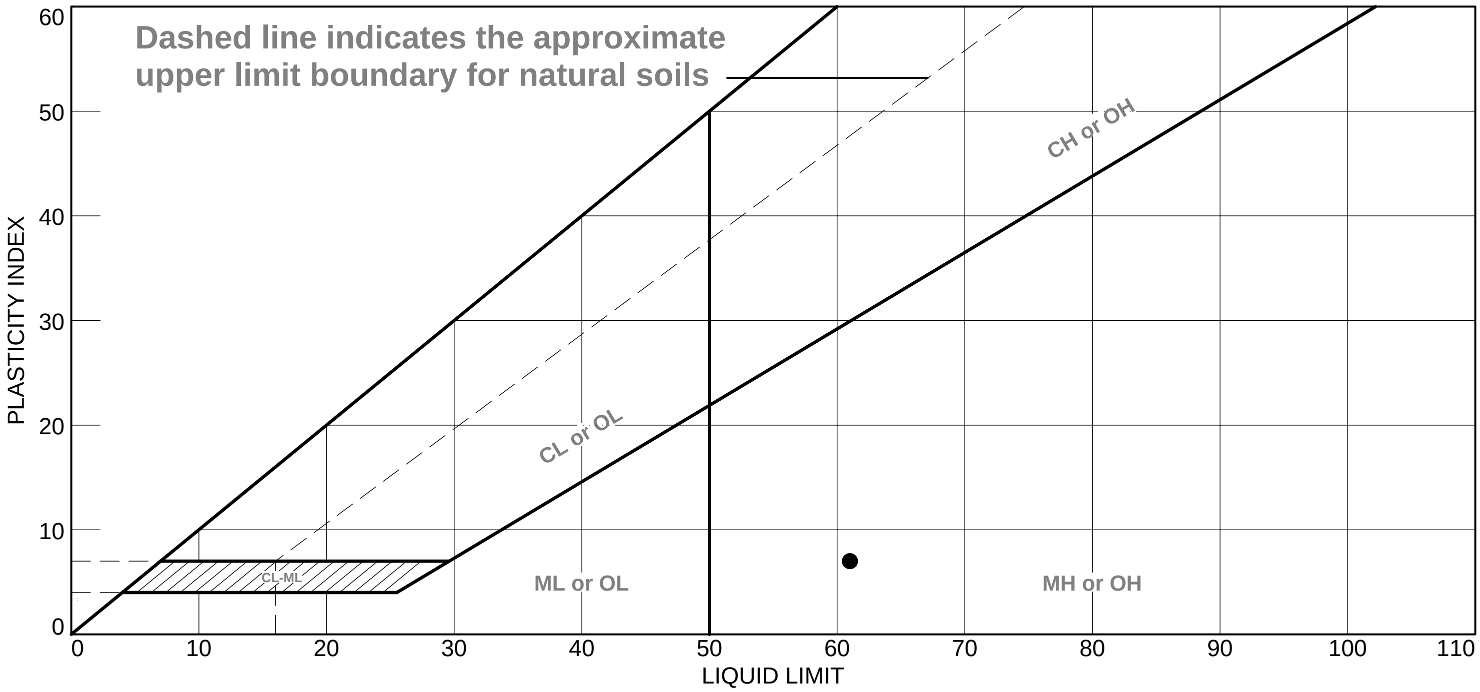
Remarks:

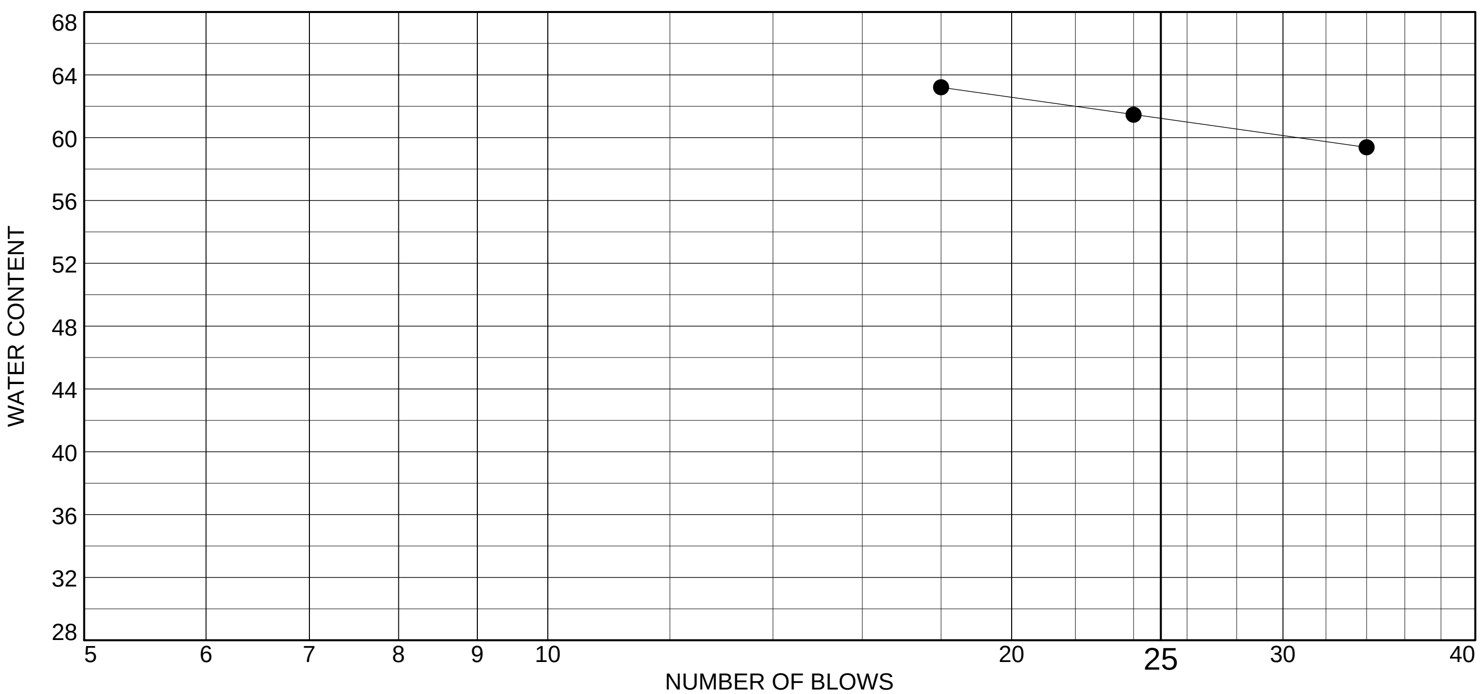
Terracon

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	FILL: BROWN SANDY SILT WITH CLAY CHUNKS	61	54	7			MH

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

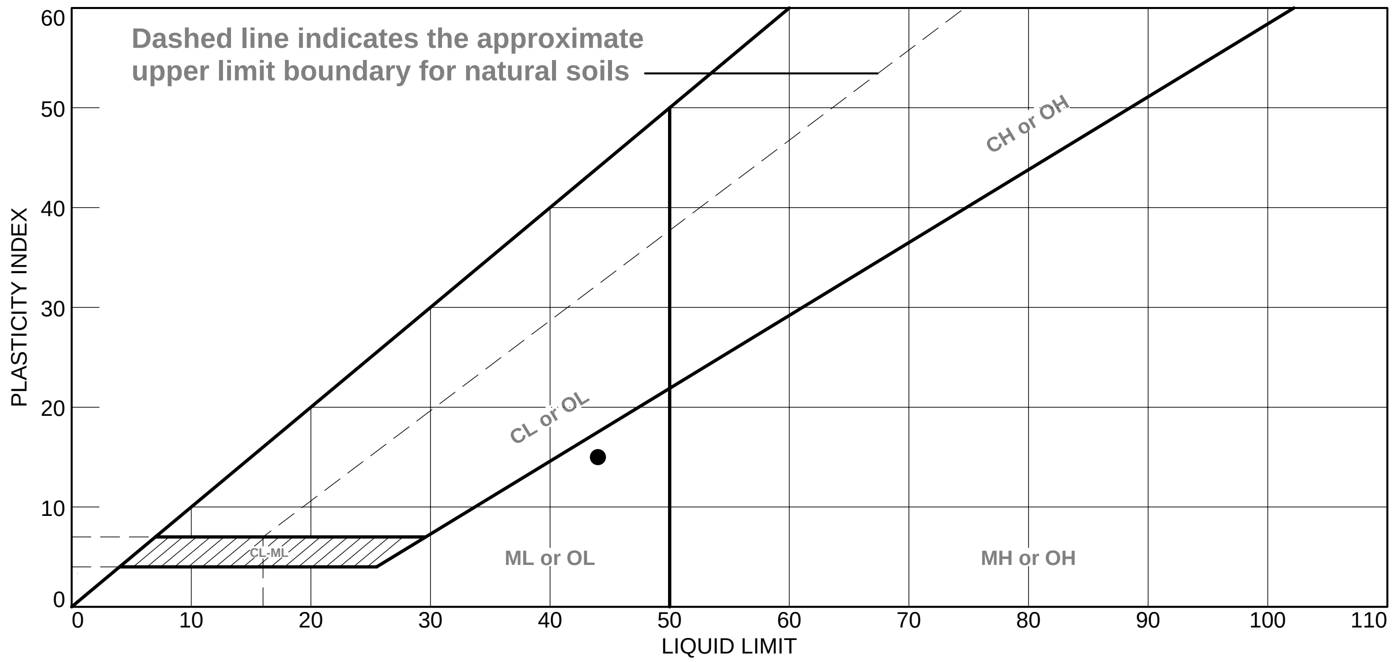
Source of Sample: EDW-B005 **Depth:** 5.0'-6.5'
Sample Number: S-3

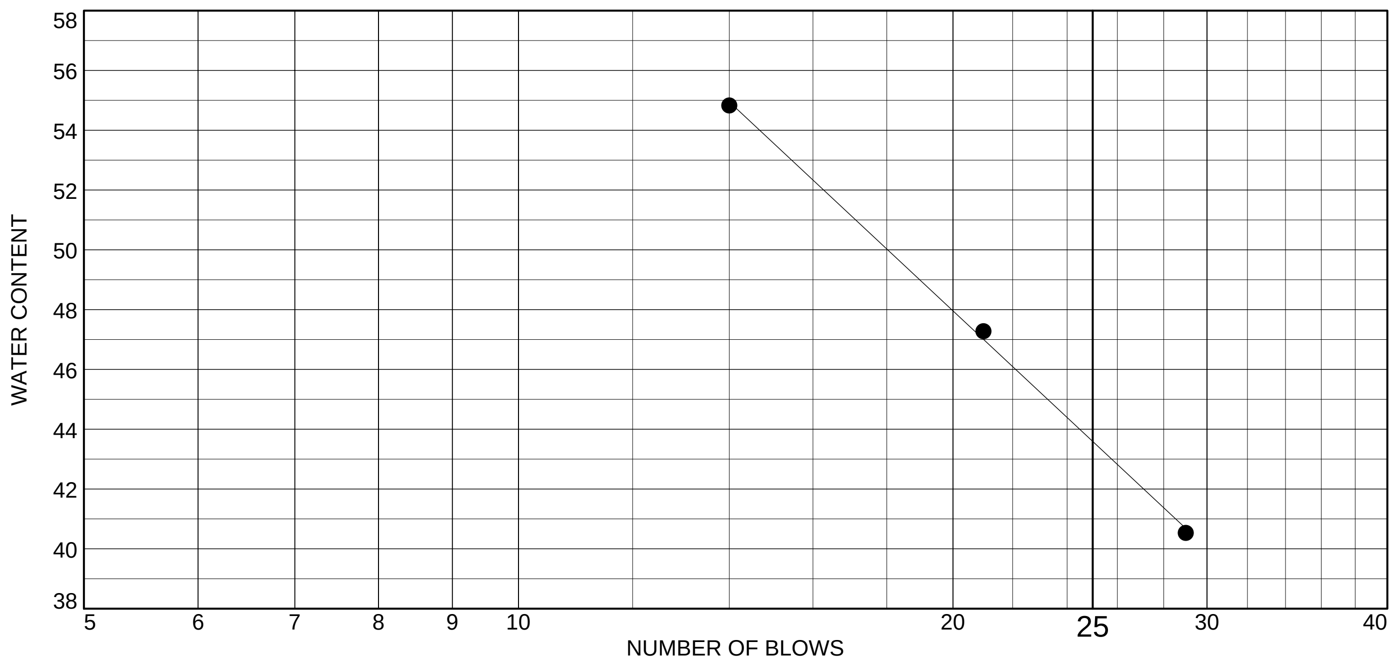
Remarks:

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	FILL: GRAY AND BLACK ORGANIC SILT	44	29	15			OL

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B005 **Depth:** 26.0'-27.0'
Sample Number: S-8A

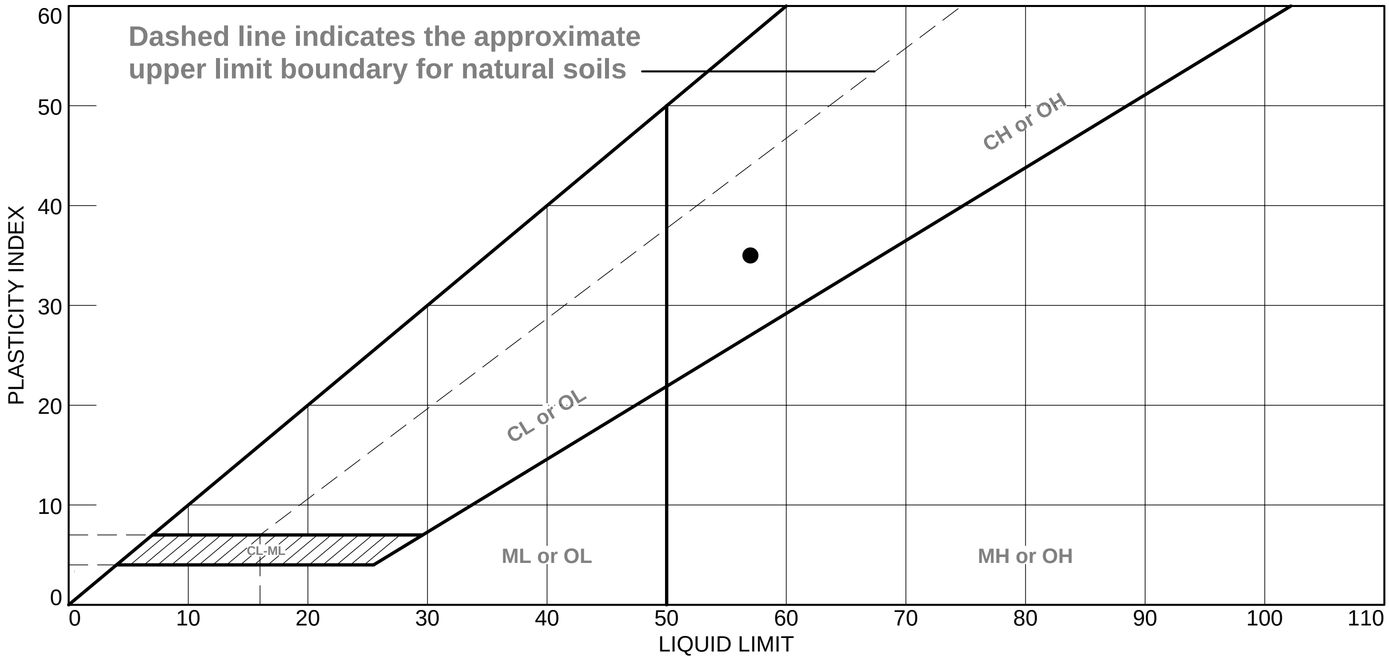
Terracon

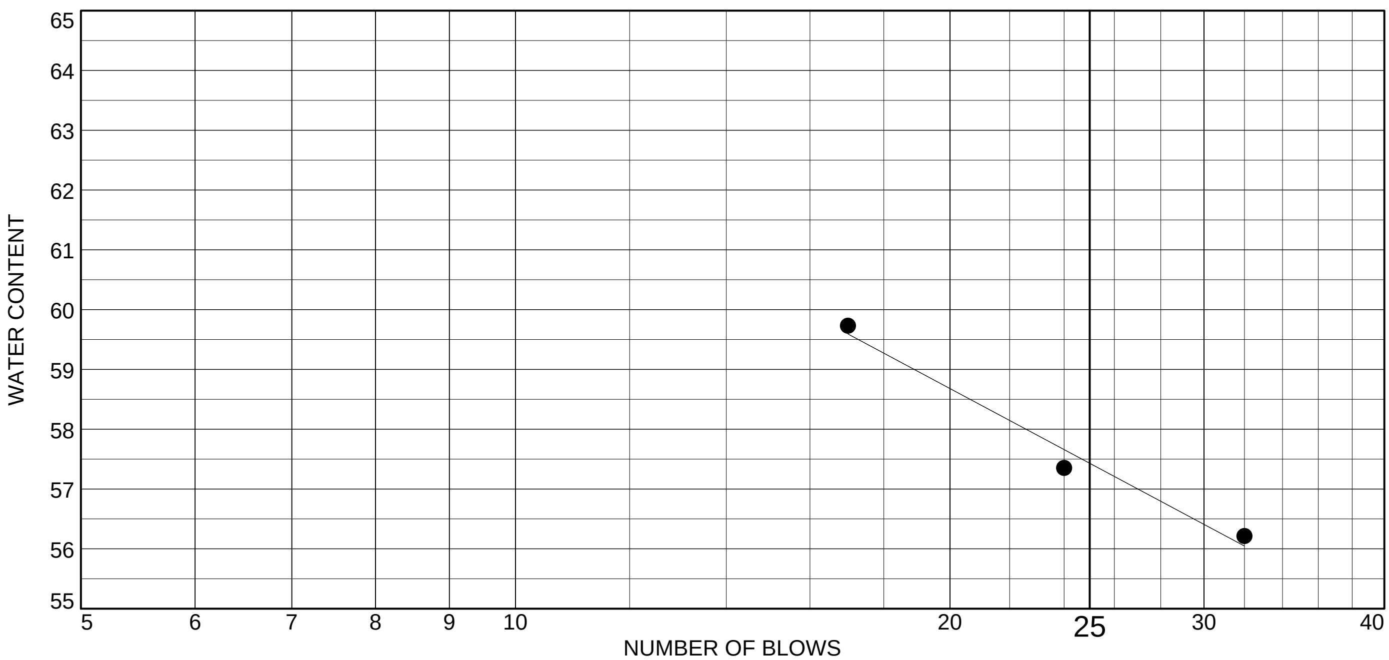
Remarks:

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAY FAT CLAY SHELL - ORGANICS NOTED	57	22	35			CH

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

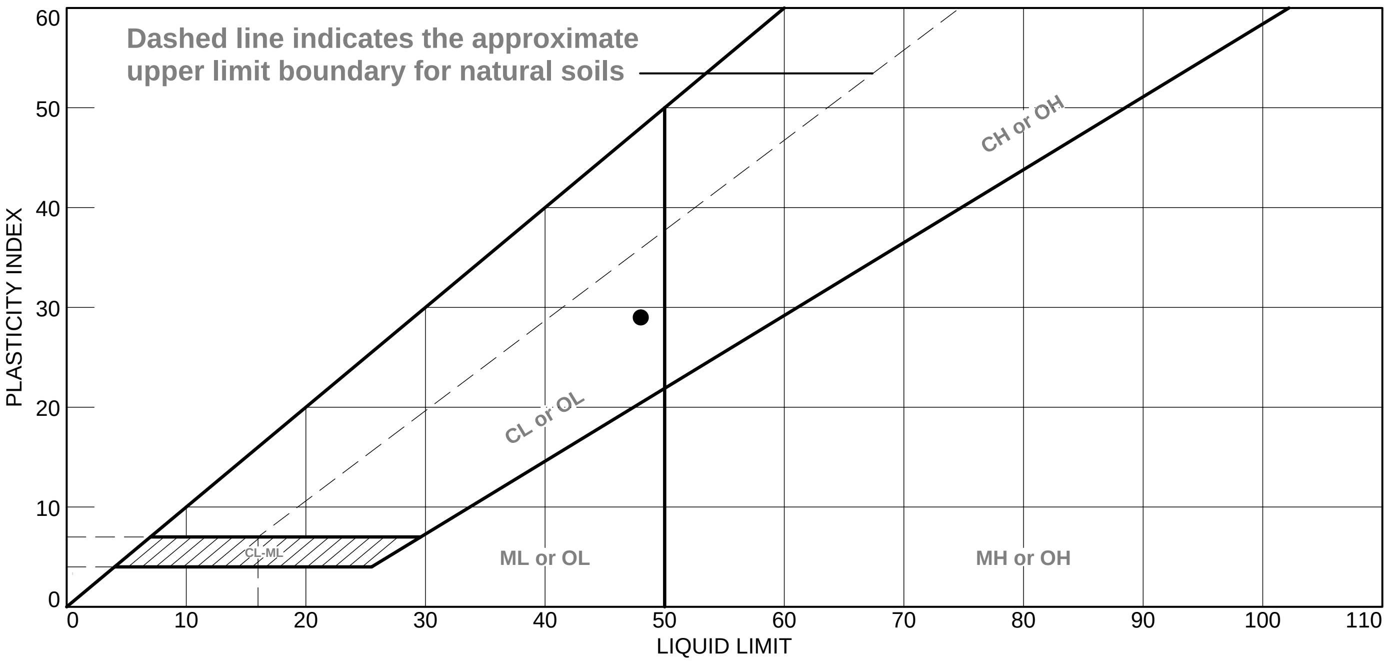
Source of Sample: EDW-B005 **Depth:** 41.0'-43.0'
Sample Number: S-11

Remarks:

Figure

Tested By: SJH **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAY AND DARK GRAY LEAN CLAY TRACE SAND	48	19	29			CL

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B006 **Depth:** 5.0'-6.5'
Sample Number: S-3

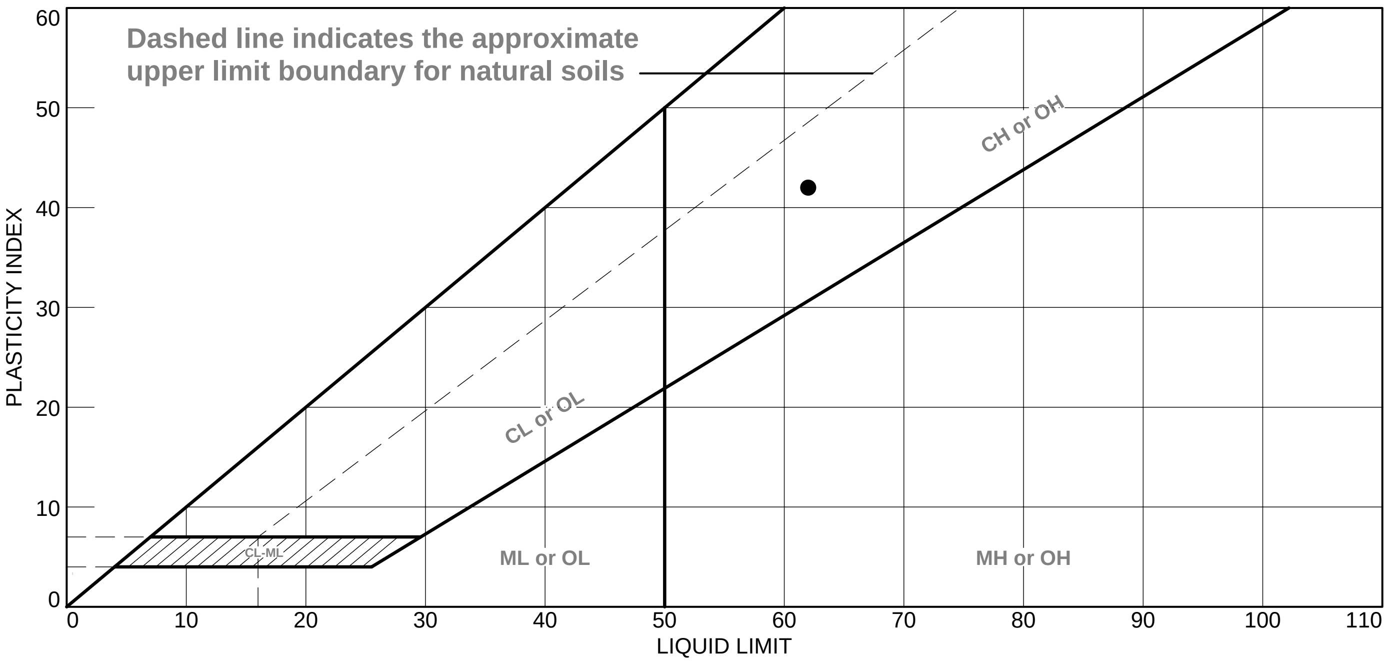
Terracon

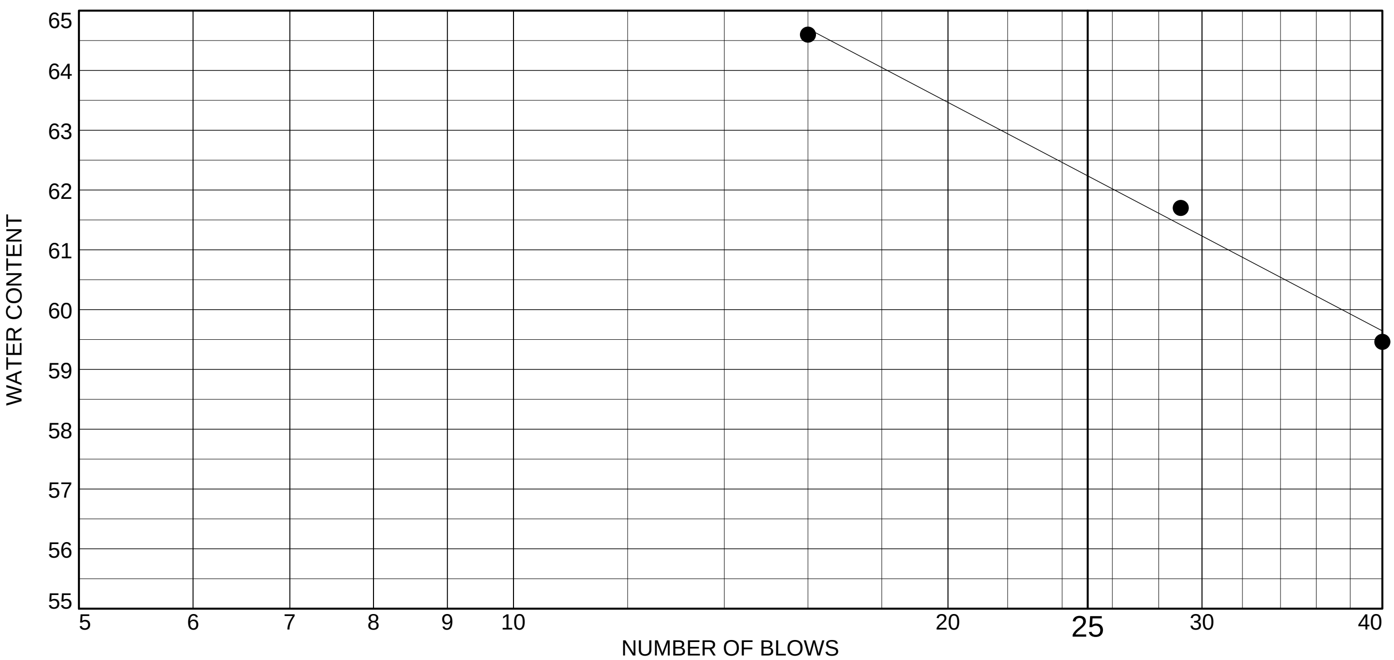
Remarks:

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAY FAT CLAY WITH SAND	62	20	42			CH

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B006 **Depth:** 13.0'-15.0'
Sample Number: S-6

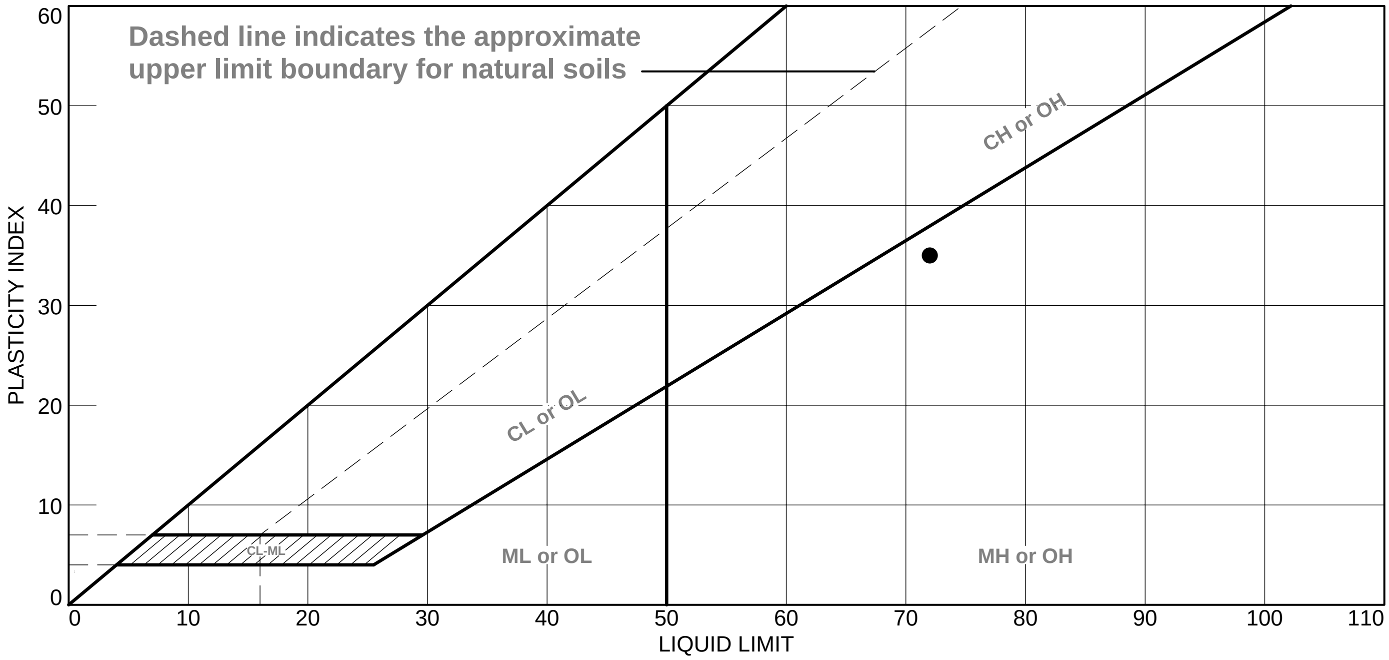
Terracon

Remarks:

Figure

Tested By: SJH **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	DARK GRAY ORGANIC SILT	72	37	35			OH

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B006 **Depth:** 26.0'-28.0'
Sample Number: S-9

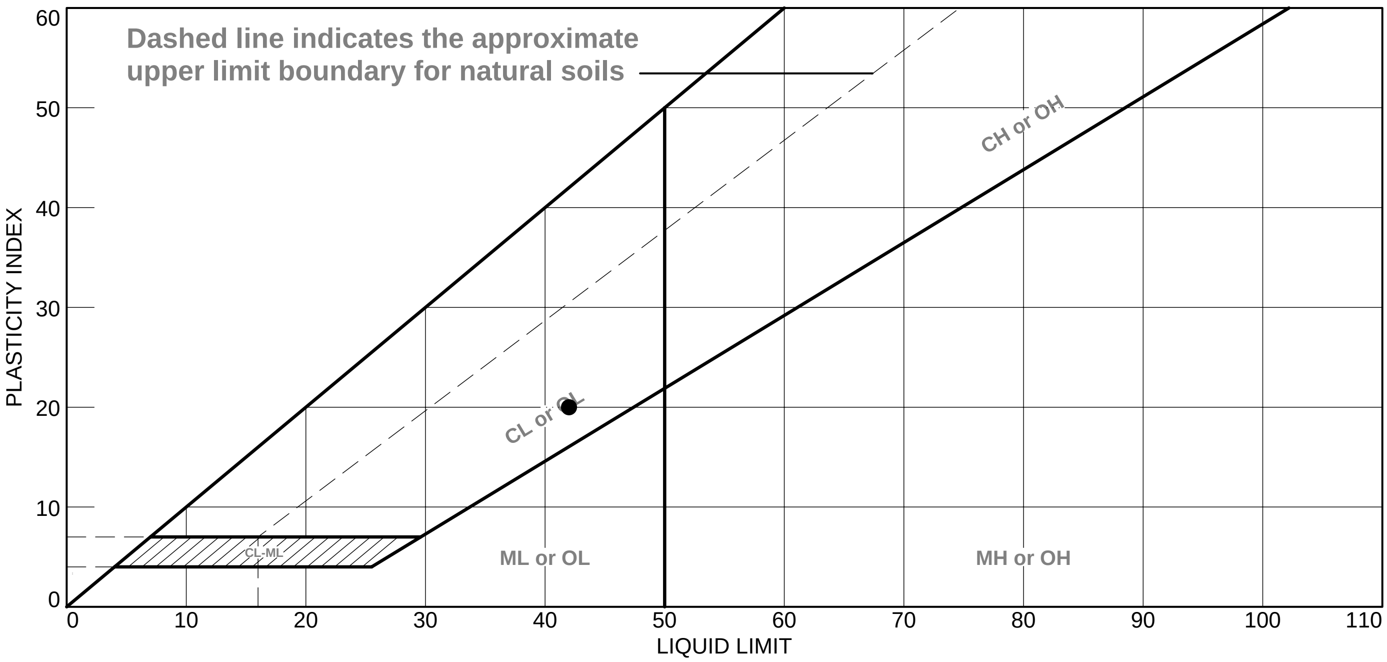
Terracon

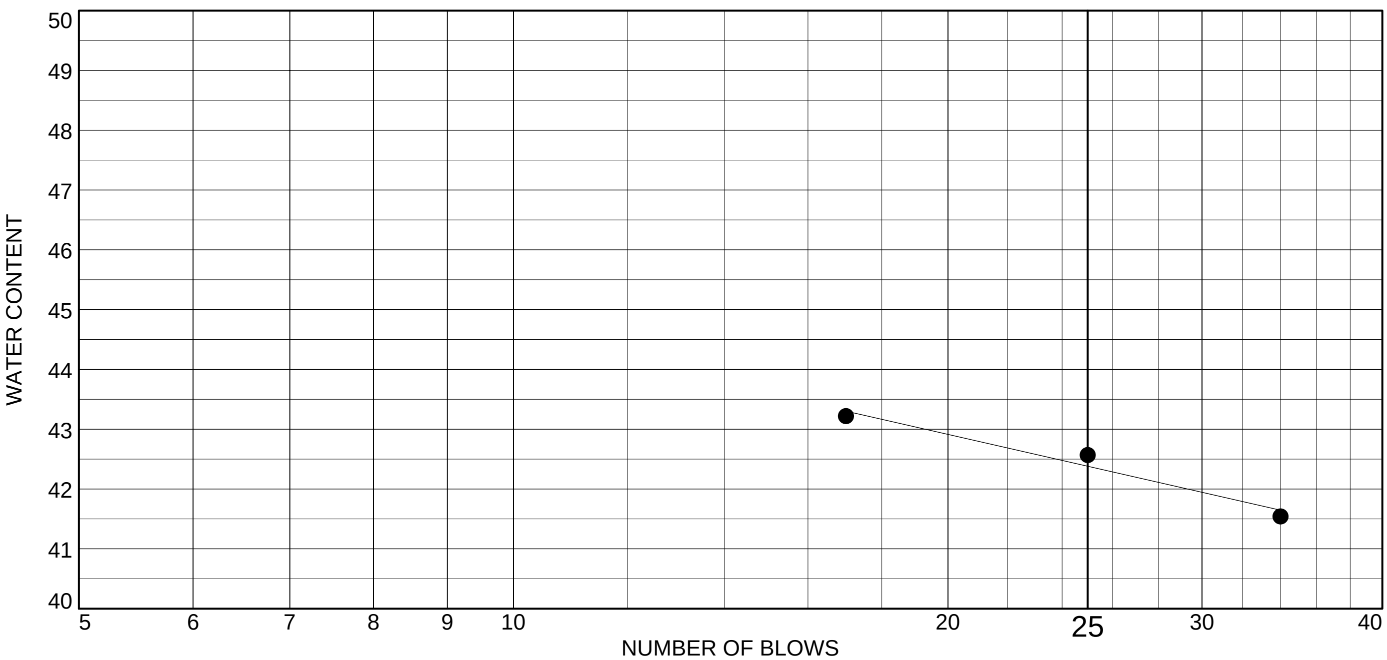
Remarks:

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	DARK BROWN LEAN CLAY WITH SAND	42	22	20			CL

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

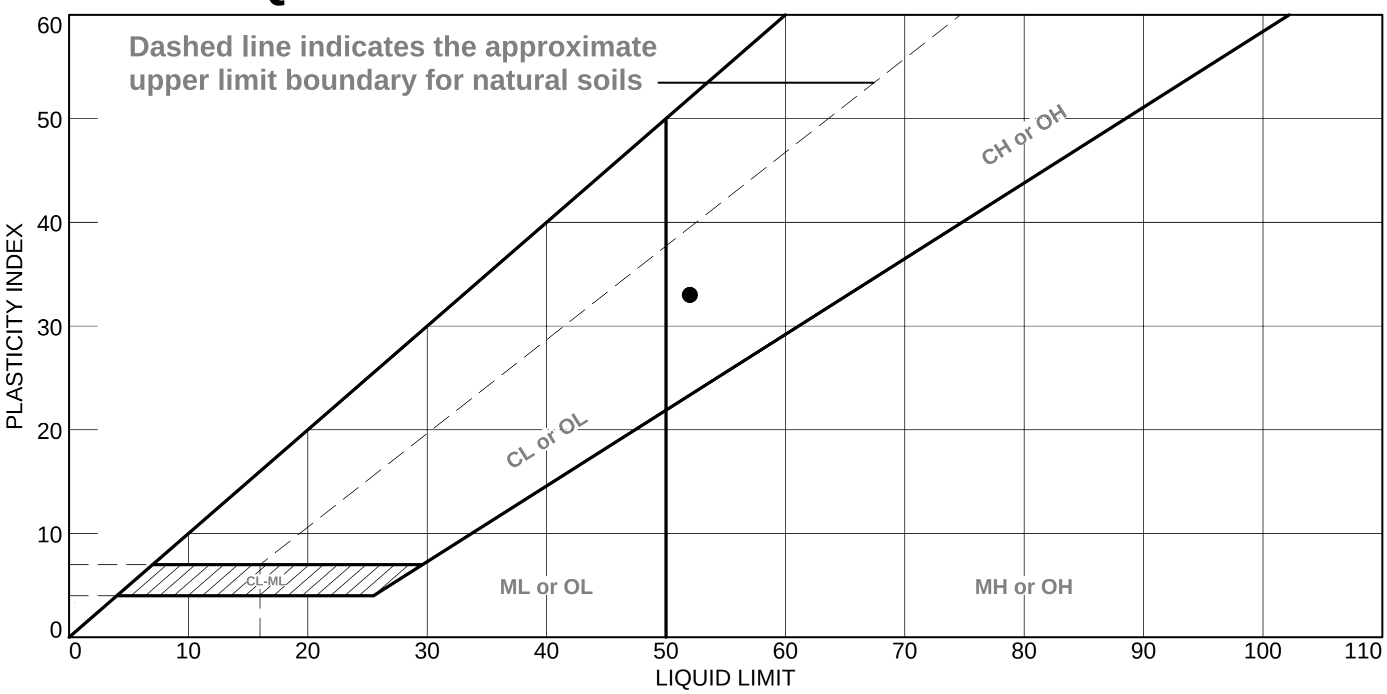
Source of Sample: EDW-B008 **Depth:** 2.5'-4.0'
Sample Number: S-2

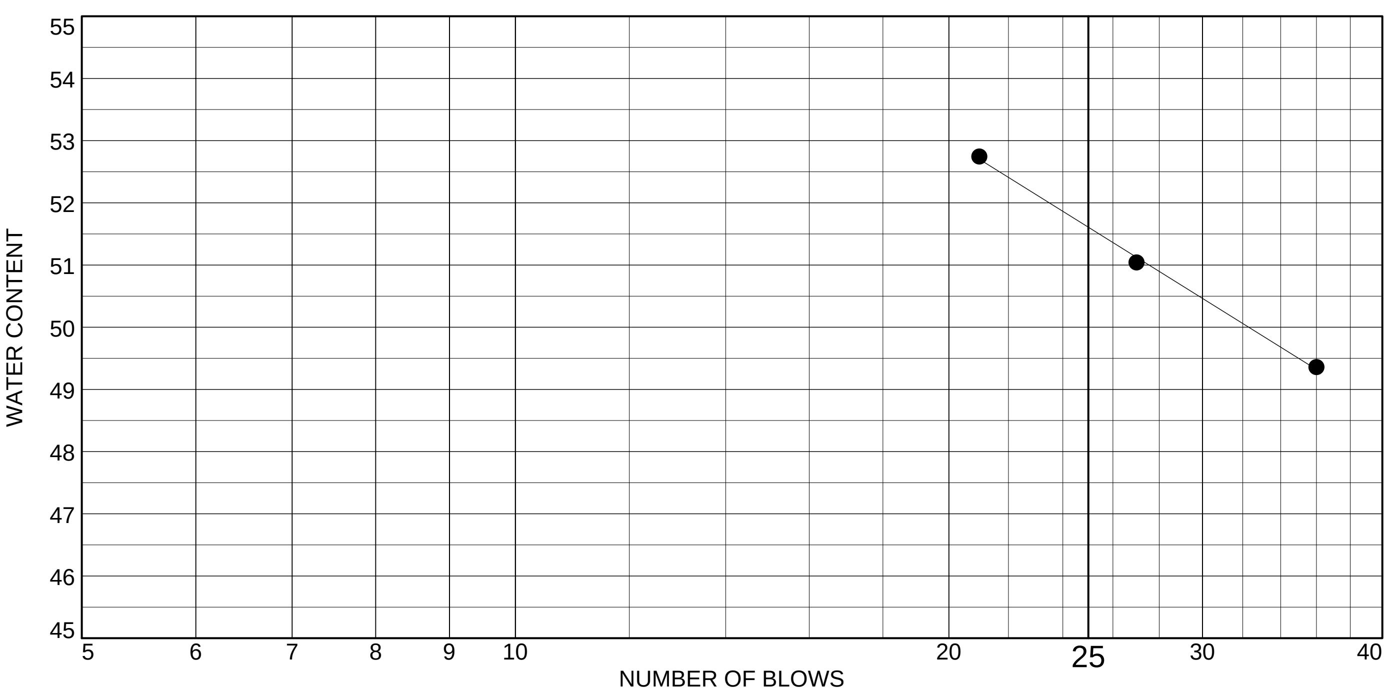
Remarks:

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	BROWN AND GRAY FAT CLAY WITH SAND	52	19	33			CH

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

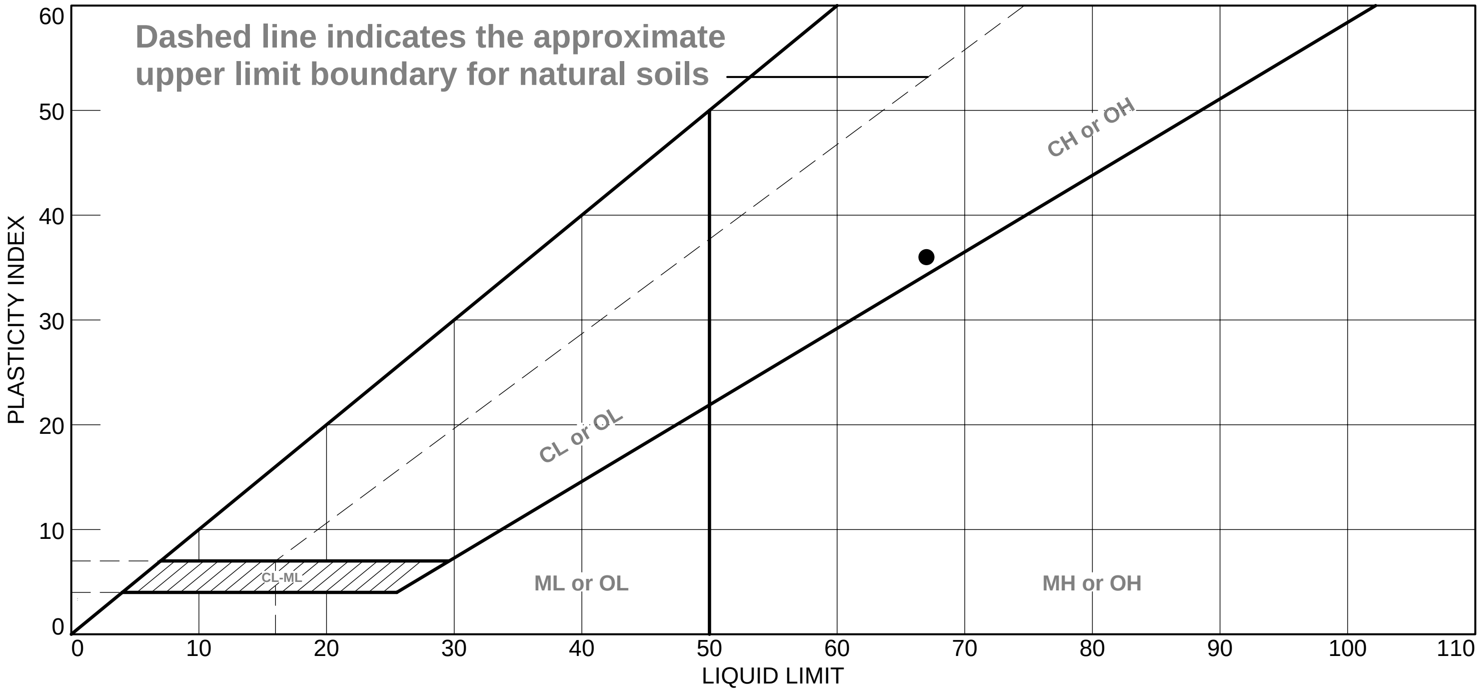
Source of Sample: EDW-B008 **Depth:** 11.0'-13.0'
Sample Number: S-5

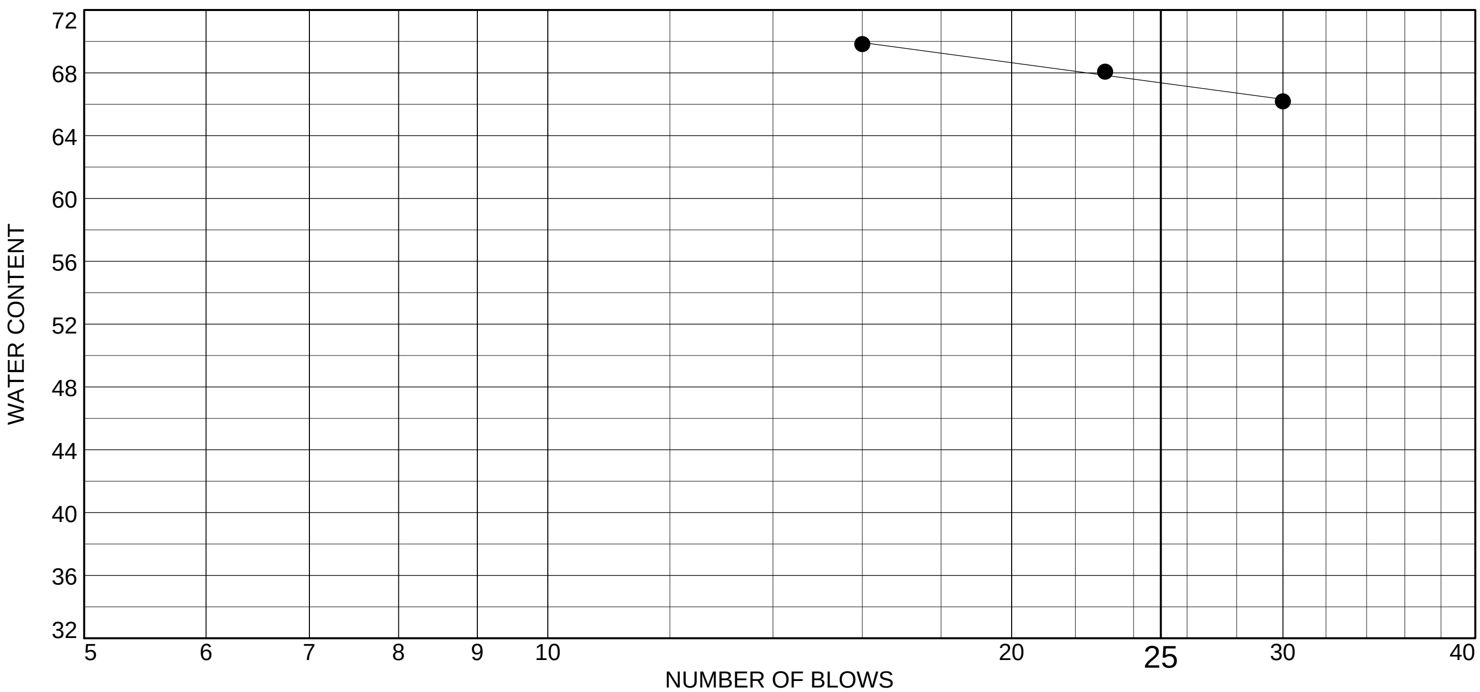
Terracon

Remarks:

Figure

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	DARK GRAY FAT CLAY SHELL - ORGANICS NOTED	67	31	36			CH

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B008 **Depth:** 24.0'-26.5'
Sample Number: S-8

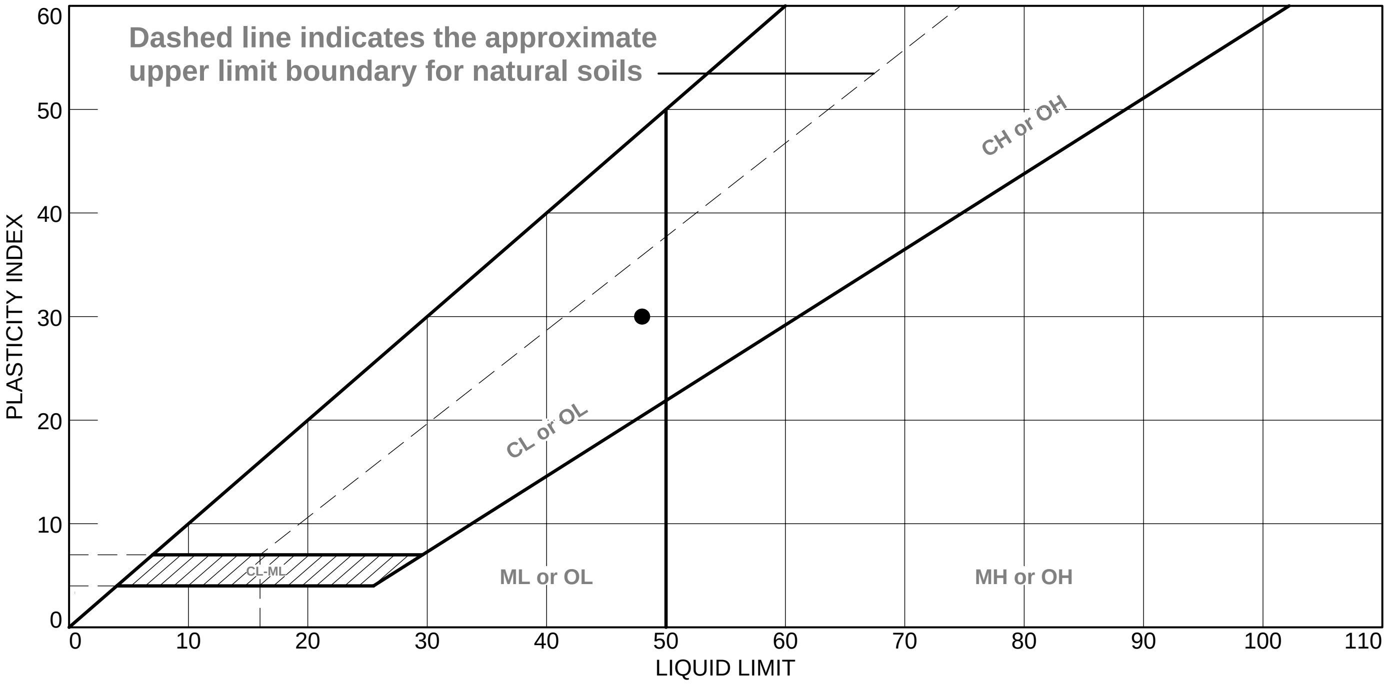
Terracon

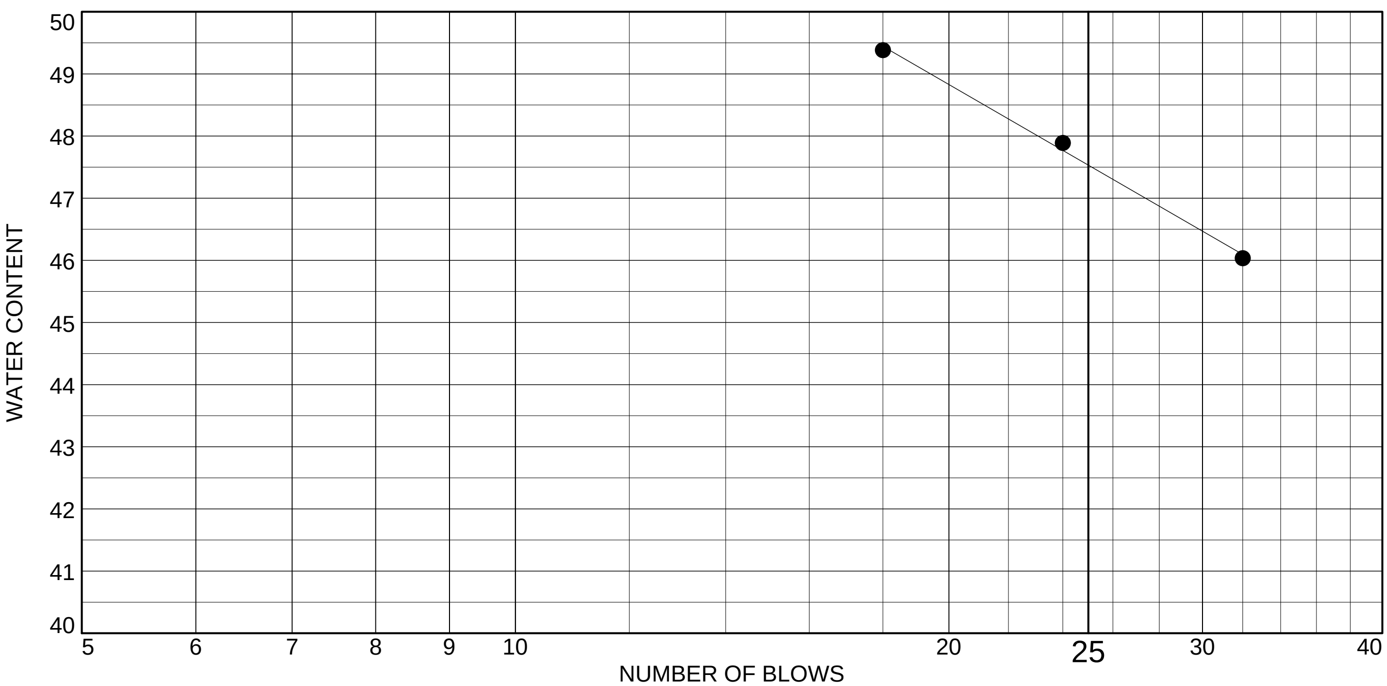
Remarks:

Figure

Tested By: SJH **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	BROWN AND GRAY MOTTLED LEAN CLAY	48	18	30			CL

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

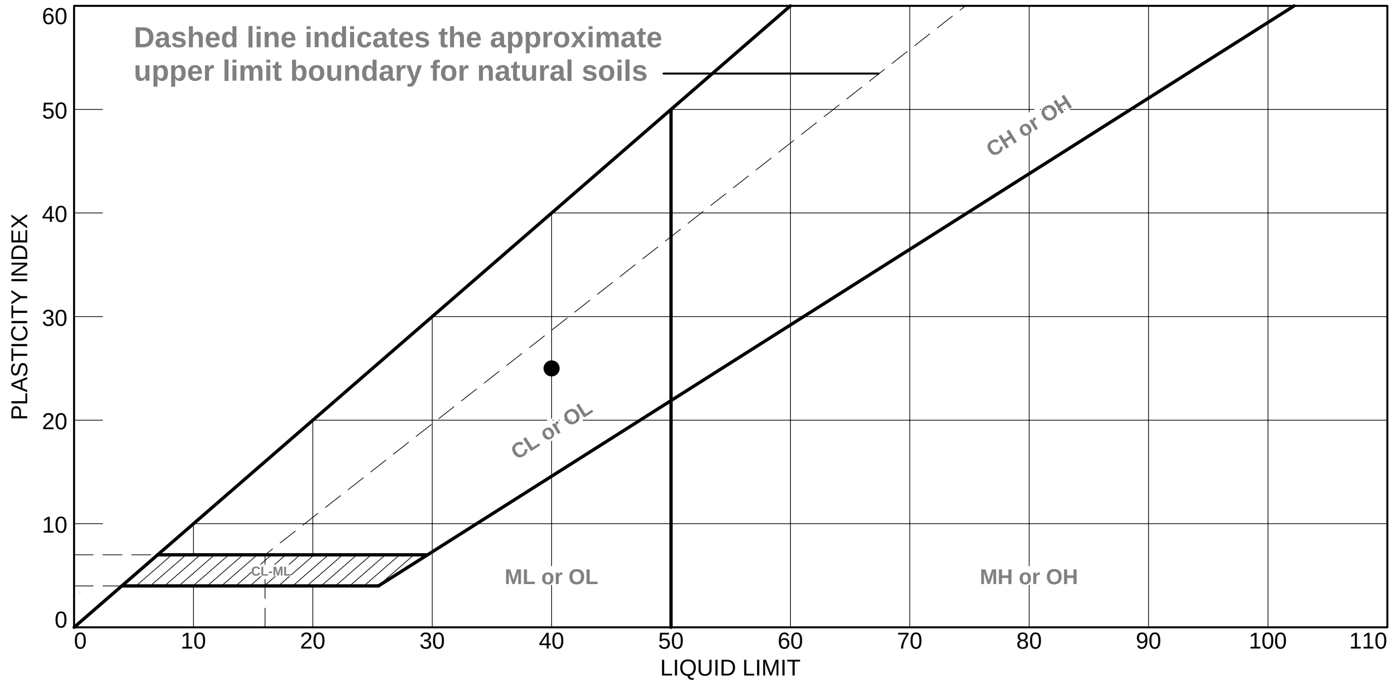
Source of Sample: EDW-B010 **Depth:** 15.0'-17.0'
Sample Number: S-7

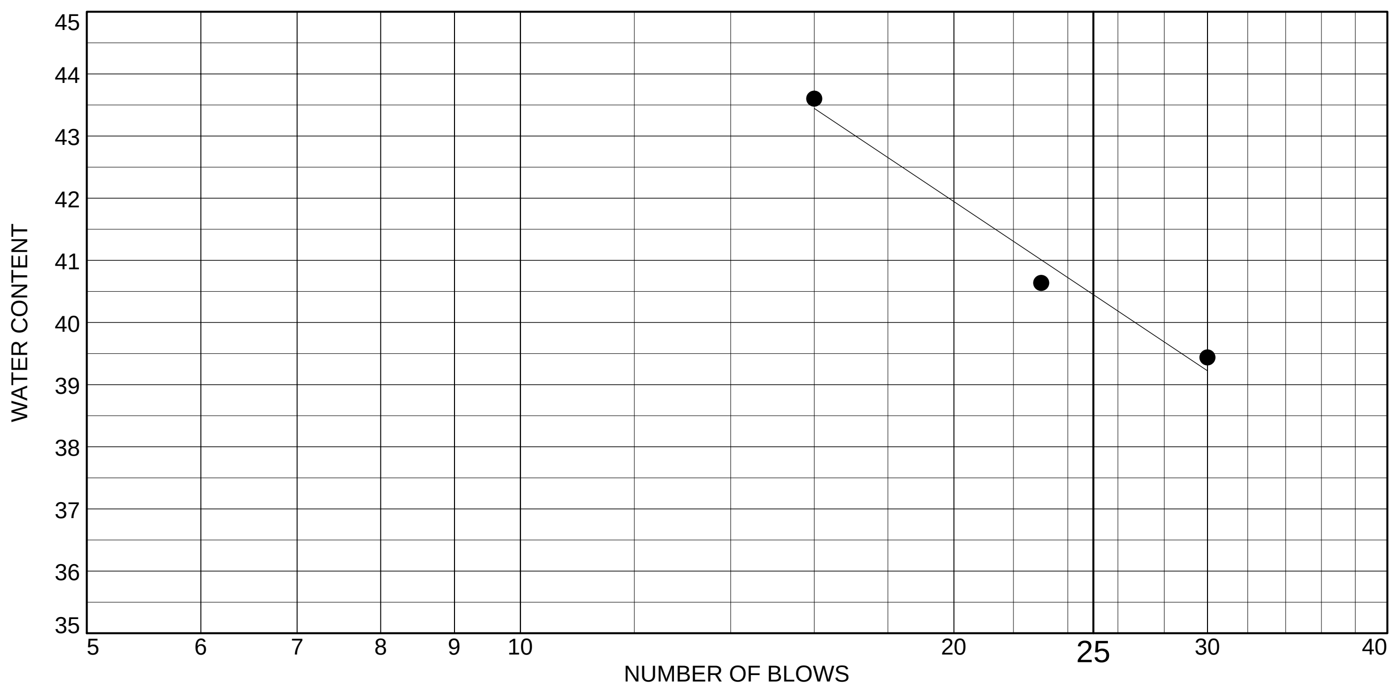
Terracon

Remarks:

Figure

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	BLUISH GRAY LEAN CLAY	40	15	25			CL

Project No. MR155218 **Client:** DYNEGY

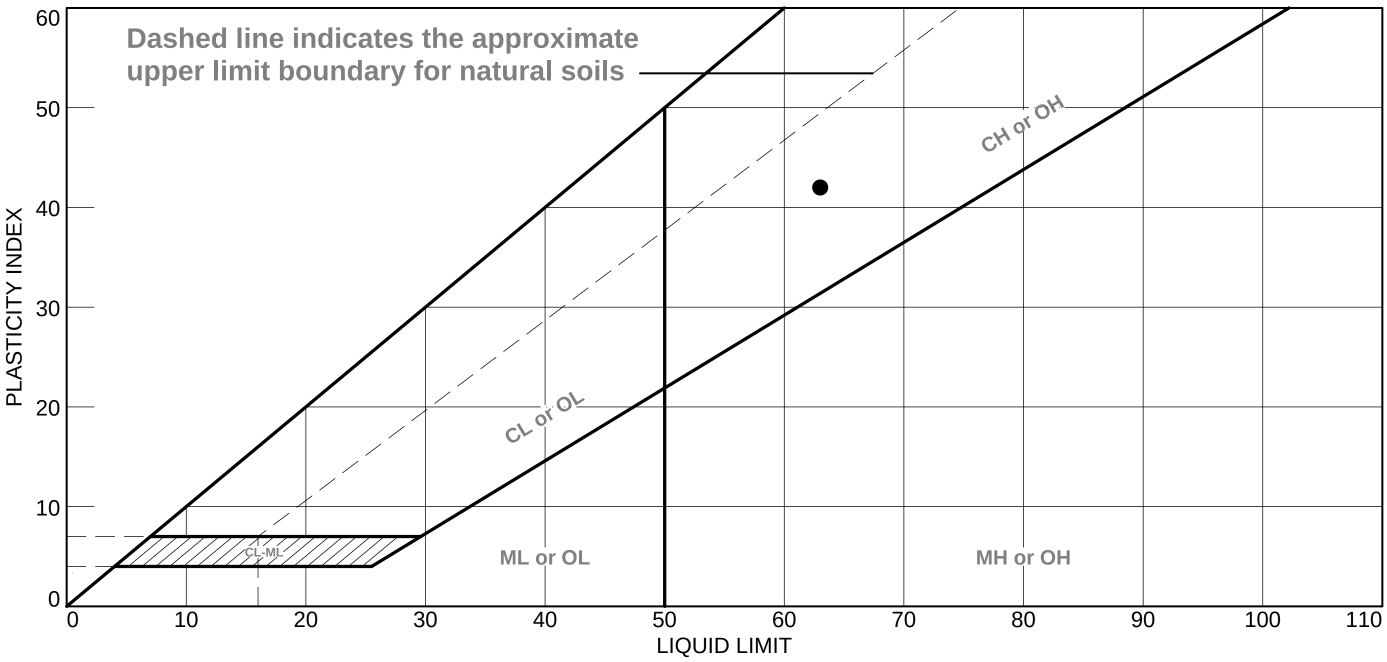
Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B010 **Depth:** 30.0'-32.0'
Sample Number: S-10

Remarks:

Figure

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAYISH BROWN FAT CLAY WITH SAND	63	21	42			CH

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B011 **Depth:** 45.0'-46.5'
Sample Number: S-14

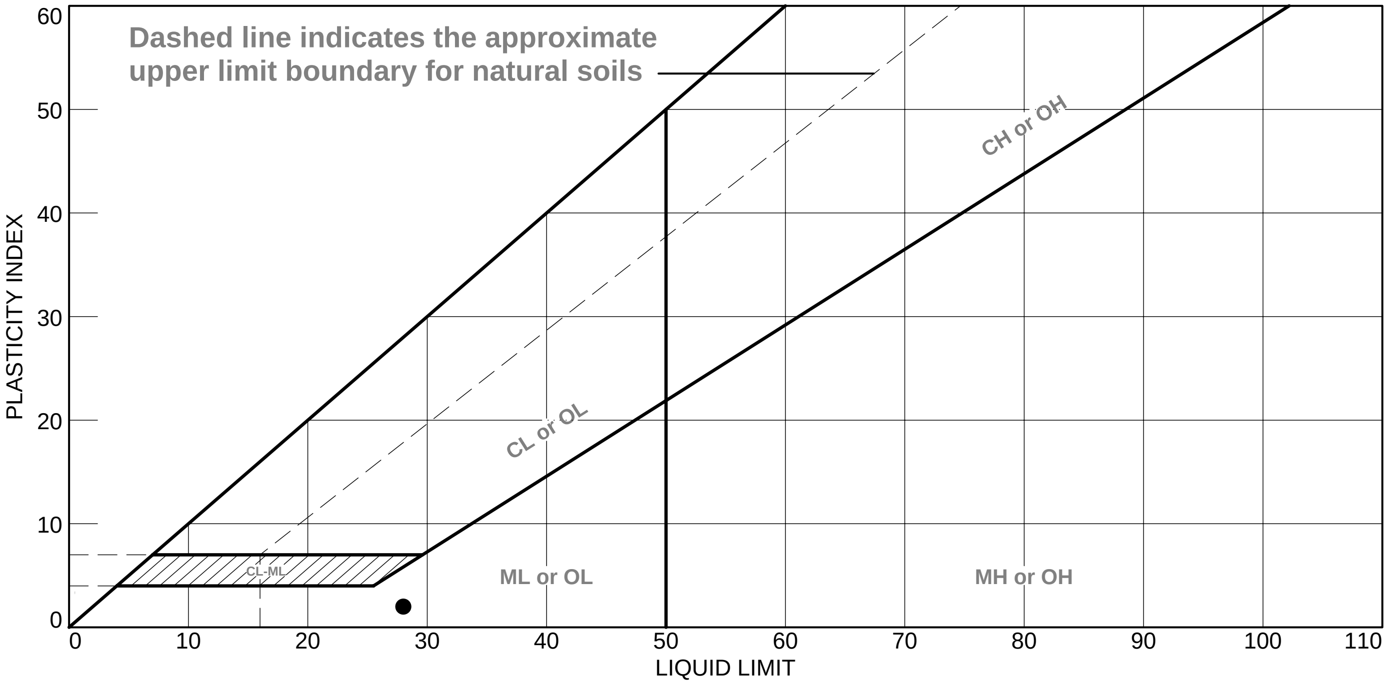
Terracon

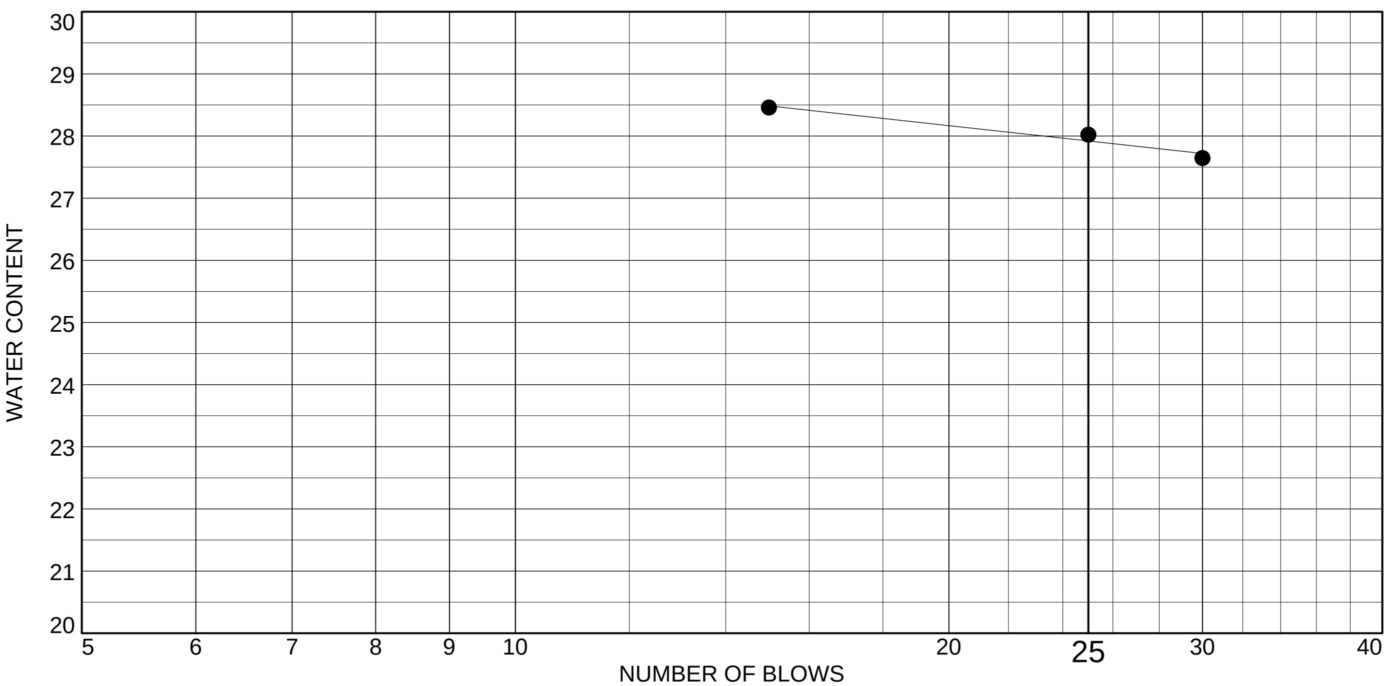
Remarks:

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	FILL: DARK GRAY FLY ASH	28	26	2			

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

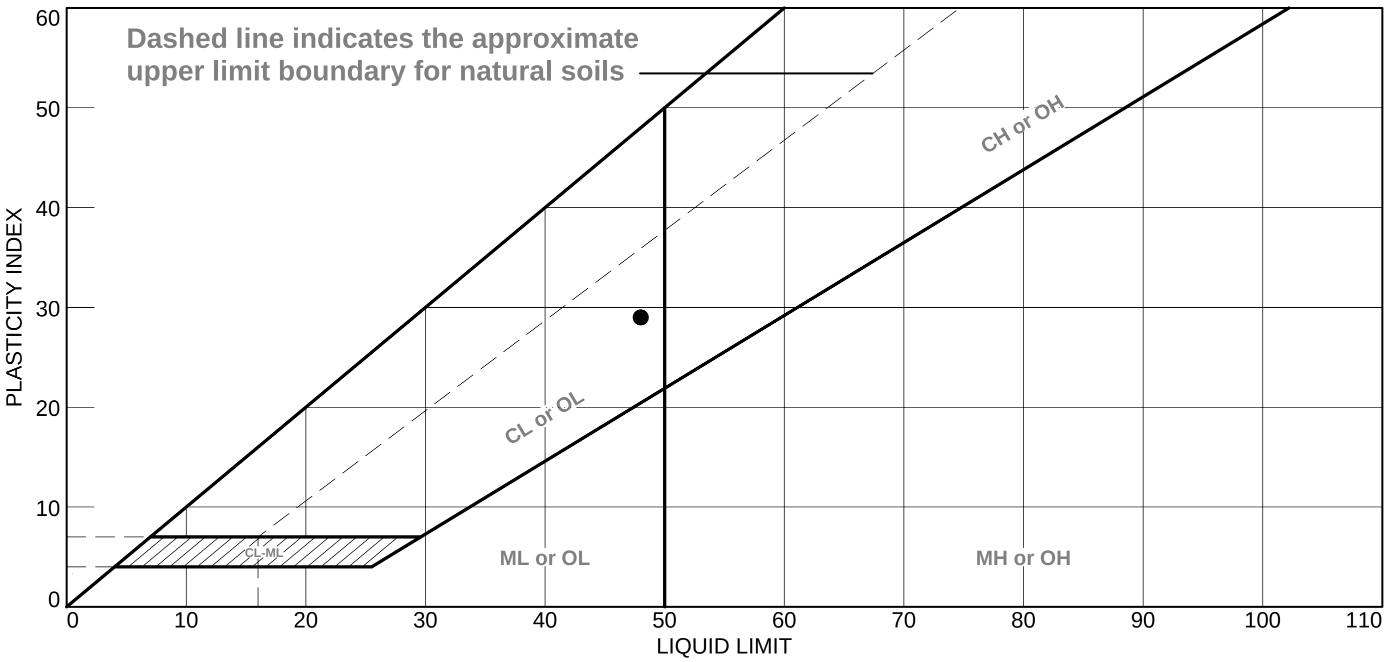
Source of Sample: EDW-B012 **Depth:** 2.5'-4.0'
Sample Number: S-2

Remarks:

Terracon

Figure

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	BROWN AND RUST BROWN MOTTLED LEAN CLAY	48	19	29			CL

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B012 **Depth:** 15.0'-16.5'
Sample Number: S-7

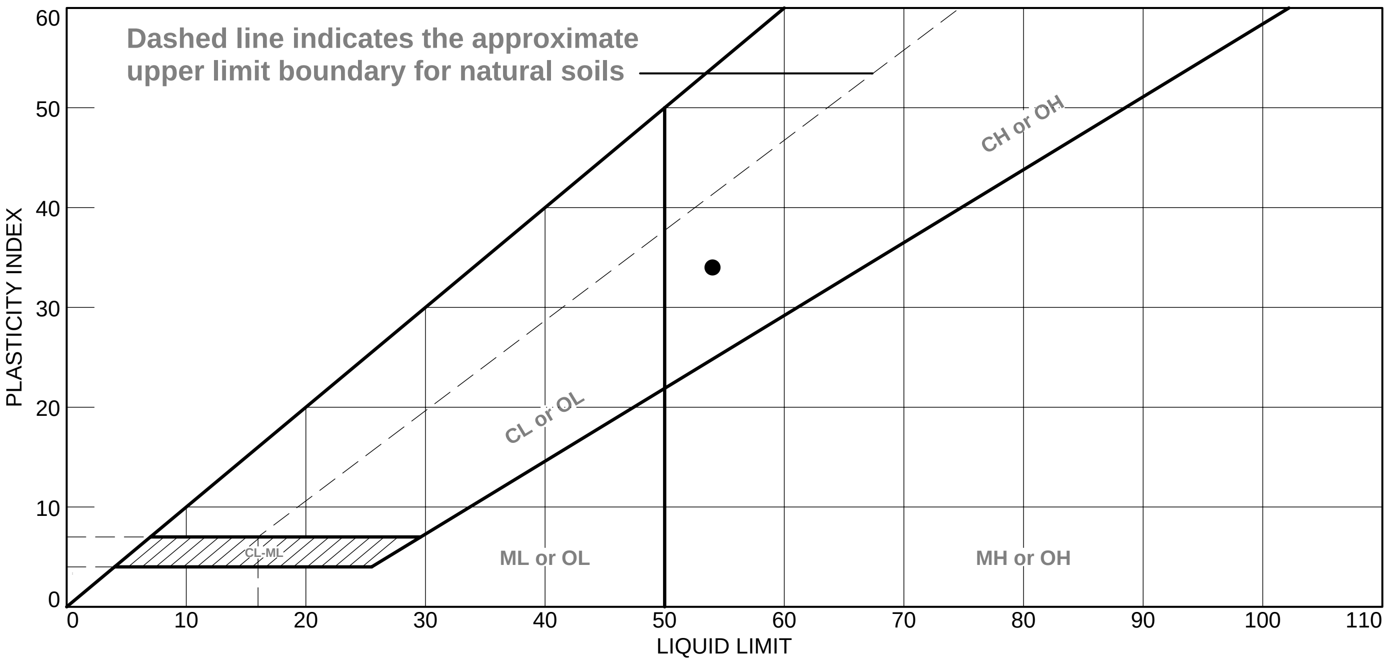
Terracon

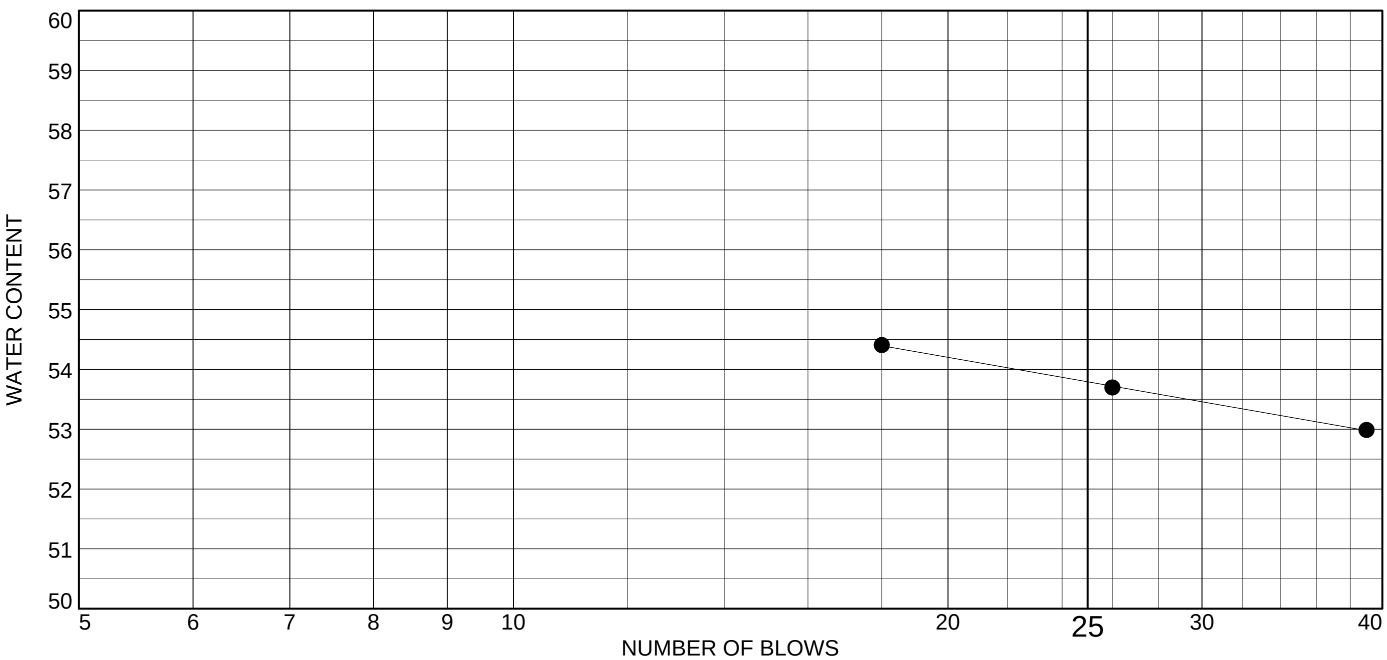
Remarks:

Figure

Tested By: SJH **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	DARK GRAY FAT CLAY	54	20	34			CH

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

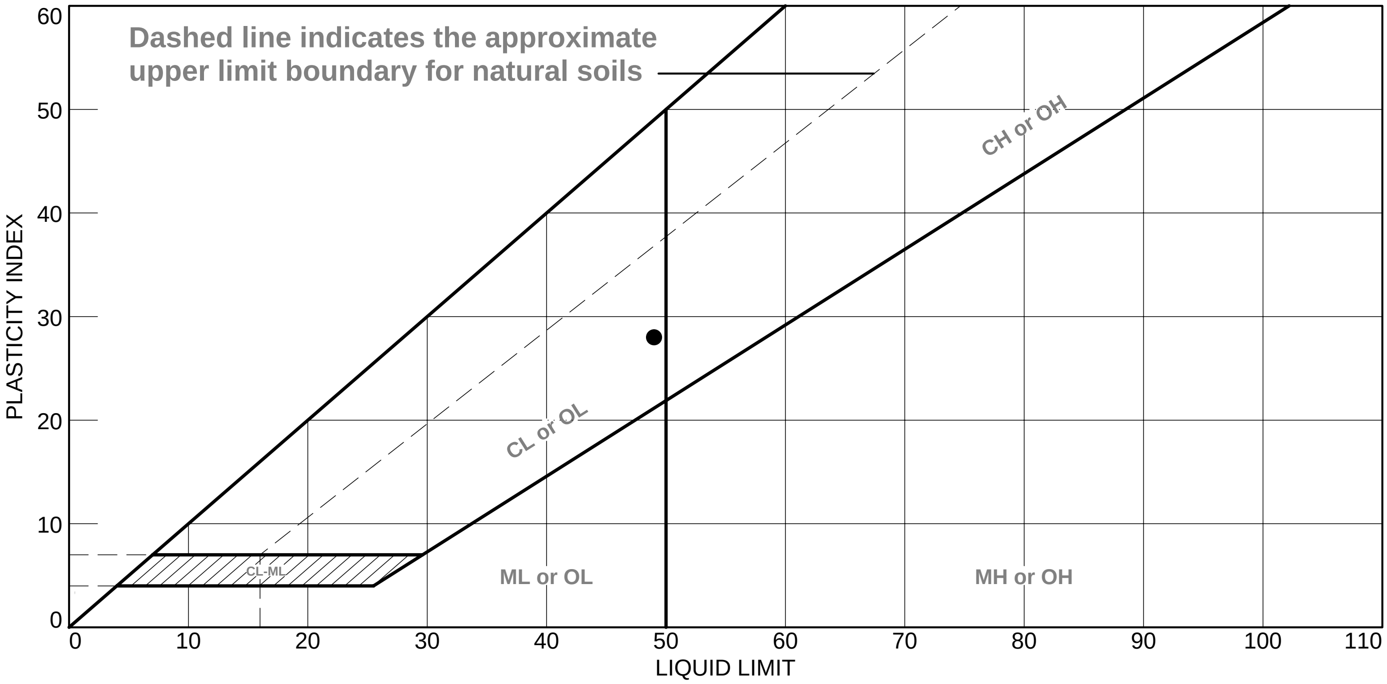
Source of Sample: EDW-B012 **Depth:** 47.0'-49.0'
Sample Number: S-14

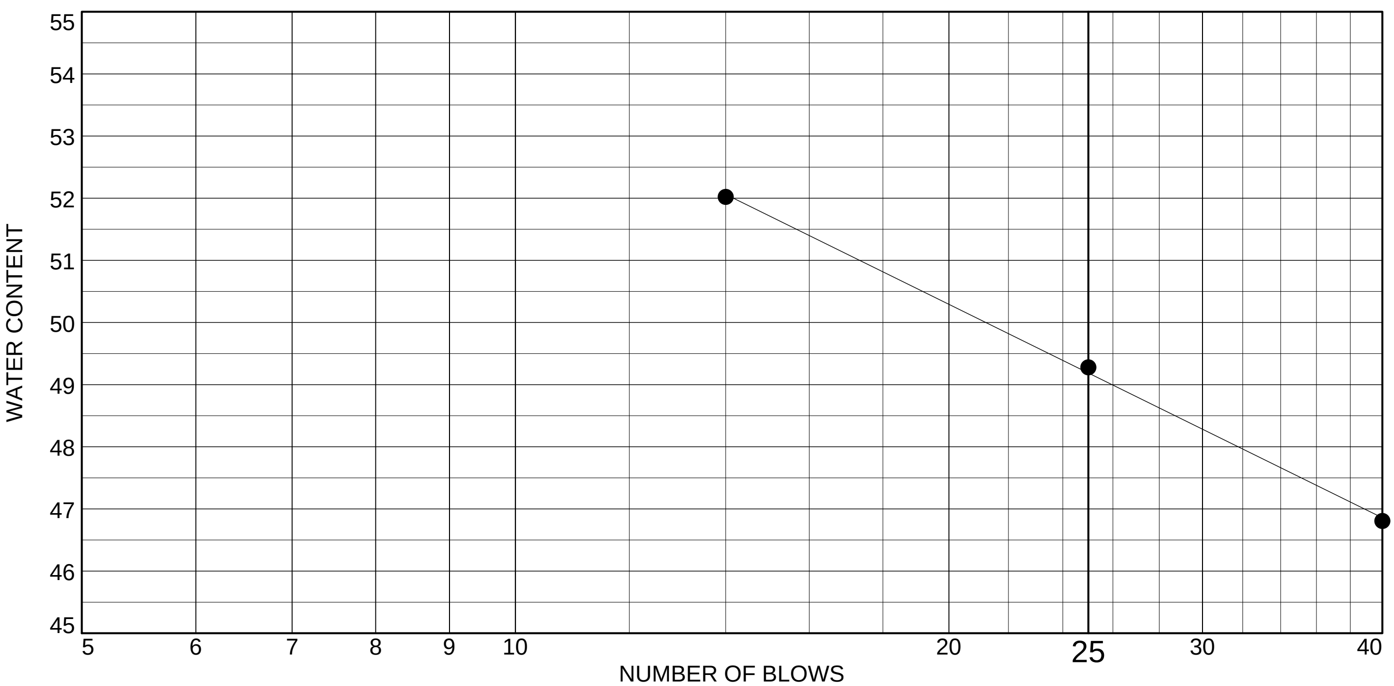
Remarks:

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	BROWNISH GRAY LEAN CLAY WITH SAND AND GRAVEL	49	21	28			CL

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

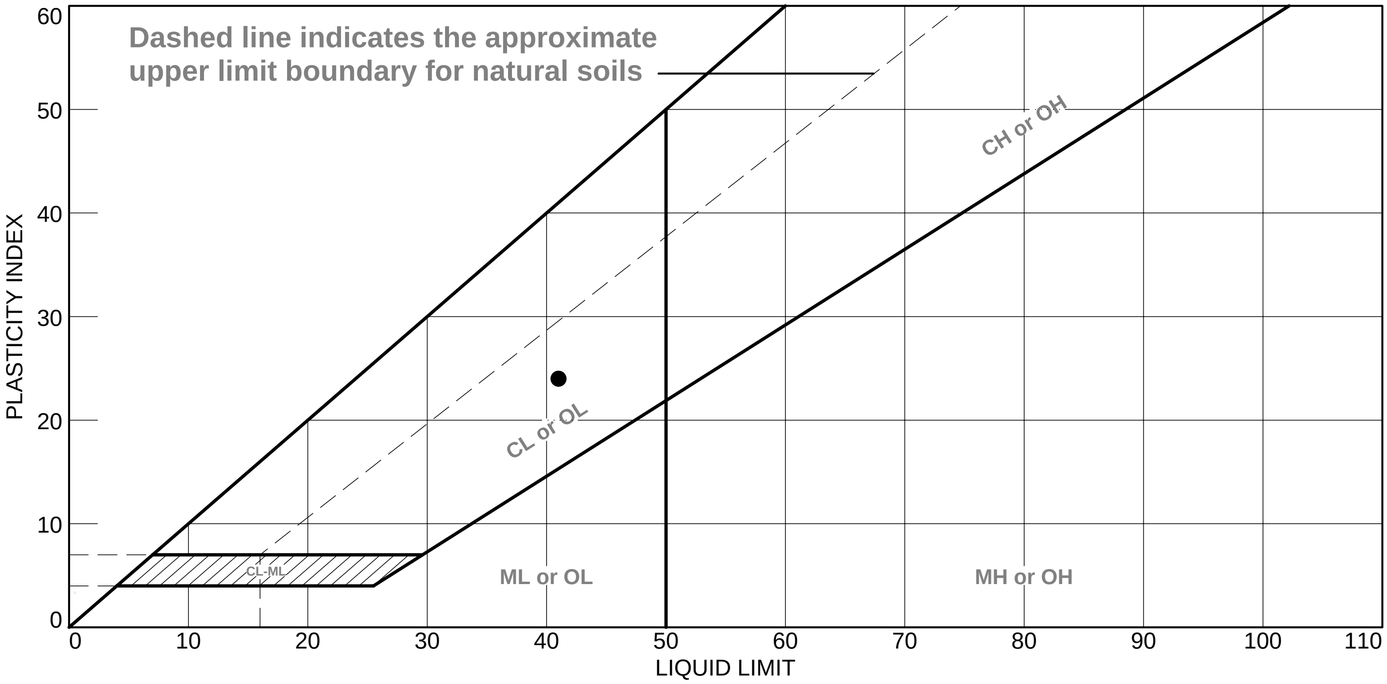
Source of Sample: EDW-B013 **Depth:** 6.0'-8.0'
Sample Number: S-3

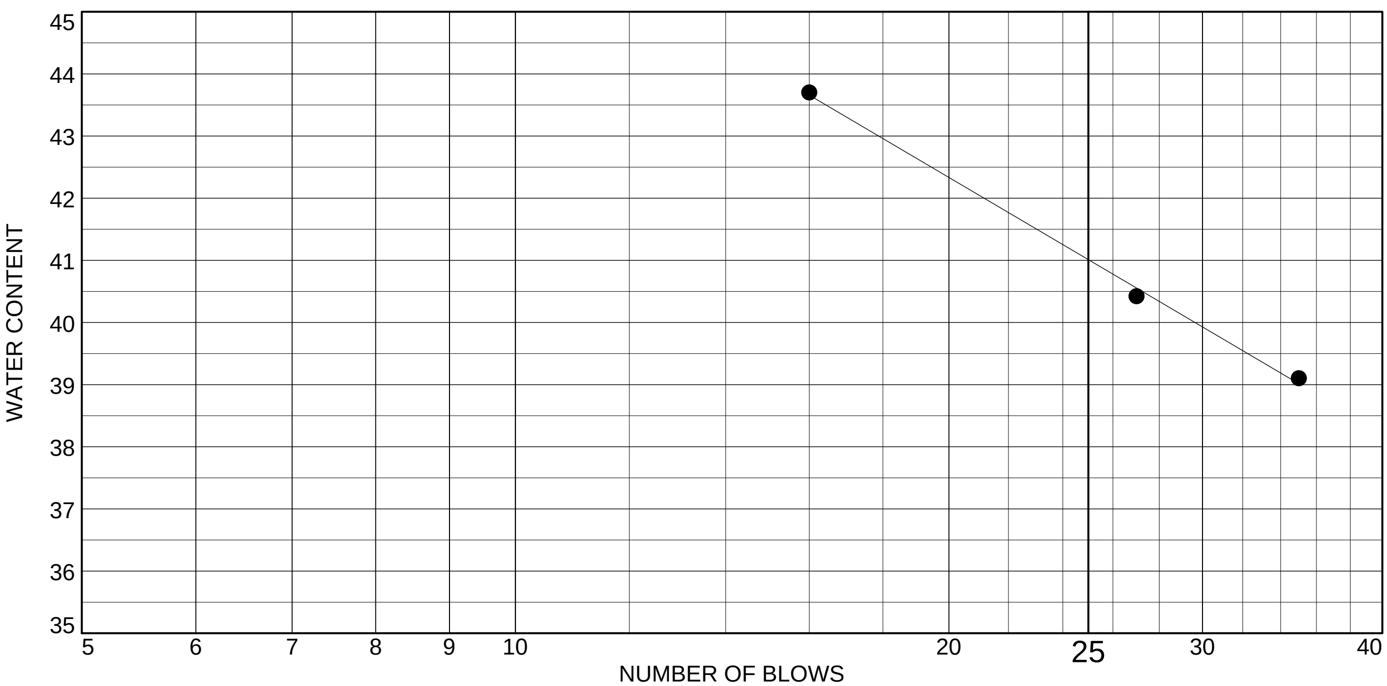
Terracon

Remarks:

Figure

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	DARK GRAY AND BROWNISH GRAY LEAN CLAY	41	17	24			CL

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

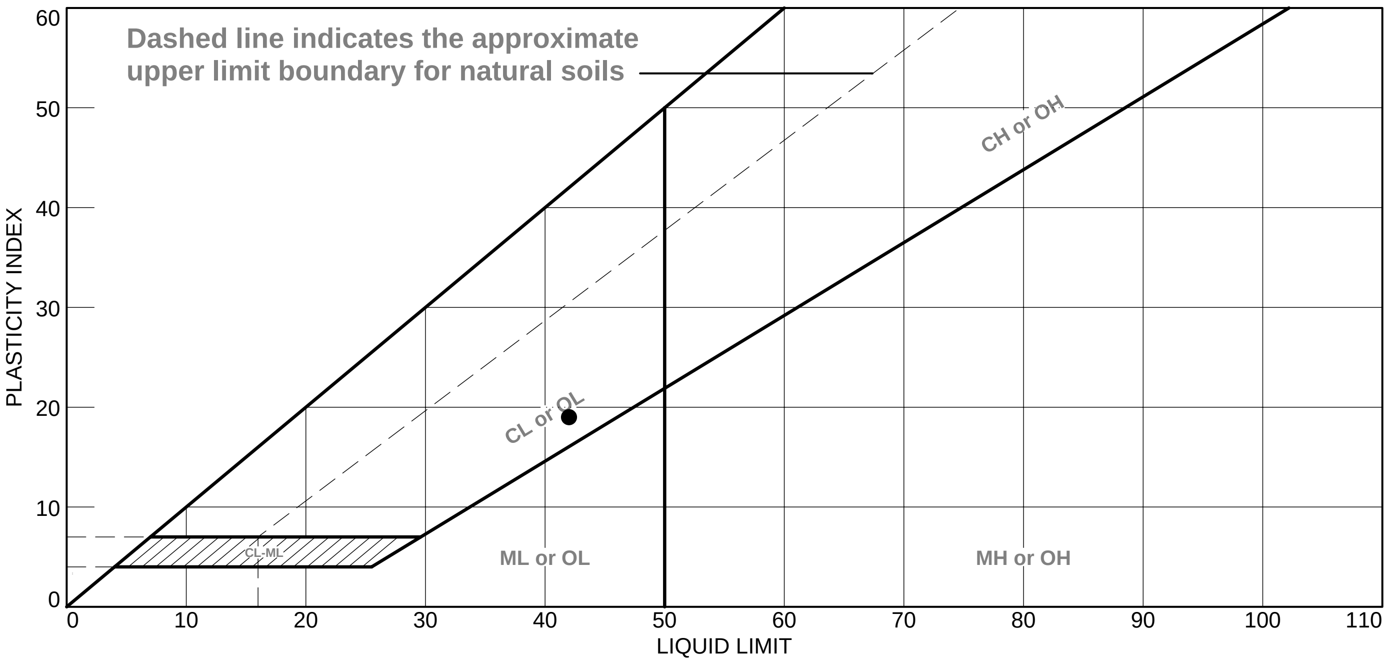
Source of Sample: EDW-B013 **Depth:** 15.0'-16.5'
Sample Number: S-6

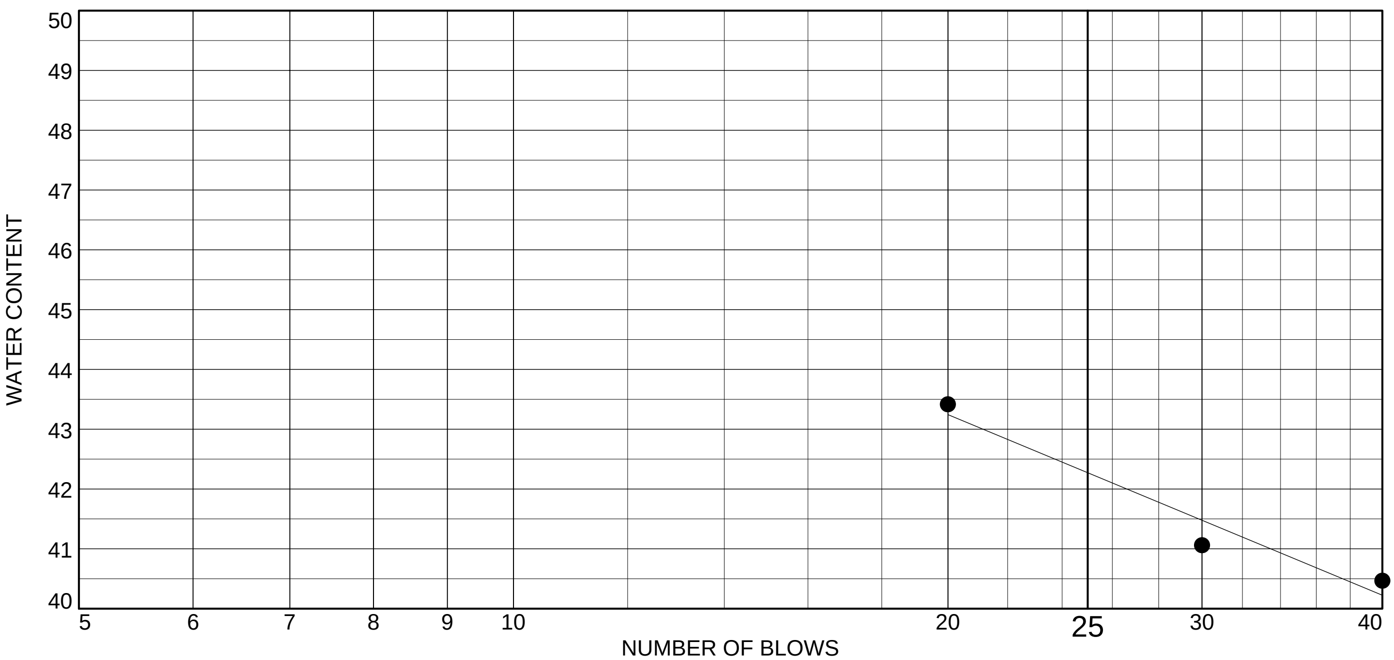
Remarks:

Terracon

Figure

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	GRAY AND BROWN LEAN CLAY WITH SAND	42	23	19			CL

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B013 **Depth:** 32.0'-34.0'
Sample Number: S-10

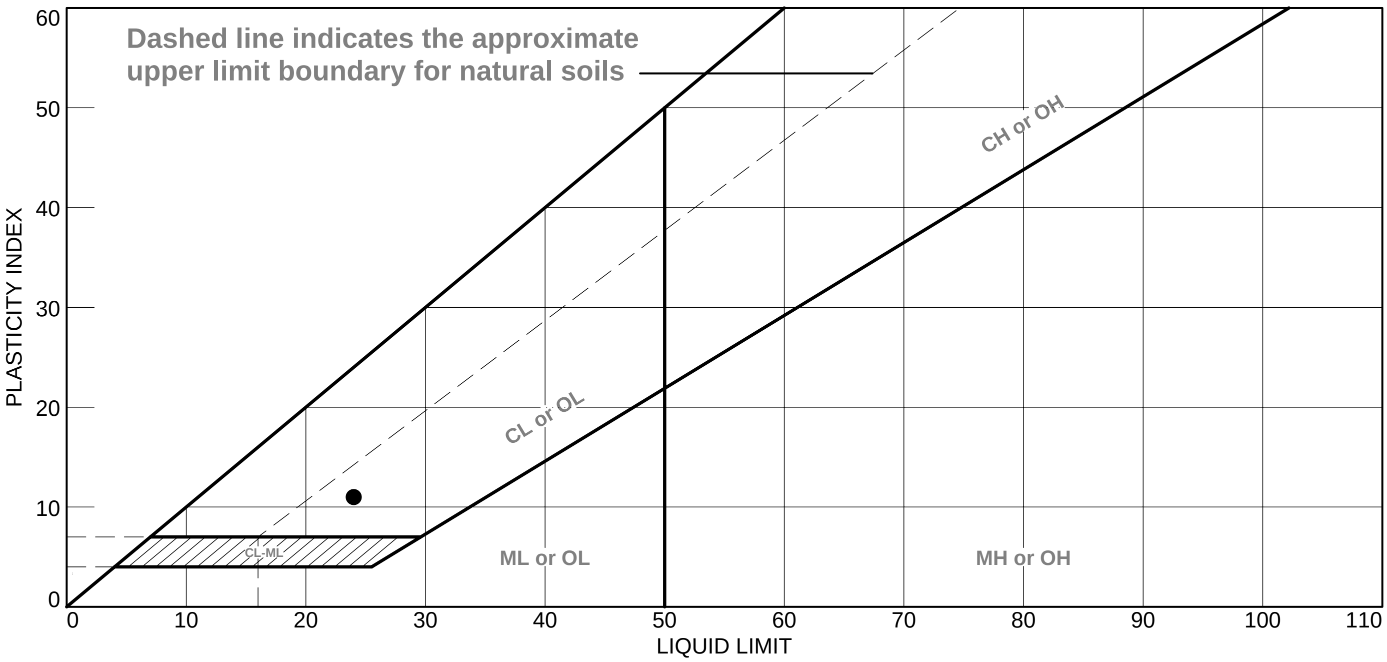
Terracon

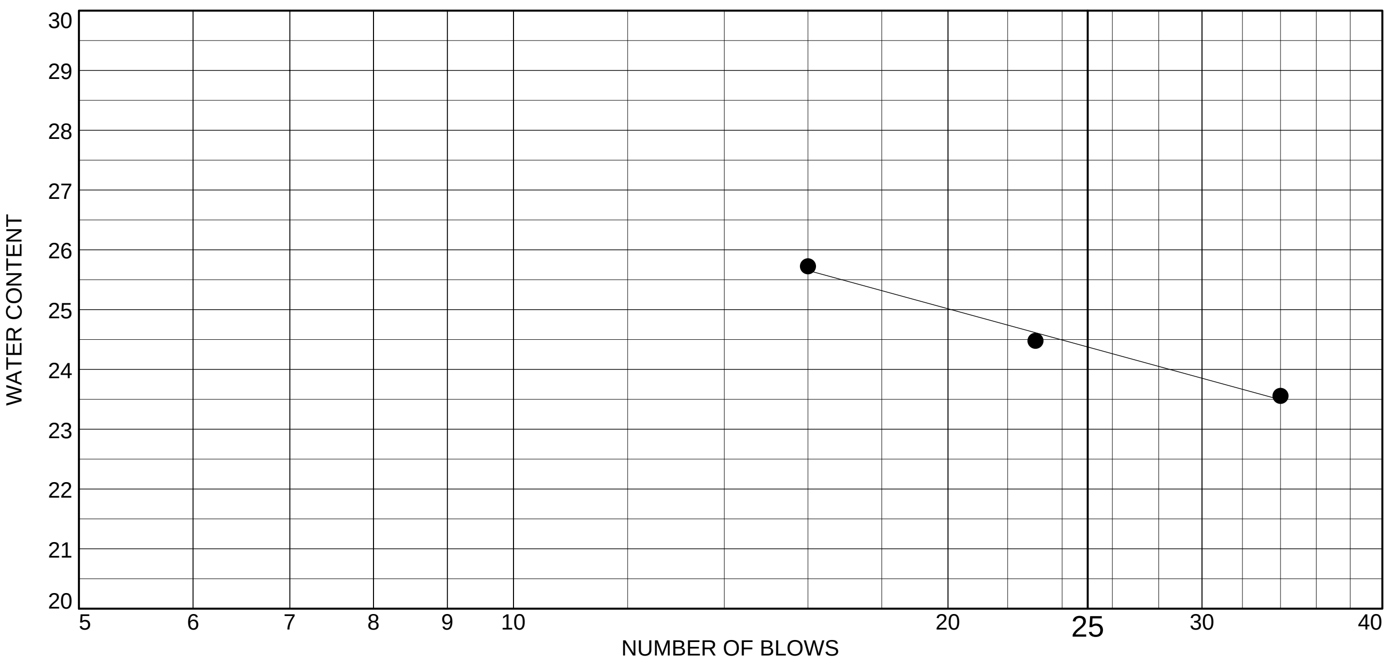
Remarks:

Figure

Tested By: DT **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	BROWN AND GRAY MOTTLED SANDY LEAN CLAY WITH GRAVEL	24	13	11			CL

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B015 **Depth:** 31.0'-33.0'
Sample Number: S-10

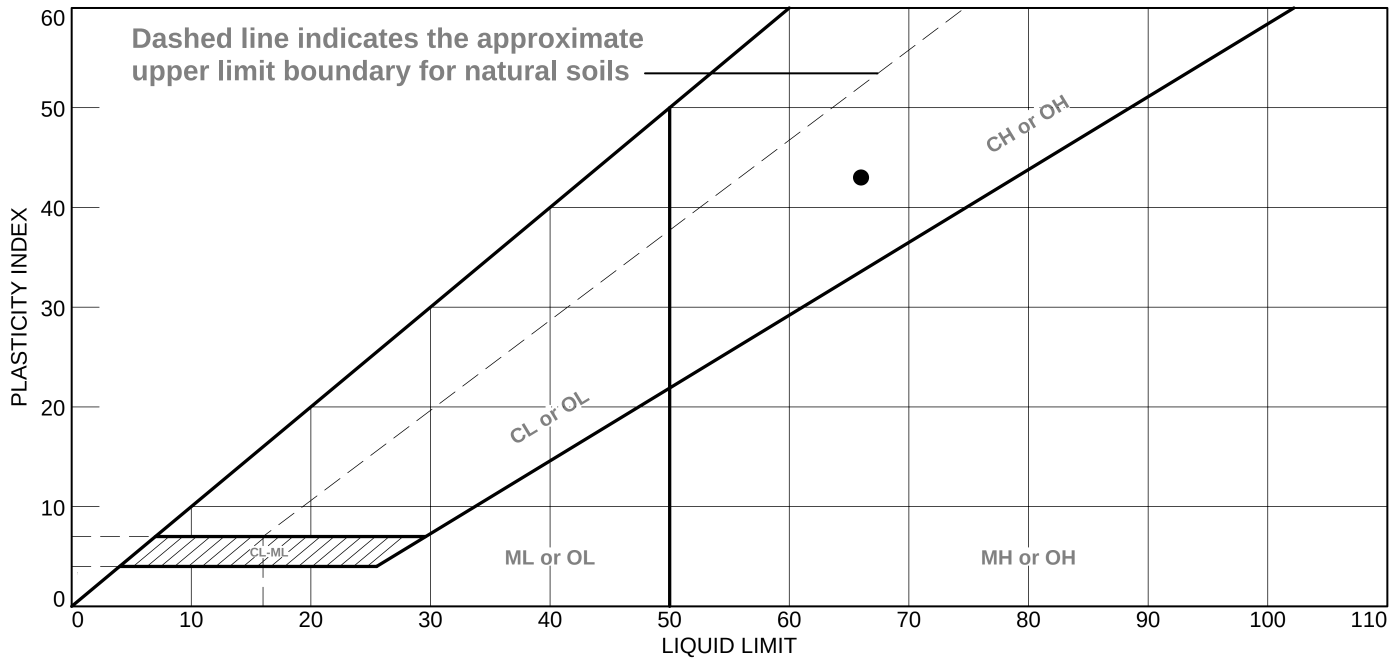
Terracon

Remarks:

Figure

Tested By: SJH **Checked By:** WPQ

LIQUID AND PLASTIC LIMITS ASTM D4318



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	DARK GRAY FAT CLAY	66	23	43			CH

Project No. MR155218 **Client:** DYNEGY

Project: DYNEGY - EDWARDS SITE

Source of Sample: EDW-B015 **Depth:** 37.0'-39.0'
Sample Number: S-12

Terracon

Remarks:

Figure

Tested By: SJH **Checked By:** WPQ

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Consulting Engineers & Scientists

SPECIFIC GRAVITY OF SOIL SOLIDS
ASTM D-854

Project Number: MR155218
Project Name: Dynegy Edwards
Test Date: 11/10/2015

Results Summary

Boring / Sample	Sample Description	USCS	Sample Number	Depth (ft)	Passing #4	Specific Gravity (Gs)
EDW-B002	DARK GRAY FLY ASH		S-8	25.0'-27.0'	100.00%	2.471
EDW-B002	GRAY LEAN CLAY	CL	S-11	40.0'-41.5'	100.00%	2.592
EDW-B003	FILL: DARK GRAY FLY ASH WITH SAND		S-1	0.0'-1.5'	100.00%	2.469
EDW-B003	FILL: DARK GRAY FLY ASH WITH SAND AND GRAVEL		S-6	15.0'-16.5'	100.00%	2.772
EDW-B004	GRAY LEAN CLAY WITH SAND	CL	S-14	50.0'-51.5'	100.00%	2.617
EDW-B005	DARK GRAY AND GREENISH GRAY LEAN CLAY WITH SAND - ORGANICS AND SHALE NOTED	CL	S-12	45.0'-46.5'	100.00%	2.521
EDW-B011	FILL: DARK GRAY FLY ASH - CLAY NOTED		S-8	25.0'-29.0'	100.00%	2.691
EDW-B014	FILL: DARK GRAY FLY ASH		S-7	20.0'-22.5'	100.00%	2.524
EDW-B014	BLUISH GRAY LEAN CLAY WITH SAND AND GRAVEL	CL	S-11	40.0'-40.5'	100.00%	2.719

Soil Resistivity	AASHTO T 288/ ASTM G 57
Soil pH	AASHTO T 289/ ASTM G 51
Soil REDOX	DIPRA
Soil Sulfides	DIPRA
Water Content	AASHTO T 93/ ASTM D 2216

Laboratory Services Group 750 Corporate Woods Parkway Vernon Hills, Illinois 60061 Ph. (224)352-7000 Fax (224)352-7024

Soil Corrosivity Indication Series

Project No.: MR155218 **Client Name: AECOM**
Project Name: DYNEGY EDWARDS **Test Date: 5/11/13/15**

Summary of Test Results

Boring / Sample No.	Resistivity Natural Miller Soil Box(ohms)	Resistivity Saturated Miller Soil Box(ohms)	pH Soil Water Slurry	REDOX (mV)Soil Water Slurry	Sulfides Reaction	As Received WC%	Saturated WC%	Total Points
EDW-B002 S6	**1,720**	**1,550**	**9.77**	**65**	**NEG**	**52.3**	**77.4**	**14.5**
Points	0	8	3	3.5	0			
Description:	DARK GRAY FLY ASH							
EDW-B004 S3	**3,380**	**3,070**	**8.97**	**140**	**NEG**	**21.4**	**36.9**	**3.0**
Points	0	0	3	0	0			
Description:	BROWN AND GRAY LEAN CLAY							
EDW-B005 S12	**1,120**	**960**	**8.38**	**195**	**NEG**	**88.7**	**99.4**	**10.0**
Points	0	10	0	0	0			
Description:	DARK GRAY AND GREENISH GRAY LEAN CLAY WITH SAND							
EDW- B011 S6	**1,760**	**1,600**	**9.85**	**60**	**NEG**	**63.6**	**82.3**	**14.5**
Points	0	8	3	3.5	0			
Description:	DARK GRAY FLY ASH							
EDW-B0014 S7	**1,995**	**1,810**	**10.89**	**35**	**4**	**86.5**	**98.6**	**15.0**
Points	0	8	3	4	0			
Description:	DARK GRAY FLY ASH							

Resistivity:	Points:	pH:	Points:	Redox:	Points:	Sulfides:	Points:	†
<1500 ohms	10	0.0-2.0	5	Negative	5	Positive	3.5	
1500-1800	8	2.0-4.0	3	0 - 50mV	4	Trace	2	
1800-2100	5	4.0-6.5	0	50 - 100mV	3.5	Negative	0	
2100-2500	2	6.5-7.5	0*	100mV+	0			
2500-3000	1	7.5-8.5	0					
3000+	0	8.5 +	3					

*- If Sulfides are present and a low or neg. ReDox, add 3 points

† - THIS SYSTEM IS BASED ON A 25.5 POINT CORROSIVITY RATING SYSTEM DEVELOPED BY THE AMERICAN NATIONAL STANDARDS FOR POLYETHYLENE ENCASEMENT AND DUCTILE-IRON PIPE SYSTEMS. IT SHOULD BE NOTED THAT THESE TEST RESULTS ARE AN INDICATION OF SOIL CHEMISTRY AND SHOULD BE USED AS A INDICATION OF POSSIBLE CORROSIVE CONDITIONS. TERRACON IS NOT LIABLE FOR ANY REMEDIAL MEASURES TAKEN ON THE BASIS OF THESE RESULTS.

Tested by: BCM Checked By: WPQ

Terracon
Consulting Engineers & Scientists

ORGANIC CONTENT TEST
ASTM D-2974
Method C

Laboratory Services Group *750 Corporate Woods Parkway, Vernon Hills, Illinois 60061* *Phone: (224) 352-7000 Fax:(224)352-7*

Project No.: MR155218
Project Name: DYNEGY - EDWARDS SITE
Client: AECOM
Date Tested: 11/13/2015

Sample Information

Boring / Source:	EDW-B005
Sample No.:	S-12
Depth (ft.):	45.0-46.5'
Description:	CL

Organic Content Test Data

Tare No.:	C
Tare Wt. (gm):	20.04
Wet Wt. + Tare (gm):	49.66
Dry Wt. + Tare (gm):	36.05
Moisture Content (%):	**85.01**
Wt. of Ash + Tare (gm):	34.63
Percent Ash:	91.13
Organic Content (%):	**8.87**

** Note: Test performed by heating the sample to 440 degrees Centigrade until constant weight of ash is attained.

Attachment F. Material Characterization Calculations

1. Objective

This calculation package summarizes the material characteristics of the subsurface strata encountered during AECOM's geotechnical investigation of the Ash Pond at Dynegy's Edwards Power Station in Bartonville, Illinois. Selection of material properties for slope stability analyses is also developed and summarized within this package.

2. Subsurface Conditions

A subsurface exploration was performed at the East Ash Complex between August 19 and November 5, 2015. The subsurface exploration included the following; fourteen soil borings, installation of four piezometers to monitor phreatic conditions, and a program of twenty-two cone penetrometer test (CPT) soundings. Pore pressure dissipation testing and seismic shear wave velocity measurements were conducted on a selection of the CPT soundings. A full set of AECOM's boring logs, including soil descriptions, types of sampling, and choice laboratory test results, is provided in **Attachment B** of the report. A complete report that includes the graphical CPT logs and the results of the SCPTu and PPD tests is included in **Attachment D** of the report. The geotechnical exploration locations are shown on **Figure 2-1 – East Ash Pond Geotechnical Site Plan** in **Attachment A** of the report.

Based on the results of the investigation, five main stratigraphic materials were identified at the site. These are listed below and briefly summarized:

New Embankment Materials: The perimeter embankment / dike of the Edwards Ash Pond was constructed in two stages, with an original embankment, and a later raise constructed on top of and on the downstream slope of the existing dike, to facilitate the addition of a rail loop around the impoundment. This raise was completed in the early 2000s, raising the dike crest from an original elevation around 455 ft to the current typical elevation around 461 ft. This newer embankment fill material is comprised of fly ash from the plant (as beneficial reuse material), classified as lean silt (ML) to poorly-graded silty sand with gravel (SP). The consistency of the new embankment fill, as measured by the standard penetration test, ranged from soft to very stiff, but generally had a stiff to very stiff consistency and appeared to be well-compacted materials.

Table F-1: New Embankment Material Summary

Category	Min.	Max.	Representative Average
First Encountered (ft bgs)	<0.5	<0.5	<0.5
Thickness (feet)	7.5	11	9.6
SPT-N	2	28	11
Pocket Penetrometer (tsf)	.125	1.5	.75
Cone Resistance (tsf)	2	537	95
Sleeve Resistance (tsf)	<0.25	6.8	1.1
Cone/Sleeve Ratio (%)	<0.25	9.2	2.0
SCPTu Shear Wave Velocity (ft/sec)	400	1250	600

Historical compaction data for the new embankment fill material was not available, but field data are generally indicative of well-compacted materials.

Old Embankment Materials: As noted above, the original Ash Pond dike was constructed to approximately elevation 455 ft, but was raised in the early 2000s to facilitate the addition of the rail loop. The original perimeter embankment / dike of the Edwards Ash Pond is largely comprised of clay fill with trace sand and shells, classified as lean clay (CL). The consistency of the old embankment fill, as measured by the standard penetration test, ranged from soft to stiff, but generally had a stiff consistency and appeared to be well-compacted materials. It was noted that the Old Embankment Fill generally had a higher measured shear strength above approximately elevation 450 ft, so this material was split into two materials (Old Embankment Fill 1 and Old Embankment Fill 2) within the slope stability models.

Table F-2: Old Embankment Fill Material Summary

Category	Min.	Max.	Representative Average
First Encountered (ft bgs)	<0.5	11	6.8
Thickness (feet)	11	24.5	16.7
SPT-N	2	13	7
Pocket Penetrometer (tsf)	.25	2.125	1
Cone Resistance (tsf)	2	444	13
Sleeve Resistance (tsf)	<0.25	2.3	<1
Cone/Sleeve Ratio (%)	<0.25	8.3	4.3
SCPTu Shear Wave Velocity (ft/sec)	400	450	400

Impounded Ash Materials: Fly ash materials were encountered in the borings drilled within the Edwards Ash Pond. The material was generally silt sized with some sand and clay, and trace gravel, and was classified as a silt (ML - fly ash). The measured consistency of the ash ranged from very loose to very dense, though generally, the consistency of ash was loose to very loose and was saturated below the residual water level in the Ash Pond.

Table F-3: Ash Material Summary

Category	Min.	Max.	Representative Average
First Encountered (ft bgs)	<0.5	<0.5	<0.5
Thickness (feet)	2.5	40	24.7
SPT-N	0	100	12
Pocket Penetrometer (tsf)	N/A	N/A	N/A
Cone Resistance (tsf)	2	969	39
Sleeve Resistance (tsf)	<0.25	3.9	<1
Cone/Sleeve Ratio (%)	<0.25	13.8	2.6
SCPTu Shear Wave Velocity (ft/sec)	450	600	600

Native Alluvial Clay Crust: The Edwards Ash Pond is underlain by a native clay of alluvial origin. This material was typically classified as lean clay (CL), with some zones of fat clay (CH) occasionally identified. (Much of the clay has a Liquid Limit near 50, denoting a borderline fat/lean clay.) The uppermost approximately 5 feet of this native alluvial clay, near the original ground surface, measured significantly higher in strength, signifying a desiccated crust layer at the original ground surface. The consistency of this clay was generally stiff.

Table F-4: Native Alluvial Clay Crust Summary

Category	Min.	Max.	Representative Average
First Encountered (ft bgs)	0	35	24.9
Thickness (feet)	2	5	4.3
SPT-N	4	14	8
Pocket Penetrometer (tsf)	.5	1.5	.75
Cone Resistance (tsf)	3	47	12
Sleeve Resistance (tsf)	<0.25	1.6	<1
Cone/Sleeve Ratio (%)	<0.25	8.5	4.1
SCPTu Shear Wave Velocity (ft/sec)	450	600	500

Native Alluvial Clay: As noted above, the Edwards Ash Pond is underlain by a native clay of alluvial origin, typically classified as lean clay (CL), with some zones of fat clay (CH) occasionally identified. (Much of the clay has a Liquid Limit near 50, denoting a borderline fat/lean clay.) Beneath the upper crust material, the clay has significantly less shear strength, and is normally consolidated or slightly over-consolidated, with strength increasing with depth. The clay consistency varied from soft to medium stiff near the top of the stratum, generally increasing in strength with depth to a consistency of medium stiff to stiff at the bedrock below. To capture this strength increase within the stability models, this material was divided into three layers (Native Clay 1, Native Clay 2, Native Clay 3).

Table F-5: Native Alluvial Clay Summary

Category	Min.	Max.	Representative Average
First Encountered (ft bgs)	5	40	30
Thickness (feet)	5.5	28	17.9
SPT-N	0	100	6
Pocket Penetrometer (tsf)	.125	1.5	.5
Cone Resistance (tsf)	2	40	7
Sleeve Resistance (tsf)	<0.25	1.7	<1
Cone/Sleeve Ratio (%)	<0.25	10.9	2.7
SCPTu Shear Wave Velocity (ft/sec)	400	800	500

Shale Bedrock: Shale bedrock was encountered below the native alluvial soils in several of the borings. The shale was found to be slightly weathered to weathered near the upper contact, and became hard with depth. The shale was cored in two locations to verify classification, but no further testing was completed on this material.

Other Materials: Other materials were encountered in relatively small quantities at the site, appearing at only one or two exploration locations, and were not considered part of the site-wide stratigraphy. These materials include old and recent fill (similar in properties to the old and new embankment fill materials), historic ash material (similar in properties to the more recent ash fill), and crushed stone embankment fill in the cut-off embankment that constructed the "Dead Pond". The crushed stone embankment fill was observed to be medium dense, fine to coarse, crushed stone gravel with sand, classified as poorly graded gravel (GP). A final additional material, a clean crushed stone toe drain material, was noted on available historical design drawings, but not encountered in the borings performed for this project.

3. Laboratory Testing Program

Representative samples were collected at regular intervals from the borings and were utilized for laboratory testing. The laboratory tests were assigned to characterize the site materials including index (moisture content, unit weight, Atterberg limits, specific gravity, and particle size analysis), permeability and consolidation tests. Strength testing included isotropically consolidated-undrained triaxial tests with pore pressure measurements (CIU), Unconfined Compression (UC) tests, and direct shear tests (DS) on the native clay materials, embankment materials, and ash materials.

Table F-6: Laboratory Testing Program for Ash Pond

ASTM Designation	Test Type	Number of Tests							
		Total	Ash	New Embankment Fill	Old Embankment Fill	Other Fill Materials	Native Clay Crust	Native Clay	Bedrock
D2216	Moisture Content	181	47	15	21	19	5	56	18
D4318	Atterberg Limits	26	4	1	5	1	1	14	-
T311, D1140, D422	Gradation / Hydrometer	10	7	3	-	-	-	-	-
D854	Specific Gravity	9	5	-	-	-	4	-	-
D5084	Hydraulic Conductivity	3	2	-	-	-	-	1	-
D2435	Consolidation	2	-	-	-	-	-	2	-
D 2166	Unconfined Compression	5	-	-	-	-	-	5	-
D4767	Consolidated Undrained Triaxial (CIU)	5	-	-	3	-	-	2	-
D6528	Direct Shear (DS)	8	2	-	-	-	1	5	-
G57, G51	Corrosion Suite	5	4	-	-	-	-	1	-

Compete results of the laboratory tests are included in **Attachment E** of the report.

4. Material Properties

Material properties for slope stability analyses were developed using both laboratory testing data (index and strength testing) and strength correlations from SPT and CPT data.

The following specific material properties were developed for the new embankment material, old embankment material, impounded ash, native clay crust, and native clay, for use in the various stability analyses performed as part of this study:

- Unit Weight
- Drained and Undrained Shear Strength of Fine-Grained Soil Strata
- Drained and Undrained Shear Strength of Ash

Material properties for the various historic fill materials on site were conservatively estimated based on the data available, empirical correlations, and experience with similar materials.

Unit Weight

Unit weight for the old embankment, ash, native clay crust, and native clay materials were evaluated using measured results from samples collected. Values were plotted and design unit weight lines were then fit to the plotted data, and layers were divided where warranted by differences in the data. Plots of these measured values are included as Attachments F.1 through F.5 at the end of this document.

For materials that could not be directly measured for unit weight (new embankment and crushed stone, and historic fill materials), estimates of the unit weight were based on empirical correlations, and experience with similar materials.

The following total unit weights were selected for use in stability analyses:

- New embankment (compacted ash): 115 pounds per cubic foot (pcf),
- Old embankment: 125 pcf,
- Ash materials: 105 pcf,
- Native clay crust: 120 pcf, and
- Native Clay: 105-117 pcf.

Drained Shear Strength Selection

Drained shear strengths were selected for all materials for use in the Long Term and Max Pool analyses. Drained strengths were primarily based on results from DS and CIU testing. Plots of both effective friction angle and effective cohesion values were created for each material type to estimate average values across each material. To supplement the effective friction angle measured in laboratory testing, correlated values of phi' were calculated using the procedure developed by Peck, Hanson, and Thornburn, 1974, based on corrected SPT blow counts. Measured laboratory values were given precedence when selecting design values. For materials that could not be directly measured for drained shear strength (new embankment, crushed stone and historic fill materials), the above correlation was used for effective friction angles. Effective cohesion values for these materials were conservatively estimated based on experience with similar materials. Where materials existed, but were not encountered in the field investigation (gravel toe drain, GP) experience with similar materials was used. Design strength lines were then fit to the plotted data, and layers were divided where warranted by differences in the data. Plots of the measured and correlated drained shear strength values for the five primary materials are included as Attachments F.1 through F.5.

Undrained Shear Strength Selection

Undrained shear strengths were selected for the cohesive materials for use in the Pseudostatic and analyses. Undrained strengths were based on results from CIU and UC testing, and correlated values of undrained shear strength from the CPT tests. Plots of undrained shear strength were created for each material type to estimate average values across each material. To supplement the undrained shear strengths measured in laboratory testing, correlated values were calculated using the procedure developed by Aas, et al (1986), based on CPT data. An NKT factor of 17 was selected for use in this correlation based on published values. S_u / σ'_{vo} lines were also calculated and plotted for comparison purposes. Design strength lines were then fit to the plotted data, and layers were divided where warranted by differences in the data. Plots of the measured and correlated undrained shear strength values for the five primary materials are included as Attachments F.1 through F.5.

Bedrock Material Selection

Based on the field investigation, the bedrock encountered is generally hard shale. SPT samples of this material were recovered, though testing, other than water contents, was generally not possible. Therefore, conservative strength and unit weight values were selected for this material, based on experience with similar materials. Failure surfaces within the models are generally not expected to extend through this material.

5. Material Properties for Analysis

The table below summarizes the material parameters used in the stability analysis, based on the analysis and strength selection procedures and considerations presented in the preceding sections.

Table F-8: Summary of Material Parameters used in Stability Analysis

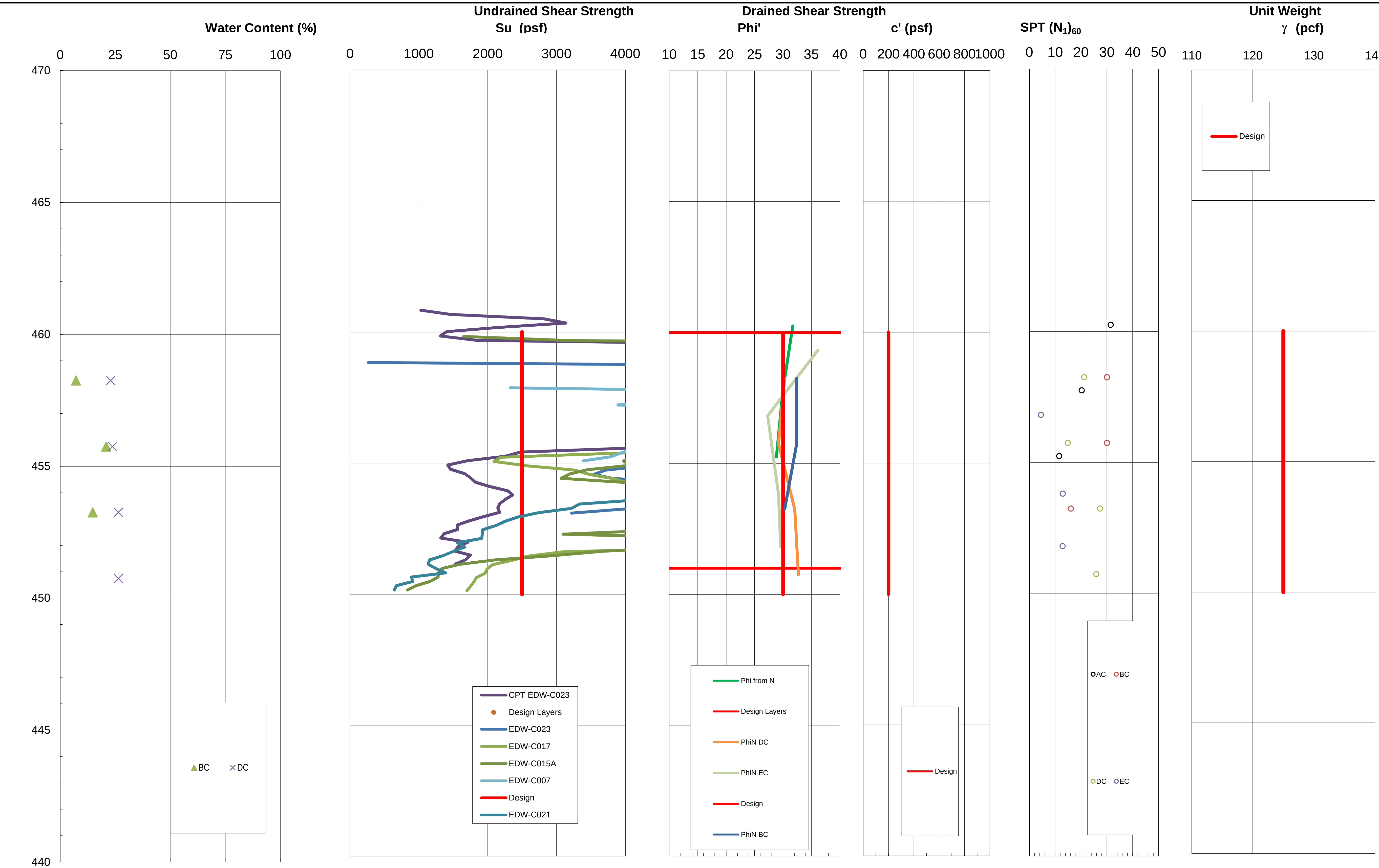
Material	Unit Weight Above WT (pcf)	Unit Weight Below WT (pcf)	Effective (drained) Shear Strength Parameters		Total (undrained) Shear Strength Parameters	
			c' (psf)	Φ' (°)	c (psf)	Φ (°)
New Embankment	115	115	200	30	2500	0
Old Embankment 1	125	125	200	28	2500	0
Old Embankment 2	125	125	100	29	1250	0
Native Clay Crust	120	120	200	27.5	1250	0
Native Clay 1	117	117	100	26	650	0
Native Clay 2	105	105	200	26	700	0
Native Clay 3	105	105	200	26	900	0
Fly Ash	105	105	100	27	600	0
Historic Ash	105	105	100	26	750	0
Historic Fill	125	125	200	28	1000	0
Recent Fill	115	115	200	30	1250	0
GP (Very Dense)	135	135	0	36	0	36
New Embankment (Crushed Stone - Sandy Gravel)	120	120	0	32	0	32
Bedrock - Shale	140	140	1000	36	1000	36

References:

Aas, G., Lacasse, S., Lunne, I., and Hoeg, K. (1986). "Use of In situ Tests for Foundation Design in Clay," Proceedings, In Situ 86, American Society of Civil Engineers, pp. 30.

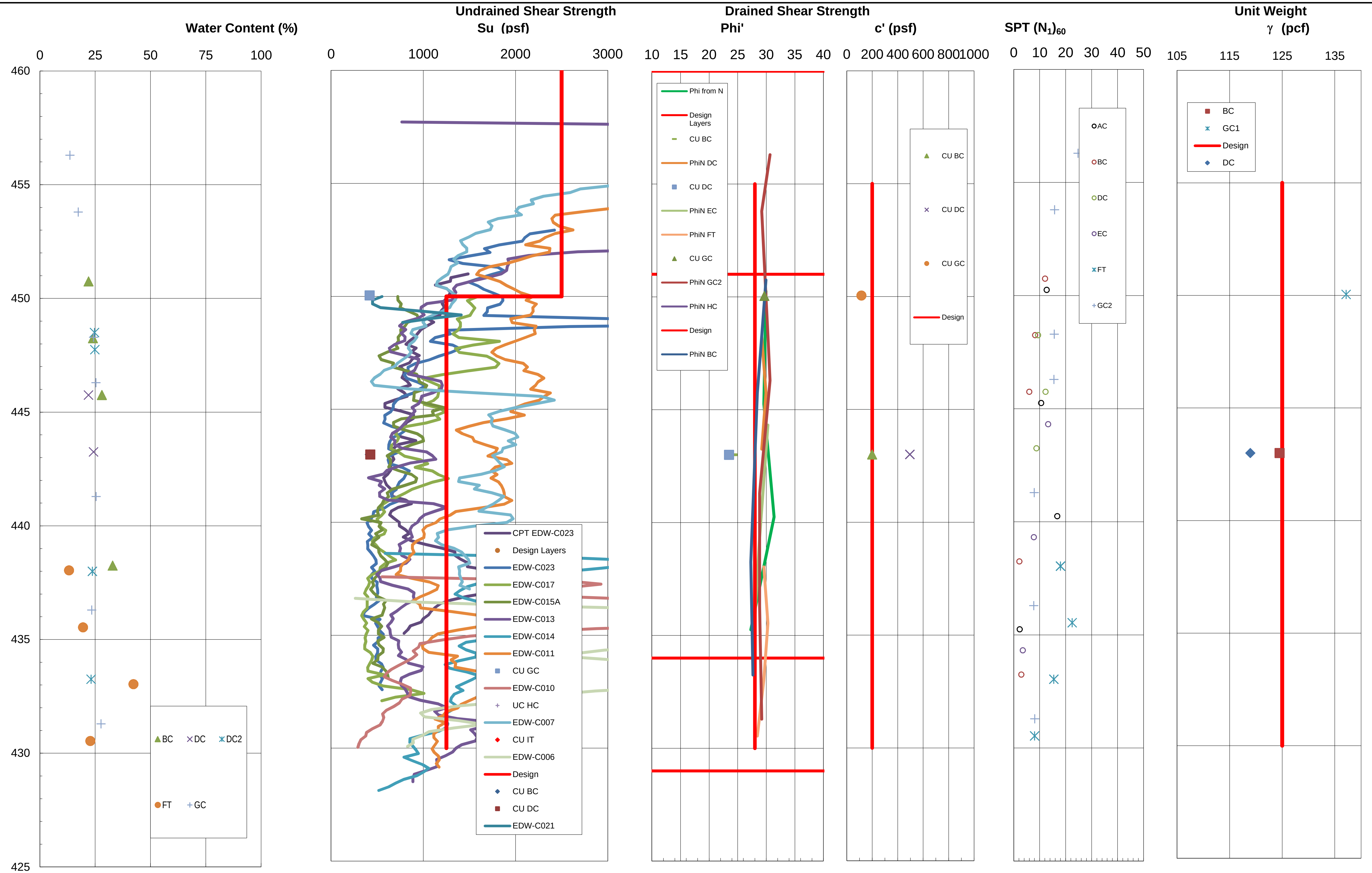
Peck, R.B., Hanson, W.E. and Thornburn, T.H., 1974. Foundation Engineering, 2nd edition, John Wiley and Sons, Inc.

Attachment F.1 Material Characterization Plot – New Embankment



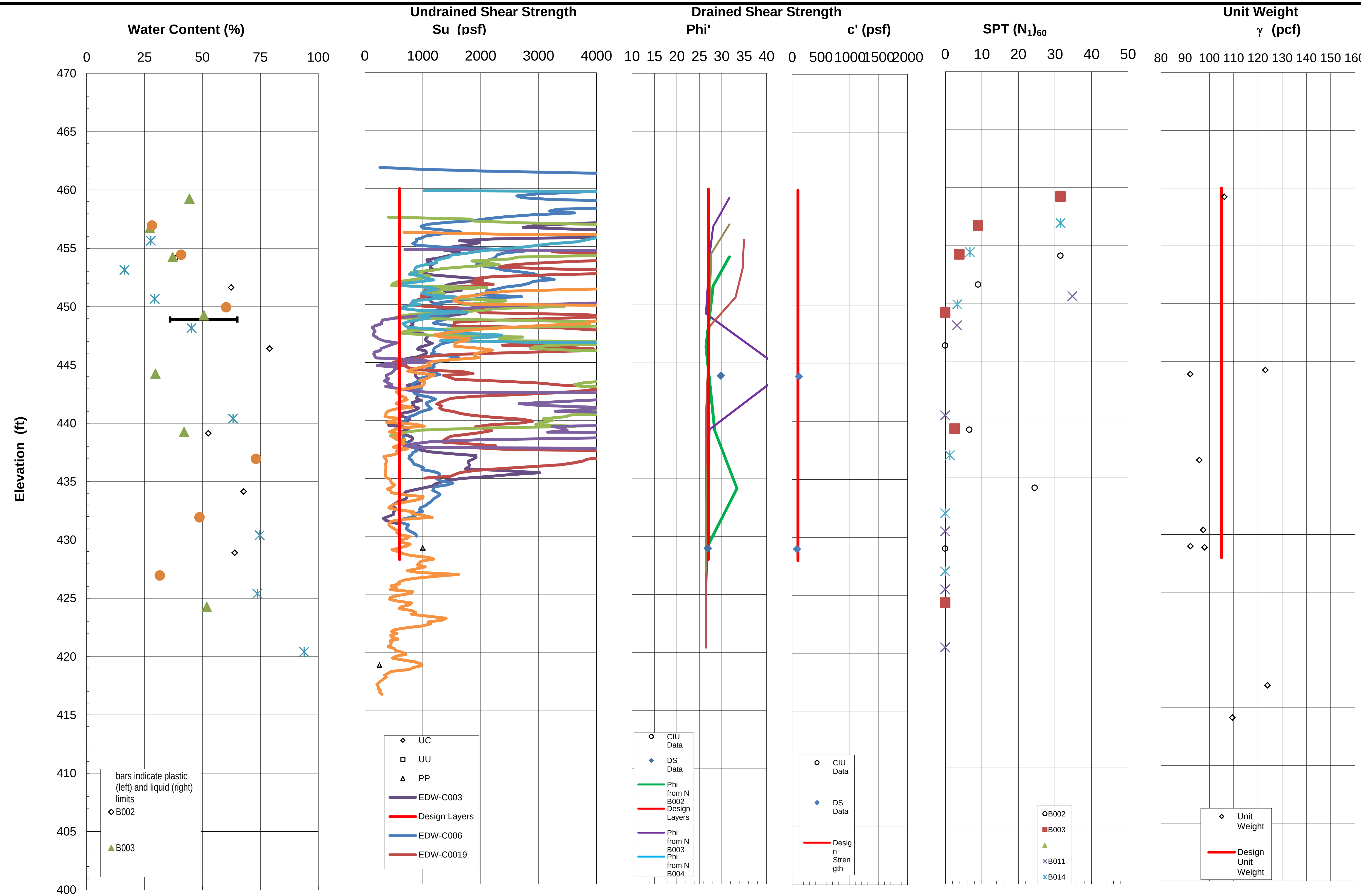
New Embankment Data	Project No. 60440202	Material Properties	AECOM		Attachment F.1

Attachment F.2 Material Characterization Plot – Original Embankment Data



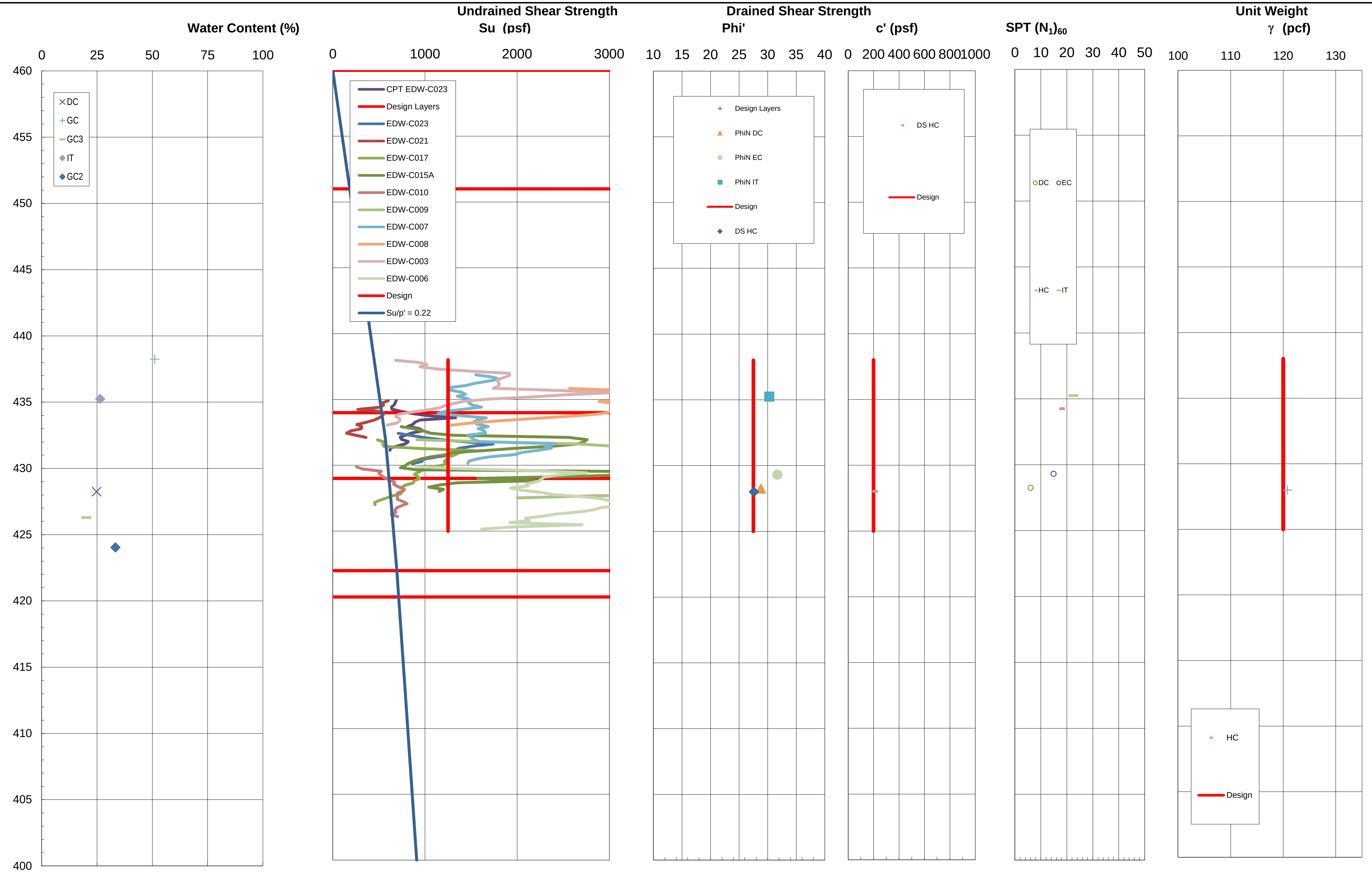
Original Embankment Data	Project No. 60440202	Material Properties	AECOM		Attachment F.2

Attachment F.3 Material Characterization Plot – Ash Data



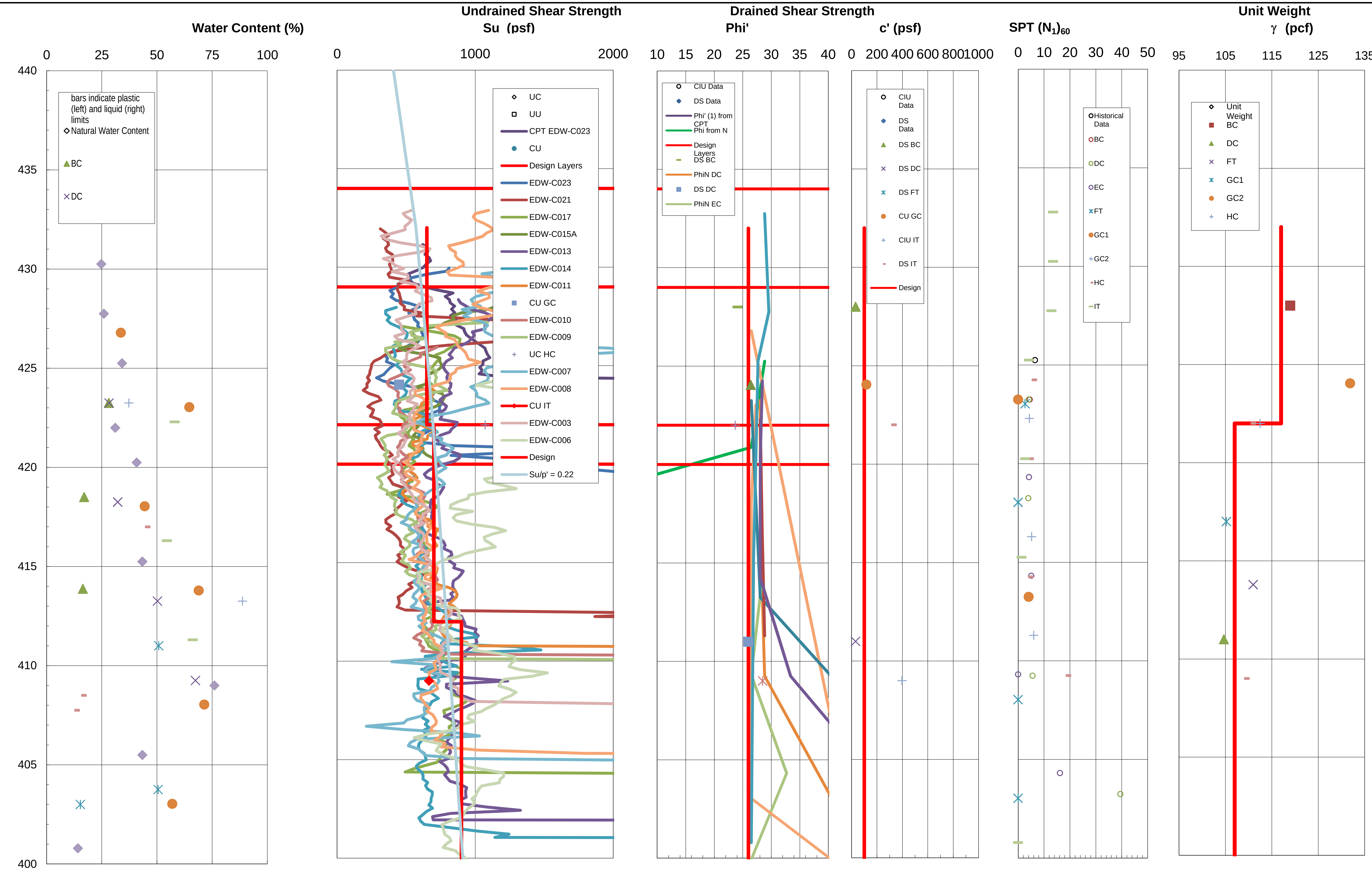
Ash Data	Project No. 60440202	Material Properties	AECOM		Attachment F.3

Attachment F.4 Material Characterization Plot – Native Clay Crust Data



Native Clay Crust Data	Project No. 60440202	Material Properties	AECOM		Attachment F.4

Attachment F.5 Material Characterization Plot – Native Clay Data



Native Clay Data	Project No. 60440202	Material Properties	AECOM		Attachment F.5

Attachment G. Slope Stability Analysis

1. Objective & Introduction

This calculation package summarizes the limit equilibrium slope stability analyses for both the static and seismic loading conditions performed in support of the Edwards Ash Pond CCR Unit Geotechnical Report for Dynegy's Edwards Power Station. Figures, calculations and computer program outputs are provided as attachments and are referenced herein. Slope stability analyses have been completed for ten cross-sections within the Edwards Ash Pond to evaluate the stability of the embankment under loading conditions required by the CCR Rule.

The objective for the slope stability analysis is to determine factors of safety (FoS) at critical cross section locations across the East Ash Pond dike complex for the following loading cases:

- Static, Steady-State, Normal Pool Conditions;
- Static, Maximum Pool Surcharge Conditions;
- Seismic Slope Stability Analysis;

The factors of safety determined from each of these loading conditions will be utilized to determine if the requirements outlined by the USEPA CCR Rule criteria are met. The methodology used to perform the slope stability analysis and the results of the analyses are summarized in the subsequent sections listed below.

2. Development of Cross-Sections for Analysis

A total of ten cross-sections (A, B, C, D, E, F, G, H, I, and J) were utilized to evaluate the perimeter embankment stability at the Ash Pond.

The section geometry for each analysis cross-section was determined based on the LiDAR ground surface topographic contours obtained from the Illinois Geospatial Data Clearinghouse.

3. Subsurface Conditions

Subsurface materials and extents (stratigraphy) at each cross section were developed by utilizing nearby subsurface explorations (CPTs and borings) from AECOM's exploration activities and historic geotechnical explorations. The subsurface strata generally encountered across the exploration locations can be generalized into five typical layers. These layers are listed below and are further described in Appendix F – Material Characterization.

- New Embankment Fill Materials
- Old Embankment Fill Materials
- Ash Material
- Native Alluvial Clay Crust
- Native Alluvial Clay

Material interfaces inferred from the subsurface explorations nearest to the cross-sections were transposed onto the profile and a reasonable interpretation of the subsurface stratigraphy between the exploration locations was developed. Table G-1 below summarizes the exploration locations utilized to construct each cross-section:

Table G-1
Cross-section Locations for Slope Stability Analyses

Cross-Section	Approximate Station	Location (Crest/Toe)	Boring/CPT Number
A	15+00	CREST	EDW-B001, EDW-C001
		TOE	
B	18+00	CREST	EDW-B010, EDW-C023
		TOE	
C	31+00	CREST	EDW-C021
		TOE	
D	41+00	CREST	EDW-B012, EDW-C017
		TOE	
E	51+00	CREST	EDW-B009, EDW-C015
		TOE	EDW-C016
F	54+00	CREST	EDW-C013
		TOE	EDW-B008, EDW-C014
G	58+00	CREST	EDW-B005, EDW-B013, EDW-C011, EDW-C012
		TOE	EDW-C010
H	60+00	CREST	EDW-B015, EDW-C009
		TOE	
I	67+00	CREST	EDW-C007
		TOE	EDW-B006, EDW-C008
J	87+00	CREST	EDW-C003
		TOE	

Additionally, design drawings from “Proposed 150 Car Loop Track For Edwards Power Plant Bartonville, Illinois” by Design Nine, Inc. (2003) were used to supplement the subsurface investigation in developing the subsurface embankment geometry. The relevant CPT soundings and test borings that were used to develop subsurface stratigraphy at the 10 analysis sections are listed in Table E-1 below.

Phreatic conditions were modeled as a piezometric line in SLOPE/W. Elevations and configuration of the lines were established based on the water levels encountered in the borings and CPTs, the piezometers installed during the 2015 AECOM exploration, and the normal pool elevation of approximately 447.2 feet for the Clarification Pond sub-basin and 449.5 feet for the Cooling Pond sub-basin, based on the 2016 AECOM hydraulics and hydrology report (AECOM, 2016).

4. Analysis Methodology

Analyses were performed using Spencer's Method which is a limit equilibrium slope stability analysis procedure. The computer program SLOPE/W 2012 by Geo-Slope International was utilized. The program analyzes a large number of potential slip surface geometries and identifies the geometry that results in a critical (i.e. lowest) factor of safety (FS). Additional information on the program is available at http://www.geo-slope.com/. Circular shaped failure surfaces, with optimization, were analyzed for the each of the loading cases considered. The optimization option within Slope/W allows the checking of non-circular failure surfaces by incrementally altering the location of the failure surface to find the lowest factor of safety. This procedure allows the failure surface to follow thin layers of lower strength, and interface boundaries to calculate a more critical factor of safety.

Each section was analyzed for the following cases:

- **Static, Steady-State, Normal Pool Condition:** This case models the conditions under static, long-term conditions, under the normal storage water level within the impoundment. Drained (effective stress) shear strength parameters were used for all materials, and phreatic conditions were estimated based on available data as described above. A target **Factor of Safety of 1.50** is needed for this loading condition. The operating water level of the Ash Pond is El. 447.2 and 449.5 ft, obtained from AECOM's Hydrologic and Hydraulic Analysis, for the Clarification Pond and Cooling Pond sub-basins, respectively. These levels were utilized in this analysis.
- **Static, Maximum Surcharge Pool Condition:** This case models the conditions under short-term surcharge pool conditions. Drained (effective stress) shear strength parameters were used for all materials, as the change in pool elevation primarily affects the upstream slope of the dike and is not anticipate to result in the development of undrained conditions within the downstream face of the dike, which is where the critical slip surface was found from the normal pool condition analysis. It was assumed that the temporary surcharge load was not of a sufficient duration to significantly alter the phreatic surface (i.e. saturation line within the embankment). Therefore, the phreatic surface was modeled equivalent to the steady state case. A target **Factor of Safety of 1.40** is needed for this loading condition. The water level of the Ash Pond was modeled at El. 457.8 and 457.4 ft for the Clarification Pond and Cooling Pond sub-basins, respectively, for this case. These values are from the 2016 Hydraulics and Hydrology report generated for this project.

- **Seismic Stability Condition:** These analyses incorporate a horizontal seismic coefficient kh selected to be representative of expected loading during the design earthquake event (i.e., a "pseudostatic" analysis). The analyses utilized peak undrained strength parameters in soils that are not consider to be rapidly draining materials, and peak drained strengths in soils considered to freely drain. The phreatic surface and pore water pressures corresponding to the Steady State Normal Storage Pool case from the static analyses were utilized. Seismic loading was included in this analysis using a pseudostatic coefficient (kh). A **Factor of Safety of 1.00** is required for this loading condition.

  Ground motion parameters for the pseudostatic analysis were estimated using the USGS Interactive Deaggregation tool (http:earthquake.usgs.gov/hazards/apps/). This application generates acceleration values, including peak ground acceleration (PGA), and mean and modal moment magnitudes, based on user entered values of location, exceedance probability, and spectral period. Results are computed based on the 2008 NSHMP PSHA Seismic Hazard Maps.

  For the Edwards Power Station, the calculated PGA for a 2,500-year event was 0.067g for top of hard rock. To determine the free-field, ground surface horizontal acceleration, the site was classified according to the site classes defined in IBC (2003) and amplified using the site amplification factors found in NEHRP (2009) The site class was determined based on the weighted average of the shear wave velocity of the foundation soils (600 ≤ vs ≤ 1,200 ft/s) and found to be Site Class D. This corresponds to a NEHRP amplification factor of 1.6, resulting in a ground surface acceleration of 0.107g. The Peak Transverse Acceleration at the dike crest was estimated using the ground surface acceleration and the procedure proposed by Idriss (2015), resulting in a crest acceleration of 0.32.

The pseudostatic coefficient was calculated based on the simplified procedure developed by Makdisi and Seed (1978). Specifically, the pseudostatic coefficient was taken as the parameter kmax, which represents the peak average acceleration along the failure surface. As shown in Figure 1 below (excerpted from the above reference), the ratio kmax/umax (where umax is the peak acceleration at the crest of the embankment) for a full height failure surface (y/H = 1.0) is 0.34. From the procedure noted above, the anticipated maximum peak crest acceleration is approximately 0.43g. Therefore, the pseudostatic coefficient kh was estimated as kh= 0.34*0.43g = 0.109g for these analyses.

The seismic hazard deaggregation output and calculations for the pseudostatic coefficient are provided at the back of this document.

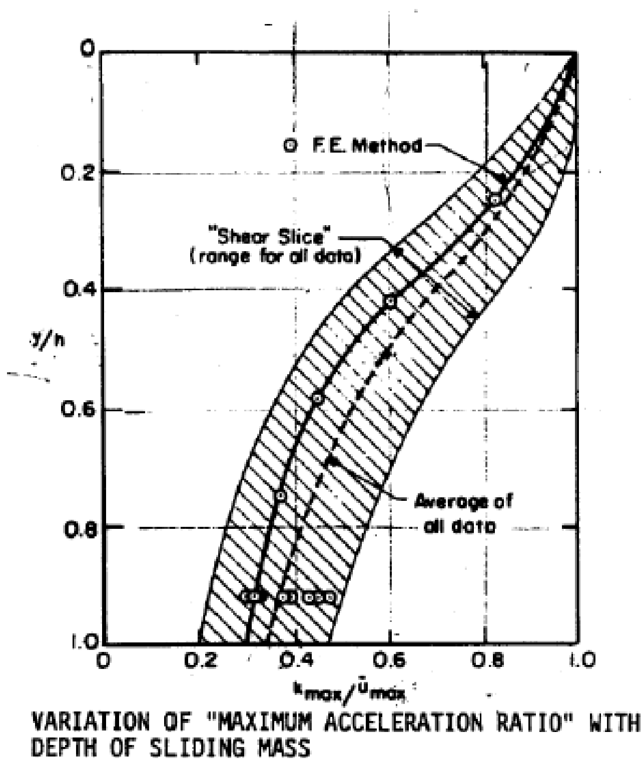


Figure 1: Determination of Maximum Average Acceleration Along Failure Surface

5. Material Properties for Analysis

Material properties for slope stability analyses were developed using both laboratory testing data (index and strength testing) and strength correlations from CPT and SPT data. Details of the material characterization and strength parameter selection for each stratum are provided in Attachment F of this report. The properties used in the stability analysis are summarized in the table below:

Table G-2: Summary of Material Parameters used in Stability Analysis

Material	Unit Weight Above WT (pcf)	Unit Weight Below WT (pcf)	Effective (drained) Shear Strength Parameters		Total (undrained) Shear Strength Parameters	
			c' (psf)	Φ' (°)	c (psf)	Φ (°)
New Embankment	115	115	200	30	2500	0
Old Embankment 1	125	125	200	28	2500	0
Old Embankment 2	125	125	100	29	1250	0
Native Clay Crust	120	120	200	27.5	1250	0
Native Clay 1	117	117	100	26	650	0
Native Clay 2	105	105	200	26	700	0
Native Clay 3	105	105	200	26	900	0
Fly Ash	105	105	100	27	600	0
Historic Ash	105	105	100	26	750	0
Historic Fill	125	120	200	28	1000	0
Recent Fill	115	115	200	30	1250	0
GP (Very Dense)	135	135	0	36	0	36
New Embankment (Crushed Stone - Sandy Gravel)	120	120	0	32	0	32
Bedrock - Shale	140	140	1000	36	1000	36

6. Results

Table G-3 summarizes the results of the stability analyses for each section, and output figures from the SLOPE/W models are provided at the back of this document.

Table G-3: Summary of Minimum Slope Stability Factors

Cross Section	Factor of Safety		
	Drained		Undrained
	Steady State (Normal Pool)	Surcharge Pool (Flood)	Seismic (Pseudostatic)
CCR Rule Criteria	*FS ≥ 1.50*	*FS ≥ 1.40*	*FS ≥ 1.00*
A	2.02	2.02	1.37
B	1.59	1.59	1.28
C	1.83	1.82	1.09
D	1.79	1.79	1.18
E	1.54	1.54	1.11
F	2.31	2.31	1.08
G	2.12	2.12	1.13
H	2.08	2.08	1.08
I	2.26	2.26	1.30
J	2.08	2.58	2.00

7. Conclusions

Load cases analyzed for this study included static (steady-state) normal pool, maximum flood surcharge pool, and seismic (pseudo-static). The calculated factors of safety from the limit equilibrium slope stability analysis satisfy the USEPA CCR Rule § 257.73(e) requirements for all the load cases analyzed at the critical analysis sections for the perimeter of the impoundment. Load cases analyzed for this study included static (steady-state) normal pool, maximum flood surcharge pool and seismic (pseudo-static).

8. References

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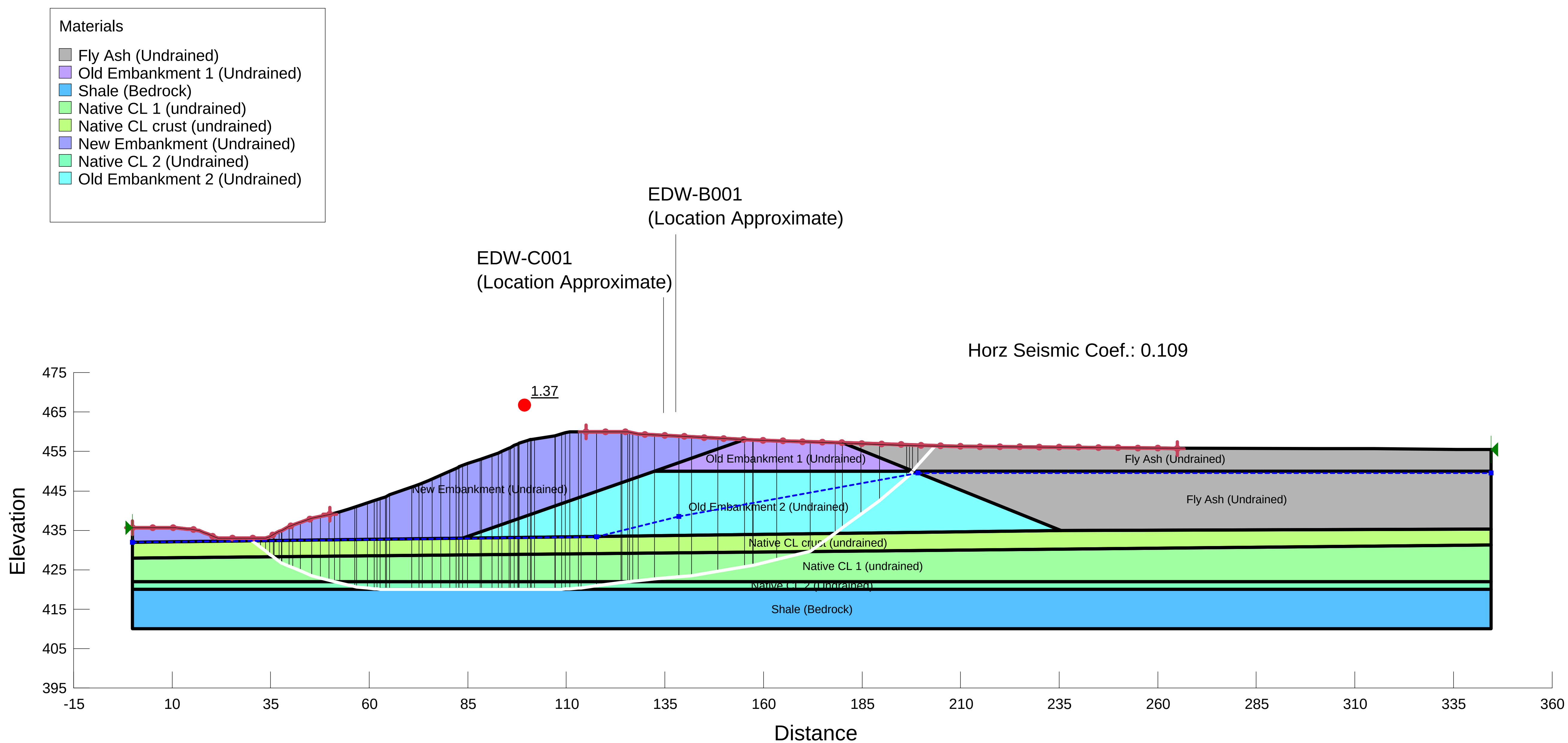
9. Attachments

G.1 Slope Stability Analysis Output Data
G.2 Seismic Parameter Calculations

Attachment G.1 Slope Stability Analysis Output Data

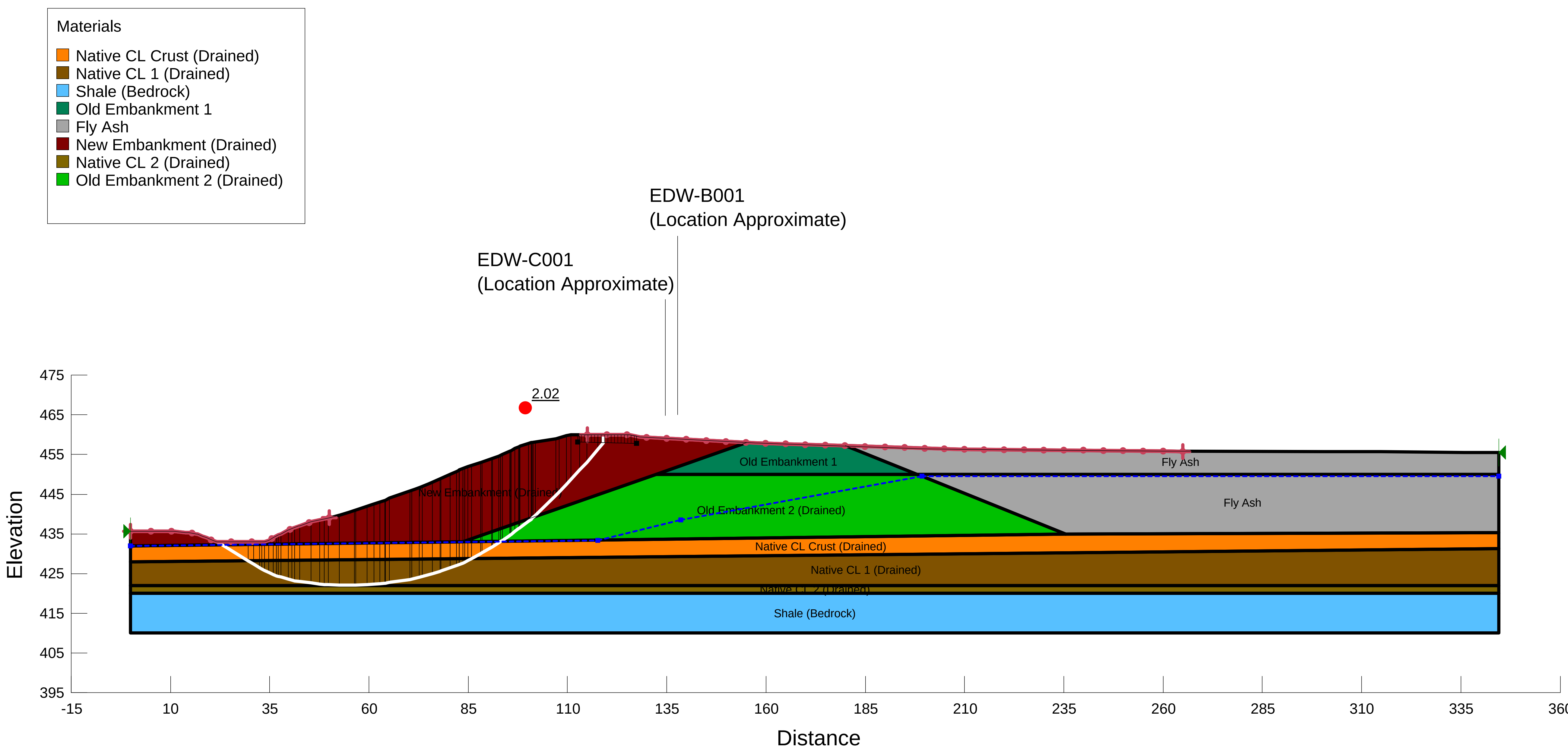
Name: Fly Ash (Undrained) Unit Weight: 105 pcf Cohesion': 600 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 1 (Undrained) Unit Weight: 125 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL crust (undrained) Unit Weight: 120 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: New Embankment (Undrained) Unit Weight: 115 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 105 pcf Cohesion': 700 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 2 (Undrained) Unit Weight: 125 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1

Dynegy Edwards
Cross-section A
Slope Stability - Seismic



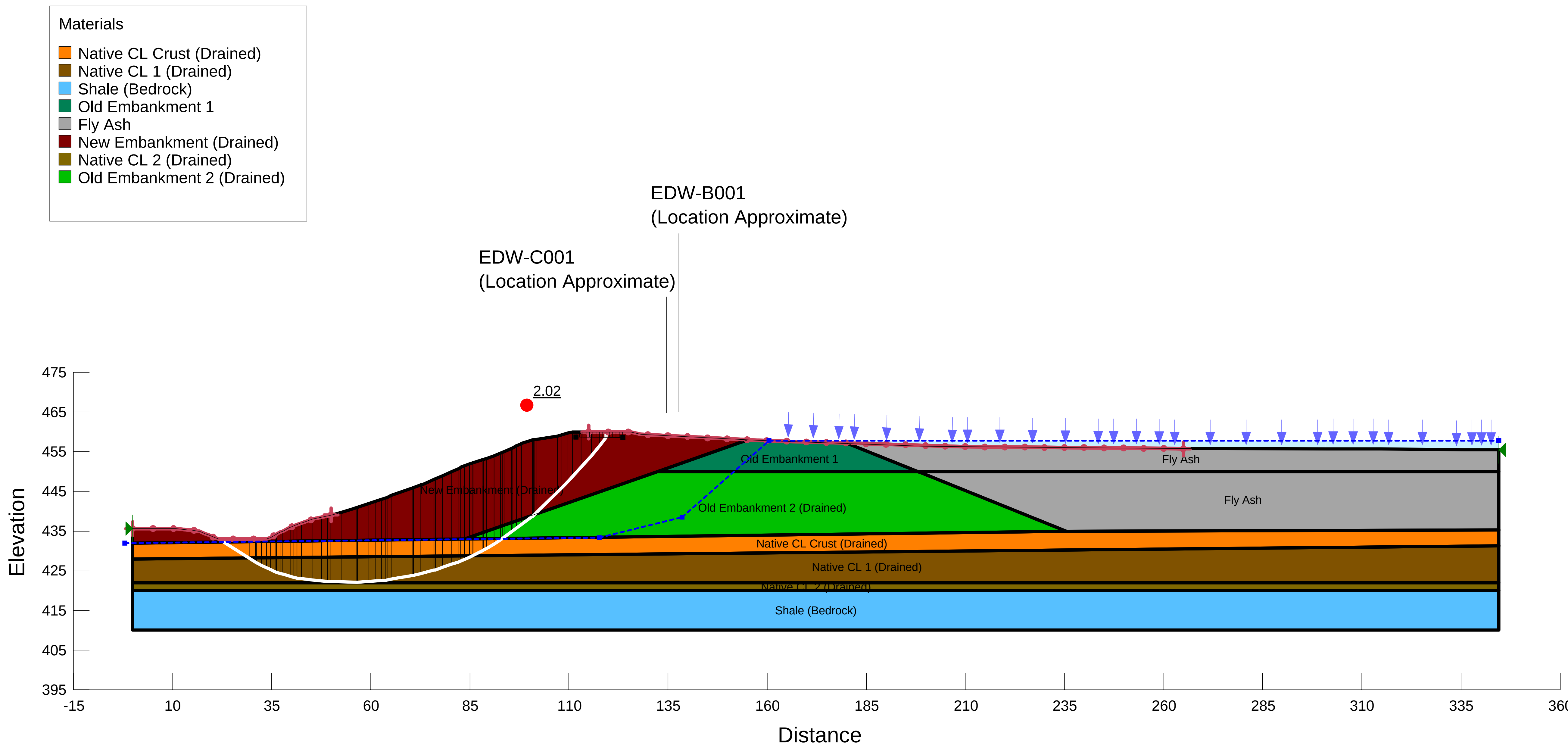
Dynegy Edwards
Cross-section A
Slope Stability - Steady State

Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 (Drained) Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1



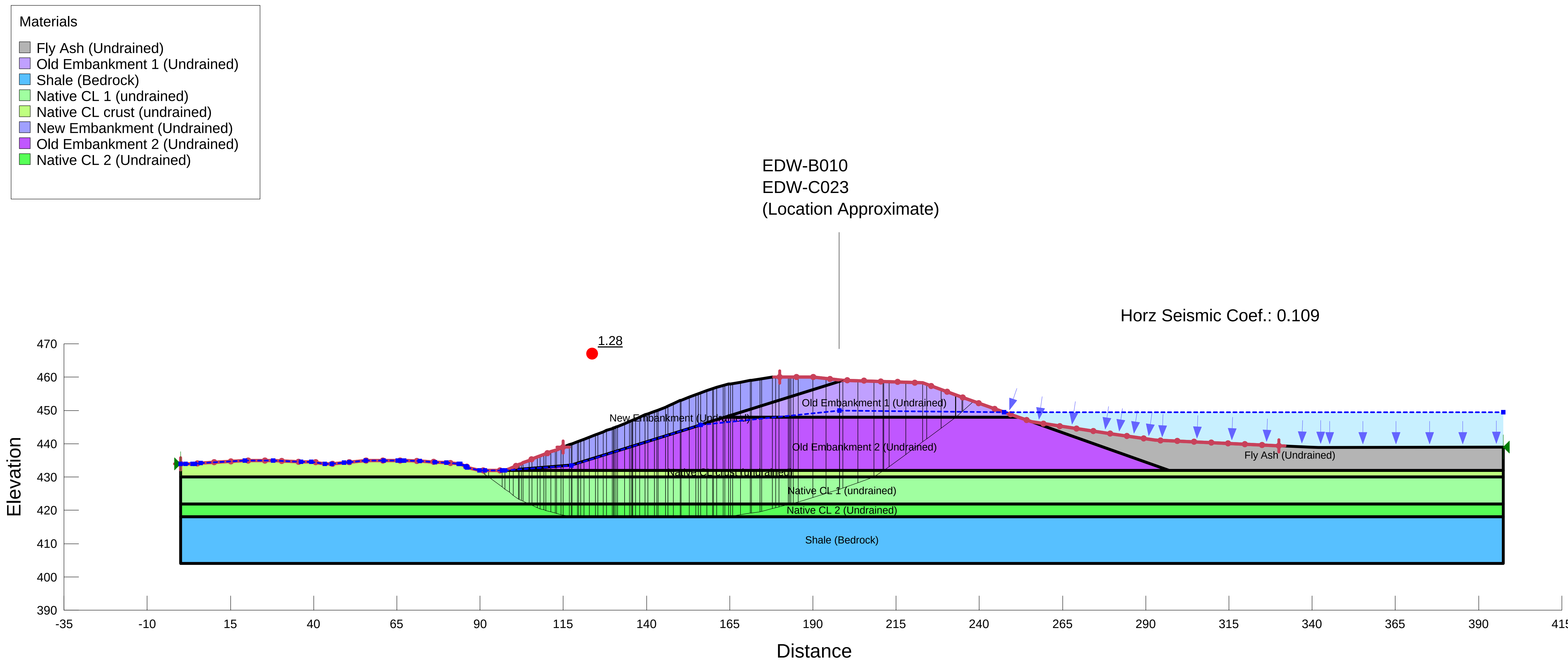
Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 (Drained) Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1

Dynegy Edwards
Cross-section A
Slope Stability - Surcharge Pool



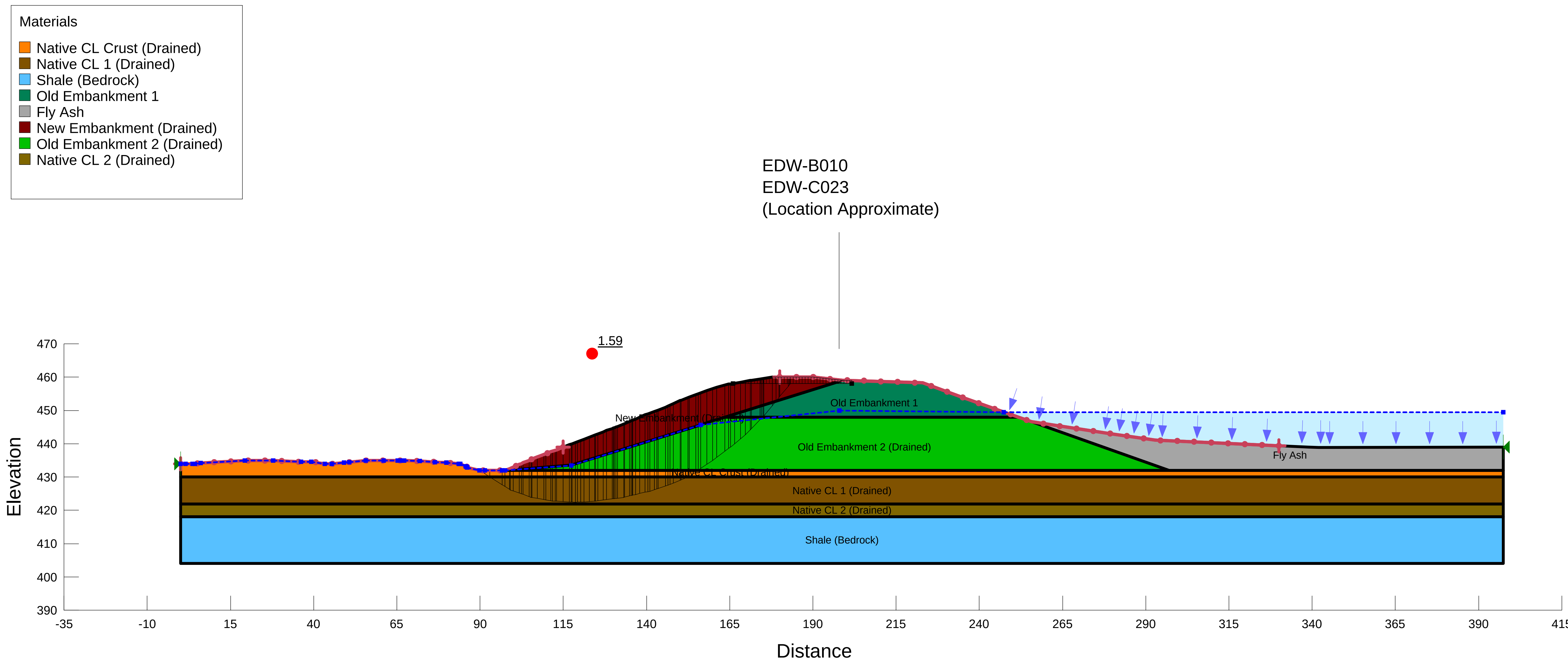
Dynegy Edwards
Cross-section B
Slope Stability - Seismic

Name: Fly Ash (Undrained) Unit Weight: 105 pcf Cohesion': 600 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 1 (Undrained) Unit Weight: 125 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL crust (undrained) Unit Weight: 120 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: New Embankment (Undrained) Unit Weight: 115 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 2 (Undrained) Unit Weight: 125 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 105 pcf Cohesion': 700 psf Phi': 0 ° Piezometric Line: 1



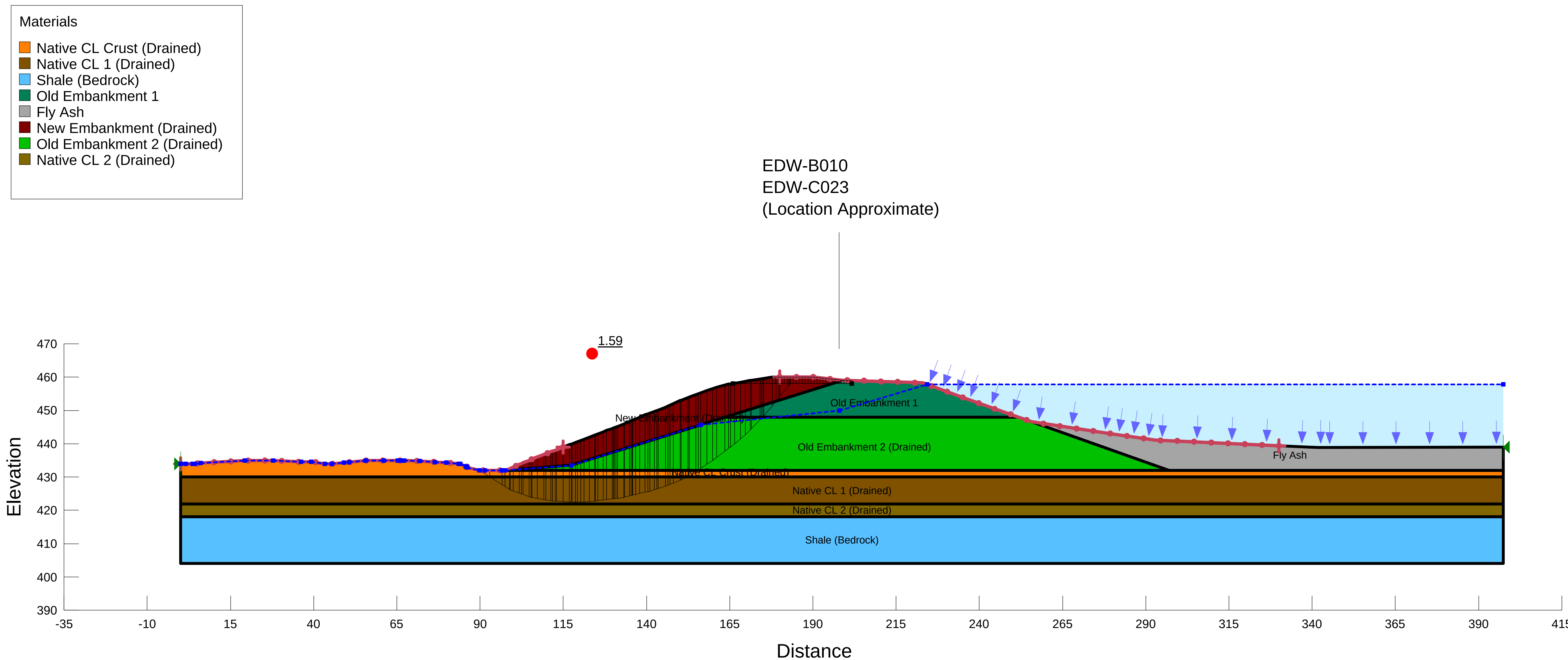
Dynegy Edwards
Cross-section B
Slope Stability - Steady State

Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: Old Embankment 2 (Drained) Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1



Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: Old Embankment 2 (Drained) Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1

Dynegy Edwards
Cross-section B
Slope Stability - Surcharge Pool

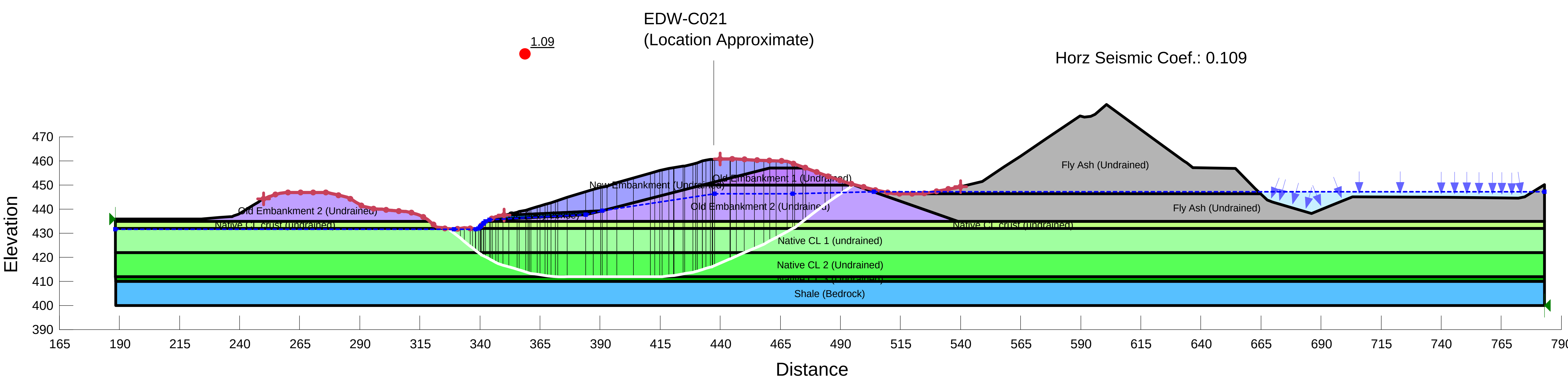


Dynegy Hennepin
Cross-section C
Slope Stability - Seismic

Name: Fly Ash (Undrained) Unit Weight: 105 pcf Cohesion': 600 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 2 (Undrained) Unit Weight: 125 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL crust (undrained) Unit Weight: 120 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: New Embankment (Undrained) Unit Weight: 115 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: GP (very dense) Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 105 pcf Cohesion': 700 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 3 (Undrained) Unit Weight: 105 pcf Cohesion': 900 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 1 (Undrained) Unit Weight: 125 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1

Materials

- Fly Ash (Undrained)
- Old Embankment 2 (Undrained)
- Shale (Bedrock)
- Native CL 1 (undrained)
- Native CL crust (undrained)
- New Embankment (Undrained)
- GP (very dense)
- Native CL 2 (Undrained)
- Native CL 3 (Undrained)
- Old Embankment 1 (Undrained)

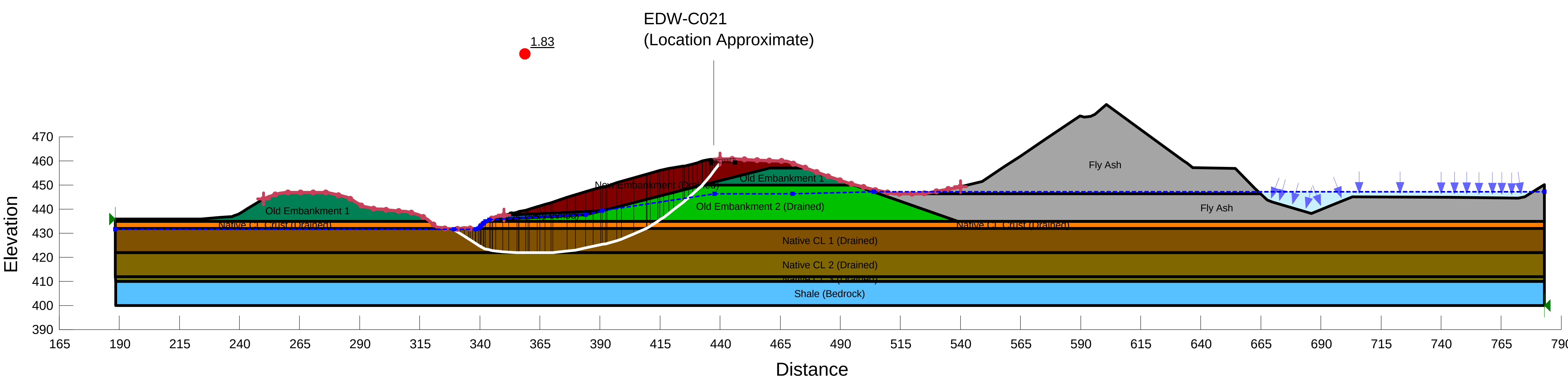


Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: GP (very dense) Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 (Drained) Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1

Dynegy Hennepin
Cross-section C
Slope Stability - Steady State

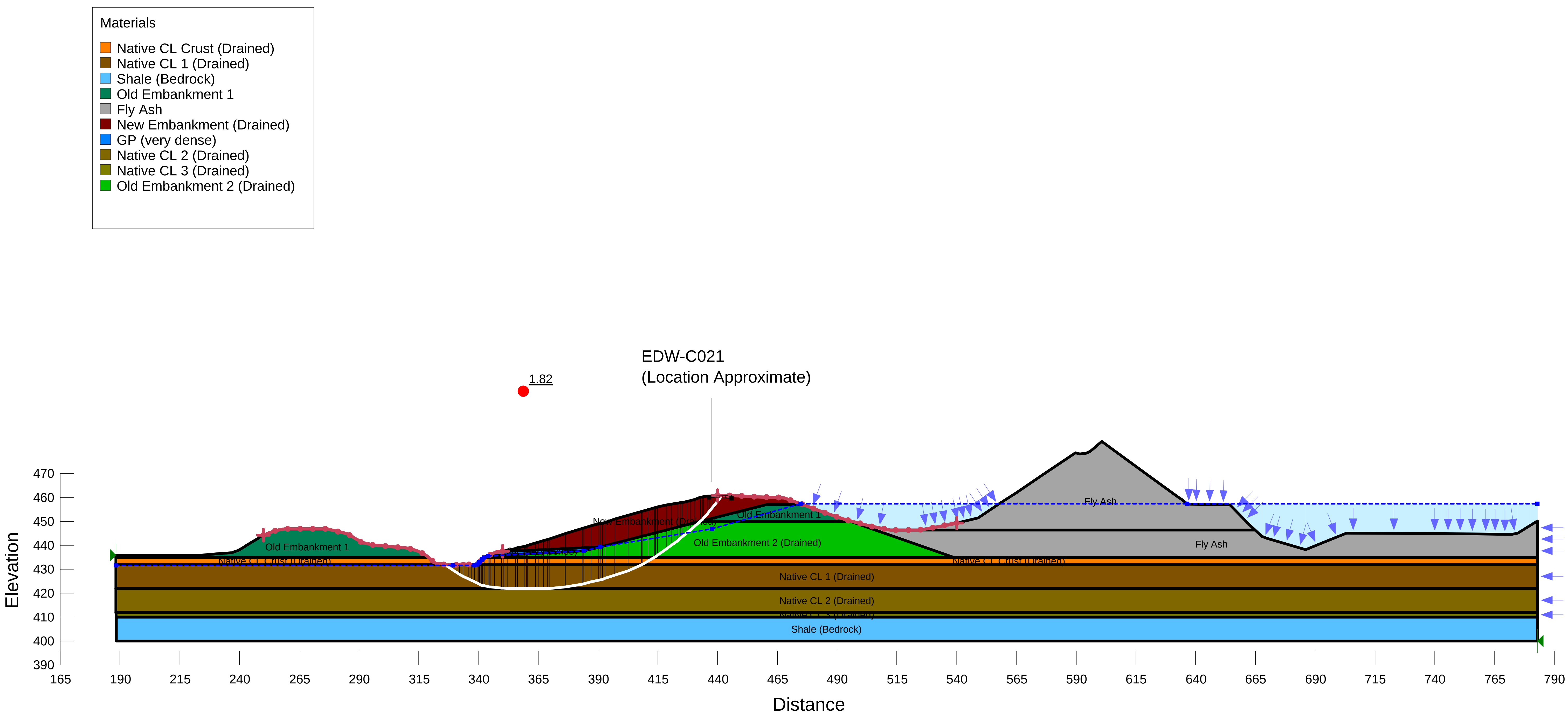
Materials

- Native CL Crust (Drained)
- Native CL 1 (Drained)
- Shale (Bedrock)
- Old Embankment 1
- Fly Ash
- New Embankment (Drained)
- GP (very dense)
- Native CL 2 (Drained)
- Native CL 3 (Drained)
- Old Embankment 2 (Drained)



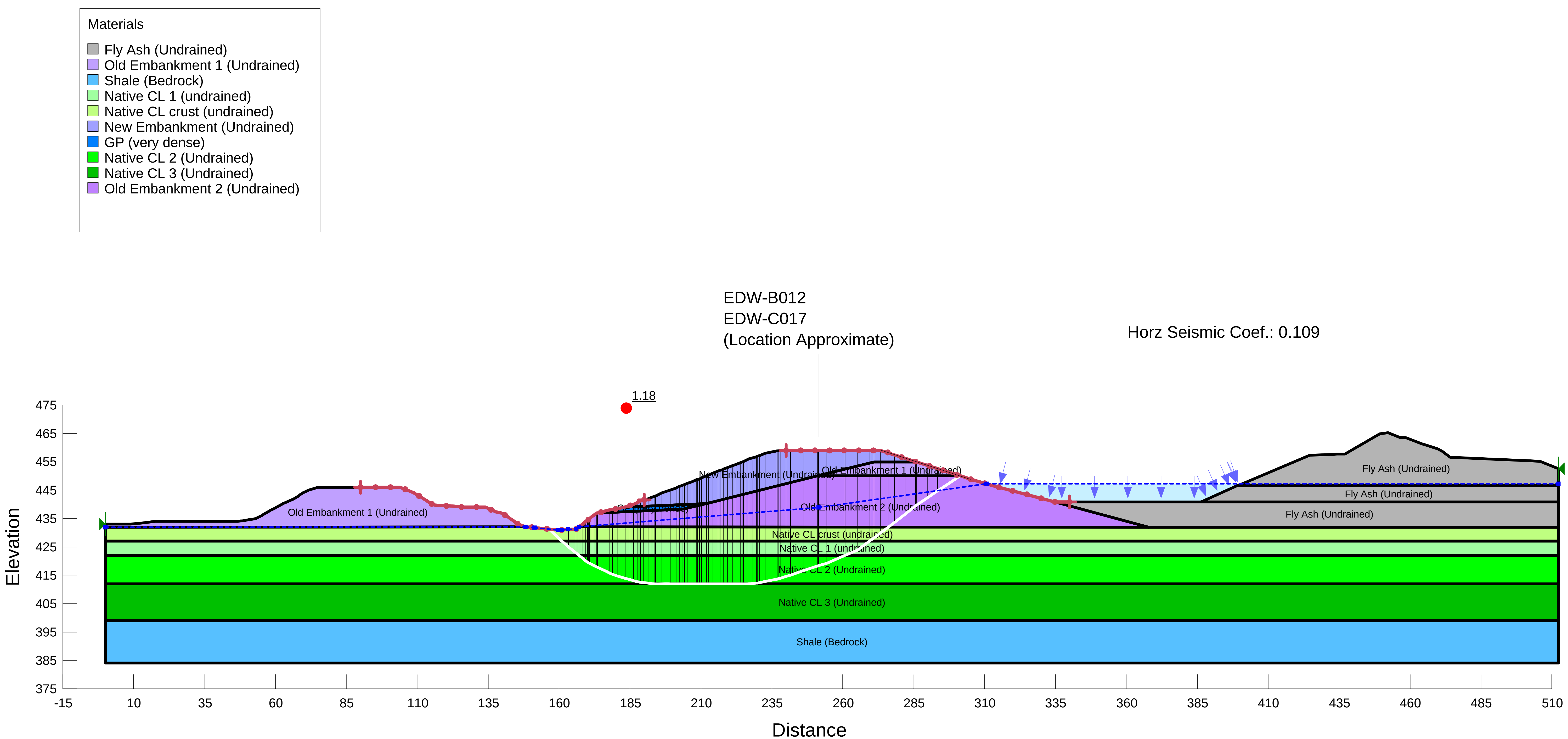
Dynegy Hennepin
Cross-section C
Slope Stability - Surcharge Pool

Name: Native CL Crust (Drained)   Unit Weight: 120 pcf   Cohesion': 200 psf   Phi': 27.5 °   Piezometric Line: 1
Name: Native CL 1 (Drained)   Unit Weight: 117 pcf   Cohesion': 100 psf   Phi': 26 °   Piezometric Line: 1
Name: Shale (Bedrock)   Unit Weight: 140 pcf   Cohesion': 1,000 psf   Phi': 36 °   Piezometric Line: 1
Name: Old Embankment 1   Unit Weight: 125 pcf   Cohesion': 200 psf   Phi': 28 °   Piezometric Line: 1
Name: Fly Ash   Unit Weight: 105 pcf   Cohesion': 100 psf   Phi': 27 °   Piezometric Line: 1
Name: New Embankment (Drained)   Unit Weight: 115 pcf   Cohesion': 200 psf   Phi': 30 °   Piezometric Line: 1
Name: GP (very dense)   Unit Weight: 135 pcf   Cohesion': 0 psf   Phi': 36 °   Piezometric Line: 1
Name: Native CL 2 (Drained)   Unit Weight: 105 pcf   Cohesion': 200 psf   Phi': 26 °   Piezometric Line: 1
Name: Native CL 3 (Drained)   Unit Weight: 105 pcf   Cohesion': 200 psf   Phi': 26 °   Piezometric Line: 1
Name: Old Embankment 2 (Drained)   Unit Weight: 125 pcf   Cohesion': 100 psf   Phi': 29 °   Piezometric Line: 1



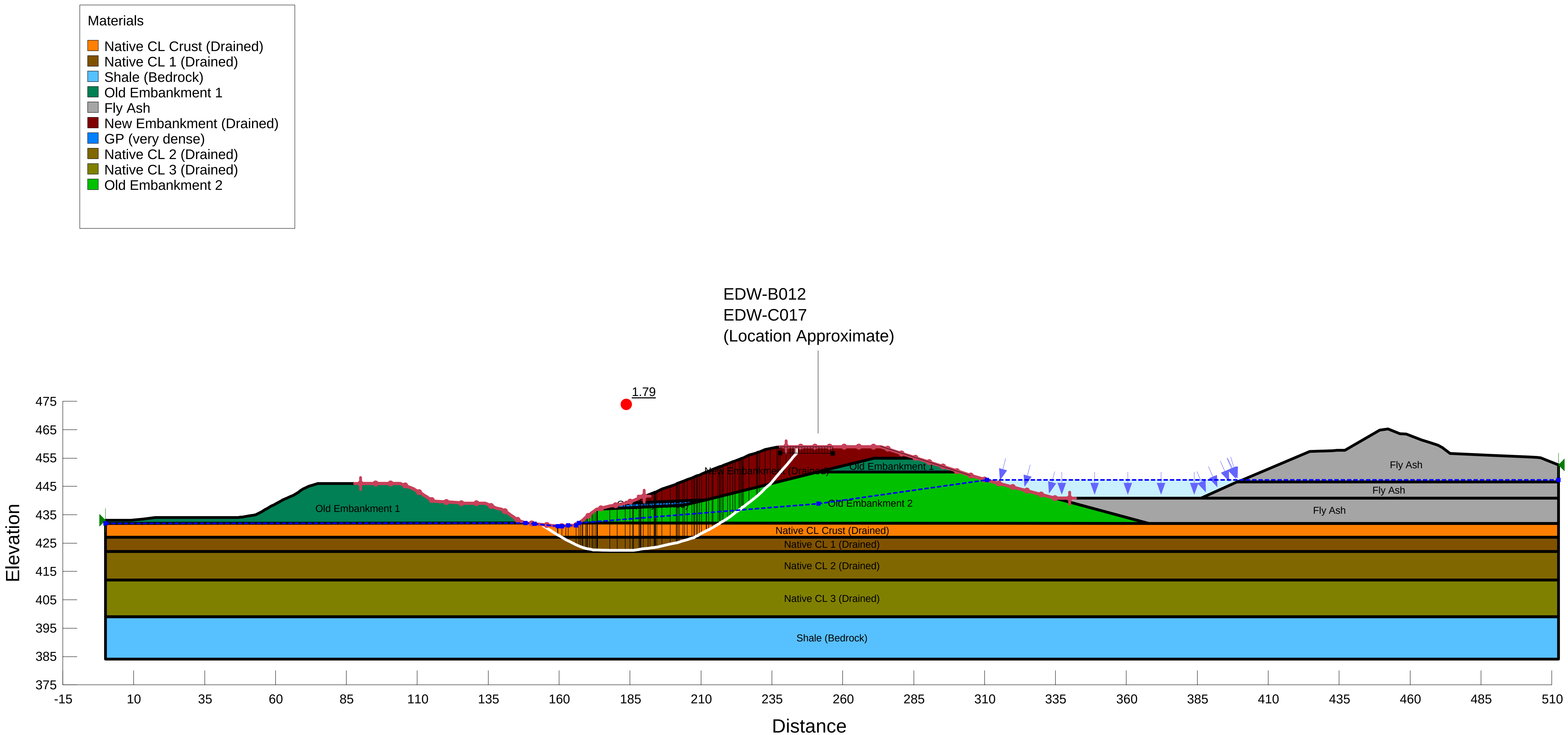
Name: Fly Ash (Undrained) Unit Weight: 105 pcf Cohesion': 600 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 1 (Undrained) Unit Weight: 125 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL crust (undrained) Unit Weight: 120 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: New Embankment (Undrained) Unit Weight: 115 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: GP (very dense) Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 105 pcf Cohesion': 700 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 3 (Undrained) Unit Weight: 105 pcf Cohesion': 900 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 2 (Undrained) Unit Weight: 125 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1

Dynegy Edwards
Cross-section D
Slope Stability - Seismic



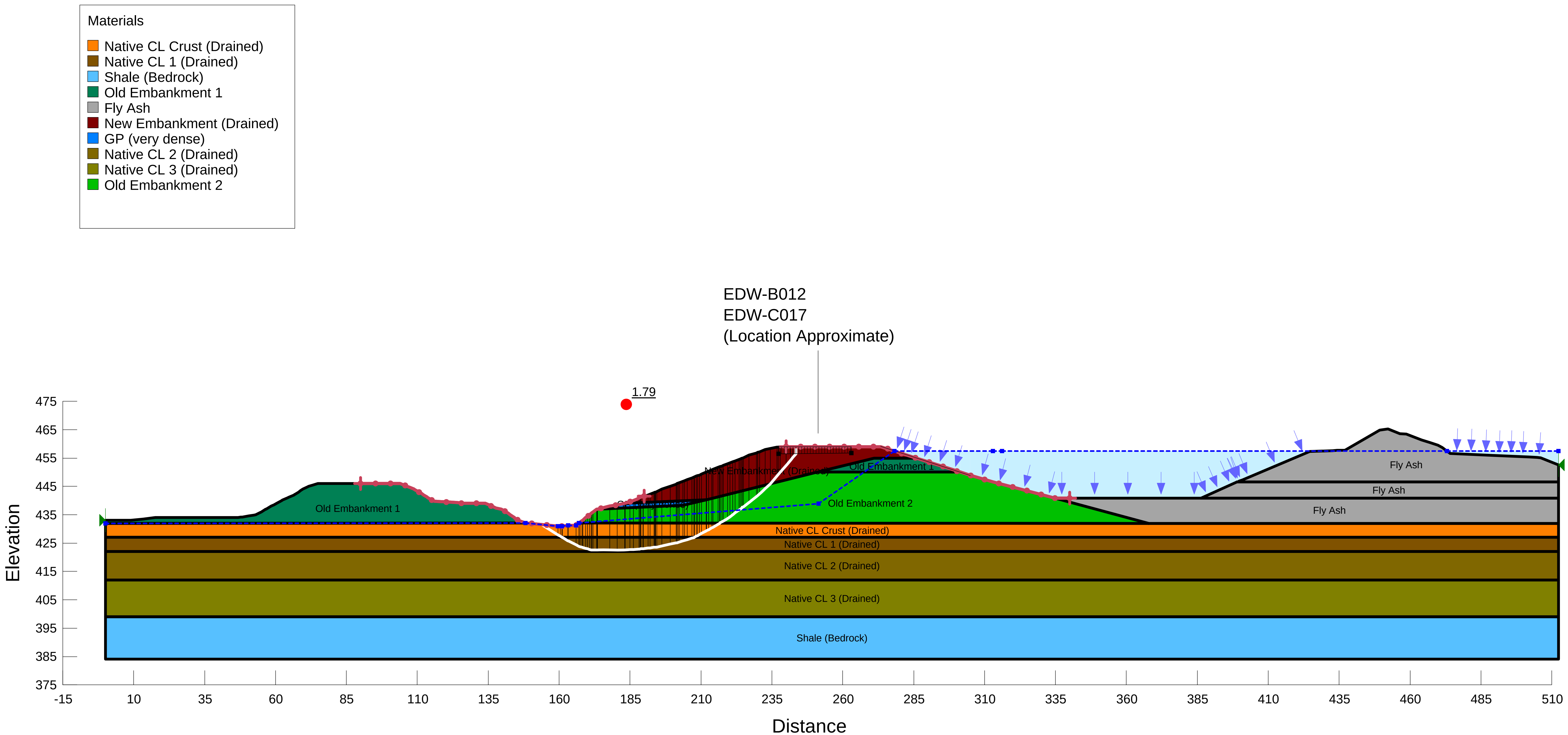
Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: GP (very dense) Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1

Dynegy Edwards
Cross-section D
Slope Stability - Steady State



Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: GP (very dense) Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1

Dynegy Edwards
Cross-section D
Slope Stability - Surcharge Pool

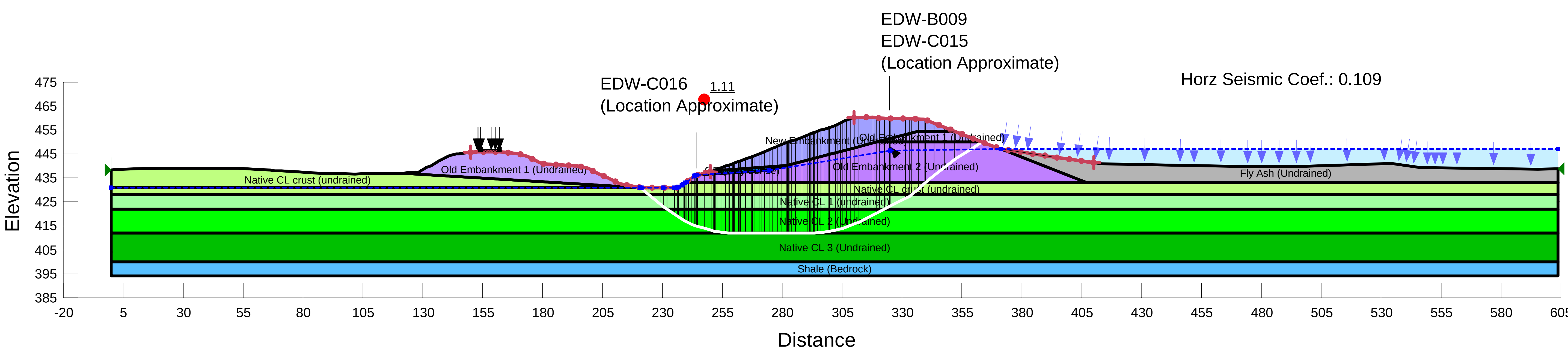


Name: Fly Ash (Undrained) Unit Weight: 105 pcf Cohesion': 600 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 1 (Undrained) Unit Weight: 125 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL crust (undrained) Unit Weight: 120 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: New Embankment (Undrained) Unit Weight: 115 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: GP (very dense) Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 105 pcf Cohesion': 700 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 3 (Undrained) Unit Weight: 105 pcf Cohesion': 900 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 2 (Undrained) Unit Weight: 125 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1

Dynegy Edwards
Cross-section E
Slope Stability - Seismic

Materials

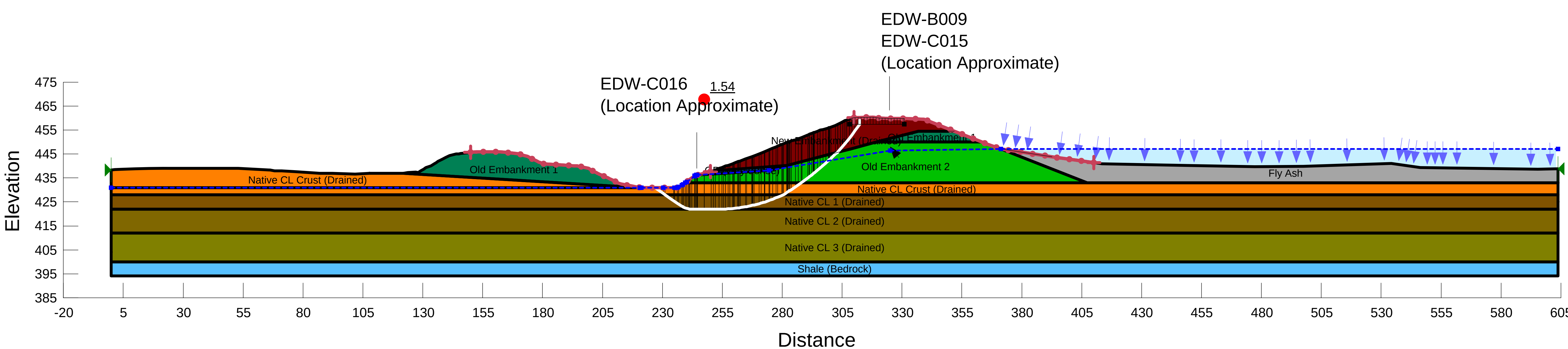
- Fly Ash (Undrained)
- Old Embankment 1 (Undrained)
- Shale (Bedrock)
- Native CL 1 (undrained)
- Native CL crust (undrained)
- New Embankment (Undrained)
- GP (very dense)
- Native CL 2 (Undrained)
- Native CL 3 (Undrained)
- Old Embankment 2 (Undrained)



Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: GP (very dense) Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1

Dynegy Edwards
Cross-section E
Slope Stability - Steady State

Materials
- Native CL Crust (Drained)
- Native CL 1 (Drained)
- Shale (Bedrock)
- Old Embankment 1
- Fly Ash
- New Embankment (Drained)
- GP (very dense)
- Native CL 2 (Drained)
- Native CL 3 (Drained)
- Old Embankment 2

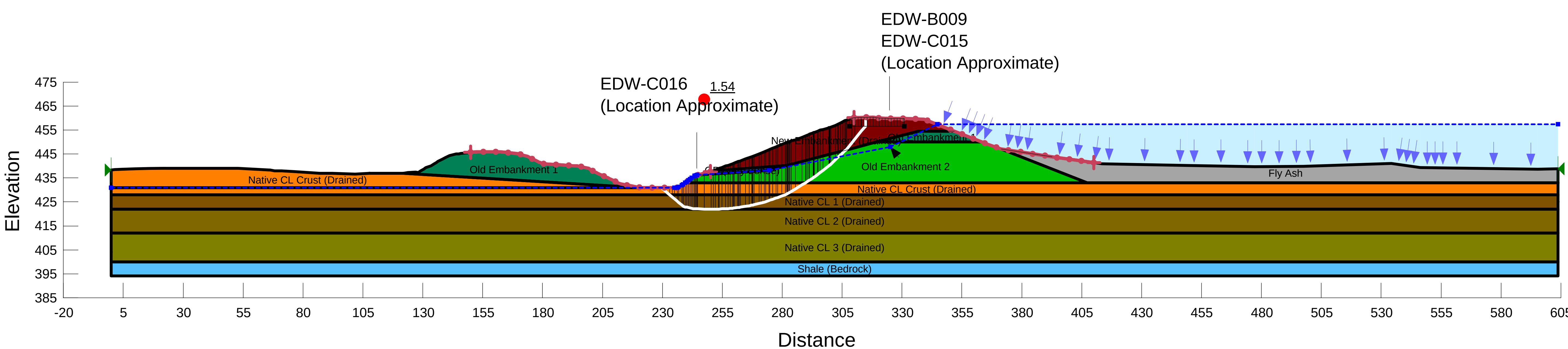


Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: GP (very dense) Unit Weight: 135 pcf Cohesion': 0 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1

Dynegy Edwards
Cross-section E
Slope Stability - Surcharge Pool

Materials

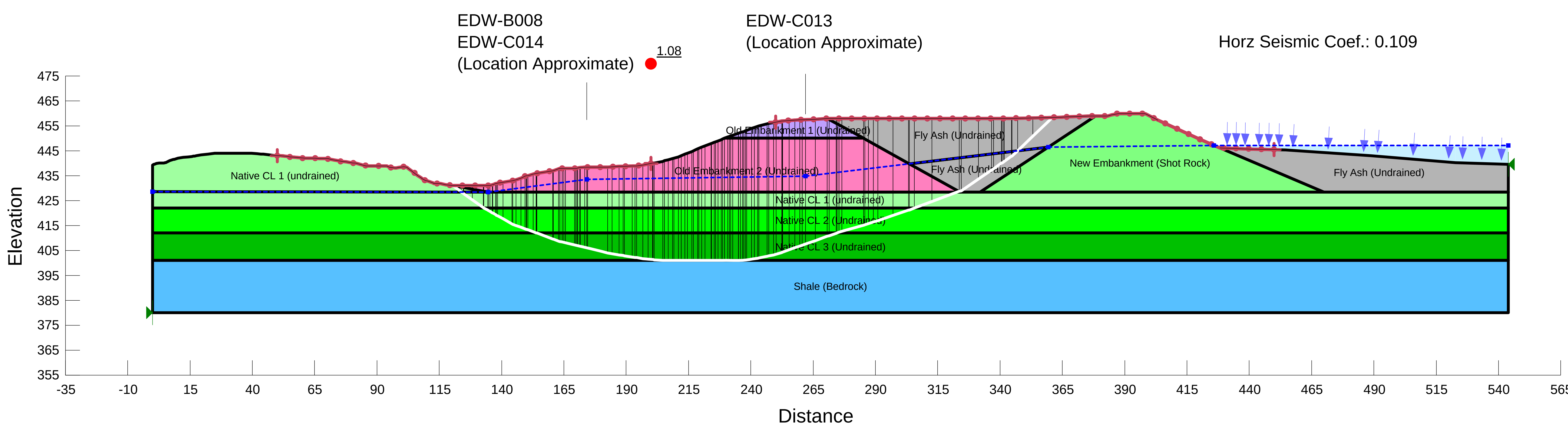
- Native CL Crust (Drained)
- Native CL 1 (Drained)
- Shale (Bedrock)
- Old Embankment 1
- Fly Ash
- New Embankment (Drained)
- GP (very dense)
- Native CL 2 (Drained)
- Native CL 3 (Drained)
- Old Embankment 2



Dynegy Edwards
Cross-section F
Slope Stability - Seismic

Name: Fly Ash (Undrained) Unit Weight: 105 pcf Cohesion': 600 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 1 (Undrained) Unit Weight: 125 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: New Embankment (Shot Rock) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 105 pcf Cohesion': 700 psf Piezometric Line: 1
Name: Native CL 3 (Undrained) Unit Weight: 105 pcf Cohesion': 900 psf Piezometric Line: 1
Name: Old Embankment 2 (Undrained) Unit Weight: 125 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1

Materials
- Fly Ash (Undrained)
- Old Embankment 1 (Undrained)
- Shale (Bedrock)
- Native CL 1 (undrained)
- New Embankment (Shot Rock)
- Native CL 2 (Undrained)
- Native CL 3 (Undrained)
- Old Embankment 2 (Undrained)

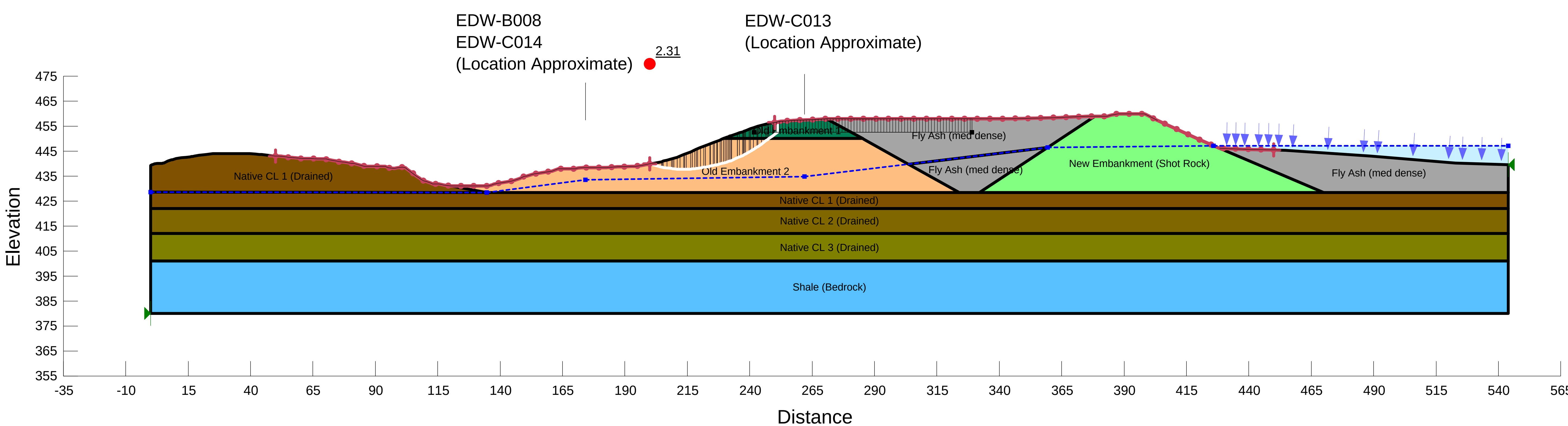


Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash (med dense) Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Shot Rock) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1

Dynegy Edwards
Cross-section F
Slope Stability - Steady State

Materials

- Native CL 1 (Drained)
- Shale (Bedrock)
- Old Embankment 1
- Fly Ash (med dense)
- New Embankment (Shot Rock)
- Native CL 2 (Drained)
- Native CL 3 (Drained)
- Old Embankment 2

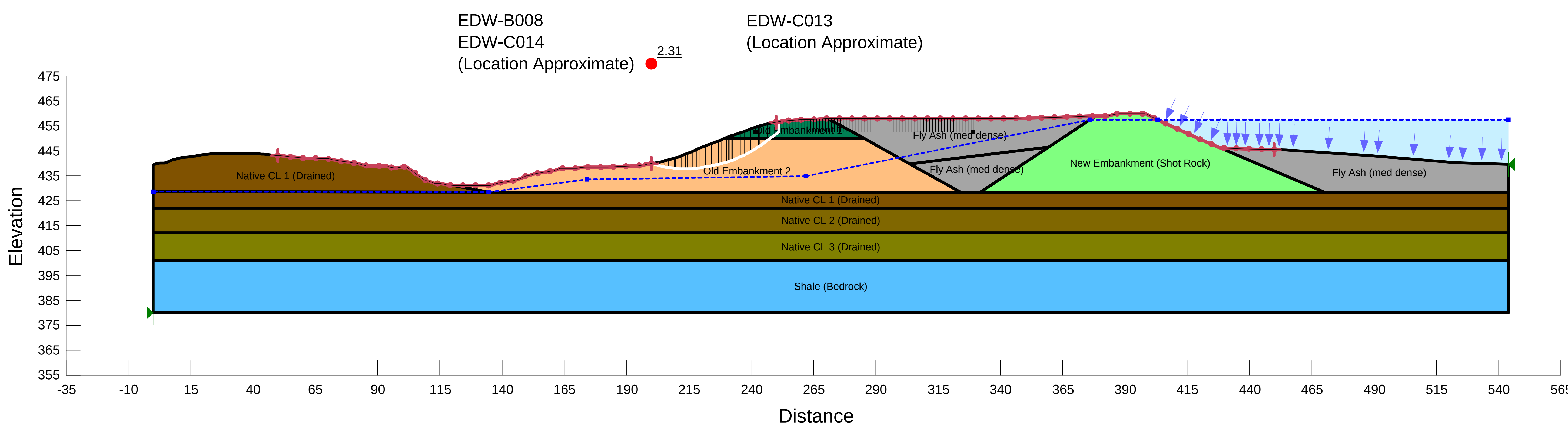


Dynegy Edwards
Cross-section F
Slope Stability - Surcharge Pool

Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash (med dense) Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Shot Rock) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1

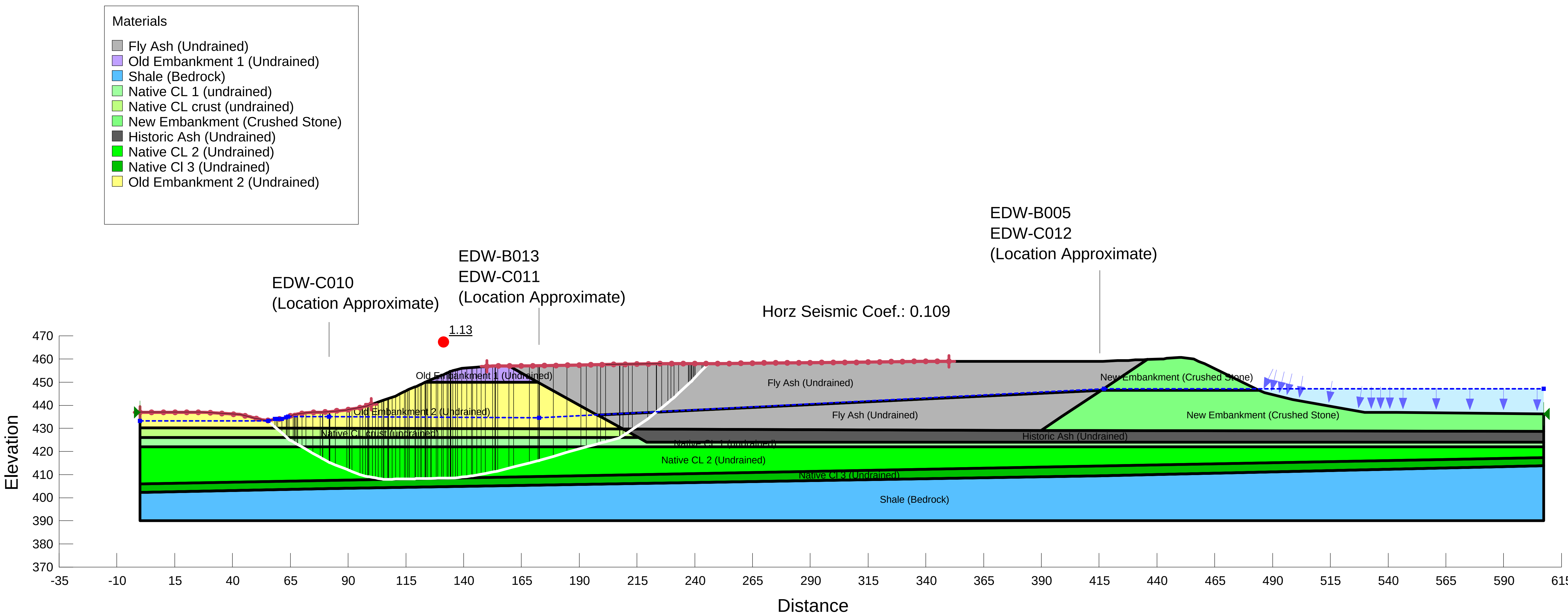
Materials

- Native CL 1 (Drained)
- Shale (Bedrock)
- Old Embankment 1
- Fly Ash (med dense)
- New Embankment (Shot Rock)
- Native CL 2 (Drained)
- Native CL 3 (Drained)
- Old Embankment 2



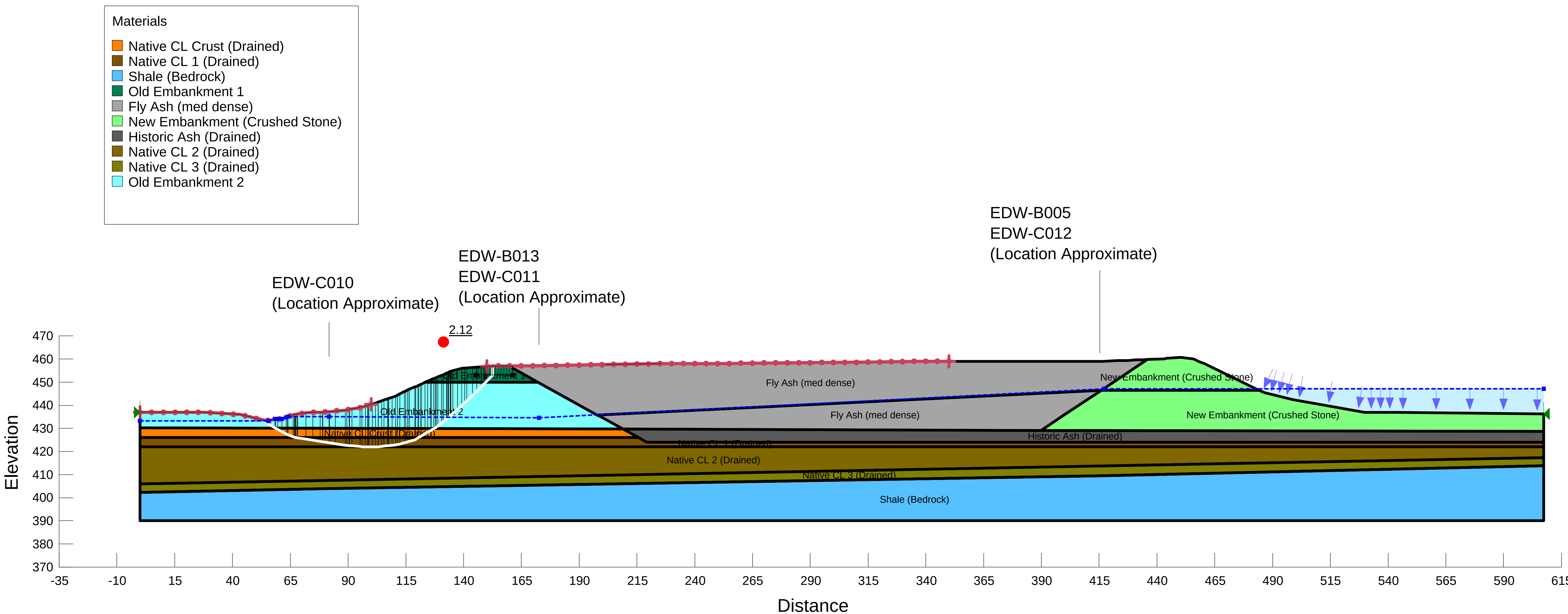
Name: Fly Ash (Undrained) Unit Weight: 105 pcf Cohesion': 600 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 1 (Undrained) Unit Weight: 125 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL crust (undrained) Unit Weight: 120 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: New Embankment (Crushed Stone) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Historic Ash (Undrained) Unit Weight: 105 pcf Cohesion': 750 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 105 pcf Cohesion': 700 psf Piezometric Line: 1
Name: Native Cl 3 (Undrained) Unit Weight: 105 pcf Cohesion': 900 psf Piezometric Line: 1
Name: Old Embankment 2 (Undrained) Unit Weight: 125 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1

Dynegy Edwards
Cross-section G
Slope Stability - Seismic



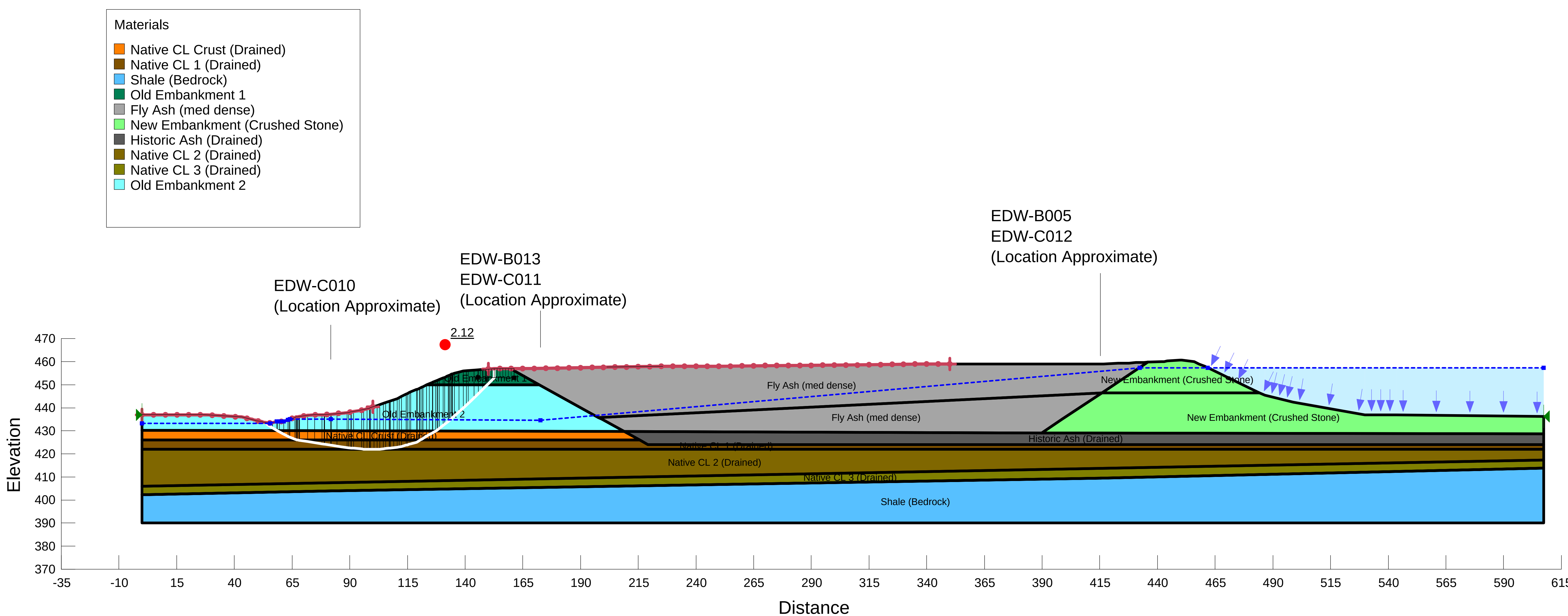
Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash (med dense) Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Crushed Stone) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Historic Ash (Drained) Unit Weight: 105 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1

Dynegy Edwards
Cross-section G
Slope Stability - Steady State



Dynegy Edwards
Cross-section G
Slope Stability - Surcharge Pool

Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash (med dense) Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Crushed Stone) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Historic Ash (Drained) Unit Weight: 105 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1

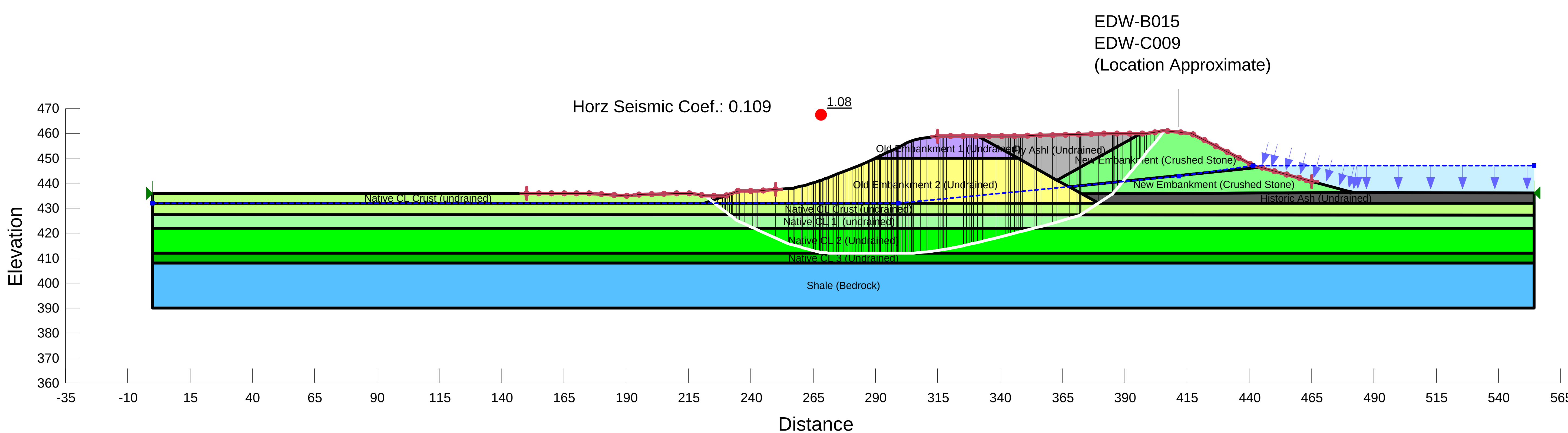


Dynegy Edwards
Cross-section H
Slope Stability - Seismic

Name: Fly Ashl (Undrained) Unit Weight: 105 pcf Cohesion': 600 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 1 (Undrained) Unit Weight: 125 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL Crust (undrained) Unit Weight: 120 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: New Embankment (Crushed Stone) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Historic Ash (Undrained) Unit Weight: 105 pcf Cohesion': 750 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 117 pcf Cohesion': 700 psf Piezometric Line: 1
Name: Native CL 3 (Undrained) Unit Weight: 105 pcf Cohesion': 900 psf Piezometric Line: 1
Name: Old Embankment 2 (Undrained) Unit Weight: 125 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1

Materials

- Fly Ashl (Undrained)
- Old Embankment 1 (Undrained)
- Shale (Bedrock)
- Native CL 1 (undrained)
- Native CL Crust (undrained)
- New Embankment (Crushed Stone)
- Historic Ash (Undrained)
- Native CL 2 (Undrained)
- Native CL 3 (Undrained)
- Old Embankment 2 (Undrained)

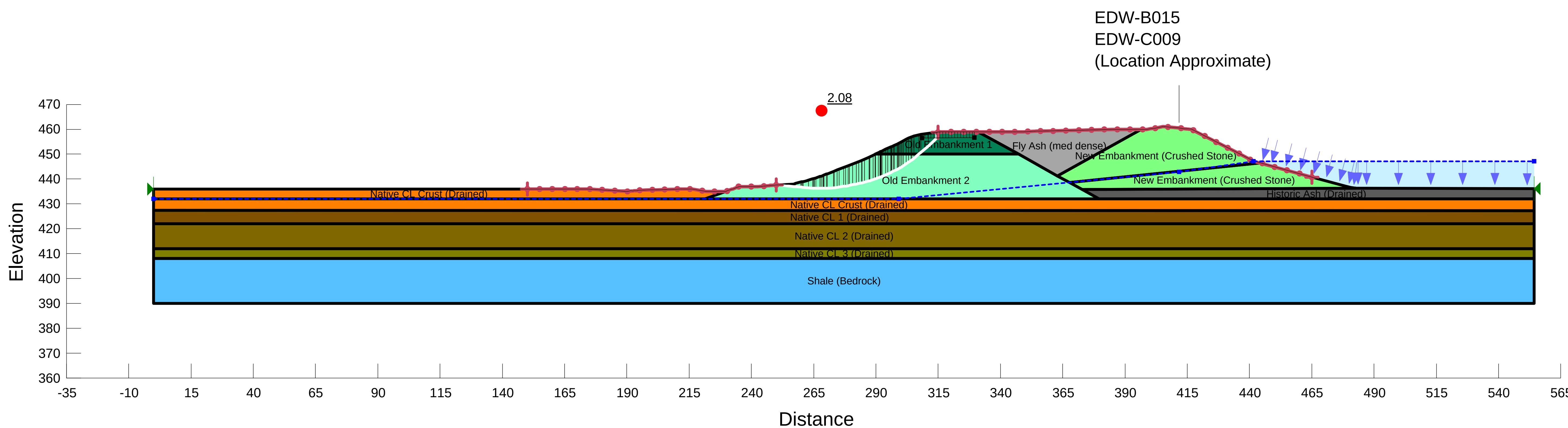


Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash (med dense) Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Crushed Stone) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Historic Ash (Drained) Unit Weight: 105 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1

Dynegy Edwards
Cross-section H
Slope Stability - Steady State

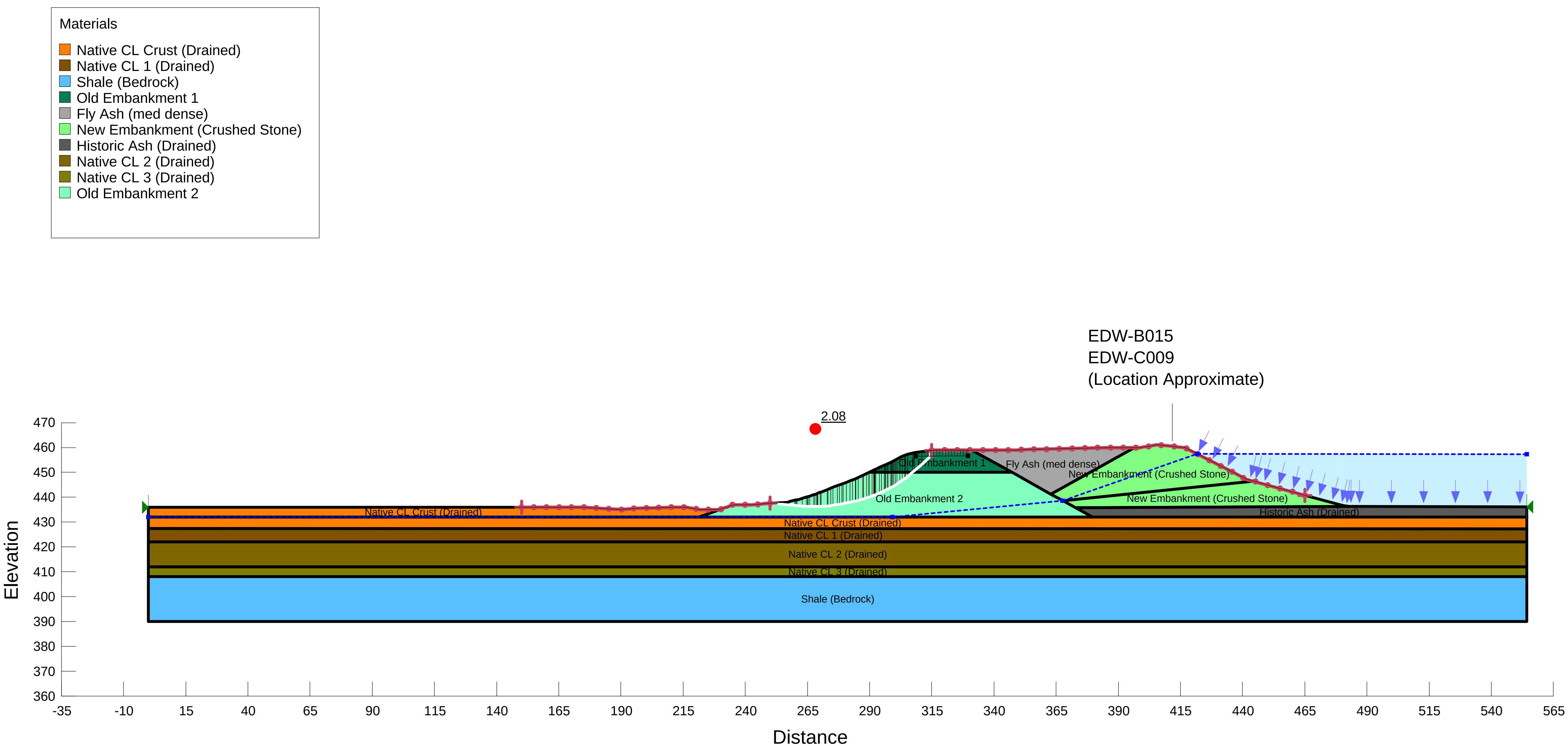
Materials

- Native CL Crust (Drained)
- Native CL 1 (Drained)
- Shale (Bedrock)
- Old Embankment 1
- Fly Ash (med dense)
- New Embankment (Crushed Stone)
- Historic Ash (Drained)
- Native CL 2 (Drained)
- Native CL 3 (Drained)
- Old Embankment 2



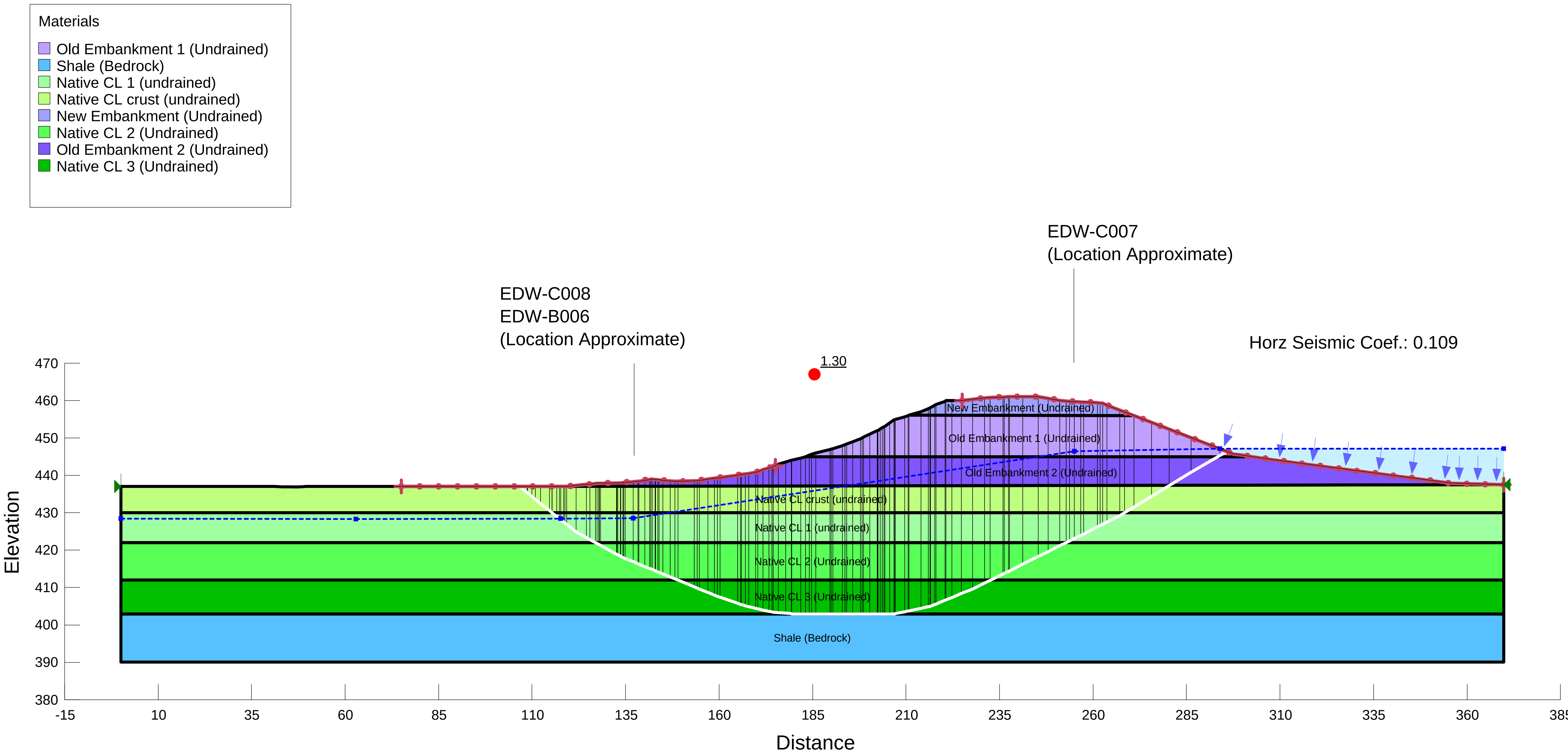
Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Fly Ash (med dense) Unit Weight: 105 pcf Cohesion': 100 psf Phi': 27 ° Piezometric Line: 1
Name: New Embankment (Crushed Stone) Unit Weight: 120 pcf Cohesion': 0 psf Phi': 32 ° Piezometric Line: 1
Name: Historic Ash (Drained) Unit Weight: 105 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Old Embankment 2 Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1

Dynegy Edwards
Cross-section H
Slope Stability - Surcharge Pool



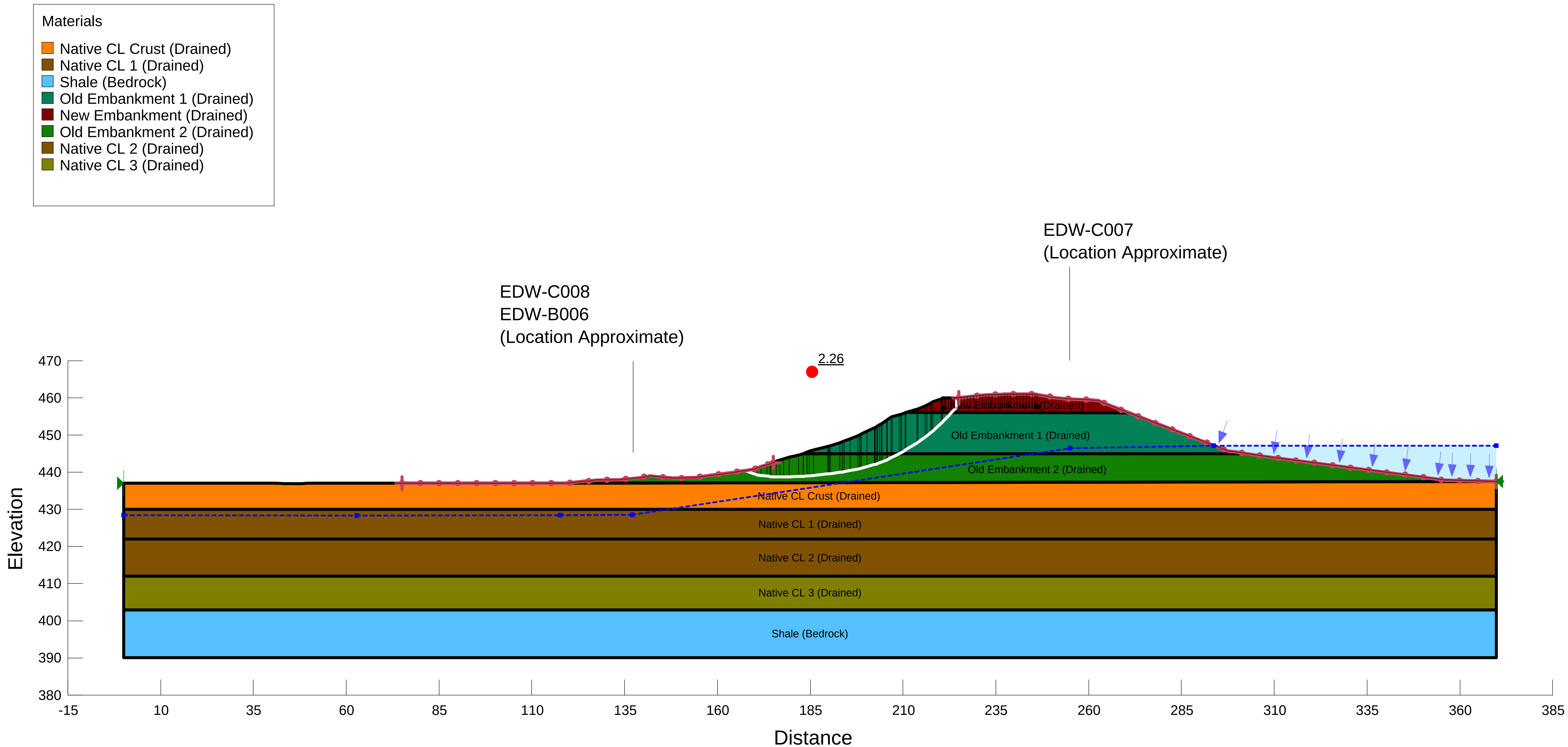
Name: Old Embankment 1 (Undrained) Unit Weight: 125 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL crust (undrained) Unit Weight: 120 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: New Embankment (Undrained) Unit Weight: 115 pcf Cohesion': 2,500 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 105 pcf Cohesion': 700 psf Phi': 0 ° Piezometric Line: 1
Name: Old Embankment 2 (Undrained) Unit Weight: 125 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 3 (Undrained) Unit Weight: 105 pcf Cohesion': 900 psf Piezometric Line: 1

Dynegy Edwards
Cross-section I
Slope Stability - Seismic



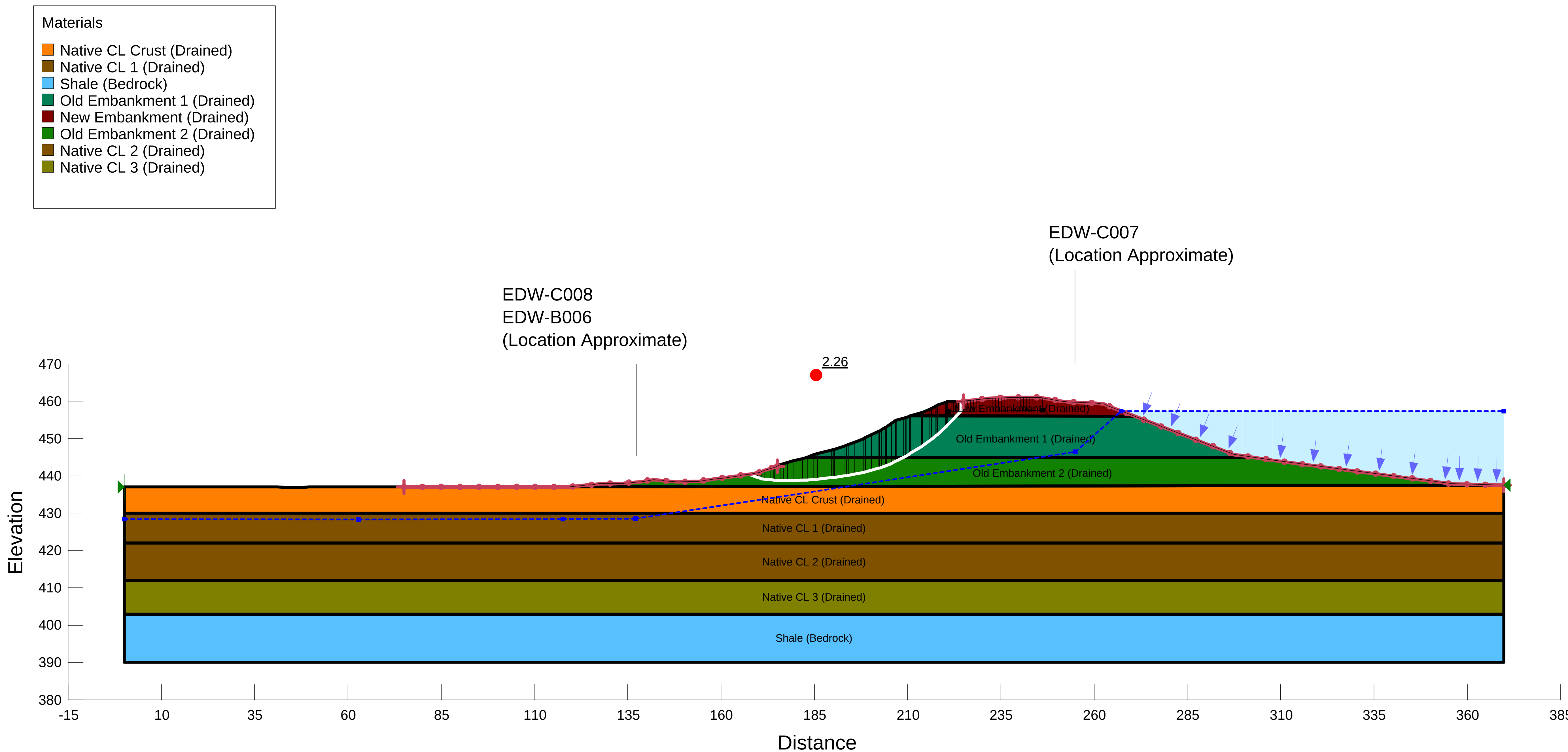
Dynegy Edwards
Cross-section I
Slope Stability - Steady State

Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 (Drained) Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: Old Embankment 2 (Drained) Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1



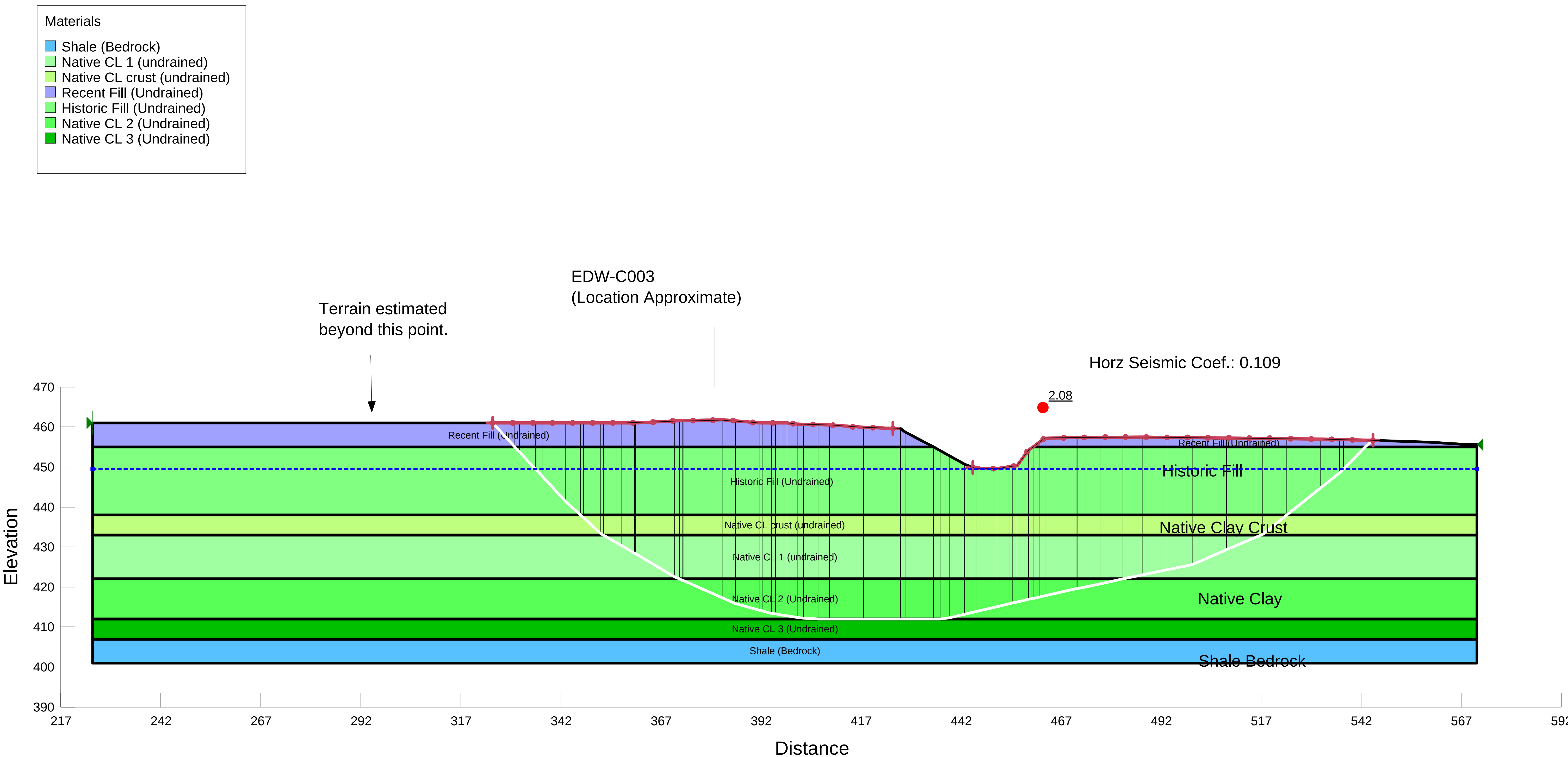
Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Old Embankment 1 (Drained) Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: New Embankment (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: Old Embankment 2 (Drained) Unit Weight: 125 pcf Cohesion': 100 psf Phi': 29 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1

Dynegy Edwards
Cross-section I
Slope Stability - Surcharge Pool



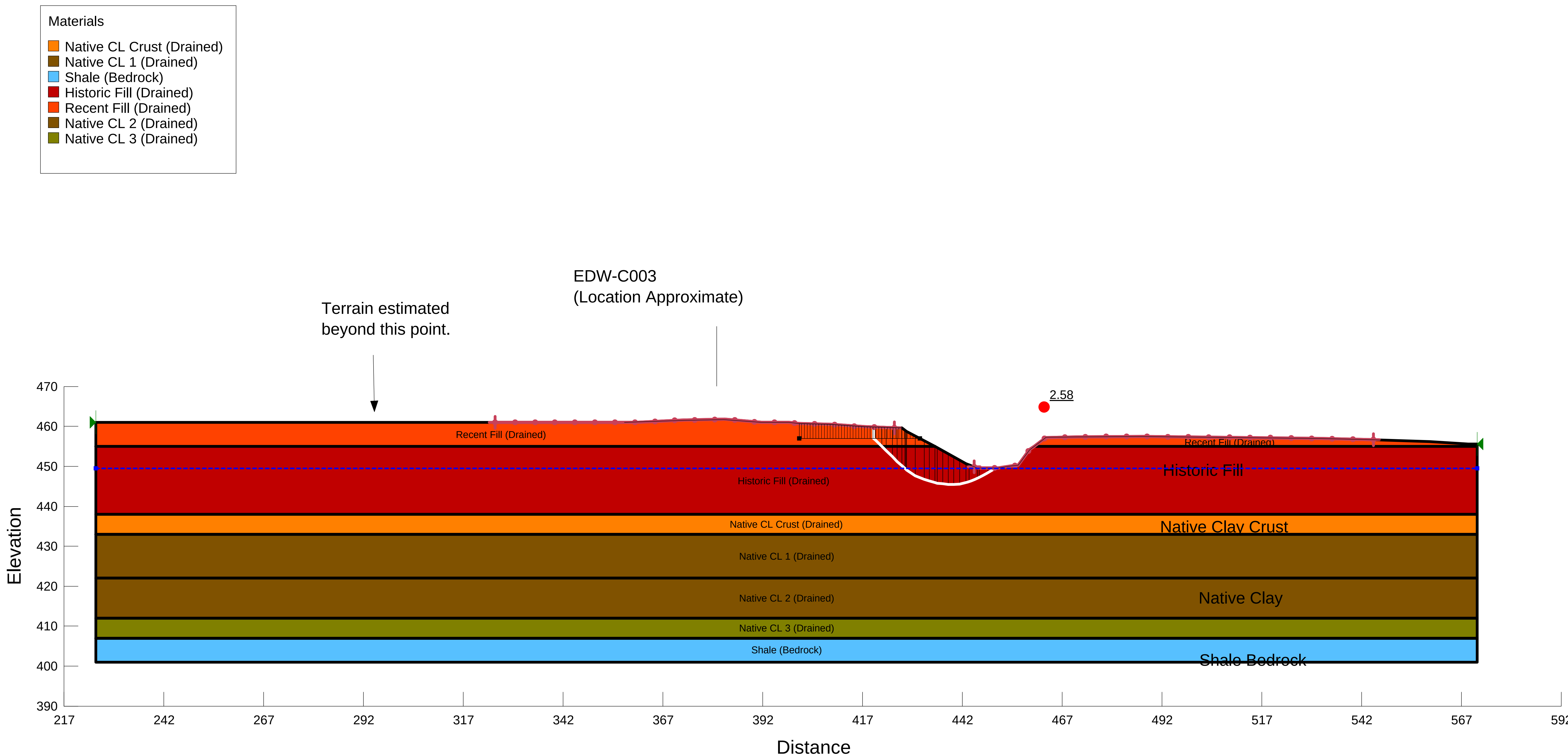
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Native CL 1 (undrained) Unit Weight: 117 pcf Cohesion': 650 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL crust (undrained) Unit Weight: 120 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: Recent Fill (Undrained) Unit Weight: 115 pcf Cohesion': 1,250 psf Phi': 0 ° Piezometric Line: 1
Name: Historic Fill (Undrained) Unit Weight: 125 pcf Cohesion': 1,000 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 2 (Undrained) Unit Weight: 105 pcf Cohesion': 700 psf Phi': 0 ° Piezometric Line: 1
Name: Native CL 3 (Undrained) Unit Weight: 105 pcf Cohesion': 900 psf Piezometric Line: 1

Dynegy Edwards
Cross-section J
Slope Stability - Seismic



Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Historic Fill (Drained) Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Recent Fill (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1

Dynegy Edwards
Cross-section J
Slope Stability - Steady-State

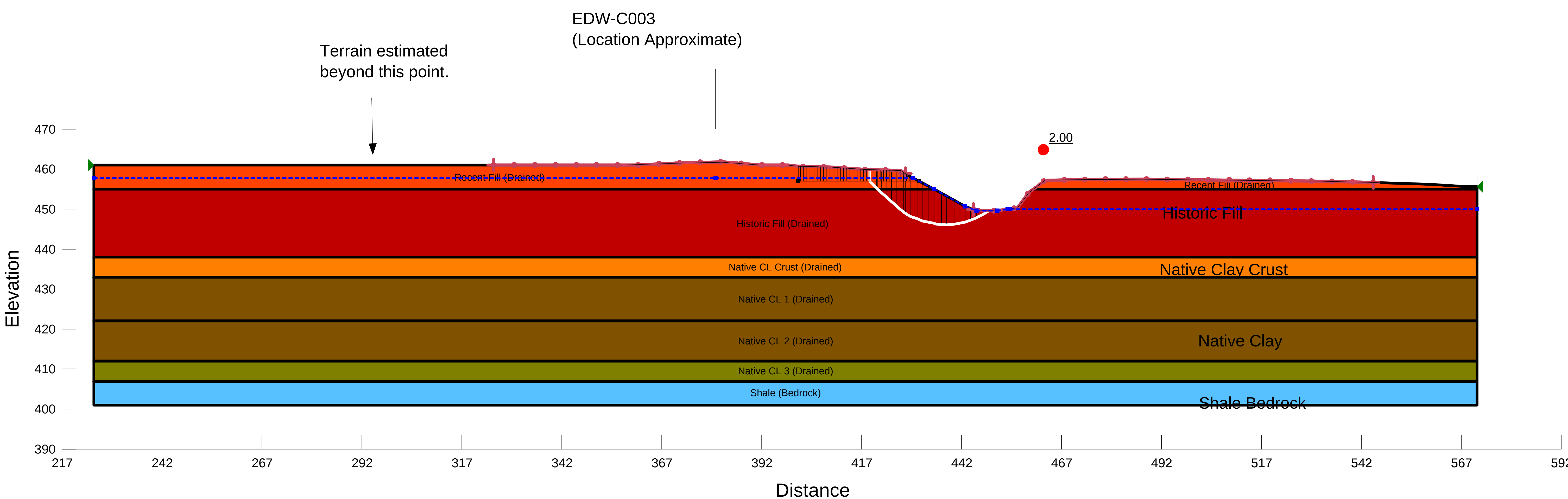


Name: Native CL Crust (Drained) Unit Weight: 120 pcf Cohesion': 200 psf Phi': 27.5 ° Piezometric Line: 1
Name: Native CL 1 (Drained) Unit Weight: 117 pcf Cohesion': 100 psf Phi': 26 ° Piezometric Line: 1
Name: Shale (Bedrock) Unit Weight: 140 pcf Cohesion': 1,000 psf Phi': 36 ° Piezometric Line: 1
Name: Historic Fill (Drained) Unit Weight: 125 pcf Cohesion': 200 psf Phi': 28 ° Piezometric Line: 1
Name: Recent Fill (Drained) Unit Weight: 115 pcf Cohesion': 200 psf Phi': 30 ° Piezometric Line: 1
Name: Native CL 2 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1
Name: Native CL 3 (Drained) Unit Weight: 105 pcf Cohesion': 200 psf Phi': 26 ° Piezometric Line: 1

Dynegy Edwards
Cross-section J
Slope Stability - Surcharge Pool

Materials

- Native CL Crust (Drained)
- Native CL 1 (Drained)
- Shale (Bedrock)
- Historic Fill (Drained)
- Recent Fill (Drained)
- Native CL 2 (Drained)
- Native CL 3 (Drained)



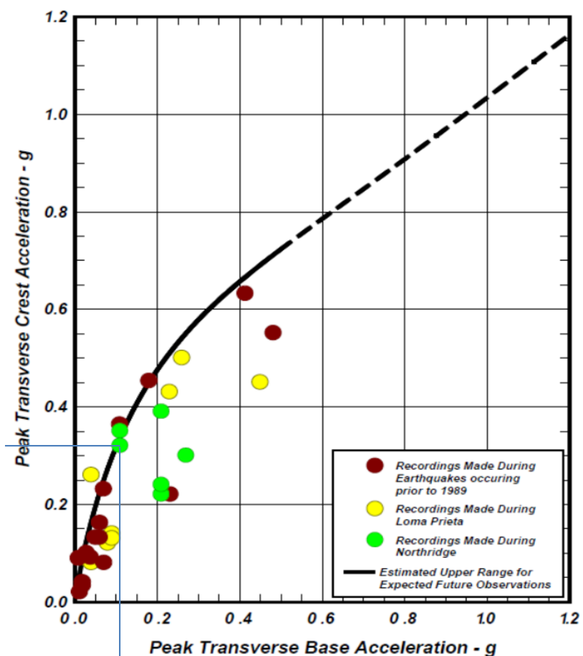
Attachment G.2 Seismic Parameter Calculations

Calculation of K_h for Pseudostatic Analysis

Calc By:	AJW
Date:	2/15/2016

Objective: Estimate kh for pseudostatic analysis.

Given: Seismic Hazard Deaggregation with PGA_{BC} = 0.067, M=6.8
Site Class D, based on IBC (2008)
FPGA = 1.6, based on NEHRP (2009)
Holzer (1998) Figure for estimation of crest acceleration
Makdisi Seed (1978) Figure for Max Acc of Slide Mass



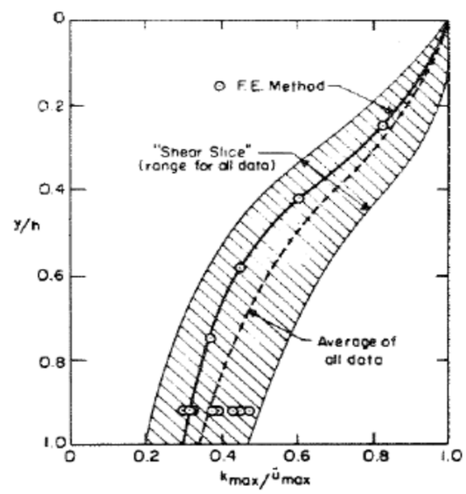


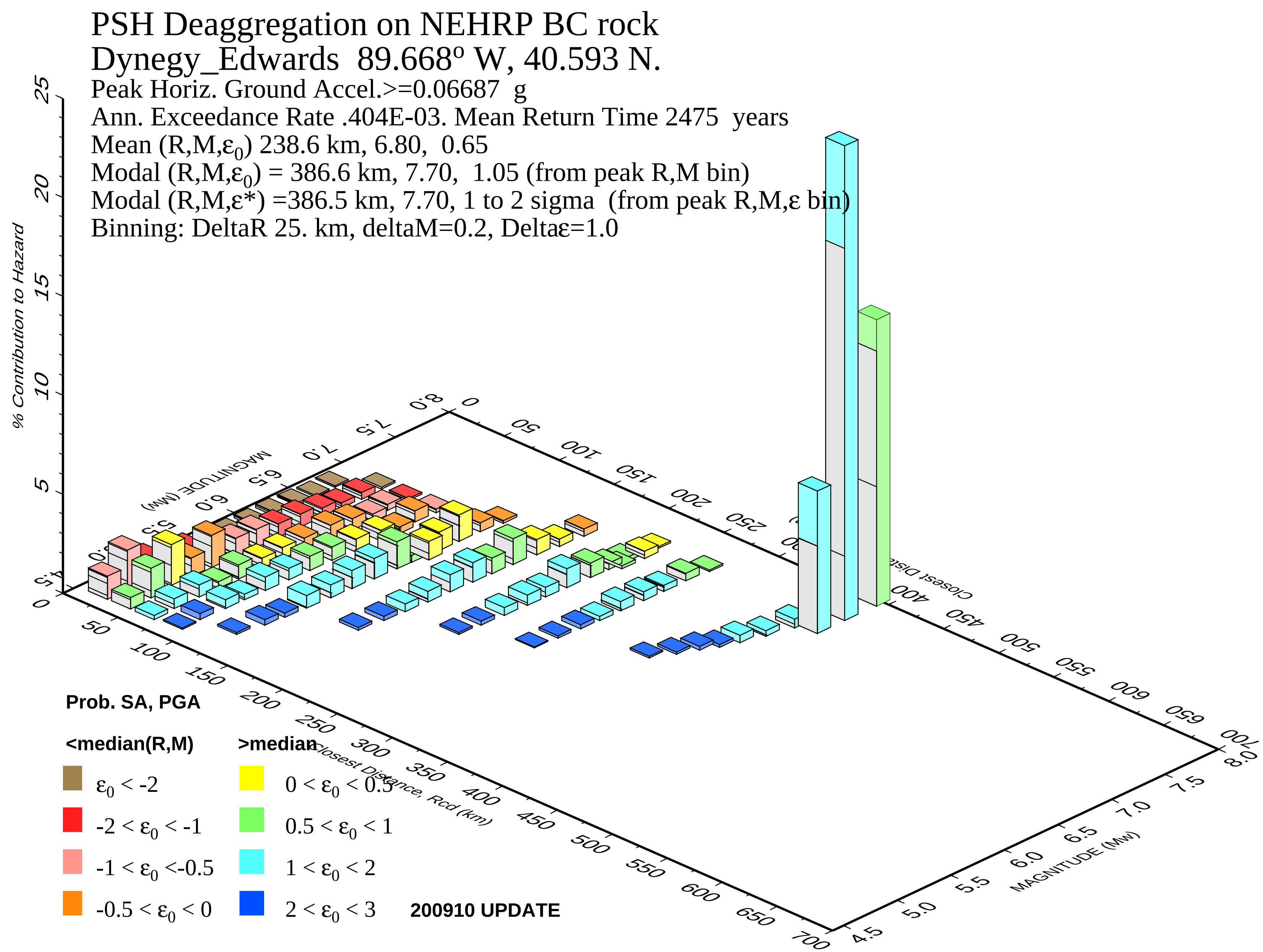
Figure 4. Variations of Maximum Acceleration Ratio with Depth of Sliding Mass (Makdisi and Seed, 1977). Maximum Acceleration Ratio is the Ratio between $(PGA)_{base\ of\ slide\ mass}$ and $(PGA)_{crest}$

Figure 3. Variations of Recorded Peak Crest Accelerations versus those Recorded at the Base of Earth and Rock Fill Dams by Idriss (2015). Source of recorded values for Loma Prieta Earthquake and prior earthquakes: Holzer, (1998).

PGA_{BC}	Site class	F_{PGA}	PGA_{BASE}	PGA_{CREST}	Makdisi -Seed reduction for full height failure	k_h
0.06687	D	1.6	0.107	0.32	0.34	0.109

Results:

Use k_h = 0.109 for pseudostatic analyses.



GMT 2015 Dec 11 15:44:51 Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on rock with average vs= 760. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted