ANDREWS ENGINEERING
3300 Ginger Creek Drive | 217.787.2334
Springfield, IL 62711

February 1, 2022

Illinois Environmental Protection Agency
DWPC – Permits MC #15
Attn: Part 845 Coal Combustion Residual Rule Submittal
1021 North Grand Avenue East
Springfield, IL 62794-9276

Hand-Delivered

Re: City Water, Light and Power
Closure Construction Permit Application

Dear Correspondent:

On behalf of City Water, Light and Power, submitted herein is a Closure Construction application for the Lakeside Ash Pond and Dallman Ash Pond pursuant to Ill. Adm. Code 845.750. The CCR 1, CCR 2CC, and CCR 2CA forms are provided in Attachment A of the application. A digital copy of the application was uploaded to the following address: https://filet.illinois.gov/filet/PIMupload.asp.

If you have any questions or require further information, please contact P.J. Becker at (217) 757-8610, extension 1110. Thank you.

Sincerely,

Brad J. Hunsberger

Brad Hunsberger, LPG
Vice President

w/attachments

cc: P.J. Becker – CWLP (hard copy and electronic file)
Deborah Williams – CWLP (electronic file)
Eric Staley – CWLP (electronic file)
Tabitha Bernhardt – Illinois EPA (electronic file)
Paul Van Metre - Andrews Engineering (cover letter only)

City Water, Light & Power

CCR Impoundments – Lakeside and Dallman Ash Ponds

Springfield, Sangamon County, Illinois

Closure Construction Permit Application

February 2022

Submitted to:
Illinois Environmental Protection Agency
Bureau of Water
1021 North Grand Avenue East
Springfield, Illinois

Prepared for:
City Water, Light & Power
3100 Stevenson Drive
Springfield, Illinois 62703

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ATTACHMENTS

1. INTRODUCTION

Springfield City Water, Light and Power (CWLP) owns two existing coal combustion residual (CCR) surface impoundments subject to the Illinois EPA Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments (35 Ill. Adm. Code 845). Characteristics of the Lakeside and Dallman Ash Ponds have been evaluated pursuant to 35 Illinois Administrative Code (IAC) 845.300 (Subpart C – Location Restrictions). Based on extensive hydrogeologic investigations at and in the near proximity to the impoundments, it has been determined the impoundments do not meet the requirements of Section 845.300 (Placement above the Uppermost Aquifer). Therefore, pursuant to Section 845.350, the closure process defined in Section 845.700 must be implemented. The Lakeside and Dallman Ash Ponds operate as a single multi-unit system for purposes of groundwater monitoring and closure.

The Closure Prioritization for the impoundments has been defined as Category 3. Therefore, pursuant to 35 IAC 845.700(h)(1), a construction permit application containing a final closure plan is being submitted by February 1, 2022.

The closure construction permit application contains information specific to both closure of the impoundments and corrective action pursuant to 35 IAC 845.220(f). All related information, including the Closure Alternatives Assessment, Assessment of Corrective Measures, Final Closure Plan (design, construction quality assurance plan, and post-closure care plan) are contained in this application. Some information required in 35 IAC 845.220 is redundant; alternate locations will be referenced within the application as necessary to minimize the occurrence of repeating information.

The applicable forms, Application Form CCR1 – General Provisions, Form 2CC – Closure Construction, and Form 2CA – Corrective Action Construction, are provided in Attachment 1. The following narrative and related attachments address those Sections contained within the aforementioned forms.

2. DESIGN AND CONSTRUCTION PLANS

Sections 2 through 8 below are in response to Application Form CCR 2CC – Closure Construction and are organized to reflect their occurrence in the application form.

2.1 Physical and Engineering Properties of the Foundation and Abutment Materials on which the CCR Surface Impoundment is Constructed

Neither CCR surface impoundment contains foundation improvements, drainage provisions, diversion ditches, or instrumentation. No identifiable natural or manmade features that could adversely affect operation of the CCR surface impoundment due to malfunction or misoperation are known to CWLP personnel.

Historically, Sugar Creek meandered across the site, generally from the west to east with an overall flow direction to the north. The subject CCR surface impoundments were constructed upon these alluvial sediments deposited within the banks of the Sugar Creek valley. Prior to development, the upper layer of soil at the site consisted of mainly brown, light brown, and brownish-gray silty clays and clayey silts having soft to stiff consistency. This includes all eolian soils (loess) deposited near the surface, isolated pockets and lenses of fine grained silty to clayey sand at some locations and alluvial silts and silty clays.

During the construction of the ash ponds, the creek was abandoned and relocated to the west of the site. As a result, much of the shallow soils were displaced during area development. The old creek bed was filled with different types of soil, ranging from cohesive soils characterized as silty clays, to granular fill characterized as poorly graded silty to clayey sands. Recompacted silty clay samples from the native soils have exhibited hydraulic conductivity values between 1 x 10^{-7} to 1 x 10^{-9} cm/sec. The in-place creek sediment's soils permeability typically range from 1 x 10^{-6} to 1 x 10^{-8} cm/sec.

The cohesive soils of the creek fill were tested as part of the CCR landfill permitting process. The soils exhibited the following range of index and engineering properties:

- Liquid limit = 34 to 46
- Plasticity index = 9 to 26
- Gravel content = 0 percent
- Sand content = 2 to 48 percent
- Silt/Clay content = 52 to 98 percent
- Dry density = 80 to 104 pcf
- Hydraulic conductivity 7.6 x 10^{-8} to 2.1 x 10^{-5} cm/sec

Sieve analysis on the granular fill yielded the following results:

- Gravel content = 0 to 2 percent
- Sand content = 55 to 65 percent
- Silt/Clay content = 33 to 45 percent

A July 2, 1987 Engineering Report was prepared for the proposed embankment modifications at the Lakeside Ash Pond. This report includes the results of laboratory testing on samples obtained from four test borings within the Lakeside Ash Pond area. The 1987 Engineering Report is provided in Attachment 2.

These soil samples were tested for:

- Soil classification (ASTM D 2488);
- Moisture content (ASTM D 2216);
- Unconfined compressive strength (ASTM D 2166)

According to the construction plan drawings for the Dallman Ash Pond, dikes were constructed on areas of the old creek bed. The notes on these drawings indicate that the creek bed in these areas was over-excavated by at least 4.0 feet below the existing channel banks and bottom. These excavations were then filled in with cohesive material and compacted to at least 90 percent of optimum density as determined under AASHTO-T99 at optimum moisture.

2.2 Type, Size, Range, and Physical and Engineering Properties of the Materials Used in Constructing Each Zone or Stage of the CCR Surface Impoundment

The July 2, 1987 Engineering Report includes the results of an investigation of the embankments along the lime-softening ponds and the embankment separating the Lakeside Ash Pond from the Clarification Pond. Although design information is limited for the surface impoundments, a stability analysis was performed by Testing Service Corporation (TSC) in 1994 for the design of the adjacent Unit 2 of the FGDS Landfill. The landfill is located in the northeastern half of the site, which is directly adjacent to the east perimeter of the Dallman Ash Pond and north of the Lakeside Ash Pond. This analysis included a review of all of the subsurface studies performed at the site (72 borings in total) as well as five additional borings drilled as part of the stability analysis study for the FGDS Landfill. Laboratory testing completed on cohesive soil samples from these five borings included analyses of moisture content, in-place dry density, unconfined compressive strength, and Atterberg limits. In addition, one sample was selected for triaxial shear testing, and another for direct shear testing.

For the Lakeside Ash Pond, a review of the historical documents found a previous geotechnical investigation and stability analysis, which was conducted prior to the upstream construction of Lakeside Ash Pond. The results of that geotechnical investigation are utilized within this assessment of the safety factors. Additionally, a literature review of technical papers was conducted to determine the geotechnical parameters for the fly ash within the impoundments. Table 1 contained in the Initial Safety Factor Assessment (October 2021) provided in Attachment 3 presents highly conservative geotechnical parameters based upon the previous geotechnical investigation utilized in the static and seismic slope stability model.

Included in Appendix B of Attachment 3 are copies of the historical boring logs and cross sections that support the geotechnical parameters provided in Table 1. Technical papers supporting the ash geotechnical parameters are included in Appendix C of Attachment 3.

For the Dallman Ash Pond, a review of the historical documents revealed the original construction plans, with cross sections provided, was completed. More recent site investigations have been conducted in the area during the installation of piezometers, which provide the stratigraphic and in situ strengths of earthen materials that correlate well with the Lakeside Ash Ponds geotechnical data. The historical data have been used to develop conservative geotechnical parameters for slope stability analysis as provided in Table 2 of Attachment 3.

Included in Appendix D of Attachment 3 are copies of the boring log and cross section that support the geotechnical parameters provided in Table 2.

2.3 Method of Site Preparation and Construction of Each Zone of Each Impoundment

During the construction of the ash ponds, the creek was abandoned and relocated to the west of the site. As a result, much of the shallow soils were displaced during area development. The old creek bed was filled with different types of soil, ranging from cohesive soils characterized as silty clays, to granular fill characterized as poorly graded silty to clayey sands.

The Lakeside Ash Pond is primarily a diked embankment with some incising along the east perimeter. The entire ash pond abuts the Lake Springfield dam to the south. The original portion of the ash pond abuts the Unit I landfill and the clarification pond to the north. The only portions of the Lakeside Ash Pond with open downstream slopes are the west dike of the original ash pond, and the vertical expansion berms, which were constructed on the east, west and south boundaries of the ash pond.

According to the July 2, 1987 Engineering Report, the initial deposition of fly ash occurred in an area north of Spaulding Dam shortly after completion of the first power plant sometime in the middle 1930’s. This original disposal area is within the southern portion of the Lakeside Ash Pond, encompassing the area that is now identified as the two eastern-most lime-softening ponds. The south portion of the west embankment of what would become the western-most lime-softening pond was part of the construction for the original ash disposal area.

In 1966, plans were prepared for expanding the disposal area to the north. The north embankment and the north portion of the west embankment were constructed in conjunction with this expansion. Slopes of 2.0H to 1.0V are indicated on the construction drawings, as is a crest width of 12 ft. The construction drawings note “Compact to 90% Maximum Density at Optimum Moisture.” Reconstruction of the original west embankment occurred in 1971. The reconstructed downstream face contained a slope of 3.0H to 1.0V.

The clarifier pond, located immediately north of the Lakeside Ash Pond was constructed between 1971 and 1976. The construction drawings for the Dallman Ash Pond were prepared in 1976. The construction drawings included drawings for modification to the north portion of the west embankment of the Lakeside Ash Pond. These modifications include a sloped granular drainage blanket connected to an 8-inch diameter perforated pipe running the length of the embankment. Compacted material downstream of this drainage blanket flattened the downstream slope to 2.5H to 1.0V. The outlet of the drainage pipe is indicated to be north of the original west embankment (which had been reconstructed in 1971).

Based on the July 2, 1987 Engineering Report the north-south cross dikes were constructed over ponded ash material in the original disposal area subsequent to 1976 to form what are presently identified as the two eastern-most lime-softening ponds. In addition, a portion of the north embankment of the original ash disposal area, the Lakeside Ash Pond, was raised in height.

The most recent change made to the Lakeside Ash Pond system was a vertical expansion completed in 1988. The vertical expansion consisted of berms built on top and inside of the existing embankments in such a way that the toe of the outer slope of the expansion berms matches up with the top of the inner slope of the existing embankments. The berms were built on top of a stable base comprised of bottom ash on the inside of the existing berms. The vertical expansion berms are approximately ten feet in height and were constructed with compacted cohesive materials. The top and outer slopes are covered with a 6-inch topsoil layer. The top of the berms are 10 feet wide. The outer slope of the berms was built at a 2H:1V slope; the inner slope of the berms was built at a 1H:1V slopes. During the vertical expansion in 1988, the Lakeside Ash Pond was separated to create lime softening ponds on the south section of the pond. There is no as-built construction documentation available for the Lakeside Ash Pond.

The entire Dallman Ash Pond was built in 1976 and is partially incised. Material from the center of the ash pond was excavated and utilized in the construction of the dikes. The Dallman Ash Pond has not been expanded. The berms for the Dallman Ash Pond were built to a height of approximately 27 feet, using slopes of 2.5H:1V for both the inner and outer slopes. The south berm for the Dallman Ash Pond is shared by the Clarification Pond located to the south. There is no as-built construction documentation is available for the Dallman Ash Pond. Notes in the construction plan drawings do call for dike materials to be compacted to “at least 90% of the minimum density at optimum moisture as determined by AASHTO-T99.”

2.4 Dates of Construction of Each Successive Stage of Construction of the CCR Surface Impoundment

The Lakeside Ash Pond was built and placed in service prior to 1958. The most recent change made to the Lakeside Ash Pond system was a vertical expansion completed in 1988. During the vertical expansion, the Lakeside Ash Pond was separated to create lime softening ponds on the south section of the pond.

The Dallman Ash Pond was built in 1976; it has not been expanded.

2.5 Drawing Satisfying the Requirements of 35 IAC 845.220(a)(1)(F)

The drawings listed below were included in the 2016 History of Construction Report which was completed pursuant to 40 CFR Section 257.73. The subject report is contained in Attachment 4 to this application.

- Figure 1 – Site Map identifying the location of the CCR units.
- Figure 2 – Plan View of the surface impoundments and the locations of outlets, normal operating pool elevations, maximum pool elevations, and maximum depths of each CCR unit.
- Construction Drawings – Plan Views and Cross Sections of each CCR unit.

Plan Drawings and Cross Sections of the Lakeside Ash Pond were taken from the construction design drawings included in the 1987 Proposed Embankment Modifications report by Hanson Engineers, Inc. No as-built drawings are available for either the original pond construction prior to 1958 or the expansion in 1988. The Plan Drawing shows the proposed expansion with two lime softening ponds. The third lime softening pond was constructed from the southern portion of the expanded settling pond at a later time.

The Plan Drawing of the Dallman Ash Pond was taken from the 1976 Construction Grading Plan; cross sections for the Dallman Ash Pond were created based on this Plan Drawing. No as-built drawings are available for the construction of the Dallman Ash Pond.

Neither CCR unit contains foundation improvements, drainage provisions, diversion ditches, or instrumentation. No identifiable natural or manmade features that could adversely affect operation of the CCR unit due to malfunction or mis-operation are known to CWLP personnel.

2.6 Type, Purpose, and Location of Existing Instrumentation

According to CWLP personnel, none of the CCR units maintained by CWLP contains any such unit instrumentation, which would include dedicated piezometers, pool elevation and freeboard instrumentation or more sophisticated measuring devices for measuring pressure, seepage, internal movement, slope movement, and/or vibration.

2.7 Area Capacity Curves for the CCR Impoundment

Area capacity curves have been developed for the subject CCR surface impoundments and are included in Attachment 4 as part of the CWLP 2016 History of Construction Report. Construction of the area capacity curves were based on information from the construction drawings discussed in the previous sections.

2.8 Spillway and Diversion Design Features, Capacities and Calculations Used in their Determination

Neither ash pond has a constructed or natural spillway.

The Lakeside Ash Pond and Lime Softening Ponds have a combined approximate storage capacity of 1,330,000 cubic yards. The Dallman Ash Pond has an approximate storage capacity of 1,500,000 cubic yards. During the vertical expansion, an outlet structure was constructed through the northern berm of the Lakeside Ash Pond, which drains into the adjacent Clarification Pond. The outlet is constructed with a 24-inch diameter reinforced concrete pipe (RCP). The length of the pipe is approximately 60 feet. The pipe was bedded in compacted cohesive material and an anti-seep collar at approximately halfway through the berm. In addition, the Lakeside Ash Pond has a 14-inch diameter pipe that drains decant water from the settling pond portion of the lime ponds. This pipe is 100 feet in length and similar to the outlet structure for the Dallman Ash Pond. The outlets appears to be structurally sound with no observed signs of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, or debris

An outlet structure has also been constructed through the southern dike of the Dallman Ash Pond. This structure allows the Dallman Ash Pond to drains into the adjacent Clarification Pond. The outlet is a 24-inch diameter high-density polyethylene (HDPE) pipe. The length of the pipe is approximately 120 feet. The outlet appears to be structurally sound with no observed signs of significant deterioration, deformation, distortion, bedding deficiencies, sedimentation, or debris.

Both the Dallman Ash Pond and the Lakeside Ash Pond are diked surface impoundments built vertically above the existing grades. Both CCR units are built in a manner in which there is no surficial flow of stormwater into the pond during precipitation events. Therefore, the only water that would flow into the pond during a precipitation event is that which falls directly into the ponds or adjacent site road. Ditches located adjacent to the south and east of the impoundments route surface water around the impoundment area ultimately discharging to the South Fork of Sugar Creek. Sugar Creek is present along the western edge and northern perimeters of ash impoundment area.

The National Oceanic and Atmospheric (NOAA) Atlas 14, Volume 2, Version 3, the 100-year, 24 hour rainfall estimate for the site location is 6.22 inches.

Both ash ponds contain at least 6.62 inches of freeboard, and therefore do not require any additional flood controls. The normal pool level for the Dallman Ash Pond is approximately 551 feet mean sea level (MSL) with a maximum design elevation of 554.0 feet, yielding a typical freeboard of 3 feet. The normal pool level for the Lakeside Ash Pond is 564.0 feet with a maximum elevation of 565.0 feet, yielding a typical freeboard of 1.0 foot.

2.9 Construction Specifications and Provisions for Surveillance, Maintenance, and Repair of the CCR Surface Impoundment

The impoundments have been inspected pursuant to 40 CFR Section 257.83, beginning in October 2015. Inspection reports are retained in the facility record and include the results of the inspections and record of any maintenance or repairs conducted as a result of the inspection. The inspection requirements are very similar to those contained in Section 845.540.

Inspection requirements for CCR surface impoundments are outlined at Section 845.540. Under Section 845.540(a) the CCR surface impoundments and appurtenances shall be inspected by a qualified person at intervals not exceeding seven days and after each 25-year, 24-hour storm. Each inspection conducted pursuant to this Section shall be documented in an inspection report that describes the condition of the CCR surface impoundment, any repairs made to the CCR surface impoundment and date of the repair. These inspection reports shall become part of the facility's operating record.

The 7-day and 25-year, 24-hour storm inspections shall note any appearances of actual or potential structural weaknesses and other conditions that are disrupting or have the potential to disrupt the operation or safety of the CCR surface impoundments; deterioration, malfunctions or improper operation of overtopping control systems; sudden drops in level of the CCR surface impoundment contents; erosion that creates rills, gullies or crevices six inches or deeper other signs of deterioration including failed or eroded vegetation in excess of 100 square feet, or cracks in dikes or other containment devices; and any visible releases. In addition, at intervals not exceeding 7-days, inspect the discharge of all outlets of hydraulic structures that pass underneath the base of the CCR surface impoundment or through the dike, of the CCR surface impoundment, for abnormal discoloration, flow or discharge of debris or sediment; and at intervals not exceeding 30-days, monitor all CCR surface impoundment instrumentation.

The annual inspection and reporting requirements are outlined under Section 845.540(b). Pursuant to Section 845.540(b), the annual inspection shall be completed by a qualified professional engineer to ensure that the design, construction, operation, and maintenance of the CCR surface impoundment is consistent recognized and generally accepted engineering standards. The inspection shall include: a review of available information regarding the status and condition of the CCR surface impoundment, including files available in the operating record (e.g., CCR surface impoundment design and construction information required by Sections 845.220(a)(1) and 845.230(d)(2)(A), previous structural stability assessments required under Section 845.450, the results of inspections by a qualified person, and results of previous annual inspections); a visual inspection of the CCR surface impoundment to identify signs of distress or malfunction of the CCR surface impoundment and appurtenant structures; a visual inspection of any hydraulic structures underlying the base of the CCR surface impoundment or passing through the dike of the CCR surface impoundment for structural integrity and continued safe and reliable operation; the annual hazard potential classification certification, if applicable (see Section 845.440); the annual structural stability assessment certification, if applicable (see Section 845.450); the annual safety factor assessment certification, if applicable (see Section 845.460); and the inflow design flood control system plan certification (see Section 845.510(c)).

Inspection reports prepared by the qualified professional engineer to document the annual inspections must address: any changes in geometry of the impounding structure since the previous annual inspection; the location and type of existing instrumentation and the maximum recorded readings of each instrument since the previous annual inspection; the approximate minimum, maximum, and present depth and elevation of the impounded water and CCR since the previous annual inspection; the storage capacity of the impounding structure at the time of the inspection; the approximate volume of the impounded water and CCR at the time of the inspection; any appearances of an actual or potential structural weakness of the CCR surface impoundment, in addition to any existing conditions that are disrupting or have the potential to disrupt the operation and safety of the CCR surface impoundment and appurtenant structures; and any other changes that may have affected the stability or operation of the impounding structure since the previous annual inspection.

Pursuant to 35 Ill. Adm. Code 845.540(b)(5) if a deficiency or release is identified during an inspection, the owner or operator must submit to the Illinois EPA documentation detailing proposed corrective measures and obtain any necessary permits from the Illinois EPA.

2.10 Record or Knowledge of Structural Instability of the CCR Surface Impoundment

Visual inspections of the CCR surface impoundments are performed on a weekly basis (minimum) in accordance with 40 CFR Section 257.83 and now Section 845.540(a)(1)(A) for the purpose of identifying appearances of actual or potential structural weaknesses and other conditions which are disrupting or have the potential to disrupt the operation or safety of the CCR surface impoundments.

Historical reports noted that signs of erosion had been periodically observed on the north and west outer berms of the Dallman Ash Pond due to storm water flow collecting at points along the top of the berm before flowing down the outer slope in concentrated streams. In the fall of 2017, the tops of the berms of the Dallman Ash Ponds were regraded with a cross slope of approximately 1/4” per foot inward towards the ponds. This has allowed the rainwater to be contained in the ponds and to not cause erosion on the slopes. Field inspections had noted minor seepage along the west berm of the Lakeside Ash Pond. However, at no time was there any structural instability of the impoundments.

As reported in the 2021 Annual Inspection, no visual indications of actual or potential structural weaknesses of the surface impoundments have been observed. Based on the review of historical aerial photographs completed during the 2016 Annual Inspection, there were no observed indications of mass movement on any of the constructed berms for the surface impoundments.

3. NARATIVE DESCRIPTION OF THE FACILITY

3.1 Types of CCR and Chemical Analyses of CCR Placed in the Surface Impoundments

Presently, the Lakeside Ash Pond only receives CCR containing material from the FGD WWTP (flue gas desulfurization waste water treatment plant). The analytical report for the FGD WWTP sludge is included as Attachment 5. Prior to 2009, the Lakeside Ash Pond received both fly ash and bottom ash. No analytical results are available of any ash (fly or bottom) that was generated from the old Lakeside Plant sluiced to the Lakeside Ash Pond. Since CWLP has always used the same mine, it is inferred the ash produced from Units 31, 32 and 33 is representative of the fly ash and bottom ash sluiced to the Lakeside Ash Pond. The laboratory analysis for the bottom ash sluiced from Units 31, 32 and 33 to the Dallman Ash Pond (Attachment 5) is representative of the fly ash and bottom ash placed into the Lakeside Ash Pond prior to 2009.

The non-CCR placed into the Lakeside Ash Pond includes water softening lime residuals from the CWLP Drinking Water Purification Plant and wash-down water from the miscellaneous floor drains.

The non-CCR placed into the Dallman Ash Pond consist of GF (generating facility) WWTP clarifier blowdown sludge, landfill leachate and evaporation water (see Attachment 5).

3.2 Maximum Capacity of Each Surface Impoundment

As stated in Section 2.8, the Lakeside Ash Pond and Lime Softening Ponds have a combined approximate storage capacity of 1,330,000 cubic yards. The Dallman Ash Pond has an approximate storage capacity of 1,500,000 cubic yards.

3.3 Rate of Waste Streams Entering Impoundments

The Lakeside Ash Pond receives approximately 39,000 gallons per day of flue gas desulfurization material from the WWTP. The pond receives an additional 1.48 million gallons with filter plant material. This equates to approximately 27,000 pounds (dry weight) per day.

The Dallman Ash Pond receives approximately 870 gallons per day of leachate from the FGDS Development Landfill, 48,000 gallons of evaporation water, and 20,000 gallons with blowdown from the generation facility. This equates to approximately 2,100 pounds (dry weight) per day.

3.4 Length of Time Impoundments will Receive Waste

As stated in Section 1, the impoundments will be closing pursuant to 35 IAC 845.700. It is anticipated the impoundments will remain active until closure activities begin in late 2023. Any regulatory revision or legal ruling may cause the closure date to deviate.

3.5 On-Site Transportation used During Operation of the Impoundments

Materials entering the impoundments occur through force mains from the water treatment facility and power plants. On-site all-weather roadways are utilized for ash or FDGS removal and maintenance purposes. Drawings provided in Attachment 7 and Attachment 8 show the site access and roadways.

4. MAPS

4.1 Site Location Map

A Site Location Map is provided in Attachment 6. Pursuant to Section 845.220(a)(3), the map contains the following information:

- The facility boundary and all adjacent property extending at least 1,000 meters beyond the facility boundary
- All surface waters
- Limits of all 100 year-flood plains
- All natural areas designated as a Dedicated Illinois Nature Preserve under the Illinois Natural Areas Preservation Act
- All Historic and archeological sites designated by the National Historic Preservation Act and the Illinois Historic Sites Advisory Council Act, and
- All areas identified as critical habitat under the Endangered Species Act of 1973 and the Illinois Endangered Species Protection Act

4.2 Site Plan Map

A Site Plan Map is provided in Attachment 7. Pursuant to Section 845.220(a)(4), the map contains the following information:

- The entire facility, including all existing CCR surface impoundment locations
- The boundaries, both above and below ground level, of the facility and all CCR surface impoundments
- Existing and proposed groundwater monitoring wells, and

- All main service corridors, transportation routes, and access roads to the facility

5. PROPOSED CONSTRUCTION INFORMATION

5.1 Description of Proposed Construction

The proposed construction subject to this application is the in-place closure of both the Lakeside Ash Pond and the Dallman Ash Pond pursuant to Section 845.750. The final cover system installation process will include:

- Dewatering of the CCR as necessary to promote final grading of the CCR to establish a final slope to promote precipitation runoff of the final cover
- Placement of a 40 mil low density polyethylene (LDPE) cover
- Placement of a geomembrane to promote lateral drainage on top of the LDPE
- Placement of a three-foot soil protective layer, or as otherwise approved
- Establishment of final vegetation on the protective layer
- Stormwater management structures

Closure via a final cover system will not result in changes to the volume of CCR or the nature of the CCR or non-CCR waste streams.

5.2 Plans and Specifications

Plans and specifications for installation of the final cover system are contained in Attachment 8. This includes design specification and the Construction Quality Assurance Plan.

5.3 Signature and Seal of Qualified Professional Engineer

All applicable designs and certifications be signed and sealed by a licensed professional engineering in the State of Illinois. However, a signature and seal of the engineer for this document is provided in Attachment 9.

5.4 Public Notification and Meetings Certification

Documentation of the public notice and summary of the public meetings addressing the Closure Alternative Assessment and Assessment of Corrective Measures is provided in Attachment 10.

5.5 Summary of Issues Raised by the Public During the Notification and Public Meetings

A summary of the issues raised by the public during the notification and public meetings are provided in Attachment 10.

5.6 Summary of Revisions, Determinations, or Other Considerations Made in Response to Issues Raised by the Public During the Notification and Public Meetings

Issues or questions raised by the public during the two meetings are summarized in Exhibit N of Attachment 10. This included comments submitted by the public during the 14-day comment period following the meetings. CWLP evaluated each of the public comments. One such comment resulted in further evaluation of the use of the rail terminus near West Laketown in the event closure by removal was implemented. Additional details were included in the Closure

Alternatives Assessment and Assessment of Corrective Action provided in Attachment 11. In addition, the Final Closure Plan will be revised to include the selected closure method which contains a geomembrane drainage layer above the 40 mil LDPE liner overlying the CCR.

5.7 List of Interested Persons in Attendance who Would Like Added to the Agency's listserv for the Facility

The names of those attendees requesting addition to the Agency's listserv are provided in Exhibit J of Attachment 10.

5.8 Certification of Contractors/Subcontractors for Erosion Control Training

Section 4 of Form CCR 2CC requires that all contractors, subcontractors, and installers utilized to construct, install, modify or close a CCR surface impoundment are participants in a training program that is approved and registered with the U.S. Department of Labor's Employment and Training Administration and that includes instruction in erosion control and environmental remediation.

Installation of the final cover system as designed herein will be typically completed by at least two different entities; an earth moving contractor and a liner crew for placement of the LDPE and geomembrane. The typical process to procure contractors is done by competitive bidding. The contractors are not known at this time. CWLP will ensure that the contractors will meet the referenced requirements, as necessary and if applicable.

5.9 Certification of Contractors/Subcontractors for Erosion Control Training

Section 4 of Form CCR 2CC requires that all contractors, subcontractors, and installers utilized to construct, install, modify or close a CCR surface impoundment are participants in a training program that is approved and registered with the U.S. Department of Labor's Employment and Training Administration and that includes instruction in heavy equipment and excavation.

Installation of the final cover system as designed herein will typically be completed by at least two different entities; an earth moving contractor and a liner crew for placement of the LDPE and geomembrane. The typical process to procure contractors is done by competitive bidding. The contractors are not known at this time. CWLP will ensure that the contractors will meet the referenced requirements, as necessary and if applicable.

6. GROUNDWATER MONITORING PROGRAM

6.1 Hydrogeologic Site Investigation

A detailed summary of the hydrogeologic site investigation is provided in Section 3 of the Closure Alternatives Assessment and Assessment of Corrective Action provided in Attachment 11. A more detailed report is included in the Hydrogeologic Report, Groundwater Monitoring Program and Statistical Procedures provided in Attachment 12.

6.2 Design and Construction Plans of the Groundwater Monitoring System

The Groundwater Monitoring System is in place and operating. The design of the Groundwater Monitoring System is contained in the Hydrogeologic Report, Groundwater Monitoring Program and Statistical Procedures provided in Attachment 12.

6.3 Groundwater Sampling and Analysis Plan

The Groundwater Sampling and Analysis Program that includes selection of the statistical procedures to be used for evaluating groundwater monitoring data is contained in the Hydrogeologic Report, Groundwater Monitoring Program and Statistical Procedures provided in Attachment 12.

7. CLOSURE

7.1 Final Closure Plan

The Final Closure Plan is provided in Attachment 13. The Closure Alternatives Assessment is provided in Attachment 11.

7.2 Proposed Closure Schedule

Currently the planned completion of installation of the final cover system on the Lakeside and Dallman Ash Ponds is the end of 2026. In the event alternate closure dates are approved by applicable regulatory entities, the final completion of closure date could vary.

7.3 Post-Closure Care Plan

The Post-Closure Care Plan is provided in Attachment 14.

8. GROUNDWATER MODELING

8.1 Results of Groundwater Contaminant Transport Model

The results of the groundwater Contaminant Transport Model and calculations showing how the closure will achieve compliance with the applicable groundwater quality standards are contained in Attachment 2 (Closure Alternatives Assessment – Contaminant Transport Model) of the Closure Alternatives Assessment and Assessment of Corrective Measures, herein provided as Attachment 11.

8.2 Modeling Input and Assumptions

The input values and model assumptions utilized in the Contaminant Transport Model are provided in Attachment 2 (Closure Alternatives Assessment – Contaminant Transport Model) of the Closure Alternatives Assessment and Assessment of Corrective Measures, herein provided as Attachment 11.

8.3 Description of Fate and Transport of Contaminants

A description of the fate and transport of contaminants with the selected corrective action over time are contained in Attachment 2 (Closure Alternatives Assessment – Contaminant Transport Model) of the Closure Alternatives Assessment and Assessment of Corrective Measures, herein provided as Attachment 11.

8.4 Capture Zone Modeling

No Capture Zone modeling was required.

8.5 Model License and Software

The two-dimensional contaminant transport model software utilized was MIGRATE. The Illinois EPA already contains the software and appropriate licenses for use of the model.

9. CORRECTIVE ACTION

Sections 9 through 15 address Application Form CCR 2CA – Corrective Action Construction.

9.1 Drawing Satisfying the Requirements of 35 IAC 845.220(a)(1)(F)

The drawings referenced in Section 845.220(a)(1)(F) are discussed in Section 2.5 above.

9.2 Type, Purpose, and Location of Existing Instrumentation

The description of the type, purpose and location of existing instrumentation was discussed in Section 2.6 above.

9.3 Area Capacity Curves for the CCR Impoundment

The area capacity curves were discussed in Section 2.7 above.

9.4 Spillway and Diversion Design Features, Capacities and Calculations Used in their Determination

Details of any spillway and diversion design features were discussed in Section 2.8 above.

9.5 Construction Specifications and Provisions for Surveillance, Maintenance, and Repair of the CCR Surface Impoundment

Construction specification and provisions for surveillance, maintenance and repair of the CCR surface impoundment were address in Section 2.9 above.

9.6 Physical and Engineering Properties of the Foundation and Abutment Materials on which the CCR Surface Impoundment is Constructed

The physical and engineering properties of the foundation and abutment materials were discussed in Section 2.1 above.

9.7 Type, Size, Range, and Physical and Engineering Properties of the Materials Used in Constructing Each Zone or Stage of the CCR Surface Impoundment

Details and discussions addressing the subject material are provided in Section 2.2 above.

9.8 Method of Site Preparation and Construction of Each Zone of Each Impoundment

Information pertaining to the method, site preparation and construction of each zone was discussed in Section 2.3 above.

9.9 Dates of Construction of Each Successive Stage of Construction of the CCR Surface Impoundment

A discussion of the dates of construction for each impoundment were provided in Section 2.4 above.

10. NARATIVE DESCRIPTION OF FACILITY

10.1 Types of CCR and Chemical Analyses of CCR Placed in the Surface Impoundments

The types of CCR and related chemical analyses are discussed in Section 3.1 above.

10.2 Maximum Capacity of Each Surface Impoundment

The maximum capacity of each surface impoundment is discussed in Section 3.2 above.

10.3 Rate of Waste Streams Entering Impoundments

The rate of waste streams entering the impoundments is discussed in Section 3.3 above.

10.4 Length of Time Impoundments will Receive Waste

The life of the impoundments has been discussed in Section 3.4 above.

10.5 On-Site Transportation used During Operation of the Impoundments

On-site transportation used during operation is discussed in Section 3.5 above.

11. MAPS

11.1 Site Location Map

The Site Location Map is discussed in Section 4.1 above.

11.2 Site Plan Map

The Site Plan Map is discussed in Section 4.2 above.

12. PROPOSED CONSTRUCTION INFORMATION

12.1 Description of Proposed Construction

The proposed construction is discussed in Section 5.1 above.

12.2 Plans and Specifications

Plans and specifications were discussed in Section 5.2 above.

12.3 Signature and Seal of Qualified Professional Engineer

The signature and seal of a qualified professional engineer is addressed in Section 5.3 above.

12.4 Public Notification and Meetings Certification

Public notification and public meeting documentation was discussed in Section 5.4 above.

12.5 Summary of Issues Raised by the Public During the Notification and Public Meetings

Issues raised during the public notification and meetings process were discussed in Section 5.5 above.

12.6 Summary of Revisions, Determinations, or Other Considerations Made in Response to Issues Raised by the Public During the Notification and Public Meetings

Information pertaining to the revisions, determinations, or other considerations made in response to issues raised by the public during the notification and public meeting process was provided in Section 5.6 above.

12.7 List of Interested Persons in Attendance who Would Like Added to the Agency's listserv for the Facility

The names of those attendees requesting addition to the Agency's listserv were discussed in Section 5.7 above.

12.8 Certification of Contractors/Subcontractors for Erosion Control Training

Certification of contractors and subcontractors was discussed in Section 5.8 above.

12.9 Certification of Contractors/Subcontractors for Erosion Control Training

Certification of contractors and subcontractors was discussed in Section 5.9 above.

13. GROUNDWATER MONITORING PROGRAM

13.1 Hydrogeologic Site Investigation

The hydrogeologic site investigation was discussed in Section 6.1 above.

13.2 Design and Construction Plans of the Groundwater Monitoring System

The design and construction plans of the Groundwater Monitoring System were discussed in Section 6.2 above.

13.3 Groundwater Sampling and Analysis Plan

The Groundwater Sampling and Analysis Program was discussed in Section 6.3 above.

14. CORRECTIVE ACTION

14.1 Corrective Action Plan

As discussed in Section 1, it has been determined the impoundments do not meet the requirements of Section 845.300 (Placement above the Uppermost Aquifer). Therefore, pursuant to Section 845.350, the closure process defined in Section 845.700 must be implemented. It has been determined that the closure process will occur by final cover system as defined in Section 845.750. Information referenced in Section 845.670 has been addressed in the closure Plans and Specifications (Attachment 8), Closure Alternatives Assessment and Assessment of Corrective Measures (Attachment 11), and in the Final Closure Plan (Attachment 13).

14.2 Corrective Action Groundwater Monitoring Program

The existing Groundwater Monitoring System is adequate to monitor the impoundments during closure. No revisions or augmentation of the current system is necessary.

14.3 Interim Measures

The Lakeside and Dallman Ash Ponds have been active since 1958 and 1976, respectively. The Groundwater Monitoring System has identified the extent of concentrations above a groundwater protection standard. The subject concentrations have been retained on CWLP owned property and are stable. The factors listed in Section 845.680(a)(3) were addressed in the Closure Alternatives Assessment and Assessment of Corrective Measures provided in Attachment 11. It is determined that no interim measures are needed during the closure process of the impoundments.

15. GROUNDWATER MODELING

15.1 Results of Groundwater Contaminant Transport Model

The results of the groundwater Contaminant Transport Model were discussed in Section 8.1 above.

15.2 Modeling Input and Assumptions

The model input values and assumptions are discussed in Section 8.2 above.

15.3 Description of Fate and Transport of Contaminants

A description of the fate and transport of contaminants is provided in Section 8.3 above.

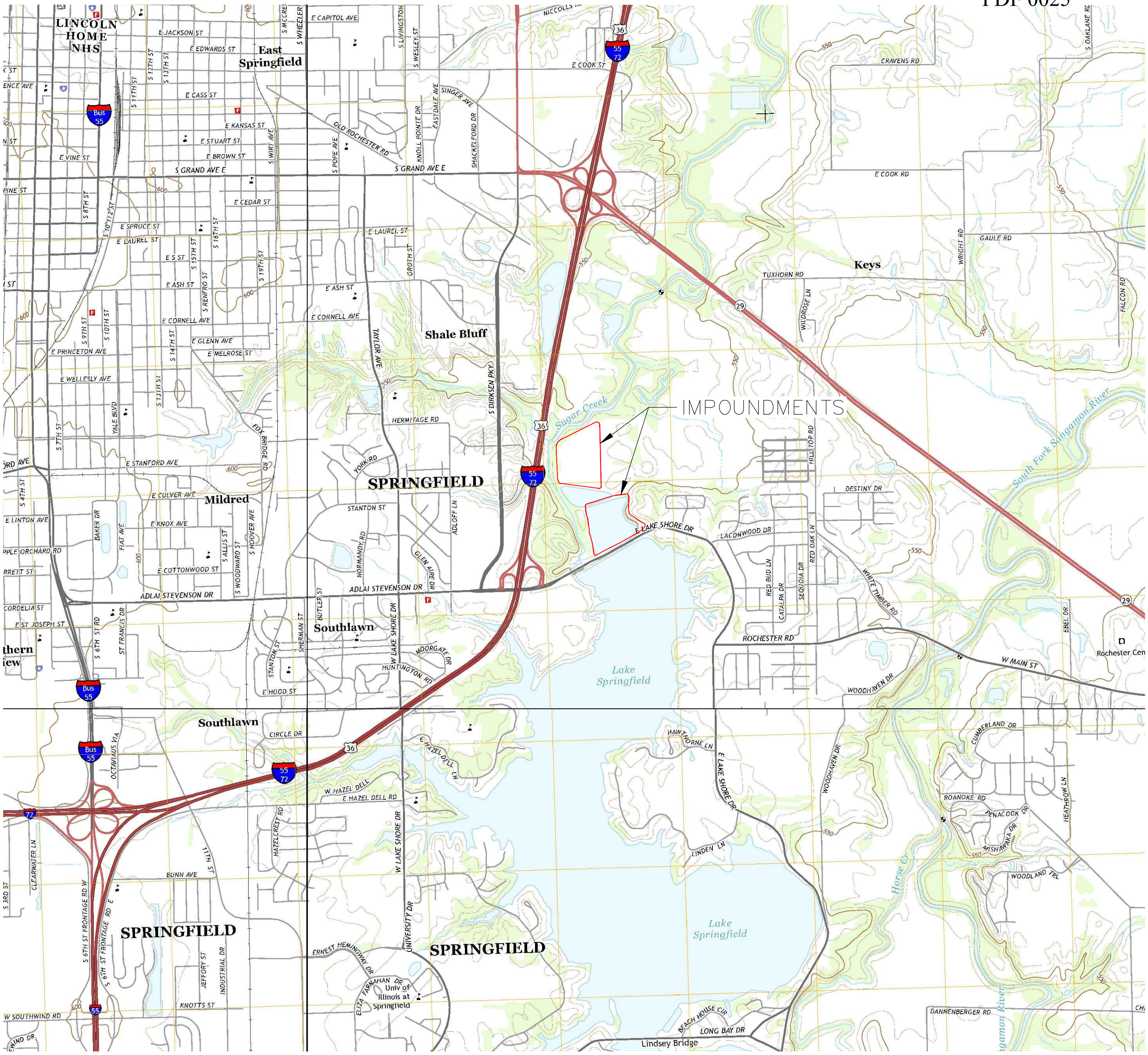
15.4 Capture Zone Modeling

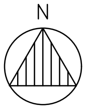
Capture zone modeling was discussed in Section 8.4 above.

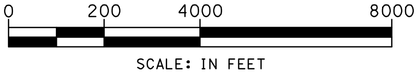
15.5 Model License and Software

The licensing and model software are discussed in Section 8.5 above.

FIGURES







NOTE:

BACKGROUND IMAGE COURTESY OF
UNITED STATES GEOLOGICAL SURVEY.

ANDREWS ENGINEERING

3300 GINGER CREEK DRIVE
SPRINGFIELD, ILLINOIS 62711-7233
PH (217) 787-2334 WWW.ANDREWS-ENG.COM
PONTIAC, IL • LOMBARD, IL • INDIANAPOLIS, IN • WARRENTON, MO

APPROVED BY: BJH *DESIGNED BY:* BJH *DRAWN BY:* MPN

SITE LOCATION

PLANS PREPARED FOR

CITY, WATER, LIGHT & POWER

SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: JULY 2021

PROJECT ID: 200387/0026

SHEET NUMBER:

FIGURE 1

LEGEND

CCR SURFACE IMPOUNDMENT

NOTE

IMAGE SOURCE: GOOGLE EARTH PRO, IMAGE DATE JUNE 7, 2016.

N

0 150 300 600

SCALE: IN FEET

NO.	DATE	REVISION DESCRIPTION	BY

ANDREWS ENGINEERING

3300 GINGER CREEK DRIVE
SPRINGFIELD, ILLINOIS 62711-7233
PH (217) 787-2334 WWW.ANDREWS-ENG.COM
PONTIAC, IL • LOMBARD, IL • INDIANAPOLIS, IN • WARRENTON, MO

APPROVED BY: DG
DESIGNED BY: DG
DRAWN BY: MPN

SITE DETAILS

PLANS PREPARED FOR
CITY, WATER, LIGHT AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: JULY 2021

PROJECT ID: 200387/0026

SHEET NUMBER:

FIG. 2

Tab: Layout1 Last Saved: July 28, 2021, by Mike Nguyen Plotted: Wednesday, July 28, 2021 9:34:45 AM
J:\S\Springfield CWLP\CWLP\dwg\2021\Site Details.dwg

ATTACHMENTS

ATTACHMENT 1

FORM CCR1, FORM CCR 2CC AND FORM CCR 2CA

- FORM CCR1 – GENERAL PROVISIONS
- FORM CCR 2CC – CLOSURE CONSTRUCTION
- FORM CCR 2CA – CORRECTIVE ACTION CONSTRUCTION

FORM CCR1

GENERAL PROVISIONS

Form CCR 1

Illinois Environmental Protection Agency
CCR Surface Impoundment Permit Application
Form CCR 1 – General Provisions

Bureau of Water ID Number:
IL0024767

CCR Permit Number:

Facility Name:
City Water, Light and Power

For IEPA Use Only

SECTION 1: FACILITY, OPERATOR, AND OWNER INFORMATION (35 Ill. Adm. Code 845.210(b))

Facility, Operator, and Owner Information

1.1 Facility Name
City Water, Light and Power

1.2 Illinois EPA CCR Permit Number (if applicable)

1.3 Facility Contact Information

Name (first and last)	Title	Phone Number
Patrick Becker	Env. Health and Safety Mgr.	217.757.8610 ext. 1110

Email address
pj.becker@cwlp.com

1.4 Facility Mailing Address

Street or P.O. box
Regulatory Affairs, 801 E. Monroe, 4th Floor

City or town	State	Zip Code
Springfield	Illinois	62701

1.5 Facility Location

Street, route number, or other specific identifier
3100 Stevenson Drive

County name	County code (if known)	
Sangamon	17167	

City or town	State	Zip Code
Springfield	Illinois	62712

1.6 Name of Owner/Operator
City of Springfield

Facility, Operator, and Owner Info

1.7 Owner/Operator Contact Information

Name (first and last)	Title	Phone Number
Patrick Becker	Env. Health and Safety Mgr.	217.757.8610 ext. 1110

Email address
pj.becker@cwlp.com

1.8 Owner/Operator Mailing Address

Street or P.O. box
Environmental Affairs, 801 E. Monroe, 4th Floor

City or town	State	Zip Code
Springfield	Illinois	62701

SECTION 2: LEGAL DESCRIPTION (35 Ill. Adm. Code 845.210(c))

Legal Description

2.1 Legal Description of the facility boundary

PIN 22120400002 - L 17-20 W CRK L 23 W1/2 SE 12-15-5
PIN 22120400007 - SE SE 12-15-5
PIN 22120400009 - PT E1/2 NE SE 12-15-5
PIN 22120400010 - LOT 9 E PT N NE CORNER & ALL LOTS 12 13 16 17 & 20 E OF CREEK W1/2 SE1/4 12-15-5
PIN 22120400011 - PT NE1/4 SE1/4 12-15-5
PIN 22120400012 - PT N PT SE1/4 12-15-5
PIN 22120200022 - PT NE 1/4 12-15-5

SECTION 3: PUBLICLY ACCESSIBLE INTERNET SITE REQUIREMENTS (35 Ill. Adm. Code 845.810)

Internet Site

3.1 Web Address(es) to publicly accessible internet site(s) (CCR website)

https://www.cwlp.com/IllinoisCCRCompliance.aspx

3.2 Is/are the website(s) titled “Illinois CCR Rule Compliance Data and Information”

☑ Yes ☐ No

SECTION 4: IMPOUNDMENT IDENTIFICATION

Impoundment Identification

4.1 List all the impoundment identification numbers for your facility and check the corresponding box to indicate that you have attached a written description for each impoundment.

Lakeside Ash Pond – W1671200052-01	☑	Attached written description
Dallman Ash Pond – W1671200052-02	☑	Attached written description
	☐	Attached written description
	☐	Attached written description
	☐	Attached written description
	☐	Attached written description

	☐	Attached written description
	☐	Attached written description
	☐	Attached written description
	☐	Attached written description

SECTION 5: CHECKLIST AND CERTIFICATION STATEMENT

Checklist and Certification Statement

5.1 In Column 1 below, mark the sections of Form 1 that you have completed and are submitting with your application. For each section, specify in Column 2 any attachments that you are enclosing.

Column 1		Column 2	
Section 1: Facility, Operator, and Owner Information	☑	w/attachments	☐
Section 2: Legal Description	☑	w/attachments	☐
Section 3: Publicly Accessible Internet Site Requirement	☑	w/attachments	☐
Section 4: Impoundment Identification	☑	w/attachments	☐

5.2 **Certification Statement**

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name (print or type first and last name) of Owner/Operator Patrick J. Becker	Official Title EHS Manager
Signature	Date Signed 1/26/2022

ATTACHMENT TO FORM CCR1

Section 4: Impoundment Identification

4.1 List all the impoundment identification numbers for your facility and check the corresponding box to indicate that you have attached a written description for each impoundment.

Lakeside Ash Pond – W1671200052-01

The Lakeside Ash Pond is primarily a diked embankment with some incising along the east perimeter. The Lakeside Ash Pond consists of four separate ponds (i.e., three lime softening ponds and a settling pond) totaling approximately 35 acres. CCR ash was first placed in the Lakeside Ash Pond area in the middle 1930's. The Lakeside Ash Pond is its present configuration was placed into service prior to 1958 and ceased receiving ash in 2009. Presently, lime-softening ponds located on the southern portion of the Lakeside Ash Pond receive water softening lime residuals from the CWLP Drinking Water Purification Plant, Flue Gas Desulfurization Waste Water Treatment Plant (FGD WWTP) clarifier blowdown sludge, and wash-down water from miscellaneous floor drains.

Dallman Ash Pond – W1671200052-01

The Dallman Ash Pond is a partially incised and diked embankment placed into service in approximately 1976. The Dallman Ash Pond is one contiguous 34.5 acre pond. The Dallman Ash Pond is used as a settling pond for fly ash and bottom ash, which are sluiced with raw lake water from Dallman Power Station Units 31, 32 and 33. In addition, industrial wastewater treatment plant clarifier blowdown, landfill leachate and evaporation pond water is pumped into the Dallman Ash Pond. No expansion of the Dallman Ash Pond has occurred since its construction.

FORM CCR 2CC

CLOSURE CONSTRUCTION

Form 2CC

Illinois Environmental Protection Agency

CCR Surface Impoundment Permit Application

Form CCR 2CC – Closure Construction

Bureau of Water ID Number:

IL0024767

CCR Permit Number:

Facility Name:

City Water, Light and Power

For IEPA Use Only

SECTION 1: DESIGN AND CONSTRUCTION PLANS (35 Ill. Adm. Code 845.220)

Design and Construction Plans (Construction History)

1.1	CCR surface impoundment name.	City Water, Light and Power
1.2	Identification number of the CCR surface impoundment (if one has been assigned by the Agency).	Lakeside Ash Pond – W1671200052-01 Dallman Ash Pond – W1671200052-02
1.3	Describe the boundaries of the CCR surface impoundment (35 Ill. Adm. Code 845.210 (c)).	PIN 22120400002 - L 17-20 W CRK L 23 W1/2 SE 12-15-5 PIN 22120400007 - SE SE 12-15-5 PIN 22120400009 - PT E1/2 NE SE 12-15-5 PIN 22120400010 - LOT 9 E PT N NE CORNER & ALL LOTS 12 13 16 17 & 20 E OF CREEK W1/2 SE1/4 12-15-5 PIN 22120400011 - PT NE1/4 SE1/4 12-15-5 PIN 22120400012 - PT N PT SE1/4 12-15-5 PIN 22120200022 - PT NE 1/4 12-15-5
1.4	State the purpose for which the CCR surface impoundment is being used.	The Lakeside Ash Pond currently receives limesludge from the CWLP Drinking Water Purification Plant, scrubber wastewater treatment plant clarifier blowdown and water from miscellaneous floor drains. The Dallman Ash Pond currently receives fly ash and bottom ash, which are sluiced with raw lake water, industrial wastewater treatment plant clarifier blowdown and landfill leachate.
1.5	How long has the CCR surface impoundment been in operation?	Lakeside - 64 years Dallman - 46 years
1.6	List the types of CCR that have been placed in the CCR surface impoundment.	Lakeside and Dallman contain fly ash, bottom ash and scrubber wastewater treatment plant clarifier blowdown.

Design and Construction Plans (Continued)

1.7	List the name of the watershed within which the CCR surface impoundment is located.	
	Both ash ponds were built from diked embankments, virtually no surface water flows into the surface impoundments. Therefore, the watershed area for both of the CCR surface impoundments would be roughly equal to their surface area.	
1.8	What is the size in acres of the watershed within which the CCR surface impoundment is located?	
	Approximately 79.5 acres.	
1.9	Check the corresponding boxes to indicate that you have attached the following:	
	☑	A description of the physical and engineering properties of the foundation and abutment materials on which the CCR surface impoundment is constructed.
	☑	A statement of the type, size, range, and physical and engineering properties of the materials used in constructing each zone or stage of the CCR surface impoundment.
	☑	A statement of the method of site preparation and construction of each zone of the CCR surface impoundment.
	☑	A statement of the approximate dates of construction of each successive stage of construction of the CCR surface impoundment.
	☑	Drawings satisfying the requirements of 35 Ill. Adm. Code 845.220(a)(1)(F).
	☑	A description of the type, purpose, and location of existing instrumentation.
	☑	Area capacity curves for the CCR impoundment.
	☑	A description of each spillway and diversion design features and capacities and provide the calculations used in their determination.
	☑	The construction specifications and provisions for surveillance, maintenance, and repair of the CCR surface impoundment.
1.10.1	Is there any record or knowledge of structural instability of the CCR surface impoundment?	
	☐ Yes ☑ No	
1.10.2	If you answered yes to Item 1.10.1, provide detailed explanation of the structural instability.	

SECTION 2: NARRATIVE DESCRIPTION OF THE FACILITY (35 Ill. Adm. Code 845.220)

Narrative Description

2.1 List the types of CCR expected in the CCR surface impoundments.

The Lakeside Ash Pond received both bottom ash and fly ash. Since 2009, the only CCR placed in the Lakeside Ash Pond is FGD WWTP sludge. The other flows to the Lakeside Ash Pond are non-CCR materials.

The Dallman Ash Pond receives both fly ash and bottom ash sluiced with raw lake water from Units 31, 32 and 33. Other flows to the Dallman Ash Pond are non-CCR.

2.2 Have you attached a chemical analysis of each type of expected CCR?

☑ Yes

2.3 Estimate of the maximum capacity of the surface impoundment in gallons or cubic yards.

Lakeside - 1,330,000 cy   Dallman - 1,500,000 cy

2.4 The rate at which CCR and non-CCR waste streams currently enter the CCR impoundment in gallons per day and dry tons.

See Section 3.3	GPD		dTn

2.5 Estimate length of time the CCR surface impoundment will receive CCR and non-CCR waste streams.

Less than 24 months, late 2023

2.6 Have you attached an on-site transportation plan that includes all existing and planned roads in the facility that will be used during the operation of the CCR surface impoundment?

☑ Yes

SECTION 3: MAPS (35 Ill. Adm. Code 845.220)

Maps

3.1 Check the corresponding boxes to indicate that you have attached the following maps:

☑ A site location map on the most recent United Sates Geological Survey (USGS) quadrangle of the area from the 7 ½ minute series (topographic) or on another map whose scale clearly shows the information required in 35 Ill. Adm. Code 845.220(a)(3).

☑ Site plans maps satisfying the requirements of 35 Ill. Adm. Code 845.220(a)(4).

SECTION 4: ATTACHMENTS

Attachments

4.1 Check the corresponding boxes to indicate that you have attached the following:

☑ A narrative description of the proposed construction of, or modification to, a CCR surface impoundment and any projected changes in the volume or nature of the CCR or non-CCR waste streams.

☑ Plans and specifications fully describing the design, nature, function, and interrelationship of each individual component of the facility.

☑ The signature and seal of a qualified professional engineer.

☑ Certification that the owner or operator of the CCR surface impoundment completed the public notification and public meetings required under 35 Ill. Adm. Code 845.240.

Attachments (Continued)

☑ A summary of the issues raised by the public during the public notification and public meetings.

☑ A summary of any revisions, determinations, or other considerations made in response to those issues raised by the public during the public notification and public meetings.

☑ A list of interested persons in attendance who would like to be added to the Agency's listserv for the facility.

☑ Certification that all contractors, subcontractors, and installers utilized to construct, install, modify, or close a CCR surface impoundment are participants in a training program that is approved by and registered with the U.S. Department of Labor's Employment and Training Administration and that includes instruction in erosion control and environmental remediation.

☑ Certification that all contractors, subcontractors, and installers utilized to construct, install, modify, or close a CCR surface impoundment are participants in a training program that is approved by and registered with the U.S. Department of Labor's Employment and Training Administration and that includes instruction in the operation of heavy equipment and excavation.

SECTION 5: GROUNDWATER MONITORING PROGRAM

Groundwater Monitoring

5.1 Indicate that you have attached the following components of a new groundwater monitoring program or any modifications to an existing groundwater monitoring program by checking the corresponding boxes:

☑ A hydrogeologic site investigation meeting the requirements of 35 Ill. Adm. Code 845.620, if applicable.

☑ Design and construction plans of a groundwater monitoring system meeting the requirements of 35 Ill. Adm. Code 845.630.

☑ A proposed groundwater sampling and analysis program that includes selection of the statistical procedures to be used for evaluating groundwater monitoring data as required by 35 Ill. Adm. Code 845.640 and 845.650.

SECTION 6: CLOSURE (35 Ill. Adm. Code 845.220(d))

Closure

6.1 What is the closure prioritization category under 35 Ill. Adm. Code 845.700(g), if applicable?

Category 3

6.2 Indicate that you have attached the following by checking the corresponding boxes:

☑ The final closure plan, as specified in 35 Ill. Adm. Code 845.720(b), which includes the closure alternatives analysis required by 35 Ill. Adm. Code 845.710.

☑ Proposed schedule to complete closure.

☑ Post-closure care plan as specified in 35 Ill. Adm. Code 845.780(d).

SECTION 7: GROUNDWATER MODELING (35 Ill. Adm. Code 845.220(d)(3))

Groundwater

7.1 Indicate that you have attached the following by checking the corresponding boxes:

☑ The results of groundwater contaminant transport modeling and calculations showing how the closure will achieve compliance with the applicable groundwater standards.

☑ All modeling inputs and assumptions.

☑ Description of the fate and transport of contaminants with the selected corrective action over time.

		☑	Capture zone modeling, if applicable.
		☑	Any necessary licenses and software needed to review and access both the model and the data contained within the model.

FORM CCR 2CA

CORRECTIVE ACTION CONSTRUCTION

Form CCR 2CA

Illinois Environmental Protection Agency

CCR Surface Impoundment Permit Application

Form CCR 2CA – Corrective Action Construction

Bureau of Water ID Number:

IL0024767

CCR Permit Number:

Facility Name:

City Water, Light and Power

For IEPA Use Only

SECTION 1: DESIGN AND CONSTRUCTION PLANS (35 Ill. Adm. Code 845.220)

Design and Construction Plans

1.1	CCR surface impoundment name.
	City Water, Light and Power
1.2	Identification number of the CCR surface impoundment (if one has been assigned by the Agency).
	Lakeside Ash Pond – W1671200052-01 Dallman Ash Pond – W1671200052-02
1.3	Describe the boundaries of the CCR surface impoundment (35 Ill. Adm. Code 845.210 (c)).
	PIN 22120400002 - L 17-20 W CRK L 23 W1/2 SE 12-15-5 PIN 22120400007 - SE SE 12-15-5 PIN 22120400009 - PT E1/2 NE SE 12-15-5 PIN 22120400010 - LOT 9 E PT N NE CORNER & ALL LOTS 12 13 16 17 & 20 E OF CREEK W1/2 SE1/4 12-15-5 PIN 22120400011 - PT NE1/4 SE1/4 12-15-5 PIN 22120400012 - PT N PT SE1/4 12-15-5 PIN 22120200022 - PT NE 1/4 12-15-5
1.4	State the purpose for which the CCR surface impoundment is being used.
	The Lakeside Ash Pond currently receives limesludge from the CWLP Drinking Water Purification Plant, scrubber wastewater treatment plant clarifier blowdown and water from miscellaneous floor drains. The Dallman Ash Pond currently receives fly ash and bottom ash, which are sluiced with raw lake water, industrial wastewater treatment plant clarifier blowdown and landfill leachate.
1.5	How long has the CCR surface impoundment been in operation?
	Lakeside - 64 years Dallman - 46 years
1.6	List the types of CCR that have been placed in the CCR surface impoundment.
	Lakeside and Dallman contain fly ash, bottom ash and scrubber wastewater treatment plant clarifier blowdown.
1.7	List the name of the watershed within which the CCR surface impoundment is located.
	Both ash ponds were built from diked embankments, virtually no surface water flows into the surface impoundments. Therefore, the watershed area for both of the CCR surface impoundments would be roughly equal to their surface area.

Design and Construction Plans (Continued)

1.8	What is the size in acres of the watershed within which the CCR surface impoundment is located?	
	Approximately 79.5 acres.	
1.9	Check the corresponding boxes to indicate that you have attached the following:	
	☑	Drawings satisfying the requirements of 35 Ill. Adm. Code 845.220(a)(1)(F).
	☑	A description of the type, purpose, and location of existing instrumentation.
	☑	Area capacity curves for the CCR Impoundment.
	☑	A description of each spillway and diversion design features and capacities and provide the calculations used in their determination.
	☑	The construction specifications and provisions for surveillance, maintenance, and repair of the CCR surface impoundment.
	☑	A description of the physical and engineering properties of the foundation and abutment materials on which the CCR surface impoundment is constructed.
	☑	A statement of the type, size, and physical and engineering properties of the materials used in constructing each zone or stage of the CCR surface impoundment.
	☑	A statement of the method of site preparation and construction of each zone of the CCR impoundment.
	☑	A statement of the approximate dates of construction of each successive stage of construction of the CCR surface impoundment.
1.10.1	Is there any record or knowledge of structural instability of the CCR surface impoundment?	
	☐ Yes ☑ No	
1.10.2	If you answered yes to Item 1.10.1, provide detailed explanation of the structural instability.	

SECTION 2: NARRATIVE DESCRIPTION OF THE FACILITY (35 Ill. Adm. Code 845.220)

Narrative Description

2.1	List the types of CCR expected in the CCR surface impoundments.
	The Lakeside Ash Pond received both bottom ash and fly ash. Since 2009, the only CCR placed in the Lakeside Ash Pond is FGD WWTP sludge. The other flows to the Lakeside Ash Pond are non-CCR materials. The Dallman Ash Pond receives both fly ash and bottom ash sluiced with raw lake water from Units 31, 32 and 33. Other flows to the Dallman Ash Pond are non-CCR.

Narrative Description (Cont.)	2.2	Have you attached a chemical analysis of each type of expected CCR?			
		☑	Yes		
	2.3	Estimate of the maximum capacity of the surface impoundment in gallons or cubic yards.			
		Lakeside - 1,330,000 cy Dallman - 1,500,000 cy			
	2.4	Enter the rate at which CCR and non-CCR waste streams currently enter the CCR impoundment in gallons per day and dry tons.			
		See Section 3.3 of App.	GPD		dTn
	2.5	Estimate length of time the CCR surface impoundment will receive CCR and non-CCR waste streams.			
		Less than 24 months, late 2023			
	2.6	Have you attached an on-site transportation plan that includes all existing and planned roads in the facility that will be used during the operation of the CCR surface impoundment?			
		☑	Yes		

SECTION 3: MAPS (35 Ill. Adm. Code 845.220)

Maps	3.1	Check the corresponding boxes to indicate that you have attached the following maps:	
		☑	A site location map on the most recent United Sates Geological Survey (USGS) quadrangle of the area from the 7 ½ minute series (topographic) or on another map whose scale clearly shows the information required in 35 Ill. Adm. Code 845.220(a)(3).
		☑	Site plans maps satisfying the requirements of 35 Ill. Adm. Code 845.220(a)(4).

SECTION 4: ATTACHMENTS

Attachments	4.1	Check the corresponding boxes to indicate that you have attached the following:	
		☑	A narrative description of the proposed construction of, or modification to, a CCR surface impoundment and any projected changes in the volume or nature of the CCR or non-CCR waste streams.
		☑	Plans and specifications fully describing the design, nature, function, and interrelationship of each individual component of the facility.
		☑	The signature and seal of a qualified professional engineer.
		☑	Certification that the owner or operator of the CCR surface impoundment completed the public notification and public meetings required under 35 Ill. Adm. Code 845.240.
		☑	A summary of the issues raised by the public during the public notification and public meetings.
		☑	A summary of any revisions, determinations, or other considerations made in response to those issues raised by the public during the public notification and public meetings.
		☑	Certification that all contractors, subcontractors, and installers utilized to construct, install, modify, or close a CCR surface impoundment are participants in a training program that is approved by and registered with the U.S. Department of Labor's Employment and Training Administration and that includes instruction in erosion control and environmental remediation.

		☑	Certification that all contractors, subcontractors, and installers utilized to construct, install, modify, or close a CCR surface impoundment are participants in a training program that is approved by and registered with the U.S. Department of Labor's Employment and Training Administration and that includes instruction in the operation of heavy equipment and excavation.

SECTION 5: GROUNDWATER MONITORING PROGRAM

Groundwater Monitoring	5.1	Indicate that you have attached the following components of a new groundwater monitoring program or any modifications to an existing groundwater monitoring program by checking the corresponding boxes:	
		☑	A hydrogeologic site investigation meeting the requirements of 35 Ill. Adm. Code 845.620, if applicable.
		☑	Design and construction plans of a groundwater monitoring system meeting the requirements of 35 Ill. Adm. Code 845.630.
		☑	A proposed groundwater sampling and analysis program that includes selection of the statistical procedures to be used for evaluating groundwater monitoring data as required by 35 Ill. Adm. Code 845.640 and 845.650.

SECTION 6: CORRECTIVE ACTION (35 Ill. Adm. Code 845.220(c))

Corrective Action	6.1	Indicate that you have attached a corrective action plan as specified in 35 Ill. Adm. Code 845.670 by checking the box below:	
		☑	Corrective action plan as specified in 35 Ill. Adm. Code 845.670.
		☑	Corrective action groundwater monitoring program, including identification of revisions to the groundwater system for corrective action.
		☑	Any interim measures necessary to reduce the contaminants leaching from the CCR surface impoundment, and/or potential exposures to human or ecological receptors, including an analysis of the factors specified in 35 Ill. Adm. Code 845.680(a)(3).

SECTION 7: GROUNDWATER MODELING (35 Ill. Adm. Code 845.220(c))

Groundwater Modeling	7.1	Indicate that you have attached the following by checking the corresponding boxes:	
		☑	The results of groundwater contaminant transport modeling and calculations showing how the corrective action will achieve compliance with the applicable groundwater standards.
		☑	All modeling inputs and assumptions.
		☑	Description of the fate and transport of contaminants with the selected corrective action over time.
		☑	Capture zone modeling, if applicable.
		☑	Any necessary licenses and software needed to review and access both the model and the data contained within the models required by 35 Ill. Adm. Code 845.220(c)(2).

ATTACHMENT 2

1987 ENGINEERING REPORT

HANSON
ENGINEERS
INCORPORATED

July 2, 1987

RECEIVED
JUL 10 1987
ENVIRONMENTAL AFFAIRS

City Water, Light and Power
V.Y. Dallman Power Plant
3100 Stevenson Drive
Springfield, Illinois 62703

Attn: Mr. Carl J. Saladino

Re: Engineering Report
Proposed Embankment Modifications
CWLP Ash Disposal Area
Springfield, Illinois

Dear Carl,

Enclosed are four copies of our Engineering Report for the proposed embankment modifications at your existing Lakeside ash disposal area.

Two copies of our report have been sent to the Illinois Department of Transportation, Division of Water Resources for conceptual approval of the permit application.

Please do not hesitate to call if you have any questions regarding this information.

Very truly yours,

HANSON ENGINEERS INCORPORATED

Danny L. Kerns

Danny L. Kerns, P.E.
Associate Partner

Enclosures

DLK/pb

HANSON ENGINEERS
INCORPORATED

July 2, 1987

Mr. Martin Stralow, P.E.
Chief, Dam Safety Section
Illinois Department of Transportation
Division of Water Resources
2300 South Dirksen Parkway
Springfield, Illinois 62764

Re: Engineering Report
Proposed Embankment Modifications
CWLP Ash Disposal Area
Springfield, Illinois

Dear Mr. Stralow:

Enclosed for your review and comments are two copies of our Engineering Report for the proposed embankment modifications at the Lakeside ash disposal area in Springfield, Illinois. The report includes an application for a permit to perform the proposed modifications.

Upon receipt of conceptual approval for this project, we will prepare and submit construction drawings and specifications along with the other items required for the permitting process.

Please keep us advised of any concerns or comments which may arise during your review so that we can address them in a timely manner.

Very truly yours,

HANSON ENGINEERS INCORPORATED

Danny L Kerns

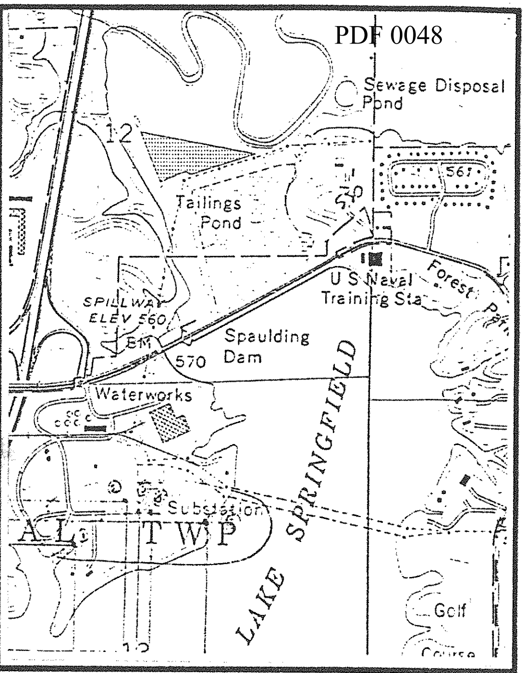
Danny L. Kerns, P.E.
Associate Partner

enclosures

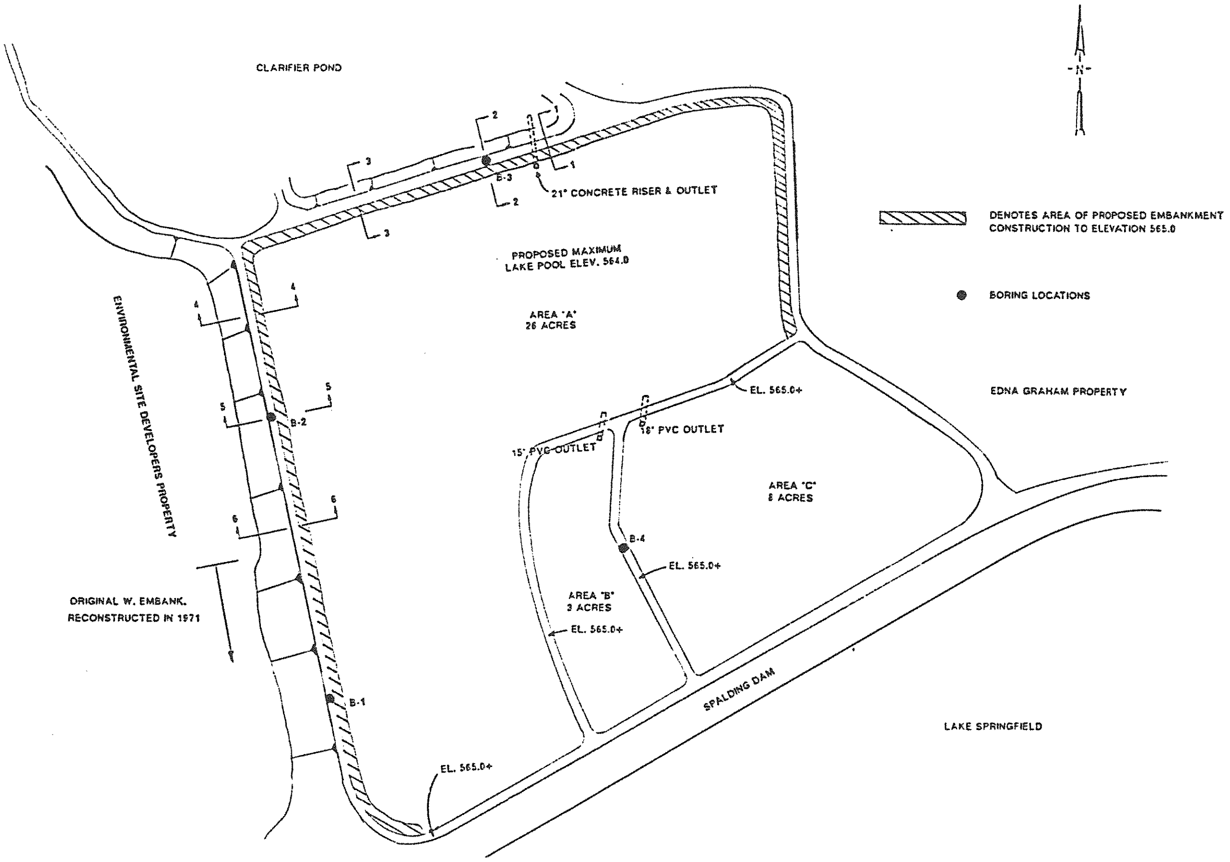
DLK/pb

✓CC: Mr. Carl J. Saladino
CWLP

1525 SOUTH SIXTH STREET ■ SPRINGFIELD, ILLINOIS 62703-2886 ■ 217/788-2450
SPRINGFIELD, ILLINOIS ■ PEORIA, ILLINOIS ■ ROCKFORD, ILLINOIS



VICINITY MAP



LIST OF ADJACENT PROPERTY OWNERS

NO.	NAME	ADDRESS
1.	ENVIRONMENTAL SITE DEVELOPERS INC.	195 EAST LAKE DRIVE SPRINGFIELD, IL. 62703
2.	MRS. EDNA GRAHAM	
3.		
4.		

PROJECT DESCRIPTION:

RAISE PORTION OF LAKESIDE
ASH DISPOSAL EMBANKMENT
A MAXIMUM OF 10 FT.

LOCATION:

SPAULDING DAM
CITY OF SPRINGFIELD
SANGAMON COUNTY

SHEET OF

NCR FORM 427
01 JUNE 81

CORPS OF ENGINEERS COPY

JOINT APPLICATION FORM

1. Application Number (To be assigned by Agency)

2. Date
Day Month Year

3. For Agency use only (Date Received)

4. Name and address of applicant
City of Springfield
City Water, Light and Power
3100 Stevenson Drive
Springfield, Illinois 62703
Telephone no. during business hours
A/C (217) 786-4063
A/C ( )

5. Name, address, and title of authorized agent
Hanson Engineers Incorporated
1525 South 6th Street
Springfield, Illinois 62703
Telephone no. during business hours
A/C (217) 788-2450
A/C ( )

6. Describe in detail the proposed activity, its purpose, and intended use. If additional space is needed, attach additional support information to each agency application.

Raise portion of existing Lakeside Ash Disposal Area embankment a maximum of 10 ft to obtain additional storage volume for ash and filter cake slude disposal.

7. Names, addresses, and telephone numbers of all adjoining and potentially affected property owners, including the owner of subject property if different from applicant.

Environmental Site Developers, Inc., 195 East Lake Drive, Springfield, IL, 217-529-1891
Mrs. Edna Graham

8. Location of activity
Address:
City Water, Light and Power - Spaulding Dam
Street, road, or other descriptive location
Springfield
In or near city or town
Sangamon Illinois 62703
County State Zip Code

Legal Description:

¼	Sec.	Twp.	Rge.	P.M.
SE	12	T15N	R5W	3rd

Tax Assessor's Description (if known):
Map No. Subdiv. No. Lot No.
Name of waterway at location of the activity

9. Date activity is proposed to commence September, 1987 Date activity is expected to be completed June, 1988

10. Is any portion of the activity for which authorization is sought now complete? Yes [✓ No] If answer is "Yes" give reasons in the remark section. Month and Year the activity was completed - Indicate the existing work on drawings.

11. List all approvals or certifications required by other federal, interstate, state, or local agencies for any structures, construction, discharges, deposits, or other activities described in this application. If this form is being used for concurrent application to the Corps of Engineers, Illinois Department of Transportation, and Illinois Environmental Protection Agency, these agencies need not be listed.

Issuing Agency	Type Approval	Identification No.	Date of Application	Date of Approval
-	-	-	-	-

12. Has any agency denied approval for the activity described herein or for any activity directly related to the activity described herein. Yes [✓ No] (If "Yes", explain in remarks.)

13. Remarks

14. Application is hereby made for authorizations of the activities described herein. I certify that I am familiar with the information contained in the application, and that to the best of my knowledge and belief, such information is true, complete, and accurate. I further certify that I possess the authority to undertake the proposed activities.

Signature of Applicant or Authorized Agent

NCR FORM 426
01 JUNE 81

CORPS OF ENGINEERS COPY - SEE JURISDICTIONAL MAP FOR ADDRESS

ENGINEERING REPORT
PROPOSED EMBANKMENT MODIFICATIONS
CWLP ASH DISPOSAL AREA
SPRINGFIELD, ILLINOIS

HANSON
ENGINEERS
INCORPORATED
®

ENGINEERING REPORT
PROPOSED EMBANKMENT MODIFICATIONS
CWLP ASH DISPOSAL AREA
SPRINGFIELD, ILLINOIS

Prepared By

Hanson Engineers Incorporated
1525 South Sixth Street
Springfield, Illinois 62703-2886

Prepared For

City Water, Light and Power
3100 Stevenson Drive
Springfield, Illinois 62703

July 2, 1987

HANSON
ENGINEERS
INCORPORATED

July 2, 1987

City Water, Light and Power
V.Y. Dallman Power Plant
3100 Stevenson Drive
Springfield, Illinois 62703

Attn: Mr. Carl J. Saladino

Re: Engineering Report
Proposed Embankment Modifications
CWLP Ash Disposal Area
Springfield, Illinois

Gentlemen:

Following is our Engineering Report for the proposed embankment modifications at your existing ash disposal area in Springfield, Illinois. This work was completed in accordance with our agreement for engineering services dated April 2, 1987.

Boring samples will be retained in our laboratory and disposed of after a minimum of 90 days. Please notify our office if you wish alternative disposition of the samples.

We are pleased to have had the opportunity to perform this work. If you have any questions concerning the report, or if Hanson Engineers may be of additional service to you on this project, please do not hesitate to call.

Very truly yours,

HANSON ENGINEERS INCORPORATED

Danny L Kerns

Danny L. Kerns, P.E.
Associate Partner

Approved by John M. Healy
John M. Healy, P.E., S.E.
Vice President

1525 SOUTH SIXTH STREET ■ SPRINGFIELD, ILLINOIS 62703-2886 ■ 217/788-2450
SPRINGFIELD, ILLINOIS ■ PEORIA, ILLINOIS ■ ROCKFORD, ILLINOIS

- CONTENTS -

INTRODUCTION

This report presents the results of our investigation of the existing ash disposal area embankment and our analyses of the proposed modifications to the embankment. The purpose of this investigation was to develop specific recommendations relative to the proposed modifications and to secure field information which will be of aid during construction.

The conclusions and recommendations presented within this report have been developed directly from: (1) the results of four test borings made at the site by Central Illinois Drilling Company, (2) the results of laboratory testing on samples obtained from these borings, (3) our site inspection of existing embankment conditions, and (4) analyses of existing and proposed conditions. This report has been prepared for the exclusive use of City Water, Light and Power for specific application to this project in accordance with generally accepted engineering practices. No other warranty, expressed or implied, is made.

The locations of the borings on the site were laid out in the field by Hanson Engineers relative to existing site features with the use of a cloth tape. Elevations of the ground surface at the boring locations were determined with a level instrument utilizing the crest of the disposal area outlet pipe at elevation 554.1 as a reference datum. The locations and elevations of the borings have been determined with sufficient accuracy for the intentions of the subsurface investigation but should not be referenced for other purposes. The boring locations relative to the proposed construction are shown in Figure 2.

Detailed field logs have been prepared by the drilling foreman which record the changes encountered in the subsurface strata and summarize the field sampling completed. No attempts have been made by Hanson Engineers to modify the subsurface descriptions on these logs to conform with later classifications made in the laboratory. It is emphasized that the recommendations contained within this report are based upon the laboratory classifications of samples. A copy of the driller's field logs is contained within Appendix A of this report.

Figures 3 and 4 are Laboratory Soil Test Data sheets which contain a completed tabulation of all visual classifications and routine tests completed by Hanson Engineers for this project. A description of procedures for the routine testing is presented within a later section of this report.

HISTORY OF ASH DISPOSAL AREA

The initial deposition of fly ash was started in the original disposal area north of Spaulding Dam shortly after completion of the first power plant sometime in the middle 1930's. This original disposal area encompassed Areas B and C shown in Figure 1, as well as the south half of Area A. The south portion of the west embankment was part of the construction for the original ash disposal area.

In 1966, plans were prepared for expanding the disposal area to the north. The north embankment and the north portion of the west embankment were constructed in conjunction with this expansion. Slopes of 2.0H to 1.0V are indicated on the construction drawings, as is a crest width of 12 ft. "Compact to 90% Maximum Density at Optimum Moisture" is noted on these 1966 drawings.

A breach occurred in the south portion (original) of the west embankment in 1970. Reconstruction of the entire original west embankment included a sand drain which was placed horizontally along the embankment toe and up the embankment slope. A buttress of compacted clay (capped on its lower portion with riprap) was placed over the sand drain. The reconstructed downstream face had a slope of 3.0H to 1.0V, with a berm formed at approximately mid-slope at the top of the riprap.

Sometime between 1971 and 1976, a clarifier pond was constructed immediately north of the ash disposal area. In 1976, construction drawings were prepared for a new ash disposal area for Dallman Power Plant. These construction drawings also include drawings for modifications to the north portion of the west embankment of the existing ash disposal area. These modifications include a sloped granular drainage blanket connected to an 8 in. diameter perforated pipe running the length of the embankment. Compacted material downstream of this drainage blanket flattened the downstream slope to 2.5 H to 1.0V. The outlet of the drainage pipe is indicated to be north of the original west embankment (which had been reconstructed in 1971).

North-south cross dikes were constructed over ponded ash material in the original disposal area subsequent to 1976. In addition, a portion of the north embankment of the original ash disposal area was raised in height. This construction formed Areas B and C to their present configurations.

PROPOSED MODIFICATIONS

In order to increase the storage capacity and useful life of the existing ash disposal area, it is proposed that the perimeter embankment of Area A be raised to elevation 565. This would effectively raise the existing embankment up to 10 ft in height and bring the Area A perimeter embankment crest to the approximate elevation of the embankments surrounding Areas B and C. The proposed modifications will involve raising approximately 3,200 lineal feet of embankment, primarily along the west and north sides of Area A.

The upstream method of construction is proposed for the embankment modifications. This method was selected for two reasons. First, it allows for the continued use of the existing embankment crest roadways during construction for haul trucks to and from the scrubber sludge and Dallman ash disposal areas to the north. These roadways can be maintained at their existing grades. Second, the upstream method of construction allows the existing embankment crest roadways to be used as a berm (width varies from approximately 14 ft to 24 ft) for the proposed final embankment section. This berm will serve to effectively reduce the overall outside slope of the embankment, thereby increasing the stability of the embankment section.

The proposed embankment modification will consist of a 10 ft wide crest with a 2.0H to 1.0V downstream side slope, a 1.0H to 1.0V upstream side slope, and a 10 ft maximum height as shown in Figure 2. In order to develop a stable base for construction equipment to place and compact the cohesive embankment material, it is proposed that bottom ash material be placed for a distance of up to approximately 45 ft upstream of the existing embankment crest. The bottom ash should displace the fly ash and filter cake sludge materials that are present upstream of the crest primarily along the north embankment and the northern portion of the west embankment.

In order to reduce the development of seepage pressures at the junction between the existing embankment and the proposed extension, we propose that a filter fabric wrapped perforated pipe be installed along this area. The pipe may be trenched in and surrounded with free draining material such as bottom ash. Non-perforated outlet pipes may be used to direct collected seepage into the clarifier pond.

A new drop inlet spillway pipe will be provided near the location of the existing pipe. This new pipe will pass through the proposed embankment and will pass through the crest and along the outside face of the existing embankment into the existing clarifier pond.

FIELD INVESTIGATION

The field investigation program for this project encompassed several items of work including: exploratory borings, sampling of the subsoils, field testing of the subsoils, and visual classifications by the boring foreman of the soil materials encountered. A site inspection was also conducted by representatives of Hanson Engineers to obtain information on present embankment conditions, spillway pipe sizes, and to develop cross sections at various locations along the embankment. In addition, 15 test pits were excavated with a backhoe to better characterize the nature of the materials directly upstream of the existing embankment crest.

The test borings were made with a truck mounted rig equipped with 8 in. diameter hollow stem augers to advance the hole. To permit proper laboratory identification and classification of the subsurface strata, representative samples of the subsoil were taken at regular intervals within each boring. Boring 1 was made in the southern portion of the west embankment. This is a portion of the original embankment for the disposal area and was reconstructed after a breach occurred in 1970. Borings 2 and 3 were made in the northern portion of the west embankment and the north embankment, respectively. These embankments were constructed as part of the disposal area expansion in 1966. Boring 4 was made in a cross dike which separates Areas B and C. This cross dike was constructed on ponded fly ash and bottom ash materials. The information obtained from Boring 4 was helpful in evaluating the effectiveness of the proposed upstream method of construction, where the proposed embankment will also be constructed on ponded fly ash and bottom ash materials.

Soil samples were recovered from the borings by driving a 2 in. O.D. (1 3/8 in. I.D.) split-barrel sampler in conformance with the requirements of ASTM Standard D 1586. The recovered samples were classified by the drilling foreman, sealed in properly identified glass jars, and stored in boxes for later shipment to Hanson Engineers' laboratory.

The field testing consisted of recording the resistance of the various substrata to penetration of the split-barrel sampler in conformance with the requirements of ASTM Standard D 1586. The testing procedure consisted of dropping a 140 lb hammer from a height of 30 in. onto the drill rods guiding the sampler. The number of blows (N) necessary to produce a penetration of 1 ft was recorded as the penetration resistance. To avoid seating errors, the blows for the first 6 in. of penetration were not taken into account; those required to increase the penetration from 6 to 18 in. were recorded as the N-value.

The site inspection was performed on June 2, 1987. The west and north embankments were observed for seepage, erosion channels, undesirable vegetative growth, sloughs, and animal holes. In addition, cross sections at various locations along these embankments were developed. Fifteen test pits were excavated along the upstream crest of the north and west embankments. These test pits were spaced approximately 100 ft apart along the north embankment and approximately 200 ft apart along the west embankment. The results of the site inspection and test pit investigation are described in a subsequent section of this report.

LABORATORY INVESTIGATION

Field samples delivered to our laboratory were subjected to a program of routine laboratory testing which included: soil type classifications by visual methods as recommended in ASTM Standard D 2488, moisture content determination, according to ASTM Standard D 2216, and unconfined compressive strength measurements (of cohesive soil samples) in general conformance with ASTM Standard D 2166. The data obtained from these standard test methods are grouped by boring and recorded on the Laboratory Soil Test Data sheets (Figures 3 and 4).

The laboratory classification of soil samples consisted of assigning each sample (by visual methods) to one of three primary soil groups, and conducting a few simple manual tests for more refined identification when required. The three soil groups are: coarse-grained soils (more than half of the particles by weight are visible to the naked eye); fine-grained soils (more than half of the particles by weight are so fine that they cannot be seen with the naked eye); and organic soils (those which obtain significant quantities of organic matter). The fine-grained soil fractions are subdivided into silt and clay based on visual appearance and simple manual tests which may include dry strength, dilatancy, and plastic thread. The coarse-grained soils are identified as boulders, cobbles, gravel, or sand, based on a visual evaluation of the size of the particles making up the sample, and estimates are made on the percentage of fines present. The presence of organic matter is based upon color, odor, and visual appearance.

In the unconfined compressive strength test, a cylinder of soil having a height of 1 1/2 to 2 times the average diameter is loaded to failure, in simple compression, quickly enough that the water content of the soil does not change. The failure load (or if the sample does not fail outright, the load required to produce 20 percent strain) is expressed as the load per unit of cross sectional area, in tons per square foot. A calibrated penetrometer was also employed to provide supplemental data on consistency or to test samples unsuitable for unconfined compressive strength testing. However, the values from the penetrometer tests are considered only as approximate indicators of consistency.

The results of the unconfined compression tests on the split-barrel samples are subject to interpretation considering the disturbance inherent to the sampling procedure that is used. Generally, shear strength determinations on split-barrel samples are considered slightly to moderately conservative depending upon the sensitivity of the subsoil strata being investigated.

EXISTING EMBANKMENT CONDITIONS

The perimeter embankment of the ash disposal area consists of several distinct sections which distinguish themselves by their configuration, history of construction, or other factors. The following paragraphs describe these various embankment sections as they relate to existing conditions and the proposed construction.

The south portion of the west embankment appeared to be in very good condition. While the downstream embankment slope is relatively flat (approximately 3.0H to 1.0V), trees and brush have been allowed to grow along this portion of the embankment. Numerous swampy, wet areas are present beyond the embankment toe. These are proably the result of drainage from the sand filter and drain which was incorporated into the 1971 reconstruction of this portion of the embankment. No signs of distress were observed along the crest or downstream slope in this area. Located along the west embankment crest are two pipes which carry ash as a slurry from Dallman Power Plant to the ash disposal area located across the clarifier pond to the north. Bottom ash is generally present upstream of this portion of the embankment.

A concentrated seep was observed at the toe of the embankment near the north end of the 1971 reconstruction. Flows from this seep were clear and were estimated to be approximately 2 to 4 gallons per minute. The location of this discharge corresponds to an 8 in. diameter toe drain outlet pipe indicated on construction drawings prepared in 1976. These drawings show a rehabilitation of the northern portion of the west embankment, incorporating a granular filter drain collecting seepage water into an 8 in. diameter perforated subdrain passing along the embankment toe to the outlet location. Compacted embankment material is shown over the granular filter drain. The rehabilitation flattened the downstream slope to 2.5H to 1.0V from 2.0H to 1.0V.

The northern portion of the west embankment also appeared to be in generally good condition. Downstream slopes were measured to be approximately 2.5H to 1.0V or flatter, and the crest width varied from 22 ft to 24 ft. The ponded materials upstream of the crest become increasingly fine to the north end of this embankment. No tension cracks or other indications of distress were noted on the embankment crest.

An erosional channel (approximately 2 ft wide and up to 1 ft deep) was noted on the downstream slope of this embankment. This channel did not appear to be active. A minor surface slide was observed on the downstream face in an area in which a break in the ash line had occurred previously. Ash was present at the toe of the embankment in this area as though it had washed down the slope. A small scarp is located near the top of the embankment in this slide area, and some embankment material is piled near the bottom of the slide area, which is located about two-thirds down the slope.

At the far north end of the west embankment, the downstream toe area is very flat and swampy, with cattail growth. This swampy area follows the toe of the west embankment around to the toe of the south embankment of the adjacent clarifier pond. No concentrated seeps were noted. However, the seepage from this area is collected in a shallow ditch which runs to nearby Sugar Creek. Flows in this ditch were estimated to be approximately 2 to 3 gallons per minute. Scattered small tree and brush growth was observed along this portion of the embankment.

The north embankment is considerably more steep than the west embankment. Measurements indicate that the downstream embankment face exists at a slope ranging from 1.0H to 1.0V to 1.3H to 1.0V. The crest width is about 14 ft, and no signs of distress were observed. Fairly heavy tree and brush growth exists along the downstream slope. A clarifier pond abuts the north embankment toe along a major portion of its length. The water level in this clarifier pond is only about 7 ft or 8 ft below the water level in the ash disposal area.

Test pits along the upstream edge of the north embankment encountered fly ash in the western portion and filter cake sludge in the eastern portion. These materials are both very fine, wet, and very soft. Cattail growth is fairly heavy along the areas where fly ash is present.

As a part of our site inspection, Illinois Department of Transportation, Division of Water Resources, Dam Inspection Forms were completed. Appendix B of this report contains these completed forms.

SLOPE STABILITY

Cross sections through the north and west embankments indicating existing and proposed conditions are presented in Figures 5, 6, and 7. Two of these cross sections were taken at the locations of Borings 2 and 3. The unconfined compressive strengths (Qu) and the Standard Penetration Test N-values from these borings are plotted on these cross sections. Also indicated are the generalized subsurface profiles at the boring locations. Similar test data and subsurface profile information are presented on Figure 8 for Borings 1 and 4.

Using this cross section information and the laboratory test data for samples obtained from the borings, slope stability analyses were performed for the north and west embankments. These analyses used slope stability charts originally published by Taylor (1937), and presented by Peck, Hanson, and Thornburn (Foundation Engineering, Second Edition, 1974, pages 298-299). These slope stability analyses used conservative values for soil shear strength and indicated factors of safety consistently greater than 1.5, which is the minimum recommended value. The slope stability calculations are included in Appendix C of this report.

HYDROLOGY AND HYDRAULICS

Our studies indicate that the ash disposal area occupies a surface area of approximately 37 acres. Of this total surface area, about 26 acres are in Area A (see Figure 1). Areas B and C occupy approximately 3 acres and 8 acres, respectively. The embankments which confine Areas B and C are at or above elevation 565. This is approximately 10 ft higher than the west and north embankments of Area A. The east side of Area A is confined by natural ground. The natural ground surface slopes upward from the east end of the Area A north embankment (about elevation 555) to the east end of the north embankment confining Area C (about elevation 565). The south limits of Areas A, B, and C are defined by Spaulding Dam, which forms Lake Springfield.

Filter cake sludge material is slurried into Areas B and C from the water treatment plant located to the southwest of the site. A majority of the solids settle in Areas B and C, and the water is decanted into Area A through drop inlet pipes located at the north ends of Areas B and C. Surface water also flows from Areas B and C into Area A through the drop inlets.

Coal combustion ash is slurried into the southwest corner of Area A from nearby Lakeside Power Plant. The ash materials settle out in Area A, and the water is decanted into the clarifier pond through a 21 in. diameter drop inlet pipe. The outlet of this pipe is submerged beneath the surface of the clarifier pond. The level of the clarifier pond was at approximately elevation 547 at the time of our site visit. The clarifier pond level is controlled by stop logs in the concrete outlet structure. Flows pass over the stop logs and then discharge into Sugar Creek.

The proposed modifications include raising the embankment surrounding Area A to approximately elevation 565, a maximum height of about 10 ft. This will extend the total height of the west and north embankments to about 28 ft.

This will also increase the storage capacity of Area A by about 260 acre-ft.

According to criteria established by the Illinois Department of Transportation, Division of Water Resources, an impoundment such as this is in the small size classification and in the Class III hazard classification. Such a structure is required to pass or contain the runoff from the 100 year rainfall event with adequate freeboard. With essentially no watershed area, the spillway would be expected to pass only the rain which falls directly on the disposal area (8.4 in. for the 100 year event). Our calculations indicate that the amount of water generated by this event (approximately 25.9 acre-ft) can be discharged from the ash disposal area into the clarifier pond in less than two days.

We propose that the crest of the new inlet structure be established at a maximum elevation of 564, which is 1 ft below the proposed embankment crest. If an emergency situation necessitates lowering the ash disposal area pool, we recommend that this be accomplished with filtered sumps and pumps or siphons discharging into the clarifier pond.

Our hydrology and hydraulic calculations are included in Appendix C of this report.

CONCLUSIONS AND RECOMMENDATIONS

The results of the investigation indicate that the proposed embankment modifications are feasible from a technical standpoint. The slope stability analyses indicate that an adequate factor of safety will exist for the proposed embankment section. Information obtained from Boring 4 indicates that construction of a compacted cohesive embankment is possible over ponded fly ash and bottom ash materials. A copy of the completed construction permit Joint Application Form is included in Appendix D.

We recommend that before construction of the proposed embankment is started the existing vegetation (cattails) should be removed from the embankment area. This may be accomplished by excavating the vegetation with a backhoe or dragline, or by displacing the vegetation (and underlying fly ash) with bottom ash material as it is placed upstream of the crest to provide a stable base for construction of the embankment. Lowering of the water level in the ash disposal area may be necessary until a stable base is provided and the compacted embankment is brought above the elevation of the existing embankment. A trial and error construction approach may be necessary to find the most effective means of providing a stable construction base.

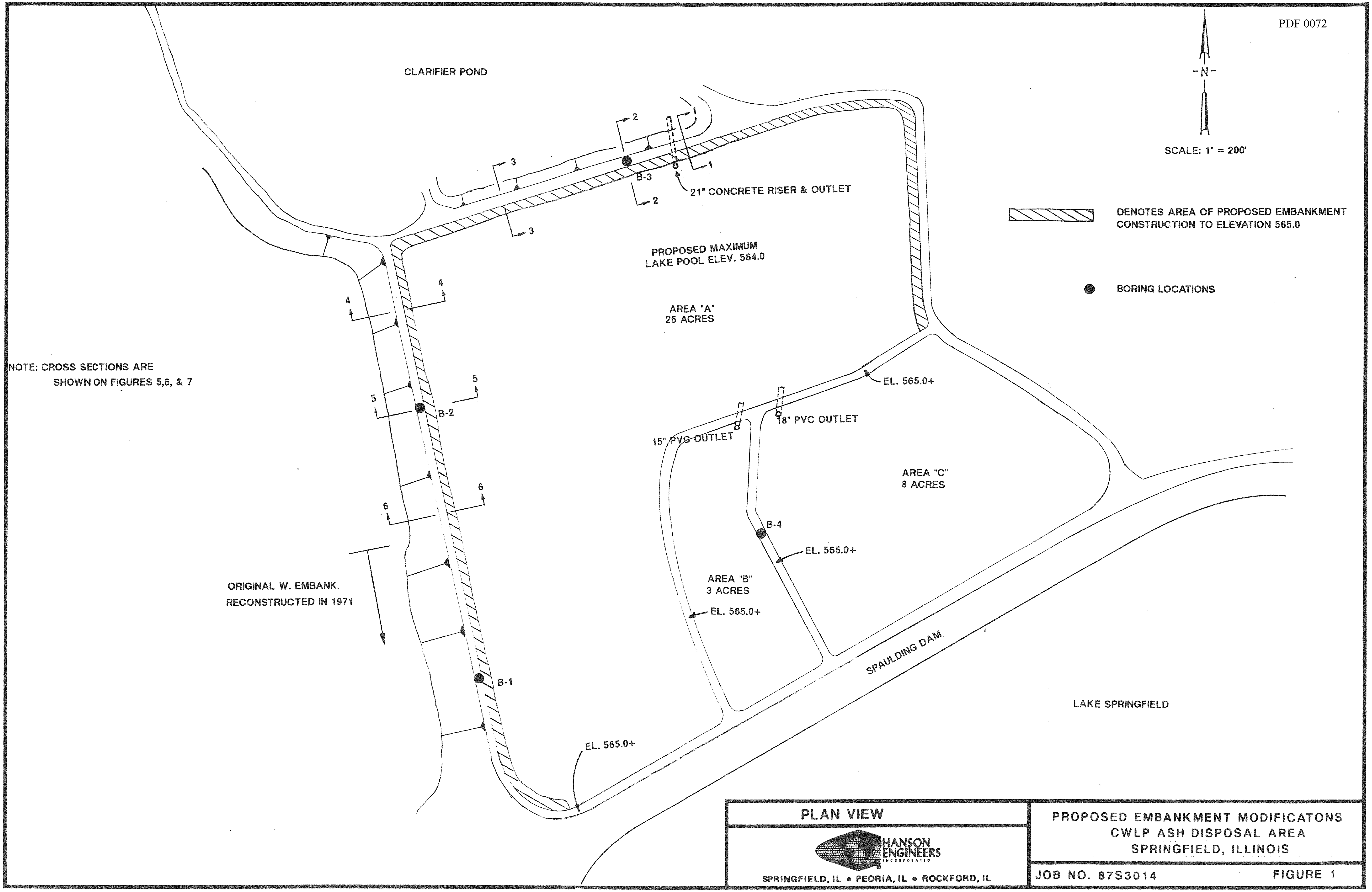
After a stable base is prepared, the cohesive embankment material should be placed in thin lifts (approximately 6 in. to 8 in. thick). The Standard Specifications for Road and Bridge Construction, adopted October 1, 1983, by Illinois Department of Transportation, should be followed for embankment construction (Section 207).

In addition to the proposed new construction, several maintenance items are proposed for the existing embankment. The trees and shrubs should be removed from the embankment faces. The downstream face of the west embankment should be dressed-up so that mowing operations can be performed. This includes repairing the minor slide area, the erosion gully, and any other areas (such as animal holes) which may obstruct mowing operations. The low, swampy areas should be sloped to drain.

The concentrated seep area should be investigated further to verify that the source of the seepage is an 8 in. diameter toe drain outlet pipe. If found, this outlet pipe should be carried farther away from the embankment toe. A headwall should be provided for the pipe so that it can be protected from mowing operations, and so that it is better identified as a drain outlet.

Although not deemed necessary for stability purposes, consideration should be given to flattening the downstream slope of the north embankment. This would be helpful for future ease of maintenance of this slope.

A Maintenance Plan for the ash disposal area embankment is included in Appendix E.



NOTE: CROSS SECTIONS ARE
SHOWN ON FIGURES 5,6, & 7

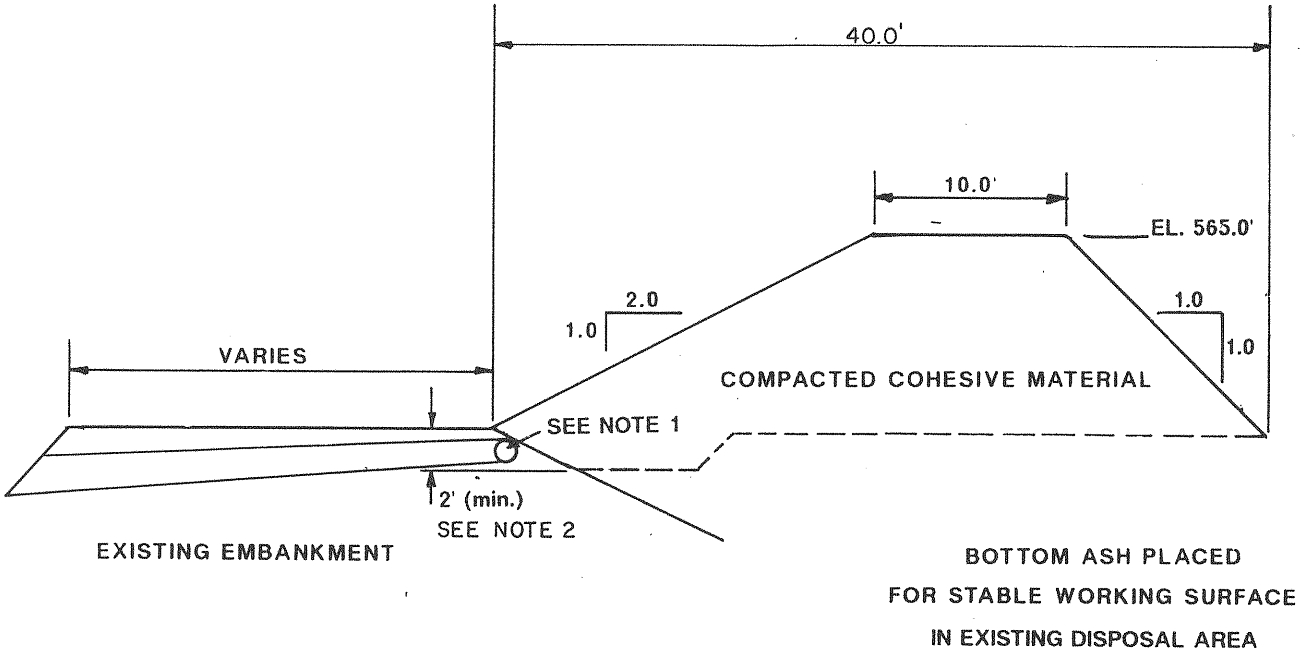
PLAN VIEW

HANSON ENGINEERS INCORPORATED

SPRINGFIELD, IL • PEORIA, IL • ROCKFORD, IL

PROPOSED EMBANKMENT MODIFICATONS
CWLP ASH DISPOSAL AREA
SPRINGFIELD, ILLINOIS

JOB NO. 87S3014 FIGURE 1



TYPICAL SECTION

NOTE: 1 - FILTER FABRIC WRAPPED PERFORATED CORRUGATED DRAINAGE PIPE WITH NON-PERFORATED OUTLETS INTO CLARIFIER POND. PIPE IS SURROUNDED WITH BED OF BOTTOM ASH

NOTE: 2 - COMPACTED COHESIVE MATERIAL "KEYED" INTO STABLE WORKING SURFACE A MINIMUM DEPTH OF 2 ft. FOR SEEPAGE CONTROL

EMBANKMENT CONFIGURATION

HANSON ENGINEERS
INCORPORATED

SPRINGFIELD, IL • PEORIA, IL • ROCKFORD, IL

PROPOSED EMBANKMENT MODIFICATONS
CWLP ASH DISPOSAL AREA
SPRINGFIELD, ILLINOIS

JOB NO. 87S3014

FIGURE 2

OPERATOR CMP
DATE June-2-1987
JOB NO.

HANSON ENGINEERS INCORPORATED

LABORATORY SOIL TEST DATA

PROJECT NAME AND LOCATION
CWL&P
Ash Pond Study
Springfield, Illinois

BOR.	SAMP.	DEPTH	ELEV.	N	STRENGTH TESTS			W	γw	γD	SPECIAL TESTS	SAMPLE DESCRIPTION
					Qu	M	P					
	Ground Surface Elev = 557.6											
1	1	2'-6"	555.1	14				6				Bottom Ash
	2	5'-0"	552.6	3				10				" "
	3	7'-6"	550.1	5				31				" " / dk. gray v.f. sandy silt
	4	10'-0"	547.6	1				79				Drk. gray v.f. sandy silt.
	5	12'-6"	545.1	4	0.92	B	0.8	33				Gray v.f. sandy silty clay.
	6	15'-0"	542.6	4			3.6	67				Gray silty f. sand. (fly ash).
	7	17'-6"	540.1	9				46				Fly ash.
	8	20'-0"	537.6	8				61				" ".
	9	22'-6"	535.1	5	0.71	Sh	1.3	26				Yel. brn. & gray v.f. sandy silty clay / ox. spots.
	10	25'-0"	532.6	15	2.27	B	1.8/3.8	21				Mix colored v.f. sandy silty clay (tr. f.-c. sand & f. gravel)
	11	27'-6"	530.1	9	1.86	B	2.4	27				Drk. gray v.f. sandy silty clay.
	12	30'-0"	527.6	8	0.50	B	0.6	33				" " " " " " ".
	Ground Surface Elev = 555.5											
2	1	2'-6"	553.0	21	5.89	BSp	4.5+	14				Brn. gray v.f. sandy silty clay / ox. spots.
	2	5'-0"	550.5	20	2.27	B	2.4	27				Yel. brn & gray v.f. sandy silty clay (tr. ox. spots.)
	3	7'-6"	548.0	10	1.86	B	2.2	29				Grn. & drk. brn v.f. sandy silty clay (tr. ox. spots.)
	4	10'-0"	545.5	12	2.68	BSh	2.4	25				Yel brn. & gray v.f. sandy silty clay / ox. spots.
	5	12'-6"	543.0	13	2.68	B	2.9	27				Grn. gray clay (tr. silt & ox. spots.)
	6	15'-0"	540.5	12	2.33	B	2.4	28				Brn. gray v.f. sandy silty clay / ox. spots.
	7	17'-6"	538.0	15	1.94	BSh	2.6	27				Yel. brn & gray v.f. sandy silty clay (tr. chard. pts.)
	8	20'-0"	535.5	14	2.27	B	2.5	28				" " & " " " " " " (" " ".)
	9	22'-6"	533.0	15	2.68	B	2.8	28				" " & " " " " " " (" " ".)
	10	25'-0"	530.5	9	1.16	B	1.1	26				" " & " " " " clayey silt / chard. pts.
	11	27'-6"	528.0	8	0.54	B	0.6	23				" " & " " " " silt (tr. chard pts.)
	12	30'-0"	525.5	6	0.89	B	0.7	24				" " & " " " " " / chard pts.
	13	35'-0"	520.5	5	0.78	B	0.8	23				" " & " " " " " & brn. f.-m. sand.
	14	40'-0"	515.5	19				14				Brn. gray f.-m. sand.
	14A	40'	515.5	19				29				Gray shaley clay.

Figure 8

OPERATOR CMP

DATE June-2-1987

JOB NO.

HANSON ENGINEERS INCORPORATED

LABORATORY SOIL TEST DATA

PROJECT NAME AND LOCATION

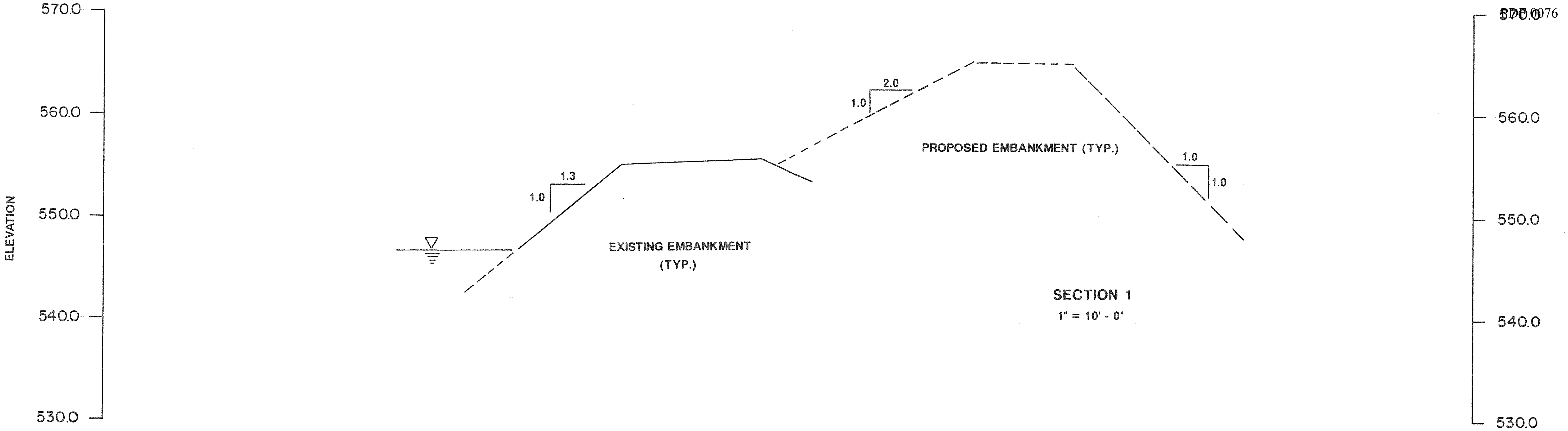
CWL&P

Ash Pond Study

Springfield, Illinois

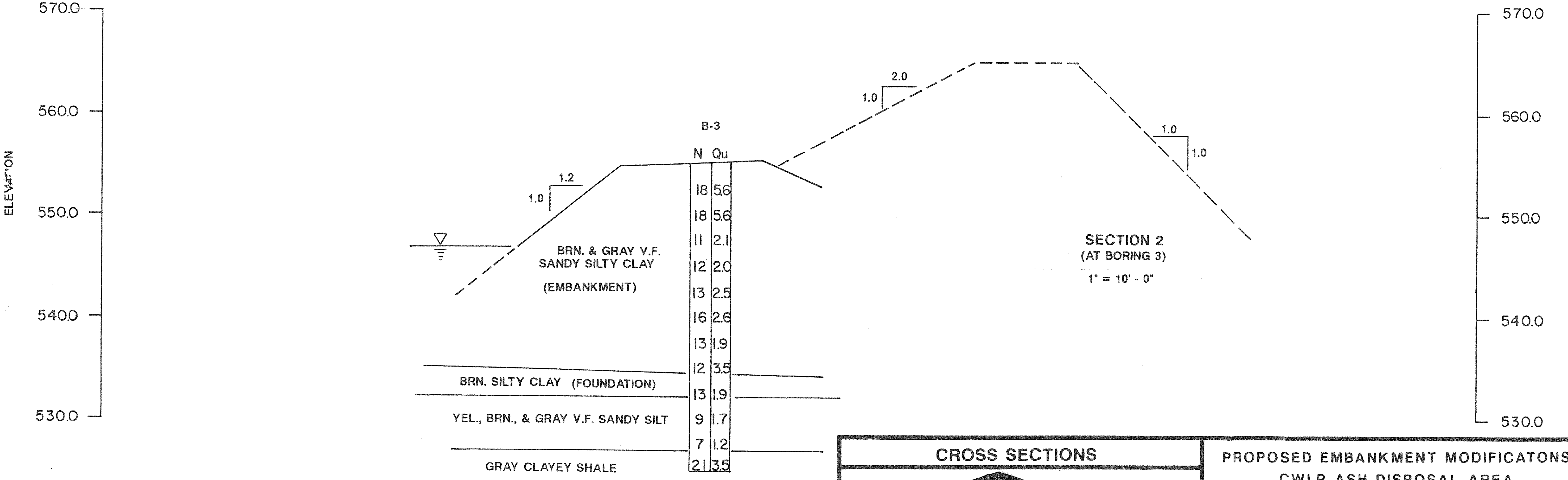
BOR.	SAMP.	DEPTH	ELEV.	N	STRENGTH TESTS			W	γW	γD	SPECIAL TESTS	SAMPLE DESCRIPTION
					Qu	M	P					
	Ground Surface Elev=555.2											
3	1	2'6"	552.7	18	5.56	BSh	4.5+	21				Brn.&drk.brn. v.f. sandy silty clay (tr. chard. pts. & sm. roots)
	2	5'0"	550.2	18	5.62	BSp	4.5+	22				Drk. gray clay (tr. chard. pts. & sm. roots.)
	3	7'6"	547.7	11	2.13	BSh	2.4	26				Yel. brn. & gray. v.f. sandy silty clay (tr. chard. pts.)
	4	10'0"	545.2	12	1.94	BSh	2.1	29				" " & drk. gray clay (tr. ox. spots.)
	5	12'6"	542.7	13	2.52	B	2.6	25				" " & gray v.f. sandy silty clay (tr. chard. pts.)
	6	15'0"	540.2	16	2.62	B	2.6	26				Drk. gray v.f. sandy silty clay.
	7	17'6"	537.7	13	1.86	B	1.6	28				Yel. brn. & gray v.f. sandy silty clay (tr. chard. pts.)
	8	20'0"	535.2	12	3.50	BSh	3.0/4.5+	21				Drk. gray v.f. sandy silty clay.
	9	22'6"	532.7	13	1.94	B	2.2	28				Yel brn & gray v.f. sandy silty clay & clayey silt/chard.pt
	10	25'0"	530.2	9	1.71	B	1.7	26				" " & " " " " silt/chard. pts.
	11	27'6"	527.7	7	1.24	B	1.2	27				" " & " " " " " / " ".
	12	30'0"	525.2	21	3.49	B	3.6	26				Brn. gray clay.
	Ground Surface Elev=566.2											
4	1	2'6"	563.7	5	3.05	Sh	2.8	20				Yel. brn. & gray v.f. sandy silt.
	2	5'0"	561.2	11	1.71	Sp	2.7	25				" " & " " " " " & fly ash.
	3	7'6"	558.7	7	1.65	BSh	2.2	13				" " & " v.f.-m. sandy silt (tr. c. sand.)
	4	10'0"	556.2	10	1.47	BSh	1.9	22				" " & " clay/brn. silty f. sand (tr. fly ash.)
	5	12'6"	553.7	8				18				Fly ash.
	6	15'0"	551.2	7				27				" ".
	7	17'6"	548.7	1				94				Drk. gray silty v.f. sand (fly ash.)
	8	20'0"	546.2	2				108				" " " " " " (" ")
	9	25'0"	541.2	1				129				" " " " " " (" ")
	10	30'0"	536.2	16	2.68	B	2.3	31				" " v.f. sandy silty clay.

Figure 4



SECTION 1

1" = 10' - 0"



SECTION 2
(AT BORING 3)

1" = 10' - 0"

CROSS SECTIONS

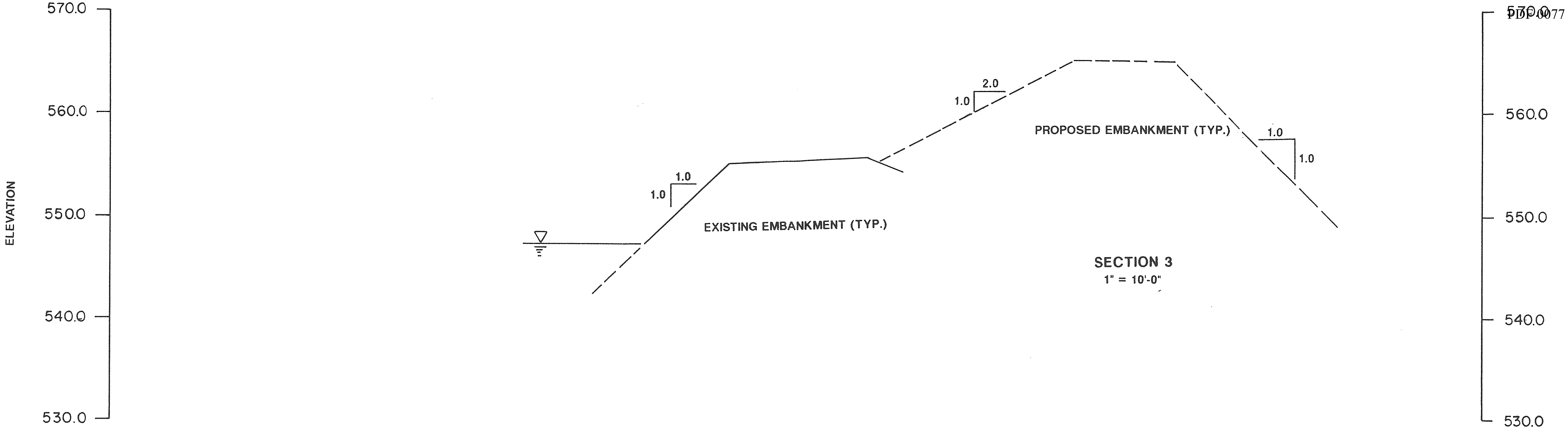
HANSON ENGINEERS INCORPORATED

SPRINGFIELD, IL • PEORIA, IL • ROCKFORD, IL

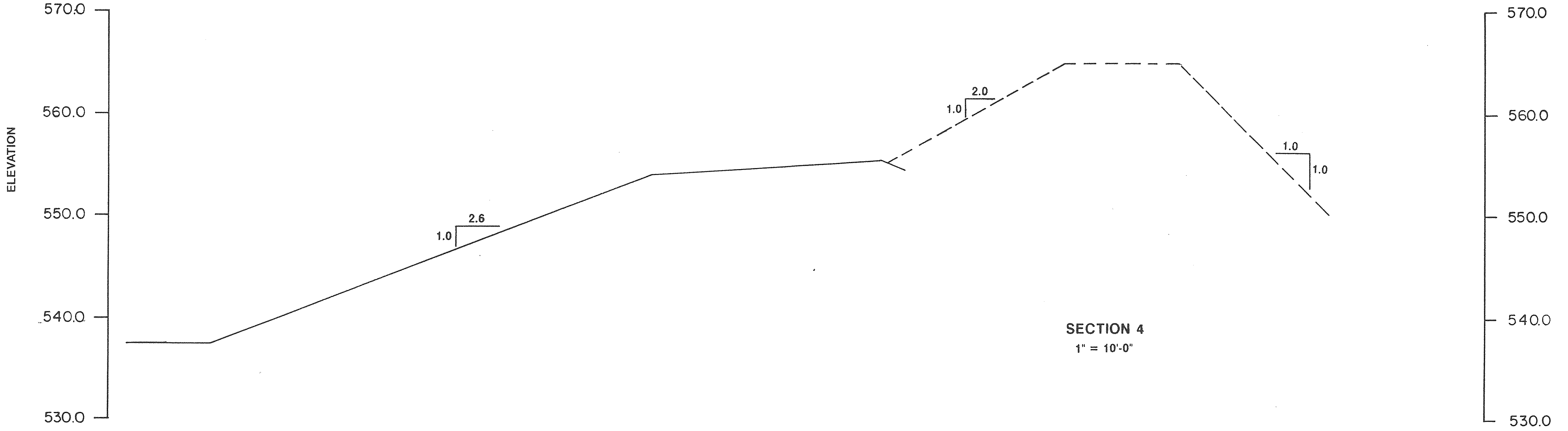
PROPOSED EMBANKMENT MODIFICATONS
CWLP ASH DISPOSAL AREA
SPRINGFIELD, ILLINOIS

JOB NO. 87S3014

FIGURE 5



SECTION 3
1" = 10'-0"



SECTION 4
1" = 10'-0"

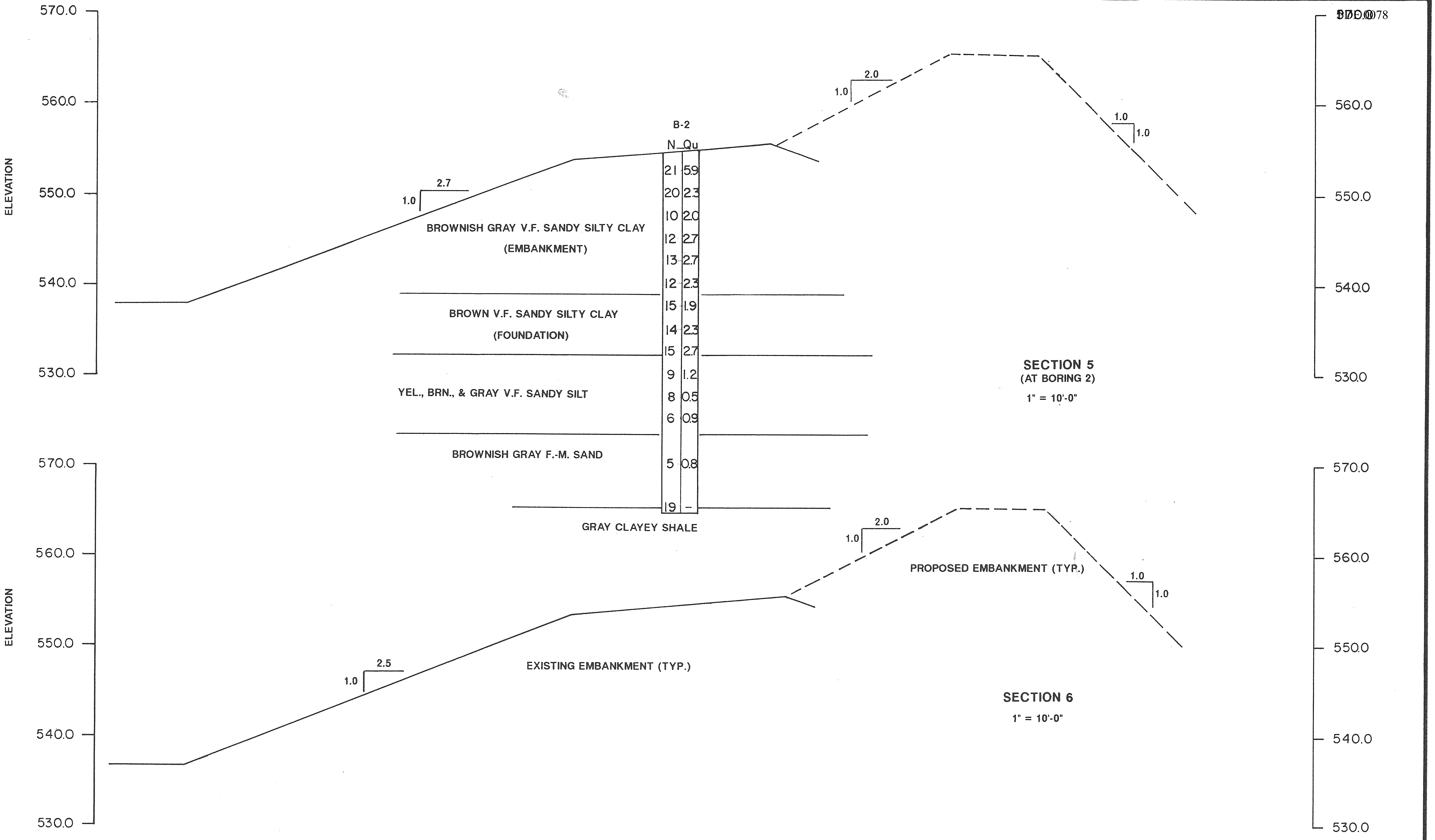
CROSS SECTIONS

HANSON ENGINEERS INCORPORATED
SPRINGFIELD, IL • PEORIA, IL • ROCKFORD, IL

PROPOSED EMBANKMENT MODIFICATONS
CWLP ASH DISPOSAL AREA
SPRINGFIELD, ILLINOIS

JOB NO. 87S3014

FIGURE 6



CROSS SECTIONS

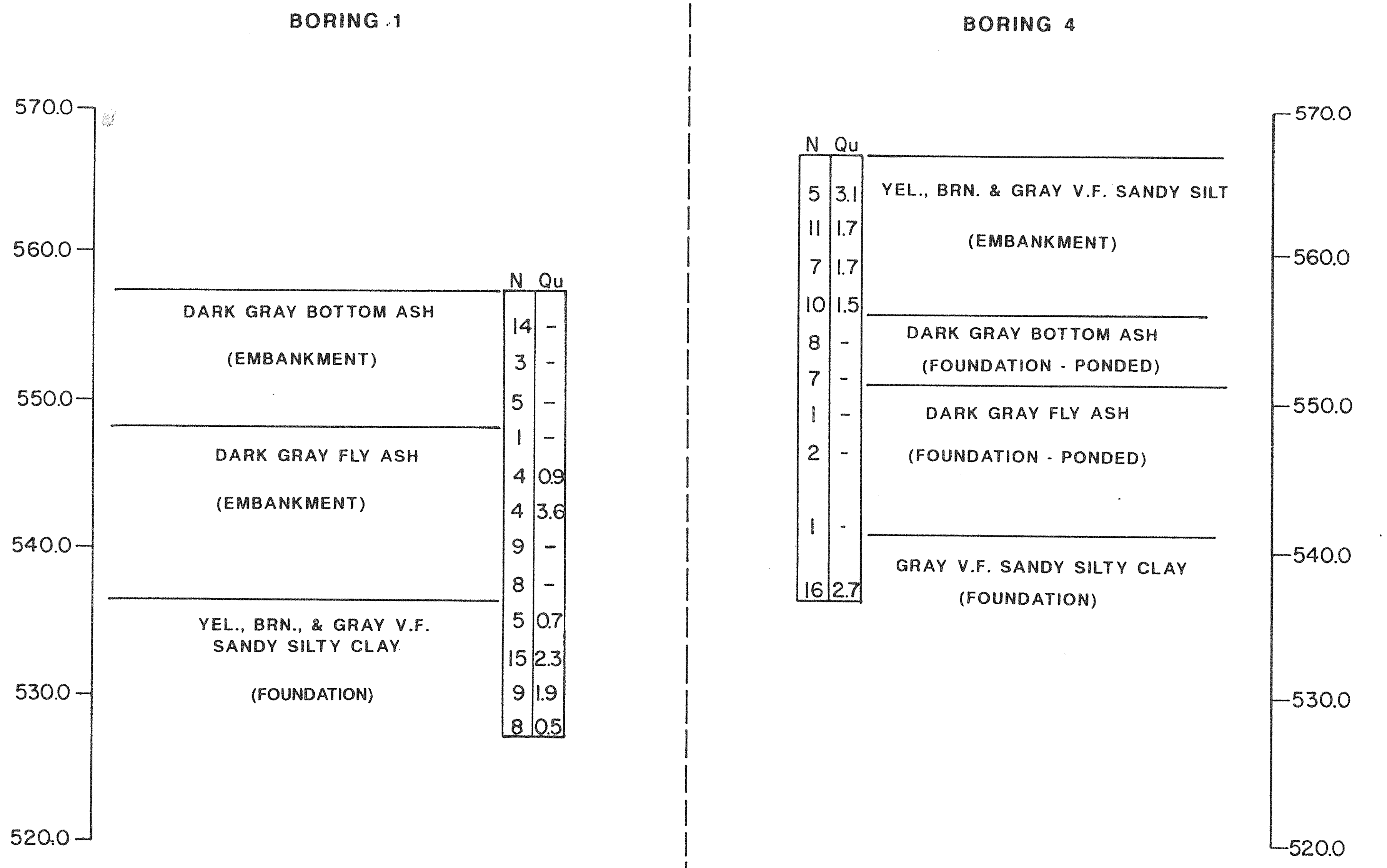
HANSON ENGINEERS INCORPORATED

SPRINGFIELD, IL • PEORIA, IL • ROCKFORD, IL

PROPOSED EMBANKMENT MODIFICATONS
CWLP ASH DISPOSAL AREA
SPRINGFIELD, ILLINOIS

JOB NO. 87S3014

FIGURE 7



BORING PROFILES

HANSON ENGINEERS INCORPORATED

SPRINGFIELD, IL • PEORIA, IL • ROCKFORD, IL

PROPOSED EMBANKMENT MODIFICATONS
CWLP ASH DISPOSAL AREA
SPRINGFIELD, ILLINOIS

JOB NO. 87S3014

FIGURE 8

APPENDIX A

LOG OF BORING

CENTRAL ILLINOIS DRILLING COMPANY
1909 OAKWOOD AVE.
BLOOMINGTON, ILLINOIS 61701
(309) 662-5968

CONTRACTED WITH HANSON ENGINEERS

BORING NO. B-1

PROJECT NAME CWLP ASH POND

CONTRACT NO.

LOCATION PER PLAN

DATUM

HAMMER WT. 140#

HAMMER DROP 30"

HOLE DIA. 6"

SURFACE ELEV.

CORE DIA.

CASING

DATE STARTED 5-18-87

COMPLETED 5-18-87

DRILLING METHOD HSA

ELEV.	DESCRIPTION	STRATA	DEPTH	SAMPLES						NOTES
		DEPTH	SCALE	BLOWS FT.	NO.	TYPE	RECOV.	QP		
		0.0	30							
				6-7-7	1	ss	14"	--		
	Blk. bot. ash, tr. f. gravel									
	fill moist-wet			3-2-1	2	ss	8	--		
			5							
				3-2-3	3	ss	10	--		WATER 5-18-87
										DD 5.0' 8:45am BAR 20.5' 10:15am AAR 4.6' 10:35am
		9.2		2-1-0	4	ss	12	--		DWL 4.0' 6:35pm
	Blk. fly ash		10							
				2-2-2	5	ss	15	0.8		
	wet									
			15	6-2-2	6	ss	14	0.9		
				4-4-5	7	ss	18	--		
				3-5-3	8	ss	18	--		
			20							

CENTRAL ILLINOIS DRILLING COMPANY
1909 OAKWOOD AVE.
BLOOMINGTON, ILLINOIS 61701
(309) 662-5968

LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS
BORING NO. B-1
PROJECT NAME CWLP ASH POND
CONTRACT NO.
LOCATION PER PLAN
DATUM
HAMMER WT. 140#
HAMMER DROP 30"
HOLE DIA. 6"
SURFACE ELEV.
CORE DIA.
CASING
DATE STARTED 5-18-87
COMPLETED 5-18-87
DRILLING METHOD HSA

ELEV.	DESCRIPTION	STRATA DEPTH	DEPTH SCALE	SAMPLES BLOWS FT.	NO.	TYPE	RECOV.	QP		NOTES
		0.0	30							
		23.1		3-2-3	9	ss	18"	1.2		
	Green gray silty clay, tr. f.m. sand, tr. f. gravel moist	25.7	25	6-8-7	10	ss	18	4.5+		
	Dk. gray silty clay moist	30.0	30	4-4- 3-4-4	11 12	ss ss	18 18	3.1 2.0		
	END OF BORING 30.0'									

PDF 0083

CENTRAL ILLINOIS DRILLING COMPANY
1909 OAKWOOD AVE.
BLOOMINGTON, ILLINOIS 61701
(309) 662-5968

LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS
BORING NO. B-2
PROJECT NAME CWLP ASH POND
CONTRACT NO.
LOCATION
DATUM
HAMMER WT. 140#
HAMMER DROP 30"
HOLE DIA. 6"
SURFACE ELEV.
CORE DIA.
CASING
DATE STARTED 5-18-87
COMPLETED 5-18-87
DRILLING METHOD HSA

ELEV.	DESCRIPTION	STRATA DEPTH	DEPTH SCALE	SAMPLES BLOWS FT.	NO.	TYPE	RECOV.	QP		NOTES
		0.0	30							
	10" white rock, brn. gray silty clay fill moist	3.3		8-10-11	1	ss	15"	4.5+		
	Light brn. silty clay fill moist	5.8	5	8-9-11	2	ss	16	3.0		
	Brn. green blk. silty clay fill moist			3-5-5	3	ss	15	2.1		WATER 5-18-87
			10	3-5-7	4	ss	16	2.4		DD 28.5' 12:00pm BAR 18.5' 1:55pm AAR WCI 15.0' 2:
				3-6-7	5	ss	13	2.0		Dwl 14.0' 6:30pm
			15	3-5-7	6	ss	18	1.7		
				5-6-9	7	ss	18	3.2		
			20	5-6-8	8	ss	18	3.2		

CENTRAL ILLINOIS DRILLING COMPANY
1909 OAKWOOD AVE.
BLOOMINGTON, ILLINOIS 61701
(309) 662-5968

LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS
BORING NO. B-2
PROJECT NAME CWLP ASH POND
CONTRACT NO.
LOCATION PER PLAN
DATUM
HAMMER WT. 140#
HAMMER DROP 30"
HOLE DIA. 6"
SURFACE ELEV.
CORE DIA.
CASING
DATE STARTED 5-18-87
COMPLETED 5-18-87
DRILLING METHOD HSA

ELEV.	DESCRIPTION	STRATA DEPTH	DEPTH SCALE	SAMPLES BLOWS FT.	NO.	TYPE	RECOV.	QP		NOTES
		0.0	30							
		22.7		4-6-9	9	ss	18"	3.5		
	Brn. gray silty clay, tr. f. sand moist	25.4	25	3-3-6	10	ss	18	1.8		
	Brn. gray clayey silt, some f. sand, occas. 1-3" f. sand seams a wet			3-4-4	11	ss	18	1.5		
			30	2-3-3	12	ss	18	0.5		
		31.5								
	Brn. f.m. sand wet		35	2-2-3	13	ss	18	1.2		
		39.8		11-11-12	14	ss	18	2.5		
	~~Brn. f.m. sand wet~~	~~40.0~~	40							
	END OF BORING 40.0'									

CENTRAL ILLINOIS DRILLING COMPANY
1909 OAKWOOD AVE.
BLOOMINGTON, ILLINOIS 61701
(309) 662-5968

LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS BORING NO. B-3

PROJECT NAME CWLP ASH POND PLAN CONTRACT NO.

LOCATION

DATUM HAMMER WT. 140# HAMMER DROP 30" HOLE DIA. 6"

SURFACE ELEV. CORE DIA. CASING

DATE STARTED 5-18-87 COMPLETED 5-18-87 DRILLING METHOD HSA

ELEV.	DESCRIPTION	STRATA DEPTH	DEPTH SCALE	SAMPLES BLOWS FT.	NO.	TYPE	RECOV.	QP		NOTES
		0.0	30							
	5" white rock, brn. gray blk. silty clay fill moist			7-6-12	1	ss	14"	4.5+		
		4.5		6-9-9	2	ss	18	4.5+		
	Blk. silty clay fill moist		5							
		8.3		5-5-6	3	ss	16	1.7		WATER 5-18-87 DD 24.0' 3:50pm BAR 12.4' 4:05pm AAR 10.0' 4:25pm DWL 9.5' 6:45pm
	Brn. green blk. silty clay fill moist		10	3-4-8	4	ss	17	2.5		
		17.9		3-6-7	5	ss	18	2.2		
	Blk. gray silty clay fill moist		15	3-6-8	6	ss	18	2.4		
				5-6-7	7	ss	18	2.3		
		20.6	20	3-4-8	8	ss	18	3.0		

CENTRAL ILLINOIS DRILLING COMPANY
1909 OAKWOOD AVE.
BLOOMINGTON, ILLINOIS 61701
(309) 662-5968

LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS
BORING NO. B-3
PROJECT NAME CWLP ASH POND
CONTRACT NO.
LOCATION PER PLAN
DATUM
HAMMER WT. 140#
HAMMER DROP 30"
HOLE DIA. 6"
SURFACE ELEV.
CORE DIA.
CASING
DATE STARTED 5-18-87
COMPLETED 5-18-87
DRILLING METHOD HSA

ELEV.	DESCRIPTION	STRATA DEPTH	DEPTH SCALE	SAMPLES BLOWS FT.	NO.	TYPE	RECOV.	QP		NOTES
		0.0	30							
	Brn. gray silty clay moist-wet			5-6-9	9	ss	18"	2.0		
			25	3-4-5	10	ss	18	2.0		
				3-3-4	11	ss	18	1.6		
		28.2								
	Gray brn. clay, little silt moist	30.0	30	6-9-12	12	ss	18	3.8		
	END OF BORING 30.0'									

CENTRAL ILLINOIS DRILLING COMPANY
1909 OAKWOOD AVE.
BLOOMINGTON, ILLINOIS 61701
(309) 662-5968

LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS
BORING NO. B-4
PROJECT NAME CWLP ASH POND
CONTRACT NO.
LOCATION PER PLAN
DATUM
HAMMER WT. 140#
HAMMER DROP 30"
HOLE DIA. 6"
SURFACE ELEV.
CORE DIA.
CASING
DATE STARTED 5-18-87
COMPLETED 5-18-87
DRILLING METHOD HSA

ELEV.	DESCRIPTION	STRATA	DEPTH	SAMPLES						NOTES
		DEPTH	SCALE	BLOWS FT.	NO.	TYPE	RECOV.	QP		
		0.0	30							
	Brn. silty clay									
				3-3-2	1	ss	10"	3.5		
	fill moist	4.0								
	Brn. gray blk. silty clay			4-5-6	2	ss	12	3.2		
			5							
	fill moist									
				3-3-4	3	ss	10	2.5		WATER 5-18-87
										DD 11.0' 5:15pm BAR 22.0' 6:00pm AAR 9.8' 6:30pm
				3-5-5	4	ss	13	2.5		
		10.5	10							DWL 9.5' 6:50pm
	Blk. bot, ash									
				5-4-4	5	ss	18	--		
	fill wet									
				5-4-3	6	ss	16	--		
		15.2	15							
	Blk. fly ash									
				1-1-0	7	ss	18	0.2		
	fill wet									
				0-0-2	8	ss	.8	0.2		
			20							

CENTRAL ILLINOIS DRILLING COMPANY
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(309) 662-5968

PDF 0088

LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS
BORING NO. B-4
PROJECT NAME CWLP ASH POND
CONTRACT NO.
LOCATION PER PLAN
DATUM
HAMMER WT. 140#
HAMMER DROP 30"
HOLE DIA. 6"
SURFACE ELEV.
CORE DIA.
CASING
DATE STARTED 5-18-87
COMPLETED 5-18-87
DRILLING METHOD HSA

ELEV.	DESCRIPTION	STRATA DEPTH	DEPTH SCALE	SAMPLES BLOWS FT.	NO.	TYPE	RECOV.	QP		NOTES
		0.0	30							
		25.5	25	1-0-1	9	ss	18"	0.5		
	Blk. gray clay, tr. silt moist	30.0		4-6-10	10	ss	18	3.3		
			30							
	END OF BORING 30.0'									

APPENDIX B

DAM INSPECTION REPORT

NAME OF DAM CWLP LAKESIDE ASH DISPOSAL AREA DAM COUNTY SANGAMON

LOCATION RANGE TOWNSHIP SECTION

OWNER CITY WATER, LIGHT & POWER 217-787-4063
NAME TELEPHONE NO.
(Day & Night Nos.)

3100 STEVENSON DRIVE
STREET

SPRINGFIELD, IL 62703
CITY ZIP

PERMIT NO. — CLASS OF DAM II

TYPE OF DAM EARTH FILL

TYPE OF SPILLWAY DROP INLET

DATE(S) INSPECTED JUNE 2, 1987

WEATHER WHEN INSPECTED DRY, CLEAR

TEMPERATURE WHEN INSPECTED ±90°F

POOL ELEVATION WHEN INSPECTED 554.3

TAILWATER ELEVATION WHEN INSPECTED 546.8

INSPECTION PERSONNEL:

DANNY L. KERNS, P.E. ASSOC. PARTNER
NAME GEOTECHNICAL ENG. TITLE

GENE WERTEPNEY ASSOCIATE
NAME HYDRAULICS ENG. TITLE

NAME TITLE

NAME TITLE

SEAL

CONDITION CODES

N.E. -	No evidence of problem
G.C. -	Good condition
M.M. -	Item needing minor repairs within the year. Safety integrity not yet imperiled
I.M. -	Item needing immediate maintenance to restore or insure present safety integrity
E.C. -	Emergency condition which if not immediately repaired or other appropriate measures taken could lead to breach of dam
O.B. -	Condition requires regular observation to insure condition does not become worse
N.A. -	Not applicable to this dam
N.I. -	Not inspected/list reason for non-inspection under deficiencies

ART MBAL NT

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES AND IMPLEMENTATION SCHEDULE
Surface Cracks	N.E.	NONE NOTED	———
Vertical & Horizontal Alignment of Crest	G.C.	NONE NOTED	———
Unusual Movement or Cracking At or Beyond Toe	N.E.	NONE NOTED	———
Sloughing or Erosion of Embankment and Abutment Slopes	M.M.	MINOR SURFACE SLOUGH ON WEST EMBANKMENT AS RESULT OF ASH LINE BREAK. ALSO, EROSION CHANNEL DOWN WEST EMBANKMENT.	WEST EMBANKMENT SHOULD BE "DRESSED UP" TO SMOOTH THE SLOUGHED AREA AND FILL THE EROSIONAL CHANNEL.
Upstream Face Slope Protection	N.I.	DISPOSAL AREA IS FILLED WITH ASH AND FILTER CAKE SLUDGE. GENERALLY, NO PONDED WATER, OR VERY SHALLOW. UPSTREAM SLOPE NOT VISIBLE.	———
Seepage	M.M.	SEEPAGE AREA NOTED AT NORTH END OF WEST EMBANKMENT. NO CONCENTRATED FLOW. CATTAIL GROWTH.	REMOVE CATTAILS, INSTALL DRAINAGE SYSTEM TO PICK UP SEEPAGE AND DIVERT TO SUGAR CREEK.
Filter & Filter Drains	N.I.	DRAINS COVERED WITH COMPACTED CLAY. OUTLET PIPE OPERATING, BUT NOT EXPOSED.	EXPOSE OUTLET PIPE, EXTEND FARTHER FROM EMBANKMENT, PROTECT WITH HEADWALL.

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES AND IMPLEMENTATION SCHEDULE
Animal Damage	N.E.	NONE NOTED	—
Embankment Drainage Ditches	G.C.	—	—
Vegetative Cover	M.M.	TREES AND BRUSH ON EMBANKMENT, PRIMARILY ON SOUTH PORTION OF WEST EMBANKMENT AND ON NORTH EMBANKMENT.	REMOVE TREES AND BRUSH. GRADE SLOPE SO THAT IT CAN BE MOWED.
Other (Name) STEEPNESS OF NORTH EMBANKMENT SLOPE	M.M.	NORTH EMBANKMENT SLOPE IS TOO STEEP FOR PROPER MAINTENANCE.	RECOMMEND FLATTENING NORTH EMBANKMENT SLOPE FOR PROPER MAINTENANCE.
Other —	—	—	—
Other —	—	—	—

CONCRETE OR MASONARY DAMS

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES AND IMPLEMENTATION SCHEDULE
Seepage	N.A.	—	—
Structure to Abutment/ Embankment Junctions	N.A.	—	—
Water Passages	N.A.	—	—
Foundation	N.A.	—	—
Surface Cracks in Concrete Surfaces	N.A.	—	—
Structural Cracking	N.A.	—	—

CONCRETE OR MASONRY DAMS
(Continued)

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES AND IMPLEMENTATION SCHEDULE
Vertical and Horizontal Alignment	N.A.	—	—
Monolith Joints	N.A.	—	—
Construction Joints	N.A.	—	—
Spalling of Concrete	N.A.	—	—
Filters, Drains, etc.	N.A.	—	—
Riprap	N.A.	—	—
Other (Name)	N.A.	—	—

IF DAM IS GATED-Fill out portion of Principal Spillway Form Related to Gated Spillways

PRINCIPAL SP 'WAY
APPROACH CH. .EL

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES AND IMPLEMENTATION SCHEDULE
Debris	N.E.	NONE NOTED	—
Side Slope Stability	N.A.	—	—
Slope Protection	N.A.	—	—
Other (Name)	N.A.	—	—
Other	—	—	—
Other	—	—	—
Other	—	—	—

PRINCIPAL SPILLWAY

☒ Drop Inlet Structure ☐ Overflow Spillway Structure ☐ Gated

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES AND IMPLEMENTATION SCHEDULE
Erosion, Spalling, Cavitation	N.A.	—	—
Structure to Embankment Junction	N.E.	DROP INLET IS NOT CONNECTED TO EMBANKMENT AT WATER LEVEL	—
Drains	N.A.	—	—
Seepage Around or Into Structure	N.E.	NONE NOTED	—
Surface Cracks	N.A.	—	—
Structural Cracks	N.A.	—	—

IF SPILLWAY IS GATED FILL OUT GATES SECTION

PR PAL LL
(Contin)

☒ Drop Inlet Structure ☐ Overflow Spillway Structure ☐ Gated

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES AND IMPLEMENTATION SCHEDULE
Alignment of Abutment Walls	N.A.	—	—
Construction Joints	N.I.	PIPE IS 21 IN. & DROP INLET WITH SUBMERGED OUTLET	—
Filter and Filter Drains	N.A.	—	—
Trash Racks	N.A.	—	—
Bridge & Piers	N.A.	—	—
Differential Settlement	N.A.	—	—
Other (Name)	N.A.	—	—

IF SPILLWAY IS GATED FILL OUT GATES SECTION

PRINCIPAL SPILLWAY
(Continued)

☒ Conduit ☐ Gated

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES AND IMPLEMENTATION SCHEDULE
Erosion, Spalling, Cavitation	N.I.	SPILLWAY PIPE IS SUBMERGED.	—
Joint Separation	N.I.	"	—
Seepage Around or Into Conduit	N.I.	"	—
Surface Cracks	N.I.	"	—
Structural Cracks	N.I.	"	—
Trash Racks	N.I.	"	—
Differential Settlement	N.I.	"	—
Alignment	N.I.	"	—
Other (Name)	—	—	—

IF SPILLWAY IS GATED FILL OUT GATES SECTION

I CIP SPIL Y
(Cont ed)

☐ Chute

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES AND IMPLEMENTATION SCHEDULE
Erosion, Cavitation, Spalling	N.A.	—	—
Structure to Embankment Junction	N.A.	—	—
Construction Joints	N.A.	—	—
Expansion & Contraction Joints	N.A.	—	—
Differential Settlement	N.A.	—	—
Surface Cracks	N.A.	—	—
Structural Cracks	N.A.	—	—
Wall Alignment	N.A.	—	—
Other (Name)	N.A.	—	—

IF SPILLWAY IS GATED FILL OUT GATES SECTION

GATES

☐ Principal Spillway ☐ Dewatering ☐ Other:

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES AND IMPLEMENTATION SCHEDULE
Gate Sill	N.A.	—	—
Gate Seals	N.A.	—	—
Gate and Frame	N.A.	—	—
Operating Machinery	N.A.	—	—
Emergency Operating Machinery	N.A.	—	—
Other (Name)	N.A.	—	—
Other	N.A.	—	—

ET S
(IF SEPARATE FROM PRINCIPA PILLWAY STRUCTURE)

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES AND IMPLEMENTATION SCHEDULE
Erosion, Spalling, Cavitation	N.A.	—	—
Joint Separation	N.A.	—	—
Seepage Around or Into Conduit	N.A.	—	—
Intake Structure	N.A.	—	—
Outlet Structure	N.A.	—	—
Outlet Channel	N.A.	—	—

OUTLET WORKS
(Conti[illegible])

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES AND IMPLEMENTATION SCHEDULE
Riprap	N.A.	—	—
Other (Name)	N.A.	—	—
Other	N.A.	—	—
Other	N.A.	—	—

ENERGY DISSIPATORS

☐ Principal Spillway ☐ Outlet Works
Type:

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES AND IMPLEMENTATION SCHEDULE
Erosion, Spalling, Cavitation	N.I.	SPILLWAY OUTLET IS SUBMERGED AND DISCHARGES INTO CLARIFIER POND	—
Structure to Embankment Junction	N.I.	//	—
Construction Joints	N.I.	//	—
Surface Cracks	N.I.	//	—
Structural Cracks	N.I.	//	—
Differential Settlement	N.I.	//	—
Expansion & Contraction Joints	N.I.	//	—

EN DI PATC
(Contin)

☐ Principal Spillway ☐ Outlet Works

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES AND IMPLEMENTATION SCHEDULE
Riprap	N-I-	SEE PREVIOUS PAGE	—
Outlet Channel	N-I-	"	—
Debris	N-I-	"	—
Other (Name)	N-I-	"	—

EMERGENCY 'LLWAY

☐ Earth ☐ Other: Name ____________________

ITEM	CONDITION	DEFICIENCIES	RECOMMENDED REMEDIAL MEASURES AND IMPLEMENTATION SCHEDULE
Erosion	N.A.	—	—
Weeds, Logs, Other Obstructions	N.A.	—	—
Side Slope Sloughing	N.A.	—	—
Vegetation	N.A.	—	—
Sedimentation	N.A.	—	—
Riprap	N.A.	—	—
Settlement of Crest	N.A.	—	—
Downstream Channel	N.A.	—	—
Other (Name)	N.A.	—	—

SUMMARY OF MAINTENANCE DONE AND/OR
REPAIRS MADE SINCE LAST INSPECTION

DATE OF PRESENT INSPECTION June 2, 1987

DATE OF LAST INSPECTION UNKNOWN

1. EARTH EMBANKMENT

UNKNOWN

2. CONCRETE MASONRY DAMS

N.A.

3. PRINCIPAL SPILLWAY

UNKNOWN

4. OUTLET WORKS

UNKNOWN

5. EMERGENCY SPILLWAY

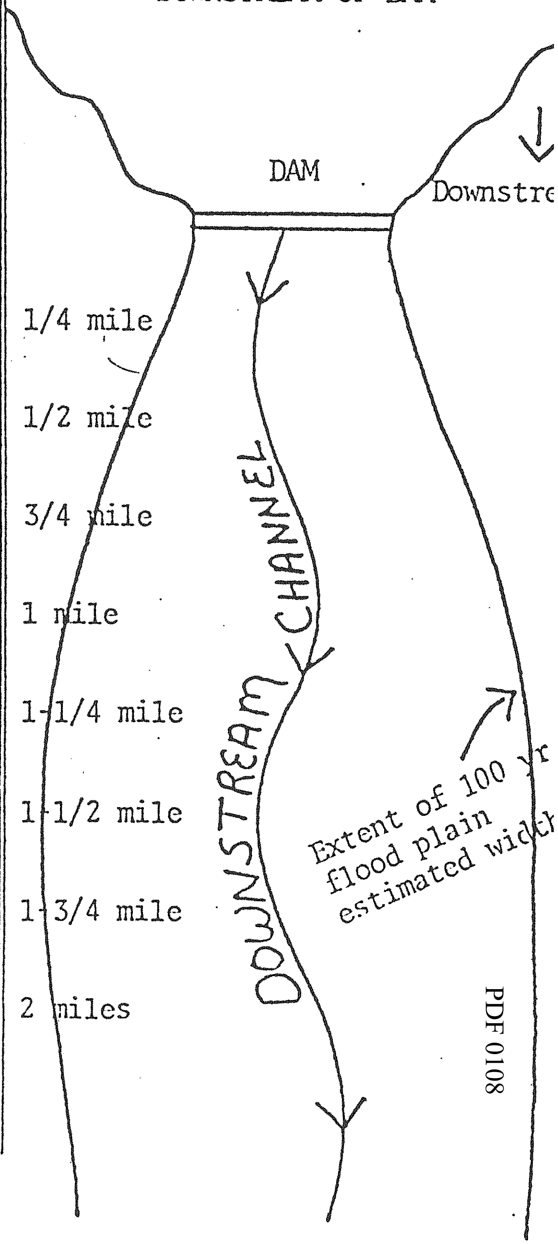
N.A.

DOWNSTREAM DEVELOPMENT

APPROXIMATE WIDTH OF AFFECTED FLOOD PLAIN ________ MILES

MILES DOWNSTREAM FROM DAM	Downstream Development													Loss of Life Poten-tial			Economic Loss Poten-tial		
	OCCUPIED HOMES	UNOCCUPIED HOMES	AGRICULTURAL BUILDINGS	INDUSTRIAL BUILDINGS	COMMERCIAL BUILDINGS	SCHOOLS	HOSPITALS	ROADS & BRIDGES	RAILROADS & R.R. BRIDGES	DAMS	OVERHEAD UTILITIES	OTHER DEVELOPMENT (Name)	OTHER DEVELOPMENT (Name)	NONE	1 TO 10	OVER 10	MINIMAL EXPECTED	APPRECIABLE EXPECTED	EXCESSIVE EXPECTED
0 to 1/4														X			X		
1/4 to 1/2														X			X		
1/2 to 3/4														X			X		
3/4 to 1														X			X		
1 to 1-1/4														X			X		
1-1/4 to 1-1/2														X			X		
1-1/2 to 1-3/4														X			X		
1-3/4 to 2														X			X		
2 to --									/										

SKETCH IN DEVELOPMENTS DOWNSTREAM OF DAM



PDF 0108

OWNER'S MAINTENANCE STATEMENT

I, ______________________________, owner of ______________________ dam, am maintaining the dam in accordance with the accepted maintenance plan which is part of Permit Number ______________.

N.A.

____
Signature

APPENDIX C

BY DLK DATE 6-15-87

CHKD. BY ______ DATE ________

HANSON ENGINEERS, INC.
ENGINEERS — CONSULTANTS
SPRINGFIELD, PEORIA & ROCKFORD, ILLINOIS

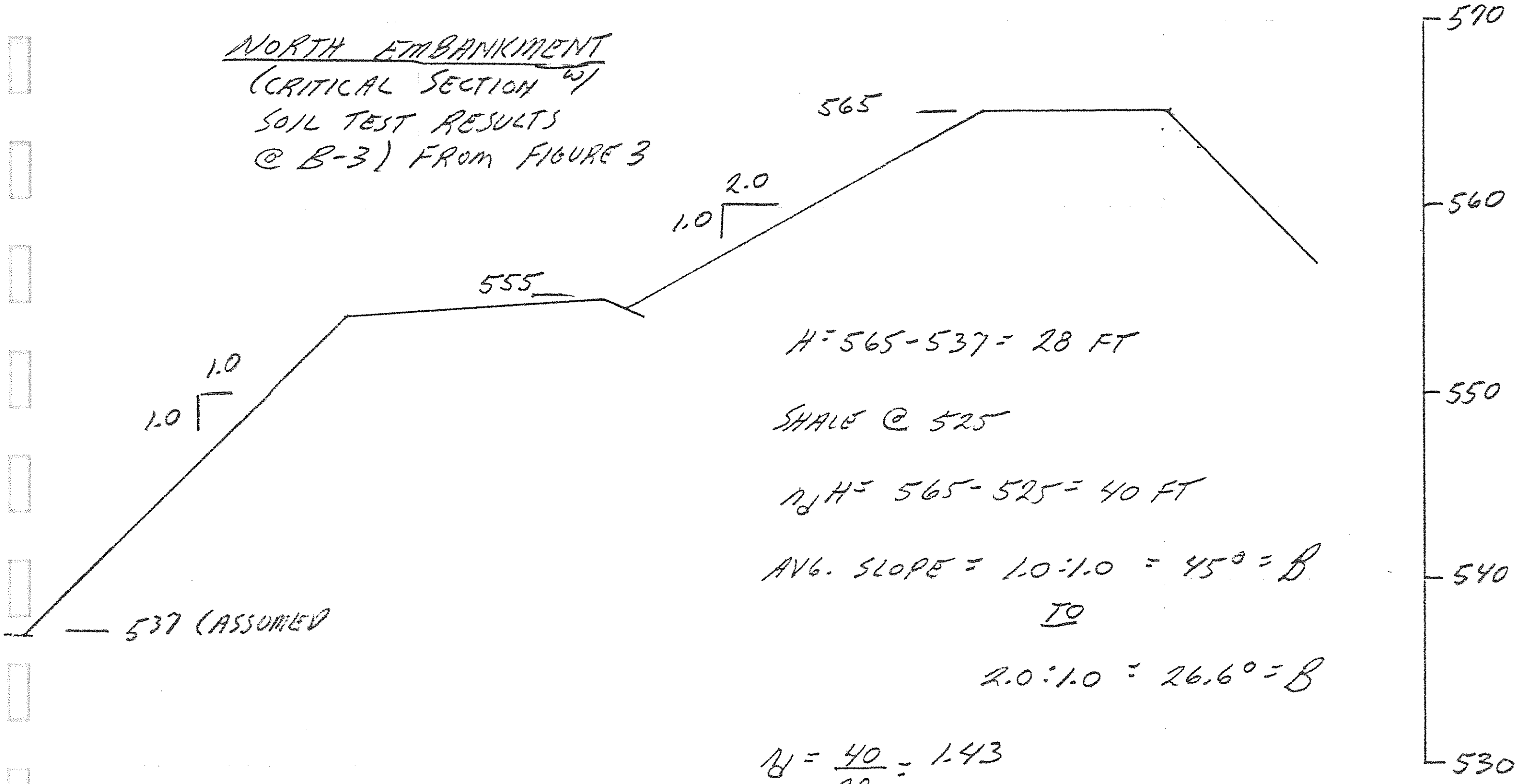
SHEET NO. 1 OF ____

JOB NO. 8753014

SLOPE STABILITY - CWLP ASH POND

USE TAYLOR'S CHART AS PRESENTED IN PECK, HANSON, AND THORNBURN, "FOUNDATION ENGINEERING", SECOND EDITION, 1974, FIGS. 18.12 & 18.13, PAGE 299

NORTH EMBANKMENT
(CRITICAL SECTION W/ SOIL TEST RESULTS @ B-3) FROM FIGURE 3



$H = 565 - 537 = 28$ FT

SHALE @ 525

$n_d H = 565 - 525 = 40$ FT

AVG. SLOPE = 1.0:1.0 = 45° = β
TO
2.0:1.0 = 26.6° = β

$n_d = \frac{40}{28} = 1.43$

ASSUME: $\gamma = 120$ PCF

$c = 1.0$ KSF = 1,000 PSF (CONSERVATIVE, AS $c_{AVG} = 2.84$ KSF)

FOR $\beta = 45°$: $N_s = 5.7 = \frac{\gamma H_c}{c} = \frac{(120)(H_c)}{1{,}000}$ $H_c = 47.5$ FT

$\frac{H_c}{H} = \frac{47.5}{28} = \underline{\underline{1.7}}$

FOR $\beta = 26.6°$: $N_s = 6.3 = \frac{\gamma H_c}{c} = \frac{(120)(H_c)}{1{,}000}$ $H_c = 52.5$ $\frac{H_c}{H} = \underline{\underline{1.9}}$

BY DLK DATE 6-15-87
CHKD. BY ______ DATE ______

SHEET NO. 2 OF ______
JOB NO. 8753014

SLOPE STABILITY - CWLP ASH POND

IF USE $c = 2.84$ KSF (AVG VALUE FROM B-3), THEN:

$\frac{H_c}{H} = \underline{\underline{4.82}}$ FOR 45° AVG SLOPE

$\frac{H_c}{H} = \underline{\underline{5.32}}$ FOR 26.6° AVG SLOPE

WEST EMBANKMENT:
(CRITICAL SECTION
w/ SOIL TEST RESULTS
@ B-2)

SEE FIGURE 7 FOR CROSS SECTION.

$H = 28$ FT

SHALE @ 515.5

$n_d H = 49.5$ FT $\quad n_d = \frac{49.5}{28} = 1.77$

AVG. SLOPE = 2.5:1.0 = 21.8° = B
TO
3.0:1.0 = 18.2° = B

ASSUME $\gamma = 120$ PCF

$c = 1{,}000$ PSF (AVG $c = 2.17$ KSF IN B-2)

FOR $B = 21.8°$, $N_s = 6.2 = \frac{\gamma H_c}{c} = \frac{(120)(H_c)}{1{,}000}$ $\quad H_c = 51.7$ $\quad \frac{H_c}{H} = \underline{\underline{1.85}}$

FOR $B = 18.2°$, $N_s = 6.5 = \frac{\gamma H_c}{c} = \frac{(120)(H_c)}{1{,}000}$ $\quad H_c = 54.2$ $\quad \frac{H_c}{H} = \underline{\underline{1.94}}$

SLOPE STABILITY – CWLP ASH POND

IF USE $C = 2.17$ KSF (AVG. VALUE FROM B-2), THEN:

$\frac{H_c}{H} = \underline{\underline{4.0}}$ FOR 21.8° AVG SLOPE

$\frac{H_c}{H} = \underline{\underline{4.2}}$ FOR 18.2° AVG SLOPE

BY DLK DATE 6-15-87

CHKD. BY ______ DATE ______

HANSON ENGINEERS INC.
ENGINEERS — CONSULTANTS
[illegible]

SHEET NO. 4 OF ______

JOB NO. 8753014

SLOPE STABILITY - CWLP ASH POND

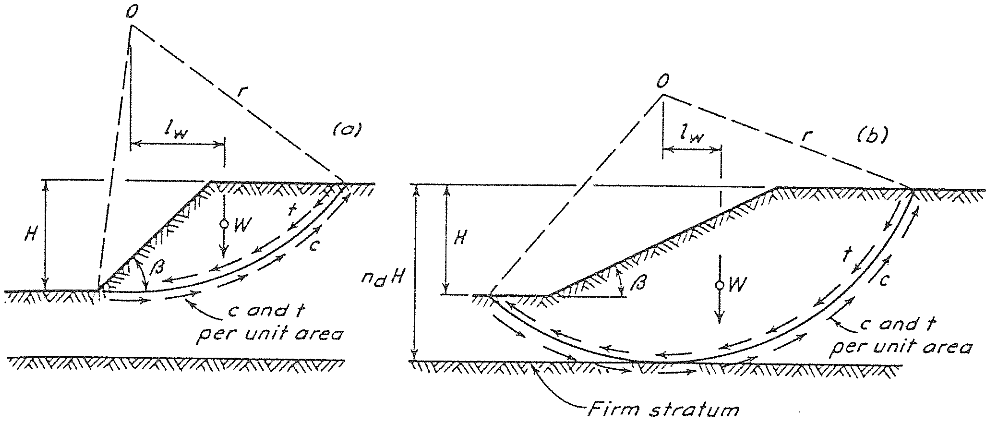


FIGURE 18.12. Position of failure surfaces. (*a*) Toe circle. (*b*) Base circle.

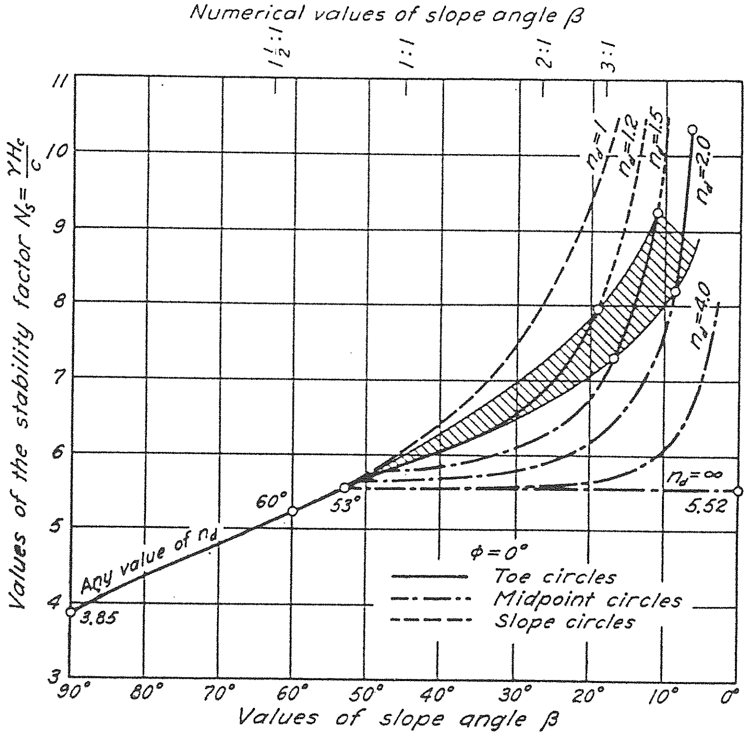


FIGURE 18.13. Relation for frictionless material between slope angle β and stability factor N_s, for different values of depth factor n_d (after Taylor, 1937).

FROM PECK, HANSON, & THORNBURN; PAGE 299

GRW

CITY WATER LIGHT & POWER
ASH DISPOSAL AREA

DAM CLASSIFICATION (SMALL DAM)

1. DRAINAGE AREA.

AREA	ACRES
A	26
B	3
C	8
TOTAL	37

2. LEVEE HEIGHT 565- 537 = 28'

3 STORAGE VOLUME (AREA A)

ASSUME ORGINAL	- 24 X 18'	432	AC. FT.
ASSUME AV. WIDTH 25AC	- 25 X 10	250	
	APPROXIMATELY	682	AC. FT

HAZARD CLASSIFICATION

INSPECTION OF THE AREA DOWNSTREAM OF THE ASH POND INDICATES THAT THE BREACH OF THE ASH POND WILL NOT RESULT IN LOSS OF LIFE OR SUBSTANTIAL ECONOMIC LOSS. THIS EMBANKMENT IS THEREFORE CLASSIFIED IN THE LOW HAZARD POTENTIAL CATEGORY.

MINIMUM DESIGN

A DAM OR LEVEE EMBANKMENT LESS THAN 40 FT HIGH AND 1000 AC. FT. OF STORAGE IS CONSIDERED TO BE A SMALL DAM. A SMALL DAM WITH A LOW HAZARD POTENTIAL IS CONSIDERED TO BE A CLASS III DAM.

A CLASS III DAM PRINCIPAL SPILLWAY SHOULD BE DESIGN TO PASS THE 100-YR 24 HOUR RAINFALL EVENT OF 8.4" (0.7') ACCORDING TO THE RAINFALL FOR NORTH CENTRAL ILLINOIS.

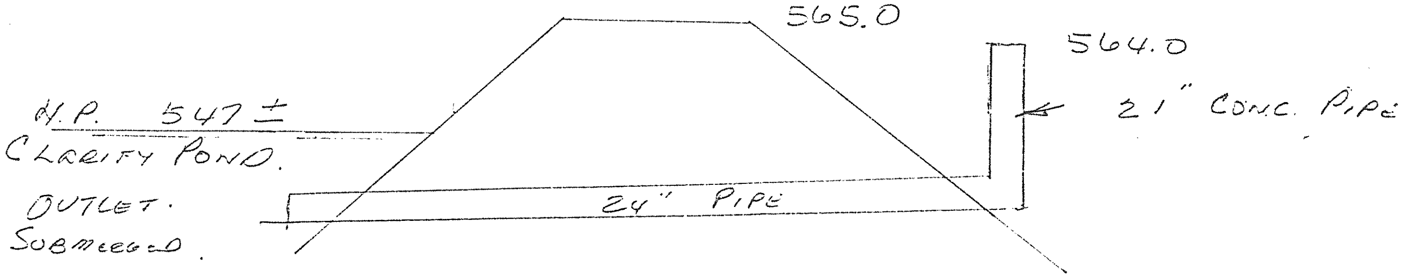
GRW

6 7

PROVISION SHOULD BE MADE TO DRAWDOWN 50 PERCENT OF THE TOTAL VOLUME OF WATER STORAGE IN 80 DAYS FOR A CLASS III DAM. SINCE THE MAJORITY OF THIS STORAGE VOLUME IS FLY ASH WE RECOMMEND THAT LARGE PORTABLE PUMPS OR SIPHON SYSTEM BE USED TO LOWER THE ASH POND POOL DURING EMERGENCIES

EVERY FIVE YEARS THE ASH POND WILL BE INSPECTED BY A PROFESSIONAL ENGINEER OR OTHER QUALIFIED PERSONNEL. A REPORT WILL BE SUBMITTED TO THE DIVISION OF WATER RESOURCES OUTLINING ANY DEFICIENCIES FOUND AND WILL DETAIL THE REMEDIAL MEASURES NECESSARY AND THE METHOD AND TIME WHICH WILL BE USED TO CORRECT THE DEFICIENCIES.

PRIMARY SPILLWAY OUTLET STRUCTURE



RATING CURVE

a) WEIR CONDITION

$Q = CLH^{3/2}$ WEIR LENGTH $\pi D = 3.14 \times \underline{1.75} = 5.5'$

$Q = 5.5\ CH^{1.5}$ $Q/D^{5/2} > 4$

H/D	C	H (FT)	Q cfs	RES ELEV.
0	0	0		
.1	1.05	.175	0.4	
.2	2.40	.350	2.7	
.3	2.94	.525	6.2	
.4	3.22	.700	8.3	564.7
.5	3.38	.875	15.2	
.6	3.50			
.7	3.56			

VOLUME 100YR RAINFALL 8.4" (.7 X 36 = 25.2 AC FT)
(AREA A + B + C = 36 AC)

1 cfs = 2 AC. FT.

$25.2/\left(\frac{15.2 \times 2}{2}\right) = 1.66$ DAYS LESS THAN 2 DAYS OK

FREEBOARD OVER FINAL POOL ELEV. OF 1.0' IS RECOMMENDED SINCE THIS IS AN ASH POND WHERE VERY SMALL WAVE ACTION CAN BE EXPECTED.

APPENDIX D

JOINT APPLICATION FORM

1. Application Number (To be assigned by Agency)

2. Date

Day Month Year

3. For Agency use only
(Date Received)

4. Name and address of applicant
City of Springfield
City Water, Light and Power
3100 Stevenson Drive
Springfield, Illinois 62703
Telephone no. during business hours
A/C (217) 786-4063
A/C ( )

5. Name, address, and title of authorized agent
Hanson Engineers Incorporated
1525 South 6th Street
Springfield, Illinois 62703
Telephone no. during business hours
A/C (217) 788-2450
A/C ( )

6. Describe in detail the proposed activity, its purpose, and intended use. If additional space is needed, attach additional support information to each agency application.

Raise portion of existing Lakeside Ash Disposal Area embankment a maximum of 10 ft to obtain additional storage volume for ash and filter cake slude disposal.

7. Names, addresses, and telephone numbers of all adjoining and potentially affected property owners, including the owner of subject property if different from applicant.

City of Springfield

8. Location of activity
Address:
City Water, Light and Power - Spaulding Dam
Street, road, or other descriptive location
Springfield
In or near city or town
Sangamon Illinois 62703
County State Zip Code

Legal Description:

SE	12	T15N	R5W	3rd
¼	Sec.	Twp.	Rge.	P.M.

Tax Assessor's Description (if known):

Map No. Subdiv. No. Lot No.

Name of waterway at location of the activity

9. Date activity is proposed to commence September, 1987 Date activity is expected to be completed June, 1988

10. Is any portion of the activity for which authorization is sought now complete? ___ Yes X No If answer is "Yes" give reasons in the remark section. Month and Year the activity was completed – Indicate the existing work on drawings.

11. List all approvals or certifications required by other federal, interstate, state, or local agencies for any structures, construction, discharges, deposits, or other activities described in this application. If this form is being used for concurrent application to the Corps of Engineers, Illinois Department of Transportation, and Illinois Environmental Protection Agency, these agencies need not be listed.

Issuing Agency	Type Approval	Identification No.	Date of Application	Date of Approval
–	–	–	–	–

12. Has any agency denied approval for the activity described herein or for any activity directly related to the activity described herein.
___ Yes X No (If "Yes", explain in remarks.)

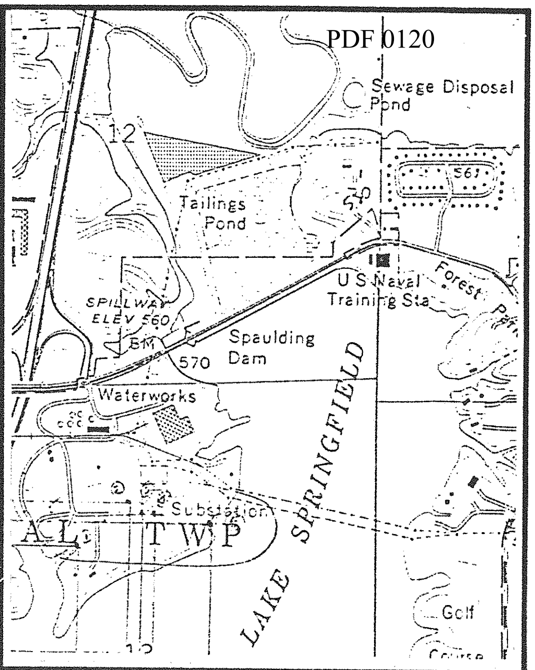
13. Remarks

14. Application is hereby made for authorizations of the activities described herein. I certify that I am familiar with the information contained in the application, and that to the best of my knowledge and belief, such information is true, complete, and accurate. I further certify that I possess the authority to undertake the proposed activities.

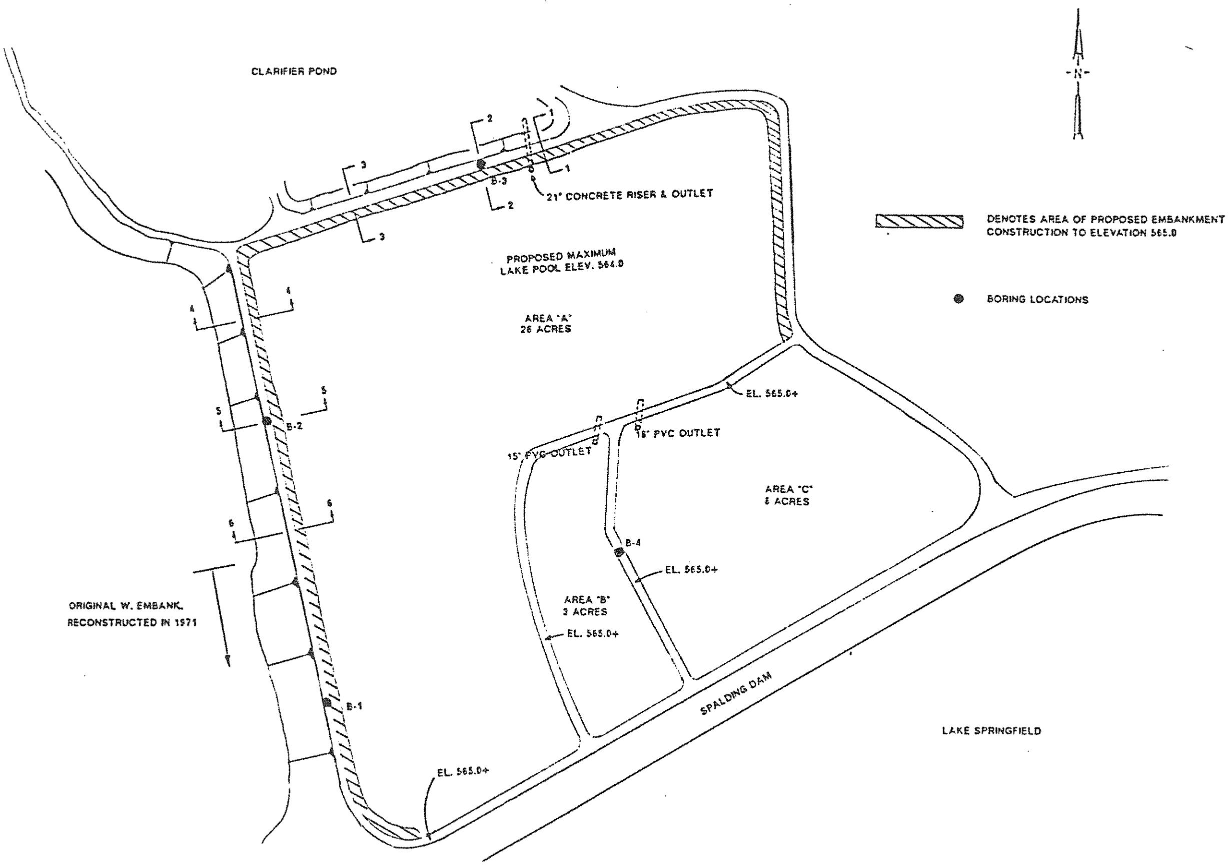
Signature of Applicant or Authorized Agent

NCR FORM 426
01 JUNE 81

CORPS OF ENGINEERS COPY - SEE JURISDICTIONAL MAP FOR ADDRESS



VICINITY MAP



LIST OF ADJACENT PROPERTY OWNERS

NO.	NAME	ADDRESS
1.		
2.	CITY OF SPRINGFIELD	
3.		
4.		

PROJECT DESCRIPTION:

RAISE PORTION OF LAKESIDE
ASH DISPOSAL EMBANKMENT
A MAXIMUM OF 10 FT.

LOCATION:

SPAULDING DAM
CITY OF SPRINGFIELD
SANGAMON COUNTY

SHEET OF

NCR FORM 427
01 JUNE 81

CORPS OF ENGINEERS COPY

APPENDIX E

CITY WATER, LIGHT AND POWER
LAKESIDE ASH POND DAM

MAINTENANCE PLAN

PREPARED FOR:

CITY OF SPRINGFIELD, ILLINOIS

PREPARED BY:

HANSON ENGINEERS INCORPORATED
1525 SOUTH SIXTH STREET
SPRINGFIELD, ILLINOIS

JUNE 1987

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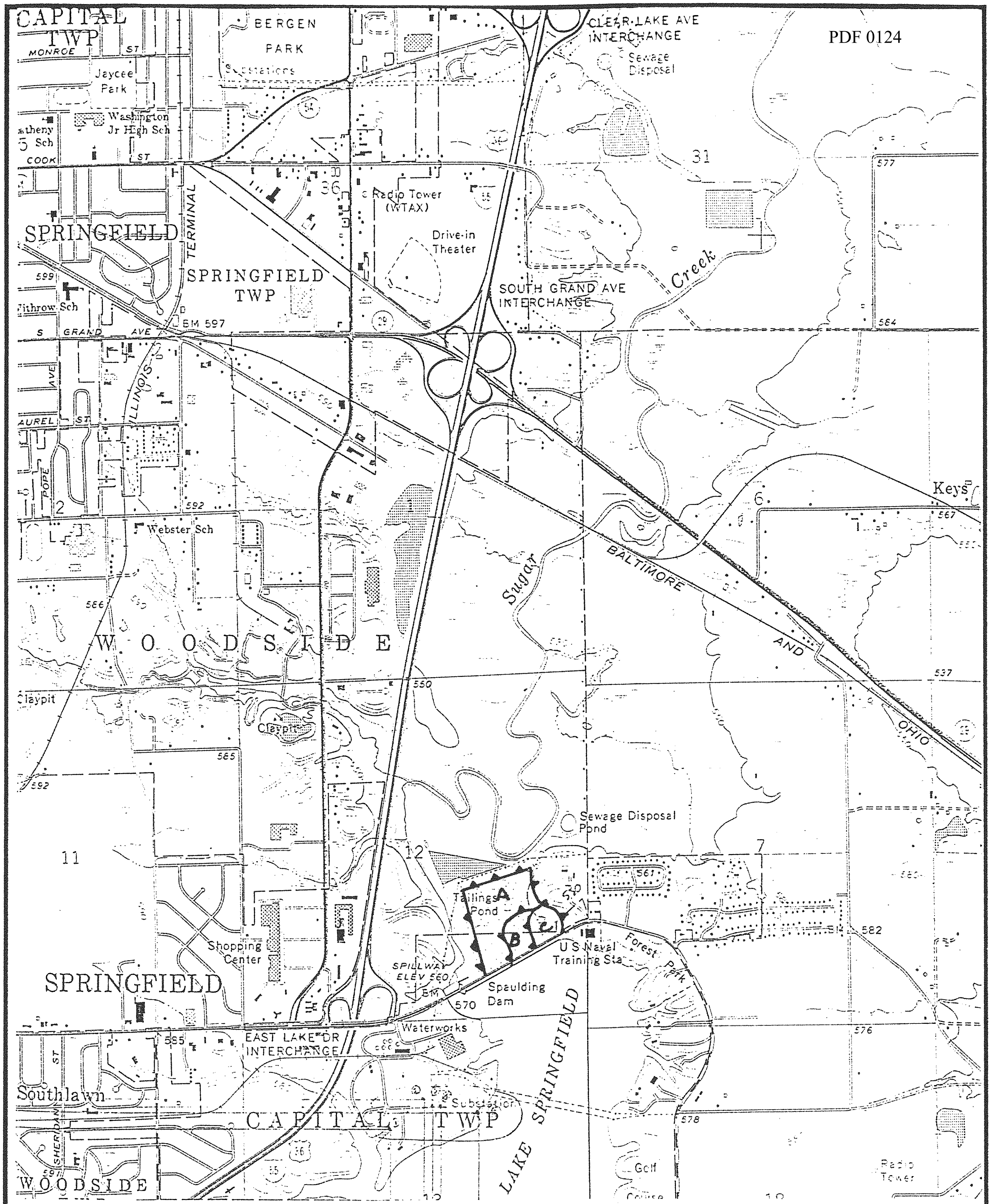


HANSON ENGINEERS INCORPORATED

SPRINGFIELD, IL • PEORIA, IL • ROCKFORD, IL

LAKESIDE FLY ASH POND
CITY WATER LIGHT AND POWER

GENERAL DESCRIPTION

The existing Lakeside Ash Disposal surface area of about 37 acres is located north of Spaulding Dam at Lake Springfield. Of this total surface area, about 26 acres are in Area A (see Figure 1). Areas B and C occupy approximately 3 acres and 8 acres, respectively. The embankments which confine Areas B and C are at or above elevation 565. This is approximately 10 ft higher than the west and north embankments of Area A. The east side of Area A is confined by natural ground. The natural ground surface slopes upward from the east end of the Area A north embankment (about elevation 555) to the east end of the north embankment confining Area C (about elevation 565). The south limits of Areas A, B, and C are defined by Spaulding Dam, which forms Lake Springfield.

The proposed modifications include raising the embankment surrounding Area A for a distance of about 3,200 ft to elevation 565, a maximum height of 10 ft above the existing embankment. This will extend the total height of the west and north embankments to about 28 ft. This will also increase the storage capacity of Area A by about 260 acre ft.

OPERATION

Filter cake sludge material is slurried into Areas B and C from the water treatment plant located to the southwest of the site. A majority of the solids settle in Areas B and C, and the water is decanted into Area A through drop inlet pipes located at the north ends of Areas B and C. Surface water also flows from Areas B and C into Area A through the drop inlets.

Coal combustion ash is slurried into the southwest corner of Area A from nearby Lakeside Power Plant. The ash materials settle out in Area A, and the water is decanted into the clarifier pond through a 21 in. diameter drop inlet pipe. The outlet of this pipe is submerged beneath the surface of the clarifier pond. The level of the clarifier pond is maintained at about elevation 547 ft.

The elevation of the existing ash pond is about 555 ft. After the ash pond embankment is raised to elevation 565 ft, the pool level in the ash pond will be raised to a maximum elevation of 564 ft. This will allow 1 ft of freeboard between the final pond elevation and the top of the embankment. The pond level will be controlled by the 21 in. outlet struture located at the north end of the ash pond. Flows from this structure will be by gravity into the clarifier pond and then discharge into Sugar Creek.

The ash pond outlet structure will not be equipped with a dewatering facility. If an emergency situation warrants lowering the ash disposal area pool, we recommend that this be accomplished with filtered sumps or siphons discharging into the clarifier pond.

The contact at City Water, Light and Power for emergency operations will be ____________________, telephone #_______________.

SECTION 1.0
MAINTENANCE

Certain maintenance procedures must be followed in order to maintain the dam and appurtenances in sound operating conditions. Some procedures must be addressed on a continuous basis, and others will become apparent as a result of site inspections.

1.1 Vegetation

Regular maintenance of vegetation, and replacement of vegetation on damaged or repaired areas is necessary to control erosion on the dam, abutments, and emergency spillways. If, during the regular inspection or following flood conditions, inadequacies are noted, certain procedures must be followed to maintain proper vegetative cover.

1. Preparation of seedbed.

   Fill eroded areas with topsoil. Remove stones larger than 4 in. and other debris. Apply lime and fertilizer, and work the seedbed to a depth of 3 in.

2. Lime.

   Commercial agricultural limestone will be applied according to soil test.

3. Fertilizer.

   The following amounts of fertilizer per acre will be applied:

Nitrogen (N)	120 pounds
Phosphorus (P)	180 pounds P_2O_5
Potassium (K)	180 pounds K_2O_5

4. Seed.

Seed mixture shall comply with Class I requirements of the prevailing edition of "Standard Specifications for Road and Bridge Construction," issued by the State of Illinois, Department of Transportation.

5. Time of Seeding.

Seeding should be done from early spring to June 1, or during August.

6. Sowing.

The seed will be broadcast and covered approximately 1/4 in. to 1/2 in. deep with a light harrow, culti-packer, or other suitable equipment. Seeding may also be done by drilling and culti-packing or using a culti-packer seeder.

7. Mulching.

Mulching will be applied immediately after seeding at the rate of 2 tons of hay or straw mulch per acre. Mulch applied on back slopes or side slopes must be anchored by plastic netting or other means adequate to hold mulch in place.

If inspections reveal that certain areas of standing vegetation require fertilizer, it should be applied at the following rates per acre:

Nitrogen - 60 pounds
Phosphorus - 60 pounds
Potassium - 60 pounds

1.2 Brush Control

The slopes of the dam shall be kept free of brush. Regular mowing or chemical spraying around the dam will control brush and weeds.

1.3 Rodent Control

Rodent holes occurring in the dam will be filled and revegetated. If the rodent population becomes a problem, a controlled program of trapping or other means as approved by the Illinois Department of Conservation will be initiated.

1.4 Obstructions

Obstructions in the form of trash, debris, logs, or excess vegetation can interrupt the normal operation of the dam if blockages occur at certain locations.

1. Primary Spillway.
    a. Spillway structure must be maintained free from obstructions. Any debris that is obstructing it must be removed.

Inspection reports as required by the Division of Water Resources shall be submitted as per the requirements set forth in Section 702.40 (b)(5)(A) of the "Rules for Construction and Maintenance of Dams," as revised February 1, 1987 by the Department of Transportation, Division of Water Resources.

RIGHT OF ACCESS STATEMENT

WHEREAS, the City of Springfield has applied for Operation and Maintenance Permit for Lakeside Ash Pond Dam, Inventory Number ____ from the Illinois Department of Transportation Division of Water Resources and,

WHEREAS, in compliance with Section 702.40(b) of the Department's "Rules for Construction and Maintenance of Dams,"

NOW THEREFORE, be it resolved by the City Council of the City of Springfield that right of access to the dam and immediate vicinity is granted to authorized personnel of the Department upon prior notice to the City of same.

Resolved this ______________ day of ____________________________, 19___.

NAME: ______________________________________

TITLE: Mayor, City of Springfield
Commissioner, City Water, Light and Power

Certified to be a true and accurate copy, passed and adopted on the above date.

NAME: ______________________________________

TITLE: City Clerk

(SEAL)

ATTACHMENT 3

SAFETY FACTOR ASSESSMENT

City Water, Light & Power
Ash Impoundments
Springfield, Sangamon County, Illinois

Initial Safety Factor Assessment for Coal Combustion Residuals Surface Impoundments

October 2021

First Five-Year Update

Prepared for:
City Water, Light & Power
3100 Stevenson Drive
Springfield, Illinois 62703

ANDREWS ENGINEERING

3300 Ginger Creek Drive, Springfield, IL 62711 | 217.787.2334

ILLINOIS | MISSOURI | INDIANA

TABLE OF CONTENTS

TABLES

APPENDICES

1. INTRODUCTION

City Water, Light and Power (CWLP) Lakeside Ash Pond and Dallman Ash Pond are coal combustion residuals (CCR) surface impoundments. An Initial Safety Factor Assessment of the CCR surface impoundments was conducted as required by 35 CFR Part 845.460:

Analysis is performed herein for the Initial Safety Factor Assessment of the existing ash ponds at Springfield City Water, Light and Power, Lakeside and Dallman Ash Ponds, Springfield, Illinois, as required per 40 CFR 257.73(e). Based upon historical geotechnical data and the existing conditions of the ash ponds, all factors of safety exceed the regulatory minimums as demonstrated within this report.

Information reviewed for this report includes the following documents:

- Coal Ash Impoundment Site Assessment Final Report (May 2011)
- Historical Aerial Photographs (April 1995 – March 2014)
- Engineering Report: Proposed Embankment Modification; CWLP Ash Disposal Area (July 1987).
- Construction Grading Plan for the Dallman Ash Pond (August 1976)

2. BACKGROUND

CWLP operates a series of ash and lime sludge clarification or settling ponds east of the power plant complex in Springfield, Illinois. The ponds are operated under National Pollutant Discharge Elimination System (NPDES) Permit Number IL0024767.

The Lakeside Ash Pond is primarily a diked embankment with some incising along the east perimeter and was placed into service prior to 1958. The original Lakeside Ash Pond was been divided into four separate ponds since it was expanded vertically in 1988: three lime softening ponds and the settling pond. The current Lakeside Ash Pond is approximately 27.6 acres and ceased receiving ash in 2009.

The second impoundment, the Dallman Ash Pond, which is a diked embankment, was placed into service in approximately 1976 and is approximately 34.5 acres. Fly ash and bottom ash are sluiced to the Dallman Ash Pond with raw lake water.

Settled water from both the Dallman Ash Pond and Lakeside Ash Pond flow into opposite sides of a Clarification Pond before being discharged, typically, to Sugar Creek at Outfall 004.

3. GEOMETRY OF THE STRUCTURES

According to personal interviews with CWLP staff, the most recent change made to the CCR surface impoundment was a vertical expansion to the Lakeside Ash Pond system in 1988. The vertical expansion consists of berms built on top and inside of the existing embankments in such a way that the toe of the outer slope of the expansion berms match up with the top of the inner slope of the existing embankments, typically identified as upstream construction. The vertical expansion berms are approximately ten feet in height.

A site map drawing containing an aerial photograph and approximate boundaries for all of the CWLP CCR Units, including the ash and lime softening ponds, is provided in Appendix A.

No changes to the geometry of the structures are applicable for this report. No changes are apparent due to structure movement or deformation.

4. GEOTECHNICAL INFORMATION

4.1 Lakeside Ash Pond Geotechnical Data

A review of the historical documents found a previous geotechnical investigation and stability analysis, which was conducted prior to the upstream construction of Lakeside Ash Pond. The results of that geotechnical investigation are utilized within this assessment of the safety factors. Additionally, a literature review of technical papers was conducted to determine the geotechnical parameters for the fly ash within the impoundments. Provided in Table 1 are highly conservative geotechnical parameters based upon the previous geotechnical investigation utilized in the static and seismic slope stability model.

Included in Appendix B are copies of the historical soils logs and cross sections that support the geotechnical parameters provided in Table 1. Technical papers supporting the ash geotechnical parameters are included in Appendix C.

TABLE 1

Lakeside Ash Pond

Soil Description	Density (pcf)	Total Strengths (Short Term)		Effective Strengths (Long Term)	
		ϕ (degrees)	c (psf)	ϕ' (degrees)	c (psf)
Ash	100	15	0	25	0
Embankment	120	0	1,400	32	145
Sandy Silty Clay w/Clayey Silt	120	0	1,800	32	190
Sandy Silty Clay	120	0	1,000	32	190
Shale	130	0	2,000	0	2,000

4.2 Dallman Ash Pond Geotechnical Data

A review of the historical documents revealed the original construction plans, with cross sections provided, was completed. More recent site investigations have been conducted in the area during the installation of piezometers, which provide the stratigraphic and in situ strengths of earthen materials that correlate well with the Lakeside Ash Ponds geotechnical data. The historical data have been used to develop conservative geotechnical parameters for slope stability analysis as provided below in Table 2.

Included in Appendix D are copies of the boring log and cross section that support the geotechnical parameters provided in Table 2.

TABLE 2

Dallman Ash Pond

Soil Description	Density (pcf)	Total Strengths (Short Term)		Effective Strengths (Long Term)	
		ϕ (degrees)	c (psf)	ϕ' (degrees)	c (psf)
Ash	100	15	0	25	0
Embankment	120	0	1,400	32	145
Rip-Rap	140	40	0	40	0
Silty Clay	120	0	1,800	32	190
Clayey Silt	120	0	1,400	32	190
Sandy Silty Clay	120	0	1,000	32	190
Sand w/Silt	120	34	0	34	0
Shale	130	0	2,000	0	2,000

4.3 Seismic Ground Motion

CWLP is susceptible to potential seismic activity as provided by the USGS Earthquake Hazards Program. Included in Appendix E of this geotechnical engineering report is the 2008 National Seismic Hazard Mapping Program's Probabilistic Seismic Hazard Analysis for the site (Latitude 39.762 North, Longitude 89.597 West). The Peak Horizontal Ground Acceleration is approximately 0.09965 g. The maximum acceleration of (aHmax = 0.10g) was selected for use in stability calculations.

5. SLOPE STABILITY ANALYSIS

The static and seismic slope stability model utilized for the following analysis was the Morgenstern and Price Circular Search Method within the Slope/W computer-based slope stability modeling software. Morgenstern and Price satisfies all conditions of equilibrium.

The periodic safety factor assessment requires that each CCR unit document whether the calculated factors of safety for each CCR unit achieve the minimum safety factors. The calculated static factor of safety under the long-term, maximum storage pool loading condition must equal or exceed 1.50. The calculated static factor of safety under the maximum surcharge pool loading condition must equal or exceed 1.40. The calculated seismic factor of safety must equal or exceed 1.00. For dikes constructed of soils that have susceptibility to liquefaction, the calculated liquefaction factor of safety must equal or exceed 1.20.

The Lakeside and Dallman Ash Ponds are not susceptible to liquefaction since the embankments are constructed of a sandy silty clay, thus analyses for each are not included below. Liquefaction occurs in fine grained non-cohesive soils. The embankments at CWLP are constructed of cohesive soils.

5.1 Lakeside Ash Pond Slope Stability

The slope stability analysis was performed on a critical cross section, previously identified as Section 2 in the Engineering Report: Proposed Embankment Modification; CWLP Ash Disposal Area (July 1987)., Based upon a review of this report and existing conditions, Section 2 appears to remain the critical cross section. Section 2 is located on the north side of the Lakeside Ash Pond next to the Clarification Pond. For a very conservative analysis, the slope was analyzed as if the Clarification Pond was drained and dredged back to the pre-existing grades of approximately 535 feet MSL.

The Lakeside Ash Pond is not susceptible to liquefaction since the embankment is constructed of a sandy silty clay; thus, analysis is not included below.

5.1.1 Long-Term Static Slope Stability Analysis

The long-term static slope stability analysis was performed on the Lakeside Ash Pond cross section using the geotechnical parameters as provided in Table 1. The long-term analysis utilizes the effective shear strength parameters, which are the drained condition. The long-term static slope stability analysis found that the factor of safety for the most critical failure surface was 1.532. The critical failure surface and stability report are included in Appendix F-1. This analysis verifies that Lakeside exceeds the factor of safety for the long-term, maximum storage pool loading condition and the maximum surcharge pool loading condition since the analysis was performed filled with ash and the pool elevation matching the top of the embankment.

5.1.2 Short-Term Static Slope Stability Analysis

The short-term static slope stability analysis was performed on the Lakeside Ash Pond cross section using the geotechnical parameters as provided in Table 1. The short-term analysis utilizes the total shear strength parameters, which are the undrained condition. The short-term static slope stability analysis found that the factor of safety for the most critical failure surface was 1.640. The critical failure surface and stability report are included in Appendix F-2.

5.1.3 Seismic Slope Stability Analysis

The seismic slope stability analysis was performed on the Lakeside Ash Pond cross section using the geotechnical parameters as provided in Table 1. The seismic analysis utilizes the total shear strength parameters, which are the undrained condition since a seismic event occurs in a short period of time. In addition, a horizontal acceleration of 0.10g was utilized within the modeling to represent the peak horizontal ground acceleration anticipated for CWLP. The seismic slope stability analysis found that the factor of safety for the most critical failure surface was 1.260. The critical failure surface and stability report are included in Appendix F-3. This analysis verifies that Lakeside exceeds the seismic factor of safety with maximum surcharge pool loading condition.

5.2 Dallman Ash Pond Slope Stability

The slope stability analysis was performed on a critical cross section based upon a review of the historical construction diagrams, cross sections and the available stratigraphic data. Section 10+00 is located on the north side of the Dallman Ash Pond near the relocated Sugar Creek.

For a very conservative analysis, the slope was analyzed as if Sugar Creek had nearly zero flow at approximately 520 feet MSL.

5.2.1 Long-Term Static Slope Stability Analysis

The long-term static slope stability analysis was performed on the Dallman Ash Pond cross section using the geotechnical parameters as provided in Table 2. The long-term analysis utilizes the effective shear strength parameters, which are the drained condition. The long-term static slope stability analysis found that the factor of safety for the most critical failure surface was 2.245. The critical failure surface and stability report are included in Appendix G-1. This analysis verifies that Dallman exceeds the factor of safety for the long term, maximum storage pool loading condition and the maximum surcharge pool loading condition since the analysis was performed filled with ash and the pool elevation matching the top of the embankment.

5.2.2 Short-Term Static Slope Stability Analysis

The short-term static slope stability analysis was performed on the Dallman Ash Pond cross section using the geotechnical parameters as provided in Table 2. The short-term analysis utilizes the total shear strength parameters, which are the undrained condition. The short-term static slope stability analysis found that the factor of safety for the most critical failure surface was 2.897. The critical failure surface and stability report are included in Appendix G-2.

5.2.3 Seismic Slope Stability Analysis

The seismic slope stability analysis was performed on the Dallman Ash Pond cross section using the geotechnical parameters as provided in Table 2. The seismic analysis utilizes the total shear strength parameters, which are the undrained condition since a seismic event occurs in a short period of time. In addition, a horizontal acceleration of 0.10g was utilized within the modeling to represent the peak horizontal ground acceleration anticipated for CWLP. The seismic slope stability analysis found that the factor of safety for the most critical failure surface was 1.754. The critical failure surface and stability report are included in Appendix G-3. This analysis verifies that Dallman exceeds the seismic factor of safety with maximum surcharge pool loading condition.

6. SUMMARY

The analyses indicate that Lakeside and Dallman Ash Ponds provide factors of safety equal to or greater than minimum values as required by 40 CFR 257.73(e). This is predicated upon the assumption that cohesive and frictional shear strengths of materials meet or exceed those used in the analyses. Table 3 below provides a summary of the slope stability results.

TABLE 3

Slope Stability Results

Cross Section	Stability Model Results	40 CFR 257.73 Minimum F.S.
Lakeside Long Term Static	1.532	1.5
Dallman Long Term Static	2.245	
Lakeside Short Term Static	1.640	1.4
Dallman Short Term Static	2.897	

Lakeside Seismic	1.26	1.0
Dallman Seismic	1.754	

7. STATEMENT

This Initial Safety Factor Assessment for Coal Combustion Residuals Surface Impoundments was completed for CWLP by Andrews Engineering, Inc. in accordance with the requirements under 35 IAC 845.460.

10-20-21

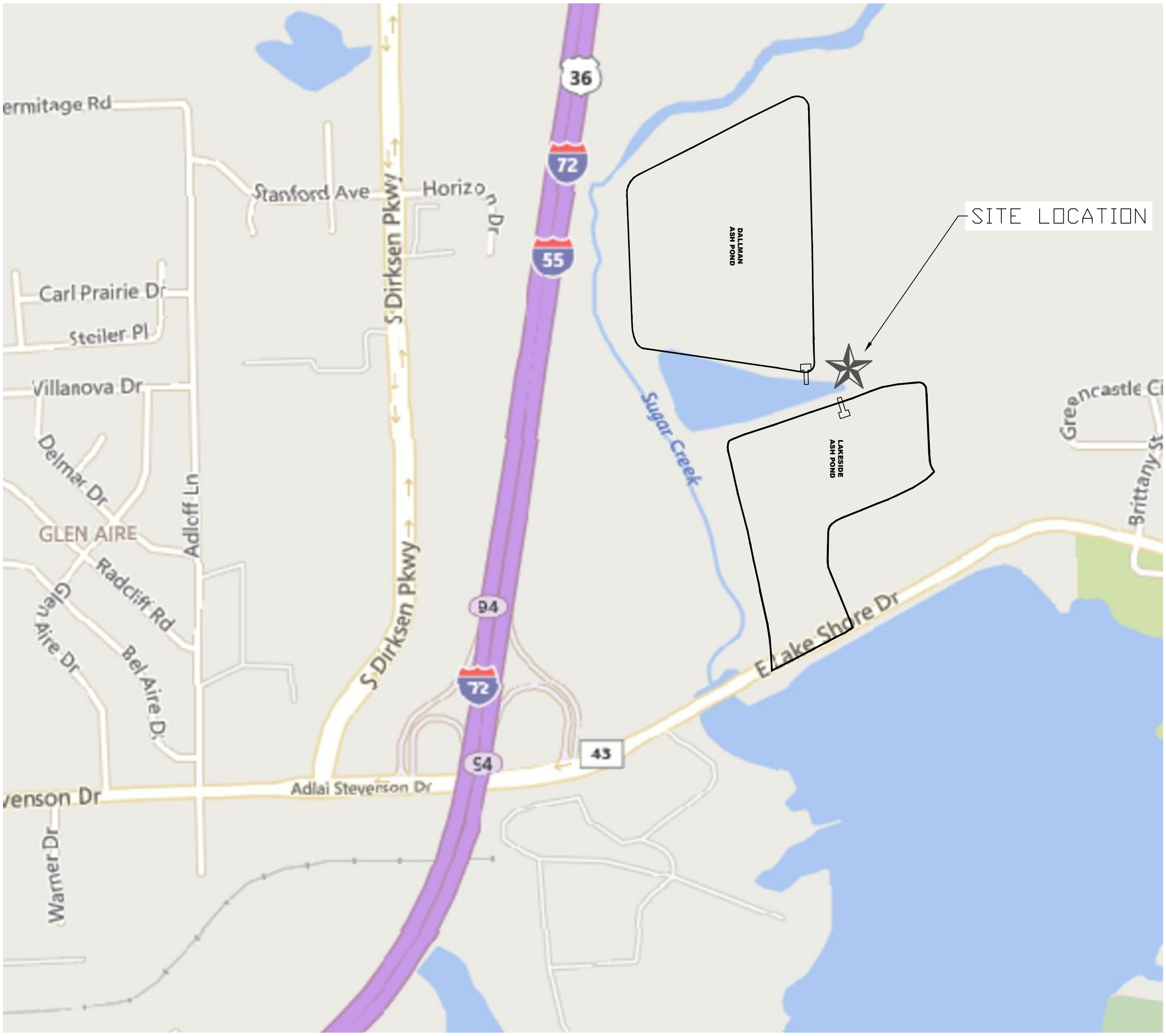
Paul M. Van Metre, P.E.

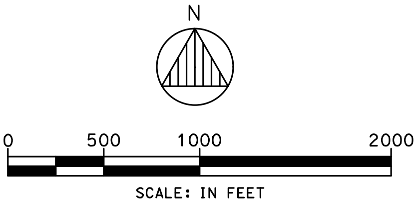
Date

STATE OF ILLINOIS
PAUL
VAN METRE
062-064175
REGISTERED
PROFESSIONAL ENGINEER

APPENDIX A

Site Map





SITE LOCATION

NOTE:
BASE IMAGE DERIVED FROM BING

ANDREWS ENGINEERING, INC.
3300 Ginger Creek Drive, Springfield, IL 62711-7233
Tel (217) 787-2334 Fax (217) 787-9495
Pontiac, IL • Naperville, IL • Indianapolis, IN • Warrenton, MO
Professional Design Engineering and Land Surveying Firm #184-001541

SITE LOCATION MAP

PLANS PREPARED FOR

CWLP

SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: OCTOBER 2016

PROJECT ID: 150077/0011

SHEET NUMBER:

FIG. 1

APPROVED BY: PMV *DESIGNED BY:* PMV *DRAWN BY:* RMC

REVISIONS			
NO.	DATE	DESCRIPTION	BY

ANDREWS
ENGINEERING, INC.
3300 GINGER CREEK DRIVE
SPRINGFIELD, ILLINOIS 62711-7233
PH (217) 787-2334 FAX (217) 787-9495
PONTIAC, IL • LOMBARD, IL • INDIANAPOLIS, IN • WARRENTON, MO
PROFESSIONAL DESIGN ENGINEERING AND LAND SURVEYING FIRM #184-001541

APPROVED BY: PMV
DESIGNED BY: PMV
DRAWN BY: MPN

CWLP COAL COMBUSTION RESIDUALS SURFACE IMPOUNDMENTS

PLANS PREPARED FOR
CITY, WATER, LIGHT & POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE:
OCTOBER 2016

PROJECT ID:
150077/0011

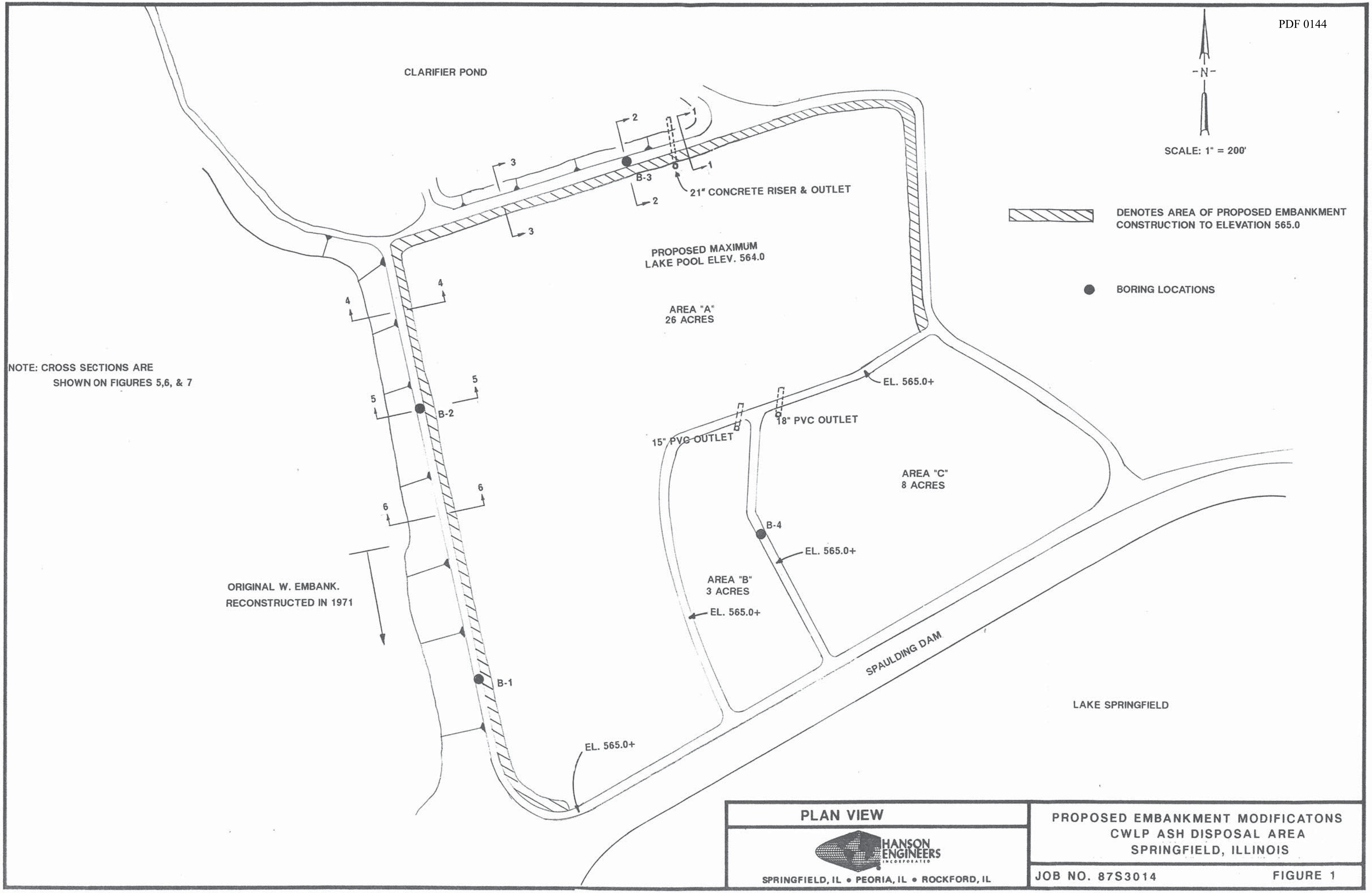
SHEET NUMBER:

FIG. 2

J:\S\Springfield CWLP\CWLP\dwg\SURFACE IMPOUNDMENTS.dwg Tab: FIGURE 2 Last Saved: October 6, 2016, by Ryan Curtis Plotted: Thursday, October 06, 2016 8:24:18 AM

APPENDIX B

Lakeside Soils Logs and Cross Section



PLAN VIEW

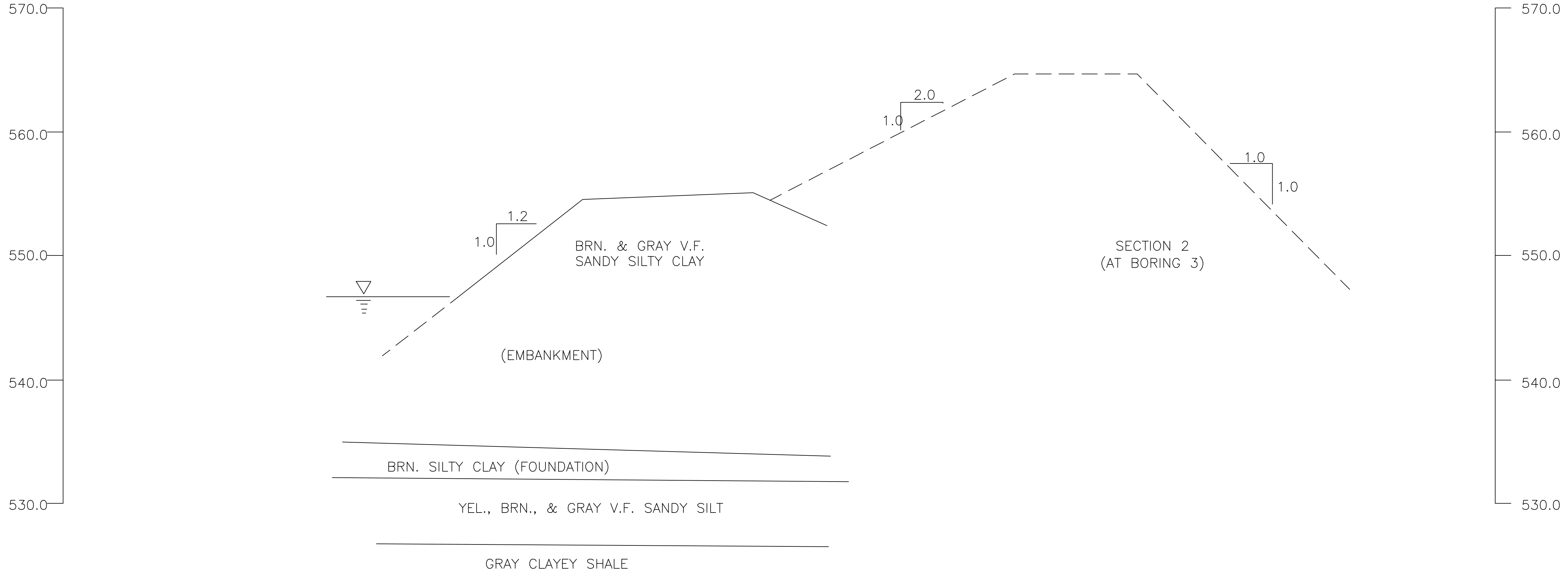
HANSON ENGINEERS INCORPORATED

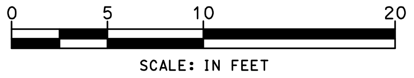
SPRINGFIELD, IL • PEORIA, IL • ROCKFORD, IL

PROPOSED EMBANKMENT MODIFICATONS
CWLP ASH DISPOSAL AREA
SPRINGFIELD, ILLINOIS

JOB NO. 87S3014

FIGURE 1





NOTES:
CROSS-SECTION BASED ON CONSTRUCTION PLAN
DRAWINGS INCLUDED IN ENGINEERING REPORT
PROPOSED EMBANKMENT MODIFICATIONS, HANSON
ENGINEERS, INC., JULY 1987

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REVISIONS			
NO.	DATE	DESCRIPTION	BY

ANDREWS
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PROFESSIONAL DESIGN ENGINEERING AND LAND SURVEYING FIRM #184001541

APPROVED BY: PMV
DESIGNED BY: PMV
DRAWN BY: RMC

LAKESIDE ASH POND CROSS-SECTION 2

PLANS PREPARED FOR
CITY, WATER, LIGHT & POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: OCTOBER 2016
PROJECT ID: 150077/0011
SHEET NUMBER:
X-SEC.

OPERATOR CMP

DATE June-2-1987

JOB NO.

HANSON ENGINEERS INCORPORATED

LABORATORY SOIL TEST DATA

PROJECT NAME AND LOCATION
CWL&P
Ash Pond Study
Springfield, Illinois

BOR.	SAMP.	DEPTH	ELEV.	N	STRENGTH TESTS			W	γw	γD	SPECIAL TESTS	SAMPLE DESCRIPTION
					Qu	M	P					
	Ground Surface Elev-557.6											
1	1	2'-6"	555.1	14				6				Bottom Ash
	2	5'-0"	552.6	3				10				" "
	3	7'-6"	550.1	5				31				" " / dK. gray v.f. sandy silt
	4	10'-0"	547.6	1				79				Drk. gray v.f. sandy silt.
	5	12'-6"	545.1	4	0.92	B	0.8	33				Gray v.f. sandy silty clay.
	6	15'-0"	542.6	4			3.6	67				Gray silty f. sand. (fly ash).
	7	17'-6"	540.1	9				46				Fly ash.
	8	20'-0"	537.6	8				61				" " .
	9	22'-6"	535.1	5	0.71	Sh	1.3	26				Yel. brn. & gray v.f. sandy silty clay / ox. spots.
	10	25'-0"	532.6	15	2.27	B	1.8/3.8	21				Mix colored v.f. sandy silty clay (tr. f.-c. sand & f. gravel)
	11	27'-6"	530.1	9	1.86	B	2.4	27				Drk. gray v.f. sandy silty clay.
	12	30'-0"	527.6	8	0.50	B	0.6	33				" " " " " " " .
	Ground Surface Elev = 555.5											
2	1	2'-6"	553.0	21	5.89	BSp	4.5+	14				Brn. gray v.f. sandy silty clay / ox. spots.
	2	5'-0"	550.5	20	2.27	B	2.4	27				Yel. brn. & gray v.f. sandy silty clay (tr. ox. spots.)
	3	7'-6"	548.0	10	1.86	B	2.2	29				Grn. & drk. brn v.f. sandy silty clay (tr. ox. spots.)
	4	10'-0"	545.5	12	2.68	BSh	2.4	25				Yel brn. & gray v.f. sandy silty clay / ox. spots.
	5	12'-6"	543.0	13	2.68	B	2.9	27				Grn. gray clay (tr. silt & ox. spots.)
	6	15'-0"	540.5	12	2.33	B	2.4	28				Brn. gray v.f. sandy silty clay / ox. spots.
	7	17'-6"	538.0	15	1.94	BSh	2.6	27				Yel. brn & gray v.f. sandy silty clay (tr. chard. pts.)
	8	20'-0"	535.5	14	2.27	B	2.5	28				" " & " " " " " " " (" " ".)
	9	22'-6"	533.0	15	2.68	B	2.8	28				" " & " " " " " " " (" " ".)
	10	25'-0"	530.5	9	1.16	B	1.1	26				" " & " " " " clayey silt / chard. pts.
	11	27'-6"	528.0	8	0.54	B	0.6	23				" " & " " " " silt (tr. chard pts.)
	12	30'-0"	525.5	6	0.89	B	0.7	24				" " & " " " " " / chard pts.
	13	35'-0"	520.5	5	0.78	B	0.8	23				" " & " " " " " & brn. f.-m. sand.
	14	40'-0"	515.5	19				14				Brn. gray f.-m. sand.
	14A	40'	515.5	19				29				Gray shaley clay.

Figure 8

HANSON ENGINEERS INCORPORATED

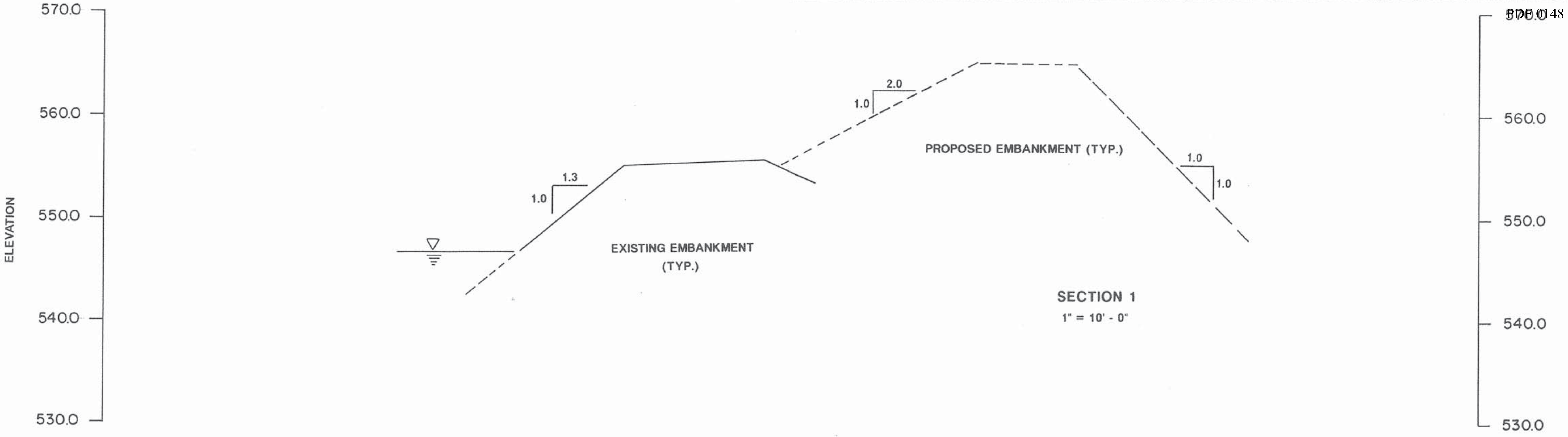
LABORATORY SOIL TEST DATA

OPERATOR CMP
DATE June-2-1987
JOB NO.

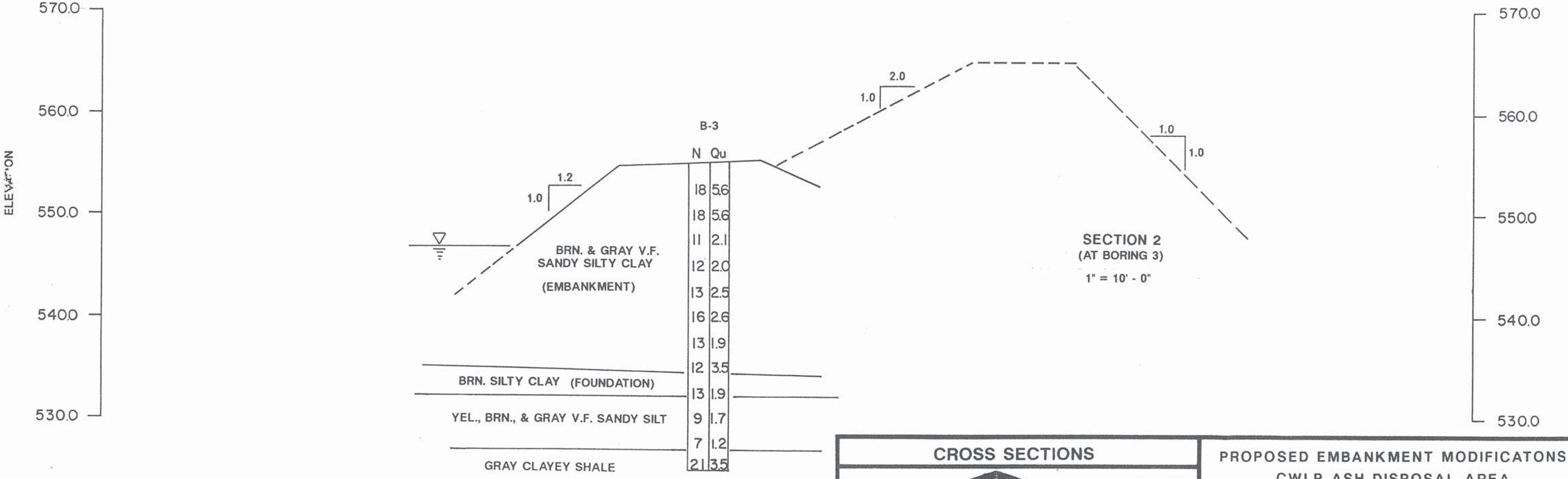
PROJECT NAME AND LOCATION
CWL&P
Ash Pond Study
Springfield, Illinois

BOR.	SAMP.	DEPTH	ELEV.	N	STRENGTH TESTS			W	γW	γD	SPECIAL TESTS	SAMPLE DESCRIPTION
					Qu	M	P					
	Ground Surface Elev=555.2											
3	1	2'6"	552.7	18	5.56	BSh	4.5+	21				Brn. & drk. brn. v.f. sandy silty clay (tr. chard. pts. & sm. roots)
	2	5'0"	550.2	18	5.62	BSp	4.5+	22				Drk. gray clay (tr. chard. pts. & sm. roots.)
	3	7'6"	547.7	11	2.13	BSh	2.4	26				Yel. brn. & gray. v.f. sandy silty clay (tr. chard pts.)
	4	10'0"	545.2	12	1.94	BSh	2.1	29				" " & drk. gray clay (tr. ox. spots.)
	5	12'6"	542.7	13	2.52	B	2.6	25				" " & gray v.f. sandy silty clay (tr. chard. pts.)
	6	15'0"	540.2	16	2.62	B	2.6	26				Drk. gray v.f. sandy silty clay.
	7	17'6"	537.7	13	1.86	B	1.6	28				Yel. brn. & gray v.f. sandy silty clay (tr. chard. pts.)
	8	20'0"	535.2	12	3.50	BSh	3.0/4.5+	21				Drk. gray v.f. sandy silty clay.
	9	22'6"	532.7	13	1.94	B	2.2	28				Yel brn & gray v.f. sandy silty clay & clayey silt/chard pts
	10	25'0"	530.2	9	1.71	B	1.7	26				" " & " " " " silt / chard. pts.
	11	27'6"	527.7	7	1.24	B	1.2	27				" " & " " " " " / " ".
	12	30'0"	525.2	21	3.49	B	3.6	26				Brn. gray clay.
	Ground Surface Elev=566.2											
4	1	2'6"	563.7	5	3.05	Sh	2.8	20				Yel. brn. & gray v.f. sandy silt.
	2	5'0"	561.2	11	1.71	Sp	2.7	25				" " & " " " " " & fly ash.
	3	7'6"	558.7	7	1.65	BSh	2.2	13				" " & " v.f.-m. sandy silt (tr. c. sand.)
	4	10'0"	556.2	10	1.47	BSh	1.9	22				" " & " clay/brn. silty f. sand (tr. fly ash.)
	5	12'6"	553.7	8				18				Fly ash.
	6	15'0"	551.2	7				27				" ".
	7	17'6"	548.7	1				94				Drk. gray silty v.f. sand (fly ash)
	8	20'0"	546.2	2				108				" " " " " " (" ")
	9	25'0"	541.2	1				129				" " " " " " (" ")
	10	30'0"	536.2	16	2.68	B	2.3	31				" " v.f. sandy silty clay.

Figure 4



SECTION 1
1" = 10' - 0"



SECTION 2
(AT BORING 3)
1" = 10' - 0"

CROSS SECTIONS

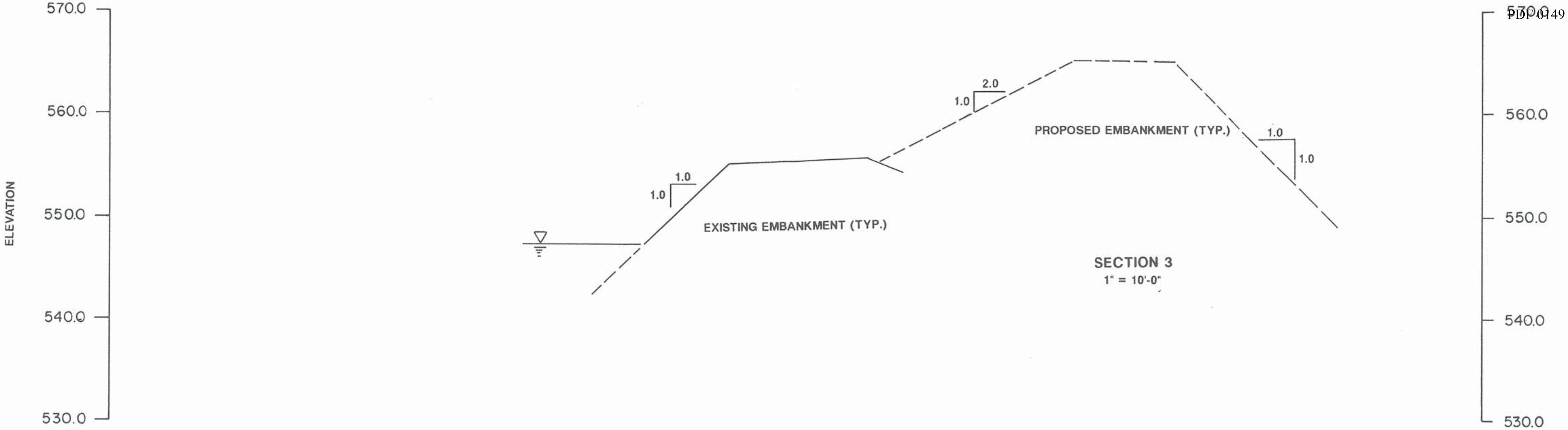
HANSON ENGINEERS INCORPORATED

SPRINGFIELD, IL • PEORIA, IL • ROCKFORD, IL

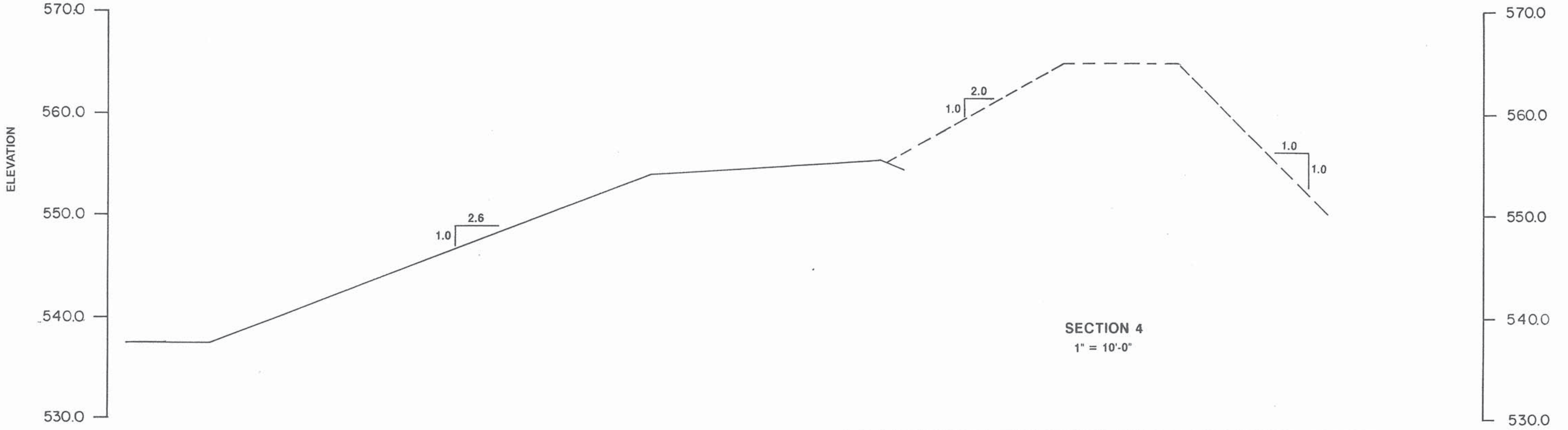
PROPOSED EMBANKMENT MODIFICATONS
CWLP ASH DISPOSAL AREA
SPRINGFIELD, ILLINOIS

JOB NO. 87S3014

FIGURE 5



SECTION 3
1" = 10'-0"



SECTION 4
1" = 10'-0"

CROSS SECTIONS

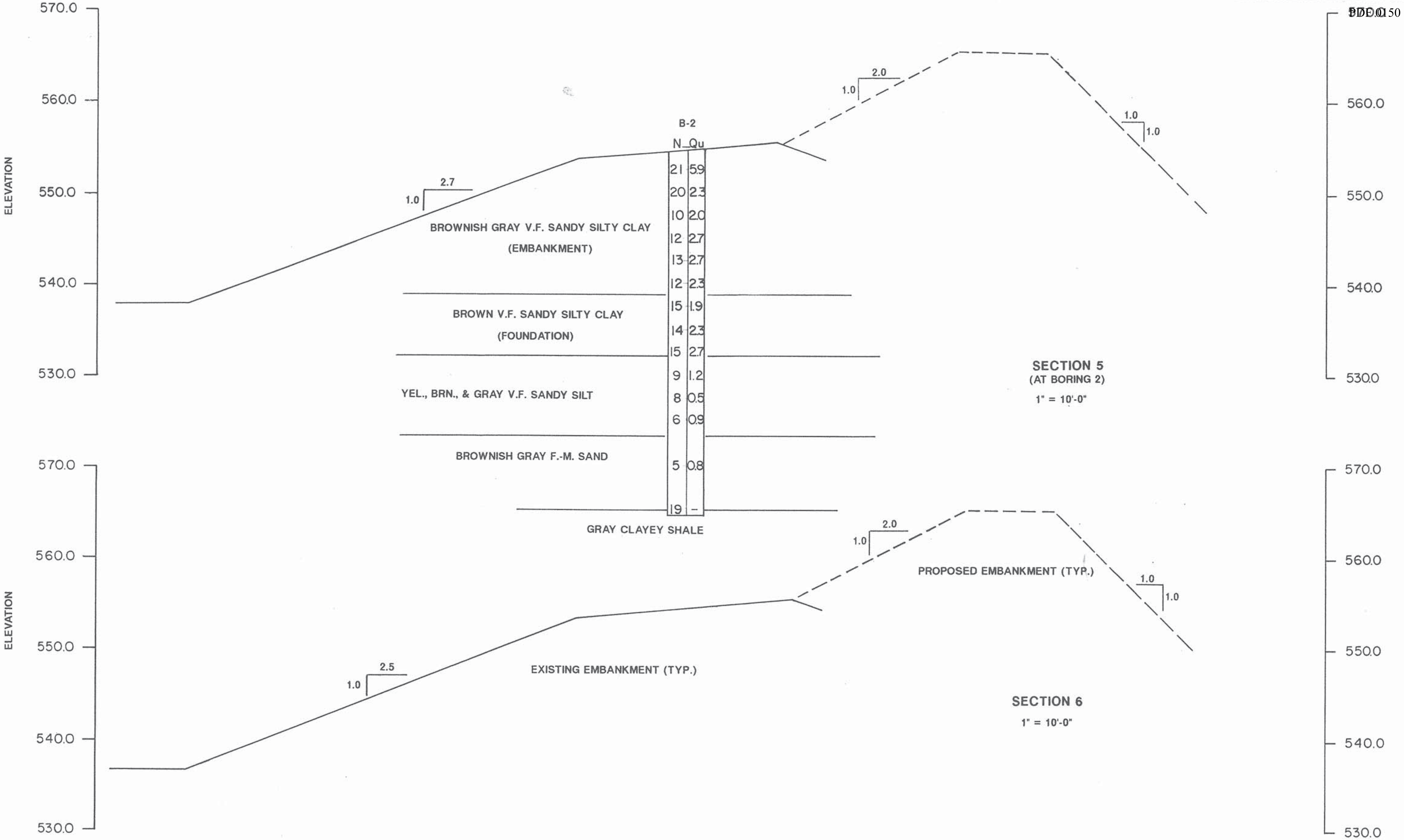
HANSON ENGINEERS INCORPORATED

SPRINGFIELD, IL • PEORIA, IL • ROCKFORD, IL

PROPOSED EMBANKMENT MODIFICATONS
CWLP ASH DISPOSAL AREA
SPRINGFIELD, ILLINOIS

JOB NO. 87S3014

FIGURE 6



CROSS SECTIONS

HANSON ENGINEERS INCORPORATED

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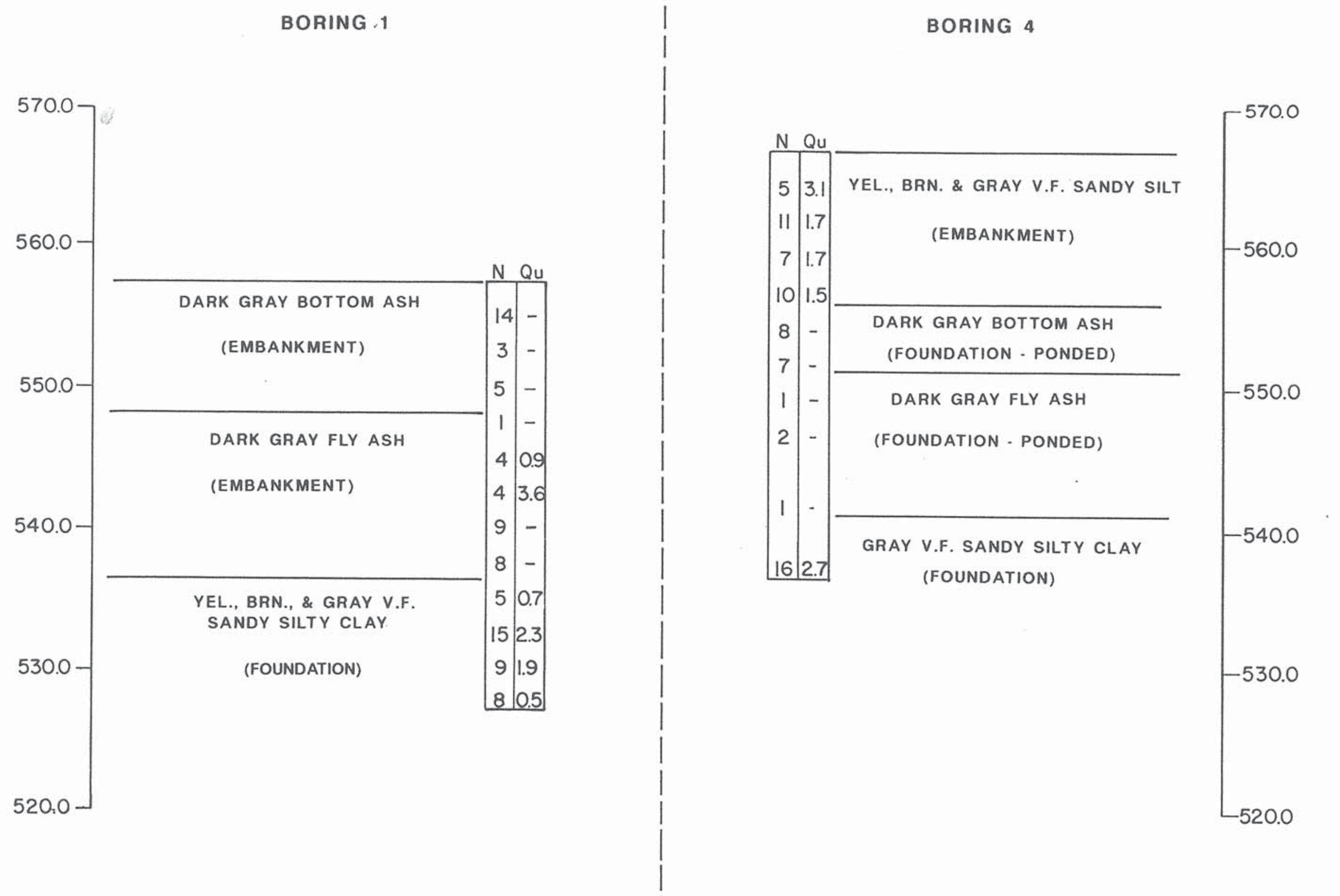
PROPOSED EMBANKMENT MODIFICATONS
CWLP ASH DISPOSAL AREA
SPRINGFIELD, ILLINOIS

JOB NO. 87S3014

FIGURE 7



BORING PROFILES

HANSON ENGINEERS INCORPORATED

SPRINGFIELD, IL • PEORIA, IL • ROCKFORD, IL

PROPOSED EMBANKMENT MODIFICATONS
CWLP ASH DISPOSAL AREA
SPRINGFIELD, ILLINOIS

JOB NO. 87S3014

FIGURE 8

APPENDIX A

CENTRAL ILLINOIS DRILLING COMPANY
1909 OAKWOOD AVE.
BLOOMINGTON, ILLINOIS 61701
(309) 662-5968

LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS
BORING NO. B-1
PROJECT NAME CWLP ASH POND
CONTRACT NO.
LOCATION PER PLAN
DATUM
HAMMER WT. 140#
HAMMER DROP 30"
HOLE DIA. 6"
SURFACE ELEV.
CORE DIA.
CASING
DATE STARTED 5-18-87
COMPLETED 5-18-87
DRILLING METHOD HSA

ELEV.	DESCRIPTION	STRATA DEPTH	DEPTH SCALE	SAMPLES BLOWS FT.	NO.	TYPE	RECOV.	QP		NOTES
		0.0	30							
				6-7-7	1	ss	14"	--		
	Blk. bot. ash, tr. f. gravel									
	fill moist-wet		5	3-2-1	2	ss	8	--		
				3-2-3	3	ss	10	--		WATER 5-18-87 DD 5.0' 8:45am BAR 20.5' 10:15am AAR 4.6' 10:35am
		9.2		2-1-0	4	ss	12	--		DWL 4.0' 6:35pm
	Blk. fly ash		10							
				2-2-2	5	ss	15	0.8		
	wet		15	6-2-2	6	ss	14	0.9		
				4-4-5	7	ss	18	--		
			20	3-5-3	8	ss	18	--		

CENTRAL ILLINOIS DRILLING COMPANY
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BLOOMINGTON, ILLINOIS 61701
(309) 662-5968

LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS
BORING NO. B-1
PROJECT NAME CWLP ASH POND
CONTRACT NO.
LOCATION PER PLAN
DATUM
HAMMER WT. 140#
HAMMER DROP 30"
HOLE DIA. 6"
SURFACE ELEV.
CORE DIA.
CASING
DATE STARTED 5-18-87
COMPLETED 5-18-87
DRILLING METHOD HSA

ELEV.	DESCRIPTION	STRATA DEPTH	DEPTH SCALE	SAMPLES BLOWS FT.	NO.	TYPE	RECOV.	QP		NOTES
		0.0	30							
		23.1		3-2-3	9	ss	18"	1.2		
	Green gray silty clay, tr. f.m. sand, tr. f. gravel moist	25.7	25	6-8-7	10	ss	18	4.5+		
	Dk. gray silty clay moist			4-4-	11	ss	18	3.1		
		30.0	30	3-4-4	12	ss	18	2.0		
	END OF BORING 30.0'									

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BLOOMINGTON, ILLINOIS 61701
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LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS BORING NO. B-2
PROJECT NAME CWLP ASH POND CONTRACT NO.
LOCATION
DATUM HAMMER WT. 140# HAMMER DROP 30" HOLE DIA. 6"
SURFACE ELEV. CORE DIA. CASING
DATE STARTED 5-18-87 COMPLETED 5-18-87 DRILLING METHOD HSA

ELEV.	DESCRIPTION	STRATA DEPTH	DEPTH SCALE	SAMPLES BLOWS FT.	NO.	TYPE	RECOV.	QP		NOTES
		0.0	30							
	10" white rock, brn. gray silty clay fill moist	3.3		8-10-11	1	ss	15"	4.5+		
	Light brn. silty clay ~~fill moist~~	5.8	5	8-9-11	2	ss	16	3.0		
	Brn. green blk. silty clay fill moist			3-5-5	3	ss	15	2.1		WATER 5-18-87
			10	3-5-7	4	ss	16	2.4		DD 28.5' 12:00pm BAR 18.5' 1:55pm AAR WCI 15.0' 2:
				3-6-7	5	ss	13	2.0		Dwl 14.0' 6:30pm
			15	3-5-7	6	ss	18	1.7		
				5-6-9	7	ss	18	3.2		
			20	5-6-8	8	ss	18	3.2		

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BLOOMINGTON, ILLINOIS 61701
(309) 662-5968

LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS
BORING NO. B-2
PROJECT NAME CWLP ASH POND
CONTRACT NO.
LOCATION PER PLAN
DATUM
HAMMER WT. 140#
HAMMER DROP 30"
HOLE DIA. 6"
SURFACE ELEV.
CORE DIA.
CASING
DATE STARTED 5-18-87
COMPLETED 5-18-87
DRILLING METHOD HSA

ELEV.	DESCRIPTION	STRATA DEPTH	DEPTH SCALE	SAMPLES BLOWS FT.	NO.	TYPE	RECOV.	QP		NOTES
		0.0	30							
		22.7		4-6-9	9	ss	18"	3.5		
	Brn. gray silty clay, tr. f. sand moist	25.4	25	3-3-6	10	ss	18	1.8		
	Brn. gray clayey silt, some f. sand, occas. 1-3" f. sand seams a wet			3-4-4	11	ss	18	1.5		
			30	2-3-3	12	ss	18	0.5		
		31.5								
	Brn. f.m. sand wet		35	2-2-3	13	ss	18	1.2		
	~~Brn. f.m. sand wet~~	39.8 ~~40.0~~	40	11-11-12	14	ss	18	2.5		
	END OF BORING 40.0'									

CENTRAL ILLINOIS DRILLING COMPANY
1909 OAKWOOD AVE.
BLOOMINGTON, ILLINOIS 61701
(309) 662-5968

LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS BORING NO. B-3
PROJECT NAME CWLP ASH POND CONTRACT NO.
LOCATION PLAN
DATUM HAMMER WT. 140# HAMMER DROP 30" HOLE DIA. 6"
SURFACE ELEV. CORE DIA. CASING
DATE STARTED 5-18-87 COMPLETED 5-18-87 DRILLING METHOD HSA

ELEV.	DESCRIPTION	STRATA DEPTH	DEPTH SCALE	SAMPLES BLOWS FT.	NO.	TYPE	RECOV.	QP		NOTES
		0.0	30							
	5" white rock, brn. gray blk. silty clay fill moist			7-6-12	1	ss	14"	4.5+		
		4.5		6-9-9	2	ss	18	4.5+		
	Blk. silty clay fill moist		5							
		8.3		5-5-6	3	ss	16	1.7		WATER 5-18-87
	Brn. green blk. silty clay fill moist			3-4-8	4	ss	17	2.5		DD 24.0' 3:50pm BAR 12.4' 4:05pm AAR 10.0' 4:25pm
			10							DWL 9.5' 6:45pm
		17.9		3-6-7	5	ss	18	2.2		
	Blk. gray silty clay fill moist			3-6-8	6	ss	18	2.4		
			15							
				5-6-7	7	ss	18	2.3		
				3-4-8	8	ss	18	3.0		
		20.6	20							

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BLOOMINGTON, ILLINOIS 61701
(309) 662-5968

LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS
BORING NO. B-3
PROJECT NAME CWLP ASH POND
CONTRACT NO.
LOCATION PER PLAN
DATUM
HAMMER WT. 140#
HAMMER DROP 30"
HOLE DIA. 6"
SURFACE ELEV.
CORE DIA.
CASING
DATE STARTED 5-18-87
COMPLETED 5-18-87
DRILLING METHOD HSA

ELEV.	DESCRIPTION	STRATA DEPTH	DEPTH SCALE	SAMPLES BLOWS FT.	NO.	TYPE	RECOV.	QP		NOTES
		0.0	30							
				5-6-9	9	ss	18"	2.0		
	Brn. gray silty clay moist-wet		25	3-4-5	10	ss	18	2.0		
				3-3-4	11	ss	18	1.6		
		28.2								
	Gray brn. clay, little silt moist	30.0	30	6-9-12	12	ss	18	3.8		
	END OF BORING 30.0'									

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BLOOMINGTON, ILLINOIS 61701
(309) 662-5968

LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS
BORING NO. B-4
PROJECT NAME CWLP ASH POND
CONTRACT NO.
LOCATION PER PLAN
DATUM
HAMMER WT. 140#
HAMMER DROP 30"
HOLE DIA. 6"
SURFACE ELEV.
CORE DIA.
CASING
DATE STARTED 5-18-87
COMPLETED 5-18-87
DRILLING METHOD HSA

ELEV.	DESCRIPTION	STRATA DEPTH	DEPTH SCALE	SAMPLES BLOWS FT.	NO.	TYPE	RECOV.	QP		NOTES
		0.0	30							
	Brn. silty clay									
				3-3-2	1	ss	10"	3.5		
	fill moist	4.0								
	Brn. gray blk. silty clay			4-5-6	2	ss	12	3.2		
			5							
	fill moist									
				3-3-4	3	ss	10	2.5		WATER 5-18-87
										DD 11.0' 5:15pm BAR 22.0' 6:00pm AAR 9.8' 6:30pm
				3-5-5	4	ss	13	2.5		
		10.5	10							DWL 9.5' 6:50pm
	Blk. bot. ash									
				5-4-4	5	ss	18	--		
	fill wet									
				5-4-3	6	ss	16	--		
		15.2	15							
	Blk. fly ash									
				1-1-0	7	ss	18	0.2		
	fill wet									
				0-0-2	8	ss	.8	0.2		
			20							

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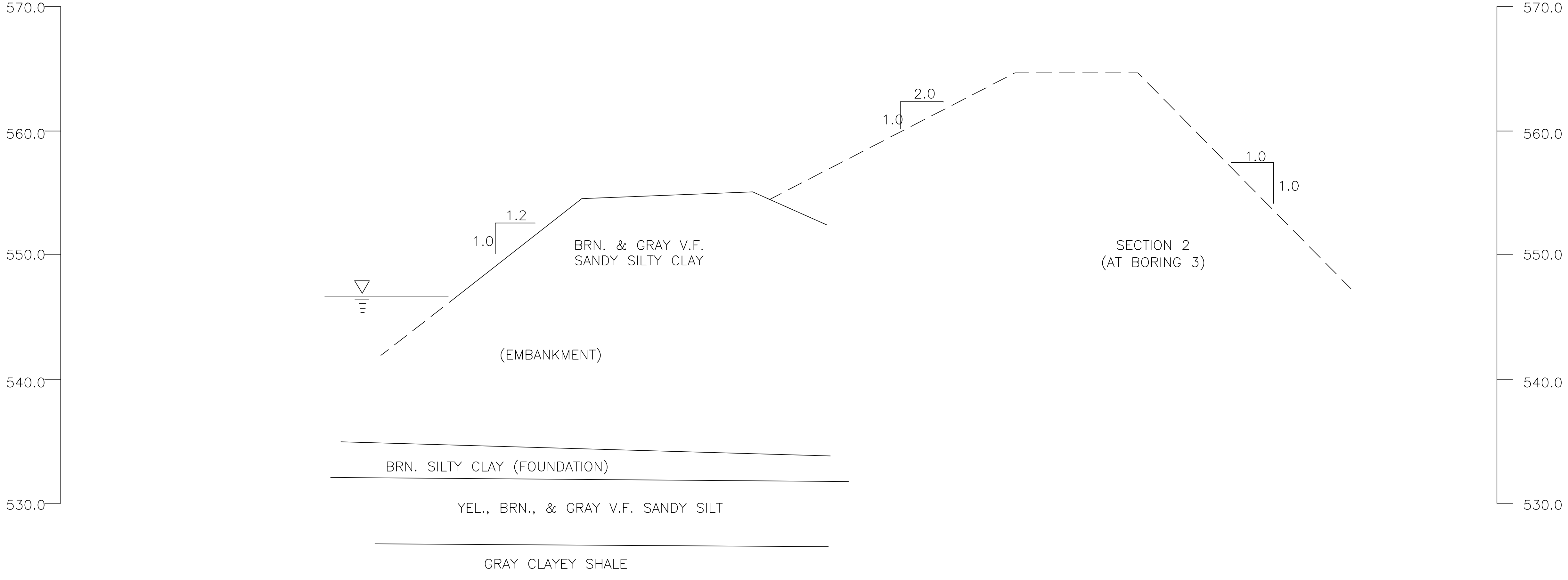
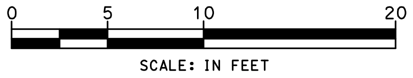
LOG OF BORING

CONTRACTED WITH HANSON ENGINEERS
BORING NO. B-4
PROJECT NAME CWLP ASH POND
CONTRACT NO.
LOCATION PER PLAN
DATUM
HAMMER WT. 140#
HAMMER DROP 30"
HOLE DIA. 6"
SURFACE ELEV.
CORE DIA.
CASING
DATE STARTED 5-18-87
COMPLETED 5-18-87
DRILLING METHOD HSA

ELEV.	DESCRIPTION	STRATA	DEPTH	SAMPLES						NOTES
		DEPTH	SCALE	BLOWS FT.	NO.	TYPE	RECOV.	QP		
		0.0	30							
		25.5	25	1-0-1	9	ss	18"	0.5		
	Blk. gray clay, tr. silt moist	30.0	30	4-6-10	10	ss	18	3.3		
	END OF BORING 30.0'									





NOTES:
CROSS–SECTION BASED ON CONSTRUCTION PLAN DRAWINGS INCLUDED IN ENGINEERING REPORT PROPOSED EMBANKMENT MODIFICATIONS, HANSON ENGINEERS, INC., JULY 1987

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SPRINGFIELD, ILLINOIS 62711-7233
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PROFESSIONAL DESIGN ENGINEERING AND LAND SURVEYING FIRM #184001541

APPROVED BY: PMV | DESIGNED BY: PMV | DRAWN BY: RMC

LAKESIDE ASH POND CROSS–SECTION 2

PLANS PREPARED FOR
CITY, WATER, LIGHT & POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: OCTOBER 2016
PROJECT ID: 150077/0011
SHEET NUMBER:
X-SEC.

APPENDIX C

Fly Ash Technical Papers

Engineering Characteristics of Coal Combustion Residuals and a Reconstitution Technique for Triaxial Samples

Nicholas A. Lacour

Thesis submitted to the faculty of the Virginia Polytechnic Institute and State University in partial fulfillment of the requirements for the degree of

Master of Science
In
Civil Engineering

Adrián Rodriguez-Marek, Chair
Joseph Dove
James Martin

19 June, 2012
Blacksburg, Virginia

Keywords: coal combustion residuals, fly ash, bottom ash, surface impoundments

Engineering Characteristics of Coal Combustion Residuals and a Reconstitution Technique for Triaxial Samples

Nicholas Alexander Lacour

ABSTRACT

Traditionally, coal combustion residuals (CCRs) were disposed of with little engineering consideration. Initially, common practice was to use a wet-scrubbing system to cut down on emissions of fly ash from the combustion facilities, where the ash materials were sluiced to the disposal facility and allowed to sediment out, forming deep deposits of meta-stable ash. As the life of the disposal facility progressed, new phases of the impoundment were constructed, often using the upstream method. One such facility experienced a massive slope stability failure on December 22, 2008 in Kingston, Tennessee, releasing millions of cubic yards of impounded ash material into the Watts Bar reservoir and damaging surrounding property. This failure led to the call for new federal regulations on CCR disposal areas and led coal burning facilities to seek out geotechnical consultants to review and help in the future design of their disposal facilities. CCRs are not a natural soil, nor a material that many geotechnical engineers deal with on a regular basis, so this thesis focuses on compiling engineering characteristics of CCRs determined by different researchers, while also reviewing current engineering practice when dealing with CCR disposal facilities. Since the majority of coal-burning facilities used the sluicing method to dispose of CCRs at one point, many times it is desirable to construct new "dry-disposal" phases above the retired ash impoundments; since in-situ sampling of CCRs is difficult and likely produces highly disturbed samples, a sample reconstitution technique is also presented for use in triaxial testing of surface impounded CCRs.

Acknowledgments

I would like to thank Dr. Adrián Rodriguez-Marek, my advisor, for his guidance throughout my thesis work and throughout my academic career at Virginia Tech. I would also like to thank my parents for their encouragement and support throughout my entire academic career. Lastly, I would like to thank my grandmother for passing on my great-grandparents' rock collection that first sparked my interest in geology and undoubtedly led to my interest in geotechnical engineering.

Contents

List of Figures

List of Tables

Chapter 1

Introduction and Background

Ever since the promulgation of the Resource Conservation and Recovery Act in 1976, there has been debate on the proper waste classification of coal combustion by-products. They have traditionally been disposed of in a fashion similar to that of mine tailings wastes. However, the failure of the Kingston Fossil Plant's main disposal cell on December 22, 2008 has once again led to discussions on how to properly regulate the disposal of these materials. From an engineering standpoint, geotechnical engineers have very little experience with coal combustion wastes, which have some unique engineering properties that set them apart from naturally occurring soils. A comprehensive literature review and compilation of engineering properties of coal combustion residual materials is consolidated and compared between researchers from different nations. Additionally, a triaxial sample reconstitution technique is proposed for surface impounded coal combustion residuals (different types of coal combustion residuals are addressed in section 1.1) which minimizes particle segregation and ensures constant density across the height of the sample. This chapter presents an introduction to the thesis and presents a brief summary of the December 22, 2008 slope stability failure at the Tennessee Valley Authority's (TVA's) Kingston power plant, which served as an inspiration for this thesis.

1.1 Introduction

Coal is the most commonly used fuel in generating electrical energy in the United States. In 2009, coal-powered steam turbines produced 45% of the almost 4 trillion kilowatt-hours of consumed energy in the US (Energy Information Administration 2010). With the burning of such large quantities of coal, there is naturally also a large amount of ash and other byproducts. The four main types of byproducts of burnt coal as described by the Environmental Protection Agency (EPA 2011) are:

Fly Ash: mostly spherical silt to clay-sized particles composed mostly of silica removed from plant exhaust gases through the use of electrostatic precipitators or bag-houses with secondary scrubber systems.

Bottom Ash: coarse, porous, angular fine sand to fine gravel-sized particles of agglomerated ash formed in pulverized ash furnaces.

Boiler Slag: molten bottom ash collected at the base of slag tap and cyclone type furnaces that is quenched with water, causing it to fracture, crystallize, and form pellets. It is composed of hard, black, angular particles that have a smooth, glassy appearance.

Flue Gas Desulfurization (FGD) Material: product of a process used for reducing SO_2 emissions from the gas system of a coal-fired boiler. Depending on the scrubbing process, the material is either predominantly calcium sulfite ($CaSO_3$), calcium sulfate ($CaSO_4$), or a mixture of the two. It consists of small, fine, particles. Calcium Sulfate FGD material can be used in place of gypsum ($CaSO_4 \cdot 2H_2O$) in wallboard manufacturing or in cement production, while calcium sulfite can be used as embankment and road base material.

There are beneficial reuses for each of these byproducts, though generation almost always outweighs demand. In order to avoid confusion, when referring to these byproducts, the definitions outlined by EPA (*Federal Register* 2010) will be used. When referring to burnt-coal byproducts being beneficially used, the term Coal Combustion Products (CCPs) will be used, while Coal Combustion Residuals (CCRs) will be used when referring to byproducts that are destined for disposal.

Use of CCPs are unique to the application in which they are being utilized. Therefore, the focus of this thesis is on the geotechnical engineering properties and design and monitoring considerations for CCR landfills and surface impoundments.

Depending on the type of system used to remove fly ash from and/or to desulfurize the exhaust gases of boilers used in electricity generation, CCRs have traditionally been disposed of using either a dry (or, more accurately, a moisture conditioned) placement method or a hydraulic sluicing method . Again referring to EPA definitions (*Federal Register* 2010), any disposal area where CCRs are disposed of using a dry method will be referred to as a CCR landfill, while any area that CCRs are disposed of hydraulically will be referred to as a CCR surface impoundment. A CCR surface impoundment is a disposal area much akin to a mine tailings dam disposal area, or to a dredge spoil area. While CCR landfill wastes are placed using backhoes or other heavy equipment and compacted in a moist condition, CCR surface impoundment wastes are simply the result of a wet-scrubbing removal system for fly ashes; the effluent from these wet-scrubbing processes is then often mixed with bottom ashes and hydraulically placed in a disposal area contained by some sort of dike system.

As a result of the Kingston Fossil Plant failure, EPA found it necessary to reexamine regulatory policies regarding the disposal of CCRs:

With the promulgation of 42 U.S.C. §6901 (1976), commonly known as the Resource Conservation and Recovery Act (RCRA), CCRs were not initially specified as hazardous (subtitle C) or solid wastes (subtitle D). In 1980, the Solid Waste Disposal Act amendments to RCRA were enacted, one of which was the “Bevill Amendment”, 42 U.S.C. §6921 (b)(3)(A)(i). This amendment temporarily exempted CCRs from subtitle C regulation, classifying them as subtitle D, which is subject to state regulation. In 1988, EPA released a report entitled *Wastes from the Combustion of Coal by Electric Utility Power Plants* in which they concluded that the four above-mentioned CCRs did not exhibit hazardous characteristics according to RCRA regulations and would therefore not be regulated under Subtitle C. However, it was not until August 9, 1993 that EPA issued the final regulatory determination applicable to these CCRs (*Federal Register* 1993), stating that regulation of them as hazardous wastes was unwarranted (Dockter and Jagiella 2005).

Most recently, on June 21, 2010, EPA announced their intent to regulate CCRs generated from the combustion of coal at electric utilities under the RCRA. The EPA announcement introduced two options:

- EPA would reverse the 1993 and 2000 exemptions of CCRs under the Bevill Amendment and list them as special wastes subject to regulation under subtitle C of RCRA when they are destined for disposal in landfills or surface impoundments.
- EPA would leave the Bevill determination in place while regulating the disposal of CCRs under subtitle D of RCRA by issuing national minimum criteria.

Regardless of the chosen alternative, EPA is also proposing to establish dam safety requirements in order to address the stability of CCR surface impoundments to prevent catastrophic releases like that at the TVA Kingston plant. EPA has suggested the adoption of the Hazard Potential Classification System for Dams, developed by the U.S. Army Corps of Engineers, since it would be relatively straightforward in its application to surface impoundments.

The main purpose of this thesis is to consolidate current published material on the properties of CCRs and to quantify the variability within the engineering properties of CCRs between countries, individual power plants, and CCR types. Furthermore, CCR impoundment areas are plentiful across the U.S. and power generating companies would prefer to begin dry disposal of CCRs directly over retired CCR surface impoundments. In order to do this, a geotechnical site investigation must be performed, in which the static and dynamic shear strengths of the surface impounded materials are analyzed. Since CCRs tend to be non-plastic in nature, undisturbed sampling is often difficult, time consuming, costly, and anything but "undisturbed." Therefore, a second objective of this thesis is to analyze a slurry deposition specimen reconstitution technique that is easier and less costly than undisturbed sampling, in order to determine if this specimen reconstitution technique forms samples of uniform relative density without particle segregation.

1.2 Kingston Fossil Plant Failure

The Kingston Fossil Plant is a coal-fired electrical power plant constructed and operated by the Tennessee Valley Authority (TVA). Construction on the facility began in 1951 and the first coal-fired electrical unit began in 1954. Ash slurries were initially released into a slack water area created by a two dikes with a gap in-between to allow water from the Watts Bar Reservoir to enter. The ash slurries and the waters of the reservoir were then allowed to commingle until the two dikes were connected in 1958, separating the reservoir and the ash disposal area. This slack water area collected silt and clay sediments from the period of 1942 to 1954; after 1954, disposed ash was added to the silts and clays being deposited and with the construction of the closure dike, additional clay runoff sediment was deposited along with the runoff silts, reservoir clays, and disposed ash. This formed a slick, weak layer found by AECOM to be a major contribution to the ash disposal area's failure in December of 2008 (Walter and Butler 2009).

The AECOM Root Cause Analysis report attributed the failure as most likely due to creep in the aforementioned weak layer due to active loading in a dredge cell contained within the disposal area. This creep caused an initial failure of various disposal phase dikes founded on older disposed ash deposits, which, in turn, caused progressive failure of upstream ashes, leading to undrained loading and subsequent failure of the downstream ash material and disposal area perimeter dike. The upstream progressive failure stopped upon reaching a former divider dike within the disposal area. The estimated ash released in the failure was 5.4 million cubic yards. Figure 1 provides an aerial photograph of the disposal area before and after the slope failure.

Figure 1: Aerial photographs comparing the Kingston Fossil Plant ash disposal area before and after the massive slope failure on December 22, 2008.

While this failure may have occurred because of a very unique site condition, AECOM did note in their Root Cause Analysis report that "extensive void ratio data in un-failed areas of the Dredge Cells showed a lack of significant consolidation of the wet ash with depth," which would indicate that strength would not increase significantly with depth in the disposed ash material. This property also raises the question of stability of these sort of disposal areas under dynamic loading. If surface-impounded coal ashes do not tend to increase in density with depth, this could leave a very deep, potentially liquefiable layer of CCRs at a given site, rather than just a single liquefaction-prone layer (which is usually the case in naturally-deposited soils).

The entire Root Cause Analysis report and other investigatory data for the Kingston Fossil Plant failure can be accessed on the TVA website at http://www.tva.gov/kingston/rca/.

1.3 Outline

This thesis is composed of eight chapters. The first chapter introduces the background as well as inspiration for the thesis topic. Chapters two and three provide consolidated research results on the static and dynamic engineering properties of CCRs, respectively. Chapter four discusses similarities between mine tailings disposal areas and CCR disposal areas and provides some guidance on how monitoring techniques developed for mine tailings disposal areas can be directly applied or slightly modified so that they can be applied to CCR disposal areas. Chapters five and six address how slope stability and settlement analyses can differ for CCR materials as opposed to naturally occurring soils. Chapter seven provides a review of common triaxial reconstitution techniques used on granular materials, while also analyzing a reconstitution technique to determine if it produces homogenous samples in terms of grain size distribution and relative density with height. Finally, chapter eight provides some final observations for each chapter, as well as a summary of topics that require further research in the future.

Chapter 2

Engineering Characterization of CCRs

Index and mechanical properties of soils provide the basic information required to design earth retaining structures, foundations, and earthen embankments and to perform slope stability analyses; determining the index properties and running field and laboratory tests to determine these properties is the first step in any geotechnical engineering application. In any given region, there is a large body of literature from past projects describing the local soils that engineers can use as a resource to accelerate this initial process. CCRs, however, are not a natural soil and have characteristics that make their behavior in certain situations markedly different than natural soils of similar grain size; additionally, coal ashes can vary considerably from one site to another based on differences in the coal source, coal preparation methods, type of power plant unit, and combustion temperatures (Yudbhir and Honjo 1991). This chapter outlines some of the major differences in the properties of CCRs as compared to other soils and compiles some CCR characteristics obtained from published technical literature. Additionally, test data from engineering reports for five specific coal combustion plants in the U.S. are included; however, information identifying the specific plants has been omitted at the request of the plant operators. These five plants are referred to as Site 1 through Site 5 consistently throughout this thesis.

2.1 Specific Gravity

Perhaps one of the most unusual characteristics of CCRs is their wide range of specific gravities. While some CCRs may have specific gravities of around 2.7 or even 2.8, some have been reported to have specific gravities as low as 1.47. Table 1 provides some values of specific gravity (G_s) determined for CCRs by researchers in different countries.

Table 1: Reported specific gravities of CCRs from different countries

Reference	Type of CCR	Country	G_s
Martin et al. (1990)	Fly Ash	USA	2.03-2.49
Tu et al. (2007)		USA	2.10-2.40
Kim and Prezzi (2008)		USA	2.30-2.81
Site 3		USA	2.42-2.71
Site 4		USA	2.21-2.73
Sridharan et al. (1998)		India	1.95-2.31
Pandian and Balasubramonian (1999)		India	1.97-2.55
Prashanth et al. (1999)		India	2.03-2.67
Sridharan et al. (2001)		India	2.07-2.55
Trivedi and Sud (2004)		India	1.72-2.03
Pandian (2004)		India	1.95-2.55
Das and Yudhbir (2005)		India	2.14-2.62
Prakash and Sridharan (2006)		India	1.95-2.55
Prakash and Sridharan (2009)		India	1.66-2.55
Jakka et al. (2010)		India	2.18-2.27
Raymond (1961)		UK	2.05-2.26
Sherwood (1975)		UK	1.90-2.37
Indraratna and Nutalaya (1991)		Canada	1.90-2.90
		Thailand	2.27-2.45
Kolay and Kismoor (2009)		Malaysia	2.11-2.31
Muhardi et al. (2010)		Malaysia	2.50-2.70
Site 1	Surface Imp.	USA	2.13-2.30
Site 2		USA	2.16-2.26
Site 3		USA	2.55-2.62
Site 4		USA	2.20-2.47
Site 5		USA	2.29-2.61

Reference	Type of CCR	Country	G_s
Sridharan et al. (1998)		India	1.91-2.15
Sridharan et al. (2001)		India	1.96-2.66
Trivedi and Sud (2002)		India	1.60-2.10
Trivedi and Sud (2004)		India	1.98-2.00
Pandian (2004)		India	1.91-2.50
Prakash and Sridharan (2006)		India	1.91-2.50
Bera et al. (2007)		India	2.16-2.23
Prakash and Sridharan (2009)		India	1.64-2.66
Skarzynska et al. (1989)		UK	2.10-2.24
		Poland	1.90-2.31
Seals et al. (1972)	Bottom Ash	USA	2.28-2.78
Sridharan et al. (1998)		India	1.82-2.15
Sridharan et al. (2001)		India	1.98-2.19
Pandian (2004)		India	1.82-2.15
Prakash and Sridharan (2006)		India	1.66-2.17
Prakash and Sridharan (2009)		India	1.47-2.19
Jakka et al. (2010)		India	2.50-2.59
Kolay and Kismoor (2009)		Malaysia	2.09-2.32

Despite the wide range of specific gravities observed for CCRs, most researchers recognize that they usually have a specific gravity lower than that of natural soils (Prakash and Sridharan 2009, Trivedi and Singh 2004b, Tu et al. 2007). It logically follows that since the unit weight of CCRs is less than that of natural soils, horizontal earth pressures in CCRs will be less than that of natural soils as well. Prakash and Sridharan (2009) cite this as a property that makes them ideal for use as backfill material for retaining structures or as a lightweight fill in other construction applications.

Many factors contribute to variability in the specific gravity of coal ashes, such as the parent coal and the combustion and cooling processes. Figure 1 compares variability of the specific gravity of different coal ashes from different countries. Additionally, some of the research studies done on ash from several different plants have a much higher variability than studies done on specific sites, indicating that variability in the specific gravity of CCRs within a given plant is lower than the specific gravity of CCRs within the country where that plant is in. Examining Figure 2, it is interesting to note the clear difference in the mean values of specific gravity between US coal ashes and Indian coal ashes; this may be due to higher iron contents in

US coals. Table 2 provides percentages of major constituent oxides in CCRs from different countries by weight, which shows how much the mineralogy of CCRs can vary between countries, another factor that can account for high variability in the specific gravity of CCRs from different countries (Yudbhir and Honjo 1991). Loss on ignition (LOI) for the CCRs is also reported in Table 2, that is, the loss in mass of the samples upon strong heating.

Table 2: Percentages by weight of major oxide constituents of CCRs from different countries (after Yudbhir and Honjo 1991).

Constituents	USA	UK	Canada	India	Thailand	Japan	Hong Kong	China	Australia	S. Africa	Poland	Germany
SiO_2	28-59	37-54	37-59	13-64	27-34	50-62	38-77	44-55	44-73	40-53	43-52	48
Al_2O_3	7-38	17-33	12-24	14-31	19-28	22-30	14-46	20-32	16-33	24-35	19-34	25
Fe_2O_2	4-42	6-22	3-39	3-24	20-24	4-7	1-18	1-17	3-6	5-11	1-13	7
CaO	0-13	1-27	1-13	1-34	11-16	3-7	0-16	5-9	0-9	5-10	2-9	3
LOI	0-48	0-27	0-10	0-16	0-2	1-6	4-8	3-9	1-9	2-11	2-10	-
Glass Content	54-87	54-87	54-95	-	-	56-58	-	29-40	49-60	29-43	-	-

Note: LOI = loss on ignition

2.2 Consolidation Properties and Volume Stability

CCRs have historically been disposed of in two major ways: collected from boilers hydraulically and diverted to a surface impoundment or collected through electrostatic precipitators or flue gas desulfurization systems and dry-placed into CCR landfills. In either of these disposal alternatives, there is traditionally no defined level of compactive effort used and depending on future uses of the disposal sites, the consolidation characteristics of CCRs can be of interest to geotechnical engineers. Again, since CCRs are not naturally occurring soils, there has been little testing on their consolidation properties and volume stability. Table 3 provides compression and recompression indices and coefficients of consolidation determined by different researchers.

Few researchers report a value for the recompression index; in a disposal area, there would not necessarily be an unloading-reloading process during normal operations. Whenever recompression indices are reported, it is usually in reference to reuse of CCRs in construction applications. Furthermore, the recompression indices reported are extraordinarily low. The reported values of coefficient of consolidation, c_v, are highly variable, as might be expected for materials that have non-typical stress histories. Furthermore, it is important to note that values of

c_v cannot be determined using the traditional Taylor or Casagrande methods, since the majority of deformation for laboratory consolidation tests is complete within one minute; therefore, it is necessary to take deformation readings at very small time intervals (Yudbhir & Honjo 1991). It is also important to note that reported values of c_v mean little independent of the vertical effective stress at which that value was recorded, since the coefficient of consolidation is dependent on both the compressibility of the material and the permeability of the material, based on Terzaghi's original one-dimensional consolidation equation:

$$c_v = \frac{1}{\gamma_w}\frac{k_v}{m_v} \tag{1}$$

where c_v = coefficient of consolidation
γ_w = unit weight of water
k_v = vertical coefficient of permeability
m_v = coefficient of compressibility

Since both k_v and m_v generally decrease with increasing overburden stress, but not necessarily at the same rate, it is hard to relate the coefficient of consolidation to the compression and recompression indices in a general manner. Consequently, the values of c_v reported in Table 3 should not be taken as "typical" values, because of how c_v is mathematically defined.

Some of the variability of compression and recompression indices and coefficient of consolidation of CCRs can be attributed to the type of CCR. For example, it is logical to assume that bottom ash would have a higher coefficient of consolidation, since it has a higher hydraulic conductivity and a lower compressibility than fly ash. For this reason, variability plots for fly ash and surface impounded ash have been presented separately from those for bottom ash. Figures 3 through 5 present variability plots for the compression and recompression indices for different types of CCRs. Since the recompression index of bottom ash is rarely determined by researchers, the variability plot for recompression index includes fly ash, surface impounded ash, and bottom ash. Figure 6 presents a variability plot for the coefficient of consolidation for CCRs at different placement conditions.

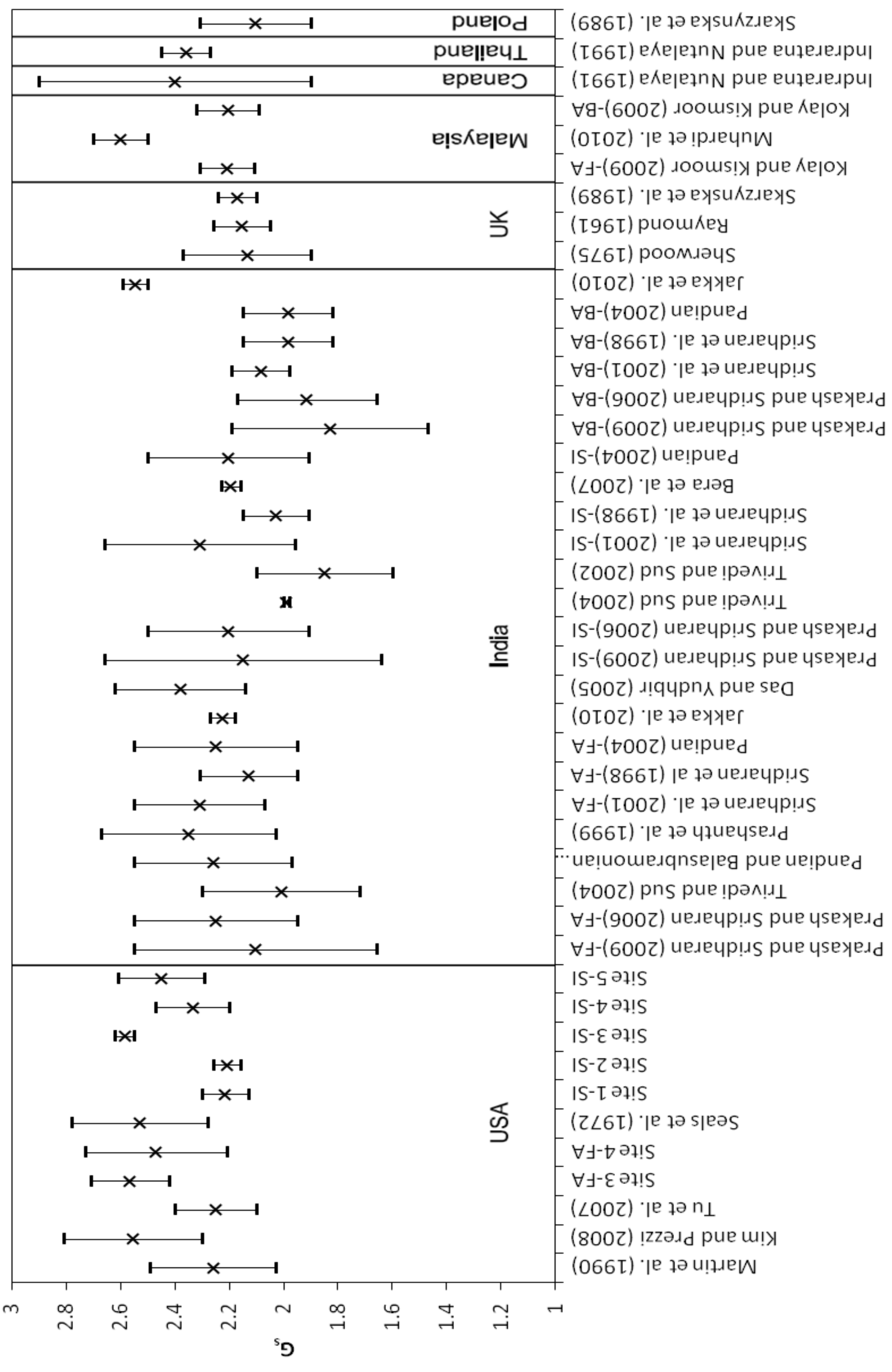

Figure 2: Variability plot for the specific gravities determined by studies performed in different countries.

Table 3: Compression and recompression indices and coefficients of consolidation for CCRs reported by different researchers.

Reference	Type of CCR	Country	C_c	C_r	C_v (cm^2/s)	Vertical Stress (psi)
Tu et al. (2007)	FA Resed.	USA	0.0390-0.0640	0.0035-0.0072	2.00-70.0	0.203-150
Site 1	SI	USA	0.080-0.710	0.0100-0.0300	-	0.694-111
Pandian and Balasubramonian (1999)	FA	India	-	-	0.00200-0.0802	0.73-116
Trivedi and Sud (2002)	SI/MH	India	0.00600-0.0100	0.000300-0.00300	-	3.34-116
Kaniraj and Gayathri (2004)	FA Comp.	India	0.0410-0.0840	0.00800	0.080-2.00	1.42-182
Pandian (2004)	FA	India	0.0490-0.284	-	1.16×10^{-5}-1.27×10^{-4}	7.12-113
	SI	India	0.0520-0.300	-	2.93×10^{-7}-8.17×10^{-4}	0.00-56.9
	BA	India	0.0570-0.484	-	7.57×10^{-7}-3.35×10^{-5}	0.00-56.9
Madhyannapu et al. (2008)	FA Resed.	India	0.100-0.167	0.00400-0.00800	-	
Prakash and Sridharan (2009)	FA Comp.	India	-	-	0.140-3.25	-
	SI Comp.	India	-	-	0.960-10.0	-
	BA Comp.	India	-	-	1.43-10.15	-
Jakka et al. (2010)	FA Comp.	India	0.079-0.246	0.018-0.023	-	7.26-29.0
	BA Comp.	India	0.051-0.059	0.013-0.024	-	7.26-29.0
Kolay and Kismoor (2009)	FA Comp.	Malaysia	0.0490-0.0510	-	-	319-2467
	SI Comp.	Malaysia	0.0780	-	-	319-2468
	BA Comp.	Malaysia	0.103-0.113	-	-	319-2469
Muhardi et al. (2010)	FA Comp.	Malaysia	0.150	-	3.00×10^{-5}-1.53×10^{-4}	-
	BA Comp.	Malaysia	1.54	-	-	-
Yudhbir and Honjo (1991)	FA Comp.	-	0.0300-0.375	-	-	-
	FA SI	-	0.0650-0.610	-	-	-
	FA SID	-	0.610-0.885	-	-	-
CAPCO (1990)	FA Comp.	Hong Kong	-	-	9.51×10^{-3}-1.90^{-2}	-
Haws et al. (1985)	FA Comp.	UK	-	-	9.51×10^{-4}-6.34×10^{-3}	-
Koo (1991)	FA Comp.	Thailand	-	-	3.17×10^{-4}-7.61×10^{-3}	-

FA = fly ash
BA = bottom ash
SI = surface impoundment ash
SID = surface impoundment/loose dry dump ash
MH = mixed hopper ash
Comp. = compacted
Resed. = resedimented

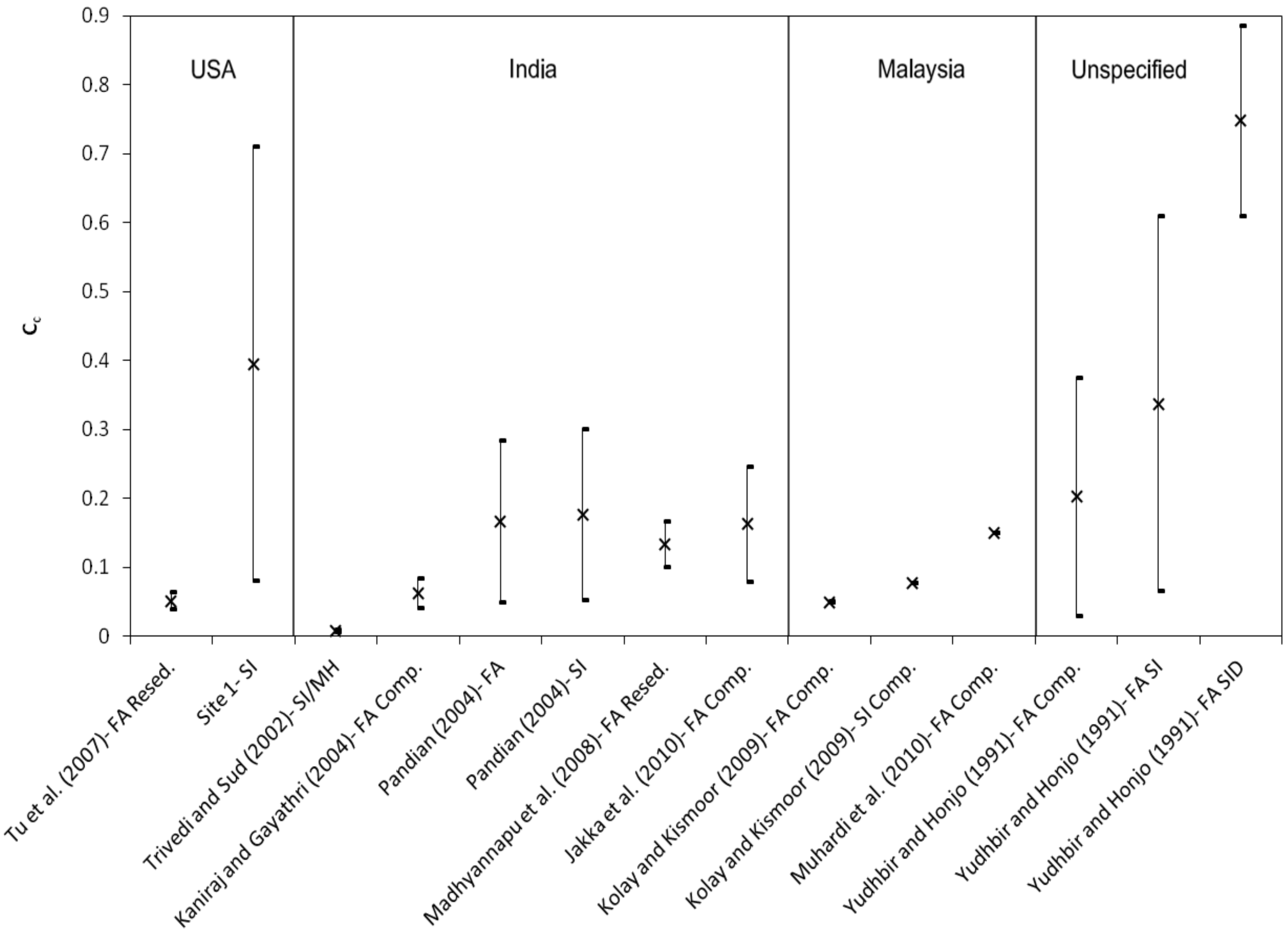

Figure 3: Variability plot for the compression indices of studies done on fly ashes and surface impounded ashes.

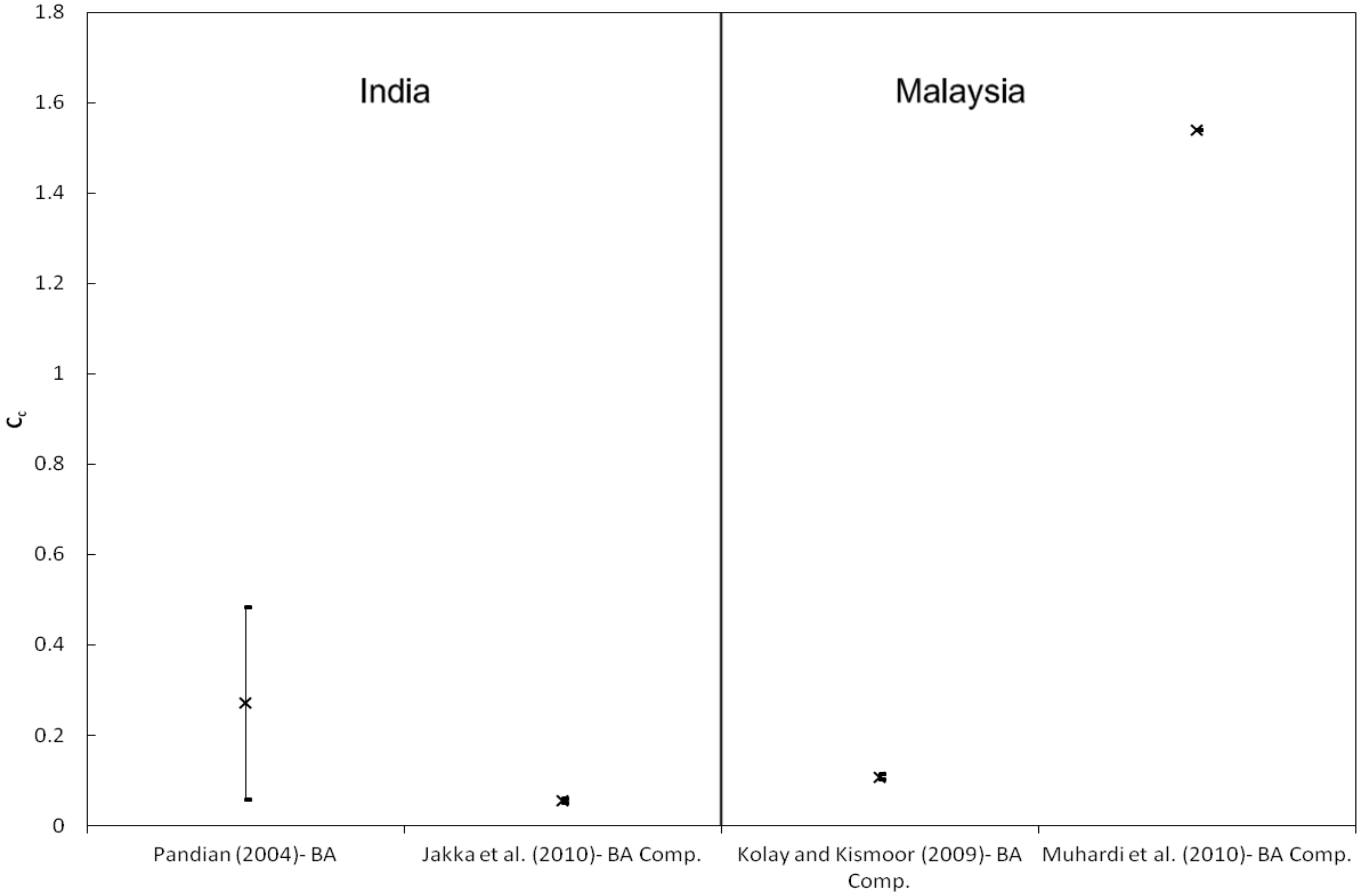

Figure 4: Variability plot of the compression indices for studies done on bottom ashes.

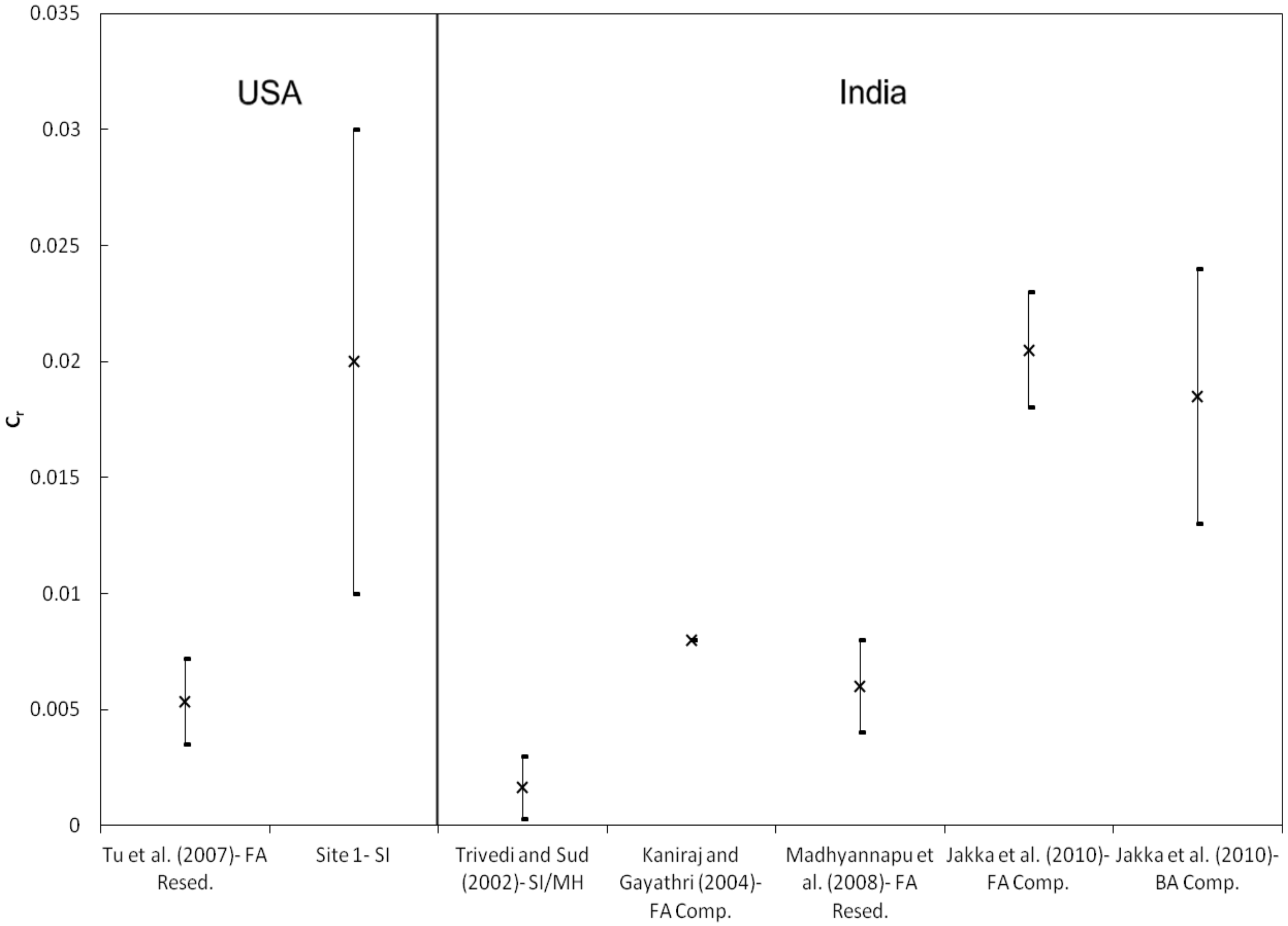

Figure 5: Variability plot of the recompression indices for studies done on fly ashes, bottom ashes, and surface impounded ashes

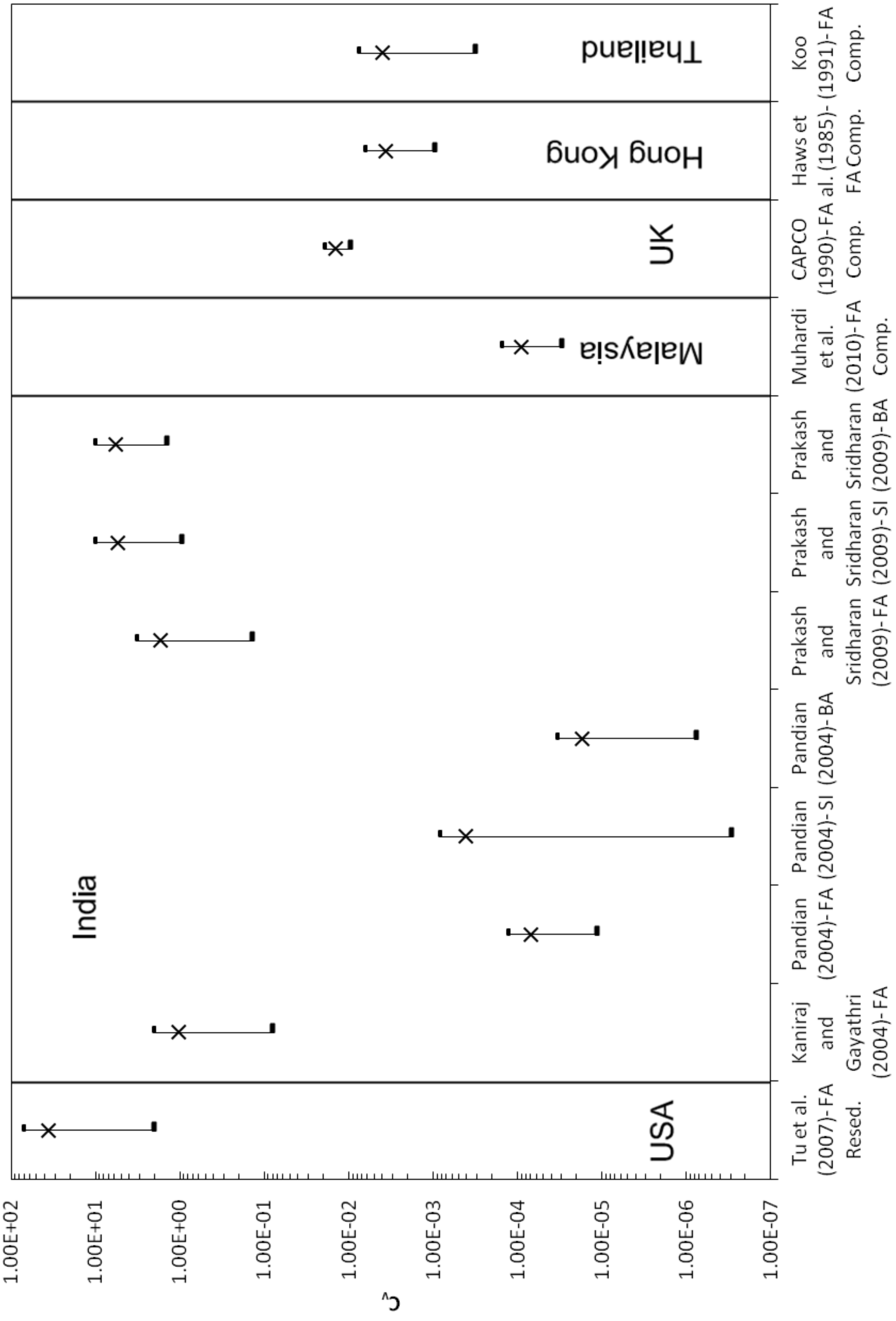

Figure 6: Variability plot for the coefficient of consolidation of studies done on fly ash, bottom ash, and surface impounded ash.

If structures are to be built on former CCR disposal areas or dry-disposed ashes are to be placed on hydraulically-placed deposits, volume stability of CCRs can also be of engineering concern. Swell, shrink, and collapse potentials are the three main types of volume instability examined for soils.

According to Sridharan and Prakash (2009), the swell potential of a soil can be examined through the use of the free swell ratio (FSR) which is defined as

$$FSR = \frac{V_d}{V_k} \tag{2}$$

where V_d = sediment volume of 10 g of oven-dried soil that passes a 425 µm sieve placed in a 100 ml jar which is then filled with de-aired water.

V_k = a sample identical to V_d except the solute is carbon tetrachloride or kerosene.

Note: a fume hood is required if there are any hazardous materials associated with the samples being tested

The swell potential can be determined based on the ranges of FSR as outlined in Table 4:

Table 4: Classification of Soils based on FSR (adapted from Sridharan and Prakash 2000)

FSR	Soil Type	Swell Potential
≤1.0	Nonswelling	Negligible
1.0-1.5	Mixture of swelling and nonswelling	Low
1.5-2.0	Swelling	Moderate
2.0-4.0	Swelling	High
>4.0	Swelling	Very High

Additionally, ASTM D4829 (2003), "Standard Test Method for Expansion Index of Soils," provides a standardized method of determining the swell potential of soils based on the expansion index (EI_{50}). In order to determine the EI_{50} of a soil, a dried soil sample must first be mixed with distilled water to the approximate optimum moisture content and allowed to sit in an air-tight container for at least 16 hours. Then, the conditioned soil is compacted in a 4.01 inch diameter mold in two two-inch lifts using 15 well-distributed blows of a 5.5 lb, 2.00 inch diameter rammer dropped from a height of 12 inches. Once the sample degree of saturation (S) is measured to be within 40% to 60%, the sample is loaded into a consolidometer and consolidated for 10 minutes under a load of 1.0 psi before the initial reading on the dial indicator is taken. The specimen is then inundated with distilled water while periodic readings of the dial indicator are made in accordance with test D2435 (2003) for 24 hours or until the rate of expansion becomes less than 0.0002 inches per hour. The EI of a soil is then defined as

$$EI_{50} = EI_{meas} - (50 - S_{meas}) \cdot \frac{65 + EI_{meas}}{220 - S_{meas}} \tag{3}$$

where S_{meas} = the degree of saturation measured in the test

and

$$EI_{meas} = \frac{\Delta H}{H_1} \cdot 1000 \tag{4}$$

where ΔH = the change in height ($D_2 - D_1$) of the sample, mm
H_1 = initial height, mm
D_1 = initial dial reading, mm
D_2 = final dial reading, mm

The shrink potential of soils is usually assessed based on that soil's shrinkage limit, which is outlined in ASTM D4943 (2002) and calculated according to equation 5:

$$SL = w - \left[\frac{(V - V_d) \cdot \rho_w}{m_s}\right] \cdot 100 \tag{5}$$

where w = moisture content of the soil at the time it was placed in the dish (%)
V = the volume of the wet soil pat = volume of the dish
V_d = volume of the dry soil pat
ρ_w = density of water
m_s = mass of the dry soil pat

However, CCRs are generally non-plastic and ASTM D4943 is only applicable when the soil is cohesive in nature. Based on the fact that CCRs generally have a uniform gradation it can be assumed that they would have a high shrinkage limit (Prakash and Sridharan, 2009).

The collapse potential of a soil is the percent change in volume of a specimen after inundation. It is usually determined using oedometer tests and, as a result, can either be expressed mathematically in terms of height or void ratio, according to equation 6.

$$C_p = \frac{\Delta h}{h_0} = \frac{\Delta e}{(1 + e_0)} \tag{6}$$

where Δh = change in height of the specimen upon inundation
h_0 = the height of the specimen prior to inundation
Δe = change in void ratio of the specimen upon inundation
e_0 = void ratio of the specimen prior to inundation

Since collapse potential can change given different applied stress levels and overconsolidation states, there are any number of typical collapse potential values for a given soil, depending on the in-situ stress and the preconsolidation pressure of the soil. Generally, if the collapse potential is below 1%, there is no danger of collapse of soil structure (Mudhyannapu et al. 2008, Trivedi and Sud 2004).

It is important to note that collapse potential increases dramatically for some dry-disposed coal ashes when tested in a moist condition as opposed to a dry condition; even soils that classify as non-collapsible in a dry condition can become collapsible in a moist condition. This is due to the presence of soluble substances not present in the coal ashes disposed of using wet disposal methods (Trivedi and Sud 2004).

2.3 Hydraulic Conductivity

An important soil property for seepage calculations for earthen embankments is hydraulic conductivity. This is an especially important property for CCR surface impoundments, since they tend to be deposited in a meta-stable structure. In addition, the CCRs are often used to construct embankments as the surface impoundments are raised. Hydraulic conductivity of CCRs deposited in surface impoundments can display anisotropy as a result of its cyclic, lacustrine-style deposition. For engineering purposes, the hydraulic conductivity of both the compacted embankment material and the disposed CCR material will be of interest, as these values are used in erosion analyses. Table 5 presents hydraulic conductivities of different types of CCRs from different countries as determined by various researchers. Due to the fact that there are different disposal methods for CCRs and different types of CCRs that are often co-disposed of, there is a wide variety of placement conditions, each of which can potentially create a different soil fabric and therefore a different range of hydraulic conductivities.

The CCRs were divided into two groups in order to assess variability in hydraulic conductivity: fly ash and surface impounded ash/bottom ash. This was done because oftentimes surface impounded ash is made up of both fly ash and bottom ash; this fact, coupled with its loose placement condition ensures hydraulic conductivity will be at the material's naturally highest value. Figures 7 and 8 are variability plots hydraulic conductivity of fly ashes and surface impounded ash/bottom ash from different countries, as determined by different researchers. It is important to note that not all researchers specified whether it fly ash tested was class c or class f (class c exhibits self-cementing properties); this fact could be a further contributor to the variability in values of hydraulic conductivity of fly ashes.

Table 5: Values of hydraulic conductivity for different CCRs for different countries as determined by different researchers (adapted from Prakash Sridharan 2009)

Reference	Country	CCR Type	Testing Condition	k (cm/s)
Seals et al. (1972)	USA	BA	Relative density = 50%	5.0×10^{-3} to 0.094
McLaren and DiGioia (1987)		Class F FA	$\gamma_{d\ max\_SP}$, $\gamma_{d\ max\_MP}$	1.3×10^{-5}
		Class F FA	SI or poorly compacted	1.8×10^{-5}
		Class C FA	$\gamma_{d\ max\_SP}$, $\gamma_{d\ max\_MP}$	1.1×10^{-5}
Martin et al. (1990)		FA	$\gamma_{d\ max\_SP}$	1.8×10^{-5} to 1.2×10^{-4}
		BA	$\gamma_{d\ max\_SP}$	1.2×10^{-3}
Yudbhir and Honjo (1991)		Class C FA	$\gamma_{d\ max}$	1.0×10^{-7} to 2.0×10^{-7}
		Class F FA	$\gamma_{d\ max}$	2.0×10^{-6} to 6.0×10^{-5}
Glogowski et al. (1992)		Eastern US FA	-	1.9×10^{-5}
		Western US FA	-	3.1×10^{-5}
Site 1		SI	Undisturbed	1.1×10^{-3} to 1.7×10^{-2}
Site 3		FA-SI	Undisturbed	7.0×10^{-7} to 6.5×10^{-7}
		BA	Bulk Recompacted	2.3×10^{-6}
Site 4		FA-Comp.	Undisturbed	1.3×10^{-7} to 8.2×10^{-5}
		SI	Undisturbed	1.6×10^{-5} to 6.3×10^{-5}
Site 5		FA-Comp.	Undisturbed	1.5×10^{-5} to 8.0×10^{-4}
		SI	Undisturbed	4.8×10^{-6} to 4.0×10^{-4}
Pandian and Balasubramonian (1999)	India	FA	Compacted to 0.95 $\gamma_{d\ max}$ and saturated	1.4×10^{-5} to 4.2×10^{-4}
Kaniraj and Gayathri (2004)		FA	$\gamma_{d\ max}$	4.7×10^{-6} to 6.0×10^{-6}
Prakash and Sridharan (2009)		FA	Compacted at $\gamma_{d\ max}$ and saturated	8.0×10^{-6} to 1.9×10^{-4}
		SI	-	5.0×10^{-5} to 9.6×10^{-4}
		BA	-	9.9×10^{-5} to 7.1×10^{-4}
Jakka et al. (2010)		FA	loose	7.0×10^{-7} to 2.1×10^{-6}
		FA	dense	3.5×10^{-7} to 9.4×10^{-7}
		BA	loose	6.0×10^{-6} to 1.3×10^{-5}
		BA	dense	1.4×10^{-6} to 3.7×10^{-6}
Indraratna et al. (1991)	Thailand	Class C FA	$\gamma_{d\ max\_SP}$	4.0×10^{-7} to 7.0×10^{-7}
		Class C FA	$\gamma_{d\ max\_SP}$, 2 weeks curing	$<10^{-7}$
Gray and Lin (1972)	UK	FA	$\gamma_{d\ max}$	5.0×10^{-7} to 8.0×10^{-5}
Porbaha et al. (2000)	Japan	FA	Slurry (e_i = 0.85 to 1.02)	10^{-5} to 10^{-4}
Skarzynska et al. (1989)	Poland	SI	-	1.5×10^{-5} to 5×10^{-5}
Chan et al. (1986)	Canada	FA	in situ	10^{-7} to 10^{-4}
		BA	-	4.8×10^{-4} to 3.4×10^{-3}
Gitari et al. (2009)	South Africa	FA	Air flush core samples, constant head	4.6×10^{-5} to 6.9×10^{-5}
		BA	Air flush core samples, constant head	8.1×10^{-5} to 4.9×10^{-4}
		FA/BA Dry Dump	Field Slug Tests	2.3×10^{-5} to 9.6×10^{-3}

Note: FA = fly ash; SI = surface impoundment ash; BA = bottom ash; OMC = optimum moisture content; e_i = initial void ratio; FA-SI = surface impounded fly ash; FA-DS = dry-stacked fly ash; FA Comp. = field-compacted fly ash

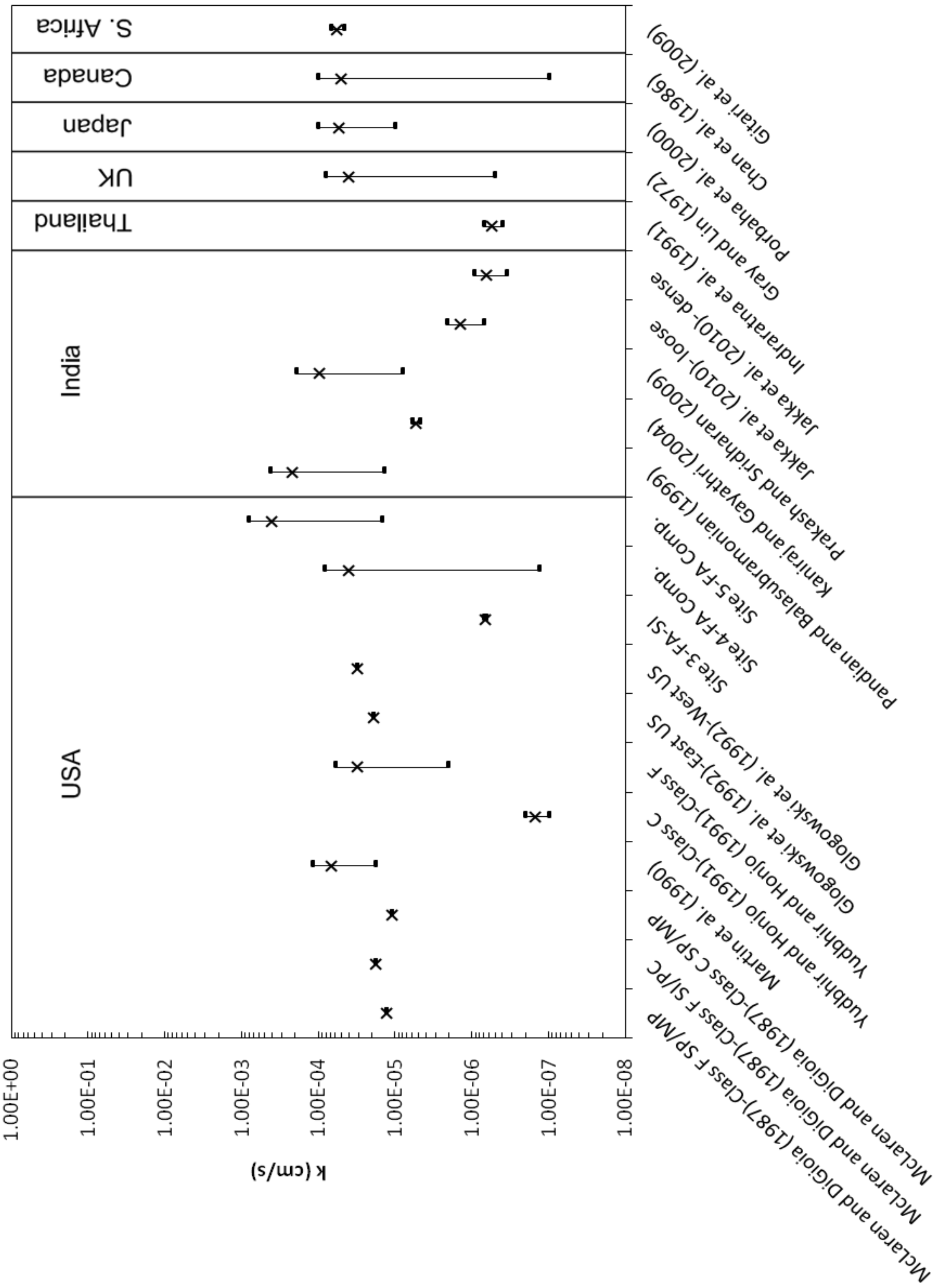

Figure 7: Variability plot of the hydraulic conductivity of fly ashes from different countries, as determined by different researchers.

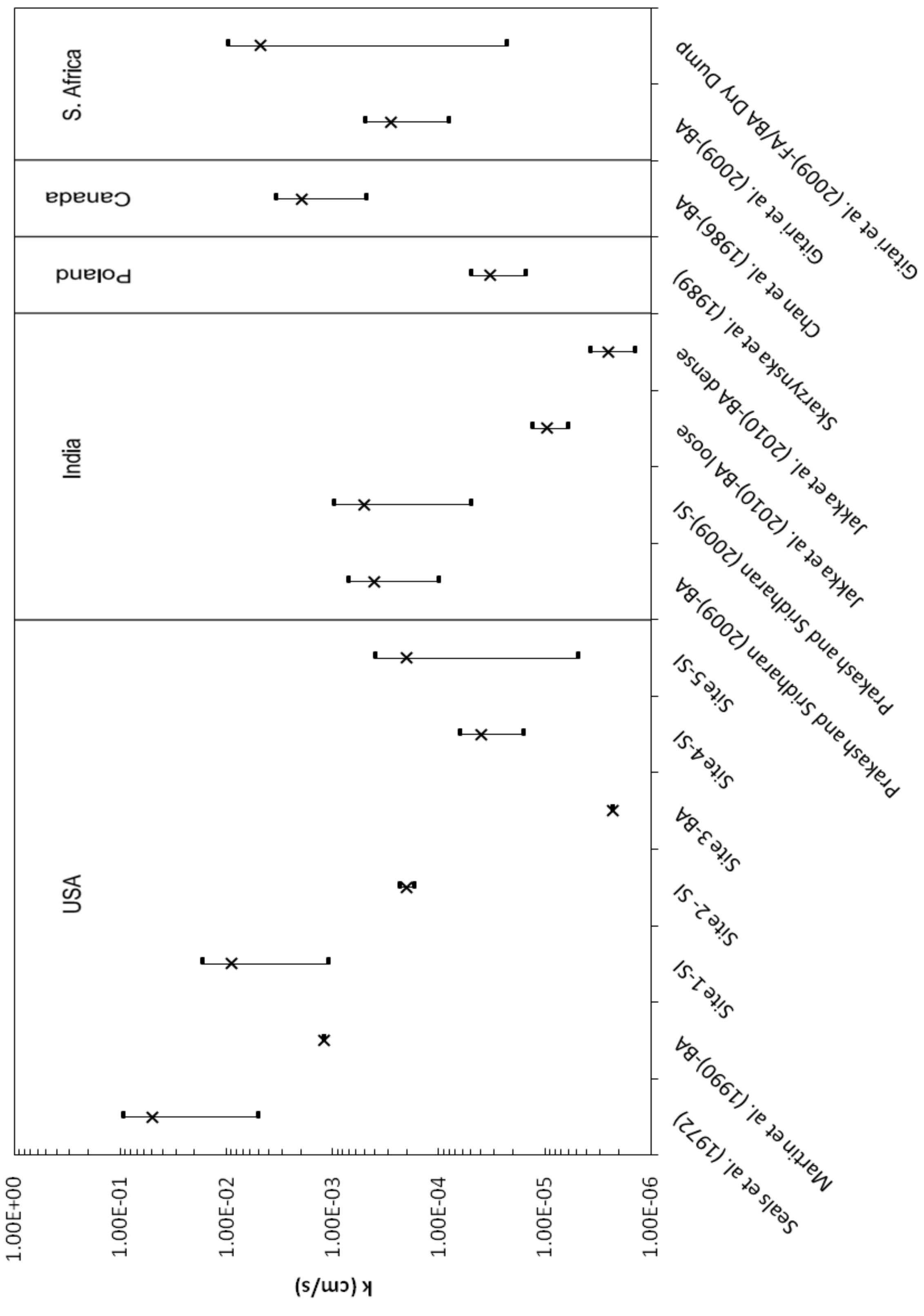

Figure 8: Variability plot of the hydraulic conductivity of surface impounded ashes and bottom ashes from different countries, as determined by different researchers.

2.4 Shear Strength

X-ray diffraction studies indicate that CCRs do not contain any of the clay minerals responsible for the cohesive portion of shear strength in soils (Trivedi and Singh 2004a, Trivedi and Singh 2004b, Ward and French 2005), which means that CCRs must derive their strength entirely from the frictional interaction between ash particles. Through the use of a scanning electron microscope (SEM), it is possible to study the morphological characteristics of coal ash particles and get an idea of their angularity, which would in turn offer clues as to the source of their frictional strength. As shown in Figures 9 and 10, bottom ash is much more angular than fly ash. In general, this can be associated with higher friction angles than fly ash at low confining stresses, which is usually the case. At high confining stresses, the higher angularity could lead to more particle breakage for bottom ash, and consequently to a larger degradation of their frictional resistance.

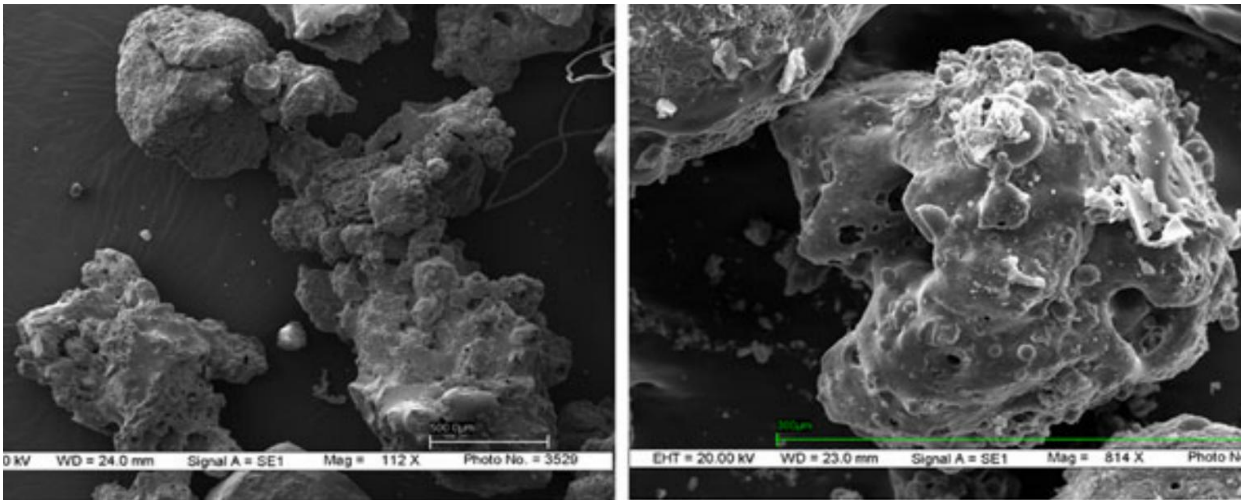

Figure 9: Micrographs of bottom ash particles magnified 112 and 373 times (Jakka et al. 2010)

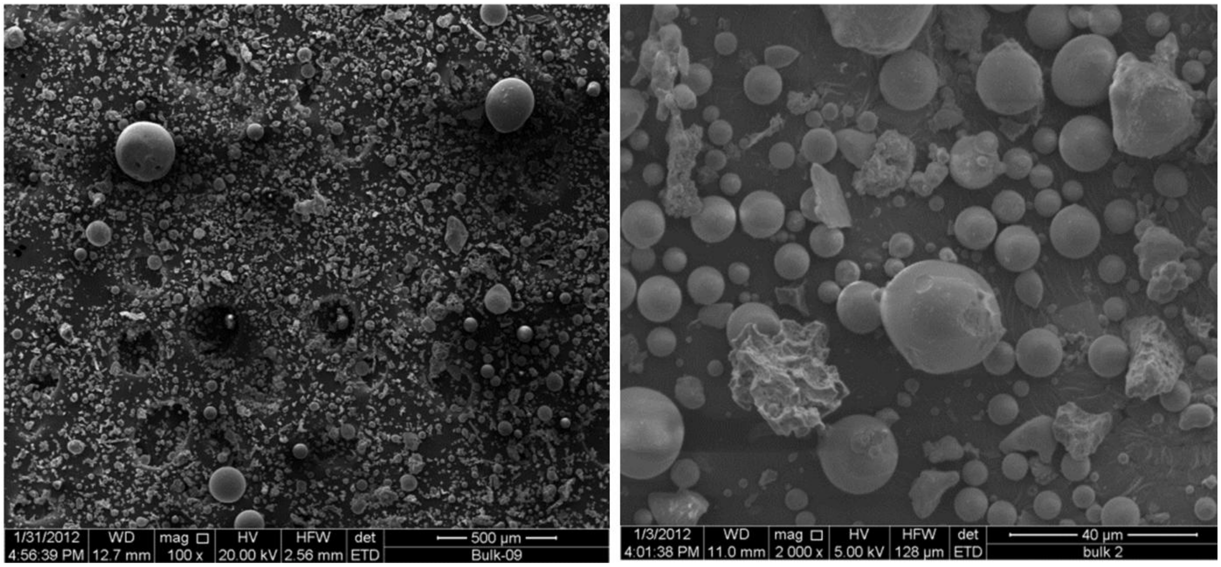

Figure 10: Micrographs of fly ash magnified 100 and 2,000 times (courtesy of Kevin Foster).

Shear strength parameters can be determined using several different laboratory test procedures. For CCRs, the most commonly performed tests are the direct shear test, consolidated drained triaxial test, and the consolidated undrained triaxial test. While the consolidated undrained triaxial test provides both effective and total stess strength parameters, most researchers only report effective strength parameters. This is undoubtedly because the rate of loading because of disposal is usually small enough that pore pressure dissipations are able to complete prior to the next disposal cycle; additionally, total strength parameters from CU tests can be misleading because of their dependence on the value of backpressure at which the specimen is sheared. Tables 6 through 8 report shear strength parameters of different CCRs from direct shear, consolidated drained, and consolidated undrained tests, respectively, reported in different studies. Figures 11 through 13 provide variability plots for the effective stress friction angles determined by various studies, compared on the basis of test type. Figures 14 through 16 provide variability plots on the basis of CCR type, while Figure 17 is a variability plot for the total stress parameters for all types of CCRs, since these parameters are not always reported. Variability plots were not made for values of cohesion since CCRs are usually reported to be non-plastic and the cohesions reported were either apparent cohesions of compacted, unsaturated samples or of samples that may have had self-cementing properties that would not be common to all disposed CCR materials. All acronymns used with the variability plots are consistent with those used in the Tables; for the Figures 14 through 16, DS, CD, and CU designate "direct shear test," "consolidated drained triaxial test," and "consolidated undrained triaxial test," respectively.

Table 6: Shear strength parameters determined by different researchers using the direct shear test.

Reference	Country	CCR Type	Condition	ϕ'_p (°)	c'_p (psf)
Kim & Prezzi (2008)	USA	FA	Comp. DoO	32.9-35.8	100-403
		FA	Comp. WoO	31.7-34.4	104-380
		FA	Comp. Sat.	30.2-34.5	58-276
Site 5		SI	Comp. Sat.	26.8-42.2	0
		SI	Undisturbed	23.4-35.4	0
Pandian (2004)	India	FA	Loose Dry	29.0-36.0	-
		SI	Loose Dry	29.0-34.0	-
		BA	Loose Dry	32.0-34.0	-
		FA	Loose Sat.	27.0-37.0	-
		SI	Loose Sat.	25.0-40.0	-
		BA	Loose Sat.	30.0-37.0	-
		FA	Comp.	28.0-42.0	205-819
		SI	Comp.	29.0-38.0	328-1024
		BA	Comp.	30.0-37.0	205-410
		FA	Comp. Sat.	28.0-41.0	-
		SI	Comp. Sat.	29.0-36.0	-
		BA	Comp. Sat.	30.0-37.0	-
Prakash &Sridharan (2009)		FA	Loose	29.0-33.0	-
		SI	Loose	30.0-33.0	-
		BA	Loose	31.0-34.0	-
		FA	Comp.	32.0-37.0	334-543
		SI	Comp.	30.0-33.0	272-334
		BA	Comp.	31.0-34.0	209-397
		FA	Comp. Sat.	32.0-35.0	0
		SI	Comp. Sat.	29.0-32.0	0
		BA	Comp. Sat.	30.0-33.0	0
Kolay & Kismoor (2009)	Malaysia	FA	Comp. Sat.	30.6-34.9	162-168
		SI	Comp. Sat.	26.2	70
		BA	Comp. Sat.	26.6	3.0-14
Muhardi et al. (2010)		FA	Comp.	23.0	251
		FA	Comp. Sat.	26.0	63
		BA	Comp.	32.0	79
		BA	Comp. Sat.	31.0	0

Note: ϕ'_p = peak effective friction angle; c'_p = peak effective cohesion; Comp. = compacted; Sat. = saturated; DoO = Dry of Optimum; WoO = Wet of Optimum

Table 7: Shear strength parameters determined by different researchers using the consolidated drained triaxial test.

Reference	Country	CCR Type	Condition	RC (%)	ϕ' (°)	c' (psf)
Kim & Prezzi (2008)	USA	FA	Reconst.	95	33.5-47.1	0
		FA	Reconst.	90	27.9-37.9	0
Site 5		SI	Reconst.	-	27.1-31.0	0
Pandian (2004)	India	FA	Reconst.	100	33.0-37.0	418-1942
		FA	Reconst.	100	33.0-43.0	0
Prakash &Sridharan (2009)		FA	Reconst.	95	33.0-43.0	0
Jakka et al. (2010)		FA	Reconst.	-	32.9-37.0	0
		BA	Reconst.	-	33.7-41.7	0
Muhardi et al. (2010)	Malaysia	FA	Reconst.	-	41.0	522
		BA	Reconst.	-	46.0	0
Indraratna et al. (1991)	Thailand	FA	Reconst.	-	26.0	731
		FA	Reconst. Pozz.	-	36.0	37594

Note: Reconst. = reconstituted; Pozz. = pozzolanic curing allowed to occur

Table 8: Shear strength parameters determined by different researchers using the consolidated undrained triaxial test.

Reference	Country	CCR Type	Condition	RC (%)	ϕ (°)	c (psf)	ϕ' (°)	c' (psf)
Site 1	USA	SI	Undist.	-	11.1-19.5	0-950	25.2-33.0	90-190
Site 2		SI	Undist.	-	12.0-45.5	640-2580	31.8-32.1	0-140
Site 3		FA	Reconst.		-	-	36.0	14.3
		SI	Undist.	-	-	-	39.6	0
		BA	Reconst.		-	-	41.0-44.0	0-261
Site 4		FA	DS, Undist.	-	3.4-37.7	200-1900	28.7-36.7	0-400
		SI	Undist.	-	18.3-27.4	400-1600	29.5-38.6	0-740
Prakash &Sridharan (2009)	India	FA	Reconst.	95	20.0-41.0	0	26.0-39.0	334-2005
		SI	Reconst.	95	25.0-34.0	0-1170	28.0-36.0	585-2109
		BA	Reconst.	95	24.0-35.0	0-564	24.0-35.0	585-1149
Jakka et al. (2010)		FA	Reconst.	-	-	-	22.3-38.5	0
		BA	Reconst.	-	-	-	32.2-42.6	0
Muhardi et al. (2010)	Malaysia	FA	Reconst.	-	41.0	710	-	-
		BA	Reconst.	-	44.0	0	-	-
Indraratna et al. (1991)	Thailand	FA	Reconst.	-	20.0	0	26.0	0

Note: Undist. = undisturbed; Reconst. = reconstituted; DS = dry-stacked in field

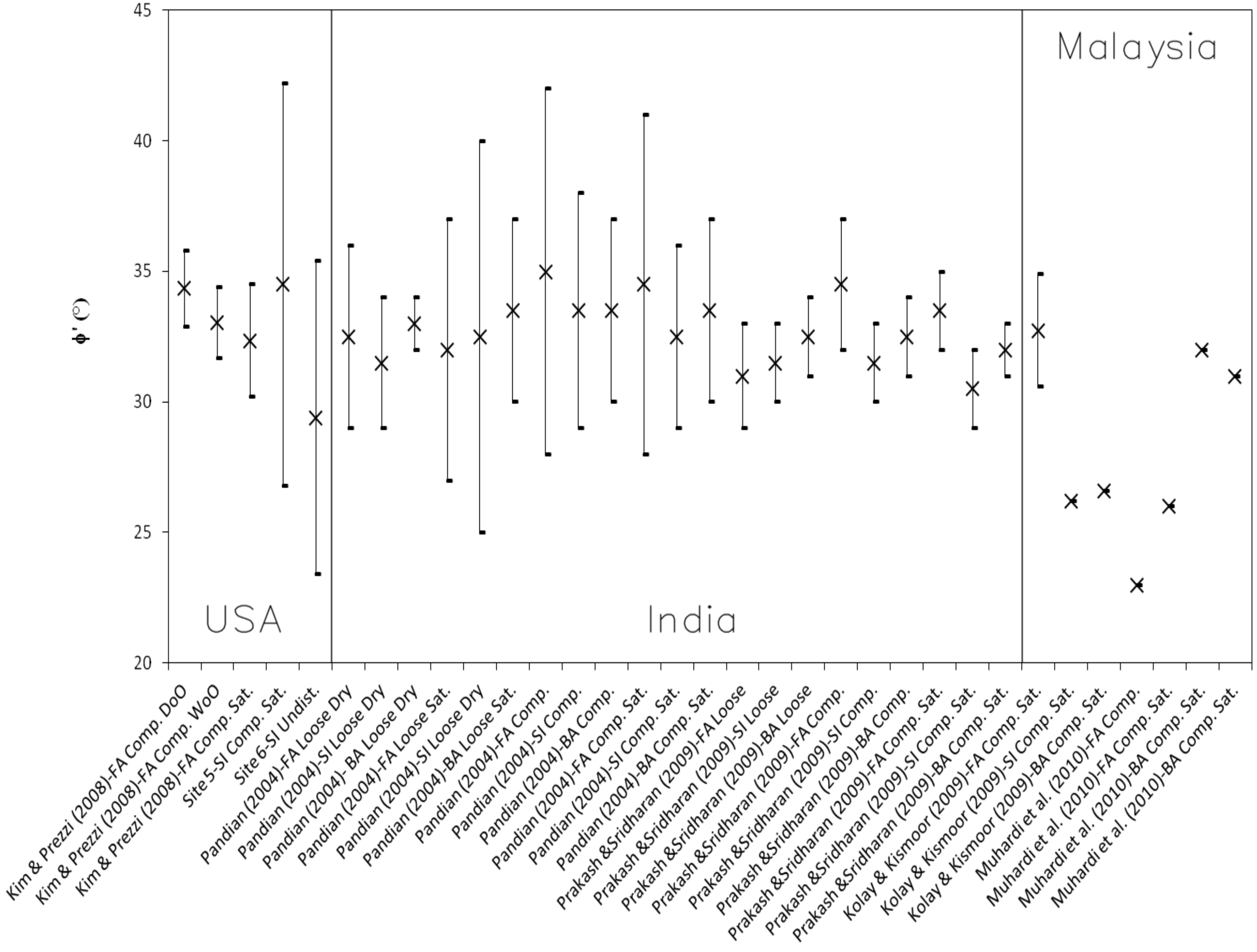

Figure 11: Variability plot of effective stress friction angle of various CCRs as determined by different researchers using the direct shear test.

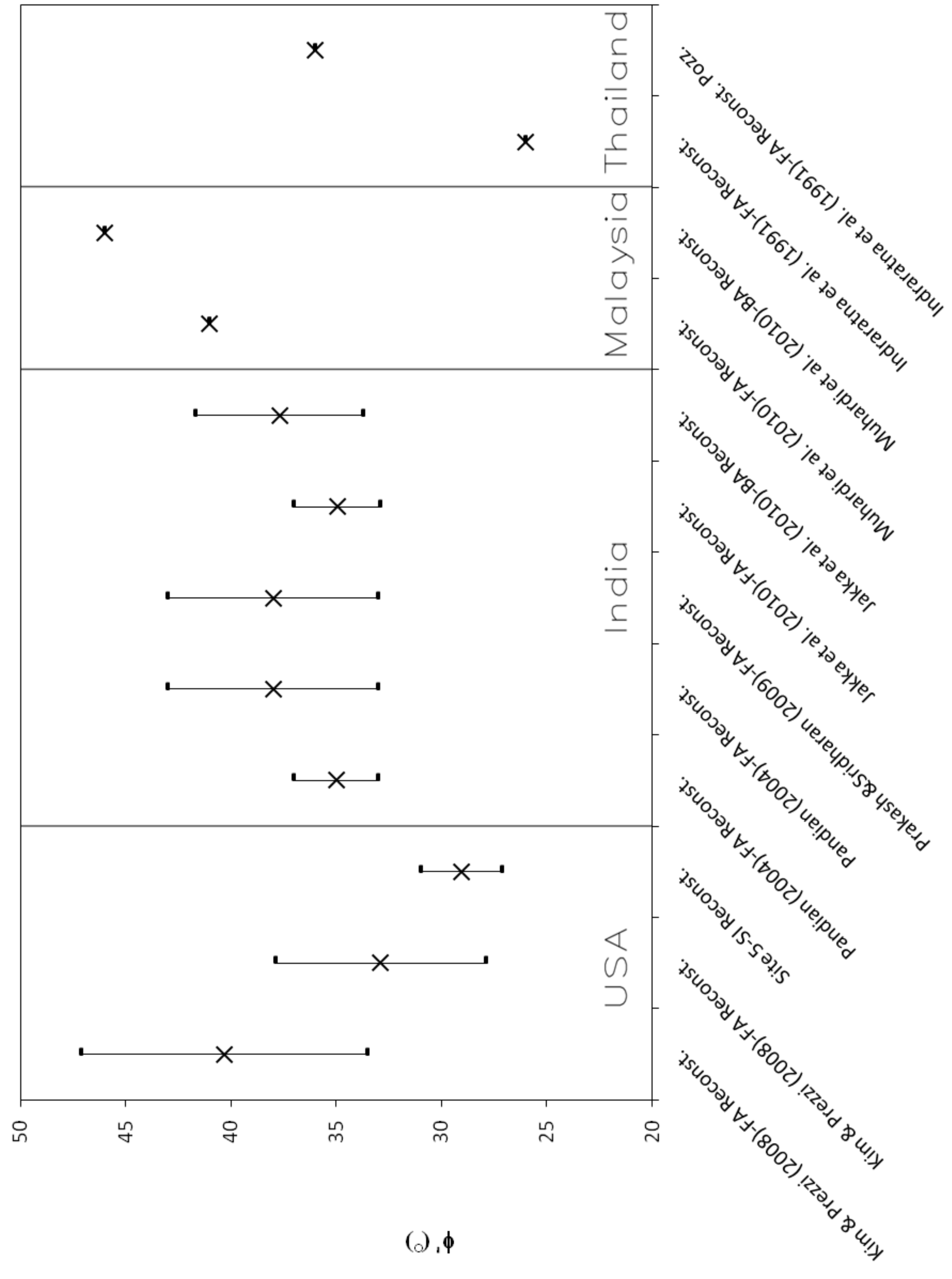

Figure 12: Variability plot of the effective stress friction angle of various CCRs as determined by different researchers using the consolidated drained triaxial test.

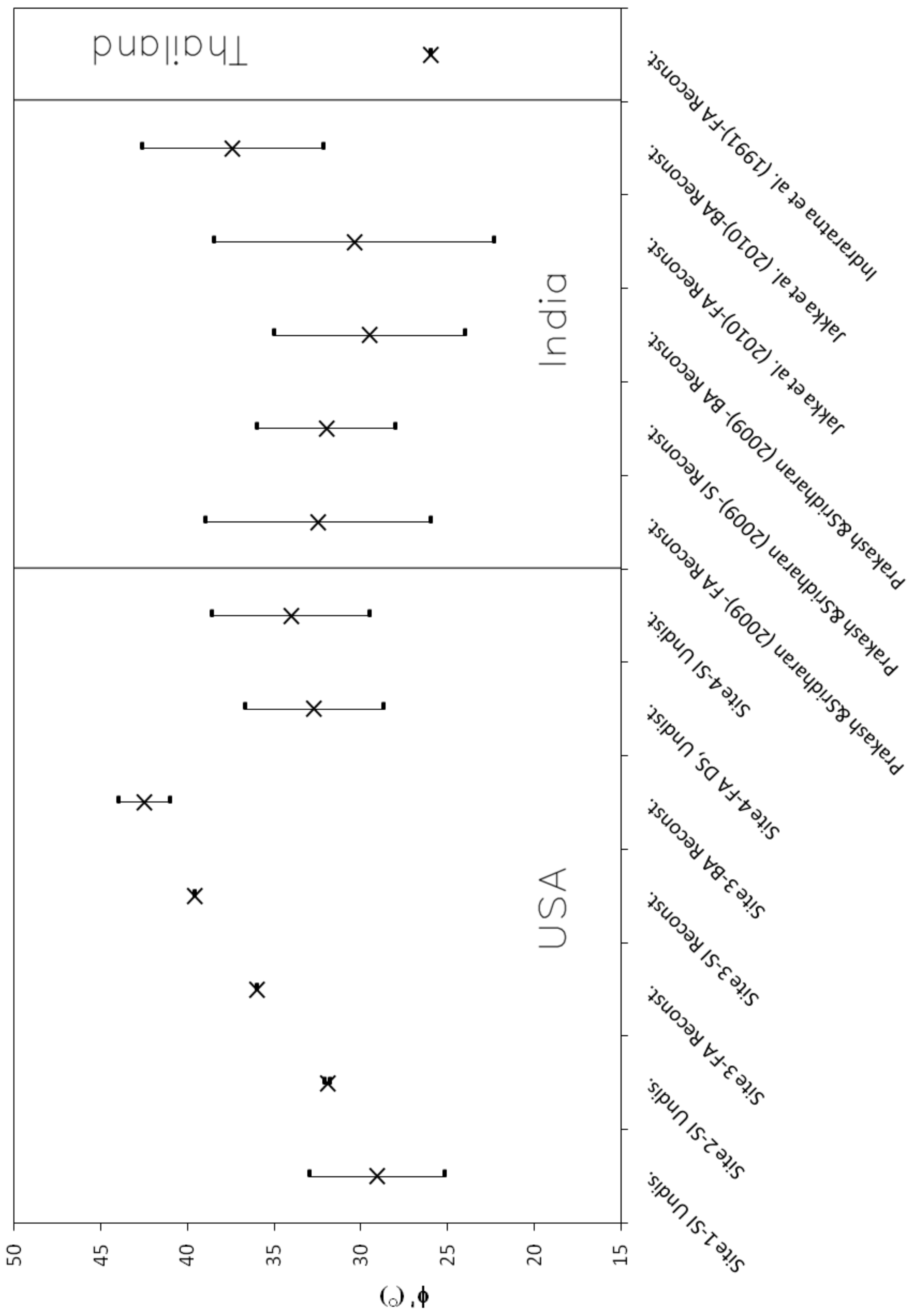

Figure 13: Variability plot of the effective stress friction angle of various CCRs as determined by different researchers using the consolidated undrained triaxial test.

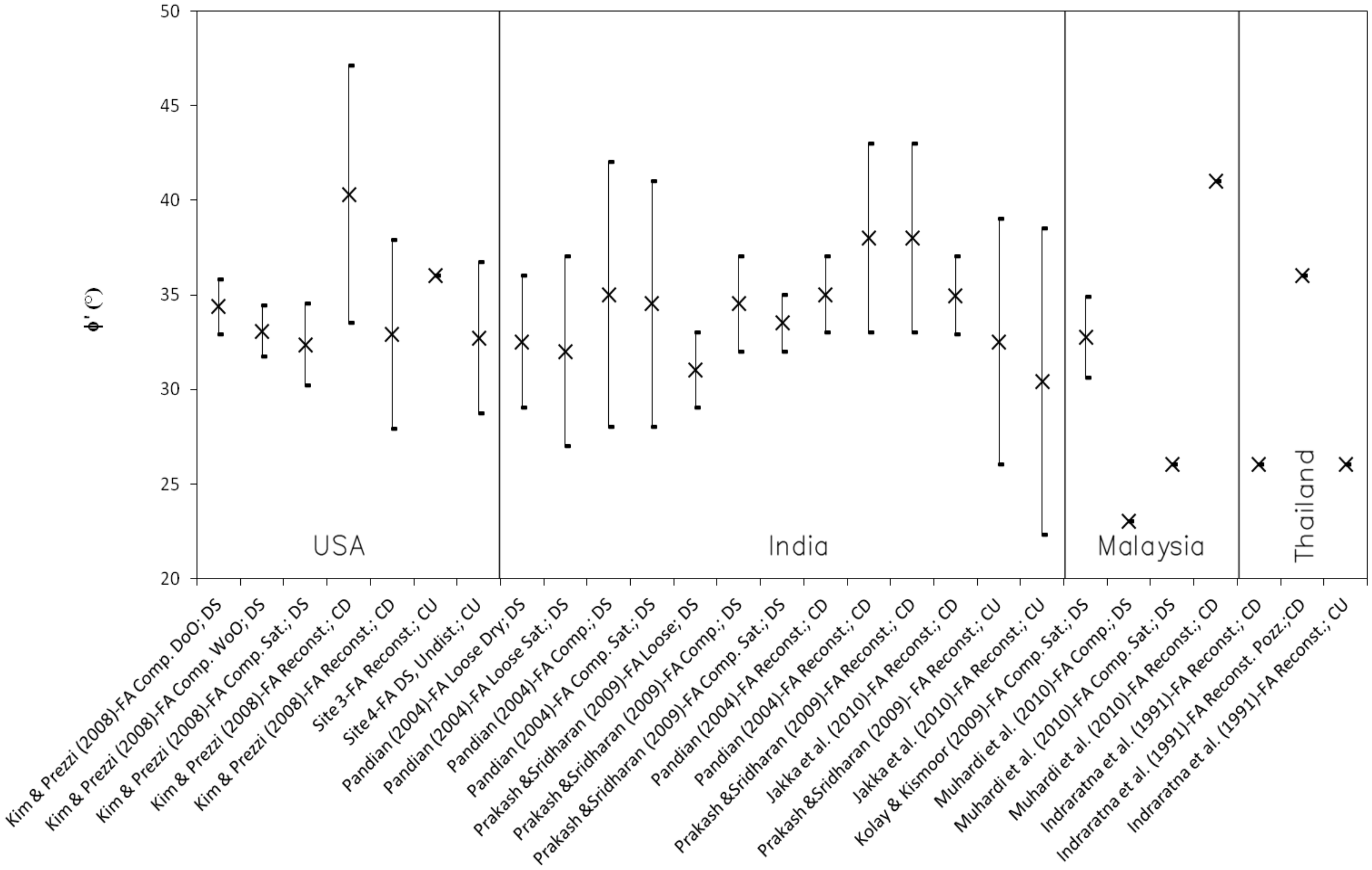

Figure 14: Variability plot of the effective stress friction angle of fly ashes for all shear strength tests performed by various researchers.

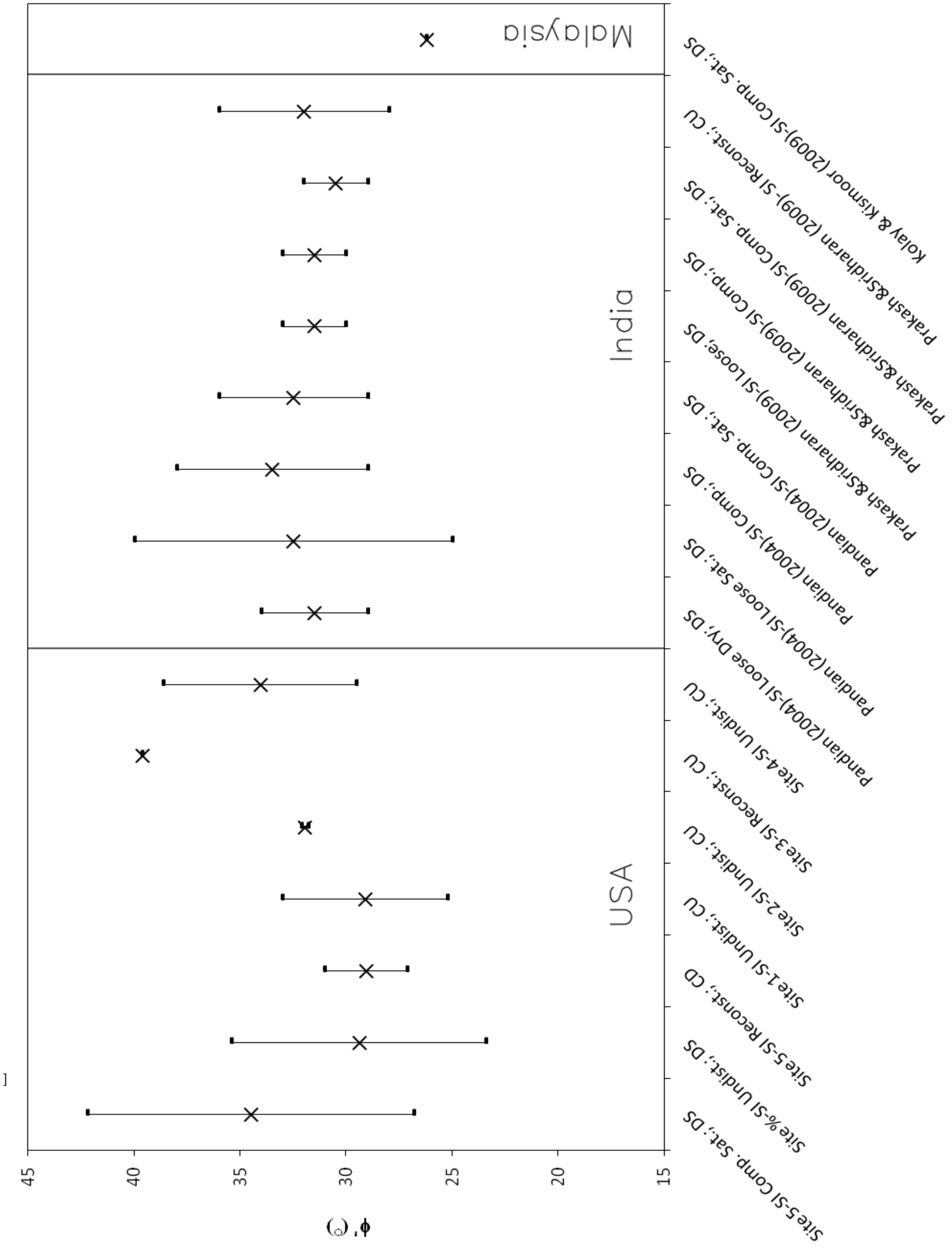

Figure 15: Variability plot of the effective stress friction angle of surface impounded ashes for all shear strength tests performed by various researchers.

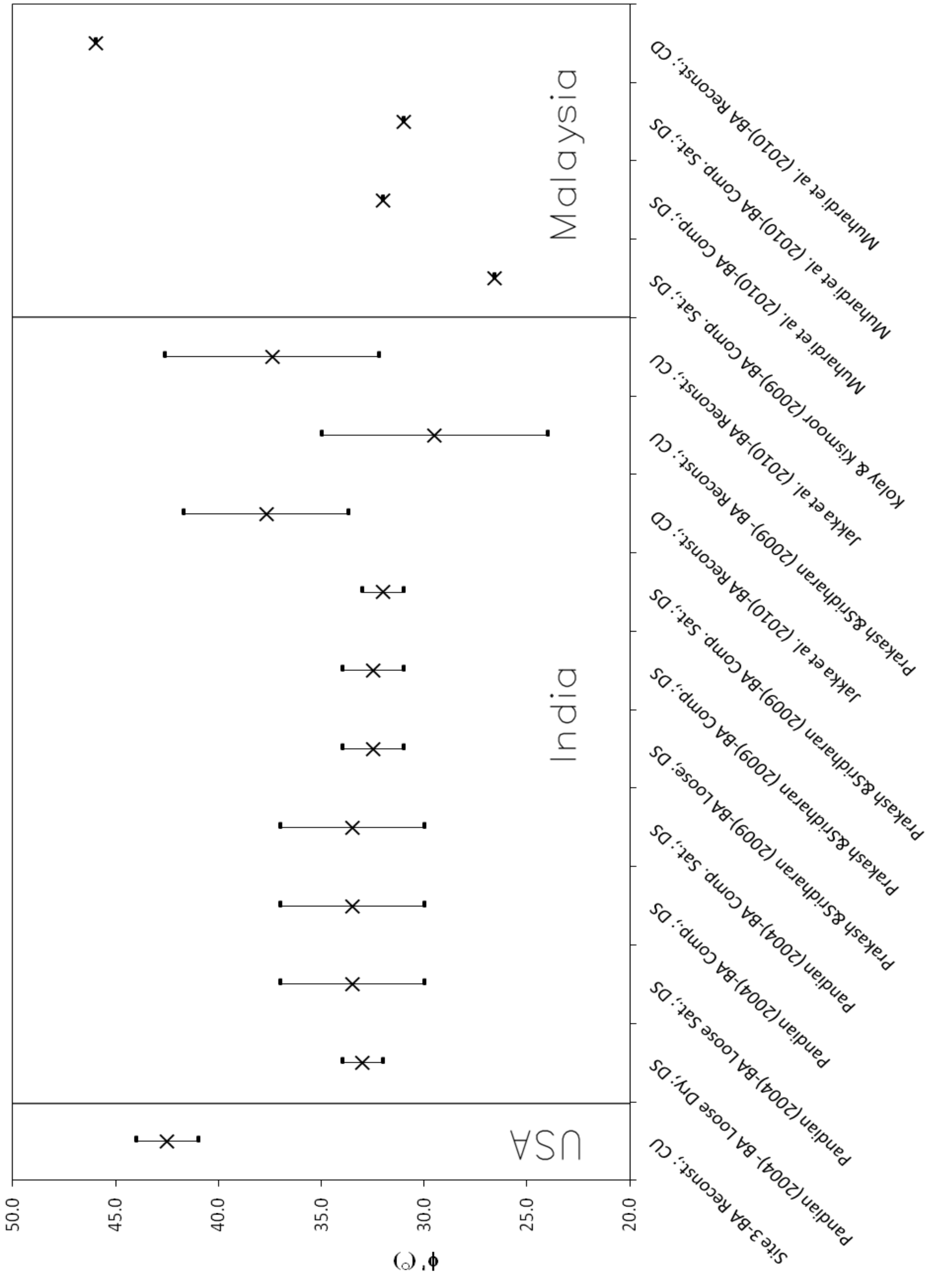

Figure 16: Variability plot of the effective stress friction angle of bottom ashes for all shear strength tests performed by various researchers.

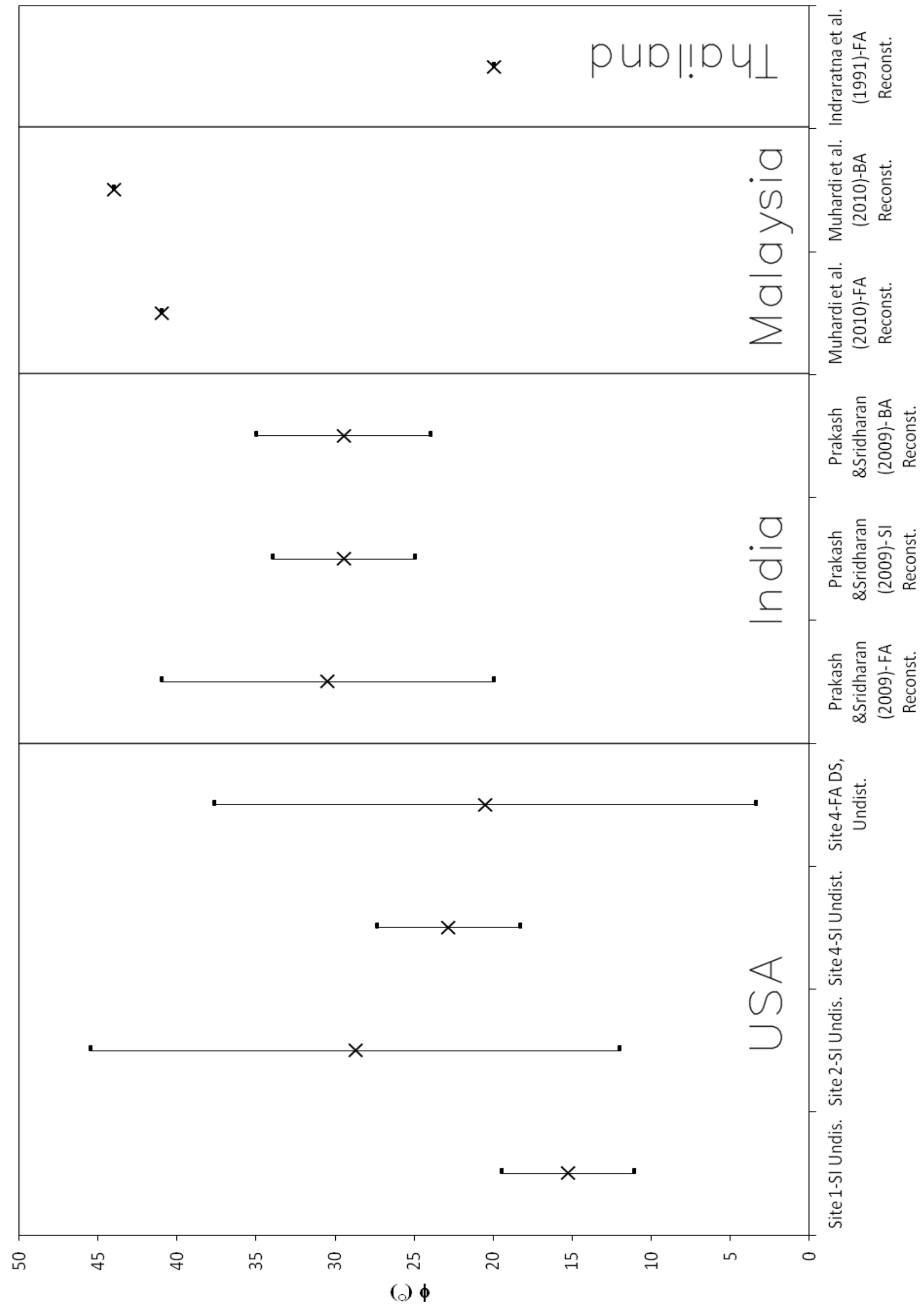

Figure 17: Variability plot of the total stress friction angle of all CCRs as determined by consolidated undrained triaxial tests performed by various researchers.

2.5 Compaction Characteristics

Since CCRs are often used in the construction of embankments for CCR disposal areas, an understanding of their compaction characteristics is necessary to control stability and seepage of the CCR disposal areas. A unique consideration when studying the compaction characteristics of CCRs is their generally low specific gravity. Since CCRs tend to have lower specific gravities and higher air voids than natural soils, their maximum dry density tends to be lower and their optimum moisture content higher than most natural soils (Bera et al. 2007, Prashanth et al. 1999, Trivedi and Singh 2004a). Trivedi and Singh (2004a) associate the high optimum water content of CCRs with the porous nature of the particles; most of the water is absorbed by the particles at lower water contents such that the particles are not workable until higher moisture contents. The lower dry density and higher corresponding water contents of CCRs results in a compaction curve that appears “flatter” than those of most natural fine-grained soils, as shown in Figure 18. The "A-Z soils" included in the plots for comparison are for natural soils from Ohio, as published by J. G. Joslin in the proceedings of the 1958 ASTM Symposium on Soil Testing in Highway Design and Construction.

Bera et al. (2007) also developed empirical models to predict the maximum dry density and optimum moisture content of a specific surface impounded ash, as long as both of these values are known for the standard proctor test:

$$MDD_E = 1.60783 \cdot MDD_{proc} + 1.85727\left(\frac{E}{E_{proc}}\right) - 6.89047 \tag{7}$$

$$OMC_E = 1.73090 \cdot OMC_{proc} - 9.01750\left(\frac{E}{E_{proc}}\right) - 25.33520 \tag{8}$$

where MDD_E = maximum dry density at a given applied energy
MDD_E = maximum dry density for a proctor test
E = amount of energy input for given condition
E_{proc} = amount of energy input for a proctor test
OMC_E = optimum moisture content for a given applied energy
OMC_{proc} = optimum moisture content for a proctor test

It should be noted, however, that these relationships were developed using test data from Indian CCRs. Therefore, before using these relationships, it should be verified that they apply to the specific CCRs in question.

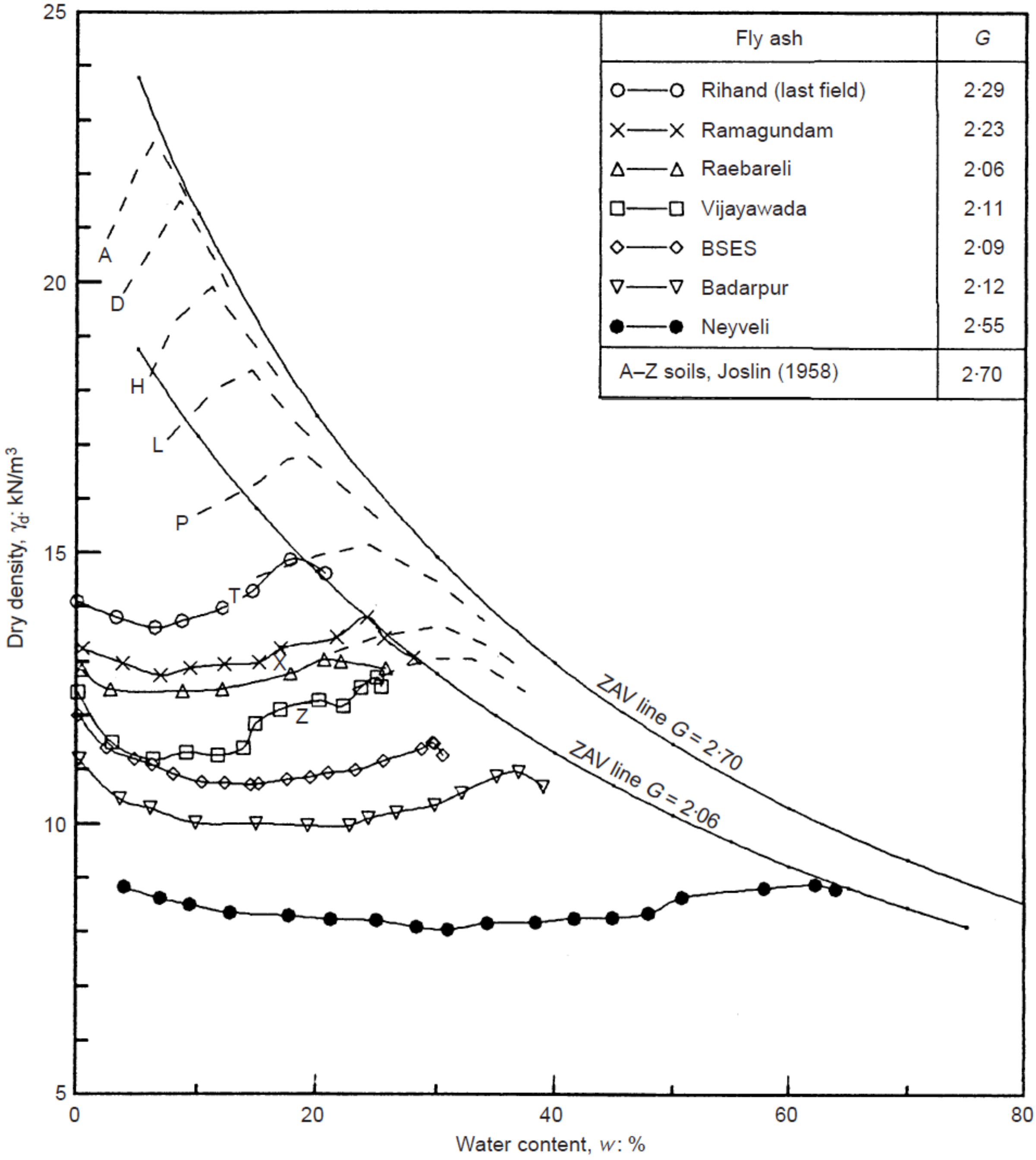

Figure 18(a): Compaction curves for different Indian fly ashes compared to those for several natural soils (Sridharan et al. 2001)

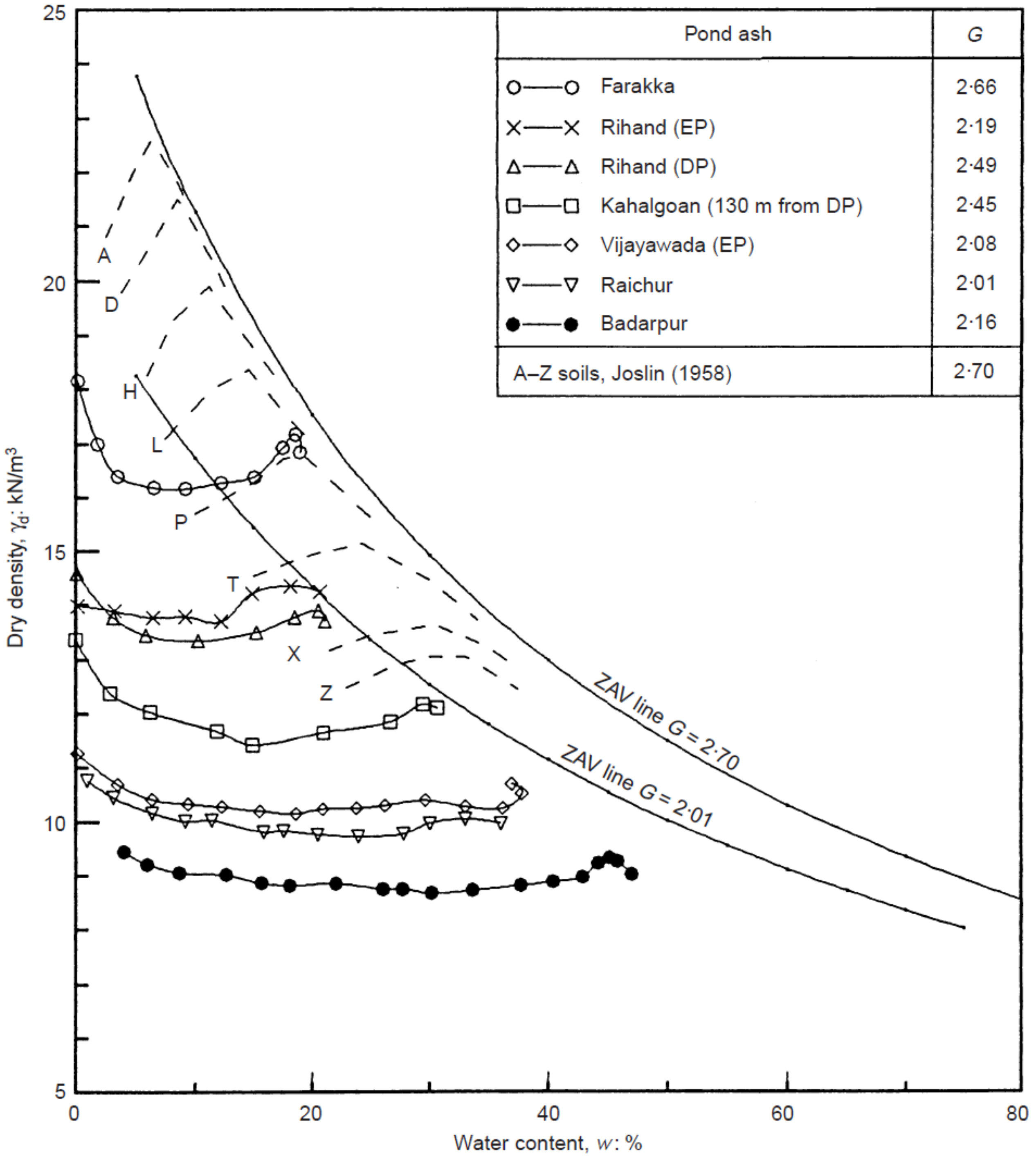

Figure 18(b): Compaction curves for different Indian surface impoundment ashes compared to those for several natural soils (Sridharan et al. 2001)

In Figures 17(a) and 17(b), the CCRs sometimes have a higher dry density at a dry condition (*w* = 0%). This is not a practical condition to use in construction or disposal situations, however, as there would be considerable dust pollution during placement (Sridharan et al. 2001).

Chapter 3

Dynamic Properties of CCRs

Regardless of the fact that CCRs are often composed of mostly fine-grained particles, they are still granular, non-plastic particles that exhibit no cohesion other than apparent cohesion in the moist state (Kaniraj and Gayathri 2004, Prakash and Sridharan 2009). Based on their grain-size, many CCRs could be classified as fine-grained soils, (which are commonly considered to have a lower liquefaction potential), but since these CCRs are also generally non-plastic, they have the potential of being liquefaction-prone. Liquefaction potential of CCRs is higher in the case of impounded CCRs, since these tend to exist at a saturated or nearly saturated state in-situ (and saturation is a necessary condition for liquefaction). In addition, the high moisture contents imply that impounded CCRs will have no negative pore pressures to help stabilize the soil mass under dynamic loading. Furthermore, the generally metastable structure of impounded CCRs makes their dynamic properties of great importance, even at low intensities of shaking. There have been a limited number of publications on the dynamic properties of CCRs; while this section presents and discusses currently published information on the dynamic properties of CCRs, there is still a need for further research in this area.

3.1 Cyclic Shear Strength Properties of CCRs

The most common laboratory test used to assess the dynamic properties of soils is the cyclic triaxial shear test. Cyclic triaxial testing apparatuses are expensive and provide very specific results, so very few commercial consultant firms own or even have access to them. Therefore, cyclic triaxial testing has traditionally been done at the academic level and has seen little use in commercial consulting. Given the specialized nature of the cyclic triaxial test, there is limited research published on the cyclic triaxial properties of CCRs. Since the cyclic shear strength properties of CCRs is a very specific topic, the research available on this topic is from academics of varied nationalities, all of whom have slightly different methods of analyzing the raw data; as a result, comparing results can be difficult.

Despite differences in how to analyze and present cyclic triaxial test results between researchers, it is useful to compare results using fundamental parameters of cyclic response, such as plots of excess pore pressure (usually excess pore pressure ratio) versus number of loading cycles, or plots of the cyclic stress ratio (CSR=$\sigma_d/2\sigma_{3c}$') versus number of loading cycles, which represents a measure of how the shear strength of the material in question degrades with cyclic loading. Figures 19 and 20 present some typical plots comparing excess pore pressures to the number of cycles to initial liquefaction, and Figures 21 through 23 present plots of CSR versus number of loading cycles to liquefaction (generally defined as 5% double-amplitude axial strain) for different surface impounded CCRs at different confining stresses and relative densities.

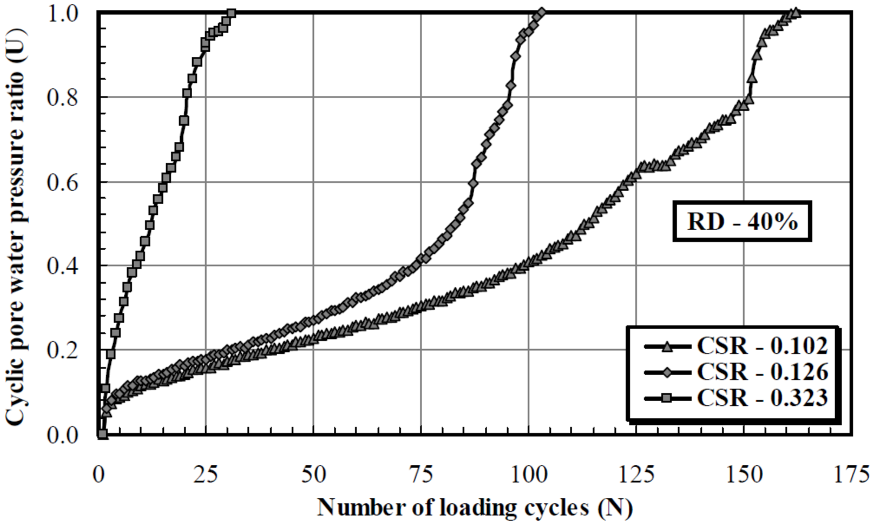

Figure 19: Plot of excess pore pressure ratio versus number of loading cycles for compacted Indian surface impoundment ash at different cyclic stress ratios and 1 Hz loading frequency (Mohanty et al. 2010).

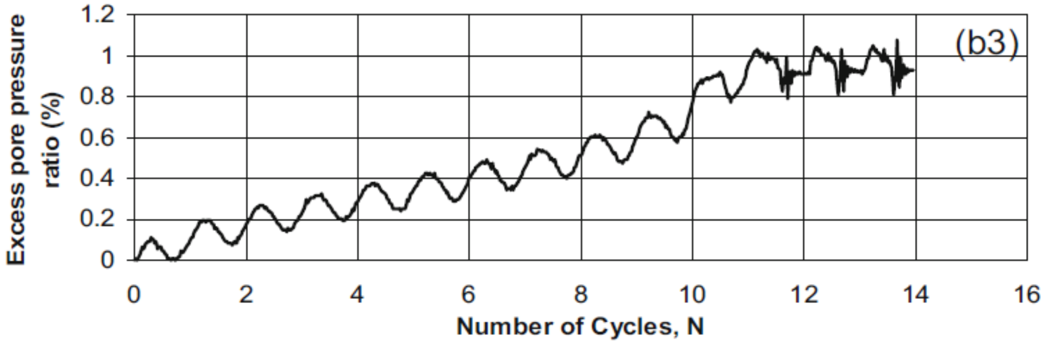

Figure 20: Plot of excess pore pressure ratio versus number of loading cycles for compacted Indian surface impoundment ash at a cyclic stress ratio of 0.10 and confining pressure of 2214 psf and 0.1 Hz loading frequency (Jakka et al. 2010)

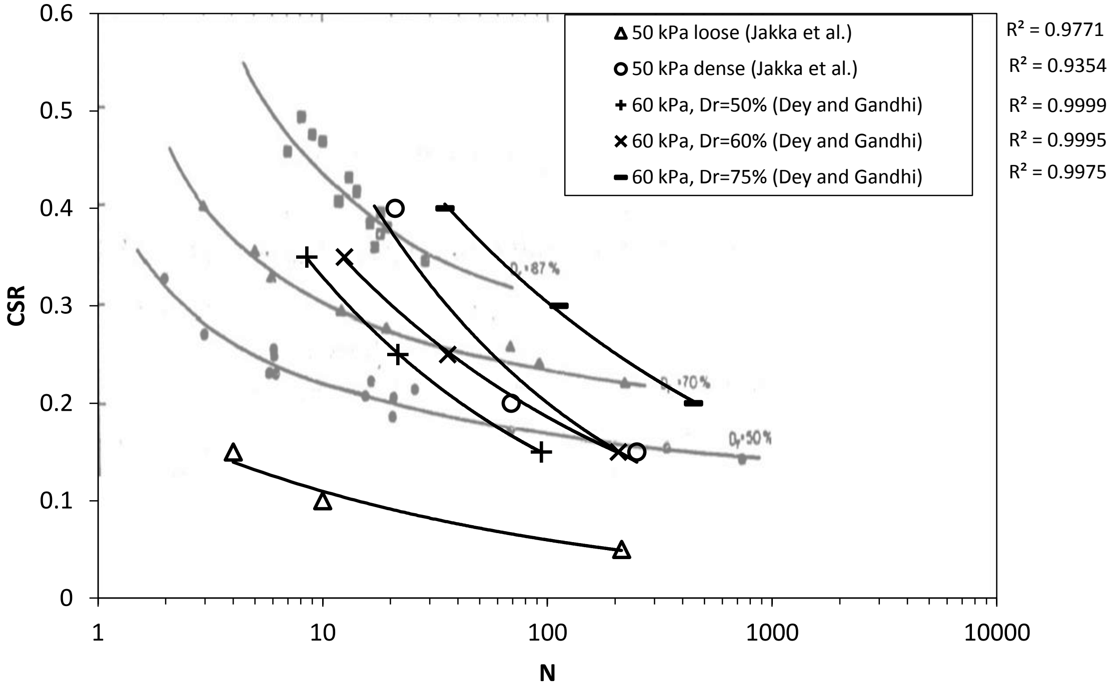

Figure 21: Plot of CSR versus number of loading cycles to liquefaction for different surface impounded CCRs tested by different researchers at confining stresses close to 50 kPa. Jakka et al. loaded specimens at 0.1 Hz to 1 Hz and Dey and Gandhi loaded specimens at 1 Hz. For comparison, curves for sands tested at the same confining pressure are superimposed (Mulilis et al 1976).

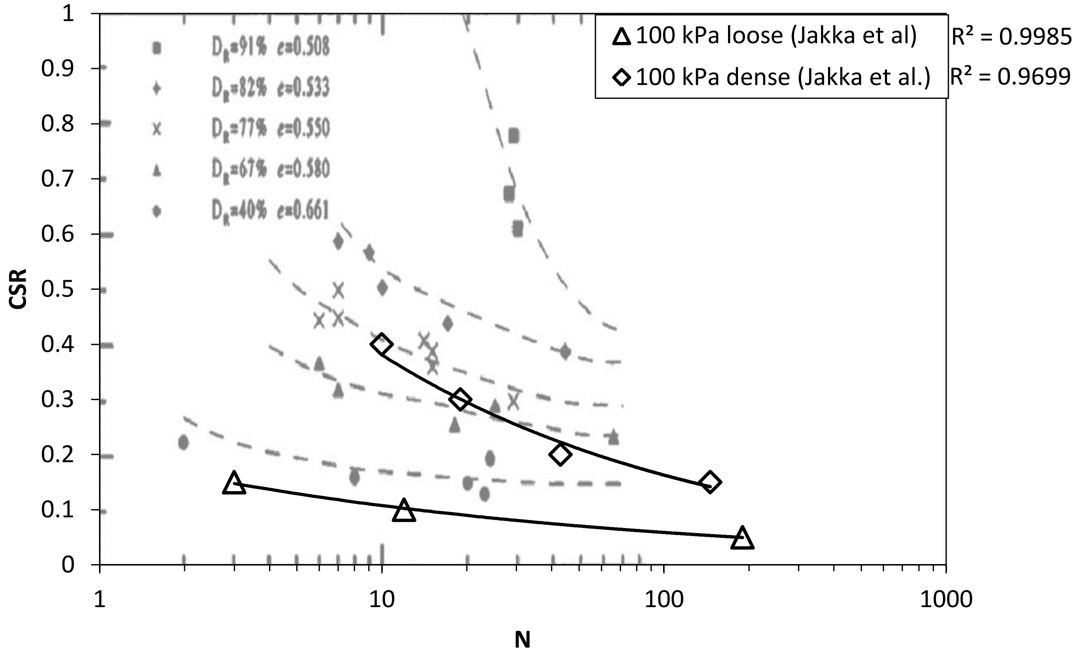

Figure 22: Plot of CSR versus number of loading cycles to liquefaction for surface impounded CCRs tested by Jakka et al (2010) at a confining pressure of 100 kPa. For comparison, curves for C778 sand at the same confining pressure are superimposed (Carraro et al 2003).

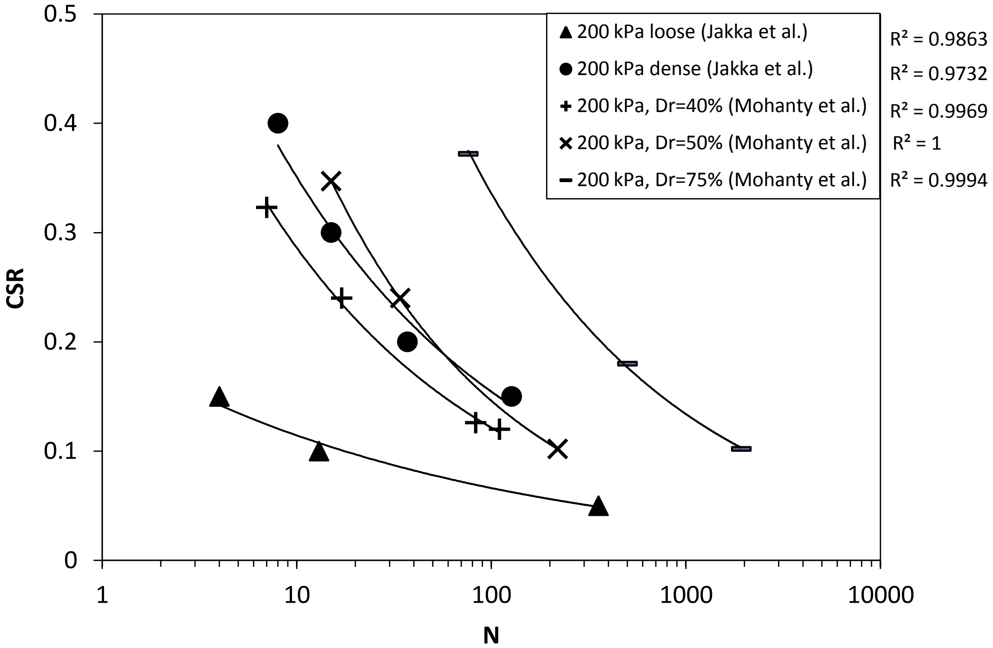

Figure 23: Plot of CSR versus number of loading cycles to liquefaction for different surface impounded CCRs tested by different researchers at 200 kPa confining stress. Jakka et al. loaded specimens at 0.1 Hz to 1 Hz and Mohanty et al. loaded specimens at 1 Hz.

For the two plots of CSR versus number of cycles to initial liquefaction where results for surface impounded CCRs are compared to tests done on sands, it is apparent that the CCRs tested tend to be more resistant to liquefaction than natural sands at higher CSRs, but less resistant to liquefaction at lower CSRs. As more cyclic triaxial tests are run on surface impounded CCRs, it will be more apparent as to whether this is an actual trend, or just an apparent trend in these three studies.

Lastly, many researchers include a plot of the hysteresis loops for a cyclically-tested triaxial sample. This is simply a plot of the deviator stress versus the axial strain through a single load cycle, at which point the plot begins again, creating a nearly-symmetrical shape about the origin of the plot. The area contained within all of these loops represents the cumulative energy dissipated by the soil being tested (Yoshimoto et al. 2006). The cumulative dissipated energy method was used by Towhata and Ishihara (1985) in order to analyze cyclic shear behavior and liquefaction strength of soils. Figure 24 shows a diagram illustrating the dissipation energy contained within a hysteresis loop.

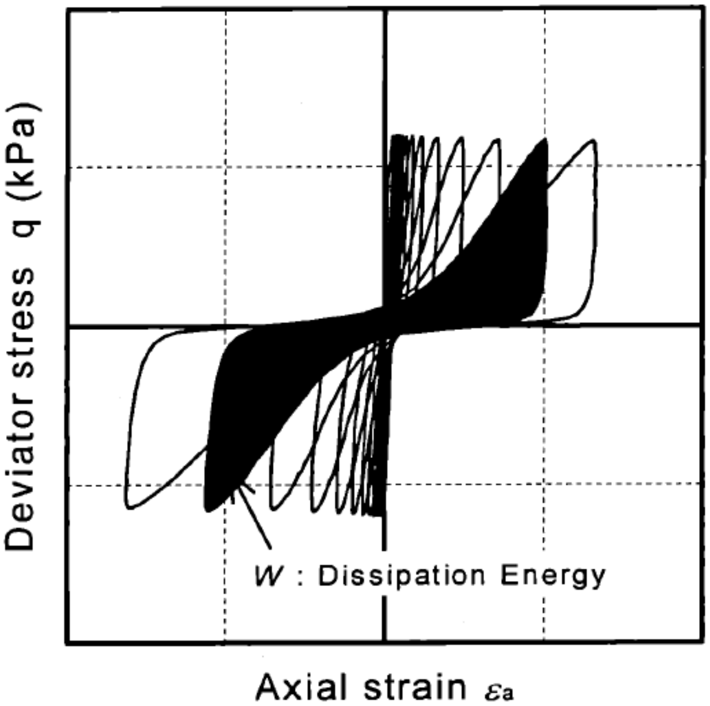

Figure 24: Example of how to determine the energy dissipated by a soil throughout a single loading cycle (Yoshimoto et al. 2006).

Chapter 4

CCR Failure Modes and Monitoring Practices

The critical failure mode for a CCR impoundment is not necessarily the same as for a CCR landfill, since differences in placement techniques for each have a significant effect on the fabric and shear strength properties of the CCRs. Determining the failure modes and developing monitoring practices for CCR impoundments can be done using the same methods as for mine tailings dams because of their similar structure. CCR landfills can be monitored much like any other earthen embankment (with material properties being the major difference), except that unlike most embankments, there is no end of construction until the landfill is retired.

4.1 Surface Impoundments

The observational method is a method of risk management outlined by Dr. Ralph Peck as the process of making design adjustments based on observed behavior in a given structure. The design can be adjusted to be either more or less conservative in order to optimize design (Martin and Davies 2000). This method of risk management is ideal for use with tailings dams since tailings dams are continuously constructed until they are retired; the same is true of CCR surface impoundments, which indicates that such methods could easily be applied to CCR surface impoundment monitoring programs. Figure 25 is a flow chart illustrating the risk management process utilizing the observational method, as applied to tailings dam design; however, the process is general enough that the same or a slightly modified flow chart could be used for surface impounding ash structures.

Another important consideration when developing a monitoring plan for surface impoundments is whether the dikes were constructed using the upstream or downstream methods, since use of the upstream method can lead to weaker dike foundations and an increased probability of sudden or catastrophic failure (Martin and Davies 2000). The upstream construction method consists of constructing the dike of a new phase of a disposal area partly on the top of the previous phase dike and partly on the upstream disposed material; contrarily, the downstream construction method consists of constructing the new phase dike partially on the previous phase dike and partially on land downstream of the disposal area. Figure 26 illustrates that the weaker foundations of mine tailings constructed using the upstream method is evident based on the prevalence of certain failure modes for upstream tailings dams as compared to other types of tailings dams (slope failure and earthquake failure constitute 59% of failure modes for upstream tailings dams, compared to 24% for other types of tailings dams).

Taking all of these factors into consideration, a sample surveillance plan schedule for a mine tailings impoundment is provided in Figure 27. As with the risk management chart presented in Figure 25, this flowchart is general enough that it could be used in its current form, or slightly modified in developing a surveillance plan for CCR surface impoundments.

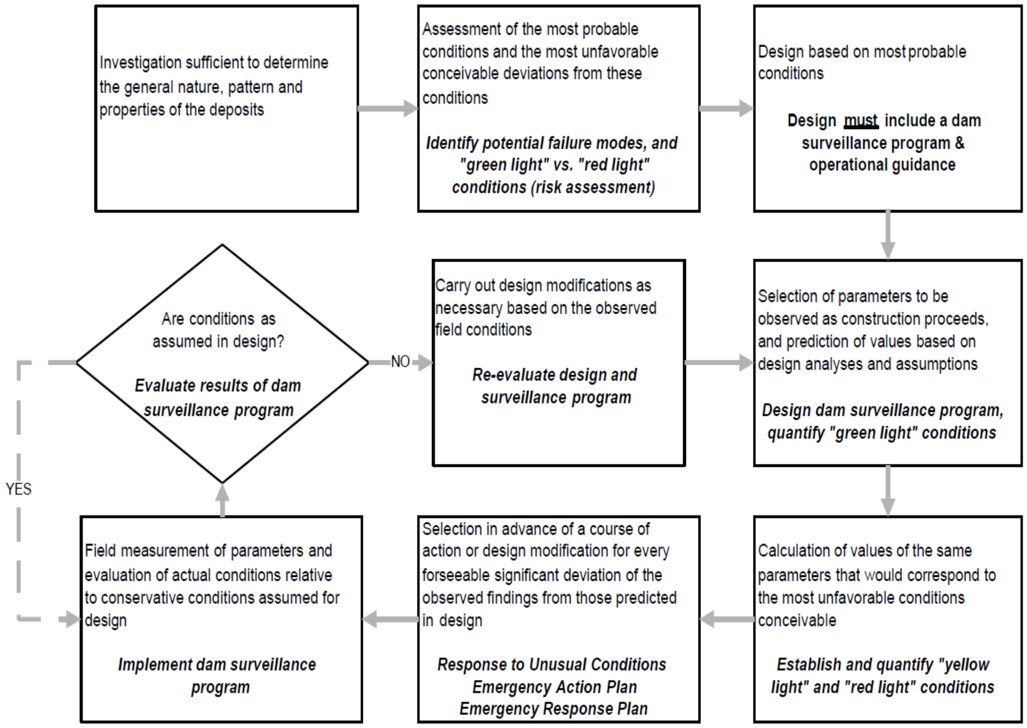

Figure 25: Flow chart illustrating risk management utilizing the observational method (after Martin and Davies 2000)

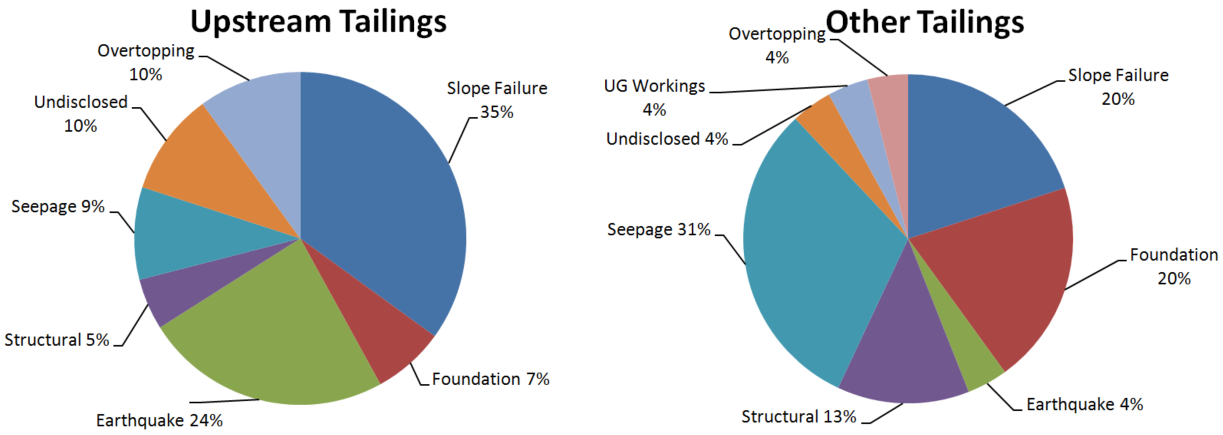

Figure 26: Comparison of failure modes of upstream mine tailings dams as compared to other types of mine tailings dams (modified from Martin and Davies 2000)

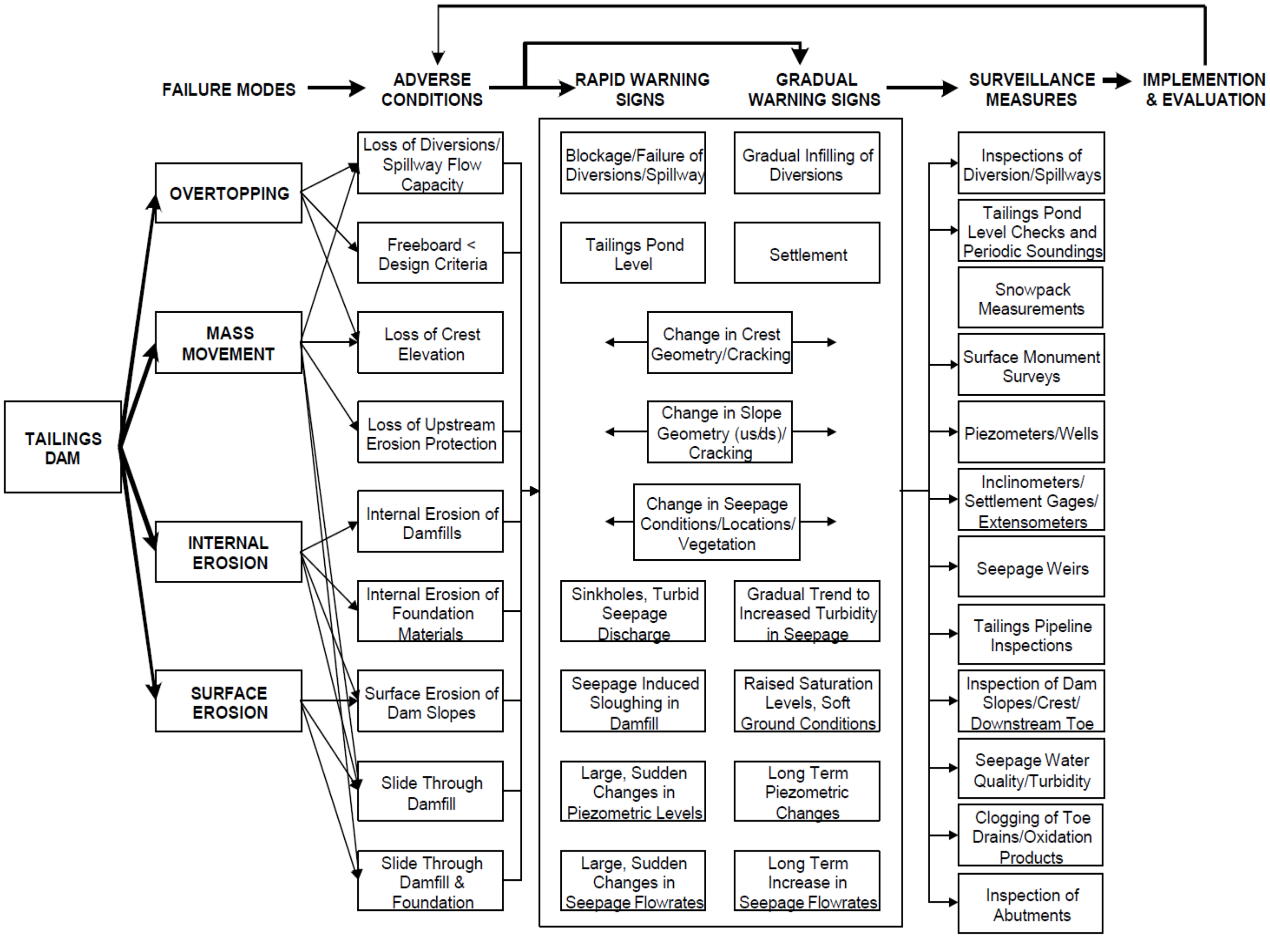

Figure 27: Sample surveillance plan schedule for a mine tailings impoundment (after Martin and Davies 2000)

Since CCR surface impoundments can have containment dikes constructed out of CCR material, natural soils, or a combination of both and these landfills have the potential to collect precipitation. An analysis procedure that can be used alongside the observational method is to treat them as earthen dams according to recommendations of the Bureau of Reclamation and the Army Corps of Engineers.

The Bureau of Reclamation’s *Dam Safety Risk Analysis Best Practices Training Manual* (Scott et al. 2010) provides an overview in Chapter 1 of their recommended method for determining potential failure modes of dams for use in conducting risk analyses of dams. In Chapter 1, the authors identify determination of potential failure modes of dams as the basis for risk evaluations, making it one of the most important steps in risk analysis of a dam. They recommend a comprehensive and thorough review of all relevant background information such as, but not limited to, geology, design, analysis and construction documentation, flood and seismic loadings, operations, dam safety evaluations, and performance and monitoring documentation. Additionally, they recommend a site examination, including questioning of the operations personnel as to how unusual events are handled and what they consider to be the vulnerabilities of the structure. The data review process should include several qualified professionals from different disciplines to ensure a thorough investigation. Lastly, the authors outline three major parts in describing a potential failure mode:

- **The initiator**, or what causes the initiation or onset of the failure mode
- **Failure progression**, a step-by-step outline of mechanisms that lead to failure
- **The resulting impacts**, a description of the expected method and magnitude of a failure if it were to occur

For more in-depth guidance on determining failure modes and developing a risk analysis program for a specific structure, the U.S. Bureau of Reclamation's *Dam Safety Risk Analysis Best Practices Training Manual* can be accessed online at http://www.usbr.gov/ssle/damsafety/Risk/methodology.html, entitled "Complete Best Practices Document."

4.2 CCR Landfills

CCR landfills are generally placed at a moist state and compacted to some degree, being constructed in a similar manner to regular earthen embankments. As a result, they can be analyzed like any other earthen embankment, with special attention paid to the engineering properties and placement conditions of the CCR materials used in the embankment. The placement method for CCR materials in CCR landfills results in less uncertainty in their fabric and relative density, generally resulting in an overall more stable structure than with surface impoundments.

Ideally these compacted CCR embankments would remain well-drained, but depending on the geology of the site and variability in the hydraulic conductivity of the CCR materials, monitoring the groundwater table within these areas and how it is affected by rainfall patterns is good practice, unless it is clearly apparent that such monitoring is unnecessary. An additional consideration with CCR landfills is the need to continually condition the landfill surface with water in order to cut down on dust pollution and surface erosion. Ideally, slopes of CCR landfills should be seeded as soon as is feasible, in order to manage surface erosion and eliminate the need to continually condition the moisture of the slopes.

One unique case would be for sites where a CCR landfill is constructed over a retired surface impoundment. This is an appealing option to most CCR disposers, since land area can be reused, negating or delaying the need to purchase new land to construct a disposal area. Since the foundation material cannot be as well-characterized as the material being placed, a more rigorous design and monitoring procedure would be necessary, perhaps the same as or similar to those discussed in section 4.1.

4.3 Failure Modes

Failure modes for CCR surface impoundments and landfills include all of the usual failure modes for a dam or embankment. However, since disposal operations continue for years or decades, the need to continually monitor disposal areas for signs indicating the initiation of a particular failure mode is very important. Since surface impounded CCRs generally have a less stable structure than CCR landfills, they will generally tend to require more vigorous monitoring. Because of the differences in disposal methods between CCR surface impoundments and CCR landfills, the most likely failure modes will not be the same for each structure.

The most common failure modes for earthen dams and embankments include internal erosion or piping (of embankment or foundation materials), surface erosion leading to global instability, excessive seepage leading to an embankment breach, overtopping during a storm event, loss of freeboard due to excessive embankment settlements or subsidence, lateral movement of the embankment, and failure as a result of a seismic event (MSHA 2009; Martin and Davies 2000). Many of these failure modes are included in Figure 27, with common warning signs indicating the initiation of these failure modes.

The majority of these failure modes can be recognized with good monitoring practices, with the exception of failures due to seismic events, for obvious reasons. There is little data on the performance of CCR disposal areas during seismic events and also very little data on the dynamic properties of CCR materials. As a result, dynamic properties of CCRs is an area where further research and laboratory testing is required.

The overall uncertainty in the engineering properties of CCR materials make it necessary to be more vigilant with monitoring practices in order to recognize when different failure modes are initiated so that remedial actions can be taken to prevent costly failures, both on an economic and life scale. Since surface impoundments often most closely resemble tailings dams in their design, a good reference for monitoring practices and identifying failure modes for surface impoundments is the MSHA 2009 “Engineering and Design Manual: Coal Refuse Facilities,” which can be accessed at:

http://www.msha.gov/Impoundments/DesignManual/ImpoundmentDesignManual.asp.

Chapter 5

Slope Stability of CCRs

The basic principles of slope stability and methods of assessing slope stability of CCR surface impoundments and landfills are the same as for naturally occurring soils; however, the results of these analyses can be very different based on the unique properties of CCR materials. For example, while an ash might have a high percentage of clay-sized particles, they rarely have any cohesion at all and may be very prone to erosion; many naturally occurring soils with clay-sized particles have a cohesive component of strength and are usually considered erosion resistant. In most instances, CCR disposal areas will not be loaded enough to incur excess pore pressures that will not be fully dissipated by the next loading cycle (the next workday). For this reason, it is generally only necessary to perform effective-stress steady-state shear strength slope stability analyses for CCR disposal areas. Special analyses, such as rapid draw-down analyses may be necessary as dictated by site geometry and design rainfall events.

5.1 Limit Equilibrium and Finite Element Analyses

The majority of slope stability analyses today are performed using commercial software programs that utilize limiting equilibrium analyses and/or finite element analyses of slope stability and seepage through slopes. It is good practice and the recommendation of the United

States Army Corps of Engineers (USACE) that some sort of check be done on the results of these software programs. In their Slope Stability Manual (EM 1110-2-1902), the USACE states that, “verification should be commensurate with the level of risk associated with the structure,” and that one or more of the following methods should be used in verification of the initial analyses:

- Graphical (force polygon) method
- Spreadsheet calculations
- A second slope stability program
- Slope stability charts

The following example is of a slope stability analysis of a CCR surface impoundment using a limit equilibrium-based software program that also has a built-in finite element groundwater seepage option. The premise of this example is that a client wants to construct a dry-stacked CCR landfill on top of a retired surface impoundment. A thin layer with increased cohesion was included at the surface of all slopes in order to eliminate infinite slope failures that are solved with vegetation; this layer is not included in the table of strata properties, presented in Table 9.

Table 9: Summary of shear strength and hydraulic parameters used in CCR surface impoundment slope stability example.

Strata	γ (pcf)	N	σ_0' (tsf)	ϕ' (°)	c' (psf)	k (ft/s)	Sources
SI CCRs	92.0	N/A	N/A	25.2	0	2.55×10^{-6}	LT
Compacted CCRs	103.5	N/A	N/A	33.0	0	3.61×10^{-7}	Tables 6-8, Table 5
Embankment Fill	112.7	N/A	N/A	33.8	0	1.79×10^{-8}	LT
RR Embankment Fill	122.0	4.0	0.34	33.7	0	3.00×10^{-8}	Kulhawy and Mayne (1990)/LT
Alluvium	110.0	11.0	0.88	40.6	100	3.28×10^{-8}	Kulhawy and Mayne (1990)/LT
Saprolite	110.0	35.0	1.2	29.6	420	9.35×10^{-7}	LT
Partially Weathered Rock	120.0	N/A	N/A	30.0	500	3.28×10^{-9}	Assumed based on parent material
Bedrock	170.0	N/A	N/A	30.0	1.4×10^{5}	3.28×10^{-10}	Barton and Choubey (1977)

Note: LT = laboratory testing

Analyses were performed for six different conditions: three geometries, each with an in-situ water table and a hypothetical high water table. Figure 28 shows the in-situ subsurface conditions, while Figures 29 through 31 provide the output results with slip surfaces below specified factors of safety shown for the six geometries considered. All slip surfaces shown with a factor of safety value are the lowest factor of safety for that slope geometry.

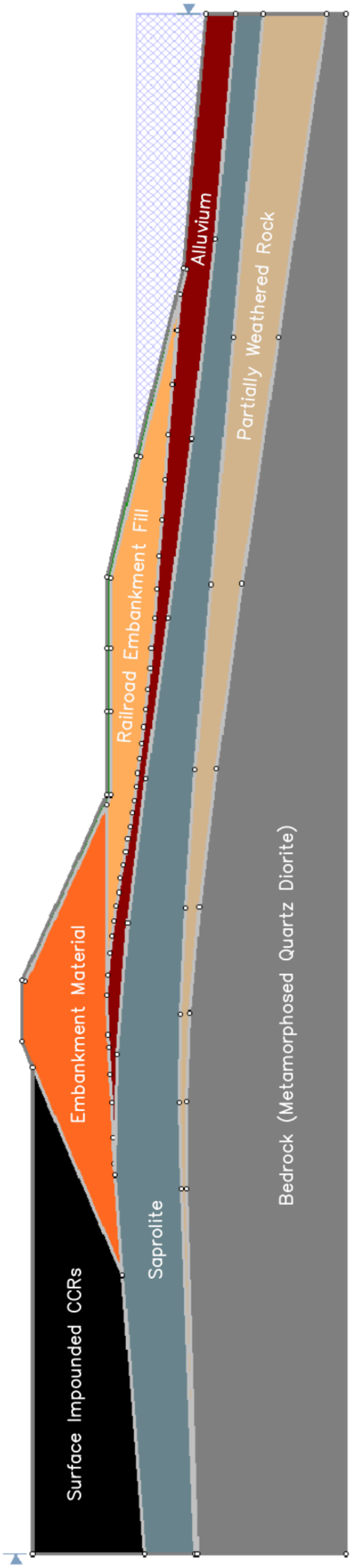

Figure 28: Subsurface profile of a slope stability example for an SI CCR embankment.

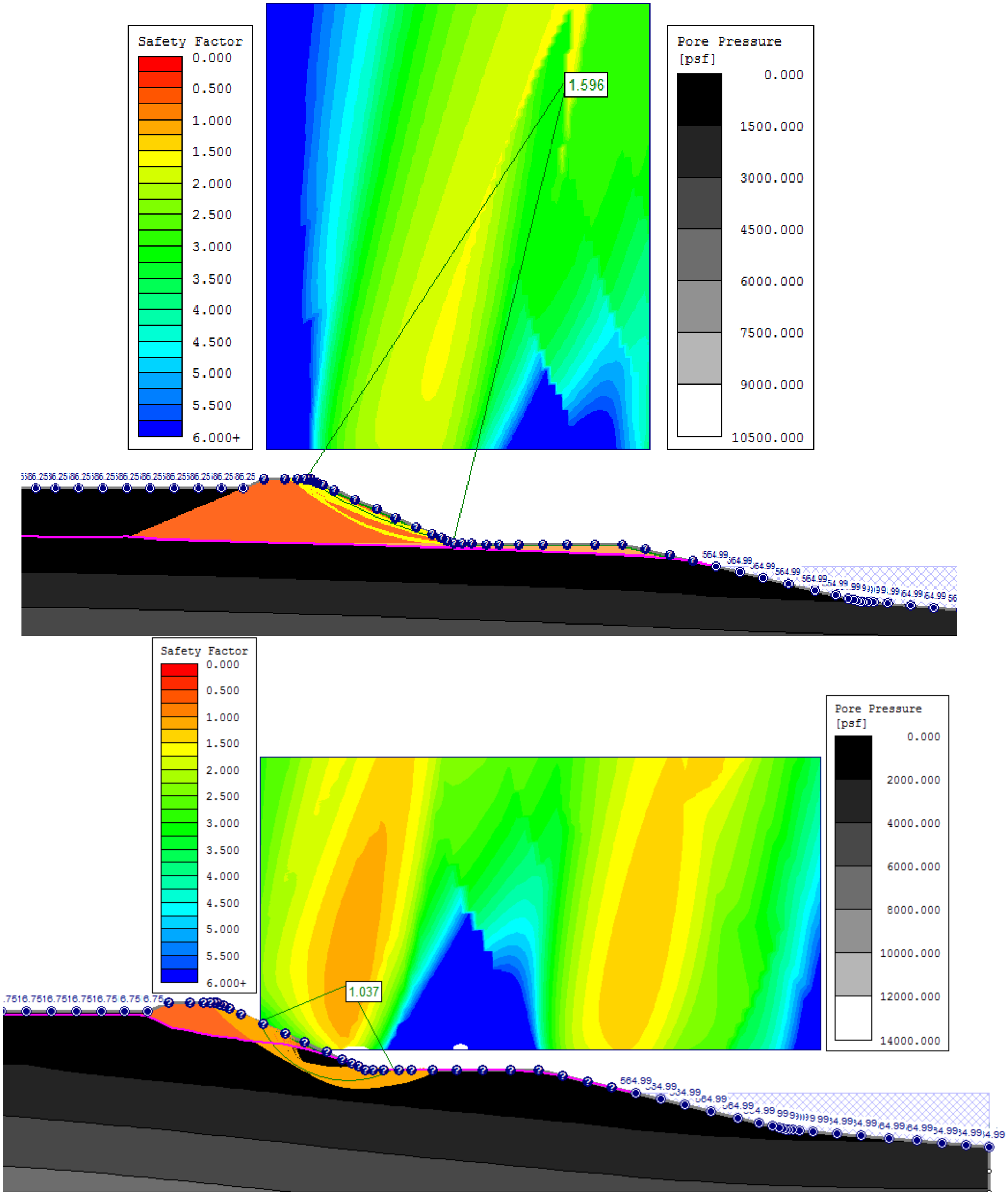

Figure 29: Analyses for the in-situ condition, first with the in-situ measured water table (above) and then with a hypothetical higher water table (below). Slip surfaces are shown for factors of safety below 1.7 for the above case and between 1.0 and 1.2 for the below case.

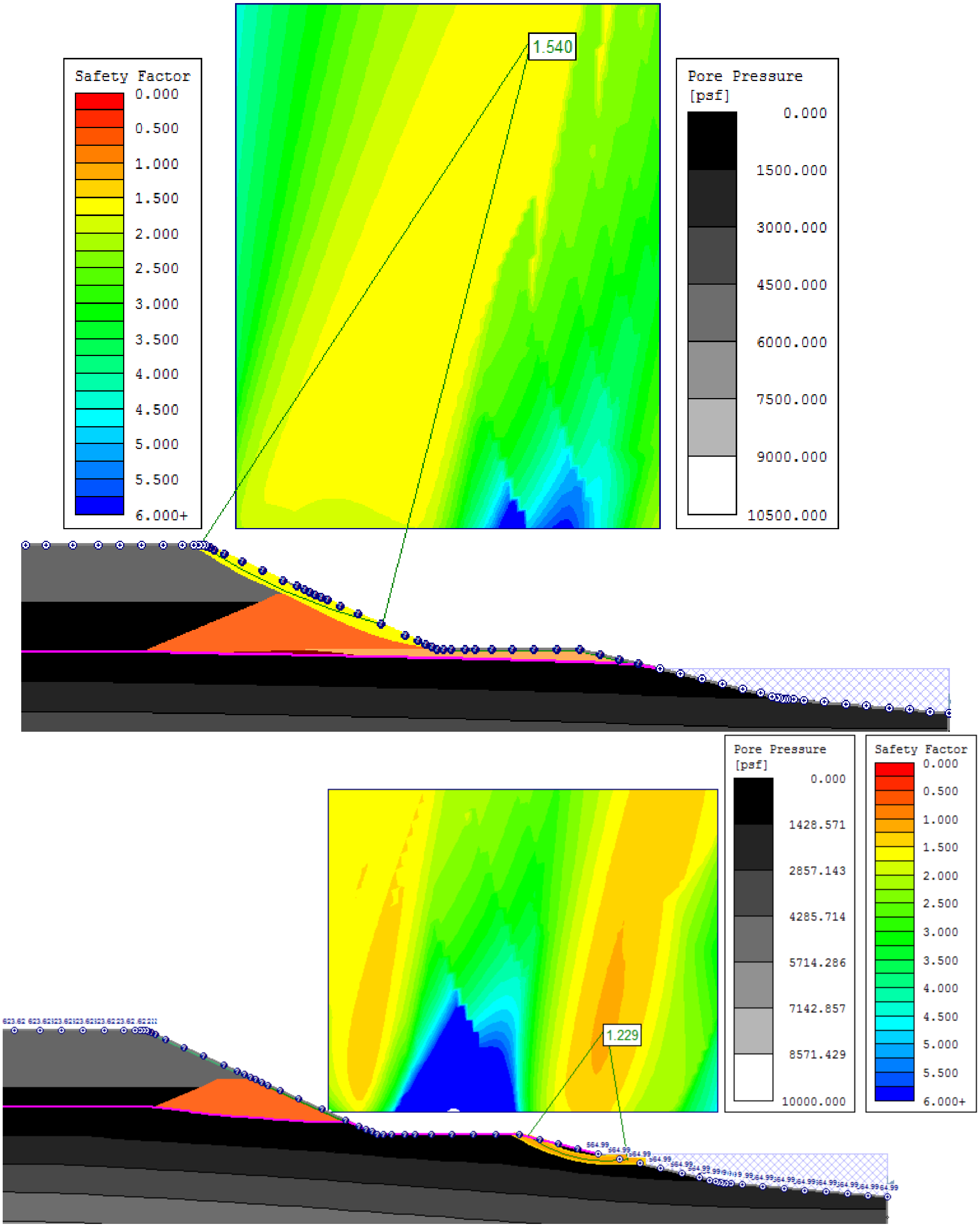

Figure 30: Analyses for an added upstream dry-disposed cell over the surface impoundment, for the in-situ water table (above) and for a hypothetical higher groundwater table (below). Slip surfaces with factors of safety between 1.5 and 1.6 are shown in the above case and between 1.2 and 1.3 for the below case.

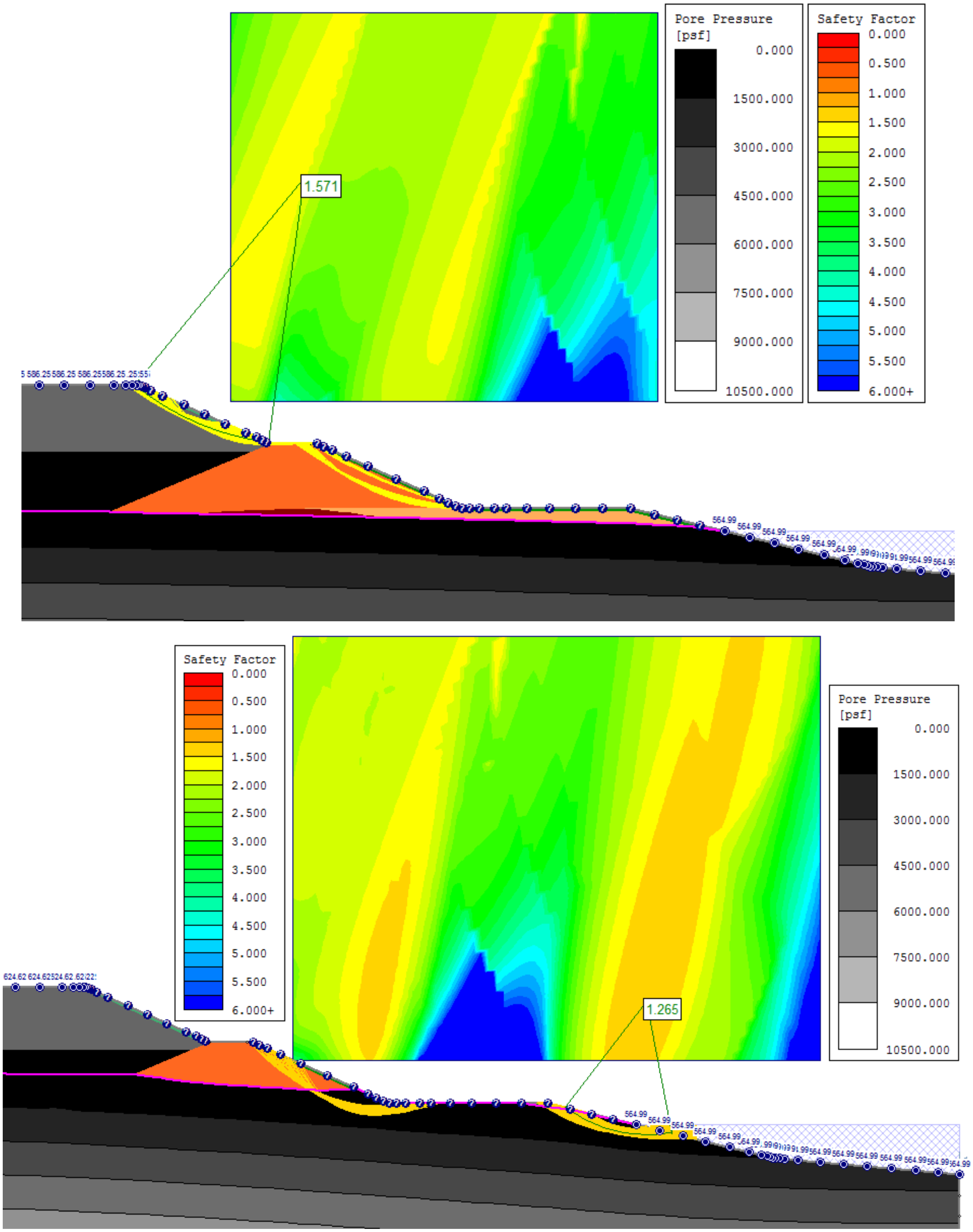

Figure 31: Analyses for an added upstream dry-disposed cell above the surface-impoundment for the in-situ groundwater table (above) and for a hypothetical higher groundwater table (below). Slip surfaces with factors of safety between 1.5 and 1.7 are shown for the above case and between 1.2 and 1.4 for the below case.

In all of the geometries considered in these analyses, a thin layer with a low cohesion was included in order to eliminate infinite slope failures that are easily remediated by keeping the slopes moist or vegetated. In addition, all of the geometries analyzed for the in-situ phreatic surface resulted in acceptable factors of safety, since the in-situ water table is so low compared to the site geometry. However, with a slight rise in the water level (perhaps as the result of a 100-year storm event), the factors of safety drop dramatically. This is the result of the fact that the embankment is constructed out of nonplastic soils that completely derive their strength from the frictional component of shear strength. As the water table rises, buoyancy effects decrease the effective overburden pressures in the geometry, thereby decreasing the slope shear strength and decreasing the factors of safety of all surfaces considered. Furthermore, the very low permeability of the embankment material makes this water table condition a real possibility, if no form of drainage through the slope is provided.

Chapter 6

Settlement Calculations for CCRs

It is common to see consolidation data reported for CCRs in research publications. However, given that CCRs often tend to be fairly free-draining, it would seem odd to use these values to determine settlement of CCRs, given that a structure or embankment were constructed over previously disposed CCRs. However, any methods developed to calculate settlements in sands are not necessarily applicable to CCRs or to silt-sized materials either. In this chapter, a comparison of common methods of calculating settlements will be made for CCRs at a specific site where a test fill was performed and actual CCR settlements monitored.

6.1 Test Fill Results

The results of a test fill of compacted, dry-placed fly ash performed over an approximately uniform 50 ft deep deposit of surface impounded ash was provided by S&ME. The test fill was 20 ft high and had lateral dimensions of 250 ft by 250 ft. The side-slopes all-around were 3H to 1V, making the entire footprint of the fill about 370 ft by 370 ft, or 136,900 ft^2. For the purposes of these analyses and the sake of simplicity this load will be characterized as a constant 20 ft load over the 250 ft square footprint of the test fill. The recorded settlements at the center of the test fill area were between 18.0 and 19.5 inches.

6.2 Settlement Calculation by Consolidation Theory

For increased accuracy, the surface impounded layer is divided into sub-layers and the settlements calculated for each layer and added together for the overall settlement. It is assumed that since the CCR material has not been loaded in the past that it is in the normally consolidated condition and that they unit weights of the surface impounded CCRs and dry-placed CCRs are 95 pcf and 100 pcf, respectively. Four sets of consolidation tests were performed on the impounded CCR material that made up the foundation for the test fill; the compression ratio for the test closest to the depth of the layer being considered is used in calculating the settlement in that layer. The water table is located 8 ft below the ground surface:

Table 10: Consolidation settlements calculated for test fill placed over a CCR surface impoundment.

Layer	T_L (ft)	D_{CL} (ft)	P_0 (psf)	ΔP (psf)	P_f (psf)	c_{ec}	S_i (in)
1	5	2.5	237.5	2000	2237.5	0.20225	11.82
2	10	10	587.7	2000	2587.7	0.20225	15.62
3	15	22.5	832.2	2000	2832.2	0.07299	6.99
4	20	40	1158.2	2000	3158.2	0.07299	7.63
						Σ	42.07

Note: T_L = layer thickness, D_{CL} = depth to center of layer, P_0 = initial stress condition, D_P = change in stress, P_f = final stress condition, and S_i = settlement for a specific layer

As displayed in Table 10, the settlements estimated using consolidation theory are just over twice the amount observed in the test fill. This is not really surprising since CCR materials do not tend to behave like soils where consolidation theory is used to calculate settlements; generally, plots of volumetric strain vs. normal stress from consolidation tests performed on CCRs do not have clearly log-linear portions corresponding to a recompression and compression ratio. As a result, depending on what values are assumed for $c_{\varepsilon c}$ and $c_{\varepsilon c}$, the settlement could either be greatly overestimated or underestimated, depending on different individuals' interpretations of the plot.

6.3 Settlement Calculation by D'Appolonia Method

The D'Appolonia (D'Appolonia et al. 1970) method of calculating settlements in sand is based on elasticity theory and can be applied to this sort of example with some moderate assumptions. Equation 8 is the equation developed by D'Appalonia et al. (1970):

$$\rho = \mu_0 \mu_1 \frac{qB}{M} \tag{9}$$

where ρ = settlement
μ_0, μ_1 = geometry factors from Figure 36
q = applied bearing pressure
B = footing width
M = 1-dimensional compression modulus

Figure 32 provides plots used to determine the geometry factors, while the applied bearing pressure and footing width are the same as determined in section 6.2. From logs of CPT tests performed at the test fill location, the average M measured over the depth of the CCR deposit was about 45 tsf (based on CPT correlations).

Given the dimensions of the test fill given in section 6.1 and Figure 32, μ_0 is estimated as 1.0 (since the fill is at the ground surface) and μ_1 would likely be around 0.14. The settlement can now be calculated as:

$$\rho = 1.0 \cdot 0.14 \cdot \frac{1\text{ tsf} \cdot 250\text{ ft}}{45\text{ tsf}} = 0.777\text{ ft} = 9.33\text{ in}$$

The most obvious problems with applying this method to placement of a fill is that it was developed for shallow foundations, which are a rigid structure and it was developed for sands, while CCRs are usually classified as silts according to the USCS. Tan and Duncan (1991) cite that this method tends to underestimate settlements around 50% of the time, as it certainly does in this case.

Since this method underestimates the settlements observed at this site by about 50 percent, it may be useful to determine what value of compressibility modulus actually give an accurate settlement:

$$M = \mu_0 \mu_1 \frac{qB}{\rho} = 1.0 \cdot 0.14 \cdot \frac{1\ \text{tsf} \cdot 250\ \text{ft}}{1.5833\ \text{ft}} = 22.1\ \text{tsf}$$

This value for the compressibility modulus is equivalent to an average modulus calibrated to the observed settlements. While one data point is not sufficient to develop a correlation, if enough settlement tests were conducted for CCR materials, it would be possible to develop a CPT-*M* correlation that better predicts settlements than the one used in this investigation.

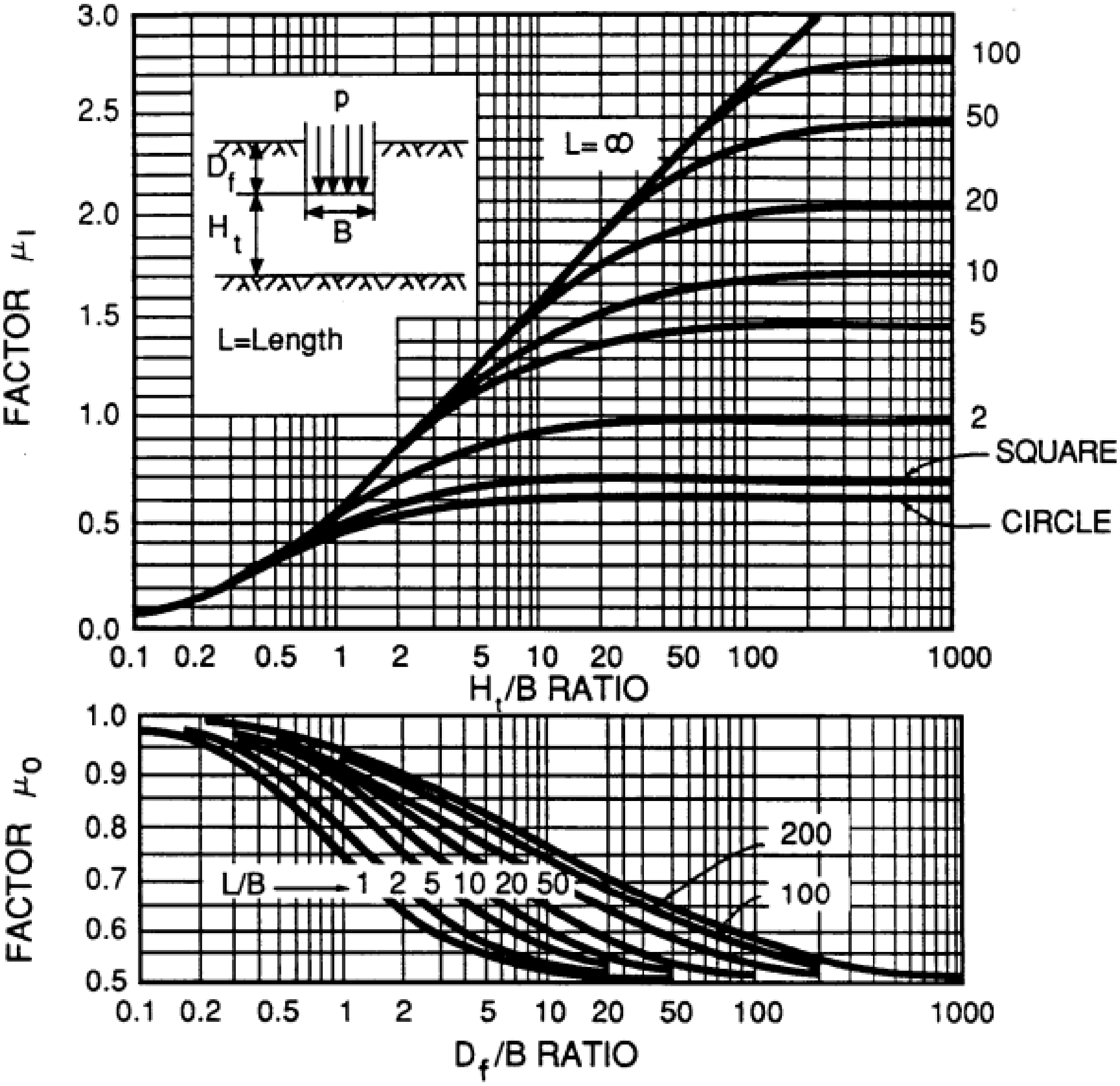

Figure 32: Plots published by D'Appolonia et al. (1970) to determine the values of the geometry factors to be used in footing settlement analyses.

6.4 Other Observations

As an alternative to specific methods of settlement calculations, if it is assumed that the fill is of large lateral extent, a basic calculation of settlement can be made using M, the pressure applied by the fill, and the depth of the soil strata being filled:

$$S = \frac{PZ}{M} \tag{10}$$

where P = the pressure applied as a result of the fill
Z = the depth of the soil where settlements are being considered

Again using a value of M = 45 tsf, the settlement is calculated as 13.33 inches. This is still an under-estimate of settlement for this test fill, but given that a CPT correlation for M in CCR materials was developed, it may be possible to calculate more precise estimates of settlement. Reduction factors could then be applied to equation 10 in order to attain an acceptable level of reliability.

A comparison of Young's modulus of soil (E_s) can also be made using Hooke's Law and the observed settlement:

$$E_s = \frac{PZ}{S} \tag{10}$$

where P = the pressure applied as a result of the fill
Z = the depth of the soil where settlements are being considered
S = the observed settlements after fill placement

versus the correlation of CPT tip resistance (q_t) to E_s used in Schmertmann's CPT settlement calculation method:

$$E_s \approx 2.5 \cdot q_t \tag{11}$$

Using Hooke's Law with a settlement of 19 inches and an applied fill pressure of 1 tsf, the E_s calculated is 31.6 tsf. Using the CPT correlation given in equation 11, the average CPT tip resistance over the depth of the CCR deposit below the test fill was about 17 tsf, which would return an E_s value of 42.5 tsf.

The accuracy of these values of E_s are questionable, however, Hooke's law assumes a linear-elastic stress-strain condition and the CPT correlation was developed for use with sandy soils. Ideally, CPT correlations should be developed specifically for CCR materials and E_s, which would require a large volume of CPT tests and data analysis.

Chapter 7

Reconstitution Technique for Surface Impounded CCRs

Sample reconstitution techniques try to balance process simplicity with matching the in-situ fabric of the soil as closely as possible. Some reconstitution techniques commonly used on sand and non-plastic silt materials include moist tamping methods, air and water-pluviated methods, and slurry deposited methods. In this chapter, a brief overview of these various methods is given and a technique not yet applied to coal ash materials is analyzed when used with surface impounded CCR materials (will be referred to as SI CCRs throughout this chapter).

7.1 Moist Tamping

The first moist tamping method was proposed by Ladd (1978) in a paper entitled "Preparing Test Specimens Using Undercompaction." In this method, specimens are formed by hand-tamping of moist soil (w% = 20% to 70%) in equal lifts within a triaxial sample split mold, while increasing the dry mass of soil in each subsequent lift. The soil samples should be mixed with water at least 16 hours prior to use and the lift thickness should not exceed 1 inch for specimens with a diameter of less than 4 inches. Ladd provided an equation to calculate the percent under-compaction for each layer placed:

$$U_n = U_{ni} - \left[\frac{(U_{ni} - U_{nt})}{n_t - 1} \times (n - 1)\right] \tag{11}$$

where U_{ni} = percent under-compaction selected for first layer
U_{nt} = percent under-compaction selected for final layer (normally zero)
n = number of layer being considered
n_i = first (initial) layer
n_t = total number of layers (final layer)

The U_{ni} of the first layer is usually between 0% for very dense specimens and 15% for very loose specimens. In order to determine the correct U_{ni}, a series of cyclic triaxial tests must be run with the same effective consolidation stresses and CSR, but with different values of U_{ni}. The specimen then observed during testing and the following observations indicate an inappropriate value of U_{ni}:

- Excessive necking or bulging in any part of the specimen during cyclic loading.
- Non-uniform vertical strains during unconsolidated-undrained loading.
- A honeycomb soil fabric structure at either end of the specimen.
- A non-uniform dry unit weight along the height of the specimen.

Other moist tamping techniques modify this method slightly, usually by either changing the method in which under-compaction is addressed or by defining a specific compaction energy to be used in compacting the sample. This method can be laborious if the correct value of U_{ni} must be determined, since a whole test regime must be completed. Additionally, with regards to hydraulically-placed soils, the fabric of the sample does not match in-situ conditions well.

7.2 Air/Water Pluviation

"Pluviation" or "raining" of soil is a technique first published by Kolbuszweski in 1948. In this technique, the soil is pluviated from a separate apparatus into the soil mold, either in a dry state, or in water. These apparatuses vary in complexity and have various opening sizes and diffuser designs. By controlling the flow rate of the soil through the diffuser and the fall height of the sand, it is possible to place the soil at varying relative densities (Rad and Tumay 1987).

While air-pluviated samples can provide relatively uniform specimens and is a good technique for modeling Aeolian deposits of poorly graded sands and silts, well-graded sands or sands with high fines content have a tendency to segregate. Furthermore, the fabric of the sample can be disturbed during the saturation phase of triaxial testing due to fines washing out of their original placement (Keurbis and Vaid 1988). Air-pluviation would not likely model the fabric of surface-impounded CCRs well, since these CCRs are deposited in a hydraulic environment. Furthermore, the high content of non-plastic fines in CCRs would make loss of soil due to dust very high.

Similarly, water-pluviated specimens form uniform samples of poorly graded soils, though usually at lower relative densities than air-pluviated specimens, since soils fall at a slower velocity through water than through air. However, with well-graded soils, or soils with high fines contents, particle segregation can be a problem with this technique (Keurbis and Vaid 1988). Particle segregation would also be an issue with surface impounded CCRs, since these tend to be a mixture of bottom ash and fly ash.

7.3 Slurry Deposition Techniques

Like the previous two methods, there are several different slurry deposition methods. The first slurry deposition method was first developed by Keurbis and Vaid (1988), which is the technique that is being assessed for use on surface impounded CCRs in this thesis, with some slight modifications. For the sake of avoiding any redundancy, the procedure for this technique will be outlined with specific reference to its use on SI CCRs, with departures from the original procedure of Keurbis and Vaid noted.

7.4 Slurry Deposition Technique Applied to SI CCRs

The basic premise of the slurry deposition technique is to form a lean (just enough water to allow for effective soil mixing), saturated slurry of soil that can then be deposited directly from a mixing tube into a triaxial split-mold, with minimal disturbance to the mixture. The slurry should be lean enough to avoid the development of sedimentation currents during the transfer from the mixing tube to the split-mold, but not so lean that mixing becomes difficult. In addition, the procedure ensures that the sample will be fully or very close to fully saturated upon completion. The samples are deposited very loosely initially and can be densified to higher relative densities by vibration. In their original slurry deposition method, Keurbis and Vaid recommend de-airing the soil-water mixture and then pluviating it into the mixing tube in order to better ensure saturation. However, CCRs can be fine enough that a considerable amount of the sample (of a specific grain-size) can be lost in the pluviation process. Therefore, the CCR samples prepared using this method are simply added to de-aired water directly into the mixing tube in order to minimize sample loss during the preparation process; if saturation ratios using this method are unacceptable, a soil-water mixture can de-aired under a vacuum or by boiling and then transferred directly to the mixing tube. The apparatus required for the CCR slurry deposition technique are as follows:

- Acrylic mixing tube, with an outer diameter slightly smaller than the target diameter of the sample being formed and a plug to seal off one end. The end opposite of the mixing tube will have rubber gasket seal glued around the rim. The other dimensions of this tube will be discussed later.

Figure 33: Acrylic mixing tube with a rubber stopper on one end and rubber gasket seal glued to the opposite end.

- A thin metal disk approximately the same diameter as the bottom porous disk used in testing.

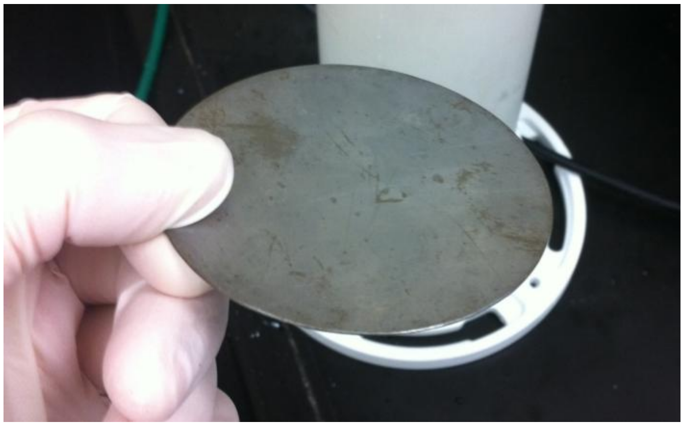

Figure 34: Thin metal disk approximately the same diameter of the bottom porous disk.

- A rubber or latex membrane with a smaller diameter than the mixing tube. Standard store-bought balloons can be cut to fit and are a cheap, readily available alternative.
- Water bath container for the acrylic mixing tube, large enough to completely submerge the mixing tube.

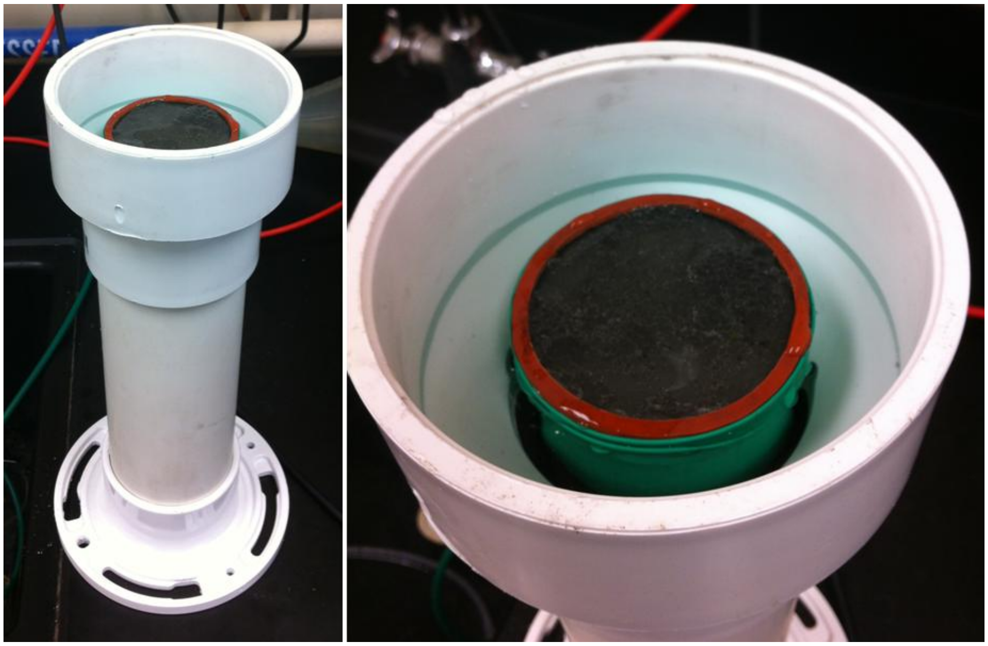

Figure 35: Water bath large enough to completely submerge the mixing tube and allow for easy placement of the porous disk and metal plate. The rubber membrane can also be seen rolled down around the mixing tube.

- Water bath container for the triaxial cell base-platen that can at least submerge the bottom drainage line and the porous disk when the mixing tube is placed on it.

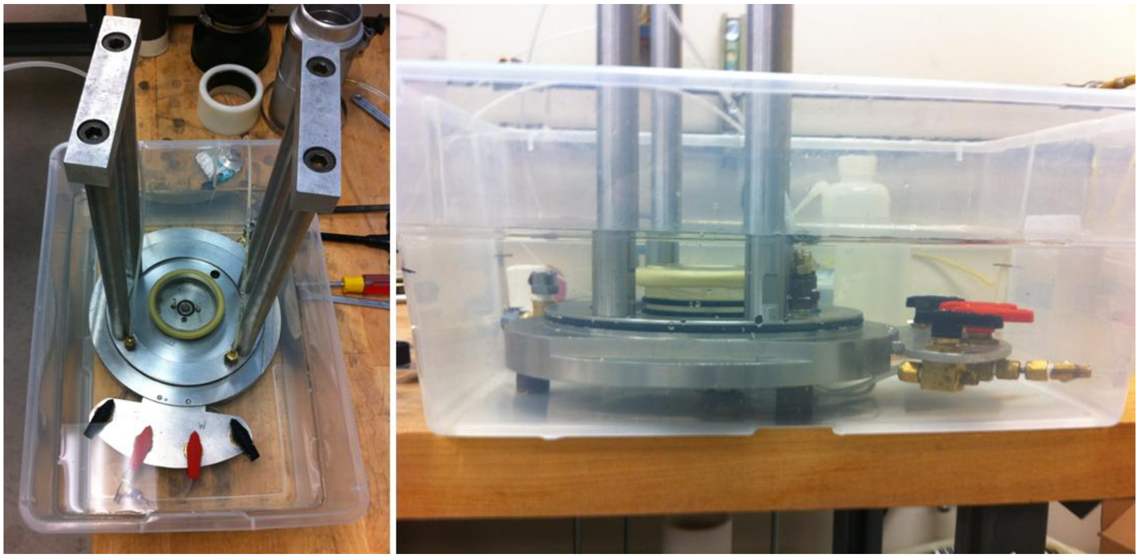

Figure 36: Water bath large enough to accommodate the bottom of the triaxial cell and submerge the bottom platen.

- A split-mold triaxial sample former.
- A collar that fits over the split-mold to accommodate the temporary increased volume of the sample when it is first placed.

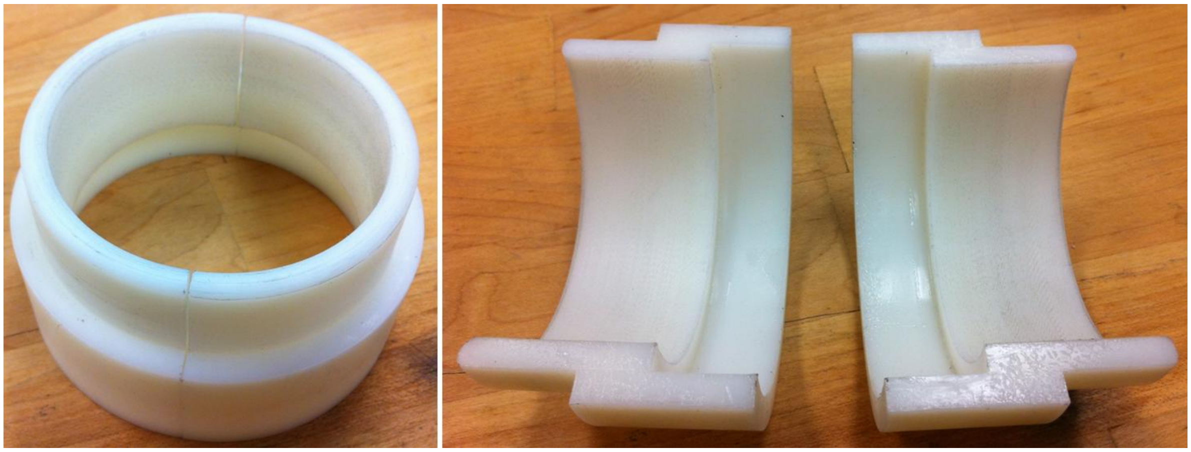

Figure 37: A custom-made split-collar to accommodate the additional volume of soil when the slurry is first placed in the specimen split-mold. This collar was machined out of nylon to fit the dimensions of the split-mold being used and the flexible collar used to accommodate the extra water volume when the slurry was placed.

- A small mechanical shaker or mallet to densify the sample once it is placed. If a mallet is used, a heavier mallet is best, as it transfers more energy than a standard rubber mallet.

In their original slurry-deposition method, Keurbis and Vaid made their soil-water mixtures using dried soil; for SI CCRs, this would be impractical because of the dust that would be lost in handling it in a dry state. Thus, it is recommended that the SI CCRs be mixed at a target water content in order to make it more workable. Once the soil is well-mixed, several small samples should be oven-dried to verify that the moisture content of the soil is homogenous.

The mixing tube should have the thin rubber membrane rolled down over the end with the rubber gasket seal and the other end plugged with the stopper. The moist CCR specimen is placed in the mixing tube, which should then be filled with de-aired water (some water can be in the tube prior to adding the moist soil in order to help collapse the structure of the moist CCRs and decrease their volume during placement in the tube). The mixing tube is now placed into the de-aired-water bath. Once the mixing tube is in the water-bath, a saturated, de-aired porous disk with a filter paper attached is placed on the open end, such that it is completely submerged in the water bath; some fines will escape the mixing tube while it is submerged and before the porous disk is placed over the opening (see Figure 38), so these fines should be put into a container to be oven-dried and weighed in order to adjust the dry mass of the sample.

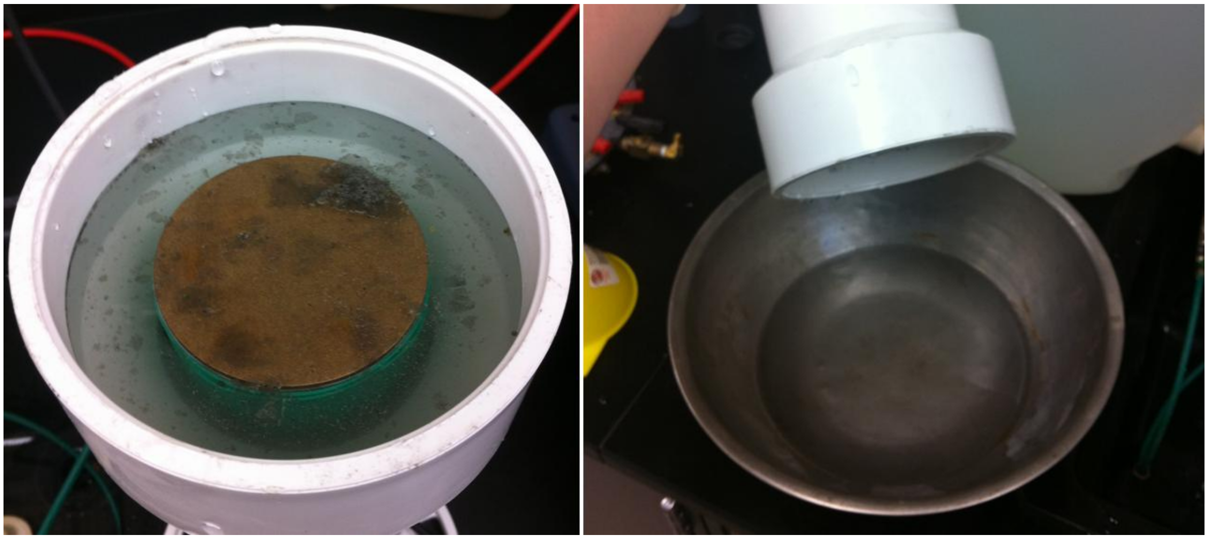

Figure 38: Placement of the porous disk and transferring of the fines lost in the water bath to a container to be oven-dried and weighed.

At this point, the thin rubber membrane is rolled over the porous disk, such that a small portion of the center of the disk is exposed. The thin, metal disk is now placed over the porous disk and membrane and the mixing tube is withdrawn from the water bath, while keeping firm pressure on the metal disk. The securing of the porous disk with the thin rubber membrane and placement of the metal disk are shown in Figure 39.

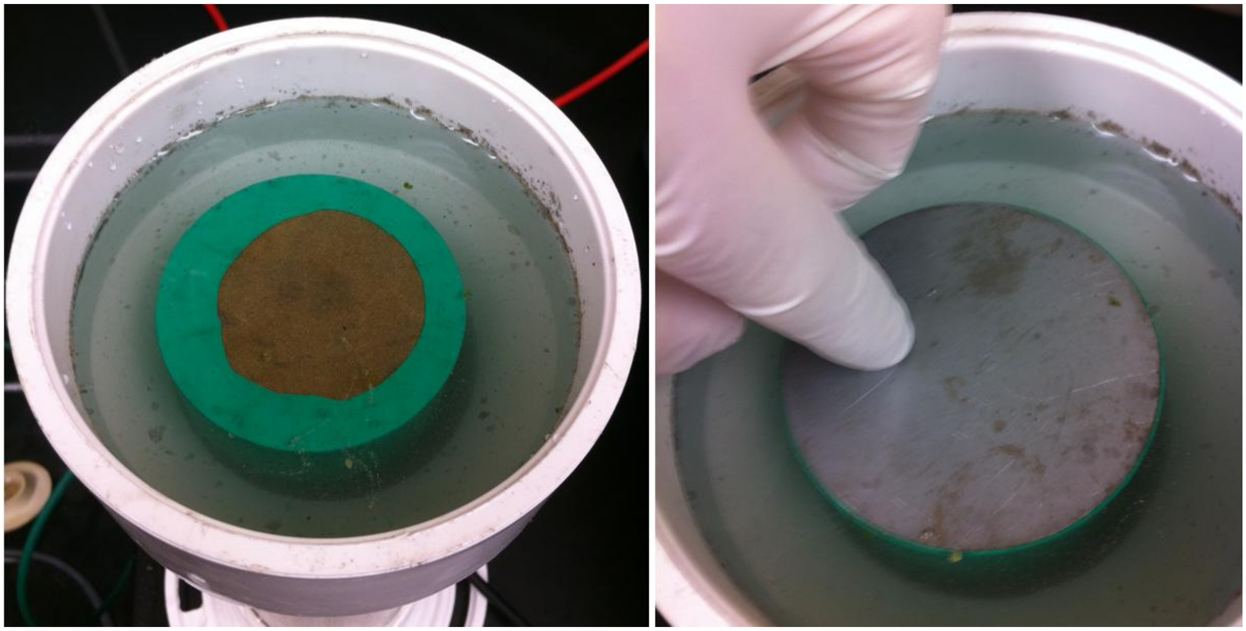

Figure 39: Securing of the porous disk with the thin rubber membrane and placement of the thin metal disk over the opening in the membrane.

Now the mixing tube is removed from the water bath while maintaining firm pressure on the thin metal disk and the soil slurry mixed vigorously, end-over-end for the next twenty minutes, to ensure homogeneity of the slurry. After twenty minutes has passed, the mixing tube is placed disk-end down and the mixture is allowed to settle to its loosest stable state. When the mixture has stabilized, the metal disk is removed (it should be held in place by suction when the mixing tube is lifted), the membrane rolled back to the edges of the porous stone, and the entire apparatus placed porous-disk-down onto the base platen, which is submerged in another de-aired water-bath. The rubber membrane around the mixing tube is now rolled up and off of the mixing tube. The sample membrane has been rolled down around and attached to the bottom platen with two o-rings prior to submerging the base platen in the de-aired water-bath and it is now rolled up and over the outside of the mixing tube. The entire bottom platen can now be removed from the water bath and the split mold formed around the mixing tube and sample membrane. Rolling of the membrane over the mixing tube and placement of the split mold and collars after removal of the triaxial cell base from the water bath is illustrated in Figure 40.

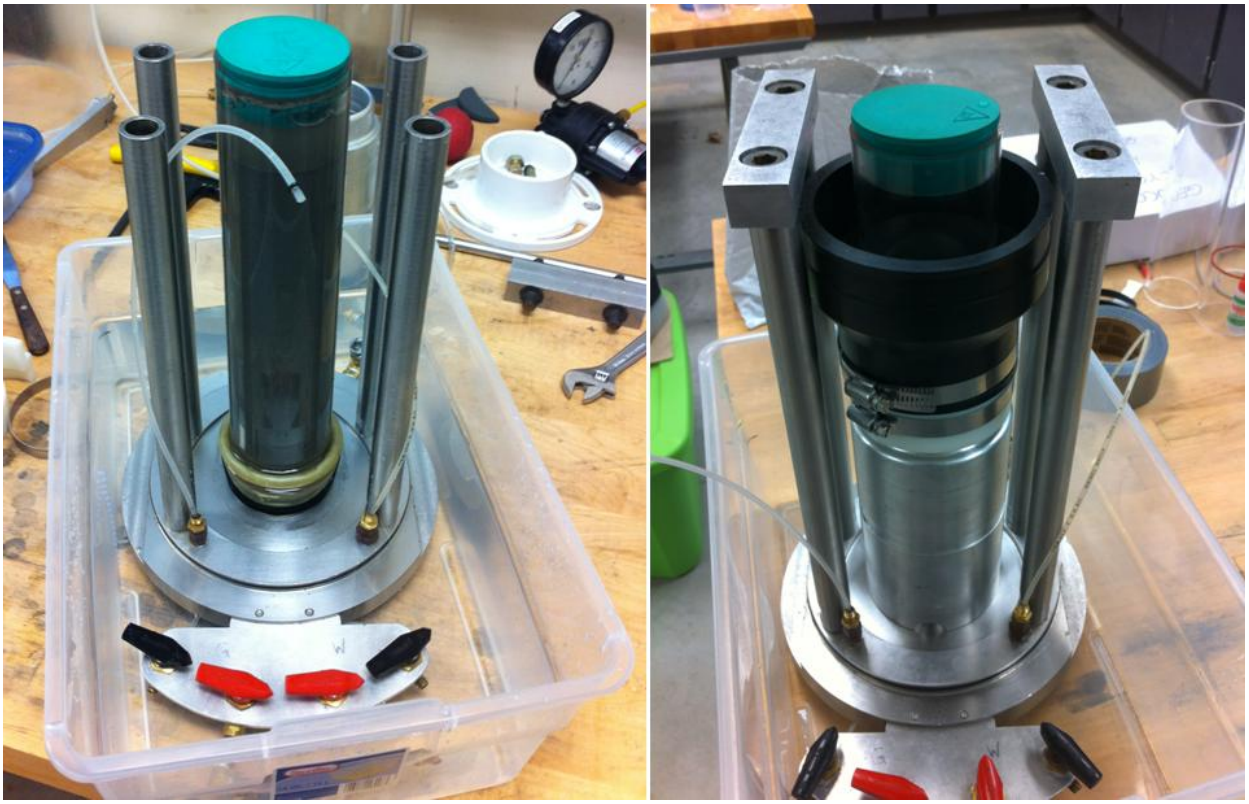

Figure 40: Rolling up the membrane around the mixing tube and placement of the specimen split-mold, the slurry extension collar, and the water extension collar after removal of the triaxial cell base from the water bath.

Once the extension collars for the split-mold is attached, a vacuum is applied between the split mold and the membrane; then, if additional volume is required to accommodate water volume, either a larger membrane can be secured using a hose clamp, or a flexible rubber PVC connection can be used (the flexible PVC connection was used in this experiment, as shown in the right-hand photograph in Figure 40). The last step before transferring the slurry to the split mold is to add a de-aired water bath to the split mold, outside of the mixing tube; this ensures minimal disturbance of the CCR material as it is transferred from the mixing tube to the split-mold. The rubber plug on the mixing tube can now be removed and the mixing tube slowly extruded, such that disturbance to the slurry is minimized as it is deposited in the split-mold. When the mixing tube has been fully extruded, the water level can be adjusted by allowing drainage through the drainage lines on the bottom platen (alternatively, some of the water and fines mixture at the top can be basted off and put into the same container as the fines from the mixing tube water bath and oven-dried and later weighed to save time). Once the water level has dropped enough to allow removal of the extra membrane or flexible PVC connection, the slurry can be densified by attaching the top platen (which also has a filter-paper applied), applying a small pressure, and vibrating the sample if necessary, while allowing excess pore pressures to dissipate through top and bottom drainage lines, as shown in Figure 41. This should be done such that the piezometric pressure is the same across the sample, which was postulated to form specimens of sand at uniform densities with height by Vaid and Negussey (1988).

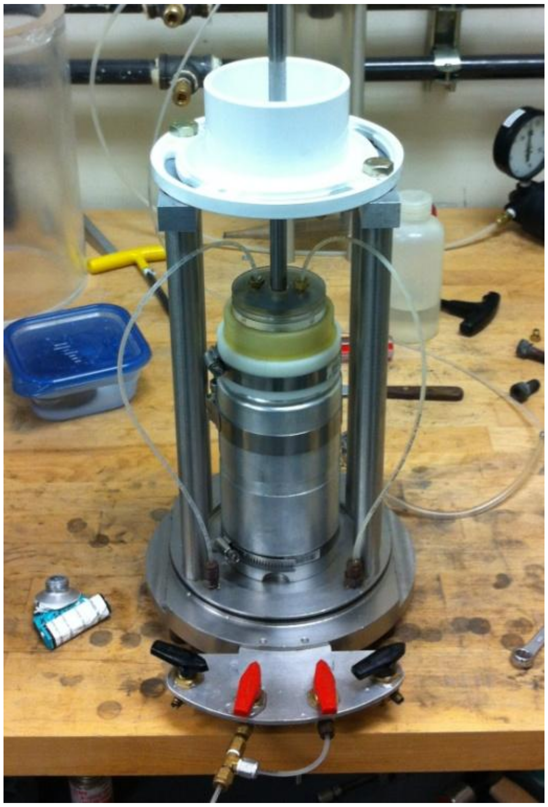

Figure 41: Setup used to densify SI CCR slurry-deposition samples. Notice that the short-circuit between the top and bottom drainage is being used to drain the sample as it is densified with the top platen applied. The top platen fits snugly enough into the extension collar to keep a water-proof seal. The white piece on the top of the triaxial base is simply a part to keep the piston plumb as the slight pressure is applied to the top of the sample during densification.

This vibrating can be accomplished with either a mechanical shaker or by tapping the side of the split mold gently with a mallet. However compaction of specimens to high relative densities can take quite a long time using a mallet, so a mechanical shaker would be preferable for SI CCR specimens. Once the target sample height is reached (and thereby the target sample volume reached), the extension collar is removed, the membrane is secured to the top platen with two o-rings, and a small vacuum pressure is applied to the sample to allow removal of the split mold. The dimensions of the sample are then measured and the sample is placed into the triaxial testing apparatus.

The dimensions of the acrylic mixing tube are determined based on the minimum density of the largest volume of soil that will be used in making a sample. That is, the length of the tube is determined based on the amount of soil required in forming the densest sample to be tested, placed at a zero percent relative density. Keurbis and Vaid found that this volume, increased by five to ten percent is sufficient to allow for adequate slurry mixing, while avoiding large particle sedimentation distances. A sample calculation determining the appropriate length for a mixing tube is included in the appendix.

7.5 Analysis of Slurry Deposition Technique with SI CCRs

In order to assess the slurry deposition technique as applied to SI CCRs, relative density and gradation were determined for the top, middle, and bottom portions of the sample. Since CCRs tend to be non-plastic and negative pore water pressures in a moist sample are not high enough to ensure no disturbance of fabric during the verification process, a gelatin solidification technique developed by Emery et al. (1973) for use with sand specimens was modified for use in this experiment. Gelatin was chosen as the solidifying agent because it is easily dissolved using heat after the volume of each individual slice of the specimen is determined. Then, by adding bromelain, a proteolytic enzyme, the gelatin is broken down, leaving a brittle crystal that can then be avoided when selecting a sample to run a hydrometer test on, and that can be washed out when the gradation is analyzed above the #200 sieve.

SI CCRs have a wide range of hydraulic conductivities (a result of how they are generated and placed), sometimes being similar to sands and other times being more similar to silts. For this reason, the time required to permeate these samples with a gelatin solution is much longer than for clean sand samples. As a result, it was determined that a lower concentration should be used than recommended by Emery et al., such that the solution remains a liquid at room temperature, but is solidified by surrounding the sample in the split mold with an ice-bath; this is explained in more detail in the following paragraphs.

Once the compaction of the slurry deposited sample was complete, height measurements were made at four locations (front, back, right, and left sides of the top platen) using the frame of the triaxial cell and a Mitutoyo micrometer. The height of the sample was determined by subtracting the thicknesses of all the component parts that are not soil from the heights measured from the bottom platen to the triaxial cell frame at four points (front, back, right, and left sides). This was done as a quality-control measure to ensure that the overall relative density across the sample was close to the target relative density. A 0.75% by-mass gelatin solution is then permeated through the specimen by applying an elevation head between the gelatin reservoir and bottom drainage lines of the specimen and allowing drainage through the top drainage lines (not more than 18 inches). About two specimen pore volumes were permeated through the specimen to ensure complete replacement of the pore fluid. After the gelatin flushing of the specimen was complete, the drainage lines were all closed and an ice-bath was packed around the specimen, as shown in Figure 42. For this experiment, the ice bath was maintained over the height of the sample for a period of four hours, which was found to be adequate to solidify the specimen.

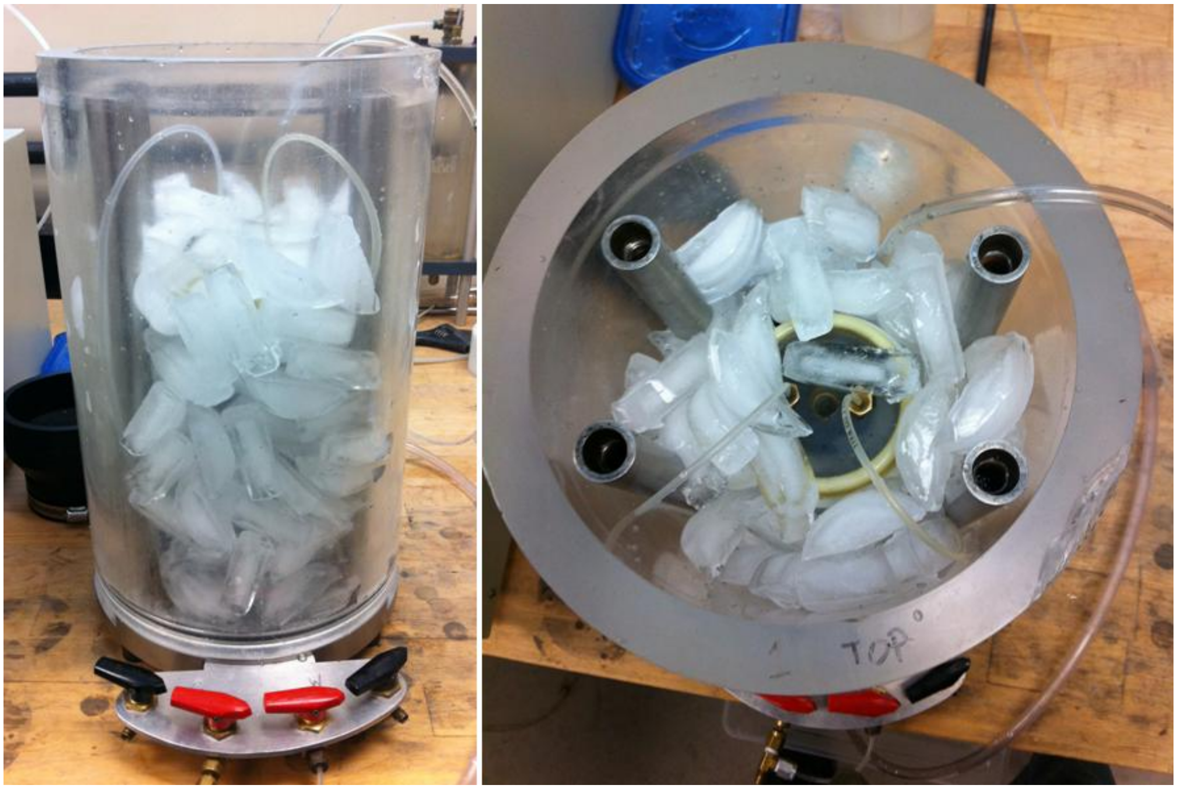

Figure 42: Ice bath placed around the compacted specimen for a period of four hours to set the gelatin.

After the four hours, the ice bath was removed and the specimen was removed from the split mold and taken out of the membrane, as shown in Figure 43, and cut into three approximately even-sized portions.

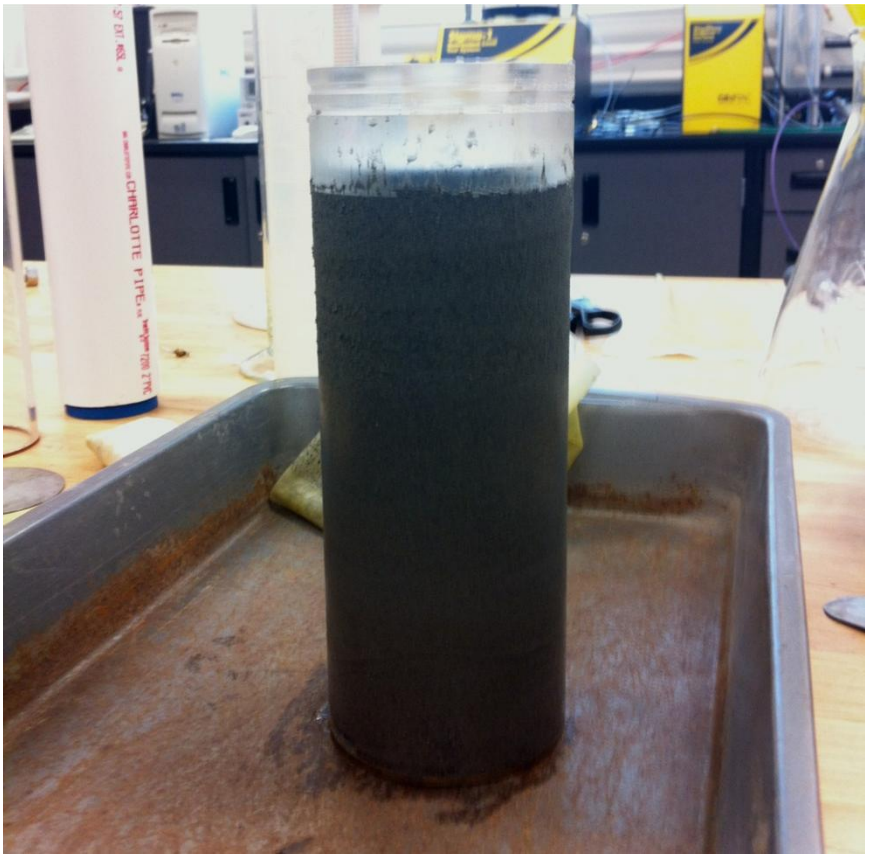

Figure 43: Specimen removed from the split mold and membrane following gelatin curing period.

The mass of these portions was taken and the volume determined using water displacement, as shown in Figure 44. These two measurements allow for the calculation of the density of each slice. It can be assumed that each of the slices is composed only of a mixture of gelatin and CCR material for the purposes of determining the relative density of each slice. The specific gravity of the gelatin solution was determined by permeating a portion of the solution through a piece of filter paper into a graduated cylinder and also placing this in an ice-bath for four hours, after which the mass and volume of the gelatin were measured and used to calculate the specific gravity at that temperature (ranged from 1.000 to 1.008). The specific gravity of the CCR material was determined according to ASTM D854, courtesy of Kevin Foster. Since the overall density of each slice is known, and the density of both component materials is known, it is possible to calculate the volume of each component according to equations 12 and 13.

$$V_{s\_slice} = \frac{\rho_{slice} \cdot V_{Slice} \frac{G_G M_{slice}}{\rho_{slice}}}{G_S - G_G} \tag{12}$$

where V_{s_slice} = volume of solids of the specimen slice
ρ_{slice} = density of the specimen slice
V_{slice} = volume of the specimen slice
G_G = specific gravity of the gelatin solution after ice-bath
M_{slice} = mass of the specimen slice
G_S = specific gravity of the CCR material

$$V_{g\_slice} = \frac{M_{slice}}{\rho_{slice}} - V_{s\_slice} \tag{13}$$

where V_{g_slice} = volume of gelatin of the specimen slice

Since it is assumed that the gelatin completely permeated the pore space of the sample, the volume of the gelatin is equal to the volume of voids in the slice and the void ratio can be calculated, which can then be used to calculate the relative density.

Once the densities of the slices has been determined, each slice is placed in its own container and allowed to dissolve (which will occur at room temperature), after which the Bromelain is added (a mass ratio of 1:10 of Bromelain to gelatin was found to be sufficient) and allowed to sit for two hours before placing it in an oven maintained at 110° C until it dried completely. ASTM D422-63 was followed in the particle-size analyses performed on each of the three slices for each sample, except for a few changes based on the properties of the CCR materials:

- The soil was not separated at the #10 sieve, since the material retained on the #10 sieve represented such a small portion of the sample. Additionally, in separating the samples at this sieve, there was the potential to lose specific particle sizes due to dust losses. Each of the hydrometer tests were separated on the #10 sieve following the test and the mass was adjusted accordingly for the hydrometer analysis calculations. This also eliminates the need to perform the calculation given in section 16 of the ASTM specification.

- A dry sample was used in each hydrometer test, since there would have been considerable time delays waiting for the specimen to dry at room-temperature (especially considering the presence of gelatin and bromelain in the specimens.

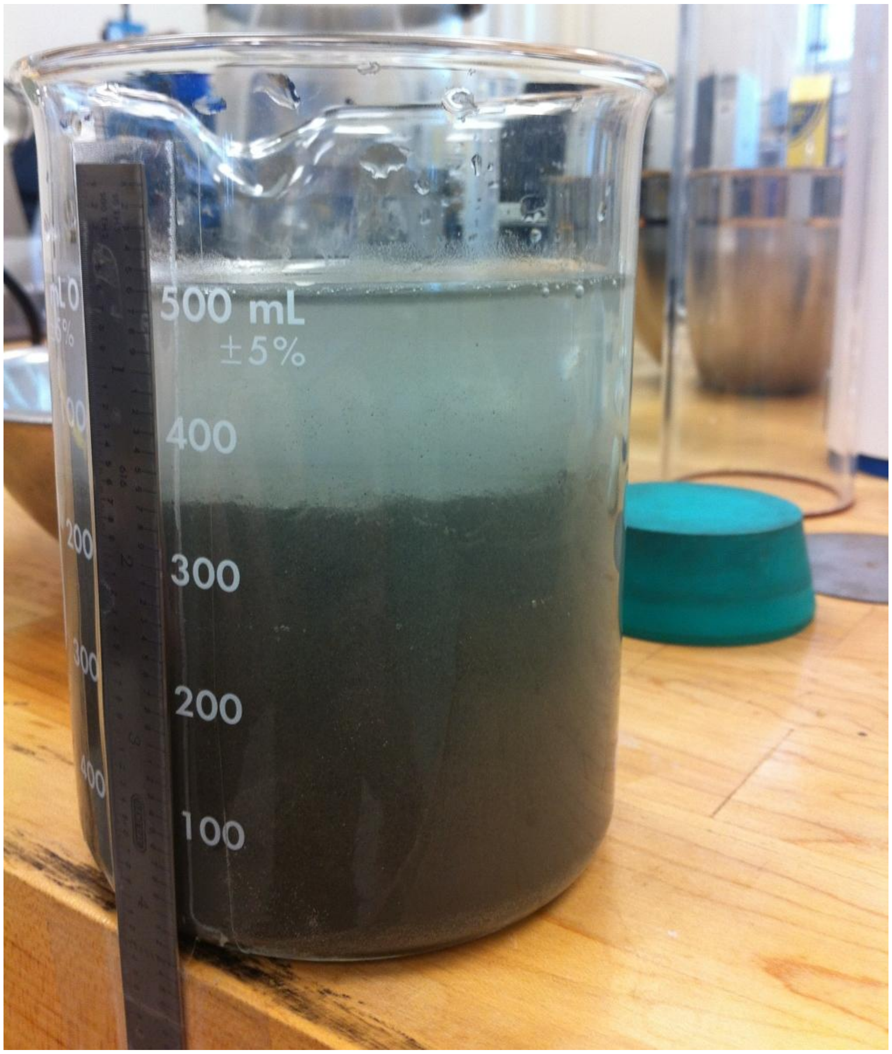

Figure 44: Each specimen slice volume was determined using water displacement. A 500 mL capacity beaker and a ruler incremented at 1/100” were used to do this. The vertical distance between a 100 mL addition of water to the beaker and the equation for the volume of a cylinder was used to calculate the diameter of the beaker; with the diameter known, it was determined that volumes could be measured accurately to ± 1.4 cm^3.

A dry sample of each of the slices could then be chosen to use in a hydrometer test (Bromelain-gelatin crystals were avoided in order to ensure they did not affect the results) to determine the grain size distribution for soil passing the #200 sieve. This soil was then added back to the rest of the dried specimen slice and washed on a #200 sieve to be included in a grain-size analysis for the particles with diameters greater than 75 μm.

Three different specimens were prepared, all at a target relative density of 70%. The first two specimens were deposited without a water bath within the split mold, while the last one was deposited with a water bath within the split mold. Table 11 makes a comparison of overall specimen slice densities and relative densities for the three specimens showing that, with or without a water bath inside the split mold, all three specimens had an increase in relative density down the height of the specimen. The top slice on the last specimen had not fully cured and as a result deformed some during the mass and volume measurements, undoubtedly resulting in the negative value of relative density. However, the bottom two slices of all three specimens are very consistent and the overall increase in relative density down the height of the specimen indicates that the densification technique that Vaid and Negussey (1988) cite as producing specimens of uniform density does not apply to SI CCR materials. Additionally, the very high values of relative density for all of the bottom slices indicate that the maximum and minimum void ratios determined for the material do not necessarily reflect the actual minimum and maximum void ratios; this could be the result of an inaccurate calculation of the specific gravity of the material, since that is a direct parameter for determining void ratio or an indication that the standards ASTM D4253 and D4254 are not appropriate methods for determining the minimum and maximum densities of CCR materials.

Table 11: Specimen relative density and density summary. The bottom two rows summarize relative density and density data for the entire specimen.

	Specimen 1		Specimen 2		Specimen 3	
	D_r	ρ (g/cm^3)	D_r	ρ (g/cm^3)	D_r	ρ (g/cm^3)
Top Slice	45%	1.63	27%	1.60	-13%	1.54
Middle Slice	93%	1.72	79%	1.69	76%	1.69
Bottom Slice	117%	1.78	113%	1.77	112%	1.77
Average	85%	1.71	73%	1.69	58%	1.67
From Dimensions	73%	-	70%	-	70%	-

The gradation curves presented for each specimen in Figures 45 through 47 show little segregation of particle size, with the most notable trend being that the bottom slice did tend to have a higher percentage of coarser particles within it; whether this phenomenon is solely the result of the placement method or the densification technique or whether both factors contribute is unclear and would require further study to determine. A comparison of the different slice gradations across specimens, presented in Figures 48 through 50, shows a very consistent gradation across the height of the sample between trials, indicating that this slight gradation difference is caused by a either the placement technique or the densification technique, though which of the one responsible cannot be stated with any certainty at this time. However, the effect of the placement technique and densification technique could be investigated easily through further testing. It is also interesting to note for specimen three, where a water-bath was used in the split-mold during slurry placement, that the gradations vary slightly more than for the two specimens, where a water-bath was not included. This may indicate that a water-bath allows sedimentation currents to form, while direct transfer without a water-bath minimizes the development of such currents. More reconstitutions would need to be made in order to perform meaningful statistical analyses on variation in gradation between samples made with and without water-baths to verify this claim. Lastly, Figure 51 plots all gradations on a single plot to make the extent of variation in the grain size distributions of the three specimens clear.

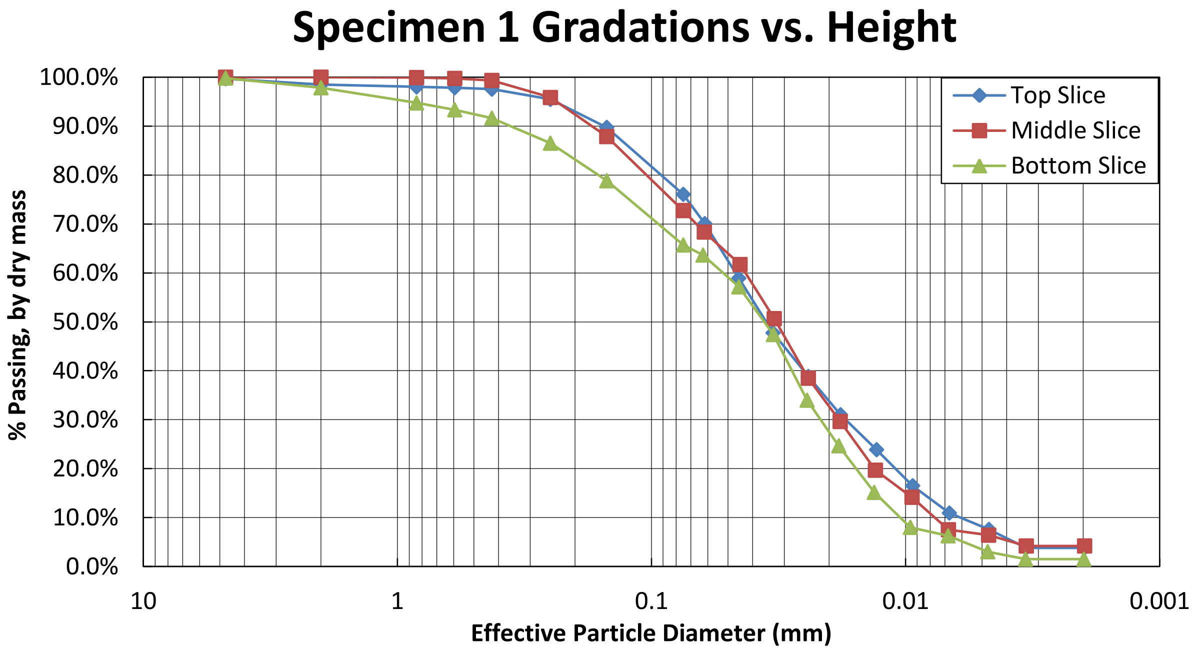

Figure 45: Plot comparing grain-size distributions across the height of specimen one.

While the results of the three reconstitutions performed for this thesis provide some insight, a statement cannot be made about the suitability of the slurry deposition method for use with SI CCRs at this time. However, it can be said that the densification technique used in this investigation is unsuitable for SI CCR materials; if an alternative densification method could be developed, a simple investigation could be undertaken to determine if the slight particle segregation observed in this investigation was due to the vibratory compaction technique used, or if it was the result of the slurry deposition technique itself.

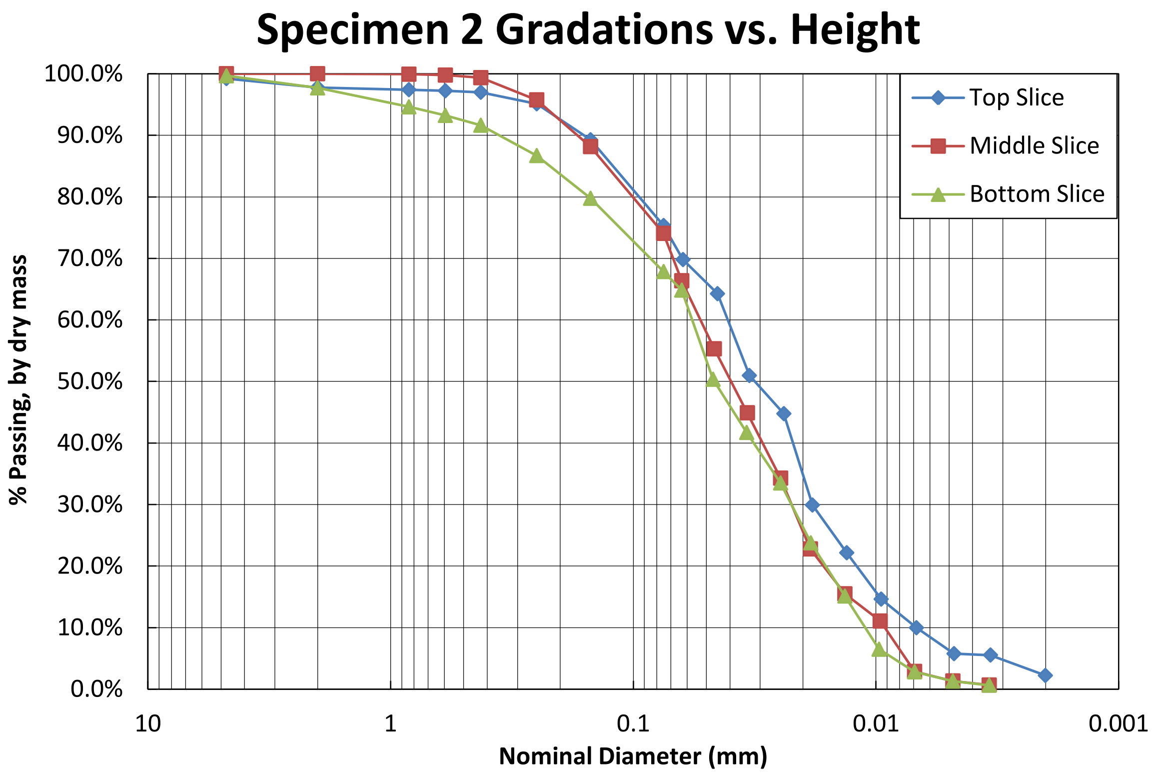

Figure 46: Plot comparing grain-size distribution across the height of specimen two.

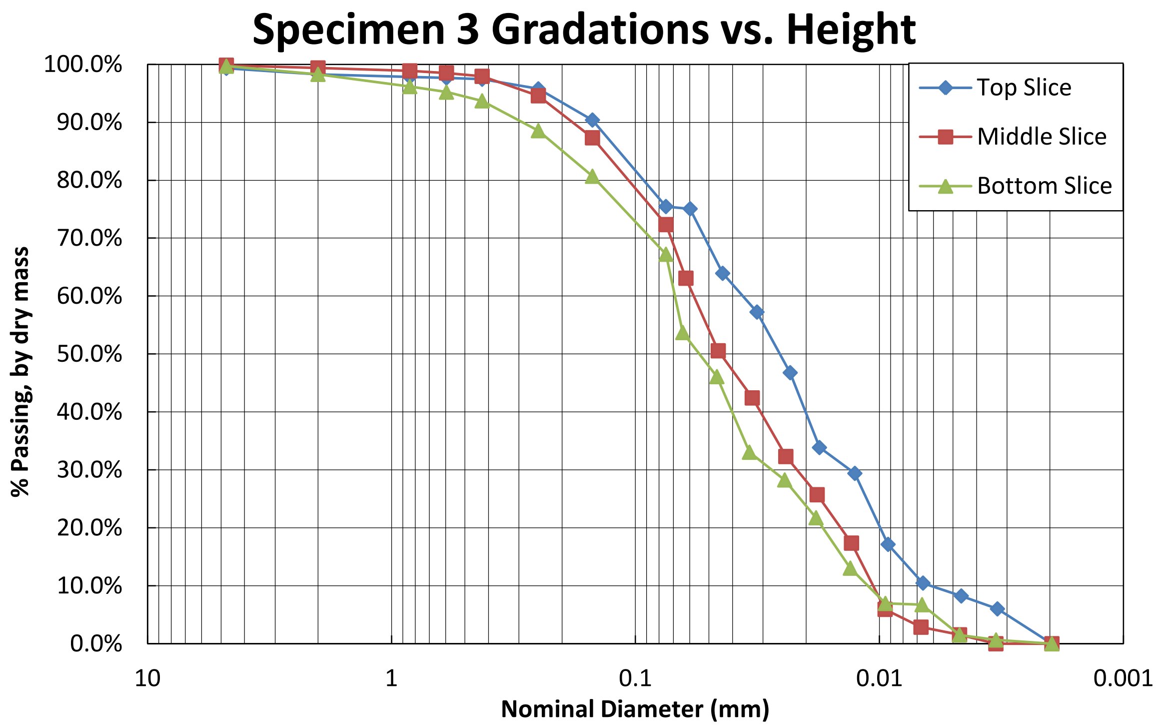

Figure 47: Plot comparing grain-size distribution across the height of specimen three.

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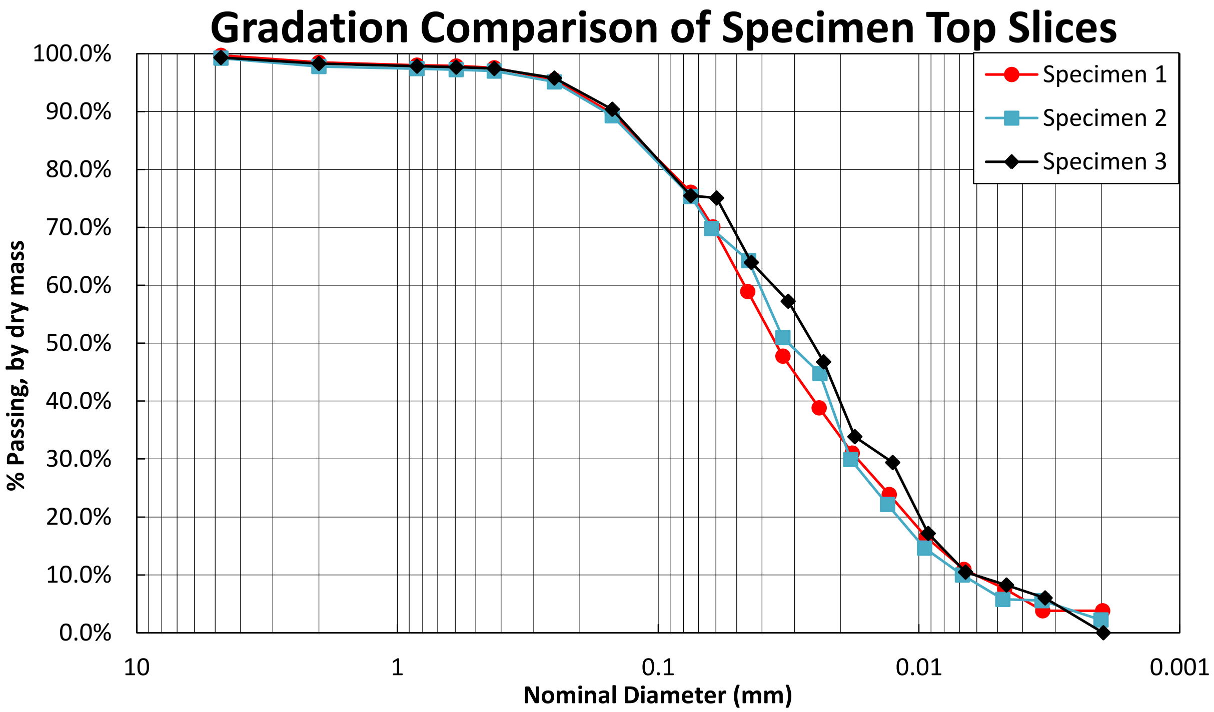

Figure 48: Plot comparing grain-size distributions of the top slices of all three specimens.

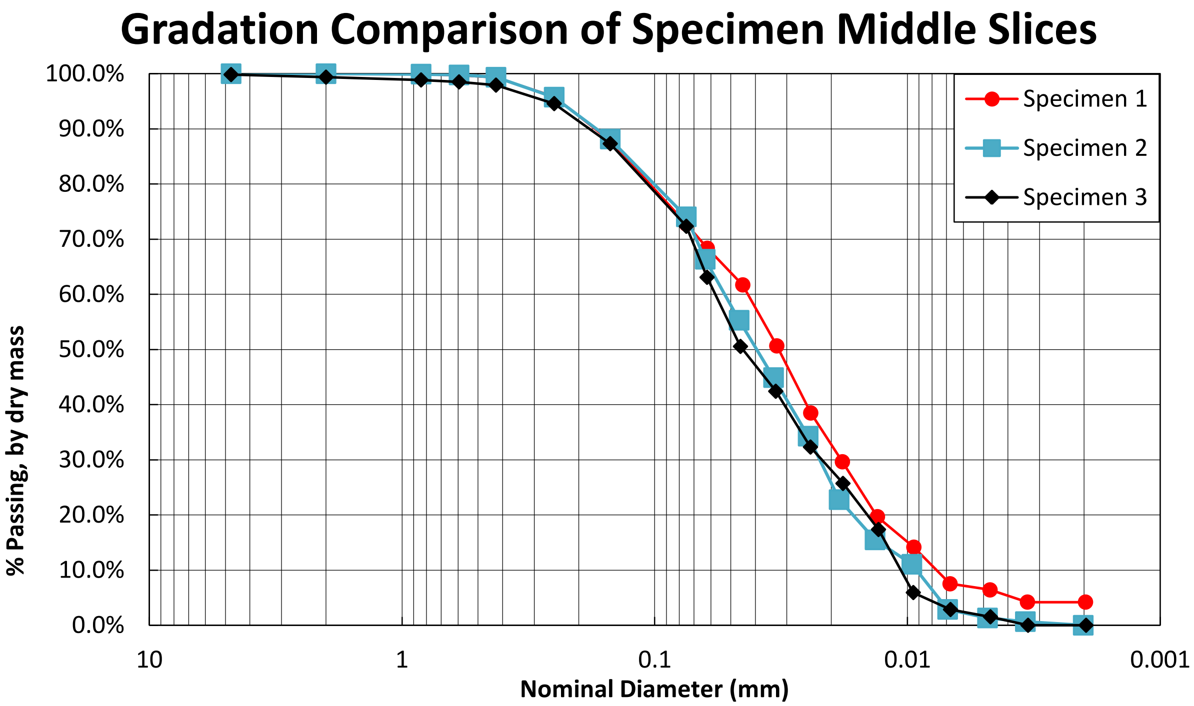

Figure 49: Plot comparing grain-size distribution of the middle slices of all three specimens.

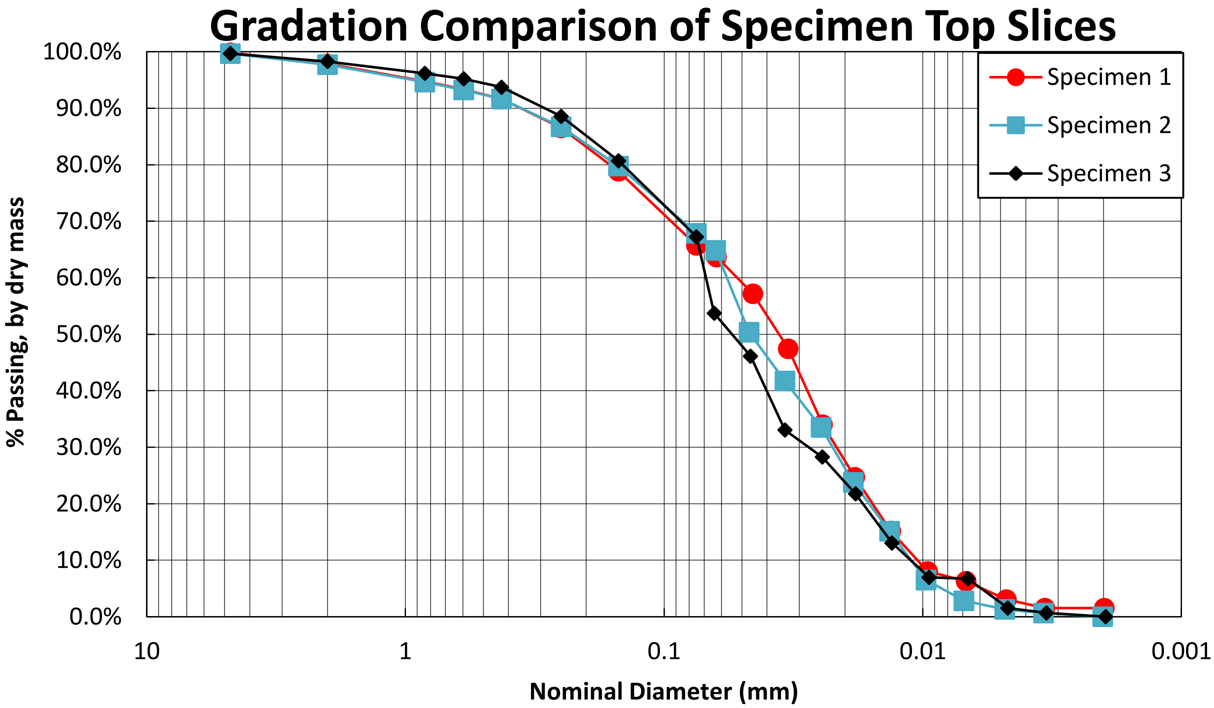

Figure 50: Plot comparing grain-size distribution for the bottom slices of all three specimens.

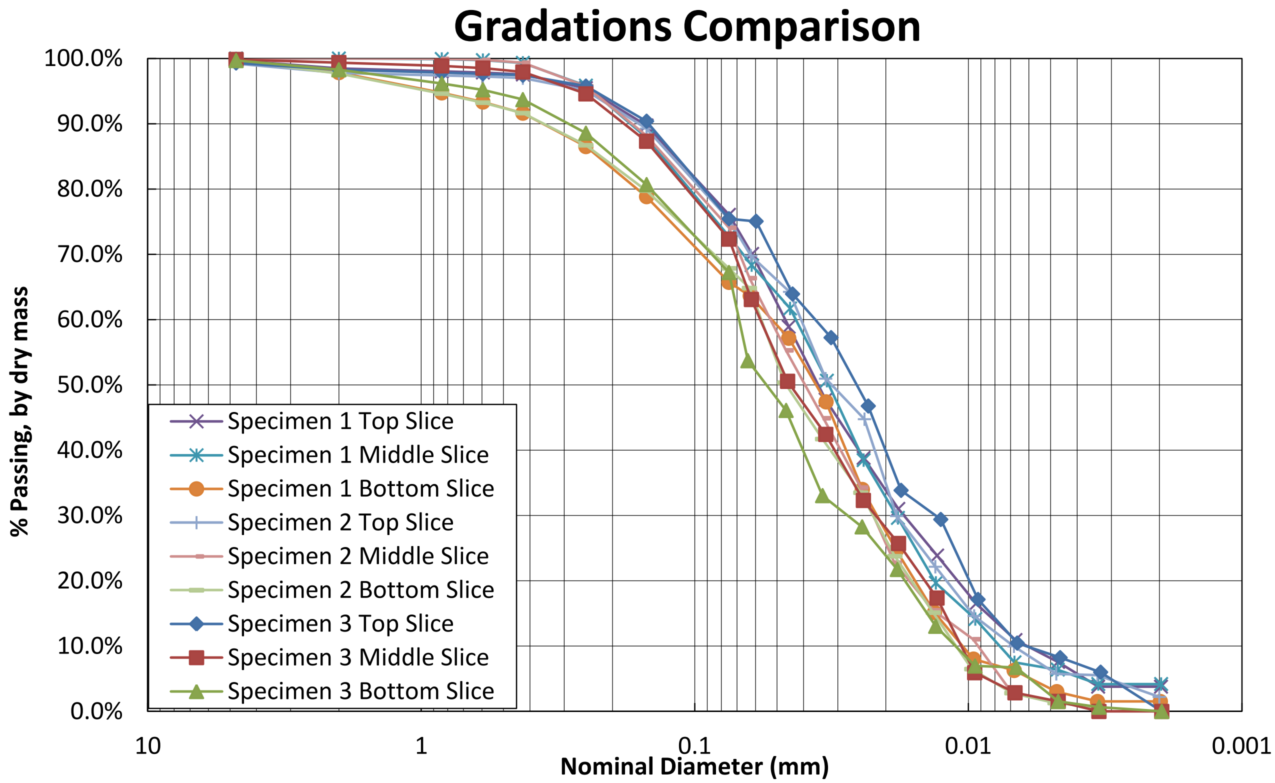

Figure 51: Comparison of all gradations for all three samples.

Examining Figure 51, it is obvious that a considerable amount of variability entered into gradation data with the portion of the graph that was determined using the hydrometer test. This may be the result of slight variations in temperature over the course of the test, regardless of the fact that the room temperature was thermostat-regulated. If temperature readings of the soil suspension had been take at each reading and used in calculating the values derived from Stokes' Law, this variability may have been reduced considerably. The maximum variability in the sieve analysis data for a given nominal diameter was about 10% by mass, while the maximum variability in the hydrometer analysis data for a given nominal diameter was about 25%.

Chapter 8

Conclusions

8.1 Engineering Characterization of CCRs

Geotechnical designs and analyses when working with CCRs are similar to those for natural soils in many respects. The physical and engineering properties of CCRs are what differentiate them from natural soils of similar grain size. Consequently, the single most important aspect of working with CCRs is determining their physical and engineering characteristics. As a result of current and past CCR disposal methods, determining variability in their properties across a given site is also important. As evidenced by the variability plots of the different engineering properties of CCRs, variability can vary greatly to very little within a specific site. However, since the coal source for a given site will inevitable vary, so will the engineering properties of the resulting ash. Because of the differences in properties of CCRs between given sites and from that of natural soils of similar grain size, a more thorough site investigation and laboratory testing schedule will almost always be necessary than for natural soils.

8.2 Dynamic Properties of CCRs

Being a mostly granular and non-plastic material, the characterization of the dynamic properties of CCRs is important to ensure that current and future CCR disposal areas are designed in order to withstand seismic events. Currently there is very little data on the dynamic properties of CCRs and the data that is available is usually from different countries, whose CCRs may not be similar enough in makeup to merit comparison with CCRs in the U. S.; more dynamic laboratory testing is required before such a conclusion can be made.

8.3 CCR Failure Modes and Monitoring Practices

The two main types of CCR disposal areas, surface impoundments and landfills, are very different in their construction and therefore are prone to different failure modes. As a result, monitoring practices should be tailored to the type of disposal area it applies to. Despite the fact that there is a lack of literature and precedence regarding monitoring of CCR disposal areas, their design tends to be similar enough to mine tailings dams that monitoring practices for tailings dams could easily be adapted and applied to CCR disposal areas. The flowcharts developed by Martin and Davies (2000) provide an excellent template that could be adapted to develop a site monitoring program for CCR disposal areas, especially for surface impoundments.

8.4 Slope Stability of CCRs

Slope stability analyses with CCRs are basically the same as for natural soils, except that there is usually an inherently higher degree of uncertainty in the CCR material. For that reason, analyses involving CCRs should have a degree of conservatism built into every step, unless there is evidence to indicate that such a measure is unnecessary. If the dikes containing surface impounded CCRs are built CCR materials, or other non-plastic soils that have the potential to have low hydraulic conductivity, then a sudden rise in the water table has a deleterious effect on the impoundment’s performance. For this reason, if such conditions do exist, it is good practice to install drainage (if not already installed) to ensure a steady-state water table can be maintained.

8.5 Settlement Calculations for CCRs

Many researchers report compression and recompression indices for CCR materials. However, since CCRs generally do not have clearly log-linear values of compression and recompression indices, calculating settlements using consolidation theory can yield variable settlements, depending on different individuals' interpretation of standard consolidation tests.

The two methods for settlement of foundations in sand provide very similar results, underestimating settlement considerably. This is possibly the result of scale effects and differences in the mechanics of the materials (silt-sized particles that are the result of an industrial process rather than natural sands). In order to accurately say that none of these settlement calculation methods works well in CCR surface impounded materials, however, more test fills would need to be performed and analyzed in a similar fashion.

8.6 Slurry Deposition Technique Applied to SI CCRs

While it was not verified that the slurry deposition technique can be applied to SI CCR materials, the method shows promise based on the low variability of grain-size distribution across specimen height for the three specimens tested. However, a major drawback to this method is that the original densification method suggested by Keurbis and Vaid (1988), which was for sands and silty sands, does not appear to work for SI CCR material. Furthermore, more investigations would be required to determine whether the gradation differences observed in these three samples are due to particle migration during vibratory densification or to the actual deposition technique; if it is due to the former, a different densification method may make the slurry deposition method a very attractive reconstitution technique because it is relatively easy and has excellent repeatability, as evidenced in the results presented in Chapter 7. All spreadsheets used in specimen preparation and specimen analysis are provided in the appendix.

8.7 Recommendations for Further Study

As discussed in Chapter two, since CCR materials are the result of an industrial process and not a naturally occurring soil, there is a variety of factors that can affect their engineering properties. Not being a naturally occurring soil, there is a comparatively small body of literature available that reports engineering properties of CCRs. Furthermore, these properties will not necessarily be comparable between different regions. It is therefore necessary to continue research in CCRs, especially with regards to the following:

- Effects of placement condition on the engineering properties of CCRs (i.e. surface impounded vs. moist-compacted).
- Variability in engineering properties of CCRs between disposal sites and within disposal sites (and how to best quantify variability for different properties).
- Dynamic properties of CCRs, to ensure that seismic design of CCR disposal areas is adequate and determine if some disposal areas are higher risk in the event of an earthquake.
- CPT correlations to determine engineering characteristics of CCR materials in-situ.
- The effect of time on the engineering properties of CCRs.
- Determining the most appropriate method to determine c_v of CCR materials, in order to determine if disposal loading rates may be cause for engineering concern.
- "Smarter" technologies that can be adapted to aid in monitoring CCR disposal areas that would better identify gradual changes that may not be readily apparent to daily inspectors.
- Further testing on slurry deposition reconstituted SI CCR samples to analyze soil fabric (a large enough body of tests to analyze statistically). The same method as used in this thesis could be used or methods to determine shear wave velocity across the height of the sample could be used.

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Appendix A

Sample Preparation and Fabric Analysis Spreadsheets

Sample Dimensions:

Note: Sample mold has bevelled top portion, so volume is calculated as two separate cylinders added together

H_{TC} =	0.72	inches	D_{TC} =	2.851	inches
H_{BC} =	5.465	inches	D_{BC} =	2.826	inches
T_{BS} =	0.112	inches	T_{M} =	0.012	inches
T_{TP} =	1.229	inches	T_{FP} =	0.007	inches

Where H_{TC} = height of top cylinder
H_{BC} = height of bottom cylinder
D_{TC} = diameter of top cylinder
D_{BC} = diameter of bottom cylinder
T_{M} = latex membrane thickness
T_{BS} = thickness of bottom porous stone
T_{TP} = thickness of top platen
T_{FP} = thickness of filter paper

Measurements of Sample Height (Datum: cell frame):

Reading Loc.	Bottom Platen (in)	Top of Top Platen (in)	Sample Height (in)
Front	**12.247**	4.724	6.182
Back	**12.253**	4.724	6.188
Right	**12.249**	4.724	6.184
Left	**12.251**	4.724	6.186
		AVG:	6.185

So target volume, V_{TAR}, is:

V_{TAR} = 38.13 in^3
624.9 cm^3

Minimum and maximum void ratios and specific gravity of solids are:

e_{min} = 0.65
e_{max} = 1.2
G_S = 2.22

Mixing Tube Dimensions Calculation Sheet:

D_r =	100%	
e =	0.65	
% V_T Voids =	39%	
% V_T Solids =	61%	
Mass solids =	840.72	g
$V_{S\_100\%Dr}$ =	378.70	cm^3
$V_{V\_0\%Dr}$ =	454.44	cm^3
V_{TOT} =	833.14	cm^3
V_{TUBE} =	874.80	cm^3
	53.384	in^3
D_{TUBE} =	2.5	inches
H_{TUBE_req} =	10.88	inches

Where

% V_T Voids = percent of sample volume occupied by void space

% V_T Solids = percent of sample volume occupied by solids

$V_{S\_100\%Dr}$ = Volume of solids to prepare a sample at 100% relative density

$V_{V\_0\%Dr}$ = Volume of voids at a placement relative density of 0%

V_{TOT} = Volume of soil to prepare a sample with a target relative density of 100% at an initial relative density of 0%

V_{TUBE} = Volume of specimen mixing tube

D_{TUBE} = Inner diameter of mixing tube

H_{TUBE_req} = Height of mixing tube of specified diameter

Specimen 1 Preparation Sheet:

D_{rTAR} =	70%	
M_{ash} =	764.3	g
w (%) =	29.2%	
M_{moist} =	987.9	g

Location	Target H_{TP} (in)	H_{BP} (in)	H_S (in)
Front	4.724	**12.247**	6.168
Back	4.724	**12.253**	6.174
Right	4.724	**12.249**	6.170
Left	4.724	**12.251**	6.172

Location	Initial H_{TP} (in)	Final H_{TP} (in)	H_{BP} (in)	H_{SI} (in)	H_{SF} (in)
Front	N/A	4.732	**12.247**	N/A	6.160
Back	N/A	4.7265	**12.253**	N/A	6.171
Right	N/A	4.728	**12.249**	N/A	6.166
Left	N/A	4.728	**12.251**	N/A	6.168

Fines Lost:		
Tare Name:	Cindy	
Tare:	475.0	g
Gross:	477.24	g
Net:	2.2	g
% Loss:	0.23%	

$G_{gelatin}$:		
Concentration :	0.75 % by mass	
Tare:	126.8	g
Gross:	224.5	g
Net:	97.7	g
Volume:	97.7	cm^3
$G_{gelatin}$:	1.000	

Approximate Placement D_r:		
D_{COLLAR} =	2.822	in
H_{SI_AVG} =	N/A	in
V_{CYL1} =	33.32	in^3
V_{CYL2} =	4.47	in^3
V_{CYL3} =	N/A	in^3
V_{TOT} =	N/A	in^3
V_{SOLIDS} =	N/A	in^3
V_{VOIDS} =	N/A	in^3
e =	N/A	
D_r =	N/A	

Approximate Densified D_r:		
V_{CYL2} =	4.315	in^3
V_{TOT} =	37.64	in^3
	616.74	cm^3
V_{SOLIDS} =	20.95	in^3
	343.29	cm^3
V_{VOIDS} =	16.69	in^3
	273.45	cm^3
e =	0.80	
D_r =	73.35%	

Specimen 1 Fabric Testing Sheet:

Volume Calculation Information:

D_{beaker} =	3.33162	in
$V_{1/100"}$ =	0.0872	in^3
	1.43	cm^3

Top Slice

Mass =	278.67	g
Weight =	0.614	lb
Volume =	10.46	in^3
	171.43	cm^3
Density =	0.059	lb/in^3
	1.63	g/cm^3
$Mass_{Ovendry}$ =	195.87	g
$Mass_{Ovenwash}$ =	46.9	g
$\%Pass_{\#200}$ =	76%	

		Sieve No.	Nominal diameter, mm	wt. retained (g)	% retained	% passing
Sieve Analysis		#4	4.75	0.6	0.3%	99.7%
		#10	2	2.4	1.5%	98.5%
Tare Name:	Tare 1	#20	0.841	0.9	2.0%	98.0%
Tare Mass (g):	329.2	#30	0.595	0.3	2.1%	97.9%
Tare + Dry Soil Mass (g):	525.1	#40	0.425	0.6	2.5%	97.5%
Tare + Dry Soil Mass After Washing (g):	360.3	#60	0.25	4.1	4.5%	95.5%
		#100	0.15	11.2	10.3%	89.7%
		#200	0.075	26.8	23.9%	76.1%
	Subtract this from $Mass_{Ovenwash}$ =>	Pan		1.9	100.0%	0.0%
			% lost:	0.00%		

		Elapsed time (min)	Reading	Comp. Reading	L (cm) (ASTM table 2)	P (ASTM eqn. 2)	D (mm) (ASTM eqn. 4)
Hydrometer Analysis		1	37	31.4	10.2	70%	0.0617
Time readings begin:	6/14/2012 8:23	2	32	26.4	11.0	59%	0.0453
Hydrometer Type:	152H	4	27	21.4	11.9	48%	0.0332
Composite Correction:	5.6	8	23	17.4	12.5	39%	0.0241
Dry mass of soil tested (g):	50.0	15	19.5	13.9	13.1	31%	0.0180
$M_{retained\ on\ \#10\ seive}$ (g):	1.2	30	16.3	10.7	13.6	24%	0.0130
Dry mass of soil past #10 (g):	48.8	60	13	7.4	14.2	17%	0.0094
W (dry mass of soil represented) (g):	49.6	120	10.5	4.9	14.6	11%	0.0067
Temperature (° F):	69	250	9	3.4	14.8	8%	0.0047
G_s correction factor (ASTM D 422, Table 1); Interpolated!:	1.11	500	7.3	1.7	15.1	4%	0.0034
K (ASTM eq. 4, based on temp and G_s):	0.0193	1440	7.3	1.7	15.1	4%	0.0020
% Passing #10 Sieve:	98.5%						

Middle Slice											
						Sieve No.	Nominal diameter, mm	wt. retained (g)	% retained	% passing	
Mass =	327.5	g	Sieve Analysis			#4	4.75	0	0.0%	100.0%	
Weight =	0.722	lb				#10	2	0	0.0%	100.0%	
Volume =	11.59	in^3	Tare Name:	Tare 2		#20	0.841	0.2	0.1%	99.9%	
	190.00	cm^3	Tare Mass (g):	332.6		#30	0.595	0.4	0.3%	99.7%	
Density =	0.062	lb/in^3	Tare + Dry Soil Mass (g):	570.7		#40	0.425	1	0.7%	99.3%	
	1.72	g/cm^3	Tare + Dry Soil Mass After Washing (g):	386.6		#60	0.25	8.3	4.2%	95.8%	
						#100	0.15	19	12.1%	87.9%	
$Mass_{Ovendry}$ =	238.12	g				#200	0.075	36	27.3%	72.7%	
$Mass_{Ovenwash}$ =	64.9	g		Subtract this from $Mass_{Ovenwash}$ =>		Pan		2.5	100.0%	0.0%	
$\%Pass_{\#200}$ =	73%										
							% lost:	0.00%			
						Elapsed time (min)	Reading	Comp. Reading	L (cm) (ASTM table 2)	P (ASTM eqn. 2)	D (mm) (ASTM eqn. 4)
			Hydrometer Analysis			1	36.5	30.9	10.3	68%	0.0619
			Time readings begin:	152H		2	33.5	27.9	10.8	62%	0.0448
			Hydrometer Type:	6/14/2012 10:05		4	28.5	22.9	11.6	51%	0.0329
			Composite Correction:	5.6		8	23	17.4	12.5	38%	0.0241
			Dry mass of soil tested (g):	50		15	19	13.4	13.2	30%	0.0181
			$M_{retained\ on\ \#10\ seive}$ (g):	0		30	14.5	8.9	13.9	20%	0.0131
			Dry mass of soil past #10 (g):	50		60	12	6.4	14.3	14%	0.0094
			W (dry mass of soil represented) (g):	50		120	9	3.4	14.8	8%	0.0068
			Temperature (° F):	69		250	8.5	2.9	14.9	6%	0.0047
			G_s correction factor (ASTM D 422, Table 1); Interpolated!:	1.11		500	7.5	1.9	15.1	4%	0.0033
			K (ASTM eq. 4, based on temp and G_s):	0.0193		1440	7.5	1.9	15.1	4%	0.0020
			% Passing #10 Sieve:	100.0%							

Bottom Slice											
						Sieve No.	Nominal diameter, mm	wt. retained (g)	% retained	% passing	
			Sieve Analysis			#4	4.75	0.6	0.2%	99.8%	
Mass =	428.1	g				#10	2	6.5	2.2%	97.8%	
Weight =	0.944	lb	Tare Name:	Tare 3		#20	0.841	10.2	5.3%	94.7%	
Volume =	14.65	in^3	Tare Mass (g):	333.7		#30	0.595	4.6	6.7%	93.3%	
	240.00	cm^3	Tare + Dry Soil Mass (g):	662.1		#40	0.425	5.6	8.4%	91.6%	
Density =	0.064	lb/in^3	Tare + Dry Soil Mass After Washing (g):	436.2		#60	0.25	16.8	13.5%	86.5%	
	1.78	g/cm^3				#100	0.15	25.2	21.2%	78.8%	
						#200	0.075	43.1	34.3%	65.7%	
Mass$_{Ovendry}$ =	328.44	g			Subtract this from Mass$_{Ovenwash}$ =>	Pan		4.5	35.7%	64.3%	
Mass$_{Ovenwash}$ =	113.6	g									
%Pass$_{\#200}$ =	65%						% lost:	0.30%			
						Elapsed time (min)	Reading	Comp. Reading	L (cm) (ASTM table 2)	P (ASTM eqn. 2)	D (mm) (ASTM eqn. 4)
			Hydrometer Analysis			1	35	29.4	10.6	64%	0.0627
			Time readings begin:	152H		2	32	26.4	11.0	57%	0.0453
			Hydrometer Type:	6/14/2012 11:43		4	27.5	21.9	11.8	47%	0.0331
			Composite Correction:	5.6		8	21.3	15.7	12.8	34%	0.0244
			Dry mass of soil tested (g):	50		15	17	11.4	13.5	25%	0.0183
			M$_{\text{retained on \#10 seive}}$ (g):	0.02		30	12.6	7	14.2	15%	0.0133
			Dry mass of soil past #10 (g):	49.98		60	9.3	3.7	14.8	8%	0.0096
			W (dry mass of soil represented) (g):	51.1		120	8.5	2.9	14.9	6%	0.0068
			Temperature (° F):	69		250	7	1.4	15.1	3%	0.0047
			G_s correction factor (ASTM D 422, Table 1); Interpolated!:	1.11		500	6.3	0.7	15.3	2%	0.0034
			K (ASTM eq. 4, based on temp and G_s):	0.0193		1440	6.3	0.7	15.3	2%	0.0020
			% Passing #10 Sieve:	97.8%							

Summary											
$\Sigma Mass_{Ovendry}$ =	762.43	g									
				Checks on Relative Density of Individual Slices:							
Mass =	1034.3	g									
Weight =	2.280	lb		Knowns:							
Volume =	36.70	in^3		V_{s1} =	171.43	cm^3	Slice 1:				
	601.43	cm^3		V_{s2} =	190.00	cm^3	V_{S_S1} =	87.90	cm^3	e_{S1} =	0.95
Density =	0.062	lb/in^3		V_{s3} =	240.00	cm^3	V_{G_S1} =	83.53	cm^3	D_{rS1} =	45%
	1.72	g/cm^3		m_{s1} =	278.7	g					
				m_{s2} =	327.5	g	Slice 2:				
M_{DRIED_FINES} =	2.24	g		m_{s3} =	428.1	g	V_{S_S2} =	112.71	cm^3	e_{S2} =	0.69
M_{DRY_SAMPLE} =	762.1	g		ρ_{S1} =	1.63	g/cm^3	V_{G_S2} =	77.29	cm^3	D_{rS2} =	93%
V_{SOLIDS} =	343.29	cm^3		ρ_{S2} =	1.72	g/cm^3					
	20.95	in^3		ρ_{S3} =	1.78	g/cm^3	Slice 3:				
V_{VOIDS} =	258.14	cm^3		G_s =	2.22		V_{S_S3} =	154.17	cm^3	e_{S3} =	0.56
	15.75	in^3		G_{gel} =	1.000		V_{G_S3} =	85.83	cm^3	D_{rS3} =	117%
e =	0.75									e_{avg} =	0.73
				M_{DRY_SAMPLE} =	787.6017474		V_{TOT} =	601.43	cm^3	D_{r_avg} =	85%
D_r =	81.5%										

Specimen 2 Preparation Sheet:

D_{rTAR} = 70%
M_{ash} = 764.3 g
w (%) = 29.2%
M_{moist} = 987.8 g

Location	Target H_{TP} (in)	H_{BP} (in)	H_S (in)
Front	4.724	**12.247**	6.168
Back	4.724	**12.253**	6.174
Right	4.724	**12.249**	6.170
Left	4.724	**12.251**	6.172

Location	Initial H_{TP} (in)	Final H_{TP} (in)	H_{BP} (in)	H_{SI} (in)	H_{SF} (in)
Front	4.245	4.729	**12.247**	6.648	6.163
Back	4.245	4.728	**12.253**	6.653	6.170
Right	4.245	4.731	**12.249**	6.649	6.163
Left	4.246	4.725	**12.251**	6.650	6.171

Fines Lost:

Tare Name: Cindy
Tare: 475.0 g
Gross: 476.3 g
Net: 1.3 g

% Loss: 0.13%

$G_{gelatin}$:

Concentration : 0.75 % by mass
Tare: 126.8 g
Gross: 224.8 g
Net: 98 g
Volume: 98 cm^3
$G_{gelatin}$: 1.000

Approximate Placement D_r:

D_{COLLAR} = 2.825
H_{IS_AVG} = 0.465
V_{CYL1} = 33.66 in^3
V_{CYL2} = 4.52 in^3
V_{CYL3} = 2.86 in^3
V_{TOT} = 41.04 in^3
V_{SOLIDS} = 20.97 in^3
V_{VOIDS} = 20.07 in^3

e = 0.96
D_r = 44%

Approximate Densified D_r:

V_{CYL2} = 4.36 in^3

V_{TOT} = 38.02 in^3
622.98 cm^3
V_{SOLIDS} = 20.97 in^3
343.69 cm^3
V_{VOIDS} = 17.04 in^3
279.29 cm^3

e = 0.81
D_r = 70.43%

Specimen 2 Fabric Testing Sheet:

Volume Calculation Information:

D_{beaker} =	3.33162	in
$V_{1/100"}$ =	0.087	in^3
	1.43	cm^3

Top Slice

Mass =	237	g
Weight =	0.522	lb
Volume =	9.07	in^3
	148.57	cm^3
Density =	0.058	lb/in^3
	1.60	g/cm^3
$Mass_{Ovendry}$ =	165.8	g
$Mass_{Ovenwash}$ =	41.1	g
$\%Pass_{\#200}$ =	75%	

Sieve Analysis

Tare Name: Tare 4
Tare Mass (g): 329.8
Tare + Dry Soil Mass (g): 495.6
Tare + Dry Soil Mass After Washing (g): 371.9

	Sieve No.	Nominal diameter, mm	wt. retained (g)	% retained	% passing
	#4	4.75	1.3	0.8%	99.2%
	#10	2	2.4	2.2%	97.8%
	#20	0.841	0.6	2.6%	97.4%
	#30	0.595	0.3	2.8%	97.2%
	#40	0.425	0.4	3.0%	97.0%
	#60	0.25	3.1	4.9%	95.1%
	#100	0.15	9.7	10.7%	89.3%
	#200	0.075	23.1	24.7%	75.3%
Subtract this from $Mass_{Ovenwash}$ =>	Pan		1	100.0%	0.0%
		% lost:	0.12%		

Hydrometer Analysis

Time readings begin: 6/15/2012 17:13
Hydrometer Type: 152H
Composite Correction: 5
Dry mass of soil tested (g): 50.0
$M_{retained\ on\ \#10\ seive}$ (g): 1.2
Dry mass of soil past #10 (g): 48.8
W (dry mass of soil represented) (g): 49.9
Temperature (° F): 68
G_s correction factor (ASTM D 422, Table 1); Interpolated!: 1.11
K (ASTM eq. 4, based on temp and G_s): 0.0194

% Passing #10 Sieve: 97.8%

Elapsed time (min)	Reading	Comp. Reading	L (cm) (ASTM table	P (ASTM eqn. 2)	D (mm) (ASTM eqn. 4)
1	36.5	31.5	10.3	70%	0.0624
2	34	29	10.7	64%	0.0450
4	28	23	11.7	51%	0.0332
8	25.2	20.2	12.2	45%	0.0240
15	18.5	13.5	13.3	30%	0.0183
30	15	10	13.8	22%	0.0132
60	11.6	6.6	14.4	15%	0.0095
120	9.5	4.5	14.7	10%	0.0068
250	7.6	2.6	15.0	6%	0.0048
500	7.5	2.5	15.1	6%	0.0034
1440	6	1	15.3	2%	0.0020

Middle Slice

Mass =	367.1	g
Weight =	0.809	lb
Volume =	13.25	in^3
	217.14	cm^3
Density =	0.061	lb/in^3
	1.69	g/cm^3
$Mass_{Ovendry}$ =	265.97	g
$Mass_{Ovenwash}$ =	69	g
$\%Pass_{\#200}$ =	74%	

Sieve Analysis

Tare Name: Tare 6
Tare Mass (g): 329.8
Tare + Dry Soil Mass (g): 595.8
Tare + Dry Soil Mass After Washing (g): 400.0

Sieve No.	Nominal diameter, mm	wt. retained (g)	% retained	% passing
#4	4.75	0	0.0%	100.0%
#10	2	0	0.0%	100.0%
#20	0.841	0.2	0.1%	99.9%
#30	0.595	0.4	0.2%	99.8%
#40	0.425	1.1	0.6%	99.4%
#60	0.25	9.6	4.2%	95.8%
#100	0.15	20.2	11.8%	88.2%
#200	0.075	37.5	25.9%	74.1%
Subtract this from $Mass_{Ovenwash}$ => Pan		1.7	100.0%	0.0%
	% lost:	0.00%		

Hydrometer Analysis

Time readings begin: 152H
Hydrometer Type: 6/15/2012 14:54
Composite Correction: 5
Dry mass of soil tested (g): 50
$M_{retained\ on\ \#10\ seive}$ (g): 0
Dry mass of soil past #10 (g): 50
W (dry mass of soil represented) (g): 50
Temperature (° F): 68
G_s correction factor (ASTM D 422, Table 1); Interpolated!: 1.11
K (ASTM eq. 4, based on temp and G_s): 0.0194

% Passing #10 Sieve: 100.0%

Elapsed time (min)	Reading	Comp. Reading	L (cm) (ASTM table	P (ASTM eqn. 2)	D (mm) (ASTM eqn. 4)
1	35	30	10.6	66%	0.0631
2	30	25	11.4	55%	0.0463
4	25.3	20.3	12.1	45%	0.0339
8	20.5	15.5	12.9	34%	0.0247
15	15.3	10.3	13.8	23%	0.0186
30	12	7	14.3	15%	0.0134
60	10	5	14.7	11%	0.0096
120	6.3	1.3	15.3	3%	0.0069
250	5.6	0.6	15.4	1%	0.0048
500	5.3	0.3	15.4	1%	0.0034
1440	5	0	15.5	0%	0.0020

Bottom Slice											
						Sieve No.	Nominal diameter, mm	wt. retained (g)	% retained	% passing	
Mass =	435.44	g	Sieve Analysis			#4	4.75	1.1	0.3%	99.7%	
Weight =	0.960	lb				#10	2	6.5	2.3%	97.7%	
Volume =	14.99	in^3	Tare Name:	Tare 5		#20	0.841	10.2	5.4%	94.6%	
	245.71	cm^3	Tare Mass (g):	335.8		#30	0.595	4.6	6.8%	93.2%	
Density =	0.064	lb/in^3	Tare + Dry Soil Mass (g):	666.8		#40	0.425	5.3	8.4%	91.6%	
	1.77	g/cm^3	Tare + Dry Soil Mass After Washing (g):	444.1		#60	0.25	16.3	13.3%	86.7%	
						#100	0.15	23	20.2%	79.8%	
Mass$_{Ovendry}$ =	331	g				#200	0.075	39.4	32.1%	67.9%	
Mass$_{Ovenwash}$ =	106.2	g		Subtract this from Mass$_{Ovenwash}$ =>		Pan		2.7	100.0%	0.0%	
%Pass$_{\#200}$ =	68%										
							% lost:	-0.06%			
						Elapsed time (min)	Reading	Comp. Reading	L (cm) (ASTM table	P (ASTM eqn. 2)	D (mm) (ASTM eqn. 4)
			Hydrometer Analysis			1	35	30	10.6	65%	0.0631
			Time readings begin:	152H		2	28.3	23.3	11.7	50%	0.0469
			Hydrometer Type:	6/15/2012 15:19		4	24.3	19.3	12.3	42%	0.0341
			Composite Correction:	5		8	20.5	15.5	12.9	33%	0.0247
			Dry mass of soil tested (g):	50		15	16	11	13.7	24%	0.0186
			M$_{retained\ on\ \#10\ seive}$ (g):	0		30	12	7	14.3	15%	0.0134
			Dry mass of soil past #10 (g):	50		60	8	3	15.0	6%	0.0097
			W (dry mass of soil represented) (g):	51.2		120	6.3	1.3	15.3	3%	0.0069
			Temperature (° F):	68		250	5.6	0.6	15.4	1%	0.0048
			G_s correction factor (ASTM D 422, Table 1); Interpolated!:	1.11		500	5.3	0.3	15.4	1%	0.0034
			K (ASTM eq. 4, based on temp and G_s):	0.0194		1440	5	0	15.5	0%	0.0020
			% Passing #10 Sieve:	97.7%							

Summary											
$\Sigma \text{Mass}_{\text{Ovendry}}$ =	762.77	g									
				Checks on Relative Density of Individual Slices:							
Mass =	1039.5	g									
Weight =	2.292	lb		Knowns:							
Volume =	37.31	in^3		V_{s1} =	148.57	cm^3	Slice 1:				
	611.43	cm^3		V_{s2} =	217.14	cm^3	V_{S_S1} =	72.48	cm^3	e_{S1} =	1.05
Density =	0.061	lb/in^3		V_{s3} =	245.71	cm^3	V_{G_S1} =	76.09	cm^3	D_{rS1} =	27%
	1.70	g/cm^3		m_{s1} =	237.0	g					
				m_{s2} =	367.1	g	Slice 2:				
$M_{\text{DRIED\_FINES}}$ =	1.3	g		m_{s3} =	435.4	g	V_{S_S2} =	122.88	cm^3	e_{S2} =	0.77
$M_{\text{DRY\_SAMPLE}}$ =	763.0	g		ρ_{S1} =	1.60	g/cm^3	V_{G_S2} =	94.26	cm^3	D_{rS2} =	79%
V_{SOLIDS} =	343.69	cm^3		ρ_{S2} =	1.69	g/cm^3					
	20.97	in^3		ρ_{S3} =	1.77	g/cm^3	Slice 3:				
V_{VOIDS} =	267.74	cm^3		G_s =	2.22		V_{S_S3} =	155.51	cm^3	e_{S3} =	0.58
	16.34	in^3		G_{gel} =	1.000		V_{G_S3} =	90.20	cm^3	D_{rS3} =	113%
e =	0.78									e_{avg} =	0.80
				$M_{\text{DRY\_SAMPLE}}$ =	778.9496685		V_{TOT} =	611.43	cm^3	D_{r_avg} =	73%
D_r =	76.5%										

Specimen 3 Preparation Sheet:

D_{rTAR} =	70%	
M_{ash} =	764.3	g
w (%) =	29.2%	
M_{moist} =	987.8	g

Location	Target H_{TP} (in)	H_{BP} (in)	H_S (in)
Front	4.724	**12.247**	6.168
Back	4.724	**12.253**	6.174
Right	4.724	**12.249**	6.170
Left	4.724	**12.251**	6.172

Location	Initial H_{TP} (in)	Final H_{TP} (in)	H_{BP} (in)	H_{SI} (in)	H_{SF} (in)
Front	4.447	4.735	**12.247**	6.446	6.157
Back	4.449	4.734	**12.253**	6.449	6.164
Right	4.451	4.734	**12.249**	6.443	6.160
Left	4.446	4.735	**12.251**	6.450	6.161

Fines Lost:		
Tare Name:	Cindy	
Tare:	475.0	g
Gross:	477.3	g
Net:	2.3	g
% Loss:	0.23%	

$G_{gelatin}$:		
Concentration:	0.75% by mass	
Tare:	126.8	g
Gross:	225.55	g
Net:	98.75	g
Volume:	98	cm^3
$G_{gelatin}$:	1.008	

Approximate Placement D_r:		
D_{COLLAR} =	2.825	
H_{IS_AVG} =	0.262	in
V_{CYL1} =	33.66	in^3
V_{CYL2} =	4.52	in^3
V_{CYL3} =	1.61	in^3
V_{TOT} =	39.79	in^3
V_{SOLIDS} =	20.95	in^3
V_{VOIDS} =	18.84	in^3
e =	0.90	
D_r =	55%	

Approximate Densified D_r:		
V_{CYL2} =	4.32	in^3
V_{TOT} =	37.98	in^3
	622.34	cm^3
V_{SOLIDS} =	20.95	in^3
	343.24	cm^3
V_{VOIDS} =	17.03	in^3
	279.10	cm^3
e =	0.81	
D_r =	70.34%	

Specimen 3 Fabric Testing Sheet:

Volume Calculation Information:

D_{beaker} = 3.33162 in
$V_{1/100''}$ = 0.087 in^3
1.43 cm^3

Top Slice

Mass = 257.6 g
Weight = 0.568 lb
Volume = 10.20 in^3
167.14 cm^3
Density = 0.056 lb/in^3
1.54 g/cm^3

$Mass_{Ovendry}$ = 174.8 g
$Mass_{Ovenwash}$ = 42.7 g
$\%Pass_{\#200}$ = 76%

		Sieve No.	Nominal diameter, mm	wt. retained (g)	% retained	% passing
Sieve Analysis		#4	4.75	1.2	0.7%	99.3%
		#10	2	1.8	1.7%	98.3%
Tare Name:	Tare 1	#20	0.841	0.8	2.2%	97.8%
Tare Mass (g):	329.2	#30	0.595	0.3	2.3%	97.7%
Tare + Dry Soil Mass (g):	504.0	#40	0.425	0.4	2.6%	97.4%
Tare + Dry Soil Mass After Washing (g):	374.0	#60	0.25	2.9	4.2%	95.8%
		#100	0.15	9.4	9.6%	90.4%
		#200	0.075	26.1	24.5%	75.5%
	Subtract this from $Mass_{Ovenwash}$ =>	Pan		2.6	100.0%	0.0%
			% lost:	-0.11%		

		Elapsed time (min)	Reading	Comp. Reading	L (cm) (ASTM table 2)	P (ASTM eqn. 2)	D (mm) (ASTM eqn. 4)
Hydrometer Analysis		1	39	33.7	9.9	75%	0.0597
Time readings begin:	6/16/2012 12:57	2	34	28.7	10.7	64%	0.0439
Hydrometer Type:	152H	4	31	25.7	11.2	57%	0.0317
Composite Correction:	5.3	8	26.3	21	12.0	47%	0.0232
Dry mass of soil tested (g):	50.0	15	20.5	15.2	12.9	34%	0.0176
$M_{retained\ on\ \#10\ seive}$ (g):	1.2	30	18.5	13.2	13.3	29%	0.0126
Dry mass of soil past #10 (g):	48.8	60	13	7.7	14.2	17%	0.0092
W (dry mass of soil represented) (g):	49.7	120	10	4.7	14.7	10%	0.0066
Temperature (° F):	71.6	250	9	3.7	14.8	8%	0.0046
G_s correction factor (ASTM D 422, Table 1); Interpolated!:	1.11	500	8	2.7	15.0	6%	0.0033
K (ASTM eq. 4, based on temp and G_s):	0.0190	1440	5.3	0	15.4	0%	0.0020
% Passing #10 Sieve:	98.3%						

Middle Slice											
						Sieve No.	Nominal diameter, mm	wt. retained (g)	% retained	% passing	
			Sieve Analysis			#4	4.75	0.4	0.2%	99.8%	
Mass =	349.9	g				#10	2	1.2	0.6%	99.4%	
Weight =	0.771	lb	Tare Name:	Tare 2		#20	0.841	1.3	1.1%	98.9%	
Volume =	12.64	in^3	Tare Mass (g):	332.5		#30	0.595	0.9	1.5%	98.5%	
	207.14	cm^3	Tare + Dry Soil Mass (g):	588.8		#40	0.425	1.5	2.1%	97.9%	
Density =	0.061	lb/in^3	Tare + Dry Soil Mass After Washing (g):	406.4		#60	0.25	8.6	5.4%	94.6%	
	1.69	g/cm^3				#100	0.15	18.6	12.7%	87.3%	
						#200	0.075	38.4	27.7%	72.3%	
$Mass_{Ovendry}$ =	256.3	g		Subtract this from $Mass_{Ovenwash}$ =>		Pan		2.9	100.0%	0.0%	
$Mass_{Ovenwash}$ =	71.3	g									
$\%Pass_{\#200}$ =	72%						% lost:	0.16%			
						Elapsed time (min)	Reading	Comp. Reading	L (cm) (ASTM table 2)	P (ASTM eqn. 2)	D (mm) (ASTM eqn. 4)
			Hydrometer Analysis			1	34	28.7	10.7	63%	0.0621
			Time readings begin:	152H		2	28.3	23	11.7	51%	0.0458
			Hydrometer Type:	6/16/2012 13:30		4	24.6	19.3	12.3	42%	0.0332
			Composite Correction:	5.3		8	20	14.7	13.0	32%	0.0242
			Dry mass of soil tested (g):	50		15	17	11.7	13.5	26%	0.0180
			$M_{retained\ on\ \#10\ seive}$ (g):	0		30	13.2	7.9	14.1	17%	0.0130
			Dry mass of soil past #10 (g):	50		60	8	2.7	15.0	6%	0.0095
			W (dry mass of soil represented) (g):	50.31409501		120	6.6	1.3	15.2	3%	0.0068
			Temperature (° F):	71.6		250	6	0.7	15.3	2%	0.0047
			G_s correction factor (ASTM D 422, Table 1); Interpolated!:	1.11		500	5.3	0	15.4	0%	0.0033
			K (ASTM eq. 4, based on temp and G_s):	0.0190		1440	5.3	0	15.4	0%	0.0020
			% Passing #10 Sieve:	99.4%							

Bottom Slice											
						Sieve No.	Nominal diameter, mm	wt. retained (g)	% retained	% passing	
Mass =	410.1	g	Sieve Analysis			#4	4.75	1	0.3%	99.7%	
Weight =	0.904	lb				#10	2	4.4	1.7%	98.3%	
Volume =	14.12	in^3	Tare Name:	Tare 3		#20	0.841	6.6	3.8%	96.2%	
	231.43	cm^3	Tare Mass (g):	333.6		#30	0.595	3	4.8%	95.2%	
Density =	0.064	lb/in^3	Tare + Dry Soil Mass (g):	646.3		#40	0.425	4.7	6.3%	93.7%	
	1.77	g/cm^3	Tare + Dry Soil Mass After Washing (g):	441.7		#60	0.25	16.1	11.4%	88.6%	
						#100	0.15	24.6	19.3%	80.7%	
$\text{Mass}_{\text{Ovendry}}$ =	312.7	g				#200	0.075	42.1	32.8%	67.2%	
$\text{Mass}_{\text{Ovenwash}}$ =	103.1	g		Subtract this from $\text{Mass}_{\text{Ovenwash}}$ =>		Pan		5.4	100.0%	0.0%	
%$\text{Pass}_{\#200}$ =	67%										
							% lost:	0.19%			
						Elapsed time (mi	Reading	Comp. Reading	L (cm) (ASTM table 2)	P (ASTM eqn. 2)	D (mm) (ASTM eqn. 4)
			Hydrometer Analysis			1	30	24.7	11.4	54%	0.0640
			Time readings begin:	152H		2	26.5	21.2	11.9	46%	0.0463
			Hydrometer Type:	6/16/2012 14:03		4	20.5	15.2	12.9	33%	0.0341
			Composite Correction:	5.3		8	18.3	13	13.3	28%	0.0244
			Dry mass of soil tested (g):	50		15	15.3	10	13.8	22%	0.0182
			$\text{M}_{\text{retained on \#10 seive}}$ (g):	0.02		30	11.3	6	14.4	13%	0.0132
			Dry mass of soil past #10 (g):	49.98		60	8.5	3.2	14.9	7%	0.0094
			W (dry mass of soil represented) (g):	50.9		120	8.4	3.1	14.9	7%	0.0067
			Temperature (° F):	71.6		250	6	0.7	15.3	2%	0.0047
			G_s correction factor (ASTM D 422, Table 1); Interpolated!:	1.11		500	5.6	0.3	15.4	1%	0.0033
						1440	5.3	0	15.4	0%	0.0020
			K (ASTM eq. 4, based on temp and G_s):	0.0190							
			% Passing #10 Sieve:	98.3%							

Summary											
$\Sigma \mathrm{Mass}_{Ovendry}$ =	743.8	g									
				Checks on Relative Density of Individual Slices:							
Mass =	1017.6	g									
Weight =	2.243	lb		Knowns:							
Volume =	36.96	in^3		V_{s1} =	167.14	cm^3	Slice 1:				
	605.71	cm^3		V_{s2} =	207.14	cm^3	V_{S_S1} =	73.56	cm^3	e_{S1} =	1.27
Density =	0.061	lb/in^3		V_{s3} =	231.43	cm^3	V_{G_S1} =	93.58	cm^3	D_{rS1} =	-13%
	1.68	g/cm^3		m_{s1} =	257.6	g					
				m_{s2} =	349.9	g	Slice 2:				
M_{DRIED_FINES} =	2.3	g		m_{s3} =	410.1	g	V_{S_S2} =	116.40	cm^3	e_{S2} =	0.78
M_{DRY_SAMPLE} =	762.0	g		ρ_{S1} =	1.54	g/cm^3	V_{G_S2} =	90.74	cm^3	D_{rS2} =	76%
V_{SOLIDS} =	343.24	cm^3		ρ_{S2} =	1.69	g/cm^3					
	20.95	in^3		ρ_{S3} =	1.77	g/cm^3	Slice 3:				
V_{VOIDS} =	262.48	cm^3		G_s =	2.22		V_{S_S3} =	145.92	cm^3	e_{S3} =	0.59
	16.02	in^3		G_{gel} =	1.008		V_{G_S3} =	85.51	cm^3	D_{rS3} =	112%
e =	0.76									e_{avg} =	0.88
				M_{DRY_SAMPLE} =	745.65		V_{TOT} =	605.71	cm^3	D_{r_avg} =	58%
D_r =	79.1%										

Note: Top Slice not cured; bottom two slices were

APPENDIX D

Dallman Boring Log and Cross Section

psi Information To Build On
Engineering • Consulting • Testing

August 30, 2010

City Water, Light & Power
Environmental Health & Safety
201 East Lake Shore Drive
Springfield, Illinois 62712

Attn: Ms. Sue Corcoran
Tel: 217-757-8610
Fax: 217-757-8615

Re: Piezometer Installation
CWLP Ash Ponds
East Lake Shore Drive
Springfield, Illinois
PSI Report No. 0020522-1 Rev. 1 Page 1 of 22 (including attachments)

Dear Ms. Corcoran:

In general accordance with your instructions, Professional Service Industries, Inc. (PSI) has completed the installation of four (4) temporary piezometers at the periphery of CWLP's ash pond area in Springfield, Illinois. Additionally, certain laboratory analysis was performed, as was in situ hydraulic conductivity (slug) testing. The piezometer locations are identified on the attached location plan. Boring depths and static water levels are shown in the table below.

	AP-1	AP-2	AP-3	AP-4
Date drilled	4/21/2010	4/21/2010	4/21/2010	4/20/2010
Total boring depth (ft)	31.5	20	19.5	60
Piezometer depth from top of first casing above ground surface (ft)	33.15	19.47	19.63	58.93
Piezometer depth from ground surface (ft)	28.34	17.18	17.91	58.31
Well screen length (ft)	10	10	10	10
Static water level from ground surface (5/5/2010)	4.81	3.89	5.16	5.95

The borings were drilled to depths ranging from approximately 17.2 to 58.3 feet below the existing ground surface, respectively. It is PSI's understanding that the purpose for these soil borings is to aid CWLP in assessing the groundwater quality outside the existing CWLP ash ponds. The general boring locations were determined and located in the field by CWLP personnel. With the approval of Ms. Corcoran, AP-2 was offset to the north of the clarifier pond drainage pipe. Depths on the attached boring logs are relative to the ground surface at each boring location.

Water level observations were made during and upon completion of the boring operations and are noted on the boring logs presented herewith. In addition, static water levels were observed at the time of the slug testing. In relatively impervious soils, the accurate determination of the groundwater elevation may not be possible even after several days of observation. Seasonal variations, temperature and recent rainfall conditions may influence the levels of the groundwater table and volumes of water will depend on the permeability of the soils.

Soil samples were visually classification in the field for logging purposes. The limited laboratory testing program included grain size analysis. Where soil tests are reported, they have been performed in accordance with generally acceptable or applicable standards. Sieve analysis worksheets are appended. Soil samples were conveyed to CWLP upon completion of the well installation activities.

A copy of the boring logs are appended. The stratification of the soils on the log represents the soil conditions in the actual boring location. Lines of demarcation represent the approximate boundaries between the soil types, but the transition may be gradual.

On May 5, 2010, in situ rising head hydraulic conductivity (slug) testing was performed on each of the four piezometers. Testing was conducted by rapidly removing one bailer (1 liter) of groundwater from the well while recording the rate of recovery using a Solinst 3001 level logger. Hydraulic conductivity was estimated using the Hvorslev method. Based on this method, the average hydraulic conductivity was estimated at 2.50E-02. Slug test results and hydraulic conductivity calculations are appended.

PSI appreciates the opportunity to perform these services and if we can be of further service, please contact our office at (217) 544-6663.

Respectfully submitted,
PROFESSIONAL SERVICE INDUSTRIES, INC.

James Gerloff, E.I.
Branch Manager

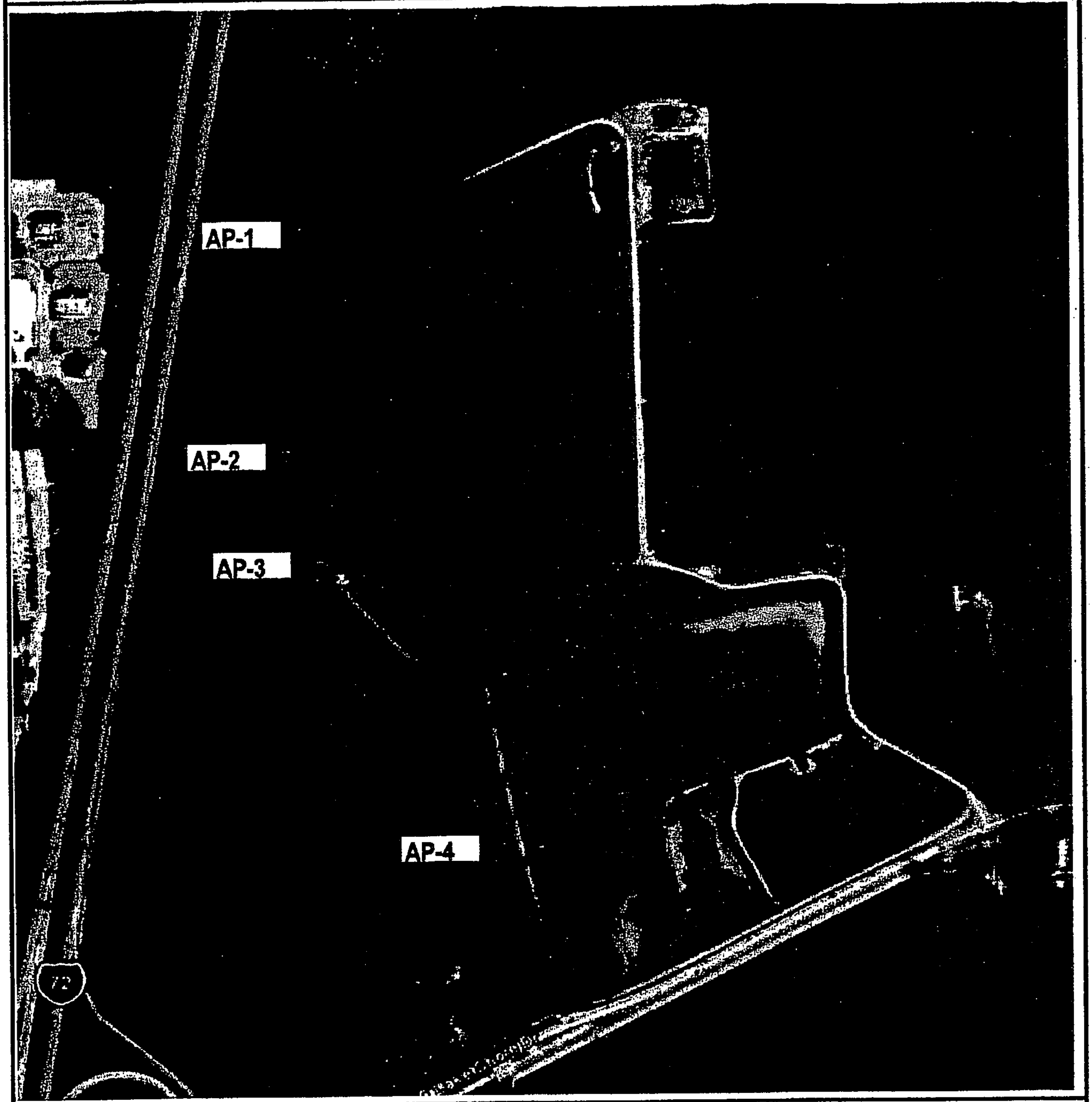
William P. Pongracz, P.E.
Vice President

Attachments:	Key to Symbols
	Boring Logs (4 pages)
	Piezometer Location Plan
	In-Situ Hydraulic Conductivity Results (6 pages)
	Sieve Analysis Worksheets (8 pages)

Distribution: (1) above

PIEZOMETER LOCATION PLAN

SOURCE:	DATE:	SCALE:	
Google © 2010 / DigitalGlobe © 2010	Nov-05	No Scale	



psi Information To Build On

Engineering • Consulting • Testing

480 North Street, Springfield, Illinois 62704
phone 217/544-6663 fax 217/544-6148

PIEZOMETER LOCATION PLAN

PSI PROJECT No.:	0020522
Project:	Piezometer Installation
Location:	CWLP Ash Pond East Lake Shore Drive Springfield, Illinois

KEY TO SYMBOLS

▩ Fill (made ground)

▨ USCS Low Plasticity Clay

▥ USCS Silt

▨ USCS Low Plasticity Sandy Clay

▨ USCS Clayey Sand

▦ USCS Well-graded Sand with Silt

░ USCS Poorly-graded Sand

▒ USCS Well-graded Sand

HSA = Hollow Stem Auger

CFA = Continuous Flight Auger

SPT = Standard Penetration Test

DCP = Dynamic Cone Penetrometer

SS = Split-spoon Sampler

ST = Shelby Tube Sampler

RC = Rock Core

DD = Dry Density

LL = Liquid Limit

PL = Plastic Limit

Qu = Unconfined Compressive Strength

Qp = Pocket Penetrometer

RQD = Rock Quality Designation

REC'D = Rock Core Recovery Percentage

PID = Photo Ionic Detector (ppm)

MR* = Unable to determine depth of water due to mud rotary drilling methods

The borings were advanced into the ground using hollow stem augers. At regular intervals throughout the boring depths, soil samples were obtained with either a 1.4-inch I.D., 2.0-inch O.D., split-spoon sampler or a 3-inch diameter Shelby tube. The split-spoon sampler was first seated 6-inches to penetrate any loose cuttings and then driven an additional foot where possible with blows of a 140 pound hammer falling 30-inches. The number of hammer blows required to drive the sampler each 6-inch increment is recorded in the field. The penetration resistance "N-value" is redesignated as the number of hammer blows required to drive the sampler the final foot and, when properly evaluated, is an index to cohesion for clays and relative density for sands. The split-spoon sampling procedures used during this exploration are in general accordance with ASTM Designation D 1586.

Relatively undisturbed Shelby tube samples were obtained by forcing a section of 3-inch diameter steel tubing into the soil at the desired sampling levels. This sampling procedure was in general accordance with ASTM Designation D 1587. Each tube, together with the encased soil, was carefully removed from the ground, sealed and transported to the laboratory for testing.

psi

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PSI Job No.: 0020522
Project: Piezometer Installation
Location: CWLP Ash Pond
East Lake Shore Drive
Springfield, Illinois

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LOG OF BORING AP-1

Sheet 1 of 1

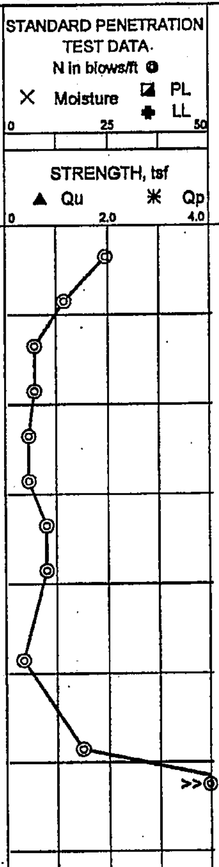
PSI Job No.: 0020522
Project: Piezometer Installation
Location: CWLP Ash Pond
East Lake Shore Drive
Springfield, Illinois

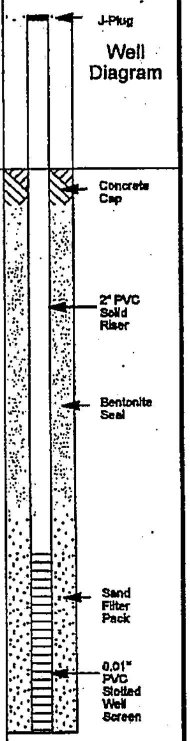
Drilling Method: Hollow Stem Auger
Sampling Method: Split Spoon
Hammer Type: CME Automatic; ETR = 86%
Boring Location: See attached boring location plan.

WATER LEVELS	
▽ While Drilling	9 feet
▼ Upon Completion	N/A
▽ Delay	N/A

Station: N/A
Offset: N/A

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
		▨	☒	1	18	Dark brown silty CLAY, very stiff, slightly moist	CL	7-8-9 N_{60}=24		
			☒	2	18	Dark brown clayey SILT, stiff, slightly moist	ML	5-5-5 N_{60}=14		
			☒	3	18	Gray clayey SILT, trace brown, firm, moist	ML	2-2-3 N_{60}=7		
			☒	4	18 ▽			2-2-3 N_{60}=7		
			☒	5	18			1-2-2 N_{60}=6		
		▨	☒	6	18	Gray silty CLAY, few brown sand, firm, saturated	CL	1-2-2 N_{60}=6		
		▨	☒	7	18	Gray sandy CLAY, stiff, saturated	CLS	4-3-4 N_{60}=10		
			☒	8	18	Blue-gray clayey SILT, soft to very stiff, moist to saturated	ML	3-3-4 N_{60}=10		
			☒	9	18			1-2-1 N_{60}=4		
			☒	10	18	Gray SAND with SILT, medium dense/very stiff, saturated	SW-SM	6-7-6 N_{60}=19		
			☒	11	6	Gray SHALE, hard, slightly moist	CL	50/6"		
						Boring terminated ay -31.5'				





Completion Depth: 35.0 ft
Date Boring Started: 4/21/10
Date Boring Completed: 4/21/10
Logged By: Rob Preuss
Drilling Contractor: PSI, Inc.

Sample Types:

Auger Cutting	Shelby Tube
☒ Split-Spoon	Hand Auger
Rock Core	Texas Cone

Latitude:
Longitude:
Drill Rig: ATV D50
Remarks: N_{60} denotes the normalization to 60% efficiency as described in ASTM D4633. Moistures determined by visual methods

The stratification lines represent approximate boundaries. The transition may be gradual.

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LOG OF BORING AP-2

Sheet 1 of 1

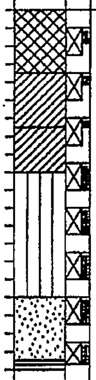
PSI Job No.: 0020522
Project: Piezometer Installation
Location: CWLP Ash Pond
East Lake Shore Drive
Springfield, Illinois

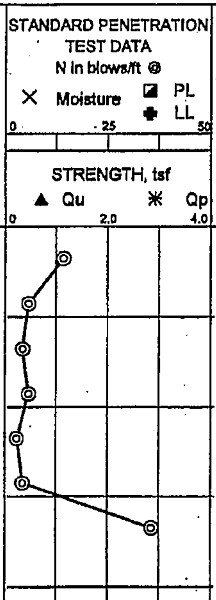
Drilling Method: Hollow Stem Auger
Sampling Method: Split Spoon
Hammer Type: CME Automatic; ETR = 86%
Boring Location: See attached boring location plan.

WATER LEVELS	
▽ While Drilling	9 feet
▼ Upon Completion	N/A
▼ Delay	N/A

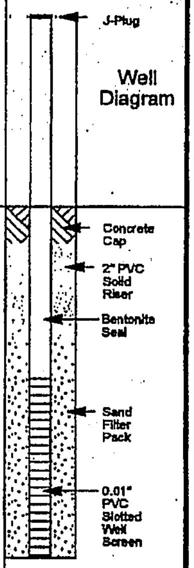
Station: N/A
Offset: N/A

Elevation (feet)	Depth, (feet)	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %
	0	☒	1	10	Dark brown silty CLAY, some sand, stiff, slightly moist (FILL)	CL	4-4-6 N_{60}=14	
	5	☒	2	8	Dark brown silty CLAY, soft to firm, moist	CL	2-2-2 N_{60}=6	
		☒	3	6	Gray silty CLAY, soft to firm, moist	CL	1-1-2 N_{60}=4	
	10	☒	4	18	Gray clayey SILT, soft to firm, saturated	ML	2-2-2 N_{60}=6	
		☒	5	18			2-1-1 N_{60}=3	
	15	☒	6	18			2-1-2 N_{60}=4	
		☒	7	18	Light gray SAND, dense, saturated	SP	4-9-16 N_{60}=36	
	20	☒	8	14	Gray SHALE, hard, slightly moist Boring terminate at -20'	CL	19-24-50/2"	





Additional Remarks



Completion Depth: 20.0 ft
Date Boring Started: 4/21/10
Date Boring Completed: 4/21/10
Logged By: Rob Preuss
Drilling Contractor: PSI, Inc.

Sample Types:
- Auger Cutting
- Split-Spoon
- Rock Core
- Shelby Tube
- Hand Auger
- Texas Cone

Latitude:
Longitude:
Drill Rig: ATV D50
Remarks: N_{60} denotes the normalization to 60% efficiency as described in ASTM D4633. Moistures determined by visual methods.

The stratification lines represent approximate boundaries. The transition may be gradual.

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LOG OF BORING AP-3

Sheet 1 of 1

PSI Job No.: 0020522
Project: Piezometer Installation
Location: CWLP Ash Pond
East Lake Shore Drive
Springfield, Illinois

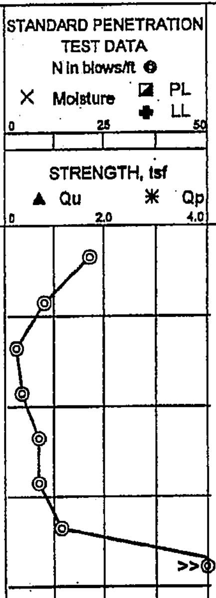
Drilling Method: Hollow Stem Auger
Sampling Method: Split Spoon
Hammer Type: CME Automatic; ETR = 86%
Boring Location: See attached boring location plan.

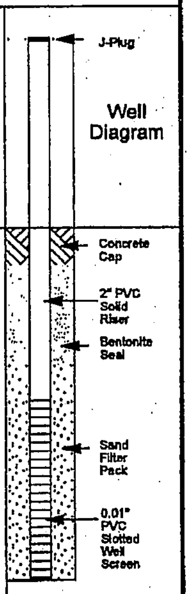
WATER LEVELS

▽ While Drilling	None feet
▼ Upon Completion	N/A
▽ Delay	N/A

Station: N/A
Offset: N/A

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0		☒	1	18	Dark brown silty CLAY, very stiff, slightly moist	CL	6-7-8 N_{60}=21		
	5		☒	2	18	Gray/brown clayey SILT, soft to stiff, moist to saturated		3-3-4 N_{60}=10		
			☒	3	18		ML	1-1-1 N_{60}=3		
	10		☒	4	18	Gray clayey SILT, soft to very stiff, saturated		2-1-2 N_{60}=4		
			☒	5	18			2-2-4 N_{60}=9		
	15		☒	6	16		ML	2-2-4 N_{60}=9		
			☒	7	18			4-4-6 N_{60}=14		
	20		☒	8	10	Gray SHALE, hard, slightly moist Boring terminated at -19.5	CL	32-50/3"		





Completion Depth: 20.0 ft
Date Boring Started: 4/21/10
Date Boring Completed: 4/21/10
Logged By: Rob Preuss
Drilling Contractor: PSI, Inc.

Sample Types:

Auger Cutting	Shelby Tube
☒ Split-Spoon	Hand Auger
Rock Core	Texas Cone

Latitude:
Longitude:
Drill Rig: ATV D50
Remarks: N_{60} denotes the normalization to 60% efficiency as described in ASTM D4633. Moistures determined by visual methods

The stratification lines represent approximate boundaries. The transition may be gradual.

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LOG OF BORING AP-4

Sheet 1 of 1

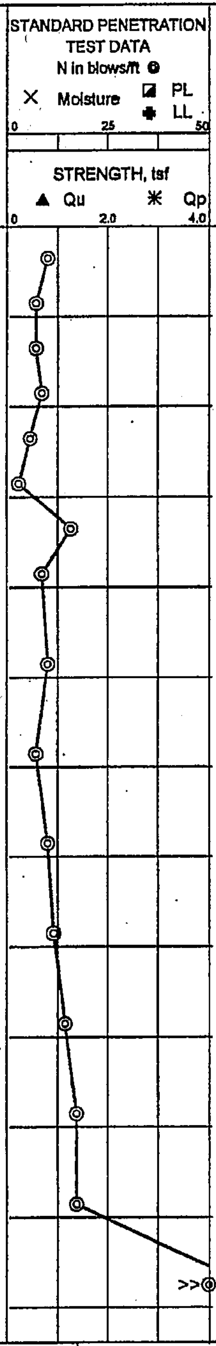
PSI Job No.: 0020522
Project: Piezometer Installation
Location: CWLP Ash Pond
East Lake Shore Drive
Springfield, Illinois

Drilling Method: Hollow Stem Auger
Sampling Method: Split Spoon
Hammer Type: CME Automatic; ETR = 86%
Boring Location: See attached boring location plan.

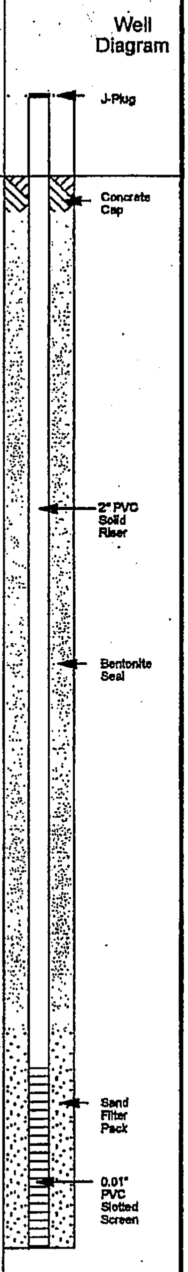
WATER LEVELS	
▽ While Drilling	11 feet
▼ Upon Completion	N/A
▽ Delay	N/A

Station: N/A
Offset: N/A

Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)
1	17	Brown silty CLAY, some brown sand, firm to stiff, slightly moist (FILL)	CL	4-4-3 N_{60}=10
2	18	Brown silty CLAY, trace roots, firm to stiff, moist (FILL)	CL	4-3-2 N_{60}=7
3	10	Brown SILT, trace gray, firm to stiff, moist (FILL)	ML	6-3-2 N_{60}=7
4	12	5" Brown SAND transitioning to Black FLY ASH at 9.4', stiff to very stiff, slightly moist (FILL)	SAND/FLY ASH	2-2-4 N_{60}=9
5	18			2-2-2 N_{60}=6
6	16			2-1-1 N_{60}=3
7	16	Black FLY ASH, some fine sub-round gravel, stiff to very stiff, moist to saturated (FILL)	FLY ASH	6-6-5 N_{60}=16
8	18	Gray/green (organic?) CLAY, stiff, trace fine sand, moist to saturated		3-3-3 N_{60}=9
9	1		CL	3-3-4 N_{60}=10
10	18	Brown/gray silty CLAY, fiorm to stiff, saturated	CL	2-2-3 N_{60}=7
11	18	Gray SILT, stiff to very stiff, saturated		3-3-4 N_{60}=10
12	18		ML	4-4-4 N_{60}=11
13	18			4-4-6 N_{60}=14
14	18	Gray fine to coarse SAND, medium dense, saturated		4-5-7 N_{60}=17
15	18		SW	5-5-7 N_{60}=17
16	1	Gray SHALE, hard, moist	CL	50/1"
		Boring terminated at -60'		



Additional Remarks



Completion Depth: 60.0 ft
Date Boring Started: 4/20/10
Date Boring Completed: 4/20/10
Logged By: Rob Preuss
Drilling Contractor: PSI, Inc.

Sample Types:
▯ Auger Cutting
☒ Split-Spoon
▯ Rock Core
■ Shelby Tube
Hand Auger
Texas Cone

Latitude:
Longitude:
Drill Rig: ATV D50
Remarks: N_{60} denotes the normalization to 60% efficiency as described in ASTM D4633. Moistures determined by visual methods.

The stratification lines represent approximate boundaries. The transition may be gradual.

In-Situ Hydraulic Conductivity Test Analysis
Utlizing the Hvorslev Slug Test Method[1]

GOVERNING EQUATION:

$$K = (r^2 * \ln(L_e/R))/(2L_eT_o)$$

K is the hydraulic conductivity (cm/sec)
r is the radius of the well casing (cm)
R is the radius of the borehole (cm)
L_e is the length of the well screen (cm)
T_o is the time it takes for the water level to rise or fall 37% of the initial change (sec)

CWLP Ash Ponds, East Lake Shore Drive, Springfield, Illinois In-Situ Hydraulic Conductivity Analysis[2]

Test Number	Test Type	L_e (ft)	L_e (cm)	T_o (min)	T_o (sec)	K (cm/sec)
AP-4	Rising Head	10.0	304.8	0.025	1.500	7.64E-02
AP-3	Rising Head	10.0	304.8	0.083	4.980	2.30E-02
AP-2.1	Rising Head	10.0	304.8	0.150	9.000	1.27E-02
AP-2.2	Rising Head	10.0	304.8	0.167	10.020	1.14E-02
AP-1	Rising Head	10.0	304.8	1.667	100.020	1.15E-03
					AVERAGE:	**2.50E-02**

CONSTANTS

r (inch)	r (cm)	R (inch)	R (cm)
2.0	5.08	8.0	20.3

HVORSLEV CALCULATIONS

Test	L_e/R (-)	$\ln(L_e/R)$ (-)	L_eT_o (cm*sec)	K (cm/sec)		
AP-4	15.00	2.71	4.57E+02	**7.64E-02**		
AP-3	15.00	2.71	1.52E+03	**2.30E-02**		
AP-2.1	15.00	2.71	2.74E+03	1.27E-02		
AP-2.2	15.00	2.71	3.05E+03	1.14E-02	AP-2 AVG:	**1.21E-02**
AP-1	15.00	2.71	3.05E+04	**1.15E-03**		

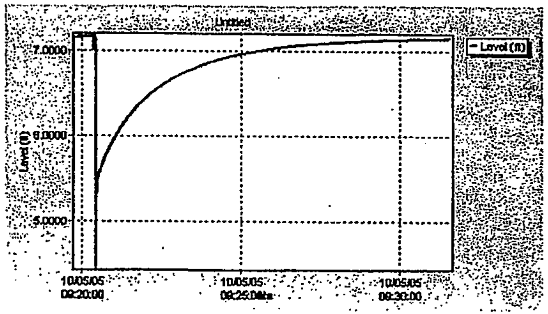
Notes:

[1] Hvorslev slug test method applied as described by C.W. Fetter in Applied Hydrology (Third Edition) published by Prentice-Hall in New Jersey in 1994 on pages 247-251.

[2] In-situ hydraulic conductivity tests conducted on monitoring wells, MW-1 thru MW-4 on May 5, 2010.

Solinst	3001		
Report generated:	5/11/2010		
Report from file:	..\mw-4.csv		
Serial number:	1032398		
Unit name:	Solinst 3001		
Test name:	AP-1	Test 1	
Test defined on:	5/5/2010		
Test started on:	5/5/2010		9:20:28
Test stopped on:	5/5/2010		9:21:41
Data gathered using Linear testing			
Time between data points:	1		Seconds
Number of data samples:	75		
TOTAL DATA SAMPLES	75		
Channel number [1]			
Measurement type:	Level		
Unit	feet		
Channel number [2]			
Measurement type:	Temperature		
Unit	Deg C		
Sensor Range:			
Specific gravity:			
Mode:	TOC		
User-defined reference*:	33.15		Feet H2O
Referenced on:	test start		
Pressure head at reference:			Feet H2O

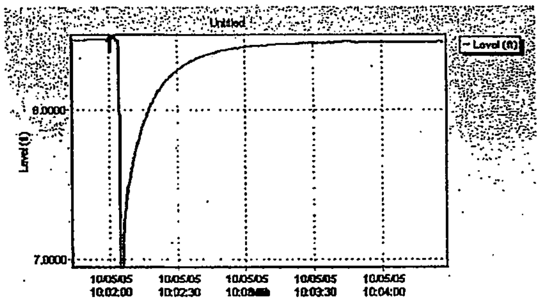
*Well depth to top of first casing terminating above ground. Does not include above ground extensions.



	Date	Time	ET (sec)	Time (min)	Test Time (min)	Temperature	Level	Water Level Bottom of well to TOC* (ft)	Change of Static Water Level (ft)	h/ho	
1	5/5/2010	9:20:27	0	0.000		11.254	7.1703	25.980	0		TEST START
2	5/5/2010	9:20:28	1	0.017	0.000	11.252	5.298	27.852	1.8723	1	SLUG REMOVED
3	5/5/2010	9:20:29	2	0.033	0.017	11.254	5.3982	27.751	1.7711	0.945948833	
4	5/6/2010	9:20:30	3	0.050	0.033	11.254	5.4584	27.692	1.7119	0.914329808	
5	5/5/2010	9:20:31	4	0.067	0.050	11.257	5.4885	27.662	1.6818	0.898253485	
6	6/5/2010	9:20:32	5	0.083	0.067	11.255	5.519	27.631	1.6513	0.881963361	
7	6/5/2010	9:20:33	6	0.100	0.083	11.258	5.5421	27.608	1.6282	0.869626504	
8	5/5/2010	9:20:34	7	0.117	0.100	11.257	5.5658	27.584	1.6045	0.856967366	
9	5/5/2010	9:20:35	8	0.133	0.117	11.258	5.5919	27.558	1.5784	0.843027293	
10	5/5/2010	9:20:36	9	0.150	0.133	11.257	5.6074	27.543	1.5629	0.834748705	
11	5/5/2010	9:20:37	10	0.167	0.150	11.257	5.6237	27.526	1.5466	0.826042836	
12	5/6/2010	9:20:38	11	0.183	0.167	11.258	5.6423	27.508	1.528	0.81610853	
13	5/5/2010	9:20:39	12	0.200	0.183	11.259	5.6595	27.491	1.5108	0.806921968	
14	5/5/2010	9:20:40	13	0.217	0.200	11.258	5.676	27.474	1.4943	0.798109277	
15	5/5/2010	9:20:41	14	0.233	0.217	11.259	5.6922	27.458	1.4781	0.789456818	
16	5/5/2010	9:20:42	15	0.250	0.233	11.261	5.7084	27.442	1.4619	0.780804358	
17	5/5/2010	9:20:43	16	0.267	0.250	11.259	5.7226	27.427	1.4477	0.773220104	
18	5/5/2010	9:20:44	17	0.283	0.267	11.259	5.7383	27.412	1.432	0.764834695	
19	5/5/2010	9:20:45	18	0.300	0.283	11.26	5.7519	27.398	1.4184	0.757570902	
20	5/5/2010	9:20:46	19	0.317	0.300	11.259	5.766	27.384	1.4043	0.750040058	
21	5/5/2010	9:20:47	20	0.333	0.317	11.261	5.7815	27.369	1.3888	0.74176147	
22	5/5/2010	9:20:48	21	0.350	0.333	11.259	5.7955	27.355	1.3748	0.734284036	
23	5/5/2010	9:20:49	22	0.367	0.350	11.259	5.8088	27.341	1.3615	0.727180473	
24	5/5/2010	9:20:50	23	0.383	0.367	11.26	5.8224	27.328	1.3479	0.71991668	
25	5/5/2010	9:20:51	24	0.400	0.383	11.259	5.8355	27.315	1.3348	0.712919938	
26	5/5/2010	9:20:52	25	0.417	0.400	11.26	5.8489	27.301	1.3214	0.705762965	
27	5/5/2010	9:20:53	26	0.433	0.417	11.261	5.8621	27.288	1.3082	0.698712813	
28	5/5/2010	9:20:54	27	0.450	0.433	11.26	5.875	27.275	1.2953	0.691822892	
29	5/5/2010	9:20:55	28	0.467	0.450	11.261	5.8867	27.263	1.2836	0.685573893	
30	5/6/2010	9:20:56	29	0.483	0.467	11.26	5.8996	27.250	1.2707	0.678683972	
31	5/5/2010	9:20:57	30	0.500	0.150	11.259	5.9124	27.238	1.2579	0.67184746	
32	5/5/2010	9:20:58	31	0.517	0.500	11.259	5.9236	27.226	1.2467	0.665865513	
33	5/5/2010	9:20:59	32	0.533	0.517	11.259	5.9351	27.215	1.2352	0.659723335	
34	5/5/2010	9:21:00	33	0.550	0.533	11.26	5.9479	27.202	1.2224	0.652886824	
35	5/5/2010	9:21:01	34	0.567	0.550	11.259	5.9589	27.191	1.2114	0.647011697	
36	5/5/2010	9:21:02	35	0.583	0.567	11.258	5.9699	27.180	1.2004	0.64113657	
37	5/5/2010	9:21:03	36	0.600	0.583	11.259	5.9803	27.170	1.19	0.635581905	
38	6/6/2010	9:21:04	37	0.617	0.600	11.258	5.9928	27.157	1.1775	0.628905624	
39	5/5/2010	9:21:05	38	0.633	0.617	11.26	6.0028	27.147	1.1675	0.62356546	
40	5/5/2010	9:21:06	39	0.650	0.633	11.258	6.0142	27.136	1.1561	0.617475832	
41	5/5/2010	9:21:07	40	0.667	0.650	11.257	6.025	27.125	1.1453	0.611707526	
42	5/5/2010	9:21:08	41	0.683	0.667	11.259	6.0346	27.115	1.1357	0.606580142	
43	5/5/2010	9:21:09	42	0.700	0.683	11.258	6.0448	27.105	1.1255	0.601132297	
44	5/5/2010	9:21:10	43	0.717	0.700	11.259	6.0554	27.095	1.1149	0.595470811	
45	5/6/2010	9:21:11	44	0.733	0.717	11.258	6.0658	27.084	1.1045	0.589916146	
46	5/5/2010	9:21:12	45	0.750	0.733	11.259	6.0765	27.074	1.0938	0.58420125	
47	5/5/2010	9:21:13	46	0.767	0.750	11.257	6.0864	27.064	1.0839	0.578913636	
48	5/5/2010	9:21:14	47	0.783	0.767	11.257	6.096	27.054	1.0743	0.573786252	
49	5/5/2010	9:21:15	48	0.800	0.783	11.257	6.1055	27.045	1.0648	0.568712279	
50	5/5/2010	9:21:16	49	0.817	0.800	11.259	6.1144	27.036	1.0559	0.563958767	
51	5/5/2010	9:21:17	50	0.833	0.817	11.257	6.1235	27.027	1.0468	0.559098435	
52	5/6/2010	9:21:18	51	0.850	0.833	11.259	6.1332	27.017	1.0371	0.553917641	
53	5/5/2010	9:21:19	52	0.867	0.850	11.257	6.1423	27.008	1.028	0.549057309	
54	5/5/2010	9:21:20	53	0.883	0.867	11.256	6.1513	26.999	1.019	0.544260387	
55	5/5/2010	9:21:21	54	0.900	0.883	11.257	6.1613	26.989	1.009	0.538909363	
56	5/5/2010	9:21:22	55	0.917	0.900	11.258	6.1693	26.981	1.001	0.534636543	
57	5/5/2010	9:21:23	56	0.933	0.917	11.257	6.1786	26.971	0.9917	0.529669391	
58	5/5/2010	9:21:24	57	0.950	0.933	11.257	6.1869	26.963	0.9834	0.52523634	
59	5/5/2010	9:21:25	58	0.967	0.950	11.257	6.196	26.954	0.9743	0.520376008	
60	5/5/2010	9:21:26	59	0.983	0.967	11.258	6.2045	26.946	0.9658	0.515836137	
61	5/5/2010	9:21:27	60	1.000	0.983	11.257	6.213	26.937	0.9573	0.511296267	
62	5/5/2010	9:21:28	61	1.017	1.000	11.256	6.2215	26.929	0.9488	0.506756396	
63	5/6/2010	9:21:29	62	1.033	1.017	11.256	6.2287	26.921	0.9416	0.502910858	
64	5/5/2010	9:21:30	63	1.050	1.033	11.255	6.2371	26.913	0.9332	0.49842438	
65	5/5/2010	9:21:31	64	1.067	1.050	11.257	6.2466	26.903	0.9237	0.493350425	
66	5/5/2010	9:21:32	65	1.083	1.067	11.257	6.2524	26.898	0.9179	0.49025263	
67	5/5/2010	9:21:33	66	1.100	1.083	11.255	6.2615	26.889	0.9088	0.485392298	
68	5/5/2010	9:21:34	67	1.117	1.100	11.256	6.268	26.882	0.9023	0.481920632	
69	5/5/2010	9:21:35	68	1.133	1.117	11.255	6.2762	26.874	0.8941	0.477540992	
70	5/5/2010	9:21:36	69	1.150	1.133	11.255	6.2835	26.867	0.8868	0.473642045	
71	6/5/2010	9:21:37	70	1.167	1.150	11.255	6.2923	26.858	0.878	0.468941943	
72	5/5/2010	9:21:38	71	1.183	1.167	11.256	6.2979	26.852	0.8724	0.465950969	
73	5/5/2010	9:21:39	72	1.200	1.183	11.256	6.3053	26.845	0.865	0.461998611	
74	5/5/2010	9:21:40	73	1.217	1.200	11.255	6.3126	26.837	0.8577	0.458099664	
75	5/5/2010	9:21:41	74	1.233	1.217	11.254	6.3208	26.829	0.8495	0.453720024	

Solinst	3001	
Report generated:	5/11/2010	
Report from file:	...\mw-3_1.csv	
Serial number:	1032308	
Unit name:	Solinst 3001	
Test name:	AP-2	Test 1
Test defined on:	5/5/2010	
Test started on:	5/5/2010	10:02:05
Test stopped on:	5/5/2010	10:02:58
Data gathered using Linear testing		
Time between data points:	1	Seconds.
Number of data samples:	55	
TOTAL DATA SAMPLES	55	
Channel number [1]		
Measurement type:	Level	
Unit	feet	
Channel number [2]		
Measurement type:	Temperature	
Unit	Deg C	
Sensor Range:		
Specific gravity:		
Mode:	TOC	
User-defined reference*:	19.47	Feet H2O
Referenced on:	test start	
Pressure head at reference:		Feet H2O

*Well depth to top of first casing terminating above ground. Does not include above ground extensions.



	Date	Time	ET (sec)	Time (min)	Test Time (min)	Temperature	Level	Water Level Bottom of well to TOC* (ft)	Change of Static Water Level (ft)	h/ho	
1	5/5/2010	10:02:04	0	0.000		11.23	8.4182	11.052	0	[illegible]	TEST START
2	5/5/2010	10:02:05	1	0.017	0.000	11.231	6.9143	12.556	1.5039	1	SLUG REMOVED
3	5/5/2010	10:02:06	2	0.033	0.017	11.231	7.2562	12.214	1.162	0.772667766	
4	5/5/2010	10:02:07	3	0.050	0.033	11.231	7.3727	12.097	1.0455	0.6951925	
5	5/5/2010	10:02:08	4	0.067	0.050	11.231	7.4828	11.987	0.9354	0.621982846	
6	5/5/2010	10:02:09	5	0.083	0.067	11.231	7.5707	11.899	0.8475	0.563534809	
7	5/5/2010	10:02:10	6	0.100	0.083	11.231	7.6472	11.823	0.771	0.512667066	
8	5/5/2010	10:02:11	7	0.117	0.100	11.231	7.715	11.755	0.7032	0.467584281	
9	5/5/2010	10:02:12	8	0.133	0.117	11.232	7.7747	11.695	0.6435	0.427887493	
10	5/5/2010	10:02:13	9	0.150	0.133	11.232	7.8285	11.642	0.5897	0.392113837	
11	5/5/2010	10:02:14	10	0.167	0.150	11.232	7.878	11.592	0.5402	0.359199415	
12	5/5/2010	10:02:15	11	0.183	0.167	11.231	7.9204	11.550	0.4978	0.331006051	
13	5/5/2010	10:02:16	12	0.200	0.183	11.232	7.9625	11.508	0.4557	0.303012168	
14	5/5/2010	10:02:17	13	0.217	0.200	11.232	8.0004	11.470	0.4178	0.277811025	
15	5/5/2010	10:02:18	14	0.233	0.217	11.232	8.0325	11.438	0.3857	0.25646852	
16	5/5/2010	10:02:19	15	0.250	0.233	11.232	8.0633	11.407	0.3549	0.235986435	
17	5/5/2010	10:02:20	16	0.267	0.250	11.231	8.0906	11.379	0.3276	0.217833633	
18	5/5/2010	10:02:21	17	0.283	0.267	11.23	8.1151	11.355	0.3031	0.201542856	
19	5/5/2010	10:02:22	18	0.300	0.283	11.23	8.1395	11.331	0.2787	0.185318173	
20	5/5/2010	10:02:23	19	0.317	0.300	11.23	8.1616	11.308	0.2568	0.170623047	
21	5/5/2010	10:02:24	20	0.333	0.317	11.23	8.1805	11.290	0.2377	0.158056722	
22	5/5/2010	10:02:25	21	0.350	0.333	11.229	8.2001	11.270	0.2181	0.14502294	
23	5/5/2010	10:02:26	22	0.367	0.350	11.229	8.2158	11.254	0.2024	0.134583416	
24	5/5/2010	10:02:27	23	0.383	0.367	11.229	8.2315	11.239	0.1867	0.124143893	
25	5/5/2010	10:02:28	24	0.400	0.383	11.229	8.2454	11.225	0.1728	0.114901257	
26	5/5/2010	10:02:29	25	0.417	0.400	11.228	8.2589	11.211	0.1593	0.105924596	
27	5/5/2010	10:02:30	26	0.433	0.417	11.228	8.2709	11.199	0.1473	0.097946342	
28	5/5/2010	10:02:31	27	0.450	0.433	11.227	8.2821	11.188	0.1361	0.090498038	
29	5/5/2010	10:02:32	28	0.467	0.450	11.228	8.2931	11.177	0.1251	0.083183722	
30	5/5/2010	10:02:33	29	0.483	0.467	11.227	8.3029	11.167	0.1153	0.076667332	
31	5/5/2010	10:02:34	30	0.500	0.150	11.226	8.3123	11.158	0.1059	0.070416916	
32	5/5/2010	10:02:35	31	0.517	0.500	11.226	8.3207	11.149	0.0975	0.064831438	
33	5/5/2010	10:02:36	32	0.533	0.517	11.225	8.3292	11.141	0.089	0.059179467	
34	5/5/2010	10:02:37	33	0.550	0.533	11.225	8.3355	11.135	0.0827	0.054990358	
35	5/5/2010	10:02:38	34	0.567	0.560	11.224	8.3418	11.128	0.0764	0.05080125	
36	5/5/2010	10:02:39	35	0.583	0.567	11.224	8.3491	11.121	0.0691	0.045947204	
37	5/5/2010	10:02:40	36	0.600	0.583	11.223	8.3548	11.115	0.0634	0.042157058	
38	5/5/2010	10:02:41	37	0.617	0.600	11.223	8.3615	11.109	0.0567	0.037701975	
39	5/5/2010	10:02:42	38	0.633	0.617	11.223	8.3654	11.105	0.0528	0.035108717	
40	5/5/2010	10:02:43	39	0.650	0.633	11.222	8.3729	11.097	0.0453	0.030121684	
41	5/5/2010	10:02:44	40	0.667	0.650	11.222	8.3761	11.094	0.0421	0.027993883	
42	5/5/2010	10:02:45	41	0.683	0.667	11.221	8.3803	11.090	0.0379	0.025201144	
43	5/5/2010	10:02:46	42	0.700	0.683	11.221	8.385	11.085	0.0332	0.022075936	
44	5/5/2010	10:02:47	43	0.717	0.700	11.22	8.3888	11.081	0.0294	0.019549172	
45	5/5/2010	10:02:48	44	0.733	0.717	11.22	8.3922	11.078	0.026	0.017288384	
46	5/5/2010	10:02:49	45	0.750	0.733	11.22	8.3959	11.074	0.0223	0.014828114	
47	5/5/2010	10:02:50	46	0.767	0.750	11.219	8.3983	11.072	0.0199	0.013232263	
48	5/5/2010	10:02:51	47	0.783	0.767	11.219	8.4029	11.067	0.0153	0.010173549	
49	5/5/2010	10:02:52	48	0.800	0.783	11.218	8.4042	11.066	0.014	0.00930913	
50	5/5/2010	10:02:53	49	0.817	0.800	11.218	8.4084	11.062	0.0098	0.006516391	
51	5/5/2010	10:02:54	50	0.833	0.817	11.218	8.4099	11.060	0.0083	0.005518984	
52	5/5/2010	10:02:55	51	0.850	0.833	11.218	8.4117	11.058	0.0065	0.004322096	
53	5/5/2010	10:02:56	52	0.867	0.850	11.218	8.4145	11.056	0.0037	0.00246027	
54	5/5/2010	10:02:57	53	0.883	0.867	11.217	8.416	11.054	0.0022	0.001462863	
55	5/5/2010	10:02:58	54	0.900	0.883	11.216	8.4182	11.052	0	0	

Solinst 3001

Report generated: 5/11/2010
Report from file: ...\mw-3_2.csv

Serial number: 1032308

Unit name: Solinst 3001

Test name: AP-2 Test 2

Test defined on: 5/5/2010
Test started on: 5/5/2010 10:08:46
Test stopped on: 5/5/2010 10:09:43

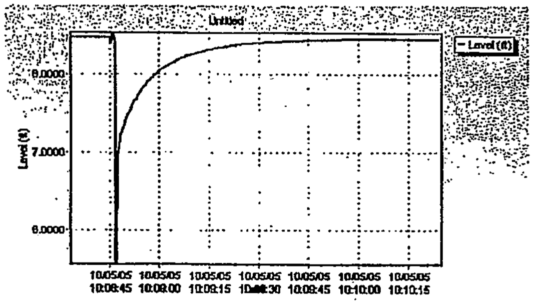
Data gathered using Linear testing
Time between data points: 1 Seconds.
Number of data samples: 57

TOTAL DATA SAMPLES 57

Channel number [1]
Measurement type: Level
Unit feet

Channel number [2]
Measurement type: Temperature
Unit Deg C
Sensor Range:
Specific gravity:
Mode: TOC
User-defined reference*: 19.47 Feet H2O
Referenced on: test start
Pressure head at reference: Feet H2O

*Well depth to top of first casing terminating above ground. Does not include above ground extensions.



	Date	Time	ET (sec)	Time (min)	Test Time (min)	Temperature	Level	Water Level Bottom of well to TOC* (ft)	Change of Static Water Level (ft)	h/ho	
1	5/5/2010	10:08:47	0	0.000		11.111	8.4246	11.045	0	[illegible]	TEST START
2	5/5/2010	10:08:48	1	0.017	0.000	11.114	6.9757	12.494	1.4489	1	SLUG REMOVED
3	5/5/2010	10:08:49	2	0.033	0.017	11.114	7.2067	12.263	1.2179	0.840588707	
4	5/5/2010	10:08:50	3	0.050	0.033	11.116	7.3467	12.123	1.0779	0.743943881	
5	5/5/2010	10:08:51	4	0.067	0.050	11.117	7.4619	12.008	0.9627	0.664435089	
6	5/5/2010	10:08:52	5	0.083	0.067	11.117	7.5593	11.911	0.8653	0.597211678	
7	5/5/2010	10:08:53	6	0.100	0.083	11.117	7.6431	11.827	0.7815	0.539374698	
8	5/5/2010	10:08:54	7	0.117	0.100	11.118	7.7197	11.750	0.7049	0.486507005	
9	5/5/2010	10:08:55	8	0.133	0.117	11.121	7.7838	11.686	0.6408	0.442266547	
10	5/5/2010	10:08:56	9	0.150	0.133	11.12	7.8425	11.628	0.5821	0.401753054	
11	5/5/2010	10:08:57	10	0.167	0.150	11.12	7.8942	11.576	0.5304	0.366070812	
12	5/5/2010	10:08:58	11	0.183	0.167	11.123	7.9419	11.528	0.4827	0.333149286	
13	5/5/2010	10:08:59	12	0.200	0.183	11.123	7.9837	11.486	0.4409	0.304298814	
14	5/5/2010	10:09:00	13	0.217	0.200	11.123	8.0214	11.449	0.4032	0.278280075	
15	5/5/2010	10:09:01	14	0.233	0.217	11.124	8.0533	11.417	0.3713	0.256263372	
16	5/5/2010	10:09:02	15	0.250	0.233	11.124	8.0854	11.385	0.3392	0.234108634	
17	5/5/2010	10:09:03	16	0.267	0.250	11.125	8.1137	11.356	0.3109	0.214576575	
18	5/5/2010	10:09:04	17	0.283	0.267	11.125	8.1388	11.333	0.2878	0.198633446	
19	5/5/2010	10:09:05	18	0.300	0.283	11.127	8.1636	11.306	0.261	0.180136656	
20	5/5/2010	10:09:06	19	0.317	0.300	11.126	8.1829	11.287	0.2417	0.166816205	
21	5/5/2010	10:09:07	20	0.333	0.317	11.127	8.2006	11.269	0.224	0.154600041	
22	5/5/2010	10:09:08	21	0.350	0.333	11.127	8.2186	11.251	0.206	0.142176824	
23	5/5/2010	10:09:09	22	0.367	0.350	11.126	8.2347	11.235	0.1899	0.131064946	
24	5/5/2010	10:09:10	23	0.383	0.367	11.127	8.2493	11.221	0.1753	0.120988336	
25	5/5/2010	10:09:11	24	0.400	0.383	11.128	8.2622	11.208	0.1624	0.112085031	
26	5/5/2010	10:09:12	25	0.417	0.400	11.128	8.275	11.195	0.1496	0.103250742	
27	5/5/2010	10:09:13	26	0.433	0.417	11.129	8.2863	11.184	0.1383	0.095451722	
28	5/5/2010	10:09:14	27	0.450	0.433	11.129	8.2973	11.173	0.1273	0.087858768	
29	5/5/2010	10:09:15	28	0.467	0.450	11.13	8.3084	11.162	0.1162	0.080198771	
30	5/5/2010	10:09:16	29	0.483	0.467	11.13	8.3152	11.155	0.1094	0.075505556	
31	5/5/2010	10:09:17	30	0.500	0.150	11.129	8.3253	11.145	0.0993	0.068534751	
32	5/5/2010	10:09:18	31	0.517	0.500	11.13	8.3319	11.138	0.0927	0.063979571	
33	5/5/2010	10:09:19	32	0.533	0.517	11.132	8.3386	11.131	0.086	0.059355373	
34	5/5/2010	10:09:20	33	0.550	0.533	11.132	8.3487	11.121	0.0759	0.052384568	
35	5/5/2010	10:09:21	34	0.567	0.550	11.131	8.3532	11.117	0.0714	0.049278763	
36	5/5/2010	10:09:22	35	0.583	0.567	11.132	8.3595	11.111	0.0651	0.044930637	
37	5/5/2010	10:09:23	36	0.600	0.583	11.132	8.3639	11.106	0.0607	0.041893851	
38	5/5/2010	10:09:24	37	0.617	0.600	11.133	8.3697	11.100	0.0549	0.037890814	
39	5/5/2010	10:09:25	38	0.633	0.617	11.133	8.3747	11.095	0.0499	0.034443882	
40	5/5/2010	10:09:26	39	0.650	0.633	11.133	8.3806	11.089	0.044	0.030367865	
41	5/5/2010	10:09:27	40	0.667	0.650	11.134	8.3842	11.086	0.0404	0.027883222	
42	5/5/2010	10:09:28	41	0.683	0.667	11.134	8.3879	11.082	0.0367	0.02532956	
43	5/5/2010	10:09:29	42	0.700	0.683	11.134	8.3903	11.080	0.0343	0.023673131	
44	5/5/2010	10:09:30	43	0.717	0.700	11.135	8.3943	11.076	0.0303	0.020912416	
45	5/5/2010	10:09:31	44	0.733	0.717	11.134	8.3975	11.073	0.0271	0.018703844	
46	5/5/2010	10:09:32	45	0.750	0.733	11.135	8.3985	11.072	0.0261	0.018013666	
47	5/5/2010	10:09:33	46	0.767	0.750	11.135	8.4027	11.067	0.0219	0.015114915	
48	5/5/2010	10:09:34	47	0.783	0.767	11.136	8.4058	11.064	0.0188	0.012975361	
49	5/5/2010	10:09:35	48	0.800	0.783	11.136	8.4085	11.062	0.0161	0.011111878	
50	5/5/2010	10:09:36	49	0.817	0.800	11.136	8.4115	11.059	0.0131	0.009041342	
51	5/5/2010	10:09:37	50	0.833	0.817	11.136	8.4124	11.058	0.0122	0.008420181	
52	5/5/2010	10:09:38	51	0.850	0.833	11.137	8.4148	11.055	0.0098	0.006763752	
53	5/5/2010	10:09:39	52	0.867	0.850	11.138	8.4159	11.054	0.0087	0.006004555	
54	5/5/2010	10:09:40	53	0.883	0.867	11.138	8.4178	11.052	0.0068	0.004693216	
55	5/5/2010	10:09:41	54	0.900	0.883	11.137	8.4188	11.051	0.0058	0.004003037	
56	5/5/2010	10:09:42	55	0.917	0.900	11.137	8.4221	11.048	0.0025	0.001725447	
57	5/5/2010	10:09:43	56	0.933	0.917	11.138	8.4239	11.046	0.0007	0.000483125	

Solinst 3001

Report generated: 5/11/2010
Report from file: ...\mw-2_1.csv

Serial number: 1032308

Unit name: Solinst 3001

Test name: AP-3 Test 1

Test defined on: 5/5/2010
Test started on: 5/5/2010 10:44:21
Test stopped on: 5/5/2010 11:45:28

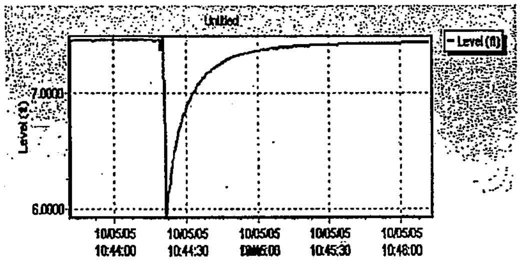
Data gathered using Linear testing
Time between data points: 1 Seconds.
Number of data samples: 69

TOTAL DATA SAMPLES 69

Channel number [1]
Measurement type: Level
Unit feet

Channel number [2]
Measurement type: Temperature
Unit Deg C
Sensor Range:
Specific gravity:
Mode: TOC
User-defined reference*: 19.83 Feet H2O
Referenced on: test start
Pressure head at reference: Feet H2O

*Well depth to top of first casing terminating above ground. Does not include above ground extensions.



	Date	Time	ET (sec)	Time (min)	Test Time (min)	Temperature	Level	Water Level Bottom of well to TOC* (ft)	Change of Static Water Level (ft)	h/ho	
1	5/5/2010	10:44:20	0	0.000		11.841	7.4264	12.204	0		TEST START
2	5/5/2010	10:44:21	1	0.017	0.000	11.841	4.946	14.684	2.4804	1	SLUG REMOVED
3	5/5/2010	10:44:22	2	0.033	0.017	11.841	6.031	13.599	1.3954	0.562570563	
4	5/5/2010	10:44:23	3	0.050	0.033	11.841	6.2314	13.399	1.195	0.481777133	
5	5/5/2010	10:44:24	4	0.067	0.050	11.839	6.374	13.256	1.0524	0.424286405	
6	5/5/2010	10:44:25	5	0.083	0.067	11.841	6.4939	13.136	0.9325	0.375947428	
7	5/5/2010	10:44:26	6	0.100	0.083	11.841	6.5956	13.034	0.8308	0.334946978	
8	5/5/2010	10:44:27	7	0.117	0.100	11.84	6.6811	12.949	0.7453	0.30047573	
9	5/5/2010	10:44:28	8	0.133	0.117	11.841	6.7553	12.875	0.6711	0.2705612	
10	5/5/2010	10:44:29	9	0.150	0.133	11.84	6.8204	12.810	0.606	0.244315433	
11	5/5/2010	10:44:30	10	0.167	0.150	11.837	6.8768	12.753	0.5496	0.221577165	
12	5/5/2010	10:44:31	11	0.183	0.167	11.839	6.9267	12.703	0.4997	0.201459442	
13	5/5/2010	10:44:32	12	0.200	0.183	11.837	6.9731	12.657	0.4533	0.182752782	
14	5/5/2010	10:44:33	13	0.217	0.200	11.837	7.0111	12.619	0.4153	0.167432672	
15	5/5/2010	10:44:34	14	0.233	0.217	11.839	7.0481	12.582	0.3783	0.152515723	
16	5/5/2010	10:44:35	15	0.250	0.233	11.836	7.0792	12.551	0.3472	0.139977423	
17	5/5/2010	10:44:36	16	0.267	0.250	11.837	7.1094	12.521	0.317	0.127801967	
18	5/5/2010	10:44:37	17	0.283	0.267	11.837	7.1355	12.495	0.2909	0.117279471	
19	5/5/2010	10:44:38	18	0.300	0.283	11.837	7.1579	12.472	0.2685	0.108248667	
20	5/5/2010	10:44:39	19	0.317	0.300	11.834	7.1803	12.450	0.2461	0.099217868	
21	5/5/2010	10:44:40	20	0.333	0.317	11.834	7.1981	12.432	0.2283	0.092041606	
22	5/5/2010	10:44:41	21	0.350	0.333	11.836	7.2175	12.413	0.2089	0.084220287	
23	5/5/2010	10:44:42	22	0.367	0.350	11.834	7.2342	12.396	0.1922	0.077487502	
24	5/5/2010	10:44:43	23	0.383	0.367	11.831	7.2477	12.382	0.1787	0.072044831	
25	5/5/2010	10:44:44	24	0.400	0.383	11.833	7.2613	12.369	0.1651	0.066561845	
26	5/5/2010	10:44:45	25	0.417	0.400	11.831	7.2733	12.357	0.1531	0.061723916	
27	5/5/2010	10:44:46	26	0.433	0.417	11.83	7.2842	12.346	0.1422	0.057329463	
28	5/5/2010	10:44:47	27	0.450	0.433	11.829	7.2947	12.335	0.1317	0.053096275	
29	5/5/2010	10:44:48	28	0.467	0.450	11.829	7.3038	12.326	0.1226	0.049427512	
30	5/5/2010	10:44:49	29	0.483	0.467	11.828	7.313	12.317	0.1134	0.045718433	
31	5/5/2010	10:44:50	30	0.500	0.150	11.83	7.3204	12.310	0.106	0.042735043	
32	5/5/2010	10:44:51	31	0.517	0.500	11.83	7.3277	12.302	0.0987	0.039791969	
33	5/5/2010	10:44:52	32	0.533	0.517	11.827	7.3358	12.294	0.0906	0.036526367	
34	5/5/2010	10:44:53	33	0.550	0.533	11.828	7.3408	12.289	0.0856	0.034510563	
35	5/5/2010	10:44:54	34	0.567	0.550	11.827	7.3465	12.284	0.0799	0.032212546	
36	5/5/2010	10:44:55	35	0.583	0.567	11.827	7.3529	12.277	0.0735	0.029632317	
37	5/5/2010	10:44:56	36	0.600	0.583	11.825	7.3567	12.273	0.0697	0.028100306	
38	5/5/2010	10:44:57	37	0.617	0.600	11.826	7.3618	12.268	0.0646	0.026044186	
39	5/5/2010	10:44:58	38	0.633	0.617	11.825	7.3666	12.263	0.0598	0.024109015	
40	5/5/2010	10:44:59	39	0.650	0.633	11.823	7.3705	12.260	0.0559	0.022536688	
41	5/5/2010	10:45:00	40	0.667	0.650	11.824	7.3748	12.255	0.0516	0.020803096	
42	5/5/2010	10:45:01	41	0.683	0.667	11.823	7.3783	12.252	0.0481	0.019392034	
43	5/5/2010	10:45:02	42	0.700	0.683	11.823	7.3814	12.249	0.045	0.018142235	
44	5/5/2010	10:45:03	43	0.717	0.700	11.821	7.3848	12.245	0.0416	0.016771488	
45	5/5/2010	10:45:04	44	0.733	0.717	11.82	7.3878	12.242	0.0386	0.015562006	
46	5/5/2010	10:45:05	45	0.750	0.733	11.82	7.3908	12.239	0.0356	0.014352524	
47	5/5/2010	10:45:06	46	0.767	0.750	11.819	7.3935	12.237	0.0328	0.013223674	
48	5/5/2010	10:45:07	47	0.783	0.767	11.818	7.3943	12.236	0.0321	0.012941461	
49	5/5/2010	10:45:08	48	0.800	0.783	11.817	7.3971	12.233	0.0293	0.011812611	
50	5/5/2010	10:45:09	49	0.817	0.800	11.816	7.3997	12.230	0.0267	0.010764393	
51	5/5/2010	10:45:10	50	0.833	0.817	11.819	7.4032	12.227	0.0232	0.00935333	
52	5/5/2010	10:45:11	51	0.850	0.833	11.815	7.4038	12.226	0.0226	0.009111434	
53	5/5/2010	10:45:12	52	0.867	0.850	11.817	7.4051	12.225	0.0213	0.008587325	
54	5/5/2010	10:45:13	53	0.883	0.867	11.816	7.4083	12.222	0.0181	0.00729721	
55	5/5/2010	10:45:14	54	0.900	0.883	11.815	7.4088	12.221	0.0178	0.007176262	
56	5/5/2010	10:45:15	55	0.917	0.900	11.813	7.411	12.219	0.0154	0.006208676	
57	5/5/2010	10:45:16	56	0.933	0.917	11.815	7.4116	12.218	0.0148	0.005966779	
58	5/5/2010	10:45:17	57	0.950	0.933	11.814	7.4149	12.216	0.0115	0.004636349	
59	5/5/2010	10:45:18	58	0.967	0.950	11.813	7.4155	12.215	0.0109	0.004394453	
60	5/5/2010	10:45:19	59	0.983	0.967	11.811	7.4162	12.214	0.0102	0.00411224	
61	5/5/2010	10:45:20	60	1.000	0.983	11.811	7.4176	12.212	0.0088	0.003547815	
62	5/5/2010	10:45:21	61	1.017	1.000	11.81	7.4187	12.211	0.0077	0.003104339	
63	5/5/2010	10:45:22	62	1.033	1.017	11.81	7.4192	12.211	0.0072	0.002902758	
64	5/5/2010	10:45:23	63	1.050	1.033	11.808	7.4215	12.209	0.0049	0.001975488	
65	5/5/2010	10:45:24	64	1.067	1.050	11.809	7.4218	12.208	0.0046	0.00185454	
66	5/5/2010	10:45:25	65	1.083	1.067	11.811	7.4231	12.207	0.0033	0.001330431	
67	5/5/2010	10:45:26	66	1.100	1.083	11.81	7.4244	12.206	0.002	0.000806322	
68	5/5/2010	10:45:27	67	1.117	1.100	11.809	7.424	12.206	0.0024	0.000967586	
69	5/5/2010	10:45:28	68	1.133	1.117	11.807	7.4257	12.204	0.0007	0.000282213	
70											
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Solinst 3001

Report generated: 5/11/2010
Report from file: ...MW-1.lev

Serial number: 1032308

Unit name: Solinst 3001

Test name: AP-4

Test defined on: 5/5/2010
Test started on: 5/5/2010 11:25:32
Test stopped on: 5/5/2010 11:25:51

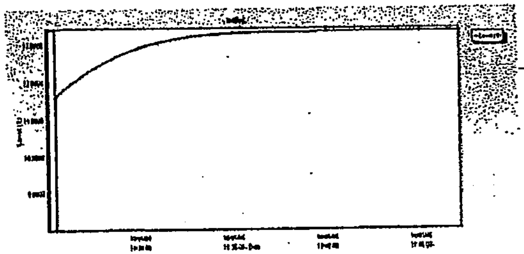
Data gathered using Linear testing
Time between data points: 0.5 Seconds
Number of data samples: 41

TOTAL DATA SAMPLES 41

Channel number [1]
Measurement type: Level
Unit feet

Channel number [2]
Measurement type: Temperature
Unit Deg C
Sensor Range:
Specific gravity:
Mode: TOC
User-defined reference*: 58.93 Feet H2O
Referenced on: test start
Pressure head at reference: Feet H2O

*Well depth to top of first casing terminating above ground. Does not include above ground extensions.



	Date	Time	ET (sec)	Time (min)	Test Time (min)	Temperature	Level	Water Level Bottom of well to TOC* (ft)	Change of Static Water Level (ft)	h/ho	
1	5/5/2010	11:25:31	0	0.000		12.799	13.4081	45.522	0	[illegible]	TEST START
2	5/5/2010	11:25:31	0	0.000	0.000	12.789	11.9721	46.958	1.436	[illegible]	SLUG REMOVED
3	5/5/2010	11:25:32	0.5	0.008	0.008	12.794	8.02638	50.904	5.38172	1	
4	5/5/2010	11:25:32	1	0.017	0.017	12.785	11.2523	47.678	2.1558	0.400578254	
5	5/5/2010	11:25:33	1.5	0.025	0.025	12.79	11.5307	47.399	1.8774	0.34884758	
6	5/5/2010	11:25:33	2	0.033	0.033	12.781	11.5481	47.382	1.86	0.346614413	
7	5/5/2010	11:25:34	2.5	0.042	0.042	12.785	11.5979	47.332	1.8102	0.339380686	
8	5/5/2010	11:25:34	3	0.050	0.050	12.776	11.5927	47.337	1.8154	0.33732711	
9	5/5/2010	11:25:35	3.5	0.058	0.058	12.78	11.6036	47.326	1.8045	0.335301725	
10	5/5/2010	11:25:35	4	0.067	0.067	12.771	11.6202	47.310	1.7879	0.332217209	
11	5/5/2010	11:25:36	4.5	0.075	0.075	12.775	11.6344	47.296	1.7737	0.329578648	
12	5/5/2010	11:25:36	5	0.083	0.083	12.766	11.6361	47.294	1.772	0.329262764	
13	5/5/2010	11:25:37	5.5	0.092	0.092	12.771	11.6445	47.286	1.7636	0.327701924	
14	5/5/2010	11:25:37	6	0.100	0.100	12.763	11.6514	47.279	1.7567	0.326419606	
15	5/5/2010	11:25:38	6.5	0.108	0.108	12.767	11.6587	47.271	1.7494	0.325063363	
16	5/5/2010	11:25:38	7	0.117	0.117	12.758	11.6626	47.267	1.7455	0.324338687	
17	5/5/2010	11:25:39	7.5	0.125	0.125	12.762	11.669	47.261	1.7391	0.323149476	
18	5/5/2010	11:25:39	8	0.133	0.133	12.752	11.6739	47.256	1.7342	0.322238987	
19	5/5/2010	11:25:40	8.5	0.142	0.142	12.758	11.6794	47.251	1.7287	0.321217009	
20	5/5/2010	11:25:40	9	0.150	0.150	12.749	11.6836	47.246	1.7245	0.320436689	
21	5/5/2010	11:25:41	9.5	0.158	0.158	12.753	11.6884	47.242	1.7197	0.319544681	
22	5/5/2010	11:25:41	10	0.167	0.167	12.743	11.6921	47.238	1.716	0.318857168	
23	5/5/2010	11:25:42	10.5	0.175	0.175	12.748	11.6959	47.233	1.7112	0.317965325	
24	5/5/2010	11:25:42	11	0.183	0.183	12.739	11.7013	47.229	1.7068	0.317147678	
25	5/5/2010	11:25:43	11.5	0.192	0.192	12.745	11.7049	47.225	1.7032	0.316478747	
26	5/5/2010	11:25:43	12	0.200	0.200	12.735	11.7092	47.221	1.6989	0.315679749	
27	5/5/2010	11:25:44	12.5	0.208	0.208	12.74	11.7131	47.217	1.695	0.31495607	
28	5/5/2010	11:25:44	13	0.217	0.217	12.731	11.7157	47.214	1.6924	0.314471963	
29	5/5/2010	11:25:45	13.5	0.225	0.225	12.735	11.7212	47.209	1.6869	0.313449975	
30	5/5/2010	11:25:45	14	0.233	0.233	12.726	11.7248	47.205	1.6833	0.312781044	
31	5/5/2010	11:25:46	14.5	0.242	0.075	12.731	11.7288	47.201	1.6793	0.312037787	
32	5/5/2010	11:25:46	15	0.250	0.250	12.722	11.7311	47.199	1.677	0.311610416	
33	5/5/2010	11:25:47	15.5	0.258	0.258	12.727	11.7354	47.195	1.6727	0.310811413	
34	5/5/2010	11:25:47	16	0.267	0.267	12.719	11.7394	47.191	1.6687	0.310068157	
35	5/5/2010	11:25:48	16.5	0.275	0.275	12.723	11.743	47.187	1.6651	0.309399226	
36	5/5/2010	11:25:48	17	0.283	0.283	12.713	11.7467	47.183	1.6614	0.308711713	
37	5/5/2010	11:25:49	17.5	0.292	0.292	12.718	11.75	47.180	1.6581	0.308098626	
38	5/5/2010	11:25:49	18	0.300	0.300	12.709	11.7529	47.177	1.6552	0.307559665	
39	5/5/2010	11:25:50	18.5	0.308	0.308	12.714	11.7568	47.173	1.6513	0.30683489	
40	5/5/2010	11:25:50	19	0.317	0.317	12.705	11.7612	47.169	1.6469	0.306017407	
41	5/5/2010	11:25:51	19.5	0.325	0.325	12.709	11.7641	47.166	1.644	0.305478546	

SIEVE ANALYSIS WORKSHEET

CLIENT: CWLP
Environmental Health & Safety

PROJECT: Piezometer Installation
CWLP Ash Ponds
Springfield, IL

DATE: April 26, 2010

PSI REPORT NO. 0020522-1 Page 1 of 8

GENERAL SAMPLE INFORMATION

SAMPLE TYPE: Clayey SILT, Some Fine to Coarse Sand	SAMPLED BY: PSI DATE SAMPLED: 4/21/2010
SAMPLE SOURCE: AP-1, 3'-7'	TESTED BY: Don Reed DATE TESTED: April 26, 2010
SPECIFICATIONS: ASTM C136	NOTES/OBSERVATIONS NP=Not Provided to PSI

SIEVE ANALYSIS DATA/RESULTS

SIEVE ANALYSIS DATA/RESULTS		TEST METHOD
Original "Wet" Sample Mass (OSM) + Pan:	996.3	ASTM C136
Pan Weight:	93.2	
Original "Wet" Sample Mass (OSM):	903.1	
Total "Dry" Sample Mass (TSM) + Pan:	820.4	
Pan Weight:	93.2	
Total "Dry" Sample Mass (TSM):	727.2	
Total "Dry" Washed Sample Mass (TWM) + Pan Wt.	182.6	
Pan Weight:	93.2	
Total "Dry" Washed Sample Mass (TWM), grams	89.4	

Sieve Size metric (English)	Individual Weight (g)	Cumulative Weight (g)	Percent Retained (%)	Percent Passing (%)	Specification
37.5 (1 1/2)	0.0	0.0	0.0	100.0	NP
25 (1)	0.0	0.0	0.0	100.0	NP
19 (3/4)	0.0	0.0	0.0	100.0	NP
16 (5/8)	0.0	0.0	0.0	100.0	NP
12.5 (1/2)	0.0	0.0	0.0	100.0	NP
9.5 (3/8)	0.0	0.0	0.0	100.0	NP
6.3 (1/4)	0.4	0.4	0.1	99.9	NP
4.75 (4)	1.2	1.6	0.2	99.8	NP
2.36 (8)	3.0	4.6	0.6	99.4	NP
1.18 (16)	2.1	6.7	0.9	99.1	NP
0.6 (30)	5.3	12.0	1.7	98.3	NP
0.425 (40)	0.0	12.0	1.7	98.3	NP
0.3 (50)	7.9	19.9	2.7	97.3	NP
0.15 (100)	27.4	47.3	6.5	93.5	NP
0.075 (200)	39.3	86.6	11.9	88.1	NP
Pan					

SIEVE ANALYSIS WORKSHEET

CLIENT: CWLP
Environmental Health & Safety

PROJECT: Piezometer Installation
CWLP Ash Ponds
Springfield, IL

DATE: April 26, 2010

PSI REPORT NO. 0020522-1 Page 2 of 8

GENERAL SAMPLE INFORMATION

SAMPLE TYPE: Clayey SILT, Some Fine to Coarse Sand	SAMPLED BY: PSI DATE SAMPLED: 4/21/2010
SAMPLE SOURCE: AP-1, 10'-15'	TESTED BY: Don Reed DATE TESTED: April 26, 2010
SPECIFICATIONS: ASTM C136	NOTES/OBSERVATIONS NP=Not Provided to PSI

SIEVE ANALYSIS DATA/RESULTS

		TEST METHOD
Original "Wet" Sample Mass (OSM) + Pan:	1030.6	ASTM C136
Pan Weight:	93.5	
Original "Wet" Sample Mass (OSM):	937.1	
Total "Dry" Sample Mass (TSM) + Pan:	814.4	
Pan Weight:	93.5	
Total "Dry" Sample Mass (TSM):	720.9	
Total "Dry" Washed Sample Mass (TWM) + Pan Wt.	247.0	
Pan Weight:	93.5	
Total "Dry" Washed Sample Mass (TWM), grams	153.5	

Sieve Size metric (English)	Individual Weight (g)	Cumulative Weight (g)	Percent Retained (%)	Percent Passing (%)	Specification
37.5 (1 1/2)	0.0	0.0	0.0	100.0	NP
25 (1)	0.0	0.0	0.0	100.0	NP
19 (3/4)	0.0	0.0	0.0	100.0	NP
16 (5/8)	0.0	0.0	0.0	100.0	NP
12.5 (1/2)	0.0	0.0	0.0	100.0	NP
9.5 (3/8)	0.9	0.9	0.1	99.9	NP
6.3 (1/4)	0.9	1.8	0.2	99.8	NP
4.75 (4)	3.1	4.9	0.7	99.3	NP
2.36 (8)	21.1	26.0	3.6	96.4	NP
1.18 (16)	40.7	66.7	9.3	90.7	NP
0.6 (30)	31.2	97.9	13.6	86.4	NP
0.425 (40)	0.0	97.9	13.6	86.4	NP
0.3 (50)	14.4	112.3	15.6	84.4	NP
0.15 (100)	14.7	127.0	17.6	82.4	NP
0.075 (200)	25.6	152.6	21.2	78.8	NP
Pan					

SIEVE ANALYSIS WORKSHEET

CLIENT:	CWLP Environmental Health & Safety	PROJECT:	Piezometer Installation CWLP Ash Ponds Springfield, IL
DATE:	April 26, 2010	PSI REPORT NO.	0020522-1 Page 3 of 8

GENERAL SAMPLE INFORMATION

SAMPLE TYPE: Clayey SILT, Some Fine to Coarse Sand	SAMPLED BY: PSI DATE SAMPLED: 4/21/2010
SAMPLE SOURCE: AP-2, 3'-7'	TESTED BY: Don Reed DATE TESTED: April 26, 2010
SPECIFICATIONS: ASTM C136	NOTES/OBSERVATIONS NP=Not Provided to PSI

SIEVE ANALYSIS DATA/RESULTS

SIEVE ANALYSIS DATA/RESULTS		TEST METHOD
Original "Wet" Sample Mass (OSM) + Pan:	1706.4	ASTM C136
Pan Weight:	90.7	
Original "Wet" Sample Mass (OSM):	1615.7	
Total "Dry" Sample Mass (TSM) + Pan:	1381.0	
Pan Weight:	90.7	
Total "Dry" Sample Mass (TSM):	1290.3	
Total "Dry" Washed Sample Mass (TWM) + Pan Wt.	420.6	
Pan Weight:	90.7	
Total "Dry" Washed Sample Mass (TWM), grams	329.9	

Sieve Size metric (English)	Individual Weight (g)	Cumulative Weight (g)	Percent Retained (%)	Percent Passing (%)	Specification
37.5 (1 1/2)	0.0	0.0	0.0	100.0	NP
25 (1)	0.0	0.0	0.0	100.0	NP
19 (3/4)	0.0	0.0	0.0	100.0	NP
16 (5/8)	0.0	0.0	0.0	100.0	NP
12.5 (1/2)	0.0	0.0	0.0	100.0	NP
9.5 (3/8)	3.5	3.5	0.3	99.7	NP
6.3 (1/4)	2.3	5.8	0.4	99.6	NP
4.75 (4)	2.7	8.5	0.7	99.3	NP
2.36 (8)	6.6	15.1	1.2	98.8	NP
1.18 (16)	7.0	22.1	1.7	98.3	NP
0.6 (30)	8.0	30.1	2.3	97.7	NP
0.425 (40)	0.0	30.1	2.3	97.7	NP
0.3 (50)	18.1	48.2	3.7	96.3	NP
0.15 (100)	119.7	167.9	13.0	87.0	NP
0.075 (200)	156.2	324.1	25.1	74.9	NP
Pan					

SIEVE ANALYSIS WORKSHEET

CLIENT:	CWLP Environmental Health & Safety	PROJECT:	Piezometer Installation CWLP Ash Ponds Springfield, IL
DATE:	April 26, 2010	PSI REPORT NO.	0020522-1 Page 4 of 8

GENERAL SAMPLE INFORMATION

SAMPLE TYPE: Clayey SILT, Some Fine to Coarse Sand	SAMPLED BY: PSI DATE SAMPLED: 4/21/2010
SAMPLE SOURCE: AP-2, 9'-16'	TESTED BY: Don Reed DATE TESTED: April 26, 2010
SPECIFICATIONS: ASTM C136	NOTES/OBSERVATIONS NP=Not Provided to PSI

SIEVE ANALYSIS DATA/RESULTS

		TEST METHOD
Original "Wet" Sample Mass (OSM) + Pan:	1461.6	ASTM C136
Pan Weight:	173.0	
Original "Wet" Sample Mass (OSM):	1288.6	
Total "Dry" Sample Mass (TSM) + Pan:	1178.1	
Pan Weight:	173.0	
Total "Dry" Sample Mass (TSM):	1005.1	
Total "Dry" Washed Sample Mass (TWM) + Pan Wt.	319.2	
Pan Weight:	173.0	
Total "Dry" Washed Sample Mass (TWM), grams	146.2	

Sieve Size metric (English)	Individual Weight (g)	Cumulative Weight (g)	Percent Retained (%)	Percent Passing (%)	Specification
37.5 (1 1/2)	0.0	0.0	0.0	100.0	NP
25 (1)	0.0	0.0	0.0	100.0	NP
19 (3/4)	0.0	0.0	0.0	100.0	NP
16 (5/8)	0.0	0.0	0.0	100.0	NP
12.5 (1/2)	0.0	0.0	0.0	100.0	NP
9.5 (3/8)	0.0	0.0	0.0	100.0	NP
6.3 (1/4)	0.8	0.8	0.1	99.9	NP
4.75 (4)	1.2	2.0	0.2	99.8	NP
2.36 (8)	1.5	3.5	0.3	99.7	NP
1.18 (16)	2.8	6.3	0.6	99.4	NP
0.6 (30)	5.7	12.0	1.2	98.8	NP
0.425 (40)	0.0	12.0	1.2	98.8	NP
0.3 (50)	7.2	19.2	1.9	98.1	NP
0.15 (100)	42.1	61.3	6.1	93.9	NP
0.075 (200)	82.8	144.1	14.3	85.7	NP
Pan					

SIEVE ANALYSIS WORKSHEET

CLIENT: CWLP
Environmental Health & Safety

PROJECT: Piezometer Installation
CWLP Ash Ponds
Springfield, IL

DATE: April 26, 2010

PSI REPORT NO. 0020522-1 Page 5 of 8

GENERAL SAMPLE INFORMATION

SAMPLE TYPE: Clayey SILT, Some Fine to Coarse Sand, Trace Subround Gravel	SAMPLED BY: PSI DATE SAMPLED: 4/21/2010
SAMPLE SOURCE: AP-3, 3'-6'	TESTED BY: Don Reed DATE TESTED: April 26, 2010
SPECIFICATIONS: ASTM C136	NOTES/OBSERVATIONS NP=Not Provided to PSI

SIEVE ANALYSIS DATA/RESULTS

Original "Wet" Sample Mass (OSM) + Pan:	816.4
Pan Weight:	94.6
Original "Wet" Sample Mass (OSM):	721.8
Total "Dry" Sample Mass (TSM) + Pan:	663.7
Pan Weight:	94.6
Total "Dry" Sample Mass (TSM):	569.1
Total "Dry" Washed Sample Mass (TWM) + Pan Wt.	195.2
Pan Weight:	94.6
Total "Dry" Washed Sample Mass (TWM), grams	100.6

TEST METHOD

ASTM C136

Sieve Size metric (English)	Individual Weight (g)	Cumulative Weight (g)	Percent Retained (%)	Percent Passing (%)	Specification
37.5 (1 1/2)	0.0	0.0	0.0	100.0	NP
25 (1)	0.0	0.0	0.0	100.0	NP
19 (3/4)	0.0	0.0	0.0	100.0	NP
16 (5/8)	0.0	0.0	0.0	100.0	NP
12.5 (1/2)	0.0	0.0	0.0	100.0	NP
9.5 (3/8)	2.5	2.5	0.4	99.6	NP
6.3 (1/4)	0.4	2.9	0.5	99.5	NP
4.75 (4)	0.4	3.3	0.6	99.4	NP
2.36 (8)	1.3	4.6	0.8	99.2	NP
1.18 (16)	3.6	8.2	1.4	98.6	NP
0.6 (30)	7.6	15.8	2.8	97.2	NP
0.425 (40)	0.0	15.8	2.8	97.2	NP
0.3 (50)	10.2	26.0	4.6	95.4	NP
0.15 (100)	31.7	57.7	10.1	89.9	NP
0.075 (200)	41.5	99.2	17.4	82.6	NP
Pan					

SIEVE ANALYSIS WORKSHEET

CLIENT:	CWLP Environmental Health & Safety	PROJECT:	Piezometer Installation CWLP Ash Ponds Springfield, IL
DATE:	April 26, 2010	PSI REPORT NO.	0020522-1 Page 6 of 8

GENERAL SAMPLE INFORMATION

SAMPLE TYPE: Clayey SILT, Some Fine to Coarse Sand	SAMPLED BY: PSI DATE SAMPLED: 4/21/2010
SAMPLE SOURCE: AP-3, 10'-15'	TESTED BY: Don Reed DATE TESTED: April 26, 2010
SPECIFICATIONS: ASTM C136	NOTES/OBSERVATIONS NP=Not Provided to PSI

SIEVE ANALYSIS DATA/RESULTS

TEST METHOD

ASTM C136

Original "Wet" Sample Mass (OSM) + Pan:	1010.5
Pan Weight:	104.2
Original "Wet" Sample Mass (OSM):	906.3
Total "Dry" Sample Mass (TSM) + Pan:	812.2
Pan Weight:	104.2
Total "Dry" Sample Mass (TSM):	708.0
Total "Dry" Washed Sample Mass (TWM) + Pan Wt.	250.7
Pan Weight:	104.2
Total "Dry" Washed Sample Mass (TWM), grams	146.5

Sieve Size metric (English)	Individual Weight (g)	Cumulative Weight (g)	Percent Retained (%)	Percent Passing (%)	Specification
37.5 (1 1/2)	0.0	0.0	0.0	100.0	NP
25 (1)	0.0	0.0	0.0	100.0	NP
19 (3/4)	0.0	0.0	0.0	100.0	NP
16 (5/8)	0.0	0.0	0.0	100.0	NP
12.5 (1/2)	0.0	0.0	0.0	100.0	NP
9.5 (3/8)	0.0	0.0	0.0	100.0	NP
6.3 (1/4)	1.8	1.8	0.3	99.7	NP
4.75 (4)	0.4	2.2	0.3	99.7	NP
2.36 (8)	3.4	5.6	0.8	99.2	NP
1.18 (16)	5.5	11.1	1.6	98.4	NP
0.6 (30)	7.4	18.5	2.6	97.4	NP
0.425 (40)	0.0	18.5	2.6	97.4	NP
0.3 (50)	16.6	35.1	5.0	95.0	NP
0.15 (100)	52.0	87.1	12.3	87.7	NP
0.075 (200)	56.8	143.9	20.3	79.7	NP
Pan					

SIEVE ANALYSIS WORKSHEET

CLIENT: CWLP
Environmental Health & Safety

PROJECT: Piezometer Installation
CWLP Ash Ponds
Springfield, IL

DATE: April 26, 2010

PSI REPORT NO. 0020522-1 Page 7 of 8

GENERAL SAMPLE INFORMATION

SAMPLE TYPE: Composite of FLY ASH and Silty CLAY, With Fine to Coarse Sand, Trace Subround gravel

SAMPLE SOURCE: AP-4, 18'-23'

SPECIFICATIONS: ASTM C136

SAMPLED BY: PSI

DATE SAMPLED: 4/20/2010

TESTED BY: Don Reed

DATE TESTED: April 26, 2010

NOTES/OBSERVATIONS

NP=Not Provided to PSI

SIEVE ANALYSIS DATA/RESULTS

TEST METHOD: ASTM C136

Original "Wet" Sample Mass (OSM) + Pan:	1931.9
Pan Weight:	147.6
Original "Wet" Sample Mass (OSM):	1784.3
Total "Dry" Sample Mass (TSM) + Pan:	1596.1
Pan Weight:	147.6
Total "Dry" Sample Mass (TSM):	1448.5
Total "Dry" Washed Sample Mass (TWM) + Pan Wt.	752.6
Pan Weight:	147.6
Total "Dry" Washed Sample Mass (TWM), grams	605.0

Sieve Size metric (English)	Individual Weight (g)	Cumulative Weight (g)	Percent Retained (%)	Percent Passing (%)	Specification
37.5 (1 1/2)	0.0	0.0	0.0	100.0	NP
25 (1)	0.0	0.0	0.0	100.0	NP
19 (3/4)	0.0	0.0	0.0	100.0	NP
16 (5/8)	8.2	8.2	5.6	94.4	NP
12.5 (1/2)	0.0	8.2	0.6	99.4	NP
9.5 (3/8)	2.5	10.7	0.7	99.3	NP
6.3 (1/4)	12.3	23.0	1.6	98.4	NP
4.75 (4)	10.8	33.8	2.3	97.7	NP
2.36 (8)	52.2	86.0	5.9	94.1	NP
1.18 (16)	144.3	230.3	15.9	84.1	NP
0.6 (30)	132.2	362.5	25.0	75.0	NP
0.425 (40)	0.0	362.5	25.0	75.0	NP
0.3 (50)	110.4	472.9	32.6	67.4	NP
0.15 (100)	75.1	548.0	37.8	62.2	NP
0.075 (200)	53.5	601.5	41.5	58.5	NP
Pan					

SIEVE ANALYSIS WORKSHEET

CLIENT:	CWLP Environmental Health & Safety	PROJECT:	Piezometer Installation CWLP Ash Ponds Springfield, IL
DATE:	April 26, 2010	PSI REPORT NO.	0020522-1 Page 8 of 8

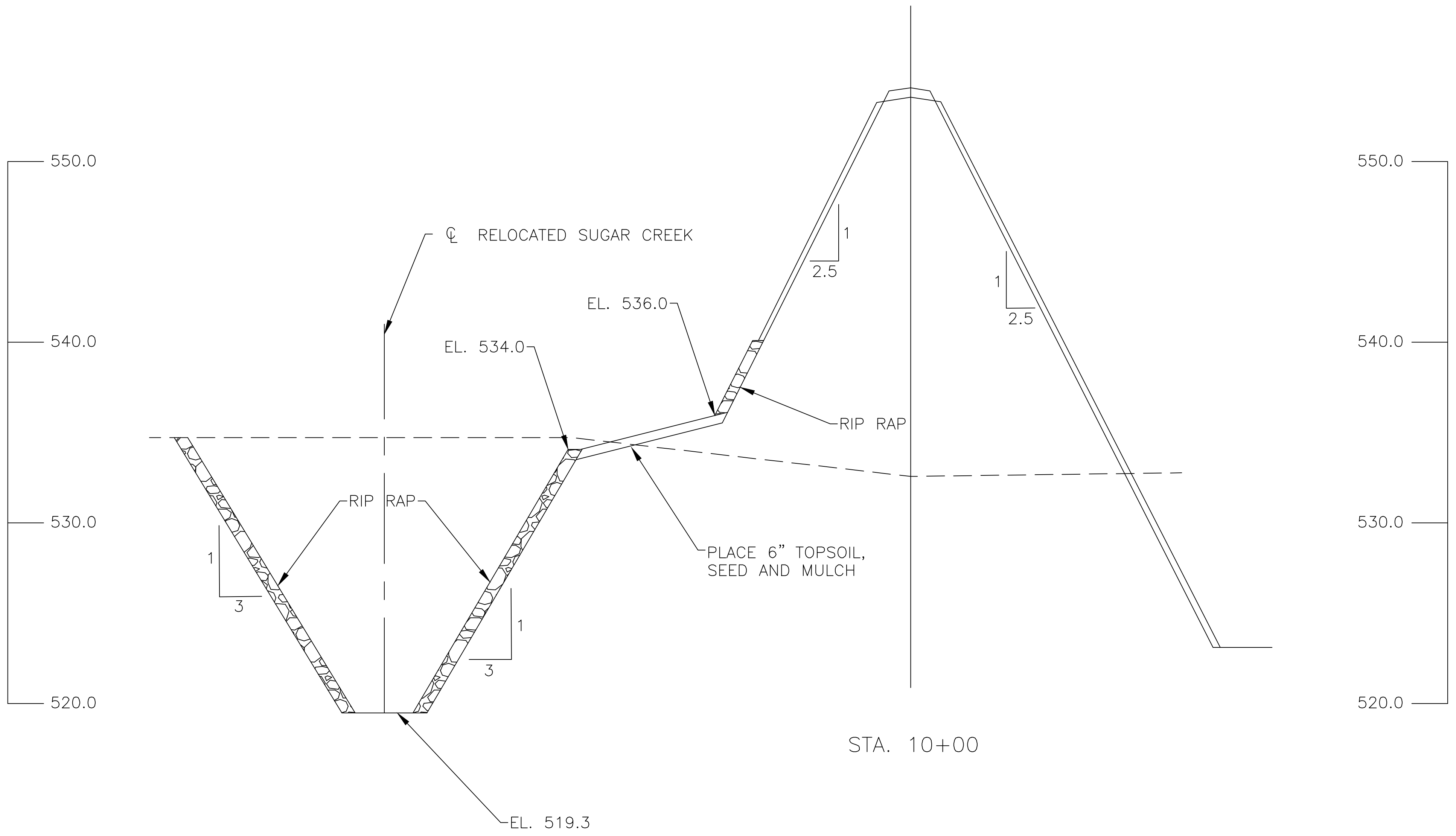
GENERAL SAMPLE INFORMATION

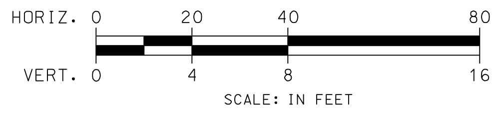
SAMPLE TYPE: Clayey SILT With Fine to Coarse Sand, Trace Subround Gravel	SAMPLED BY: PSI DATE SAMPLED: 4/20/2010
SAMPLE SOURCE: AP-4, 45'-55'	TESTED BY: Don Reed DATE TESTED: April 26, 2010
SPECIFICATIONS: ASTM C136	NOTES/OBSERVATIONS NP=Not Provided to PSI

SIEVE ANALYSIS DATA/RESULTS

		TEST METHOD
Original "Wet" Sample Mass (OSM) + Pan:	1855.4	ASTM C136
Pan Weight:	99.7	
Original "Wet" Sample Mass (OSM):	1755.7	
Total "Dry" Sample Mass (TSM) + Pan:	1509.0	
Pan Weight:	99.7	
Total "Dry" Sample Mass (TSM):	1409.3	
Total "Dry" Washed Sample Mass (TWM) + Pan Wt.	584.6	
Pan Weight:	99.7	
Total "Dry" Washed Sample Mass (TWM), grams	484.9	

Sieve Size metric (English)	Individual Weight (g)	Cumulative Weight (g)	Percent Retained (%)	Percent Passing (%)	Specification
37.5 (1 1/2)	0.0	0.0	0.0	100.0	NP
25 (1)	0.0	0.0	0.0	100.0	NP
19 (3/4)	0.0	0.0	0.0	100.0	NP
16 (5/8)	0.0	0.0	0.0	100.0	NP
12.5 (1/2)	0.0	0.0	0.0	100.0	NP
9.5 (3/8)	2.7	2.7	0.2	99.8	NP
6.3 (1/4)	6.7	9.4	0.7	99.3	NP
4.75 (4)	11.0	20.4	1.4	98.6	NP
2.36 (8)	31.4	51.8	3.7	96.3	NP
1.18 (16)	35.3	87.1	6.2	93.8	NP
0.6 (30)	55.9	143.0	10.1	89.9	NP
0.425 (40)	0.0	143.0	10.1	89.9	NP
0.3 (50)	162.8	305.8	21.7	78.3	NP
0.15 (100)	94.7	400.5	28.4	71.6	NP
0.075 (200)	82.5	483.0	34.3	65.7	NP
Pan					





NOTES:
CROSS-SECTION BASED ON CONSTRUCTION PLAN DRAWINGS
PREPARED BY BURNS & McDONNEL IN AUGUST 1976

J:\S\Springfield CWLP\CWLP\dwg\DALLMAN X-SEC.dwg Tab: Layout1 Last Saved: October 7, 2016, by Ryan Curtis Plotted: Friday, October 07, 2016 4:17:38 PM

REVISIONS		
NO.	DATE	DESCRIPTION	BY

ANDREWS
ENGINEERING, INC.
3300 GINGER CREEK DRIVE
SPRINGFIELD, ILLINOIS 62711-7233
PH (217) 787-2334 FAX (217) 787-9495
PONTIAC, IL • LOMBARD, IL • INDIANAPOLIS, IN • WARRENTON, MO
PROFESSIONAL DESIGN ENGINEERING AND LAND SURVEYING FIRM #184-001541

APPROVED BY: PMV
DESIGNED BY: PMV
DRAWN BY: RMC

DALLMAN ASH POND CROSS-SECTION AT STA. 10+00

PLANS PREPARED FOR
CITY, WATER, LIGHT & POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE:
OCTOBER 2016
PROJECT ID:
150077/0011
SHEET NUMBER:
X-SEC.

APPENDIX E

USGS Earthquake Hazards Program Probabilistic Seismic Hazard Analysis

PSH Deaggregation on NEHRP BC rock
Springfield_Cit 89.597° W, 39.762 N.

Peak Horiz. Ground Accel.>=0.09965 g

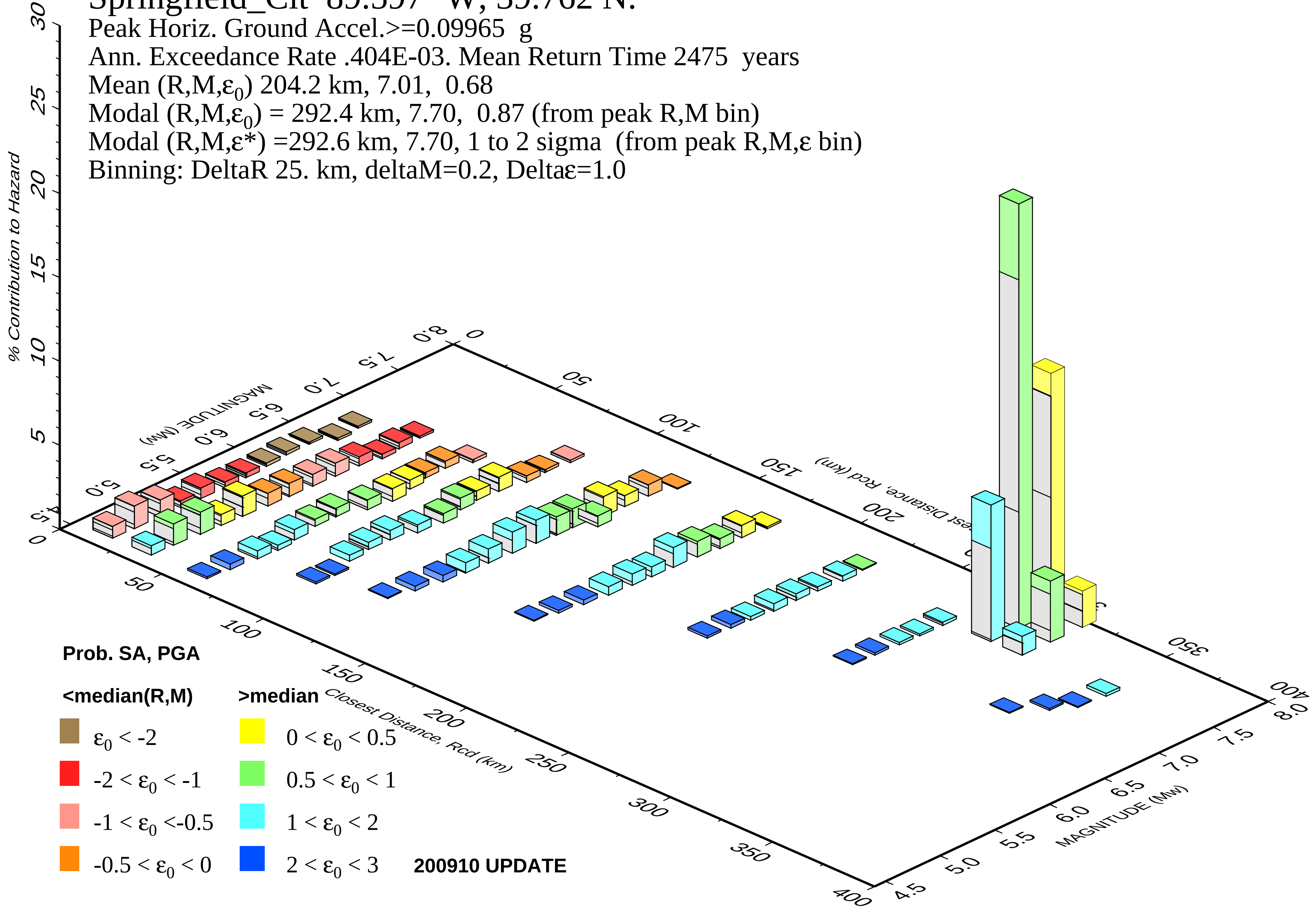
Ann. Exceedance Rate .404E-03. Mean Return Time 2475 years

Mean (R,M,ε_0) 204.2 km, 7.01, 0.68

Modal (R,M,ε_0) = 292.4 km, 7.70, 0.87 (from peak R,M bin)

Modal (R,M,ε^*) =292.6 km, 7.70, 1 to 2 sigma (from peak R,M,ε bin)

Binning: DeltaR 25. km, deltaM=0.2, Deltaε=1.0



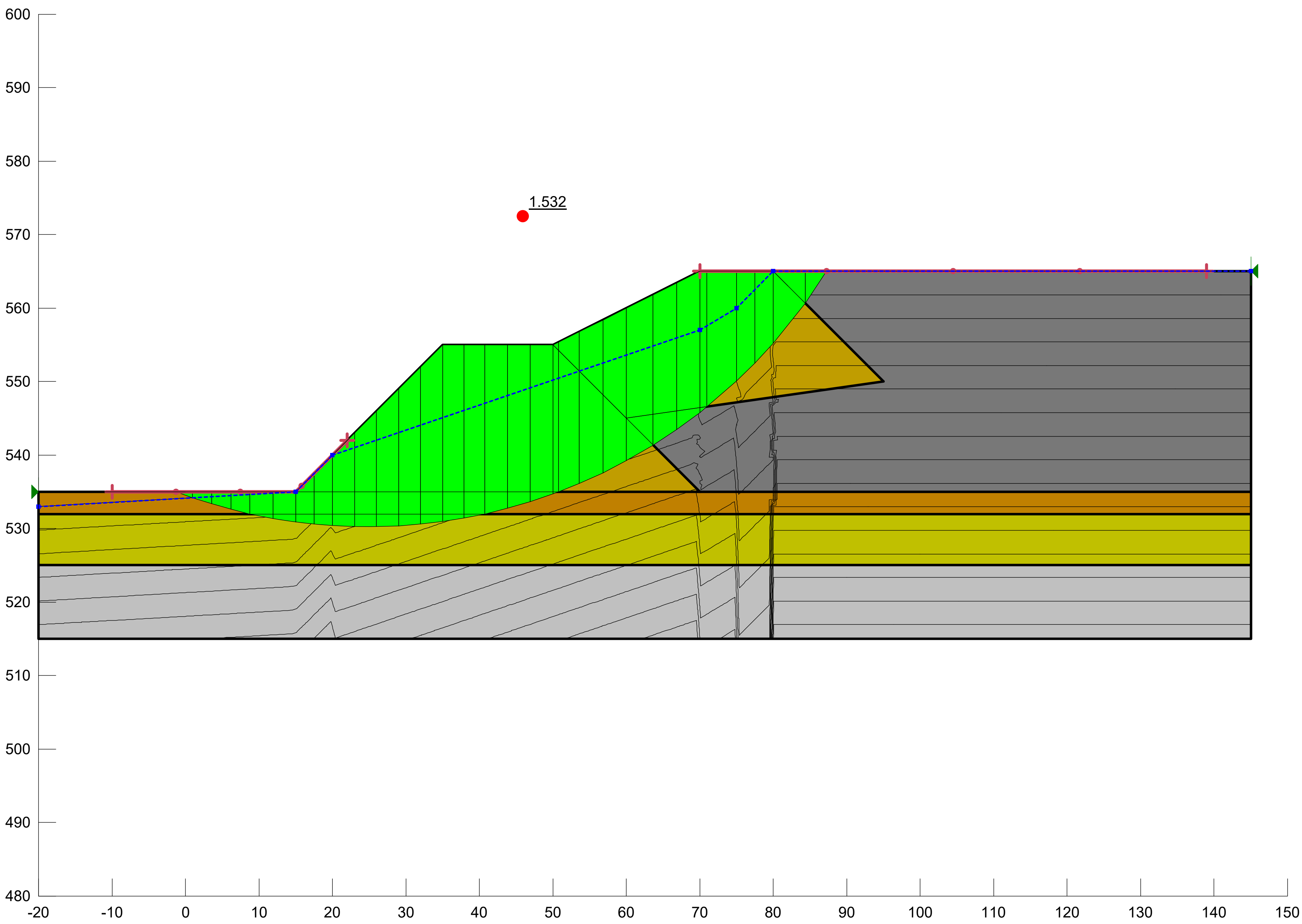
GMT 2016 Sep 28 21:22:05 Distance (R), magnitude (M), epsilon (E0,E) deaggregation for a site on rock with average vs= 760. m/s top 30 m. USGS CGHT PSHA2008 UPDATE Bins with lt 0.05% contrib. omitted

APPENDIX F

Lakeside Ash Pond Slope Stability Analysis

APPENDIX F-1

Long-Term Static Slope Stability Analysis


1.532
600
590
580
570
560
550
540
530
520
510
500
490
480
-20
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

CWLP Lakeside Long Term Static

File Information

File Version: 8.14
Created By: Karl Finke
Last Edited By: Karl Finke
Revision Number: 47
Date: 10/3/2016
Time: 2:09:57 PM
Tool Version: 8.14.1.10087
File Name: CWLP Lakeside Long Term Section 2.gsz
Directory: J:\CWLP Factor of Safety Report\SlopeW\
Last Solved Date: 10/3/2016
Last Solved Time: 2:09:59 PM

Project Settings

Length(L) Units: Feet
Time(t) Units: Seconds
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

Analysis Settings

CWLP Lakeside Long Term Static

Description: CWLP Lakeside
Kind: SLOPE/W
Method: Morgenstern-Price
Settings
  Side Function
    Interslice force function option: Half-Sine
  PWP Conditions Source: Piezometric Line
  Apply Phreatic Correction: Yes
  Use Staged Rapid Drawdown: No
Slip Surface
  Direction of movement: Right to Left
  Use Passive Mode: No
  Slip Surface Option: Entry and Exit
  Critical slip surfaces saved: 1

Resisting Side Maximum Convex Angle: 1 °

Driving Side Maximum Convex Angle: 5 °

Optimize Critical Slip Surface Location: No

Tension Crack

Tension Crack Option: (none)

F of S Distribution

F of S Calculation Option: Constant

Advanced

Number of Slices: 30

F of S Tolerance: 0.001

Minimum Slip Surface Depth: 0.1 ft

Search Method: Root Finder

Tolerable difference between starting and converged F of S: 3

Maximum iterations to calculate converged lambda: 20

Max Absolute Lambda: 2

Materials

Brn Gry Sandy Silty Clay

Model: Mohr-Coulomb

Unit Weight: 120 pcf

Cohesion': 145 psf

Phi': 32 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Brn Silty Clay

Model: Mohr-Coulomb

Unit Weight: 120 pcf

Cohesion': 190 psf

Phi': 32 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Yel Brn Gry VF Sandy Silt

Model: Mohr-Coulomb

Unit Weight: 120 pcf

Cohesion': 190 psf

Phi': 32 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Gray Clayey Shale

Model: Mohr-Coulomb

Unit Weight: 130 pcf
Cohesion': 2,000 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
    Piezometric Line: 1

Ash

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 0 psf
Phi': 25 °
Phi-B: 0 °
Pore Water Pressure
    Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (-10, 535) ft
Left-Zone Right Coordinate: (22, 542) ft
Left-Zone Increment: 4
Right Projection: Range
Right-Zone Left Coordinate: (70, 565) ft
Right-Zone Right Coordinate: (139, 565) ft
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (-20, 535) ft
Right Coordinate: (145, 565) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	-20	533
Coordinate 2	15	535
Coordinate 3	20	540
Coordinate 4	70	557
Coordinate 5	75	560
Coordinate 6	80	565
Coordinate 7	145	565

Points

	X (ft)	Y (ft)
Point 1	15	535
Point 2	35	555
Point 3	50	555
Point 4	60	545
Point 5	70	535
Point 6	70	565
Point 7	80	565
Point 8	95	550
Point 9	145	565
Point 10	-20	535
Point 11	145	535
Point 12	-20	532
Point 13	145	532
Point 14	-20	525
Point 15	145	525
Point 16	-20	515
Point 17	145	515

Regions

	Material	Points	Area (ft²)
Region 1	Brn Gry Sandy Silty Clay	1,2,3,4,5	700
Region 2	Brn Gry Sandy Silty Clay	3,6,7,8,4	550
Region 3	Brn Silty Clay	10,1,5,11,13,12	495
Region 4	Yel Brn Gry VF Sandy Silt	12,14,15,13	1,155
Region 5	Ash	8,4,5,11,9,7	2,000
Region 6	Gray Clayey Shale	14,16,17,15	1,650

Current Slip Surface

Slip Surface: 33

F of S: 1.532

Volume: 1,258.2941 ft³

Weight: 150,210.74 lbs

Resisting Moment: 5,434,428.4 lbs-ft

Activating Moment: 3,545,823.9 lbs-ft

Resisting Force: 68,187.197 lbs

Activating Force: 44,512.413 lbs

F of S Rank: 1

Exit: (-1.2751263, 535) ft

Entry: (87.25, 565) ft

Radius: 73.560778 ft

Center: (24.754863, 603.80136) ft

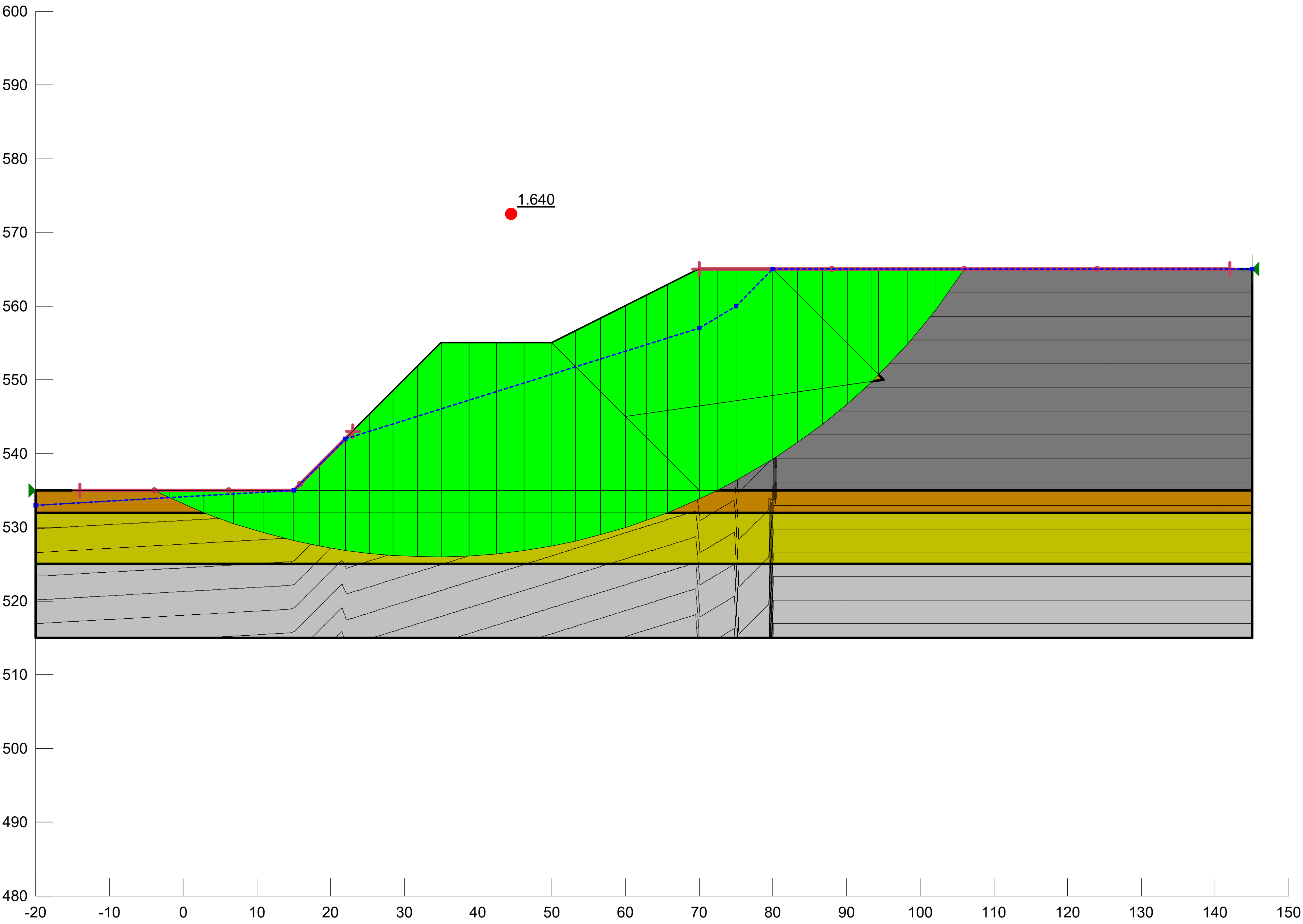
Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	-0.16048362	534.59869	-28.921787	116.63294	72.880347	190
Slice 2	2.2555676	533.77922	30.633885	239.91856	130.77557	190
Slice 3	4.8583846	532.99536	88.638254	357.95512	168.28786	190
Slice 4	7.4612017	532.31483	140.21555	463.62052	202.08585	190
Slice 5	10.321958	531.68791	189.37551	562.23057	232.9857	190
Slice 6	13.440653	531.13303	234.97122	647.75213	257.93414	190
Slice 7	16.25	530.74473	343.52879	872.41907	330.48732	190
Slice 8	18.75	530.49682	514.99863	1,237.8844	451.70913	190
Slice 9	21.5	530.32797	569.52187	1,633.4497	664.81587	190
Slice 10	24.5	530.25632	630.58214	2,026.2219	872.09255	190
Slice 11	27.5	530.30715	684.79174	2,374.6858	1,055.963	190
Slice 12	30.5	530.48071	732.13642	2,676.6103	1,215.0422	190
Slice 13	33.5	530.77789	772.56714	2,932.1543	1,349.4598	190
Slice 14	36.436779	531.18867	805.44064	2,961.7079	1,347.3854	190
Slice 15	39.310336	531.70991	830.93376	2,787.6141	1,222.6696	190
Slice 16	42.289263	532.3786	850.1832	2,595.7963	1,090.7801	190
Slice 17	45.373558	533.20762	862.4684	2,390.7241	954.96017	190
Slice 18	48.457853	534.1831	866.56169	2,182.7153	822.42405	190
Slice 19	50.392426	534.85408	865.82212	2,074.5141	755.2746	190
Slice 20	52.183471	535.56217	860.27695	2,045.1601	740.39712	145
Slice 21	55.186567	536.85367	845.14961	1,991.516	716.32925	145
Slice 22	58.395522	538.40841	819.21351	1,925.9735	691.58041	145
Slice 23	61.820519	540.29639	778.74635	1,813.4119	646.53076	145
Slice 24	65.230778	542.40704	725.54379	1,765.7584	485.06005	0
Slice 25	68.410259	544.62796	661.78492	1,717.5015	492.28874	0
Slice 26	70.482325	546.18359	509.56053	1,647.8538	530.79489	0
Slice 27	72.982325	548.32026	480.3485	1,367.3352	554.25078	145
Slice 28	76.25	551.30019	310.43404	1,075.0936	477.81232	145
Slice	78.75	553.87819	308.00034	862.30889	346.37042	145

29						
Slice 30	82.16908	557.94599	440.16994	557.72891	73.458995	145
Slice 31	85.79408	562.83092	135.35062	184.12653	22.744581	0

APPENDIX F-2

Short-Term Static Slope Stability Analysis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30
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100
110
120
130
140
150

CWLP Lakeside Short Term Static

File Information

File Version: 8.14
Created By: Karl Finke
Last Edited By: Karl Finke
Revision Number: 48
Date: 10/3/2016
Time: 2:12:27 PM
Tool Version: 8.14.1.10087
File Name: CWLP Lakeside Short Term Section 2.gsz
Directory: J:\CWLP Factor of Safety Report\SlopeW\

Project Settings

Length(L) Units: Feet
Time(t) Units: Seconds
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

Analysis Settings

CWLP Lakeside Short Term Static

Description: CWLP Lakeside
Kind: SLOPE/W
Method: Morgenstern-Price
Settings
  Side Function
    Interslice force function option: Half-Sine
  PWP Conditions Source: Piezometric Line
  Apply Phreatic Correction: Yes
  Use Staged Rapid Drawdown: No
Slip Surface
  Direction of movement: Right to Left
  Use Passive Mode: No
  Slip Surface Option: Entry and Exit
  Critical slip surfaces saved: 1
  Resisting Side Maximum Convex Angle: 1 °
  Driving Side Maximum Convex Angle: 5 °

Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

Materials

Brn Gry Sandy Silty Clay

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,400 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Brn Silty Clay

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,800 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Yel Brn Gry VF Sandy Silt

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,000 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Gray Clayey Shale

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 2,000 psf

Phi': 0 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Ash

Model: Mohr-Coulomb

Unit Weight: 100 pcf

Cohesion': 0 psf

Phi': 15 °

Phi-B: 0 °

Pore Water Pressure

Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range

Left-Zone Left Coordinate: (-14, 535) ft

Left-Zone Right Coordinate: (23, 543) ft

Left-Zone Increment: 4

Right Projection: Range

Right-Zone Left Coordinate: (70, 565) ft

Right-Zone Right Coordinate: (142, 565) ft

Right-Zone Increment: 4

Radius Increments: 4

Slip Surface Limits

Left Coordinate: (-20, 535) ft

Right Coordinate: (145, 565) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	-20	533
Coordinate 2	15	535
Coordinate 3	22	542
Coordinate 4	70	557
Coordinate 5	75	560
Coordinate 6	80	565
Coordinate 7	145	565

Points

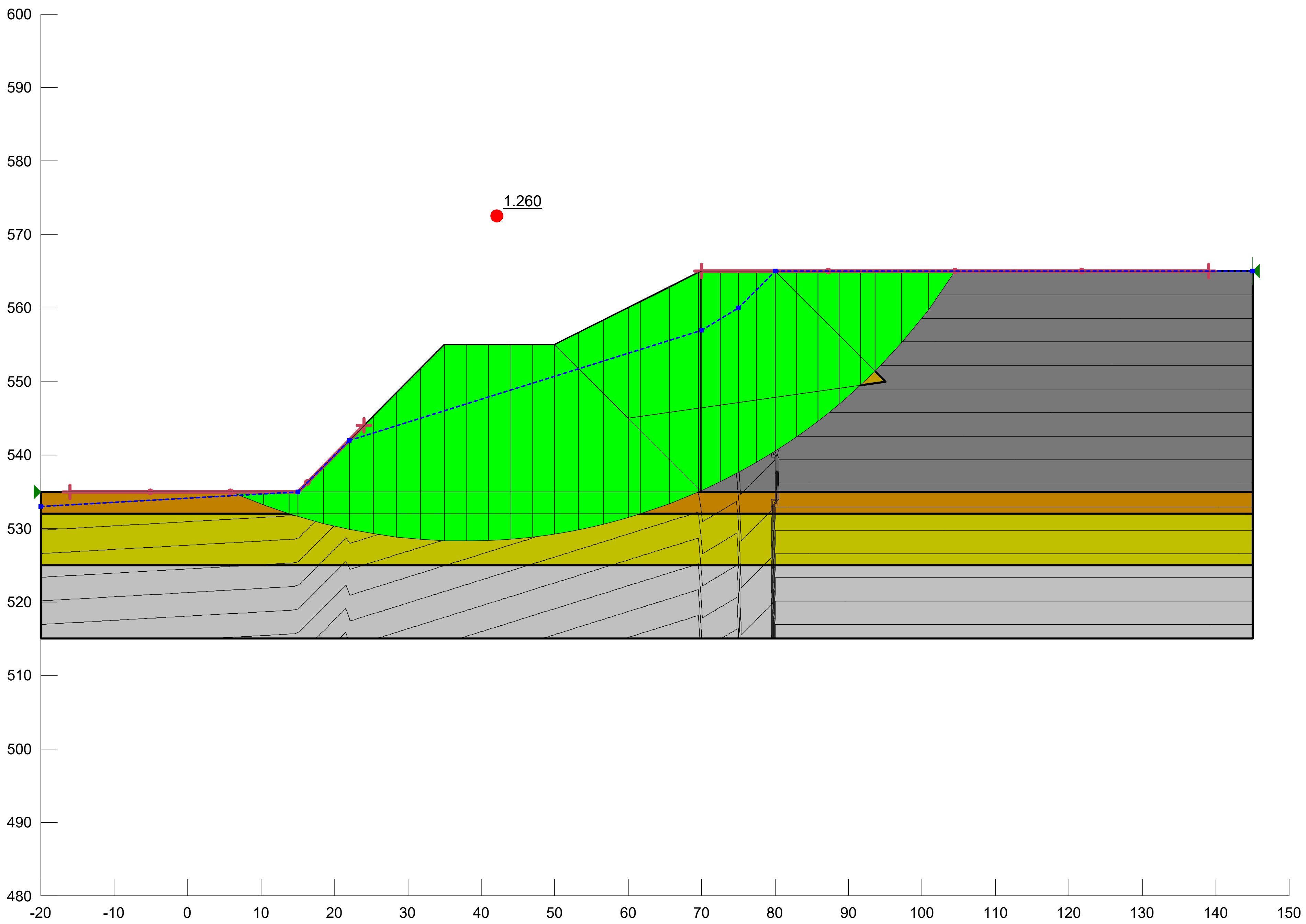
	X (ft)	Y (ft)
Point 1	15	535
Point 2	35	555
Point 3	50	555
Point 4	60	545
Point 5	70	535
Point 6	70	565
Point 7	80	565
Point 8	95	550
Point 9	145	565
Point 10	-20	535
Point 11	145	535
Point 12	-20	532
Point 13	145	532
Point 14	-20	525
Point 15	145	525
Point 16	-20	515
Point 17	145	515

Regions

	Material	Points	Area (ft²)
Region 1	Brn Gry Sandy Silty Clay	1,2,3,4,5	700
Region 2	Brn Gry Sandy Silty Clay	3,6,7,8,4	550
Region 3	Brn Silty Clay	10,1,5,11,13,12	495
Region 4	Yel Brn Gry VF Sandy Silt	12,14,15,13	1,155
Region 5	Ash	8,4,5,11,9,7	2,000
Region 6	Gray Clayey Shale	14,16,17,15	1,650

APPENDIX F-3

Lakeside Seismic Slope Stability Analysis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490
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-20
-10
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
150

CWLP Lakeside Short Term Seismic

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File Information

File Version: 8.14
Created By: Karl Finke
Last Edited By: Karl Finke
Revision Number: 52
Date: 10/3/2016
Time: 2:14:02 PM
Tool Version: 8.14.1.10087
File Name: CWLP Lakeside Short Term Seismic Section 2.gsz
Directory: J:\CWLP Factor of Safety Report\SlopeW\
Last Solved Date: 10/3/2016
Last Solved Time: 2:14:06 PM

Project Settings

Length(L) Units: Feet
Time(t) Units: Seconds
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

Analysis Settings

CWLP Lakeside Short Term Seismic

- Description: CWLP Lakeside
- Kind: SLOPE/W
- Method: Morgenstern-Price
- Settings
  - Side Function
    - Interslice force function option: Half-Sine
  - PWP Conditions Source: Piezometric Line
  - Apply Phreatic Correction: Yes
  - Use Staged Rapid Drawdown: No
- Slip Surface
  - Direction of movement: Right to Left
  - Use Passive Mode: No
  - Slip Surface Option: Entry and Exit
  - Critical slip surfaces saved: 1

Resisting Side Maximum Convex Angle: 1 °
Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

Materials

Brn Gry Sandy Silty Clay

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,400 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Brn Silty Clay

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,800 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Yel Brn Gry VF Sandy Silt

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,000 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Gray Clayey Shale

Model: Mohr-Coulomb

Unit Weight: 130 pcf
Cohesion': 2,000 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Ash

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 0 psf
Phi': 15 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (-16, 535) ft
Left-Zone Right Coordinate: (24, 544) ft
Left-Zone Increment: 4
Right Projection: Range
Right-Zone Left Coordinate: (70, 565) ft
Right-Zone Right Coordinate: (139, 565) ft
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (-20, 535) ft
Right Coordinate: (145, 565) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	-20	533
Coordinate 2	15	535
Coordinate 3	22	542
Coordinate 4	70	557
Coordinate 5	75	560
Coordinate 6	80	565
Coordinate 7	145	565

Seismic Coefficients

Horz Seismic Coef.: 0.1

Vert Seismic Coef.: 0

Points

	X (ft)	Y (ft)
Point 1	15	535
Point 2	35	555
Point 3	50	555
Point 4	60	545
Point 5	70	535
Point 6	70	565
Point 7	80	565
Point 8	95	550
Point 9	145	565
Point 10	-20	535
Point 11	145	535
Point 12	-20	532
Point 13	145	532
Point 14	-20	525
Point 15	145	525
Point 16	-20	515
Point 17	145	515

Regions

	Material	Points	Area (ft²)
Region 1	Brn Gry Sandy Silty Clay	1,2,3,4,5	700
Region 2	Brn Gry Sandy Silty Clay	3,6,7,8,4	550
Region 3	Brn Silty Clay	10,1,5,11,13,12	495
Region 4	Yel Brn Gry VF Sandy Silt	12,14,15,13	1,155
Region 5	Ash	8,4,5,11,9,7	2,000
Region 6	Gray Clayey Shale	14,16,17,15	1,650

Current Slip Surface

Slip Surface: 63

F of S: 1.260

Volume: 1,901.9136 ft³

Weight: 220,860.5 lbs

Resisting Moment: 7,130,465.7 lbs-ft

Activating Moment: 5,657,637.6 lbs-ft

Resisting Force: 85,224.85 lbs

Activating Force: 67,622.745 lbs

F of S Rank: 1

Exit: (5.863961, 535) ft
Entry: (104.5, 565) ft
Radius: 79.109148 ft
Center: (37.720356, 607.41151) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	6.3985031	534.76952	-16.235239	666.78022	0	1,800
Slice 2	8.6540842	533.85892	48.417777	824.15224	0	1,800
Slice 3	12.096162	532.5894	139.61124	1,052.2735	0	1,800
Slice 4	14.408601	531.81762	195.83209	915.79274	0	1,000
Slice 5	16.75	531.15401	349.18995	1,237.5437	0	1,000
Slice 6	20.25	530.27641	622.35204	1,804.3101	0	1,000
Slice 7	23.625	529.58574	734.59908	2,313.1757	0	1,000
Slice 8	26.875	529.06648	821.85486	2,760.4465	0	1,000
Slice 9	30.125	528.68475	901.29201	3,161.9008	0	1,000
Slice 10	33.375	528.43857	973.0241	3,515.7678	0	1,000
Slice 11	36.5	528.32601	1,034.9389	3,637.264	0	1,000
Slice 12	39.5	528.33662	1,087.631	3,541.0214	0	1,000
Slice 13	42.5	528.46119	1,133.8449	3,421.4585	0	1,000
Slice 14	45.5	528.70025	1,173.5497	3,282.3533	0	1,000
Slice 15	48.5	529.05487	1,206.6858	3,127.2166	0	1,000
Slice 16	51.619048	529.55023	1,233.9353	3,039.0174	0	1,000
Slice 17	54.928571	530.21608	1,254.8771	3,014.6722	0	1,000
Slice 18	58.309524	531.04871	1,267.6066	2,974.7747	0	1,000
Slice 19	60.811756	531.75225	1,272.0639	2,922.9997	0	1,000
Slice 20	63.611822	532.68895	1,268.5574	2,836.2034	0	1,800
Slice 21	67.588442	534.18895	1,253.9299	2,627.4289	0	1,800
Slice 22	69.723473	535.0649	1,242.0626	2,534.1139	0	1,400
Slice 23	69.935097	535.15874	1,240.4874	2,588.738	361.26267	0
Slice 24	71.25	535.77273	1,008.3689	2,514.1676	403.47755	0
Slice 25	73.75	536.99738	1,021.0026	2,378.8723	363.8401	0
Slice 26	76.25	538.3342	714.97294	2,233.9803	407.0168	0

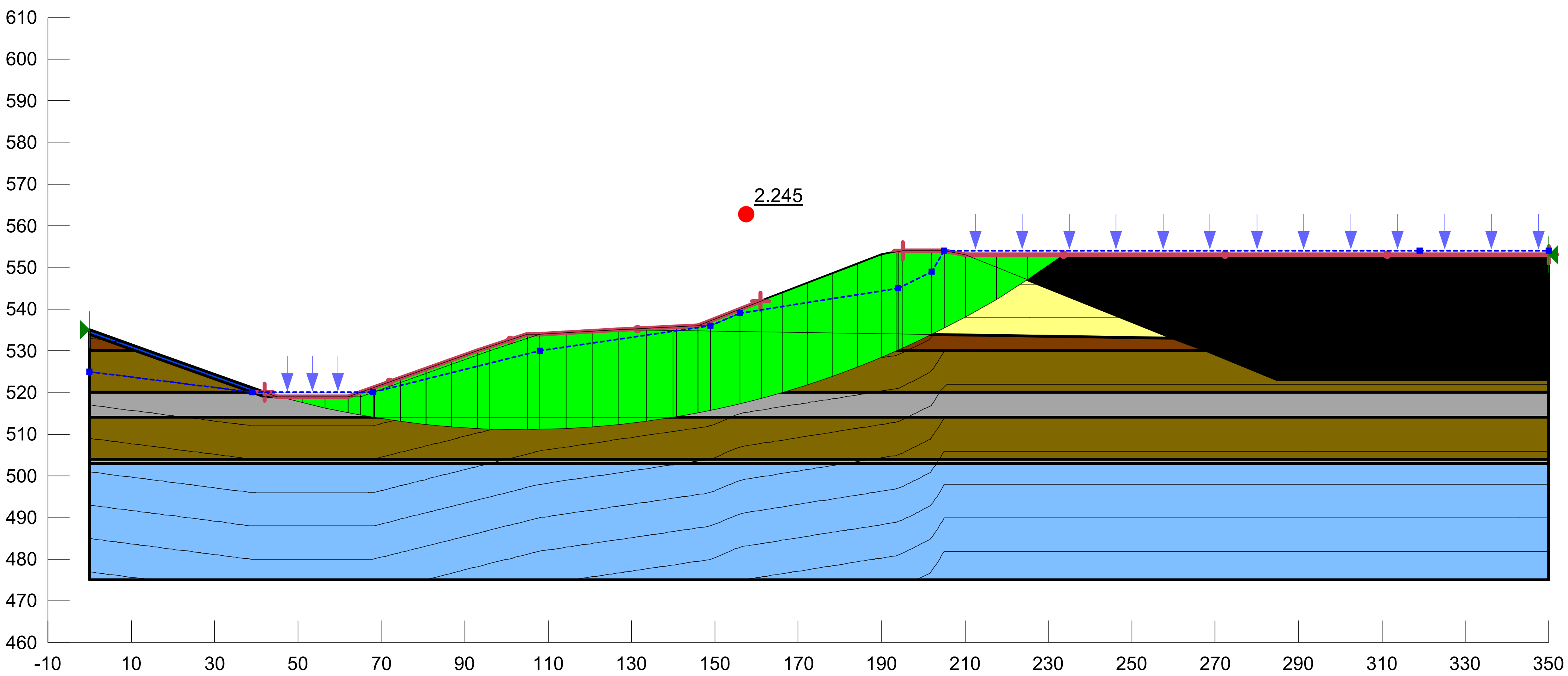
Slice 27	78.75	539.78986	747.55632	2,103.0434	363.20167	0
Slice 28	81.454318	541.51348	1,465.559	1,988.8949	140.22742	0
Slice 29	84.362954	543.54069	1,339.0611	1,797.0107	122.70723	0
Slice 30	87.27159	545.77183	1,199.8378	1,598.0888	106.71104	0
Slice 31	90.180226	548.23008	1,046.4432	1,386.8062	91.199981	0
Slice 32	92.613771	550.46311	907.10183	416.08203	-0	1,400
Slice 33	95.410831	553.34674	727.16315	925.16796	53.055228	0
Slice 34	99.046499	557.52099	466.69001	618.90263	40.785248	0
Slice 35	102.68217	562.37775	163.62838	227.05533	16.995201	0

APPENDIX G

Dallman Ash Pond Slope Stability Analysis

APPENDIX G-1

Long-Term Static Slope Stability Analysis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310
330
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Dallman Long Term Static

File Information

File Version: 8.14
Created By: Karl Finke
Last Edited By: Karl Finke
Revision Number: 45
Date: 10/3/2016
Time: 2:45:37 PM
Tool Version: 8.14.1.10087
File Name: CWLP Dallman Long Term Static.gsz
Directory: J:\CWLP Factor of Safety Report\SlopeW\
Last Solved Date: 10/3/2016
Last Solved Time: 2:45:42 PM

Project Settings

Length(L) Units: Feet
Time(t) Units: Seconds
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

Analysis Settings

Dallman Long Term Static

- Kind: SLOPE/W
- Method: Morgenstern-Price
- Settings
    - Side Function
        - Interslice force function option: Half-Sine
    - PWP Conditions Source: Piezometric Line
    - Apply Phreatic Correction: No
    - Use Staged Rapid Drawdown: No
- Slip Surface
    - Direction of movement: Right to Left
    - Use Passive Mode: No
    - Slip Surface Option: Entry and Exit
    - Critical slip surfaces saved: 1
    - Resisting Side Maximum Convex Angle: 1 °

Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack
  Tension Crack Option: (none)
F of S Distribution
  F of S Calculation Option: Constant
Advanced
  Number of Slices: 30
  F of S Tolerance: 0.001
  Minimum Slip Surface Depth: 0.1 ft
  Search Method: Root Finder
  Tolerable difference between starting and converged F of S: 3
  Maximum iterations to calculate converged lambda: 20
  Max Absolute Lambda: 2

Materials

Embankment

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 145 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
  Piezometric Line: 1

Dk Brn Silty Clay

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 190 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
  Piezometric Line: 1

Clayey Silt

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 190 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
  Piezometric Line: 1

Gry Snd Silty Clay

Model: Mohr-Coulomb
Unit Weight: 120 pcf

Cohesion': 190 psf
Phi': 32 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Gry Sand w/Silt

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 34 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Shale

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 2,000 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Rip-Rap

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Ash

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 0 psf
Phi': 25 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (42, 520) ft
Left-Zone Right Coordinate: (161, 541.91176) ft
Left-Zone Increment: 4

Right Projection: Range
Right-Zone Left Coordinate: (195, 554) ft
Right-Zone Right Coordinate: (350, 553) ft
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0, 535) ft
Right Coordinate: (350, 553) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	0	525
Coordinate 2	39	520
Coordinate 3	68	520
Coordinate 4	108	530
Coordinate 5	149	536
Coordinate 6	156	539
Coordinate 7	194	545
Coordinate 8	202	549
Coordinate 9	205	554
Coordinate 10	319	554
Coordinate 11	350	554

Seismic Coefficients

Horz Seismic Coef.: 0
Vert Seismic Coef.: 0

Points

	X (ft)	Y (ft)
Point 1	0	535
Point 2	105	534
Point 3	146	536
Point 4	190	553
Point 5	195	554
Point 6	205	554
Point 7	210	553
Point 8	260	533
Point 9	285	523

Point 10	319	523
Point 11	108	534
Point 12	149	536
Point 13	156	539
Point 14	156	540
Point 15	127	535
Point 16	0	534
Point 17	0	530
Point 18	0	520
Point 19	0	514
Point 20	0	504
Point 21	0	503
Point 22	0	490
Point 23	319	490
Point 24	319	503
Point 25	319	504
Point 26	319	514
Point 27	319	520
Point 28	268	530
Point 29	96	530
Point 30	93	530
Point 31	68	520
Point 32	65	520
Point 33	65	519
Point 34	62	519
Point 35	45	519
Point 36	42	519
Point 37	42	520
Point 38	39	520
Point 39	14	530
Point 40	11	530
Point 41	319	553
Point 42	319	554
Point 43	0	475
Point 44	319	475
Point 45	350	475
Point 46	350	503
Point 47	350	504
Point 48	350	514
Point 49	350	520
Point 50	350	523
Point 51	350	553
Point 52	350	554

Regions

	Material	Points	Area (ft^2)
Region 1	Embankment	15,3,12,13,14,4,5,6,7,8	1,329

Region 2	Dk Brn Silty Clay	8,28,29,11,15	653.5
Region 3	Dk Brn Silty Clay	16,17,40	22
Region 4	Clayey Silt	17,18,38,40	250
Region 5	Clayey Silt	31,29,28,9,50,49	2,165.5
Region 6	Gry Snd Silty Clay	18,19,48,49,31,33,34,35,36,38	2,074
Region 7	Clayey Silt	19,20,47,48	3,500
Region 8	Gry Sand w/Silt	20,21,46,47	350
Region 9	Shale	21,22,43,45,46	9,800
Region 10	Rip-Rap	14,13,12,3	9.5
Region 11	Rip-Rap	11,2,30,32,34,33,31,29	45
Region 12	Rip-Rap	1,16,40,38,36,35,37,39	46
Region 13	Ash	50,9,28,8,7,51	3,072.5

Current Slip Surface

Slip Surface: 7

F of S: 2.245

Volume: 3,200.3592 ft³

Weight: 383,171.01 lbs

Resisting Moment: 36,423,187 lbs-ft

Activating Moment: 16,221,979 lbs-ft

Resisting Force: 158,991.47 lbs

Activating Force: 70,815.407 lbs

F of S Rank: 1

Exit: (45.522783, 519) ft

Entry: (233.67574, 553) ft

Radius: 221.12319 ft

Center: (104.14305, 732.21147) ft

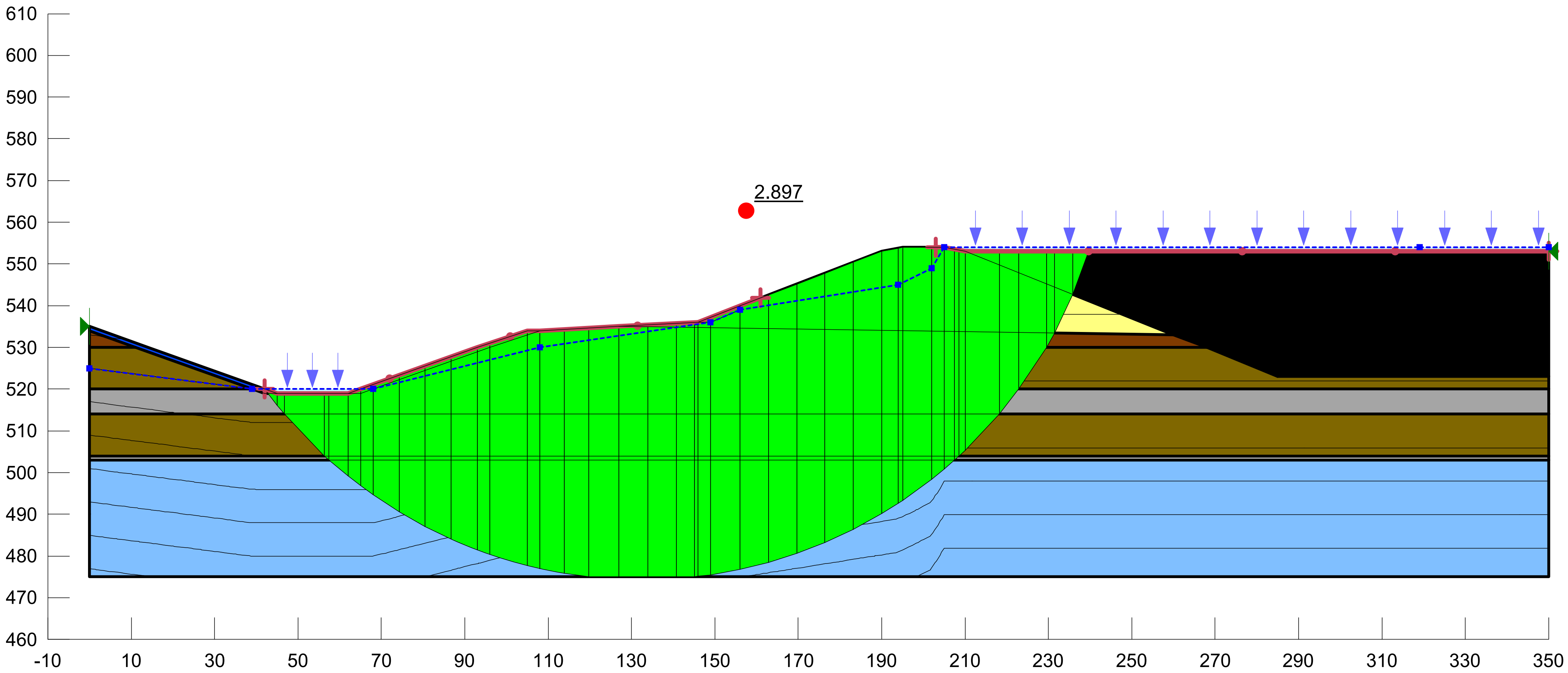
Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	48.268985	518.28274	107.15674	178.87139	44.812287	190
Slice 2	53.761391	516.92283	192.01571	353.71493	101.04088	190
Slice 3	59.253797	515.71076	267.64836	511.69752	152.49884	190
Slice 4	63.5	514.86088	320.68133	660.9906	212.64883	190
Slice 5	66.5	514.32124	354.35436	839.15316	302.93591	190
Slice 6	68.188424	514.03105	375.40183	956.76282	363.27466	190
Slice 7	71.454742	513.5399	457.00431	1,171.6028	446.53067	190
Slice 8	77.61053	512.70776	604.96029	1,562.4615	598.31313	190
Slice 9	83.766318	512.05084	741.98189	1,926.5541	740.20288	190
Slice 10	89.922106	511.5676	868.16684	2,261.6771	870.76189	190
Slice 11	94.5	511.30374	956.04651	2,488.3181	957.46953	190
Slice 12	100.5	511.1641	1,058.3602	2,738.6197	1,049.9427	190
Slice 13	106.5	511.10593	1,155.5902	2,901.8597	1,091.1903	190

Slice 14	111.16667	511.22256	1,200.6293	2,877.0302	1,047.5315	190
Slice 15	117.5	511.51486	1,240.2241	2,843.683	1,001.9523	190
Slice 16	123.83333	511.98965	1,268.4315	2,784.2952	947.21677	190
Slice 17	130.22731	512.6562	1,285.2263	2,699.9685	884.02907	190
Slice 18	136.68194	513.51981	1,290.2789	2,592.4107	813.66226	190
Slice 19	140.33133	514.07002	1,289.2711	2,525.18	772.28159	190
Slice 20	143.3767	514.61303	1,283.1968	2,460.0575	735.38418	190
Slice 21	147.5	515.38596	1,272.6186	2,435.0091	726.34218	190
Slice 22	152.5	516.4704	1,312.2468	2,513.0909	750.37068	190
Slice 23	158.57153	517.90802	1,341.4759	2,572.8352	769.43867	190
Slice 24	163.71458	519.28057	1,306.5016	2,609.0957	813.95114	190
Slice 25	169.25034	520.91337	1,259.1564	2,631.83	857.74164	190
Slice 26	175.17882	522.83241	1,197.8192	2,639.2275	900.69184	190
Slice 27	181.10729	524.93876	1,124.7941	2,628.7031	939.74661	190
Slice 28	187.03576	527.2382	1,039.7203	2,600.2125	975.10375	190
Slice 29	191.80962	529.21848	963.18591	2,530.9234	979.63114	190
Slice 30	193.80962	530.08446	928.85427	2,475.0325	966.15936	190
Slice 31	194.5	530.39277	927.09136	2,455.6885	955.17346	190
Slice 32	198.5	532.26834	934.8556	2,265.3266	831.37054	190
Slice 33	203.5	534.67452	1,049.9097	2,031.1828	613.16748	145
Slice 34	207.5	536.75096	1,076.3401	1,798.7329	451.40109	145
Slice 35	213.74088	540.20827	860.60409	1,381.2735	325.35038	145
Slice 36	221.22264	544.6791	581.62409	853.3867	169.81613	145
Slice 37	229.31963	550.0073	249.14466	341.52741	43.078784	0

APPENDIX G-2

Short-Term Static Slope Stability Analysis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570
560
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530
520
510
500
490
480
470
460
-10
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30
50
70
90
110
130
150
170
190
210
230
250
270
290
310
330
350

Dallman Short Term Static

File Information

File Version: 8.14
Created By: Karl Finke
Last Edited By: Karl Finke
Revision Number: 40
Date: 10/3/2016
Time: 1:54:59 PM
Tool Version: 8.14.1.10087
File Name: CWLP Dallman Short Term Static.gsz
Directory: J:\CWLP Factor of Safety Report\SlopeW\
Last Solved Date: 10/3/2016
Last Solved Time: 1:55:04 PM

Project Settings

Length(L) Units: Feet
Time(t) Units: Seconds
Force(F) Units: Pounds
Pressure(p) Units: psf
Strength Units: psf
Unit Weight of Water: 62.4 pcf
View: 2D
Element Thickness: 1

Analysis Settings

Dallman Short Term Static

Kind: SLOPE/W
Method: Morgenstern-Price
Settings
    Side Function
        Interslice force function option: Half-Sine
    PWP Conditions Source: Piezometric Line
    Apply Phreatic Correction: No
    Use Staged Rapid Drawdown: No
Slip Surface
    Direction of movement: Right to Left
    Use Passive Mode: No
    Slip Surface Option: Entry and Exit
    Critical slip surfaces saved: 1
    Resisting Side Maximum Convex Angle: 1 °

        Driving Side Maximum Convex Angle: 5 °
        Optimize Critical Slip Surface Location: No
        Tension Crack
            Tension Crack Option: (none)
    F of S Distribution
        F of S Calculation Option: Constant
    Advanced
        Number of Slices: 30
        F of S Tolerance: 0.001
        Minimum Slip Surface Depth: 0.1 ft
        Search Method: Root Finder
        Tolerable difference between starting and converged F of S: 3
        Maximum iterations to calculate converged lambda: 20
        Max Absolute Lambda: 2

Materials

Embankment

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,400 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
    Piezometric Line: 1

Dk Brn Silty Clay

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,800 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
    Piezometric Line: 1

Clayey Silt

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,400 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
    Piezometric Line: 1

Gry Snd Silty Clay

Model: Mohr-Coulomb
Unit Weight: 120 pcf

Cohesion': 1,000 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
    Piezometric Line: 1

Gry Sand w/Silt

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 34 °
Phi-B: 0 °
Pore Water Pressure
    Piezometric Line: 1

Shale

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 2,000 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
    Piezometric Line: 1

Rip-Rap

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
    Piezometric Line: 1

Ash

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 0 psf
Phi': 15 °
Phi-B: 0 °
Pore Water Pressure
    Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (42, 520) ft
Left-Zone Right Coordinate: (161, 541.91176) ft
Left-Zone Increment: 4

Right Projection: Range
Right-Zone Left Coordinate: (203, 554) ft
Right-Zone Right Coordinate: (350, 553) ft
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0, 535) ft
Right Coordinate: (350, 553) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	0	525
Coordinate 2	39	520
Coordinate 3	68	520
Coordinate 4	108	530
Coordinate 5	149	536
Coordinate 6	156	539
Coordinate 7	194	545
Coordinate 8	202	549
Coordinate 9	205	554
Coordinate 10	319	554
Coordinate 11	350	554

Seismic Coefficients

Horz Seismic Coef.: 0
Vert Seismic Coef.: 0

Points

	X (ft)	Y (ft)
Point 1	0	535
Point 2	105	534
Point 3	146	536
Point 4	190	553
Point 5	195	554
Point 6	205	554
Point 7	210	553
Point 8	260	533
Point 9	285	523

Point 10	319	523
Point 11	108	534
Point 12	149	536
Point 13	156	539
Point 14	156	540
Point 15	127	535
Point 16	0	534
Point 17	0	530
Point 18	0	520
Point 19	0	514
Point 20	0	504
Point 21	0	503
Point 22	0	490
Point 23	319	490
Point 24	319	503
Point 25	319	504
Point 26	319	514
Point 27	319	520
Point 28	268	530
Point 29	96	530
Point 30	93	530
Point 31	68	520
Point 32	65	520
Point 33	65	519
Point 34	62	519
Point 35	45	519
Point 36	42	519
Point 37	42	520
Point 38	39	520
Point 39	14	530
Point 40	11	530
Point 41	319	553
Point 42	319	554
Point 43	0	475
Point 44	319	475
Point 45	350	475
Point 46	350	503
Point 47	350	504
Point 48	350	514
Point 49	350	520
Point 50	350	523
Point 51	350	553
Point 52	350	554

Regions

	Material	Points	Area (ft^2)
Region 1	Embankment	15,3,12,13,14,4,5,6,7,8	1,329

Region 2	Dk Brn Silty Clay	8,28,29,11,15	653.5
Region 3	Dk Brn Silty Clay	16,17,40	22
Region 4	Clayey Silt	17,18,38,40	250
Region 5	Clayey Silt	31,29,28,9,50,49	2,165.5
Region 6	Gry Snd Silty Clay	18,19,48,49,31,33,34,35,36,38	2,074
Region 7	Clayey Silt	19,20,47,48	3,500
Region 8	Gry Sand w/Silt	20,21,46,47	350
Region 9	Shale	21,22,43,45,46	9,800
Region 10	Rip-Rap	14,13,12,3	9.5
Region 11	Rip-Rap	11,2,30,32,34,33,31,29	45
Region 12	Rip-Rap	1,16,40,38,36,35,37,39	46
Region 13	Ash	50,9,28,8,7,51	3,072.5

Current Slip Surface

Slip Surface: 9

F of S: 2.897

Volume: 9,136.4623 ft³

Weight: 1,093,861.8 lbs

Resisting Moment: 47,499,602 lbs-ft

Activating Moment: 16,395,280 lbs-ft

Resisting Force: 357,222.23 lbs

Activating Force: 123,292.08 lbs

F of S Rank: 1

Exit: (42, 520) ft

Entry: (239.67574, 553) ft

Radius: 112.36371 ft

Center: (132.46693, 586.64336) ft

Slip Slices

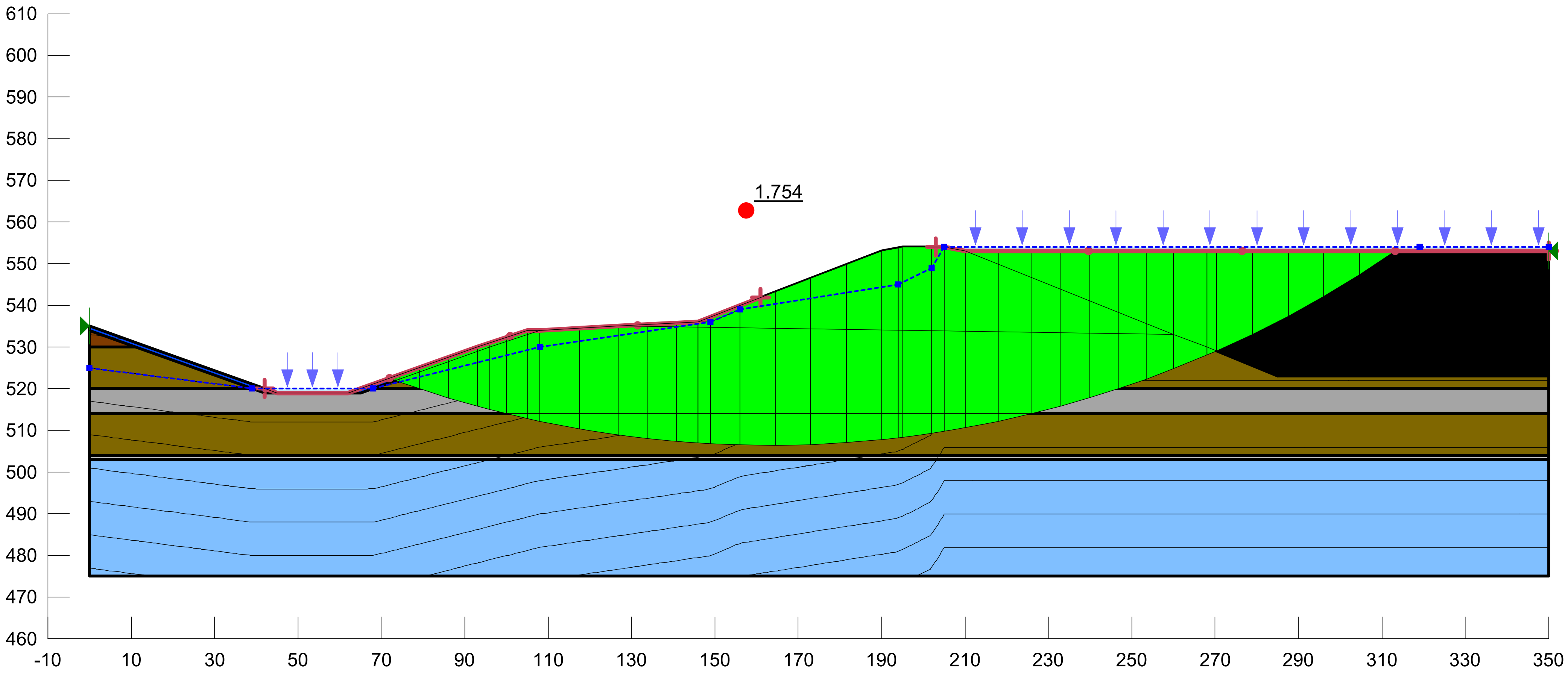
	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	42.372628	519.5	31.2	73.027936	35.097806	0
Slice 2	43.872628	517.55435	152.60873	711.94304	0	1,000
Slice 3	45.871637	515.05435	308.60873	974.73547	0	1,000
Slice 4	51.540427	509	686.4	1,850.0351	0	1,400
Slice 5	56.88762	503.5	1,029.6	2,336.2148	881.32283	0
Slice 6	59.71883	501.06093	1,181.7983	3,000.1174	0	2,000
Slice 7	63.5	497.9554	1,375.5833	3,409.4613	0	2,000
Slice 8	66.5	495.70089	1,516.2646	3,784.4612	0	2,000
Slice 9	71.125	492.57502	1,760.0687	4,370.811	0	2,000
Slice 10	77.375	488.77803	2,094.5006	5,106.8708	0	2,000
Slice 11	83.625	485.50966	2,395.9473	5,767.5331	0	2,000
Slice 12	89.875	482.71971	2,667.54	6,353.5021	0	2,000
Slice 13	94.5	480.90039	2,853.2155	6,740.4066	0	2,000

Slice 14	100.5	479.02514	3,063.8314	7,152.3338	0	2,000
Slice 15	106.5	477.33213	3,263.075	7,458.84	0	2,000
Slice 16	110.94101	476.40154	3,371.4003	7,514.7108	0	2,000
Slice 17	116.82303	475.41364	3,486.7583	7,567.0138	0	2,000
Slice 18	123.38202	475	3,572.4641	7,392.9072	0	2,000
Slice 19	130.43835	475	3,636.9005	7,390.4633	0	2,000
Slice 20	137.31506	475	3,699.6965	7,383.8323	0	2,000
Slice 21	142.96161	475	3,751.2592	7,375.7445	0	2,000
Slice 22	145.58491	475.04879	3,772.1697	7,172.558	0	2,000
Slice 23	147.5	475.30011	3,773.9755	7,179.3671	0	2,000
Slice 24	152.5	476.13713	3,829.0431	7,210.3691	0	2,000
Slice 25	159.4	477.61149	3,864.1417	7,194.7724	0	2,000
Slice 26	166.2	479.52204	3,811.9215	7,137.3757	0	2,000
Slice 27	173	481.90854	3,730.0017	7,036.0639	0	2,000
Slice 28	179.8	484.80463	3,616.2836	6,889.9686	0	2,000
Slice 29	186.6	488.25558	3,467.9422	6,695.9509	0	2,000
Slice 30	192	491.37608	3,326.4275	6,468.2458	0	2,000
Slice 31	194.5	492.95696	3,263.0859	6,318.1096	0	2,000
Slice 32	198.5	495.83306	3,208.4168	5,963.0255	0	2,000
Slice 33	203.5	499.60223	3,238.4207	5,489.861	0	2,000
Slice 34	206.2481	501.91318	3,250.2175	5,189.8481	0	2,000
Slice 35	208.04624	503.5	3,151.2	5,153.528	1,350.5873	0
Slice 36	209.29814	504.65773	3,078.9575	4,990.2829	0	1,400
Slice 37	214.09529	509.65773	2,766.9575	4,364.4456	0	1,400
Slice 38	220.56223	517	2,308.8	3,606.2371	0	1,000
Slice 39	226.22135	525	1,809.6	2,420.3273	0	1,400

Slice 40	230.46996	531.7148	1,390.5962	1,289.2997	-0	1,800
Slice 41	233.64675	538.04232	995.7594	636.10168	-0	1,400
Slice 42	237.76908	547.82751	385.16317	531.44729	39.196713	0

APPENDIX G-3

Seismic Slope Stability Analysis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230
250
270
290
310
330
350

Dallman Short Term Seismic

File Information

- File Version: 8.14
- Created By: Karl Finke
- Last Edited By: Karl Finke
- Revision Number: 39
- Date: 10/3/2016
- Time: 2:01:36 PM
- Tool Version: 8.14.1.10087
- File Name: CWLP Dallman Short Term Seismic.gsz
- Directory: J:\CWLP Factor of Safety Report\SlopeW\
- Last Solved Date: 10/3/2016
- Last Solved Time: 2:01:42 PM

Project Settings

- Length(L) Units: Feet
- Time(t) Units: Seconds
- Force(F) Units: Pounds
- Pressure(p) Units: psf
- Strength Units: psf
- Unit Weight of Water: 62.4 pcf
- View: 2D
- Element Thickness: 1

Analysis Settings

Dallman Short Term Seismic

- Kind: SLOPE/W
- Method: Morgenstern-Price
- Settings
  - Side Function
    - Interslice force function option: Half-Sine
  - PWP Conditions Source: Piezometric Line
  - Apply Phreatic Correction: No
  - Use Staged Rapid Drawdown: No
- Slip Surface
  - Direction of movement: Right to Left
  - Use Passive Mode: No
  - Slip Surface Option: Entry and Exit
  - Critical slip surfaces saved: 1
  - Resisting Side Maximum Convex Angle: 1 °

Driving Side Maximum Convex Angle: 5 °
Optimize Critical Slip Surface Location: No
Tension Crack
Tension Crack Option: (none)
F of S Distribution
F of S Calculation Option: Constant
Advanced
Number of Slices: 30
F of S Tolerance: 0.001
Minimum Slip Surface Depth: 0.1 ft
Search Method: Root Finder
Tolerable difference between starting and converged F of S: 3
Maximum iterations to calculate converged lambda: 20
Max Absolute Lambda: 2

Materials

Embankment

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,400 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Dk Brn Silty Clay

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,800 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Clayey Silt

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 1,400 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Gry Snd Silty Clay

Model: Mohr-Coulomb
Unit Weight: 120 pcf

Cohesion': 1,000 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Gry Sand w/Silt

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 0 psf
Phi': 34 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Shale

Model: Mohr-Coulomb
Unit Weight: 120 pcf
Cohesion': 2,000 psf
Phi': 0 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Rip-Rap

Model: Mohr-Coulomb
Unit Weight: 130 pcf
Cohesion': 0 psf
Phi': 40 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Ash

Model: Mohr-Coulomb
Unit Weight: 100 pcf
Cohesion': 0 psf
Phi': 15 °
Phi-B: 0 °
Pore Water Pressure
Piezometric Line: 1

Slip Surface Entry and Exit

Left Projection: Range
Left-Zone Left Coordinate: (42, 520) ft
Left-Zone Right Coordinate: (161, 541.91176) ft
Left-Zone Increment: 4

Right Projection: Range
Right-Zone Left Coordinate: (203, 554) ft
Right-Zone Right Coordinate: (350, 553) ft
Right-Zone Increment: 4
Radius Increments: 4

Slip Surface Limits

Left Coordinate: (0, 535) ft
Right Coordinate: (350, 553) ft

Piezometric Lines

Piezometric Line 1

Coordinates

	X (ft)	Y (ft)
Coordinate 1	0	525
Coordinate 2	39	520
Coordinate 3	68	520
Coordinate 4	108	530
Coordinate 5	149	536
Coordinate 6	156	539
Coordinate 7	194	545
Coordinate 8	202	549
Coordinate 9	205	554
Coordinate 10	319	554
Coordinate 11	350	554

Seismic Coefficients

Horz Seismic Coef.: 0.1
Vert Seismic Coef.: 0

Points

	X (ft)	Y (ft)
Point 1	0	535
Point 2	105	534
Point 3	146	536
Point 4	190	553
Point 5	195	554
Point 6	205	554
Point 7	210	553
Point 8	260	533
Point 9	285	523

Point 10	319	523
Point 11	108	534
Point 12	149	536
Point 13	156	539
Point 14	156	540
Point 15	127	535
Point 16	0	534
Point 17	0	530
Point 18	0	520
Point 19	0	514
Point 20	0	504
Point 21	0	503
Point 22	0	490
Point 23	319	490
Point 24	319	503
Point 25	319	504
Point 26	319	514
Point 27	319	520
Point 28	268	530
Point 29	96	530
Point 30	93	530
Point 31	68	520
Point 32	65	520
Point 33	65	519
Point 34	62	519
Point 35	45	519
Point 36	42	519
Point 37	42	520
Point 38	39	520
Point 39	14	530
Point 40	11	530
Point 41	319	553
Point 42	319	554
Point 43	0	475
Point 44	319	475
Point 45	350	475
Point 46	350	503
Point 47	350	504
Point 48	350	514
Point 49	350	520
Point 50	350	523
Point 51	350	553
Point 52	350	554

Regions

	Material	Points	Area (ft^2)
Region 1	Embankment	15,3,12,13,14,4,5,6,7,8	1,329

Region 2	Dk Brn Silty Clay	8,28,29,11,15	653.5
Region 3	Dk Brn Silty Clay	16,17,40	22
Region 4	Clayey Silt	17,18,38,40	250
Region 5	Clayey Silt	31,29,28,9,50,49	2,165.5
Region 6	Gry Snd Silty Clay	18,19,48,49,31,33,34,35,36,38	2,074
Region 7	Clayey Silt	19,20,47,48	3,500
Region 8	Gry Sand w/Silt	20,21,46,47	350
Region 9	Shale	21,22,43,45,46	9,800
Region 10	Rip-Rap	14,13,12,3	9.5
Region 11	Rip-Rap	11,2,30,32,34,33,31,29	45
Region 12	Rip-Rap	1,16,40,38,36,35,37,39	46
Region 13	Ash	50,9,28,8,7,51	3,072.5

Current Slip Surface

Slip Surface: 42

F of S: 1.754

Volume: 6,598.2566 ft³

Weight: 766,725.5 lbs

Resisting Moment: 71,665,768 lbs-ft

Activating Moment: 40,847,042 lbs-ft

Resisting Force: 263,139.9 lbs

Activating Force: 149,983.87 lbs

F of S Rank: 1

Exit: (71.965012, 522.4875) ft

Entry: (313.22525, 553) ft

Radius: 265.53272 ft

Center: (162.97654, 771.93595) ft

Slip Slices

	X (ft)	Y (ft)	PWP (psf)	Base Normal Stress (psf)	Frictional Strength (psf)	Cohesive Strength (psf)
Slice 1	72.710494	522.21803	-64.921586	84.576094	70.967769	0
Slice 2	73.938352	521.77687	-18.238546	472.45788	0	1,400
Slice 3	76.758491	520.80259	86.550781	718.90818	0	1,400
Slice 4	82.57219	518.89551	296.24629	1,134.4225	0	1,000
Slice 5	89.524063	516.79035	536.05734	1,710.1262	0	1,000
Slice 6	94.5	515.38931	701.10704	2,105.3764	0	1,000
Slice 7	97.957845	514.49447	810.88759	2,362.8992	0	1,000
Slice 8	102.45784	513.40492	949.07567	2,767.0697	0	1,400
Slice 9	106.5	512.48332	1,069.641	2,986.2009	0	1,400
Slice 10	112.75	511.24165	1,213.8969	3,170.3135	0	1,400
Slice 11	122.25	509.5891	1,403.7668	3,429.6314	0	1,400
Slice 12	130.43835	508.42715	1,551.0464	3,605.8766	0	1,400
Slice 13	137.31506	507.6687	1,661.1696	3,715.8515	0	1,400

Slice 14	143.3767	507.14065	1,749.4733	3,787.6752	0	1,400
Slice 15	147.5	506.8589	1,804.7072	3,890.9901	0	1,400
Slice 16	152.5	506.63311	1,926.094	4,125.6573	0	1,400
Slice 17	160.25	506.45125	2,072.9157	4,430.4254	0	1,400
Slice 18	168.75	506.50004	2,153.6184	4,724.8943	0	1,400
Slice 19	177.25	506.8213	2,217.3194	4,975.4526	0	1,400
Slice 20	185.75	507.41601	2,263.9567	5,186.2206	0	1,400
Slice 21	192	508.00184	2,288.98	5,279.8551	0	1,400
Slice 22	194.5	508.28155	2,306.8313	5,276.83	0	1,400
Slice 23	198.5	508.81386	2,398.4152	5,183.9269	0	1,400
Slice 24	203.5	509.51802	2,619.6756	5,051.391	0	1,400
Slice 25	207.5	510.17489	2,734.6872	4,909.4629	0	1,400
Slice 26	214.00935	511.38541	2,659.1506	4,657.9989	0	1,400
Slice 27	222.02804	513.08535	2,553.0742	4,341.2089	0	1,400
Slice 28	229.50729	514.89814	2,439.9562	4,038.4685	0	1,000
Slice 29	236.4471	516.79547	2,321.5624	3,744.462	0	1,000
Slice 30	243.38691	518.89734	2,190.4062	3,435.4115	0	1,000
Slice 31	250.14261	521.14201	2,050.3384	3,081.8957	0	1,400
Slice 32	256.7142	523.52391	1,901.7079	2,742.488	0	1,400
Slice 33	264	526.40963	1,721.6393	2,341.8376	0	1,400
Slice 34	269.14655	528.55562	1,587.7296	2,046.5904	0	1,400
Slice 35	274.58632	531.04491	1,432.3974	2,013.5709	155.72496	0
Slice 36	283.17275	535.21394	1,172.2503	1,660.0611	130.7085	0
Slice 37	291.75918	539.77533	887.61932	1,267.4716	101.78111	0
Slice 38	300.3456	544.75278	577.02659	827.27814	67.054701	0
Slice 39	308.93203	550.17436	238.71985	329.37161	24.290066	0

ATTACHMENT 4

2016 HISTORY OF CONSTRUCTION REPORT

City Water, Light & Power
Ash Impoundments
Springfield, Sangamon County, Illinois

History of Construction Report for Coal Combustion Residuals Surface Impoundments

October 2016

Prepared for:
City Water, Light & Power
3100 Stevenson Drive
Springfield, Illinois 62703

Prepared by:

ANDREWS
ENGINEERING INC

3300 Ginger Creek Drive
Springfield, IL 62711
Tel: (217) 787-2334; Fax: (217) 787-9495

TABLE OF CONTENTS

APPENDICES

1. INTRODUCTION

City Water, Light and Power (CWLP) Lakeside Ash Pond and Dallman Ash Pond are coal combustion residuals (CCR) surface impoundments. A review of the construction history for the CCR surface impoundments was conducted as required by 40 CFR Part 257.73:

> *257.73* *(c)(1) No later than October 17, 2016, the owner or operator of the CCR unit must compile a history of construction, which shall contain, to the extent feasible, the information specified in paragraphs (c)(1)(i) through (xi) of this section.*

Andrews Engineering, Inc. (AEI) performed the review of information, which included the following documents:

- Coal Ash Impoundment Site Assessment Final Report (May 2011)
- Historical Aerial Photographs (April 1995 – March 2014)
- Engineering Report: Proposed Embankment Modification; CWLP Ash Disposal Area (July 1987).
- Construction Grading Plan for the Dallman Ash Pond (August 1976)

2. CCR UNIT INFORMATION

Both the Lakeside Ash Pond and the Dallman Ash Pond are owned and operated by CWLP. The CWLP main office is located at 4th Floor, Municipal Center East, 800 E. Monroe Street, Springfield, IL 62757. The ponds are operated under National Pollutant Discharge Elimination System (NPDES) Permit Number IL0024767.

3. LOCATION

The Lakeside Ash Pond and the Dallman Ash Pond are located north of East Lake Shore Drive, just east of Interstate 55. The CCR units are located in the eastern half of Range 5 West, Township 15 North, Section 12 in Sangamon County, Illinois (Springfield East Quadrangle, Illinois, USGS). The locations of the CCR units are shown in Figure 1 of this report.

4. PURPOSE

The Lakeside Ash Pond is primarily a diked embankment with some incising along the east perimeter and was placed into service prior to 1958. The original Lakeside Ash Pond was been divided into four separate ponds since it was expanded vertically in 1988: three lime softening ponds and the settling pond. The current Lakeside Ash Pond is approximately 27.6 acres and ceased receiving ash in 2009.

The Dallman Ash Pond was placed into service in approximately 1976 and is approximately 34.5 acres. Fly ash and bottom ash from the CWLP power plant are sluiced to the Dallman Ash Pond with raw lake water.

Settled water from both the Dallman Ash Pond and Lakeside Ash Pond flow into opposite sides of a Clarification Pond before being discharged to Sugar Creek at Outfall 004.

5. WATERSHED AREA

The site is located within the South Fork Sangamon Watershed (USGS 07130007). However, since both ash ponds were built from diked embankments, virtually no surface water flows into the surface impoundments. Therefore, the watershed area for both of the ash ponds would be roughly equal to their surface area. The Dallman Ash Pond is approximately 34.5 acres. The Lakeside Ash Pond is approximately 27.6 acres.

6. FOUNDATION

The Sugar Creek historically meandered across the site, generally from the west to east with an overall flow direction to the north. During the construction of the ash ponds, the creek was abandoned and relocated to the west of the site. The old creek bed was filled with different types of soil, ranging from cohesive soils characterized as silty clays, to granular fill characterized as poorly graded silty to clayey sands. Most of the soil analysis was performed during hydrogeological investigations performed for the east adjacent CCR landfill.

The cohesive soils of the creek fill were tested as part of the CCR landfill permitting process. The landfill location is shown in Figure 1. The soils exhibited the following range of index and engineering properties:

- Liquid limit = 34 to 46
- Plasticity index = 9 to 26
- Gravel content = 0 percent
- Sand content = 2 to 48 percent
- Silt/Clay content = 52 to 98 percent
- Dry density = 80 to 104 pcf
- Hydraulic conductivity 7.6 x 10^{-8} to 2.1 x 10^{-5} cm/sec

Sieve analysis on the granular fill yielded the following results:

- Gravel content = 0 to 2 percent
- Sand content = 55 to 65 percent
- Silt/Clay content = 33 to 45 percent

Prior to the area development, the upper layer of soil at the site consisted of mainly brown, light brown, and brownish-gray silty clays and clayey silts having soft to stiff consistency. This includes all eolian soils (loess) deposited near the surface, isolated pockets and lenses of fine grained silty to clayey sand at some locations and alluvial silts and silty clays. Recompacted silty clay samples from the native soils have exhibited hydraulic conductivity values between 1 x 10^{-7} to 1 x 10^{-9} cm/sec. The in-place creek sediment’s soils permeability typically range from 1 x 10^{-6} to 1 x 10^{-8} cm/sec. Much of the shallow soils were displaced during area development.

7. CONSTRUCTION

7.1 Lakeside Ash Pond

The Lakeside Ash Pond is a diked pond. The pond was built prior to 1958 and was bounded by the Lake Springfield Spaulding Dam to the south. The original pond was approximately 44 acres. The soil berms comprising the east, north, and west boundaries were built approximately 18 to 20 feet above the inside bottom elevation, with side slopes ranging between 2.5 to 3.0H:1.0V.

The Lakeside Ash Pond system was expanded vertically in 1988. The vertical expansion consists of berms built on top and inside of the existing embankments in such a way that the toe of the outer slope of the expansion berms matches up with the top of the inner slope of the existing embankments. The berms were built on top of a stable base comprised of bottom ash on the inside of the existing berms. The vertical expansion berms are approximately ten feet in height. The berms were constructed with compacted cohesive materials. The top and outer slopes are covered with a 6-inch topsoil layer. The top of the berms are 10 feet wide. The outer slope of the berms was built at a 2H:1V slope. The inner slope of the berms was built at a 1H:1V slopes. During the vertical expansion in 1988, the Lakeside Ash Pond was separated to create lime softening ponds on the south section of the pond.

7.2 Dallman Ash Pond

The Dallman Ash Pond was built 1976; it has not been expanded. The berms for the Dallman Ash Pond were built to a height of approximately 27 feet, using slopes of 2.5H:1V for both the inner and outer slopes. Riprap was placed at the bottom section of the outer slopes for the west and north berms. The south berm for the Dallman Ash Pond is shared by the Clarification Pond located to the south.

8. DRAWINGS

The following drawings are included in Appendix A of this report:

- Figure 1 – Site Map identifying the location of the CCR units.
- Figure 2 – Plan View of the surface impoundments and the locations of outlets, normal operating pool elevations, maximum pool elevations, and maximum depths of each CCR unit.
- Construction Drawings – Plan Views and Cross Sections of each CCR unit.

Plan Drawings and Cross Sections of the Lakeside Ash Pond are taken from the construction design drawings included in the 1987 Proposed Embankment Modifications report by Hanson Engineers, Inc. No as-built drawings are available for either the original pond construction prior to 1958 or the expansion in 1988. No construction design drawings are available for the original pond construction. The Plan Drawing shows the proposed expansion with two lime softening ponds. The third lime softening pond was constructed from the southern portion of the expanded settling pond at a later time.

The Plan Drawing of the Dallman Ash Pond is taken from the 1976 Construction Grading Plan. Cross Sections for the Dallman Ash Pond have been created based on this Plan Drawing. No as-built drawings are available for the construction of the Dallman Ash Pond.

Neither CCR unit contains foundation improvements, drainage provisions, diversion ditches, or instrumentation. No identifiable natural or manmade features that could adversely affect operation of the CCR unit due to malfunction or misoperation are known to CWLP personnel.

9. INSTRUMENTATION

According to CWLP personnel, none of the CCR units contains any such unit instrumentation, which would include dedicated piezometers, pool elevation and freeboard instrumentation or more sophisticated measuring devices for measuring pressure, seepage, internal movement, slope movement, and/or vibration. Due to the limited extent of the impoundments, such instrumentation was deemed unnecessary.

10. AREA-CAPACITY CURVES

Area-capacity curves for the CCR units are included in Appendix B of this report. Area-capacity curves for the CCR units are calculated based on information from the construction drawings discussed in Section 8 of this report.

11. SPILLWAYS

Neither ash pond has constructed or natural spillways.

12. SURVEILLANCE, MAINTENANCE, AND REPAIR

Visual inspections of the CCR units are performed on a weekly basis in accordance with 40 CFR 257.83(a)(1)(i) for the purpose of identifying appearances of actual or potential structural weaknesses and other conditions that are disrupting or have the potential to disrupt the operation or safety of the CCR units or appurtenant structures. Erosional features, such as ruts or gullies, are promptly filled with soil and seeded. Any repairs completed as part of maintenance are specifically monitored during the weekly inspections for future occurrences. Because of the limited extent of the impoundments, only minimal maintenance is necessary.

13. STRUCTURAL CONDITION OF CCR UNITS

Signs of erosion have been periodically observed on the north and west outer berms of the Dallman Ash Pond in the forms of ruts and gullies that typically range from 6 to 24 inches deep. The erosion appears to be caused by stormwater flow collecting at points along the top of the berm before flowing down the outer slope in concentrated streams. Ruts and gullies are routinely filled with soil and monitored in the observed locations. Erosion of similar severity was discussed in the 2011 Site Assessment Final Report, which recommended that the erosion be repaired on an as-needed basis.

Indications of seepage have been observed on outer berms of the Lakeside Ash Pond and lime softening ponds, between the top of the original pond berms and the vertical expansion berms. These range from staining or dampness to areas with noticeable drainage. Signs of seepage have been observed along the west berm, as well as isolated portions on the east and west portions of the north berm of the Lakeside Ash Pond. This seepage is discussed in the 2011 Site Assessment Final Report.

No other visual indications of actual or potential structural weaknesses and other conditions that are disrupting or have the potential to disrupt the operation or safety of the CCR unit or appurtenant structures have been observed for the CCR units during any of the weekly inspections since the initiation of this weekly inspection program on October 16, 2015. Based on the review of historical aerial photographs, there were no observed indications of mass movement on any of the constructed berms for the active cells of the CCR units.

14. STATEMENT

This History of Construction Report for Coal Combustion Residuals Surface Impoundments was completed for CWLP by Andrews Engineering, Inc. in accordance with the requirements under 40 CFR Part 257.73.

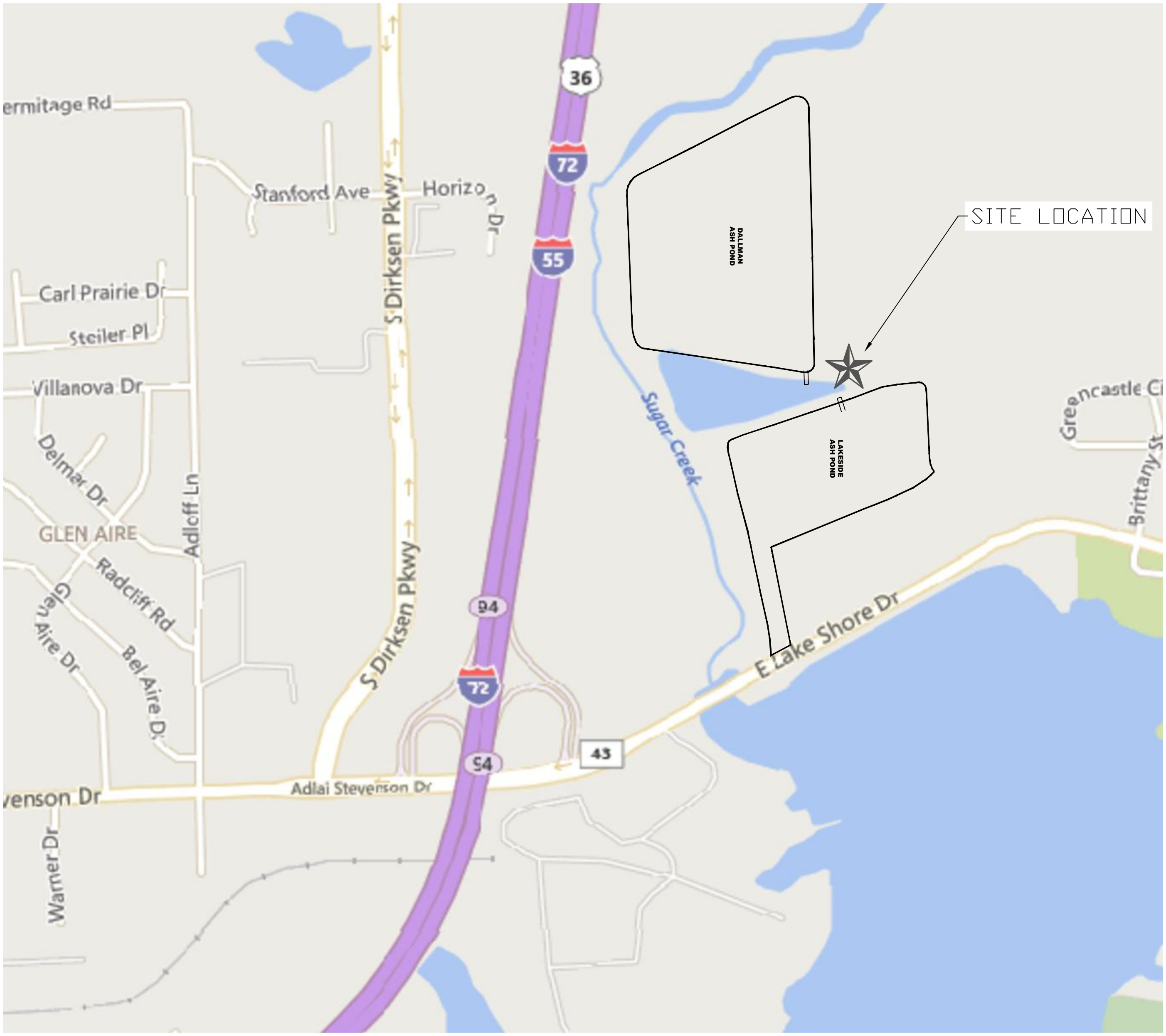
Paul M. Van Metre, P.E.

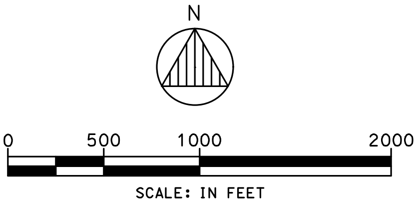
10-14-2016
Date

STATE OF ILLINOIS
PAUL
VAN METRE
062-064175
REGISTERED
PROFESSIONAL ENGINEER

APPENDIX A

Figures





SITE LOCATION

NOTE:
BASE IMAGE DERIVED FROM BING

ANDREWS ENGINEERING, INC.
3300 Ginger Creek Drive, Springfield, IL 62711-7233
Tel (217) 787-2334 Fax (217) 787-9495
Pontiac, IL • Naperville, IL • Indianapolis, IN • Warrenton, MO
Professional Design Engineering and Land Surveying Firm #184-001541

SITE LOCATION MAP

PLANS PREPARED FOR
CWLP
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: OCTOBER 2016
PROJECT ID: 150077/0011
SHEET NUMBER:
FIG. 1

APPROVED BY: PMV
DESIGNED BY: PMV
DRAWN BY: RMC

J:\S\Springfield CWLP\CWLP\dwg\SURFACE IMPOUNDMENTS.dwg Tab: FIGURE 2 Last Saved: October 13, 2016, by Ryan Curtis Plotted: Thursday, October 13, 2016 10:08:03 AM

REVISIONS

NO.	DATE	DESCRIPTION	BY

ANDREWS
ENGINEERING, INC.
3300 GINGER CREEK DRIVE
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PONTIAC, IL • LOMBARD, IL • INDIANAPOLIS, IN • WARRENTON, MO
PROFESSIONAL DESIGN ENGINEERING AND LAND SURVEYING FIRM #184-001541

APPROVED BY: PMV DESIGNED BY: PMV DRAWN BY: MPN

CWLP COAL COMBUSTION RESIDUALS SURFACE IMPOUNDMENTS

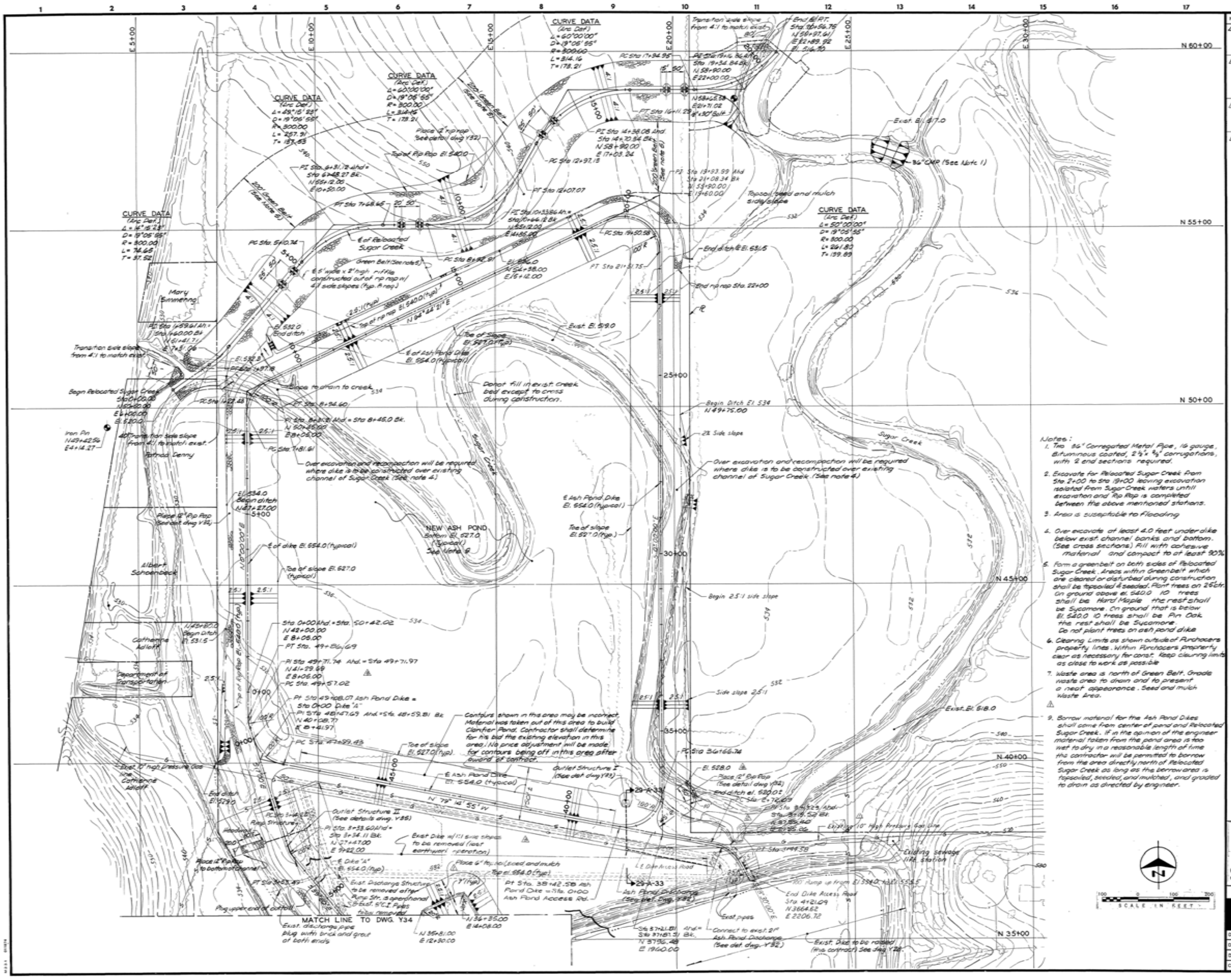
PLANS PREPARED FOR
CITY, WATER, LIGHT & POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE:
OCTOBER 2016

PROJECT ID:
150077/0011

SHEET NUMBER:

FIG. 2



Notes:

1. Two 36" Corregated Metal Pipe, 16 gauge, Bituminous coated, 2⅔" x ½" corrugations, with 2 end sections required.
2. Excavate for Relocated Sugar Creek from Sta. 2+00 to Sta 19+00 leaving excavation isolated from Sugar Creek waters untill excavation and Rip Rap is completed between the above mentioned stations.
3. Area is susceptable to Flooding
4. Over excavate at least 4.0 feet under dike below exist. channel banks and bottom. (See cross sections.) Fill with cohesive material and compact to at least 90%
5. Form a greenbelt on both sides of Relocated Sugar Creek. Areas within Greenbelt which are cleared or disturbed during construction shall be topsoiled & seeded. Plant trees on 25' ctr. On ground above el. 540.0 10 trees shall be Hard Maple the rest shall be Sycomore. On ground that is below El. 540.0 10 trees shall be Pin Oak the rest shall be Sycomore. Do not plant trees on ash pond dike
6. Clearing Limits as shown outside of Purchacers property lines. Within Purchacers property clear as necessary for const. Keep clearing limits as close to work as possible
7. Waste area is north of Green Belt. Grade waste area to drain and to present a neat appearance. Seed and mulch Waste Area.

△

9. Borrow material for the Ash Pond Dikes shall come from center of pond and Relocated Sugar Creek. If in the opinion of the engineer material taken from the pond area is too wet to dry in a reasonable length of time the contractor will be permitted to borrow from the area directly north of Relocated Sugar Creek as long as the borrow area is topsoiled, seeded, and mulched, and graded to drain as directed by engineer.

NO.	DATE	BY	REVISION
△1	12-7-76	TKP	(M,7) Added 6" topsoil to dike. (L,18) Removed Bench Mark and note 8.
	12-10-76	LNB	ISSUED
△2	4-27-77	MGH	Changed Dike Access Rd. and exist. dike alignments. Removed 300' pipe. Moved exist. pipe
	4-27-77	LNB	ISSUED
△3	5-26-77	DBJ	Revised dike alignment along So. side of Ash Pond.
	5-31-77	LNB	ISSUED
△4	2-1-79	DLM	**CONFORMING TO CONSTRUCTION RECORDS**

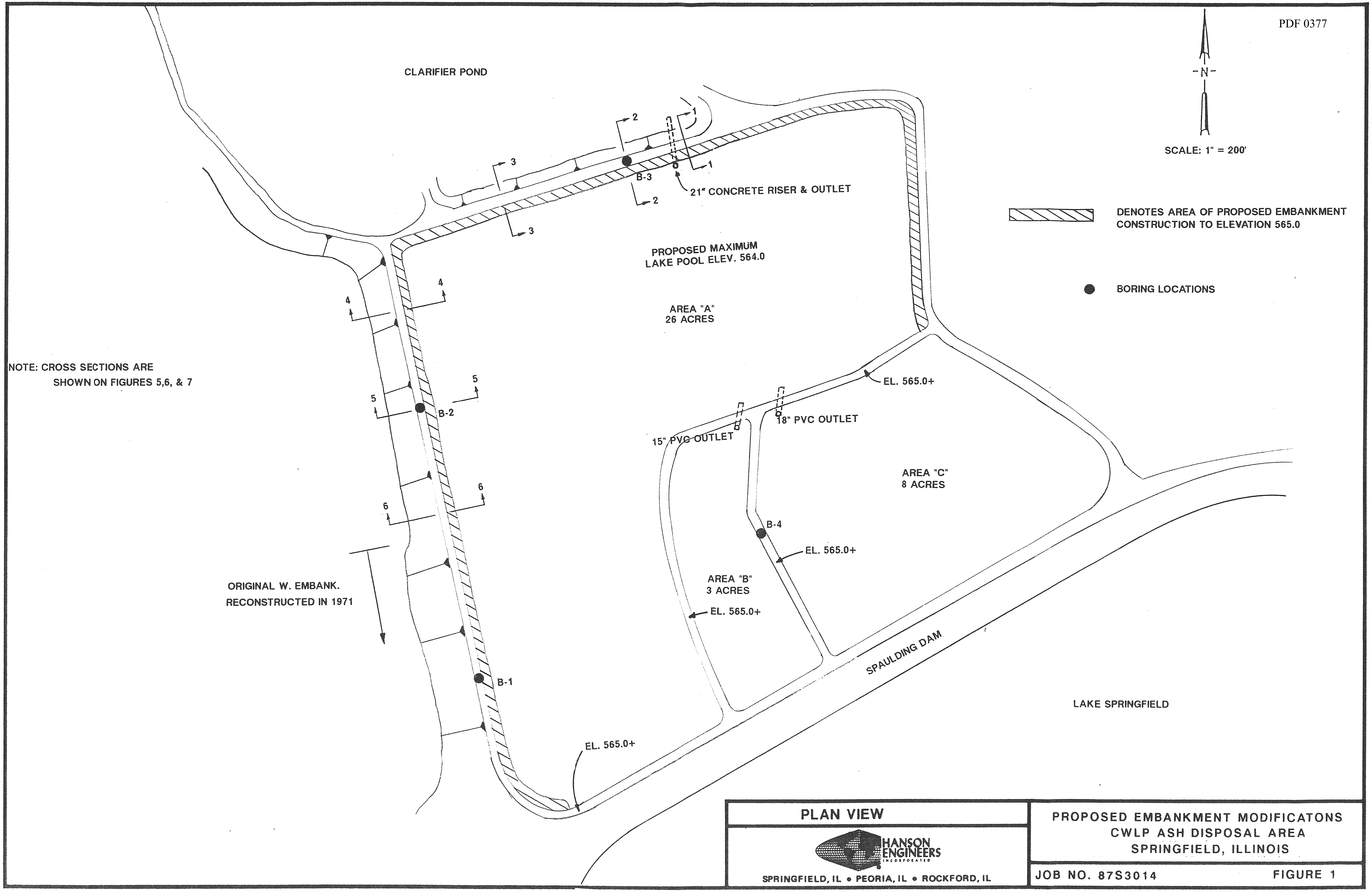
CONTRACT NO. 3333
ASH POND

V.Y. DALLMAN POWER STATION - UNIT 33
SPRINGFIELD, ILLINOIS

GRADING PLAN

Burns & McDonnell
Engineers – Architects – Consultants
KANSAS CITY, MISSOURI

DATE AUG. 13, 1976	DRAWING NO. REV. Y29 – 4
DESIGNED LNB	
DETAILED TRP	PROJECT [73-008-1]
CHECKED	SHEET OF SHEETS



NOTE: CROSS SECTIONS ARE SHOWN ON FIGURES 5,6, & 7

PLAN VIEW

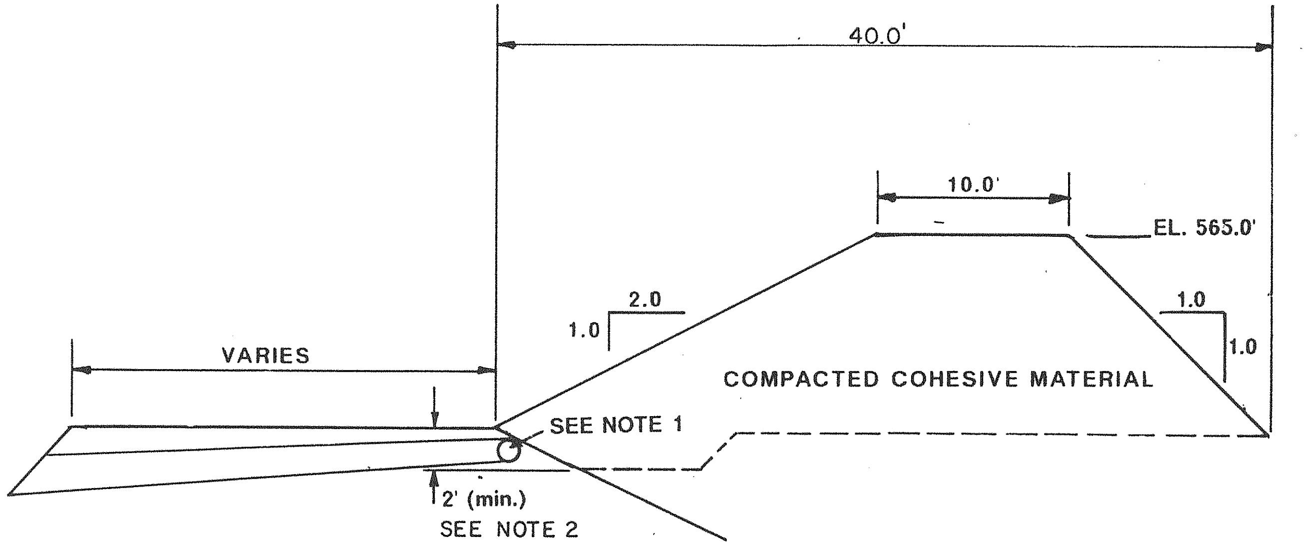
HANSON ENGINEERS INCORPORATED

SPRINGFIELD, IL • PEORIA, IL • ROCKFORD, IL

PROPOSED EMBANKMENT MODIFICATONS
CWLP ASH DISPOSAL AREA
SPRINGFIELD, ILLINOIS

JOB NO. 87S3014

FIGURE 1



BOTTOM ASH PLACED
FOR STABLE WORKING SURFACE
IN EXISTING DISPOSAL AREA

TYPICAL SECTION

NOTE: 1 - FILTER FABRIC WRAPPED PERFORATED CORRUGATED DRAINAGE PIPE WITH NON-PERFORATED OUTLETS INTO CLARIFIER POND. PIPE IS SURROUNDED WITH BED OF BOTTOM ASH

NOTE: 2 - COMPACTED COHESIVE MATERIAL "KEYED" INTO STABLE WORKING SURFACE A MINIMUM DEPTH OF 2 ft. FOR SEEPAGE CONTROL

EMBANKMENT CONFIGURATION

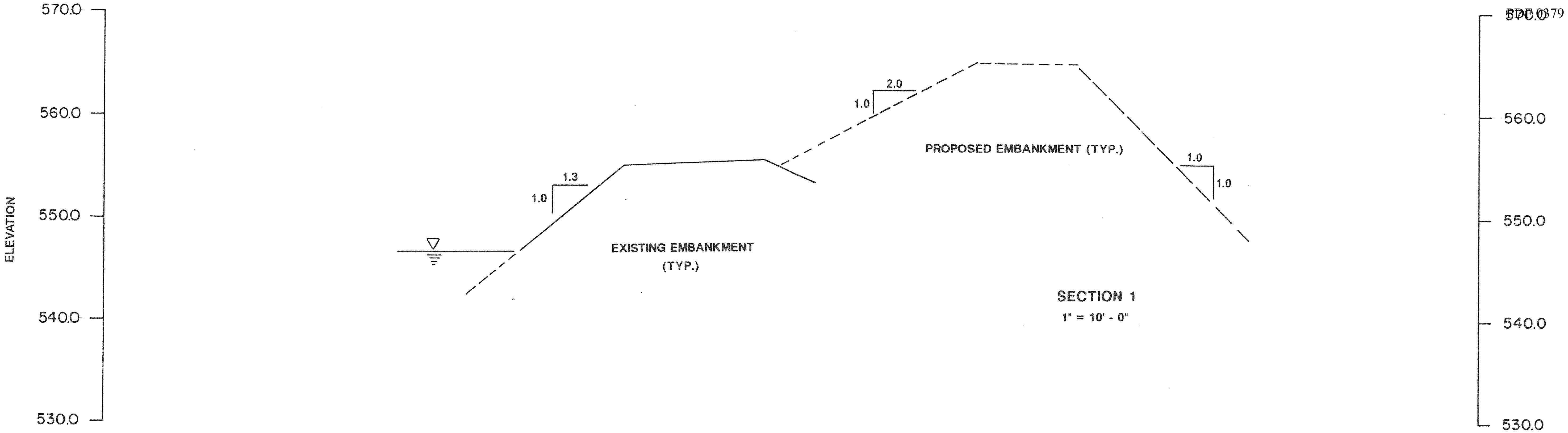
HANSON ENGINEERS INCORPORATED

SPRINGFIELD, IL • PEORIA, IL • ROCKFORD, IL

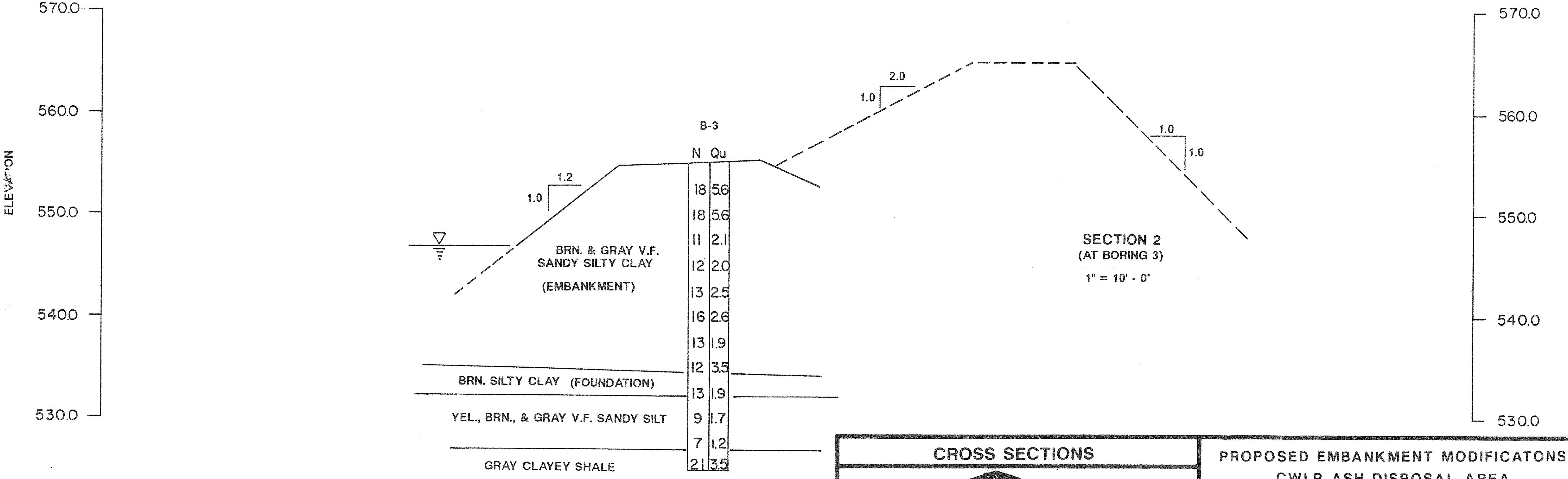
PROPOSED EMBANKMENT MODIFICATONS
CWLP ASH DISPOSAL AREA
SPRINGFIELD, ILLINOIS

JOB NO. 87S3014

FIGURE 2



SECTION 1
1" = 10' - 0"



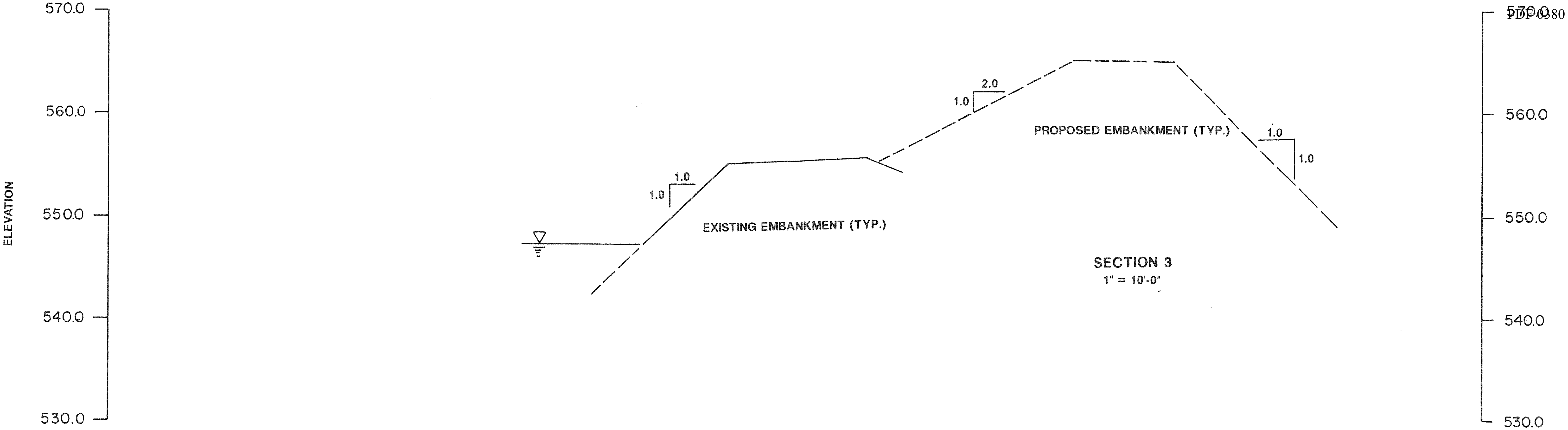
SECTION 2
(AT BORING 3)
1" = 10' - 0"

CROSS SECTIONS

HANSON ENGINEERS INCORPORATED
SPRINGFIELD, IL • PEORIA, IL • ROCKFORD, IL

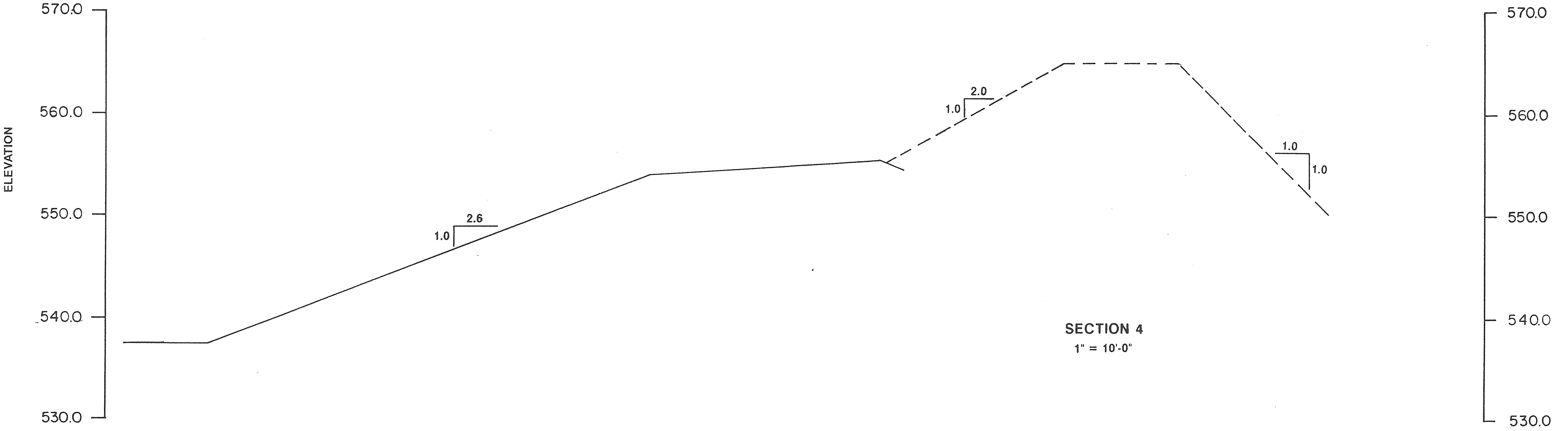
PROPOSED EMBANKMENT MODIFICATONS
CWLP ASH DISPOSAL AREA
SPRINGFIELD, ILLINOIS

JOB NO. 87S3014
FIGURE 5



SECTION 3

1" = 10'-0"



SECTION 4

1" = 10'-0"

CROSS SECTIONS

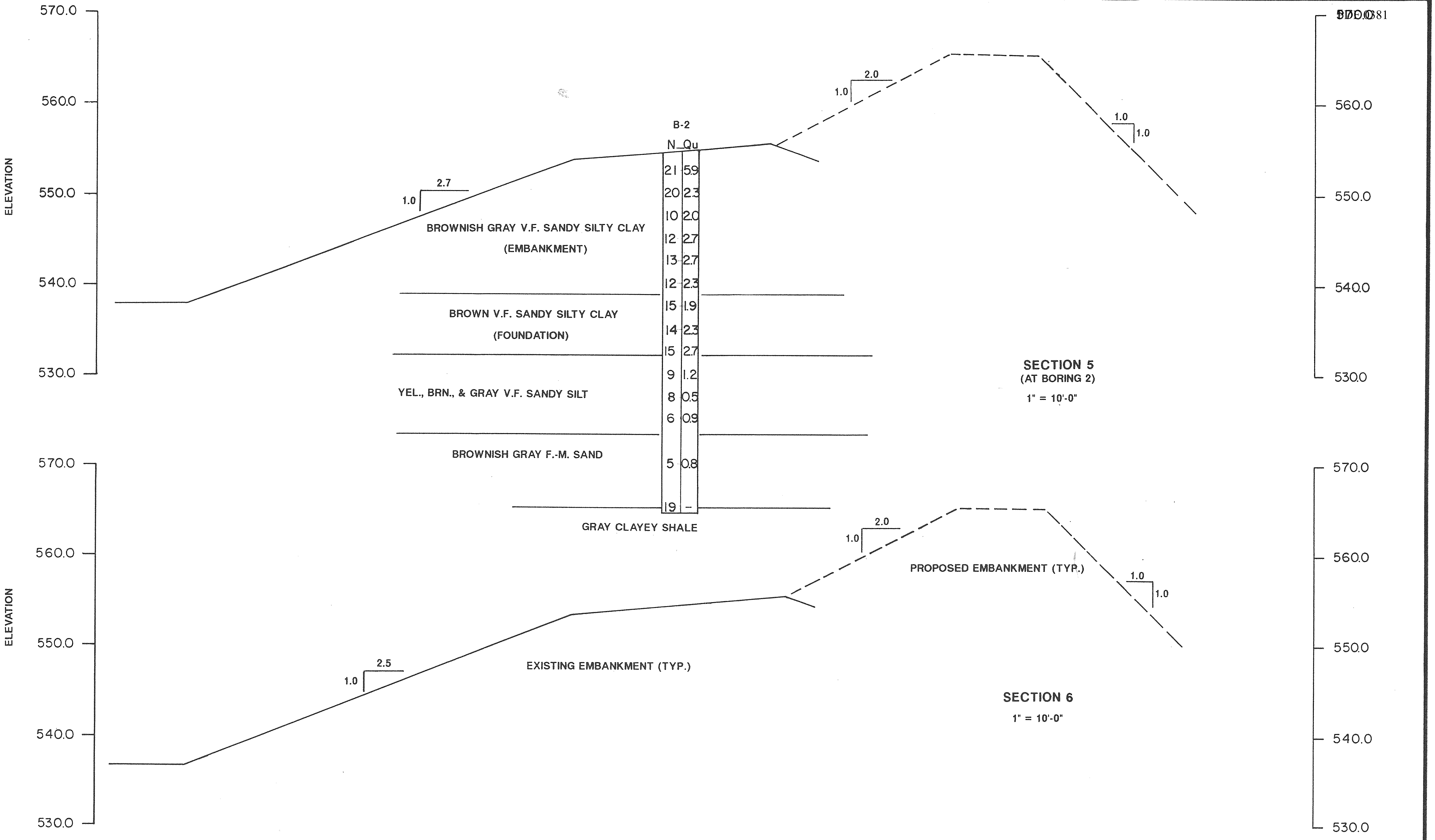
HANSON ENGINEERS INCORPORATED

SPRINGFIELD, IL • PEORIA, IL • ROCKFORD, IL

PROPOSED EMBANKMENT MODIFICATONS
CWLP ASH DISPOSAL AREA
SPRINGFIELD, ILLINOIS

JOB NO. 87S3014

FIGURE 6



CROSS SECTIONS

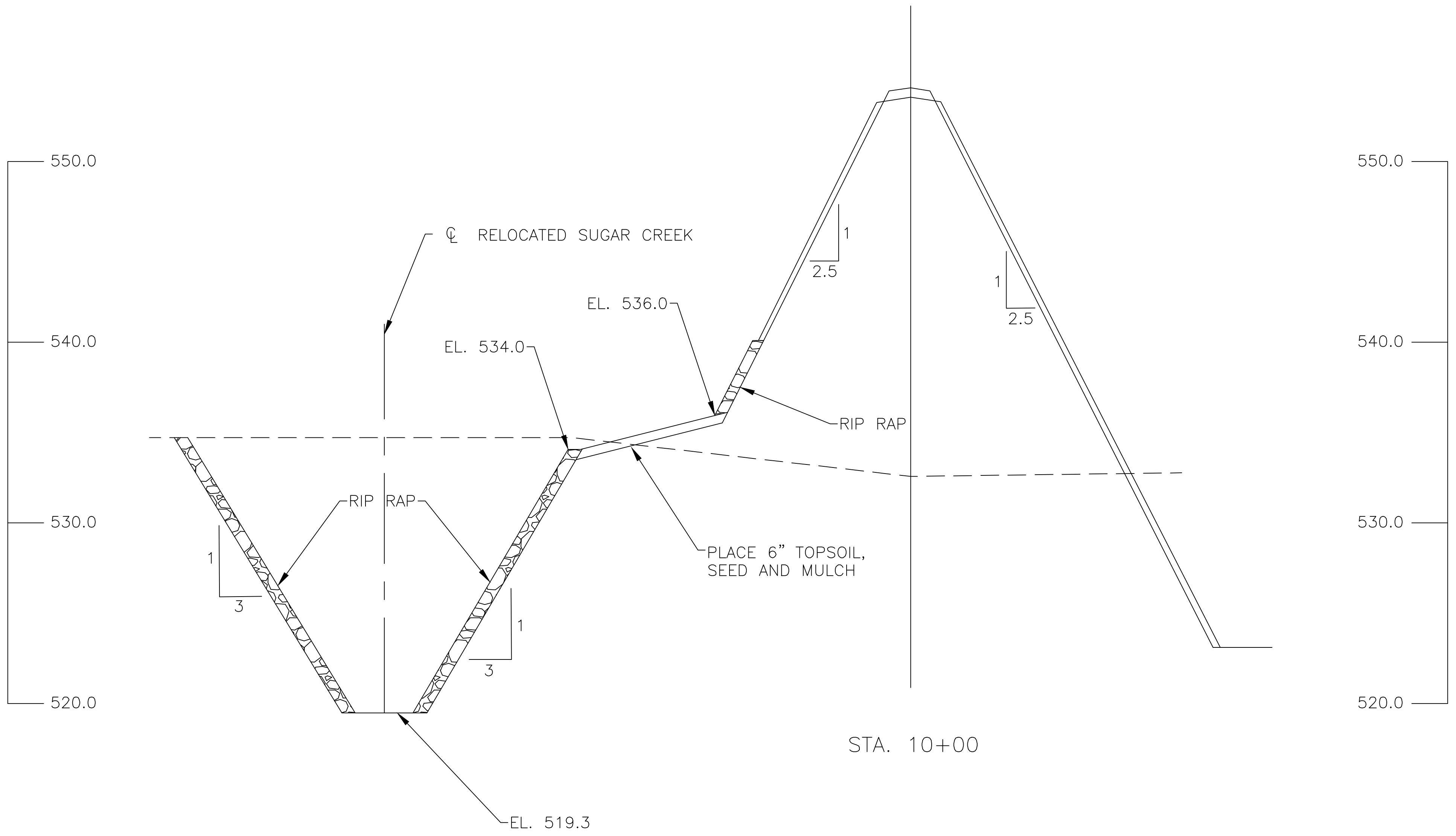
HANSON ENGINEERS INCORPORATED

SPRINGFIELD, IL • PEORIA, IL • ROCKFORD, IL

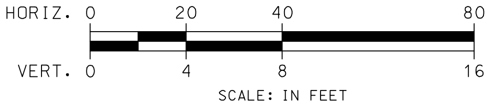
PROPOSED EMBANKMENT MODIFICATONS
CWLP ASH DISPOSAL AREA
SPRINGFIELD, ILLINOIS

JOB NO. 87S3014

FIGURE 7



STA. 10+00



NOTES:
CROSS-SECTION BASED ON CONSTRUCTION PLAN DRAWINGS
PREPARED BY BURNS & McDONNEL IN AUGUST 1976

REVISIONS

NO.	DATE	DESCRIPTION	BY

ANDREWS
ENGINEERING, INC.
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PONTIAC, IL • LOMBARD, IL • INDIANAPOLIS, IN • WARRENTON, MO
PROFESSIONAL DESIGN ENGINEERING AND LAND SURVEYING FIRM #184-001541

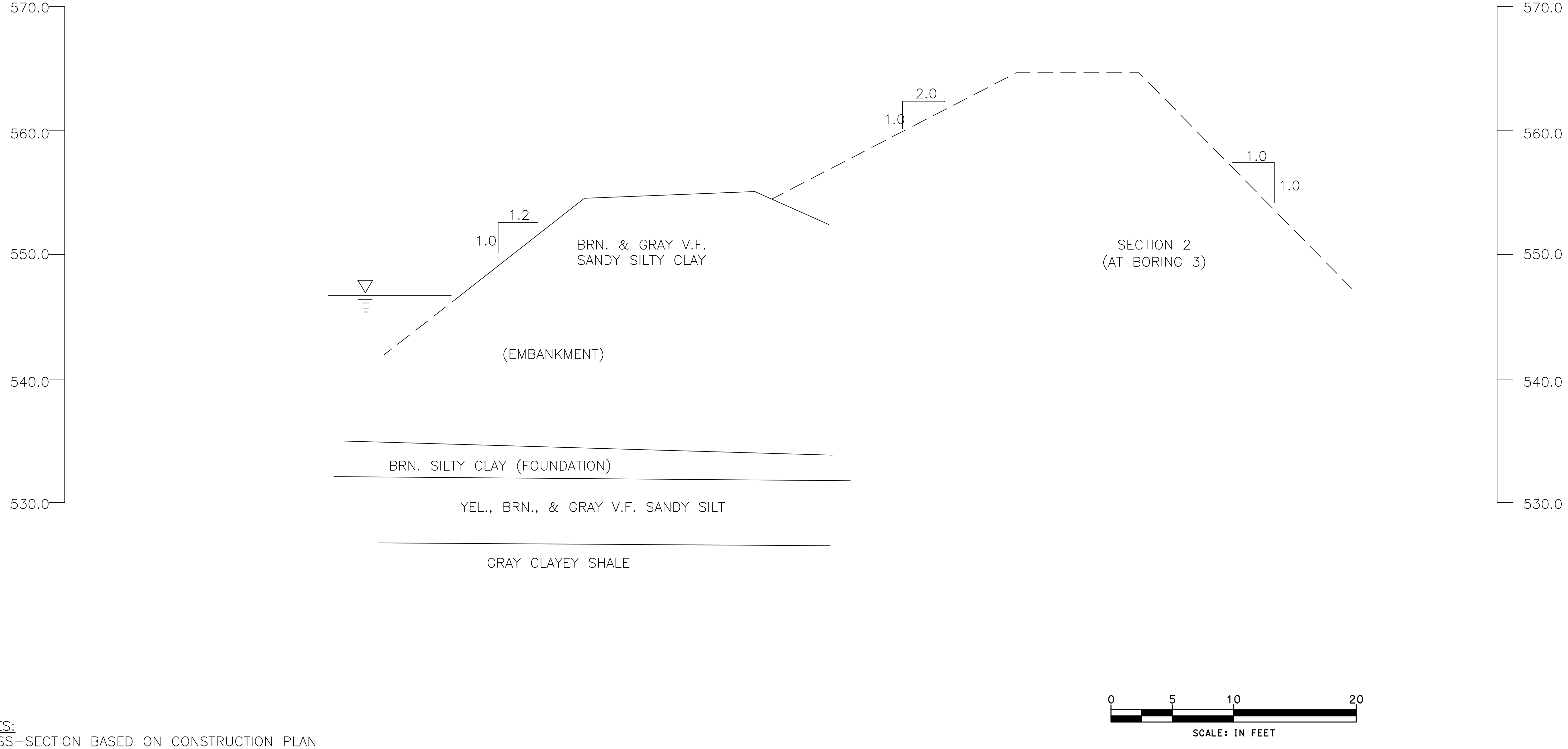
APPROVED BY: PMV DESIGNED BY: PMV DRAWN BY: RMC

DALLMAN ASH POND CROSS-SECTION AT STA. 10+00

PLANS PREPARED FOR
CITY, WATER, LIGHT & POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: OCTOBER 2016
PROJECT ID: 150077/0011
SHEET NUMBER:
X-SEC.

J:\S\Springfield CWLP\CWLP\dwg\DALLMAN X-SEC.dwg Tab: Layout1 Last Saved: October 7, 2016, by Ryan Curtis Plotted: Friday, October 07, 2016 4:17:38 PM



NOTES:
CROSS-SECTION BASED ON CONSTRUCTION PLAN DRAWINGS INCLUDED IN ENGINEERING REPORT PROPOSED EMBANKMENT MODIFICATIONS, HANSON ENGINEERS, INC., JULY 1987

REVISIONS

NO.	DATE	DESCRIPTION	BY

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PROFESSIONAL DESIGN ENGINEERING AND LAND SURVEYING FIRM #184001541

APPROVED BY: PMV
DESIGNED BY: PMV
DRAWN BY: RMC

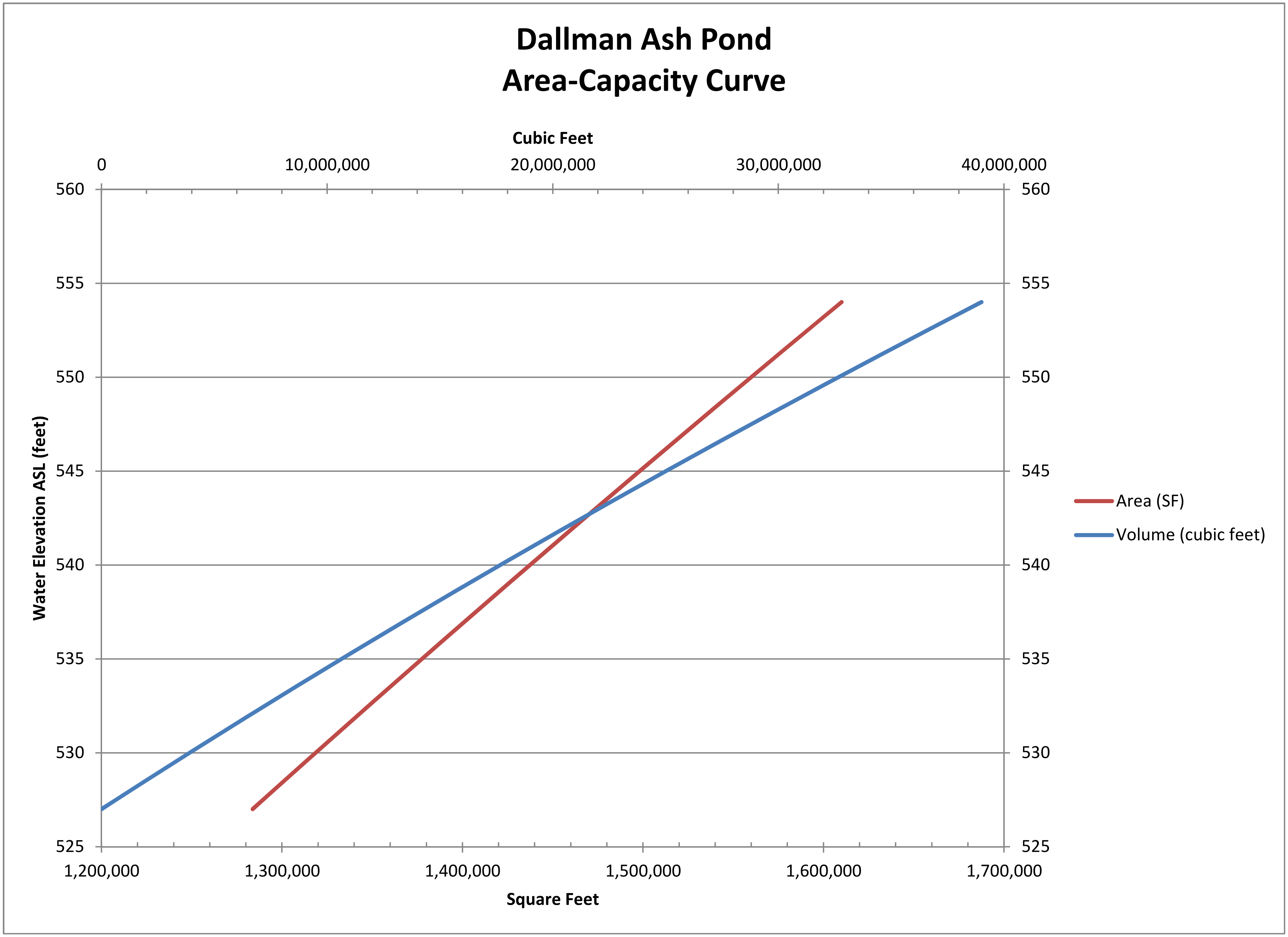
LAKESIDE ASH POND CROSS-SECTION 2

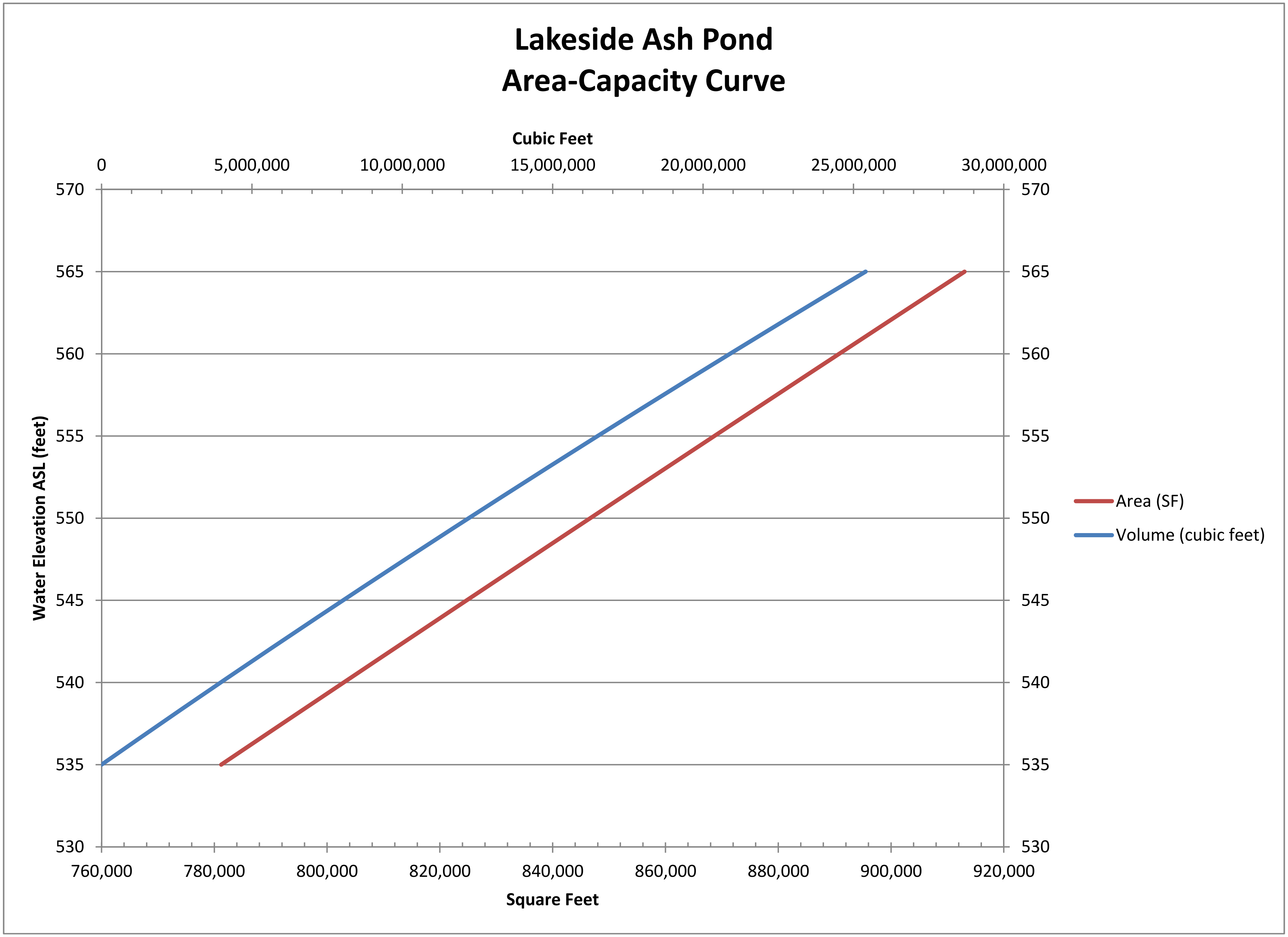
PLANS PREPARED FOR
CITY, WATER, LIGHT & POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: OCTOBER 2016
PROJECT ID: 150077/0011
SHEET NUMBER:
X-SEC.

APPENDIX B

Area-Capacity Curves


Dallman Ash Pond
Area-Capacity Curve
Cubic Feet
0
10,000,000
20,000,000
30,000,000
40,000,000
Water Elevation ASL (feet)
560
555
550
545
540
535
530
525
Area (SF)
Volume (cubic feet)
1,200,000
1,300,000
1,400,000
1,500,000
1,600,000
1,700,000
Square Feet


Lakeside Ash Pond
Area-Capacity Curve
Cubic Feet
0
5,000,000
10,000,000
15,000,000
20,000,000
25,000,000
30,000,000
Water Elevation ASL (feet)
570
565
560
555
550
545
540
535
530
760,000
780,000
800,000
820,000
840,000
860,000
880,000
900,000
920,000
Square Feet
Area (SF)
Volume (cubic feet)

ATTACHMENT 5

ANALYTICAL REPORT FOR CCR SURFACE IMPOUNDMENTS

- DOCUMENT 1: LAKESIDE ASH POND - NON CCR - OLD LIME SLUDGE LAB RESULTS - CURRENTLY IN LAKESIDE ASH POND
- DOCUMENT 2: LAKESIDE ASH POND - NON CCR - DRINKING WATER PURIFICATION PLANT SLUDGE ENTERING LAKESIDE ASH POND
- DOCUMENT 3: LAKESIDE ASH POND - CCR - LIME SLUDGE AND FILTER PLANT SLUDGE CCR THAT GOES TO LAKESIDE ASH POND
- DOCUMENT 4: DALLMAN ASH POND - NON CCR - EVAPORATION POND WATER FROM FGDS LANDFILL
- DOCUMENT 5: DALLMAN ASH POND P – EVAPORATION POND LIQUIDS - 21051663
- DOCUMENT 6: DALLMAN ASH POND – EVAPORATION POND LIQUIDS -21050850
- DOCUMENT 7: DALLMAN ASH POND - CCR - UNIT 31 32 AND 33 BOTTOM ASH
- DOCUMENT 8: DALLMAN ASH POND - CCR - JAN 2017 COMBINED FLY ASH TRACE METALS - REPRESENTS ALL ASH GOING TO DALLMAN ASH POND
- DOCUMENT 9: DALLMAN ASH POND - CCR - JAN 2017 COMBINED FLY ASH TOTALS DALLMAN ASH POND - REPRESENTS ALL ASH GOING TO DALLMAN ASH POND
- DOCUMENT 10: DALLMAN ASH POND - CCR - FLUE GAS DESULFURIZATION SLUDGE ENTERING DALLMAN ASH POND
- DOCUMENT 11: FGDS DEVELOPMENT LANDFILL LEACHATE ENTERING DALLMAN ASH POND

DOCUMENT 1: LAP - NON CCR - OLD LIME SLUDGE LAB RESULTS - CURRENTLY IN LAP

TMI Analytical Services

3501 South Sixth Street
Springfield, IL 62703

Fax:(217) 585-1838
Phone:(217) 585-1557

To: **C.W.L.P.**
201 E. LAKE SHORE DRIVE
SPRINGFIELD, IL 62707

ATTN: SUE CORCORAN

Site: CITY, WATER, LIGHT & POWER

Project: CWL00141

Sampled By: CORCORAN

Report Comments:

Receipt Date:08/05/97
Report Date:08/19/97
Sample Date:08/05/97

Client Sample ID: DRY SLUDGE

Lab ID: MM11970
Sample Matrix: SOLID
DRY SLUDGE

Analyte	Method	MDL	Units	Result
METALS				
Arsenic, dry weight	EPA 7060	0.200	mg/kg	9.70
Cadmium, dry weight	EPA 7130	1.25	mg/kg	BELOW MDL
Chromium, dry weight	EPA 7190	2.5	mg/kg	11.5
Lead, dry weight	EPA 7420	25	mg/kg	BELOW MDL
Mercury, dry weight	EPA 7470	0.25	mg/kg	BELOW MDL
Selenium, dry weight	EPA 7740	0.200	mg/kg	BELOW MDL
Copper, dry weight	EPA 7210	1.0	mg/kg	21.6
Zinc, dry weight	EPA 7950	0.50	mg/kg	92.9
Nickel, dry weight	EPA 7520	25	mg/kg	37.9
Barium, dry weight	EPA 7080	25	mg/kg	BELOW MDL
Silver, dry weight	EPA 7760	2.5	mg/kg	4.09
Hexavalent chromium	SM 312 B	10	mg/kg	BELOW MDL
WET CHEMISTRY				
Calcium Carbonate Equivalents	ASTM		lbs/yd3	1070
Percent Solids	EPA 160.3	0.5	%	94.1
pH, solid	EPA 150.1	NONE	UNITS	8.74

Signed: Corcoran
Authorized Signature

BELOW MDL = compound is not detected at or above the specified MDL.

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8100 North Austin Avenue • Morton Grove, IL 60053-3203
847.967.6666 • 800.246.0663 • fax: 847.967.6735 • www.emt.com

December 13, 2002

Sue Corcoran
City Water, Light & Power
201 East Lake Shore Drive
Springfield, IL 62707

RE Filter Plant Sludge Mix

Lab Orders:
02120160

Dear Ms. Sue Corcoran:

Enclosed are the analytical reports for the EMT Lab Order listed. If you have any questions, please contact me at 847-967-6666.

Sincerely,

Andrew R Wemmer
Project Manager

Approved by,

Mitchell Ostrowski
Laboratory Director

RECEIVED
DEC 17 2002
ENVIRONMENTAL
HEALTH & SAFETY

The Contents of this report apply to the sample(s) analyzed. No duplication is allowed except in its entirety.

State of Illinois Chemical Analysis in Drinking Water Accredited Lab. No. 100256
State of Wisconsin Wastewater and Hazardous Waste No. 999888890

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CLIENT: City Water, Light & Power
Project: Filter Plant Sludge Mix
Lab Order: 02120160

Date: *13-Dec-02*

CASE NARRATIVE

Unless other wise noted, analysis conducted according to the Methods specified in 40 CFR Part 136.

Unless otherwise noted, all method blanks, laboratory spikes, and/or matrix spikes met quality assurance objectives.

Sample results relate only to the analytes of interest tested and to the sample received at the laboratory.

All results are reported on a wet weight basis, unless otherwise noted. Dry weight adjusted results are indicated by the notation "dry" in the Units column.

Accreditation by the State of Illinois is not an endorsement or a guarantee of the validity of data generated. For specific information regarding EMT's scope of accreditation , please contact your EMT project manager.

The Reporting Limit listed on the Report of Laboratory Analysis is EMT's reporting limit for the analyte reported. For most test methods this reporting limit is primarily based upon the lowest point in the calibration curve. The Reporting Limit may not reflect the regulatory limit for the given analyte.

Method References:

SW=USEPA, Test Methods for Evaluating Solid Waste, SW-846.

E=USEPA Methods for the Determination of Inorganic Substances in Environmental Samples; Methods for Chemical Analysis of Water and Wastes; Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, 40 CFR Part 136, App A; methods for the Determination of Metals in Environmental Samples; Methods for the Determination of Organic Compounds in Drinking Water.

SM= APHA, Standard Methods for the Examination of Water and Wastewater.

D=ASTM, Annual Book of Standards

ACCREDITED ACCORDANCE WITH nelac
No. 100256

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Report of Laboratory Analysis

CLIENT: City Water, Light & Power
Lab Order: 02120160
Project: Filter Plant Sludge Mix
Lab ID: 02120160-01

Client Sample ID: Lime Sludge Mix
Report Date: 12/13/2002
Collection Date: 12/5/2002
Matrix: Solid

Analyses	Result	EMT Reporting Limit	Units	Date Analyzed	Analyst
Ammonia as N		Method: E350.2			
Nitrogen, Ammonia (As N)	< 0.9	0.9	mg/Kg-dry	12/9/2002	IA
Corrosivity by pH		Method: SW9045C			
pH	9.24		pH Units	12/7/2002 8:20:22 AM	VT
Hexavalent Chromium		Method: M3500-CR D			
Chromium, Hexavalent	< 0.13	0.13	mg/kg	12/6/2002	LNS
Solids, Total		Method: M2540B			
Total Solids (Percent)	43.9	0.1	% (Percent)	12/7/2002 1:43:11 PM	VT
Total Kjeldahl Nitrogen		Method: E351.3			
Nitrogen, Kjeldahl, Total	456	310	mg/Kg-dry	12/11/2002	IA
Volatile Matter		Method: D2369-86			
Volatile Matter	54.7	0.2	% (Percent)	12/10/2002	RM2
Hardness Calculated from Ca		Method: E200.7			
Hardness (Ca as CaCO3)	814000.	5.	mg/K-dry	12/10/2002 1:23:26 PM	MLB
ICP Metals Solids Total		Method: SW6010B			
Barium	108.	0.79	mg/Kg-dry	12/10/2002 1:23:26 PM	MLB
Cadmium	< 1.38	1.38	mg/Kg-dry	12/10/2002 1:23:26 PM	MLB
Calcium	326000.	57700.	mg/Kg-dry	12/10/2002 1:23:26 PM	MLB
Chromium	14.7	3.16	mg/Kg-dry	12/10/2002 1:23:26 PM	MLB
Copper	8.84	6.64	mg/Kg-dry	12/10/2002 1:23:26 PM	MLB
Lead	< 8.31	8.31	mg/Kg-dry	12/10/2002 1:23:26 PM	MLB
Nickel	15.4	8.31	mg/Kg-dry	12/10/2002 1:23:26 PM	MLB
Phosphorous	727.	75.7	mg/Kg-dry	12/10/2002 1:23:26 PM	MLB
Potassium	140.	98.7	mg/Kg-dry	12/12/2002 11:27:39 AM	AG
Silver	< 3.16	3.16	mg/Kg-dry	12/10/2002 1:23:26 PM	MLB
Zinc	18.8	6.72	mg/Kg-dry	12/10/2002 1:23:26 PM	MLB
Mercury in Solid		Method: SW7471A			
Mercury	0.135	0.0436	mg/Kg-dry	12/9/2002	VM

Qualifiers:

B - Analyte detected in the associated Method Blank
E - Estimated
H - Holding Time Exceeded
C - Laboratory not accredited for this parameter

S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
J - Analyte detected below quanititation limits

3

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No. 100256

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Report of Laboratory Analysis

CLIENT: City Water, Light & Power
Lab Order: 02120160
Project: Filter Plant Sludge Mix
Lab ID: 02120160-01

Client Sample ID: Lime Sludge Mix
Report Date: 12/13/2002
Collection Date: 12/5/2002
Matrix: Solid

Analyses	Result	EMT Reporting Limit	Units	Date Analyzed	Analyst
Metals by GFAA Total		**Method:**	**SW7060A**		
Arsenic	11.4	0.718	mg/Kg-dry	12/10/2002	IG
Metals by GFAA Total		**Method:**	**SW7740**		
Selenium	2.9	1.07	mg/Kg-dry	12/10/2002	IG

Qualifiers:

B - Analyte detected in the associated Method Blank
E - Estimated
H - Holding Time Exceeded
C - Laboratory not accredited for this parameter
S - Spike Recovery outside accepted recovery limits
R - RPD outside accepted recovery limits
J - Analyte detected below quanititation limits

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Morton Grove, Illinois 60053-3203

847-967-6666
FAX: 847-967-6735
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Chain of Custody Record

TURNAROUND TIME:
☐ RUSH
____ day turnaround
☒ ROUTINE

Due Date: __-__-__ COC #:

Company: City Water Light & Power
Address: 201 E. Lake Shore Drive
Springfield IL 62707
Phone #: (217) 757-8610 Fax #: (217) 757-8615
P.O. #:
Proj. #:
Client Contact: Sue Corcoran
Project ID / Location: Filter Plant Sludge Mix

Sample Type:
1. Waste Water
2. Drinking Water
3. Soil
4. Sludge
5. Oil
6. Groundwater
7. Groundwater (filtered)
[✓ 8. Other] Solid

Container Type:
P - Plastic
G - Glass
V - VOC Vial
B - Tedlar Bag
O - Other

Preservative:
1. None
2. H2SO4
3. HNO3
4. NaOH
5. HCl
6. MeOH
7. Zn Ace
8. Other

Sample I.D.	Sample Type	Container			Sampling					Preservation		Analyses											EMT USE ONLY EMT WORKORDER #02120160
		Size	Type	No.	By	Date	Time	pH	Temp.	Field	Lab	[illegible]	% Solids	calcium carbonate	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Lime Sludge mix	8		G	2	SC	12/5/02				1	1	X	X	X	X	X	X	X	X	X	X	X	01A

report in mg/kg for metals

Relinquished By:	Date / Time	Received By:	Date / Time
Susan Corcoran	Date: 12-5-02 Time: 2:00pm	Fed Ex	Date: 12-5-02 Time: 2:00pm
Relinquished By:	Date: - - Time: :	Received By:	Date: - - Time: :
Relinquished By:	Date: - - Time: :	Received For Lab By:	Date: 12-6-02 Time: 10:00

EMT USE ONLY
Client Code:
EMT Project I.D.
Jar Lot No.

☐ SAMPLE RECEIVED ON ICE.
☑ TEMPERATURE (Must be recorded if sampling was greater than 6 hrs. prior to sample receipt)
4°C

EMT SAMPLE RETURN POLICY ON BACK

SPECIAL INSTRUCTIONS:

Prairie Analytical Systems, INCORPORATED

Tuesday, February 26, 2013

Ms. Sue Corcoran
City, Water, Light & Power
3100 Stevenson Drive
Springfield, IL 62707

TEL: (217) 757-8610
FAX: (217) 757-8615

RE: Lime Sludge Analysis 1-25-13

PAS WO: 13A0445

Prairie Analytical Systems, Inc. received 1 sample(s) on 1/24/2013 for the analyses presented in the following report.

All applicable quality control procedures met method specific acceptance criteria unless otherwise noted.

This report shall not be reproduced, except in full, without the prior written consent of Prairie Analytical Systems, Inc.

If you have any questions, please feel free to contact me at (217) 753-1148.

Respectfully submitted,

Michael D. Brophy
Project Manager

Certifications: NELAP/NELAC - IL #100323

Prairie Analytical Systems, Inc. Date: 2/26/2013

LABORATORY RESULTS

Client: City, Water, Light & Power
Project: Lime Sludge Analysis 1-25-13 **Lab Order:** 13A0445
Client Sample ID: Lime Sludge **Lab ID:** 13A0445-01
Collection Date: 1/24/13 13:00 **Matrix:** Solid

Analyses	Result	Limit	Qual	Units	DF	Date Prepared	Date Analyzed	Method	Analyst
Metals by ICP-MS									
*Barium	109	0.802		mg/Kg dry	2	1/29/13 13:24	1/31/13 12:15	SW 6020A	JTC
*Mercury	0.428	0.160		mg/Kg dry	2	1/29/13 13:24	1/31/13 12:15	SW 6020A	JTC
*Selenium	1.94	0.802		mg/Kg dry	2	1/29/13 13:24	1/31/13 12:15	SW 6020A	JTC
TCLP Metals by ICP-MS									
*Arsenic	U	0.0150		mg/L	3	1/29/13 13:45	1/30/13 23:38	SW 6020A	JTC
*Mercury	U	0.000600		mg/L	3	1/29/13 13:45	1/30/13 23:38	SW 6020A	JTC
*Selenium	0.0174	0.0150		mg/L	3	1/29/13 13:45	1/30/13 23:38	SW 6020A	JTC
*Silver	U	0.0150		mg/L	3	1/29/13 13:45	1/30/13 23:38	SW 6020A	JTC
Metals by ICP									
*Aluminum	1030	160		mg/Kg dry	20	1/29/13 13:24	1/30/13 13:41	SW 6010B	JHN
*Arsenic	3.86	0.802		mg/Kg dry	1	1/29/13 13:24	1/30/13 12:42	SW 6010B	JHN
*Cadmium	0.460	0.401		mg/Kg dry	1	1/29/13 13:24	1/30/13 12:42	SW 6010B	JHN
*Chromium	10.5	0.401		mg/Kg dry	1	1/29/13 13:24	1/30/13 12:42	SW 6010B	JHN
*Cobalt	1.66	0.401		mg/Kg dry	1	1/29/13 13:24	1/30/13 12:42	SW 6010B	JHN
*Copper	8.16	0.401		mg/Kg dry	1	1/29/13 13:24	1/30/13 12:42	SW 6010B	JHN
*Iron	11500	802		mg/Kg dry	100	1/29/13 13:24	1/30/13 13:37	SW 6010B	JHN
*Lead	0.777	0.401		mg/Kg dry	1	1/29/13 13:24	1/30/13 12:42	SW 6010B	JHN
*Manganese	391	4.01		mg/Kg dry	10	1/29/13 13:24	1/30/13 13:44	SW 6010B	JHN
*Molybdenum	0.595	0.401		mg/Kg dry	1	1/29/13 13:24	1/30/13 12:42	SW 6010B	JHN
*Nickel	7.88	0.401		mg/Kg dry	1	1/29/13 13:24	1/30/13 12:42	SW 6010B	JHN
*Potassium	204	80.2		mg/Kg dry	1	1/29/13 13:24	1/30/13 12:42	SW 6010B	JHN
*Sodium	107	40.1		mg/Kg dry	1	1/29/13 13:24	1/30/13 12:42	SW 6010B	JHN
*Vanadium	22.2	0.401		mg/Kg dry	1	1/29/13 13:24	1/30/13 12:42	SW 6010B	JHN
*Zinc	14.0	0.401		mg/Kg dry	1	1/29/13 13:24	1/30/13 12:42	SW 6010B	JHN
TCLP Metals by ICP									
*Barium	0.0697	0.00500		mg/L	1	1/29/13 13:45	1/30/13 11:57	SW 6010B	JHN
*Cadmium	U	0.00500		mg/L	1	1/29/13 13:45	1/30/13 11:57	SW 6010B	JHN
*Chromium	U	0.00500		mg/L	1	1/29/13 13:45	1/30/13 11:57	SW 6010B	JHN
*Lead	U	0.00500		mg/L	1	1/29/13 13:45	1/30/13 11:57	SW 6010B	JHN
Anions by Ion Chromatography									
Sulfate	37100	1010		mg/Kg dry	200	1/30/13 14:50	1/30/13 23:30	EPA 300.0	JHN
Conventional Chemistry Parameters									
Sulfite	U	33.8		mg/Kg dry	1	1/29/13 9:05	1/29/13 13:25	SM 4500-SO3	RSR
Total Alkalinity (as CaCO3)	537000	337		mg/Kg dry	1	1/28/13 9:04	1/28/13 13:16	SM 2320B (M	CMH
Ammonia (as N)	11.6	3.32		mg/Kg dry	1	2/4/13 8:58	2/4/13 12:04	SM 4500-NH	CMH
Ash Content	96.0	0.100		%	1	1/30/13 14:20	1/31/13 9:17	ASTM D2974	CCD
Organic Matter	4.03	0.100		%	1	1/30/13 14:20	1/31/13 9:17	ASTM D2974	CCD
Fractional Organic Carbon	2.34	0.100		%	1	1/30/13 14:20	1/31/13 9:17	ASTM D2974	CCD
*Hexavalent Chromium	U	1.04		mg/Kg dry	1	1/29/13 10:44	1/30/13 11:00	SW 7196A	RSR
*Reactive Cyanide	U	2.01		mg/Kg dry	1	1/28/13 9:32	1/28/13 16:07	SW 9014	CMH
*Ignitability (Flash Point)	>200	50.0		°F	1	1/28/13 10:30	1/28/13 11:04	SW 1010 (M)	CCD
Total Kjeldahl Nitrogen	751	82.0		mg/Kg dry	1	1/29/13 9:13	1/30/13 11:02	EPA 351.4 (M	CMH
Oil and Grease	U	56.3		mg/Kg dry	1	1/29/13 9:48	1/29/13 15:39	EPA 1664A (	SLS

LABORATORY RESULTS

Client:	City, Water, Light & Power		
Project:	Lime Sludge Analysis 1-25-13	**Lab Order:**	13A0445
Client Sample ID:	Lime Sludge	**Lab ID:**	13A0445-01
Collection Date:	1/24/13 13:00	**Matrix:**	Solid

Analyses	Result	Limit	Qual	Units	DF	Date Prepared	Date Analyzed	Method	Analyst
Biochemical Oxygen Demand	**139**	33.8		mg/Kg dry	1	1/28/13 10:05	2/2/13 10:30	SM 5210B (M	JHN
Chemical Oxygen Demand	**22600**	10300		mg/Kg dry	25	1/29/13 9:05	1/30/13 9:03	SM 5220D	RSR
*Paint Filter	Pass			P/F	1	1/28/13 10:30	1/28/13 11:04	SW 9095A	CCD
***pH**	**8.29**	0.0100		pH Units	1	1/28/13 10:40	1/28/13 14:17	SW 9045C	CCD
*Phenolics	U	8.44		mg/Kg dry	1	1/28/13 9:00	1/28/13 14:04	SW 9065 (M)	CCD
Phosphorus	**600**	84.4	MC	mg/Kg dry	50	1/30/13 10:10	1/30/13 14:48	EPA 365.2 (M	RSR
Total Volatile Solids	**4.03**	0.100		%	1	1/30/13 14:20	1/31/13 9:17	SM 2540E (M	CCD
*Reactive Sulfide	U	15.8		mg/Kg dry	1	1/30/13 12:58	1/30/13 14:00	SW 9034	CMH
Percent Moisture	**40.8**	0.100		%	1	1/29/13 10:05	1/29/13 15:47	ASTM D2216	CCD
Percent Solids	**59.2**	0.100		%	1	1/29/13 10:05	1/29/13 15:47	ASTM D2216	CCD
Precision Petroleum Labs, Inc									
Sulfur	U	0.001		Wt%	1	2/21/13 0:00	2/21/13 0:00	D-4294	SUB
Extractable Organic Halides	U	1		mg/Kg	1	2/21/13 0:00	2/21/13 0:00	SW 9023	SUB

LABORATORY RESULTS

Client: City, Water, Light & Power
Project: Lime Sludge Analysis 1-25-13 **Lab Order:** 13A0445

Notes and Definitions

S	Spike recovery outside acceptance limits.
R	RPD outside acceptance limits.
P1	Pass
MC	Matrix correction performed due to the presence of turbidity.
I	Matrix interference.
E	Result above quantitation range.
*	NELAC certified compound.
U	Analyte not detected (i.e. less than RL or MDL).

Page 5 of 5

Chain of Custody Record

Central IL - 1210 Capital Airport Drive - Springfield, IL 62707-8490 - Phone (217) 753-1148 - Facsimile (217) 753-1152
Chicago IL Office - 9114 Virginia Rd., Ste 112 - Lake in the Hills, IL 60156 - Phone (847) 651-2604 - Facsimile (847) 458-9680
Central/Southern IL Office - Phone (217) 414-7762 - Facsimile (217) 223-7922

Prairie Analytical Systems, Incorporated
www.prairieanalytical.com

Client: CWLP
Address: 201 E Lake Shore Drive
City, State, Zip Code: Springfield IL 62712
Phone / Facsimile: 757-8710
Project Name / Number: Lime Sludge Analyses
Project Location: Lime Sludge Pond Staging area
P.O. # or Invoice To: CWLP
Contact Person: Sue [illegible]

Analysis and/or Method Requested:

1. Green sheet analyses minus organics - mg/L
2. Reactive Cyanide mg/Kg dry; Reactive Sulfide
3. % Total Solids; % total volatile solids
4. % moisture; COD, BOD5, TOC
5. Total alkalinity as CaCO3
6. O+G mg/L; Sulfate + Sulfite Total mg/L
7. ammonia mg/L; Total Kjeldahl Nitrogen mg/L
8. Sulfur, Al, As, Ba, Cd, Co, Chrom hex, Cr, Cu
9. Fe, P, K, Hg, Mn, Mb, Ni, Pb, Se, Na, V, Zn

Reporting:
TACO ☐ Resid ☐ Ind/Comm
CALM ☐ A ☐ D ☐ B ☐ E ☐ C ☐ F
RISC ☐ Resid ☐ Indust

Sample Description	Sampling Date	Sampling Time	Matrix Code	Preserv Code	No. of Containers	Sample Type Comp.	Sample Type Grab	1	2	3	4	5	6	7	8	9	Sampler Comments
Lime Sludge	1/24/13	1100	S	0	1	X		X	X	X	✓	X	✓	✓	✓	X	
																	metals on
	sample is a composite of 10 sites																mg/Kg dry

Matrix Code: A - Aqueous; DW - Drinking Water; GW - Ground Water; NA - Non-Aqueous Liquid; S - Solid; O - Oil; X - Other (Specify)
Preserv Code: 0 - None; 1 - HCl; 2 - H2SO4; 3 - HNO3; 4 - NaOH; 5 - 5035 Kit; X - Other (Specify)

Relinquished By	Date	Time	Received By	Date	Time	Method of Shipment
	1/24/13	2:35		1-24-13	2:35	Hand

Special Instructions: in out of field

Turnaround Time: Standard ☒ Rush ☐
Date Required:
QC Level 1☐ 2☐ 3☐ 4☐
On wet ice? Yes [✓ No]
Temperature (°C) 17.4

PAS COC Rev. 3

Page 1 of 1

Copies: White - Client / Yellow - PAS, Inc. / Pink - Sampler

DA Daily Analytical Laboratories
1621 W. Candletree Drive Peoria, Illinois 61614
Tel. (309) 692-5252 (800) 752-6651

City Water, Light & Power
201 E Lake Shore Drive
Springfield, IL 62707

Attn: Ms. Sue Corcoran

Work ID: Scrubber Sludge
P O # :

Date Received: 07/06/95
Date of Report: 07/24/95
Work Order: 95-07-112
Job Number:
# of Samples: 1

Test	Units	Scrubber Sludge 07/05/95 08:30
Silver, Total Dry Wt.	mg/kg	<0.21
Silver, Total	mg/kg	<0.19
Aluminum, Total Dry Wt.	mg/kg	140
Aluminum, Total	mg/kg	130
Arsenic, Total Dry Wt.	mg/kg	<1.2
Arsenic, Total	mg/kg	<1.1
Barium, Total Dry Wt.	mg/kg	0.60
Barium, Total	mg/kg	0.55
Cadmium, Total Dry Wt.	mg/kg	<0.10
Cadmium, Total	mg/kg	<0.09
Cobalt, Total Dry Wt.	mg/kg	<0.21
Cobalt, Total	mg/kg	<0.19
Chromium, Total Dry Wt.	mg/kg	0.68
Chromium, Total	mg/kg	0.62
Copper, Total Dry Wt.	mg/kg	0.44
Copper, Total	mg/kg	0.40
Iron, Total Dry Wt.	mg/kg	330
Iron, Total	mg/kg	300
Mercury, Total Dry Wt.	mg/kg	0.071
Mercury, Total	mg/kg	0.065
Potassium, Total Dry Wt.	mg/kg	68

RECEIVED
JUL 25 1995
ENVIRONMENTAL
HEALTH & SAFETY

Test	Units	Scrubber Sludge 07/05/95 08:30
Potassium, Total	mg/kg	62
Manganese, Total Dry Wt.	mg/kg	18
Manganese, Total	mg/kg	16
Molybdenum, Total Dry Wt.	mg/kg	<0.42
Molybdenum, Total	mg/kg	<0.38
Sodium, Total Dry Wt.	mg/kg	9.2
Sodium, Total	mg/kg	8.4
Nickel, Total Dry Wt.	mg/kg	0.38
Nickel, Total	mg/kg	0.34
Lead, Total Dry Wt.	mg/kg	<0.42
Lead, Total	mg/kg	<0.38
Selenium, Total Dry Wt.	mg/kg	<0.84
Selenium, Total	mg/kg	<0.76
Sulfur, Total Dry Wt.	mg/kg	48000
Sulfur, Total	mg/kg	44000
Vanadium, Total Dry Wt.	mg/kg	0.42
Vanadium, Total	mg/kg	0.38
Zinc, Total Dry Wt.	mg/kg	0.56
Zinc, Total	mg/kg	0.51
Metals Digest, nonaqueous	date of prep.	07/07/95
Acidity, Total Dry Wt.	mg/kg	18000
Acidity, Total as CaCO3	mg/kg	16000
Alkalinity, Total Dry Wt.	mg/kg	10000
Alkalinity, Total as CaCO3	mg/kg	9500
Biochemical Oxygen Demand	mg/kg	<30

Page 3 DAILY LABS REPORT Work Order # 95-07-112
Received: 07/06/95 07/24/95 14:14:13 Continued From Above

Test	Units	Scrubber Sludge 07/05/95 08:30
Cyanide, Reactive Dry Wt.	mg/kg	<0.51
Cyanide, Reactive	mg/kg	<0.46
Cyanide, Total Dry Wt.	mg/kg	<0.52
Cyanide, Total	mg/kg	<0.47
COD, Total Dry Wt.	mg/kg	600
Chem. Oxygen Dem. Hi Range	mg/kg	550
Chromium, Hex. Dry Wt.	mg/kg	<0.5
Chromium, Hexavalent	mg/kg	<0.5
Flashpoint, Closed Cup	degrees F	>200
Grease & Oil, Dry Wt.	mg/kg	120
Grease & Oil	mg/kg	110
Nitrogen, Ammonia Dry Wt.	mg/kg	<12
Nitrogen, Ammonia as N	mg/kg	<11
Phenol, Dry Wt.	mg/kg	4.8
Phenol	mg/kg	4.4
pH Nonaqueous	units	7.5
Phosphorus, Total Dry Wt.	mg/kg	75
Phosphorus, Total as P	mg/kg	68
Radio Chemistry	C/100 ml	*
Sulfide, Reactive Dry Wt.	mg/kg	<0.51
Reactive Sulfide	mg/kg	<0.46
Sulfide, Total Dry Wt.	mg/kg	0.86
Total Sulfide	mg/kg	0.78
Sulfate, Dry Wt.	mg/kg	16000
Sulfate	mg/kg	15000

Page 4 DAILY LABS REPORT Work Order # 95-07-112
Received: 07/06/95 07/24/95 14:14:13 Continued From Above

Test	Units	Scrubber Sludge 07/05/95 08:30
Specific Conductivity	umhos/cm	21000
Total Organic Carbon	mg/kg	370
Total Solids	%w/w	91
Tot Volatile Solid Dry Wt.	%w/w	20
Volatile Acids of Filtrate	mg/l	36

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* Subcontracted, report to follow.

Certified By:
David J. Cirilli
Senior Inorganic Chemist

Daily Analytical is an IEPA certified laboratory.
All analyses are performed by methodology
acceptable to USEPA and IEPA.

Prairie Analytical Systems, Inc.

Date: *24-Jul-07*

CLIENT: City, Water, Light & Power
Project: Lime Sludge
Lab Order: 0706403

Lab ID: 0706403-001
Client Sample ID: Lime Sludge
Collection Date 6/29/2007 10:10:00 AM
Matrix: SOLID

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
METALS ANALYSIS		**SW6020**		**(SW3050B)**		Analyst: **MCL**
Arsenic	16.0	0.798		mg/Kg-dry	2	7/8/2007 1:07:00 AM
Barium	84.2	0.798		mg/Kg-dry	2	7/8/2007 1:07:00 AM
Cadmium	U	0.798		mg/Kg-dry	2	7/8/2007 1:07:00 AM
Chromium	10.1	0.798		mg/Kg-dry	2	7/8/2007 1:07:00 AM
Copper	3.27	1.60		mg/Kg-dry	2	7/8/2007 1:07:00 AM
Lead	1.71	0.798		mg/Kg-dry	2	7/8/2007 1:07:00 AM
Mercury	0.306	0.160		mg/Kg-dry	2	7/8/2007 1:07:00 AM
Nickel	9.28	0.798		mg/Kg-dry	2	7/8/2007 1:07:00 AM
Phosphorus	701	16.0		mg/Kg-dry	2	7/9/2007 4:54:00 PM
Potassium	U	160		mg/Kg-dry	2	7/9/2007 4:54:00 PM
Selenium	2.13	0.798		mg/Kg-dry	2	7/8/2007 1:07:00 AM
Silver	U	0.798		mg/Kg-dry	2	7/8/2007 1:07:00 AM
Zinc	15.9	1.60		mg/Kg-dry	2	7/8/2007 1:07:00 AM
VOLATILE SOLIDS ANALYSIS		**E160.4 (M)**				Analyst: **AJD**
Total Volatile Solids	1.83	0.100		%	1	7/12/2007
ALKALINITY ANALYSIS		**M2320 B M**				Analyst: **AJD**
Alkalinity, Total (as CaCO3)	182000	8390		mg/Kg-dry	10	7/11/2007
AMMONIA ANALYSIS		**M4500-NH3 F M**				Analyst: **ARR**
Ammonia (as N)	U	14.5		mg/Kg-dry	1	7/12/2007
HEXAVALENT CHROMIUM ANALYSIS		**SW7196A**		**(SW3060A)**		Analyst: **RMN**
Chromium, Hexavalent	U	11.5		mg/Kg-dry	10	7/18/2007
PH ANALYSIS		**SW9045C**				Analyst: **ARR**
pH	8.79	0.01		pH Units	1	7/3/2007 11:11:00 AM
PERCENT MOISTURE ANALYSIS		**D2216**				Analyst: **RMN**
Percent Moisture	41.6	0.01		wt%	1	7/12/2007
PERCENT SOLIDS ANALYSIS		**D2216**				Analyst: **RMN**
Percent Solids	58.4	0.01		wt%	1	7/12/2007
TOTAL KJELDAHL NITROGEN ANALYSIS		**M4500-NORG B**				Analyst: **AJD**
Total Kjeldahl Nitrogen	408	150		mg/Kg-dry	1	7/12/2007 4:12:00 PM

Qualifiers:

B - Analyte detected in the associated method blank.

E - Value above quantitation range.

H - Analysis performed past holding time.

HT - Sample received past holding time.

J - Analyte detected between RL and MDL.

R - RPD outside acceptance limits.

S - Spike recovery outside acceptance limits.

U - Analyte not detected (i.e. less than RL or MDL).

Prairie Analytical Systems, Inc.

Date: *07-Jan-05*

CLIENT: City, Water, Light & Power
Project: Lime Sludge Mixture
Lab Order: 0412152

Lab ID: 0412152-001
Client Sample ID: Limesludge Mixture
Collection Date: 12/27/2004 3:00:00 PM
Matrix: SOLID

Analyses	Result	Limit	Qual	Units	DF	Date Analyzed
METALS ANALYSIS		**SW6020**		**(SW3050B)**		Analyst: **MCL**
Arsenic	4.88	0.601		mg/Kg-dry	2	12/30/2004 12:19:00 PM
Barium	35.3	0.601		mg/Kg-dry	2	12/30/2004 12:19:00 PM
Cadmium	U	0.601		mg/Kg-dry	2	12/30/2004 12:19:00 PM
Chromium	15.5	0.601		mg/Kg-dry	2	12/30/2004 12:19:00 PM
Copper	7.15	1.20		mg/Kg-dry	2	12/30/2004 12:19:00 PM
Lead	4.33	0.120		mg/Kg-dry	2	12/30/2004 12:19:00 PM
Mercury	U	0.120		mg/Kg-dry	2	1/6/2005 8:30:00 PM
Nickel	13.7	0.601		mg/Kg-dry	2	1/6/2005 8:30:00 PM
Phosphorus	409	12.0		mg/Kg-dry	2	1/6/2005 8:30:00 PM
Potassium	262	120		mg/Kg-dry	2	1/6/2005 8:30:00 PM
Selenium	U	0.601		mg/Kg-dry	2	12/30/2004 12:19:00 PM
Silver	U	0.601		mg/Kg-dry	2	12/30/2004 12:19:00 PM
Zinc	28.6	1.20		mg/Kg-dry	2	12/30/2004 12:19:00 PM
VOLATILE SOLIDS ANALYSIS		**E160.4 (M)**				Analyst: **RMN**
Total Volatile Solids	0.288	0.100		%	1	1/7/2005
ALKALINITY ANALYSIS		**M2320 B M**				Analyst: **RMN**
Alkalinity, Total (as CaCO3)	640	120		mg/Kg-dry	1	1/7/2005
AMMONIA ANALYSIS		**M4500-NH3 F M**				Analyst: **RMN**
Ammonia (as N)	U	12.0		mg/Kg-dry	1	1/7/2005
HEXAVALENT CHROMIUM ANALYSIS		**SW7196A**		**(SW3060A)**		Analyst: **RMN**
Chromium, Hexavalent	U	6.35		mg/Kg-dry	10	1/7/2005
PH ANALYSIS		**SW9045C**				Analyst: **RMN**
pH	7.37	0.01		pH Units	1	1/7/2005
PERCENT MOISTURE ANALYSIS		**D2216**				Analyst: **RMN**
Percent Moisture	21.2	0.01		wt%	1	1/3/2005
PERCENT SOLIDS ANALYSIS		**D2216**				Analyst: **RMN**
Percent Solids	78.8	0.01		wt%	1	1/3/2005
TOTAL KJELDAHL NITROGEN ANALYSIS		**M4500-NORG B**				Analyst: **RMN**
Total Kjeldahl Nitrogen	99.0	60.7		mg/Kg-dry	1	1/5/2005

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Qualifiers:

B - Analyte detected in the associated method blank.

E - Value above quantitation range.

H - Analysis performed past holding time.

HT - Sample received past holding time.

J - Analyte detected between RL and MDL.

R - RPD outside acceptance limits.

S - Spike recovery outside acceptance limits.

U - Analyte not detected (i.e. less than RL or MDL).

An Analytical
Testing Laboratory

Prairie Analytical
Systems, INCORPORATED

1210 Capital Airport Drive
Springfield, Illinois 62707
Phone: 217-753-1148
Fax: 217-753-1152
www.prairieanalytical.com

January 07, 2005

Ms. Sue Corcoran
City, Water, Light & Power
3100 Stevenson Drive
Springfield, IL 62707

RE: Lime Sludge Mixture

PAS Order No.: 0412152

Dear Ms. Sue Corcoran:

Prairie Analytical Systems, Inc. received 1 sample on 12/28/2004 12:05:00 PM for the analyses presented in the following report.

All applicable quality control procedures met method specific acceptance criteria.

This report shall not be reproduced, except in full, without the prior written consent of Prairie Analytical Systems, Inc.

If you have any questions, please feel free to call me at (217) 753-1148.

Sincerely,

Michael D. Brophy
Project Manager

Chain of Custody Record

1210 Capital Airport Drive • Springfield, IL 62707-8490 • Phone (217) 753-1148 • Facsimile (217) 753-1152 • E-mail info@prairieanalytical.com

Prairie Analytical Systems, INCORPORATED

Client	CWLP	Client Project	lime sludge mixture
Address	201 E. Lake Shore Drive	Project Location	FGDS landfill
City, State Zip Code	Spfld IL 62712	Sampler(s) / Phone No.	Sue Corcoran / 757-8610
Phone / Facsimile No.	757-8610 x1108 / 757 8615	Turnaround Time	Standard [X] Rush [ ] Date Required:
Contact Person	Sue Corcoran	P.O. # or Invoice To	CWLP - Sue Corcoran

Sample Description (10 Characters Only)	Sampling		Container		³M / ⁴P Code	Analysis and / or Method Requested	Laboratory Comments
	Date	Time	¹ Size	² Type / No.			
limesludge mixture	12/27/04	3:00	quart	G / 1	S / A	Ba, Cd, Cr, Cu, Pb, Hg, Ni, P, K, Ag, Zn	
				/	/	Arsenic, Selenium,	
				/	/	Alkalinity, Total (as $CaCO_3$)	
				/	/	Chromium hexavalent	
				/	/	ph	
				/	/	% moisture	
				/	/	Nitrogen, Ammonia (As N)	
				/	/	Total solids	
				/	/	Nitrogen, Kjeldahl Total	
				/	/	volatile matter	
				/	/		
				/	/		

¹ Size of Container	40 mL	125 mL	250 mL	500 mL	1000 mL	O - Other (Specify)
² Type of Container	G - Glass (Clear)	AG - Glass (Amber)	P - HDPE	VC - Volatile Core	SC - Soil Core	O - Other (Specify)
³ M = Matrix Code	A - Aqueous	DW - Drinking Water	NA - Non-aqueous Liquid	SE - Saline Water	S - Solids	O - Other (Specify)
⁴ P = Preservative Code	A - None	B - HNO_3	C - H_2SO_4	D - NaOH	E - HCl	O - Other (Specify)

Relinquished By	Date	Time	Received By	Date	Time	Method of Shipment
Patrick A. Tucker	12-28-04	12:05		12/28/04	12:05	HAND

Special Instructions:

Temperature (°C) 10.1

Page _____ of _____

Copies: White - Client Yellow - PAS, Inc. Pink - Sampler

TMI Analytical Services

3501 South Sixth Street
Springfield, IL 62703

Fax:(217) 585-1838
Phone:(217) 585-1557

To: **C.W.L.P.**
201 E. LAKE SHORE DRIVE
SPRINGFIELD, IL 62707

Project: CWL00141

Sampled By: S CORCORAN

Receipt Date: 10/31/96
Report Date: 11/01/96
Sample Date: 10/28/96

ATTN: SUE CORCORAN

Report Comments:

Site: CITY, WATER, LIGHT & POWER

Client Sample ID: LIME
SLUDGE MIX.
Lab ID: MM09690
Sample Matrix: SOLID

Analyte	Method	MDL	Units	Result
Manganese, total	EPA 7460	12.5	mg/kg	425
Boron/total	EPA 6010A	10	mg/kg	94.2
Molybdenum/total	EPA 6010A	10	mg/kg	BELOW MDL

Signed: Corcoran
Authorized Signature

BELOW MDL = compound is not detected at or above the specified MDL.

Prairie Analytical Systems, Inc.

An Environmental and Agricultural Testing Laboratory

Page 1 of 1

City, Water, Light & Power
201 East Lake Shore Drive
Springfield, IL 62707

Date Sampled: 27 September 1996
Date Received: 30 September 1996
Date Analyzed: 01-03 October 1996
Date Reported: 03 October 1996

Project: Lime Sludge/Scrubber Sludge

PAS Project Code: GEN-038

Sample Description:	Lime Sludge	Scrubber Sludge	Lime/Scrubber
Sample Number:	9609304057	9609304058	9609304059

Total Metal Analysis

Parameters	Detection Limit mg/kg	Result mg/kg	Result mg/kg	Result mg/kg	E.P.A. Method
Arsenic, Total	0.2	15.9	<0.2	2.2	7060A
Barium, Total	0.1	135	2.4	41.8	7081
Cadmium, Total	0.1	0.2	<0.1	0.1	7131A
Chromium, Total	0.1	5.2	1.1	2.3	7191
Chromium, Hexavalent	2.5	<2.5	<2.5	<2.5	7196A
Copper, Total	0.1	9.9	<0.1	4.4	7211
Lead, Total	0.1	0.2	<0.1	<0.1	7421
Manganese, Total	0.1	423	8.4	205	7461
Mercury, Total	0.01	<0.01	0.06	0.21	7471A
Nickel, Total	0.1	9.0	<0.1	4.0	6010A
Phosphorus, Total	0.1	1354	92.6	319	6010A
Selenium, Total	0.2	<0.2	<0.2	<0.2	7740
Silver, Total	0.1	<0.1	<0.1	<0.1	7761
Zinc, Total	0.1	33.9	0.9	2.9	7951

Miscellaneous Analysis

Parameters	Detection Limit mg/kg	Result mg/kg	Result mg/kg	Result mg/kg	S.M. Method
Ammonia (as N)	1.0	<1.0	<1.0	<1.0	4500-NH_3F
Organic Nitrogen	25	1410	<25	<25	4500-N_{ORG}B
Total Kjeldahl Nitrogen	25	1410	<25	<25	4500-N_{ORG}B

Stephen R. Johnson, Laboratory Director

P.O. Box 8326 • 205 Main Terminal • Capital Airport • Springfield, IL 62791-8326 • (217) 753-1148

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Form PAS-RWMET3

DOCUMENT 2: LAP - NON CCR - DRINKING WATER PURIFICATION PLANT SLUDGE ENTERING LAP

Teklab, Inc.
Environmental Laboratory

http://www.teklabinc.com/

March 03, 2021

Rhon Hasenyager
Hanson Professional Services, Inc.
1525 South Sixth Street
Springfield, IL 62703
TEL: (217) 747-9235
FAX: (217) 788-5241

NELAP ACCREDITED TNI LABORATORY

Illinois	100226
Kansas	E-10374
Louisiana	05002
Louisiana	05003
Oklahoma	9978

RE: CWLP - 19E0107/4000

WorkOrder: 21021164

Dear Rhon Hasenyager:

TEKLAB, INC received 2 samples on 2/23/2021 4:30:00 PM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. Unless otherwise documented within this report, Teklab Inc. analyzes samples utilizing the most current methods in compliance with 40CFR. All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Elizabeth A. Hurley

Elizabeth A. Hurley
Project Manager
(618)344-1004 ex 33
ehurley@teklabinc.com

Report Contents

http://www.teklabinc.com/

Client: Hanson Professional Services, Inc.
Work Order: 21021164
Client Project: CWLP - 19E0107/4000
Report Date: 03-Mar-21

This reporting package includes the following:

Definitions

Client: Hanson Professional Services, Inc.
Work Order: 21021164
Client Project: CWLP - 19E0107/4000
Report Date: 03-Mar-21

Abbr	Definition
*	Analytes on report marked with an asterisk are not NELAP accredited
CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
CRQL	A Client Requested Quantitation Limit is a reporting limit that varies according to customer request. The CRQL may not be less than the MDL.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilution factors.
DNI	Did not ignite
DUP	Laboratory duplicate is a replicate aliquot prepared under the same laboratory conditions and independently analyzed to obtain a measure of precision.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample is a sample matrix, free from the analytes of interest,spiked with verified known amounts of analytes and analyzed exactly like a sample to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MBLK	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	"The method detection limit is defined as the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results."
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method's recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
NC	Data is not acceptable for compliance purposes
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions.
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes.
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TIC	Tentatively identified compound: Analytes tentatively identified in the sample by using a library search. Only results not in the calibration standard will be reported as tentatively identified compounds. Results for tentatively identified compounds that are not present in the calibration standard, but are assigned a specific chemical name based upon the library search, are calculated using total peak areas from reconstructed ion chromatograms and a response factor of one. The nearest Internal Standard is used for the calculation. The results of any TICs must be considered estimated, and are flagged with a "T". If the estimated result is above the calibration range it is flagged "ET"
TNTC	Too numerous to count (> 200 CFU)

Definitions

Client: Hanson Professional Services, Inc.
Work Order: 21021164
Client Project: CWLP - 19E0107/4000
Report Date: 03-Mar-21

Qualifiers

- Unknown hydrocarbon
C - RL shown is a Client Requested Quantitation Limit
H - Holding times exceeded
J - Analyte detected below quantitation limits
ND - Not Detected at the Reporting Limit
S - Spike Recovery outside recovery limits
X - Value exceeds Maximum Contaminant Level
B - Analyte detected in associated Method Blank
E - Value above quantitation range
I - Associated internal standard was outside method criteria
M - Manual Integration used to determine area response
R - RPD outside accepted recovery limits
T - TIC(Tentatively identified compound)

Case Narrative

http://www.teklabinc.com/

Client: Hanson Professional Services, Inc.
Client Project: CWLP - 19E0107/4000
Work Order: 21021164
Report Date: 03-Mar-21

Cooler Receipt Temp: 7.8 °C

Locations

Collinsville

Address	5445 Horseshoe Lake Road Collinsville, IL 62234-7425
Phone	(618) 344-1004
Fax	(618) 344-1005
Email	jhriley@teklabinc.com

Springfield

Address	3920 Pintail Dr Springfield, IL 62711-9415
Phone	(217) 698-1004
Fax	(217) 698-1005
Email	KKlostermann@teklabinc.com

Kansas City

Address	8421 Nieman Road Lenexa, KS 66214
Phone	(913) 541-1998
Fax	(913) 541-1998
Email	jhriley@teklabinc.com

Collinsville Air

Address	5445 Horseshoe Lake Road Collinsville, IL 62234-7425
Phone	(618) 344-1004
Fax	(618) 344-1005
Email	EHurley@teklabinc.com

Chicago

Address	1319 Butterfield Rd. Downers Grove, IL 60515
Phone	(630) 324-6855
Fax	
Email	arenner@teklabinc.com

Accreditations

Client: Hanson Professional Services, Inc.

Work Order: 21021164

Client Project: CWLP - 19E0107/4000

Report Date: 03-Mar-21

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2022	Collinsville
Kansas	KDHE	E-10374	NELAP	4/30/2021	Collinsville
Louisiana	LDEQ	05002	NELAP	6/30/2021	Collinsville
Louisiana	LDEQ	05003	NELAP	6/30/2021	Collinsville
Oklahoma	ODEQ	9978	NELAP	8/31/2021	Collinsville
Arkansas	ADEQ	88-0966		3/14/2021	Collinsville
Illinois	IDPH	17584		5/31/2021	Collinsville
Kentucky	UST	0073		1/31/2022	Collinsville
Missouri	MDNR	00930		5/31/2021	Collinsville
Missouri	MDNR	930		1/31/2022	Collinsville

Laboratory Results

Client: Hanson Professional Services, Inc.
Work Order: 21021164
Client Project: CWLP - 19E0107/4000
Report Date: 03-Mar-21
Lab ID: 21021164-001
Client Sample ID: Clarifier Water
Matrix: AQUEOUS
Collection Date: 02/23/2021 9:00

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
EPA 1664A								
Hexane Extractable Material	NELAP	4		**< 4**	mg/L	1	02/24/2021 13:09	R287799
EPA 600 351.2								
Total Kjeldahl Nitrogen (as N)	NELAP	1.0		**< 1.0**	mg/L	1	02/25/2021 10:24	174177
STANDARD METHODS 2320 B (TOTAL) 1997								
Alkalinity, Bicarbonate (as CaCO3)	NELAP	0		**274**	mg/L	1	02/24/2021 12:08	R287751
STANDARD METHODS 2320 B 1997								
Alkalinity, Carbonate (as CaCO3)	NELAP	0		**214**	mg/L	1	02/24/2021 12:08	R287751
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	20		**166**	mg/L	1	02/25/2021 14:28	R287851
STANDARD METHODS 2540 D 1997								
Total Suspended Solids	*	1.0		**265**	mg/L	2	02/24/2021 9:55	R287746
STANDARD METHODS 4500-NH3 G (TOTAL) 1997, 2011								
Nitrogen, Ammonia (as N)	NELAP	0.10		**0.23**	mg/L	1	02/24/2021 16:53	R287738
STANDARD METHODS 4500-NO2 B (TOTAL) 2000								
Nitrogen, Nitrite (as N)	NELAP	0.05		**< 0.05**	mg/L	1	02/23/2021 18:57	R287672
STANDARD METHODS 4500-NO3 F (TOTAL) 2000, 2011								
Nitrogen, Nitrate (as N)	NELAP	0.050		**0.258**	mg/L	1	02/24/2021 15:59	R287750
SW-846 7196A								
Chromium, Hexavalent	NELAP	0.001		**0.001**	mg/L	1	02/23/2021 18:04	R287671
SW-846 9012A (TOTAL)								
Cyanide	NELAP	0.005		**< 0.005**	mg/L	1	02/25/2021 9:35	174161
SW-846 9036 (TOTAL)								
Sulfate	NELAP	10		**45**	mg/L	1	02/25/2021 17:57	R287821
SW-846 9066 (TOTAL)								
Phenols	NELAP	0.005		**< 0.005**	mg/L	1	02/24/2021 11:06	R287726
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.24**	mg/L	1	02/25/2021 19:10	R287857
SW-846 9251 (TOTAL)								
Chloride	NELAP	1		**26**	mg/L	1	02/25/2021 17:58	R287822
EPA 600 4.1.4, 200.7R4.4, METALS BY ICP (TOTAL)								
Arsenic	NELAP	0.0250		**< 0.0250**	mg/L	1	03/01/2021 17:17	174118
Barium	NELAP	0.0025		**0.0497**	mg/L	1	03/01/2021 17:17	174118
Boron	NELAP	0.0200		**0.0420**	mg/L	1	03/01/2021 17:17	174118
Calcium	NELAP	0.100	S	**59.9**	mg/L	1	03/03/2021 15:13	174355
Chromium	NELAP	0.0050		**< 0.0050**	mg/L	1	03/01/2021 17:17	174118
Copper	NELAP	0.0050		**< 0.0050**	mg/L	1	03/03/2021 15:13	174355
Iron	NELAP	0.0400		**1.65**	mg/L	1	03/03/2021 15:13	174355
Lead	NELAP	0.0150		**< 0.0150**	mg/L	1	03/01/2021 17:17	174118
Magnesium	NELAP	0.0500		**6.43**	mg/L	1	03/03/2021 15:13	174355
Manganese	NELAP	0.0070		**0.0244**	mg/L	1	03/03/2021 15:13	174355
Nickel	NELAP	0.0050		**< 0.0050**	mg/L	1	03/03/2021 15:13	174355
Potassium	NELAP	0.100		**3.24**	mg/L	1	03/03/2021 15:13	174355
Sodium	NELAP	0.0500		**13.7**	mg/L	1	03/03/2021 15:13	174355
Zinc	NELAP	0.0100		**< 0.0100**	mg/L	1	03/03/2021 15:13	174355

Laboratory Results

Client: Hanson Professional Services, Inc.
Work Order: 21021164
Client Project: CWLP - 19E0107/4000
Report Date: 03-Mar-21
Lab ID: 21021164-001
Client Sample ID: Clarifier Water
Matrix: AQUEOUS
Collection Date: 02/23/2021 9:00

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
EPA 600 4.1.4, 200.7R4.4, METALS BY ICP (TOTAL)								
Matrix spike control limits for Ca are not applicable due to high sample/spike ratio.								
EPA 600 4.1.4, 200.8 R5.4, METALS BY ICPMS (TOTAL)								
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/25/2021 23:44	174119
Selenium	NELAP	0.0010		**< 0.0010**	mg/L	5	02/25/2021 23:44	174119
Silver	NELAP	0.0010		**< 0.0010**	mg/L	5	02/25/2021 23:44	174119
MERCURY BY EPA METHOD 1631E (TOTAL)								
Mercury	NELAP	0.80		**< 0.80**	ng/L	1	02/25/2021 16:35	174152

Laboratory Results

Client: Hanson Professional Services, Inc.
Work Order: 21021164
Client Project: CWLP - 19E0107/4000
Report Date: 03-Mar-21
Lab ID: 21021164-002
Client Sample ID: Clarifier Water FB
Matrix: AQUEOUS
Collection Date: 02/23/2021 9:00

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
MERCURY BY EPA METHOD 1631E (TOTAL)								
Mercury	NELAP	0.80		**< 0.80**	ng/L	1	02/25/2021 15:53	174152

Teklab Inc.
Environmental Laboratory

Receiving Check List

http://www.teklabinc.com/

Client: Hanson Professional Services, Inc.

Work Order: 21021164

Client Project: CWLP - 19E0107/4000

Report Date: 03-Mar-21

Carrier: T. Cooper

Received By: EAH

Completed by: Mary E. Kemp
On:
23-Feb-21
Mary E. Kemp

Reviewed by: Elizabeth A. Hurley
On:
23-Feb-21
Elizabeth A. Hurley

Pages to follow: Chain of custody 1 Extra pages included 1

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	Temp °C 7.8
Type of thermal preservation?	None ☐	Ice ☑	Blue Ice ☐	Dry Ice ☐
Chain of custody present?	Yes ☑	No ☐		
Chain of custody signed when relinquished and received?	Yes ☑	No ☐		
Chain of custody agrees with sample labels?	Yes ☑	No ☐		
Samples in proper container/bottle?	Yes ☑	No ☐		
Sample containers intact?	Yes ☑	No ☐		
Sufficient sample volume for indicated test?	Yes ☑	No ☐		
All samples received within holding time?	Yes ☑	No ☐		
Reported field parameters measured:	Field ☐	Lab ☐	NA ☑	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐		

When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.

Water – at least one vial per sample has zero headspace?	Yes ☐	No ☐	No VOA vials ☑
Water - TOX containers have zero headspace?	Yes ☐	No ☐	No TOX containers ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☑	NA ☐
NPDES/CWA TCN interferences checked/treated in the field?	Yes ☐	No ☐	NA ☑

Any No responses must be detailed below or on the COC.

pH strip #74446/75146. - ARH/MKemp - 2/23/2021 4:46:10 PM

Additional sodium hydroxide (75679) was needed upon arrival at the laboratory. - MKemp - 2/23/2021 4:46:31 PM

Samples were preserved with bromine chloride (75629) for low level mercury analysis upon arrival at the laboratory.

CHAIN OF CUSTODY

pg. ____ of ____ Work order # 21021164

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client: Hanson Professional Services, Inc.
Address: 1525 South Sixth Street
City / State / Zip Springfield, IL 62703
Contact: Rhon Hasenyager **Phone:** (217) 788-2450
E-Mail: rhasenyager@hanson-inc.com **Fax:**

Samples on: ☒ ICE ☐ BLUE ICE ☐ NO ICE 7.8 °C LTG# 3
Preserved in: ☒ LAB ☐ FIELD **FOR LAB USE ONLY**
Lab Notes Added NaOH (75679)
AH 2/23/21 74446/75146

Are these samples known to be involved in litigation? If yes, a surcharge will apply ☐ Yes ☐ No
Are these samples known to be hazardous? ☐ Yes ☐ No
Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. ☐ Yes ☐ No

Client Comments:
Metals: As Ba B Cd Ca Cr Cu Fe Pb Mg Mn Ni P K Ag Na Zn ICP/MS: Se
see attached list,

* FB per container - EAH 2/23/21

Project Name/Number CWLP -- 19E0107/4000
Sample Collector's Name Rhon Hasenyager

Results Requested
☒ Standard ☐ 1-2 Day (100% Surcharge)
☐ Other ____ ☐ 3 Day (50% Surcharge)

Billing Instructions

			# and Type of Containers								MATRIX						INDICATE ANALYSIS REQUESTED														
Lab Use Only	Sample Identification	Date/Time Sampled	UNPRES	HNO3	NaOH	H2SO4	HCL	MeOH	NaHSO4	OTHER	Aqueous	Drinking Water	Soil	Sludge	Special Waste	Groundwater	Alkalinity (B/C)	Ammonia/TKN	Chloride/Sulfate	Fluoride/TDS	Hexavalent Cr	LL Mercury	Metals	Nitrate	Nitrite	Oil and Grease	Phenols	Total Cyanide	TSS, Low Range		
21021164001	Clarifier Water	2/23/21 9:00	3	1	1	1	2				X						X	X	X	X	X	X	X	X	X	X	X	X	X		
-002	*FB																														

Relinquished By	Date/Time	Received By	Date/Time
Rhon Hasenyager	2/23/21 15:09	T Cooper 2/23/2021	2/23/2021 15:09
T Cooper	2/23/21 16:30	Elizabeth	2/23/21 1630

The individual signing this agreement on behalf of the client, acknowledges that he/she has read and understands the terms and conditions of this agreement, and that he/she has the authority to sign on behalf of the client. See www.teklabinc.com for terms and conditions.

BottleOrder: 63816

AH
2/23/2

2102116

35 IAC 302/304 Parameters

Analyte as total concentrations	**Limit of Detection** in mg/L, unless noted	**Analyte** as total concentrations	**Limit of Detection** in mg/L, unless noted
Alkalinity, Bicarbonate	2.	Mercury, low level (in ng/L)	0.5
Alkalinity, Carbonate	2.	Nickel	0.005
Ammonia	0.1	Nitrate	0.1
Arsenic	0.05	Nitrite	0.1
Barium	0.5	Oil & Grease	3.
Boron	0.1	Oxidation-Reduction Potential	n/a
Cadmium	0.001	pH	n/a
Calcium	0.1	Phenolics, total recoverable	0.005
Chloride	5.	Phosphorus	0.01
Chromium	0.05	Potassium	0.1
Chromium (hexavalent)	0.01	Selenium	0.005
Copper	0.005	Silver	0.003
Cyanide	0.005	Sodium	0.1
Fluoride	0.1	Sulfate	0.01
Iron	0.5	Total Dissolved Solids	1.
Lead	0.05	Total Kjeldahl Nitrogen	0.1
Magnesium	0.1	Total Suspended Solids	1.5
Manganese	0.01	Zinc	0.025

DOCUMENT 3: LAP - CCR - LIME SLUDGE AND FILTER PLANT SLUDGE CCR THAT GOES TO LAP

Lab No. 201800517-001

Date Rec'd. 2/14/2018 10:30:00 AM

Date Sampled 2/9/2018

Sampled By CLIENT

STANDARD LABORATORIES, INC.
8451 River King Drive
Freeburg, IL 62243

Page 2 of 2

Report Date: 3/7/2018 3:28:35 PM

Remark: FILTER PLANT

FILTER PLANT LIME SLUDGE

TEST	Result	UNIT	METHOD	D.F.	MDL	DATE	TIME	TECH
Mercury Total	< 0.2	ug/L	SM 3112 B-2009	5	0.2	02/20/18	12:06	ELD
Boron, Total	1140	ug/L	EPA 200.7 4.4 1994	2	34	03/07/18	15:20	KGD
Iron, Total	422	mg/L	EPA 200.7 4.4 1994	5	0.035	02/23/18	12:11	KGD
Magnesium, Total	2410	mg/L	EPA 200.7 4.4 1994	10	0.2	02/23/18	15:20	KGD
Manganese, Total	11.8	mg/L	EPA 200.7 4.4 1994	1	0.004	02/23/18	12:11	KGD
Zinc, Total	0.591	mg/L	EPA 200.7 4.4 1994	1	0.004	02/23/18	12:11	KGD
Silver, Total	< 1	ug/L	EPA 200.8 5.5 1998	5	1	02/20/18	14:30	ELD
Arsenic, Total	199	ug/L	EPA 200.8 5.5 1998	5	3.5	02/20/18	14:30	ELD
Barium, Total	4550	ug/L	EPA 200.8 5.5 1998	10	4	02/20/18	14:30	ELD
Beryllium, Total	3.3	ug/L	EPA 200.8 5.5 1998	5	1	02/20/18	14:30	ELD
Cadmium, Total	11.4	ug/L	EPA 200.8 5.5 1998	5	4	02/20/18	14:30	ELD
Cobalt, Total	87.9	ug/L	EPA 200.8 5.5 1998	5	0.5	02/20/18	14:30	ELD
Chromium, Total	135	ug/L	EPA 200.8 5.5 1998	5	4	02/20/18	14:30	ELD
Copper, Total	324	ug/L	EPA 200.8 5.5 1998	5	4.5	02/20/18	14:30	ELD
Molybdenum, Total	23.1	ug/L	EPA 200.8 5.5 1998	5	2.5	02/20/18	14:30	ELD
Nickel, Total	483	ug/L	EPA 200.8 5.5 1998	10	4	02/20/18	14:30	ELD
Lead, Total	41.5	ug/L	EPA 200.8 5.5 1998	5	3.5	02/20/18	14:30	ELD
Antimony, Total	2.4	ug/L	EPA 200.8 5.5 1998	5	1	02/20/18	14:30	ELD
Selenium, Total	30.0	ug/L	EPA 200.8 5.5 1998	5	10	02/20/18	14:30	ELD
Thallium, Total	< 2	ug/L	EPA 200.8 5.5 1998	5	2	02/20/18	14:30	ELD
Vanadium, Total	835	ug/L	EPA 200.8 5.5 1998	10	20	02/20/18	14:30	ELD

Sludge from basins. coming off lime bed

Respectfully Submitted, Kayla Dunphy

DOCUMENT 4: DAP - NON CCR - EVAPORATION POND WATER FROM FGDS LANDFILL

Single Location

Name: City Water, Light and Power

Location ID: Evaporation Pond

Number of Sampling Dates: 1

Parameter Name	Units	5/13/2021
Alkalinity, Bicarbonate, total (as CaCO3)	mg/L	282
Alkalinity, Carbonate, total (as CaCO3)	mg/L	0
Arsenic, total	mg/L	<0.025/<0.008
Barium, total	mg/L	0.03
Boron, total	mg/L	5.25
Cadmium, total	mg/L	<0.001
Calcium, total	mg/L	302
Chloride, total	mg/L	116
Chromium, Hexavalent, dissolved	mg/L	<0.001
Chromium, total	mg/L	<0.005
Copper, total	mg/L	<0.005
Cyanide, total	mg/L	<0.005
Fluoride, total	mg/L	0.34
Hexane Extractable Material	mg/L	<4
Iron, total	mg/L	0.366
pH (lab)	SU	8
Lead, total	mg/L	<0.015
Magnesium, total	mg/L	85.7
Manganese, total	mg/L	0.113
Mercury, total	ng/L	3.53
Nickel, total	mg/L	<0.005
Nitrogen, Ammonia, total	mg/L	<0.1
Nitrogen, Nitrite, total	mg/L	<0.05
Phenols	mg/L	0.006
Phosphorus, total (as P)	mg/L	0.37
Potassium, total	mg/L	5.44
Selenium, total	mg/L	0.0016
Silver, total	mg/L	<0.001
Sodium, total	mg/L	24.3
Sulfate, total	mg/L	616
Total Dissolved Solids	mg/L	1350
Total Kjeldahl Nitrogen	mg/L	1.5
Total Suspended Solids	mg/L	16
Zinc, total	mg/L	<0.01
Oxidation-Reduction Potential	mV	251
Nitrogen, Nitrate (as N)	mg/L	0.63

DOCUMENT 5: DAP - EVAPPOND-21051663

Teklab, Inc.
Environmental Laboratory

http://www.teklabinc.com/

June 04, 2021

Rhon Hasenyager
Hanson Professional Services, Inc.
1525 South Sixth Street
Springfield, IL 62703
TEL: (217) 747-9235
FAX: (217) 788-5241

Illinois	100226
Kansas	E-10374
Louisiana	05002
Louisiana	05003
Oklahoma	9978

RE: CWLP - Antidegradation Samples

WorkOrder: 21051663

Dear Rhon Hasenyager:

TEKLAB, INC received 1 sample on 5/13/2021 3:36:00 PM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. Unless otherwise documented within this report, Teklab Inc. analyzes samples utilizing the most current methods in compliance with 40CFR. All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Elizabeth A. Hurley

Elizabeth A. Hurley
Project Manager
(618)344-1004 ex 33
ehurley@teklabinc.com

Report Contents

Client: Hanson Professional Services, Inc.

Work Order: 21051663

Client Project: CWLP - Antidegradation Samples

Report Date: 04-Jun-21

This reporting package includes the following:

Definitions

Client: Hanson Professional Services, Inc.
Work Order: 21051663
Client Project: CWLP - Antidegradation Samples
Report Date: 04-Jun-21

Abbr	Definition
*	Analytes on report marked with an asterisk are not NELAP accredited
CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
CRQL	A Client Requested Quantitation Limit is a reporting limit that varies according to customer request. The CRQL may not be less than the MDL.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilution factors.
DNI	Did not ignite
DUP	Laboratory duplicate is a replicate aliquot prepared under the same laboratory conditions and independently analyzed to obtain a measure of precision.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample is a sample matrix, free from the analytes of interest,spiked with verified known amounts of analytes and analyzed exactly like a sample to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MBLK	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	"The method detection limit is defined as the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results."
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method's recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
NC	Data is not acceptable for compliance purposes
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions.
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes.
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TIC	Tentatively identified compound: Analytes tentatively identified in the sample by using a library search. Only results not in the calibration standard will be reported as tentatively identified compounds. Results for tentatively identified compounds that are not present in the calibration standard, but are assigned a specific chemical name based upon the library search, are calculated using total peak areas from reconstructed ion chromatograms and a response factor of one. The nearest Internal Standard is used for the calculation. The results of any TICs must be considered estimated, and are flagged with a "T". If the estimated result is above the calibration range it is flagged "ET"
TNTC	Too numerous to count (> 200 CFU)

Definitions

Client: Hanson Professional Services, Inc.
Work Order: 21051663
Client Project: CWLP - Antidegradation Samples
Report Date: 04-Jun-21

Qualifiers

# -	Unknown hydrocarbon	B -	Analyte detected in associated Method Blank
C -	RL shown is a Client Requested Quantitation Limit	E -	Value above quantitation range
H -	Holding times exceeded	I -	Associated internal standard was outside method criteria
J -	Analyte detected below quantitation limits	M -	Manual Integration used to determine area response
ND -	Not Detected at the Reporting Limit	R -	RPD outside accepted recovery limits
S -	Spike Recovery outside recovery limits	T -	TIC(Tentatively identified compound)
X -	Value exceeds Maximum Contaminant Level		

Case Narrative

Client: Hanson Professional Services, Inc.
Client Project: CWLP - Antidegradation Samples
Work Order: 21051663
Report Date: 04-Jun-21

Cooler Receipt Temp: °C

Additional analyses to WO# 21050850.

Locations

Collinsville

Address	5445 Horseshoe Lake Road Collinsville, IL 62234-7425
Phone	(618) 344-1004
Fax	(618) 344-1005
Email	jhriley@teklabinc.com

Springfield

Address	3920 Pintail Dr Springfield, IL 62711-9415
Phone	(217) 698-1004
Fax	(217) 698-1005
Email	KKlostermann@teklabinc.com

Kansas City

Address	8421 Nieman Road Lenexa, KS 66214
Phone	(913) 541-1998
Fax	(913) 541-1998
Email	jhriley@teklabinc.com

Collinsville Air

Address	5445 Horseshoe Lake Road Collinsville, IL 62234-7425
Phone	(618) 344-1004
Fax	(618) 344-1005
Email	EHurley@teklabinc.com

Chicago

Address	1319 Butterfield Rd. Downers Grove, IL 60515
Phone	(630) 324-6855
Fax	
Email	arenner@teklabinc.com

Accreditations

Client: Hanson Professional Services, Inc.
Work Order: 21051663
Client Project: CWLP - Antidegradation Samples
Report Date: 04-Jun-21

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2022	Collinsville
Kansas	KDHE	E-10374	NELAP	4/30/2022	Collinsville
Louisiana	LDEQ	05002	NELAP	6/30/2022	Collinsville
Louisiana	LDEQ	05003	NELAP	6/30/2022	Collinsville
Oklahoma	ODEQ	9978	NELAP	8/31/2021	Collinsville
Arkansas	ADEQ	88-0966		3/14/2022	Collinsville
Illinois	IDPH	17584		5/31/2021	Collinsville
Kentucky	UST	0073		1/31/2022	Collinsville
Missouri	MDNR	00930		5/31/2021	Collinsville
Missouri	MDNR	930		1/31/2022	Collinsville

Laboratory Results

Client: Hanson Professional Services, Inc.

Work Order: 21051663

Client Project: CWLP - Antidegradation Samples

Report Date: 04-Jun-21

Lab ID: 21051663-001

Client Sample ID: Evaporation Pond

Matrix: AQUEOUS

Collection Date: 05/13/2021 10:15

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
STANDARD METHOD 4500-H B 2000, 2011, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**8.00**		1	06/01/2021 15:08	R291715
STANDARD METHODS 2580B								
Oxidation-Reduction Potential	*	0.100		**251**	mV	1	05/28/2021 15:05	R291776

Sample was analyzed at 19C with saturated Ag/AgCl electrode.

21051663

TEKLAB, INC
5445 Horseshoe Lake Road
Collinsville, IL 62234-7425
TEL: (618) 344-1004
FAX: (618) 344-1005

CHAIN-OF-CUSTODY RECORD

Page 1 of 1

WorkOrder: 21051663

Client:
Hanson Professional Services, Inc.
1525 South Sixth Street
Springfield, IL 62703

TEL: (217) 788-2450
FAX: (217) 788-5241
Project: CWLP - Antidegradation Sa

27-May-21

					Requested Tests						
Sample ID	**ClientSampID**	**Matrix**	**Date Collected**	**Bottle**	**M2580B**	**M4500-H B**					
21051663-001	Evaporation Pond	Aqueous	5/13/2021 10:15:00 AM		A	A					

Comments: Excel_PrState EDD
Per Rhon Hasenyager, additional analyses requested for WO# 21050850. MLDII 5/27/21

	Date/Time		Date/Time
Relinquished by:		**Received by:**	5/27/21
Relinquished by:		**Received by:**	
Relinquished by:		**Received by:**	

NOTE: Samples are discarded 60 days after results are reported unless other arrangements are made. Hazardous samples will be returned to client or disposed of at client expense.

Bottle Type: L-Liter V-Voa S-Soil Jar O-Orbo T-Tedlar B-Brass P-Plastic OT-Other

DOCUMENT 6: DAP - EVAPPOND-21050850

Teklab, Inc.
Environmental Laboratory
http://www.teklabinc.com/

May 27, 2021

Rhon Hasenyager
Hanson Professional Services, Inc.
1525 South Sixth Street
Springfield, IL 62703
TEL: (217) 747-9235
FAX: (217) 788-5241

NELAP ACCREDITED TNI LABORATORY

Illinois	100226
Kansas	E-10374
Louisiana	05002
Louisiana	05003
Oklahoma	9978

RE: CWLP - Antidegradation Samples **WorkOrder:** 21050850

Dear Rhon Hasenyager:

TEKLAB, INC received 2 samples on 5/13/2021 3:36:00 PM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. Unless otherwise documented within this report, Teklab Inc. analyzes samples utilizing the most current methods in compliance with 40CFR. All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Marvin L. Darling II

Marvin L. Darling
Project Manager
(618)344-1004 ex 41
mdarling@teklabinc.com

Report Contents

Client: Hanson Professional Services, Inc.

Work Order: 21050850

Client Project: CWLP - Antidegradation Samples

Report Date: 27-May-21

This reporting package includes the following:

Definitions

Client: Hanson Professional Services, Inc. **Work Order:** 21050850

Client Project: CWLP - Antidegradation Samples **Report Date:** 27-May-21

Abbr	Definition
*	Analytes on report marked with an asterisk are not NELAP accredited
CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
CRQL	A Client Requested Quantitation Limit is a reporting limit that varies according to customer request. The CRQL may not be less than the MDL.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilution factors.
DNI	Did not ignite
DUP	Laboratory duplicate is a replicate aliquot prepared under the same laboratory conditions and independently analyzed to obtain a measure of precision.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample is a sample matrix, free from the analytes of interest,spiked with verified known amounts of analytes and analyzed exactly like a sample to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MBLK	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	"The method detection limit is defined as the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results."
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method's recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
NC	Data is not acceptable for compliance purposes
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions.
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes.
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TIC	Tentatively identified compound: Analytes tentatively identified in the sample by using a library search. Only results not in the calibration standard will be reported as tentatively identified compounds. Results for tentatively identified compounds that are not present in the calibration standard, but are assigned a specific chemical name based upon the library search, are calculated using total peak areas from reconstructed ion chromatograms and a response factor of one. The nearest Internal Standard is used for the calculation. The results of any TICs must be considered estimated, and are flagged with a "T". If the estimated result is above the calibration range it is flagged "ET"
TNTC	Too numerous to count (> 200 CFU)

Definitions

Client: Hanson Professional Services, Inc.

Work Order: 21050850

Client Project: CWLP - Antidegradation Samples

Report Date: 27-May-21

Qualifiers

# -	Unknown hydrocarbon
C -	RL shown is a Client Requested Quantitation Limit
H -	Holding times exceeded
J -	Analyte detected below quantitation limits
ND -	Not Detected at the Reporting Limit
S -	Spike Recovery outside recovery limits
X -	Value exceeds Maximum Contaminant Level
B -	Analyte detected in associated Method Blank
E -	Value above quantitation range
I -	Associated internal standard was outside method criteria
M -	Manual Integration used to determine area response
R -	RPD outside accepted recovery limits
T -	TIC(Tentatively identified compound)

Case Narrative

http://www.teklabinc.com/

Client: Hanson Professional Services, Inc.
Client Project: CWLP - Antidegradation Samples
Work Order: 21050850
Report Date: 27-May-21

Cooler Receipt Temp: 4.2 °C

Locations

Collinsville

Address 5445 Horseshoe Lake Road
Collinsville, IL 62234-7425
Phone (618) 344-1004
Fax (618) 344-1005
Email jhriley@teklabinc.com

Springfield

Address 3920 Pintail Dr
Springfield, IL 62711-9415
Phone (217) 698-1004
Fax (217) 698-1005
Email KKlostermann@teklabinc.com

Kansas City

Address 8421 Nieman Road
Lenexa, KS 66214
Phone (913) 541-1998
Fax (913) 541-1998
Email jhriley@teklabinc.com

Collinsville Air

Address 5445 Horseshoe Lake Road
Collinsville, IL 62234-7425
Phone (618) 344-1004
Fax (618) 344-1005
Email EHurley@teklabinc.com

Chicago

Address 1319 Butterfield Rd.
Downers Grove, IL 60515
Phone (630) 324-6855
Fax
Email arenner@teklabinc.com

Accreditations

Client: Hanson Professional Services, Inc.

Client Project: CWLP - Antidegradation Samples

Work Order: 21050850

Report Date: 27-May-21

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2022	Collinsville
Kansas	KDHE	E-10374	NELAP	4/30/2022	Collinsville
Louisiana	LDEQ	05002	NELAP	6/30/2021	Collinsville
Louisiana	LDEQ	05003	NELAP	6/30/2021	Collinsville
Oklahoma	ODEQ	9978	NELAP	8/31/2021	Collinsville
Arkansas	ADEQ	88-0966		3/14/2022	Collinsville
Illinois	IDPH	17584		5/31/2021	Collinsville
Kentucky	UST	0073		1/31/2022	Collinsville
Missouri	MDNR	00930		5/31/2021	Collinsville
Missouri	MDNR	930		1/31/2022	Collinsville

Laboratory Results

http://www.teklabinc.com/

Client: Hanson Professional Services, Inc.
Work Order: 21050850
Client Project: CWLP - Antidegradation Samples
Report Date: 27-May-21
Lab ID: 21050850-001
Client Sample ID: Evaporation Pond
Matrix: AQUEOUS
Collection Date: 05/13/2021 10:15

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
EPA 1664A								
Hexane Extractable Material	NELAP	4		**< 4**	mg/L	1	05/19/2021 17:31	R291282
EPA 600 351.2								
Total Kjeldahl Nitrogen (as N)	NELAP	1.0		**1.5**	mg/L	1	05/19/2021 13:23	177080
EPA 600 365.4 (TOTAL)								
Phosphorus, Total (as P)	NELAP	0.100		**0.370**	mg/L	1	05/19/2021 13:21	177082
STANDARD METHODS 2320 B (TOTAL) 1997, 2011								
Alkalinity, Bicarbonate (as CaCO3)	NELAP	0		**282**	mg/L	1	05/14/2021 17:15	R291100
STANDARD METHODS 2320 B 1997, 2011								
Alkalinity, Carbonate (as CaCO3)	NELAP	0		**0**	mg/L	1	05/14/2021 17:15	R291100
STANDARD METHODS 2540 C (TOTAL) 1997, 2011								
Total Dissolved Solids	NELAP	20		**1350**	mg/L	1	05/19/2021 15:12	R291299
STANDARD METHODS 2540 D 1997, 2011								
Total Suspended Solids	NELAP	6		**16**	mg/L	1	05/19/2021 10:19	R291259
STANDARD METHODS 4500-NH3 G (TOTAL) 1997, 2011								
Nitrogen, Ammonia (as N)	NELAP	0.10		**< 0.10**	mg/L	1	05/17/2021 20:37	R291161
STANDARD METHODS 4500-NO2 B (TOTAL) 2000, 2011								
Nitrogen, Nitrite (as N)	NELAP	0.05		**< 0.05**	mg/L	1	05/13/2021 20:05	R290975
STANDARD METHODS 4500-NO3 F (TOTAL) 2000, 2011								
Nitrogen, Nitrate (as N)	NELAP	0.100		**0.630**	mg/L	2	05/14/2021 10:50	R291127
SW-846 7196A								
Chromium, Hexavalent	NELAP	0.001		**< 0.001**	mg/L	1	05/13/2021 21:20	R291000
SW-846 9012A (TOTAL)								
Cyanide	NELAP	0.005		**< 0.005**	mg/L	1	05/21/2021 11:35	177169
Sample was checked for Chlorine and Sulfide interferences in the lab and was negative for Sulfide and positive for Chlorine.								
SW-846 9036 (TOTAL)								
Sulfate	NELAP	200		**616**	mg/L	20	05/20/2021 15:35	R291329
SW-846 9066 (TOTAL)								
Phenols	NELAP	0.005		**0.006**	mg/L	1	05/17/2021 15:29	R291143
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**0.34**	mg/L	1	05/18/2021 20:54	R291254
SW-846 9251 (TOTAL)								
Chloride	NELAP	10		**116**	mg/L	10	05/17/2021 20:50	R291124
EPA 600 4.1.4, 200.7R4.4, METALS BY ICP (TOTAL)								
Arsenic	NELAP	0.0250		**< 0.0250**	mg/L	1	05/19/2021 21:04	176997
Barium	NELAP	0.0025		**0.0300**	mg/L	1	05/19/2021 21:04	176997
Boron	NELAP	0.0200		**5.25**	mg/L	1	05/19/2021 21:04	176997
Calcium	NELAP	0.100		**302**	mg/L	1	05/19/2021 21:04	176997
Chromium	NELAP	0.0050		**< 0.0050**	mg/L	1	05/19/2021 21:04	176997
Copper	NELAP	0.0050		**< 0.0050**	mg/L	1	05/19/2021 21:04	176997
Iron	NELAP	0.0400		**0.366**	mg/L	1	05/19/2021 21:04	176997
Lead	NELAP	0.0150		**< 0.0150**	mg/L	1	05/19/2021 21:04	176997
Magnesium	NELAP	0.0500		**85.7**	mg/L	1	05/19/2021 21:04	176997
Manganese	NELAP	0.0070		**0.113**	mg/L	1	05/19/2021 21:04	176997
Nickel	NELAP	0.0050		**< 0.0050**	mg/L	1	05/19/2021 21:04	176997

Client: Hanson Professional Services, Inc. **Work Order:** 21050850

Client Project: CWLP - Antidegradation Samples **Report Date:** 27-May-21

Lab ID: 21050850-001 **Client Sample ID:** Evaporation Pond

Matrix: AQUEOUS **Collection Date:** 05/13/2021 10:15

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
EPA 600 4.1.4, 200.7R4.4, METALS BY ICP (TOTAL)								
Potassium	NELAP	0.100		**5.44**	mg/L	1	05/19/2021 21:04	176997
Sodium	NELAP	0.0500	B	**24.3**	mg/L	1	05/19/2021 21:04	176997
Zinc	NELAP	0.0100		**< 0.0100**	mg/L	1	05/19/2021 21:04	176997
Sample result for Na exceeds 10 times the method blank contamination. Data is reportable per the TNI Standard.								
EPA 600 4.1.4, 200.8 R5.4, METALS BY ICPMS (TOTAL)								
Cadmium	NELAP	0.0010		**< 0.0010**	mg/L	5	05/19/2021 23:05	176996
Selenium	NELAP	0.0010		**0.0016**	mg/L	5	05/19/2021 23:05	176996
Silver	NELAP	0.0010		**< 0.0010**	mg/L	5	05/19/2021 23:05	176996
LCS recovered outside upper control limits for Cd, & Ag. Sample results are below the reporting limit. Data is reportable per the TNI Standard. *CCV recovered outside the upper control limits for Cd & Ag. Sample results are below the reporting limit. Data is reportable per the TNI standard.*								
MERCURY BY EPA METHOD 1631E (TOTAL)								
Mercury	NELAP	0.80		**3.53**	ng/L	1	05/14/2021 18:53	176939

Laboratory Results

Client: Hanson Professional Services, Inc.
Work Order: 21050850
Client Project: CWLP - Antidegradation Samples
Report Date: 27-May-21
Lab ID: 21050850-002
Client Sample ID: Evap. Pond Blank
Matrix: AQUEOUS
Collection Date: 05/13/2021 10:15

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
MERCURY BY EPA METHOD 1631E (TOTAL)								
Mercury	NELAP	0.80		**< 0.80**	ng/L	1	05/14/2021 19:04	176939

Teklab Inc.
Environmental Laboratory

Receiving Check List

http://www.teklabinc.com/

Client: Hanson Professional Services, Inc.
Work Order: 21050850
Client Project: CWLP - Antidegradation Samples
Report Date: 27-May-21

Carrier: Employee
Received By: JHR

Completed by: Mary E. Kemp
On:
13-May-21
Mary E. Kemp

Reviewed by: Marvin L. Darling II
On:
13-May-21
Marvin L. Darling

Pages to follow: Chain of custody 1 Extra pages included 0

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	Temp °C 4.2
Type of thermal preservation?	None ☐	Ice ☑	Blue Ice ☐	Dry Ice ☐
Chain of custody present?	Yes ☑	No ☐		
Chain of custody signed when relinquished and received?	Yes ☑	No ☐		
Chain of custody agrees with sample labels?	Yes ☑	No ☐		
Samples in proper container/bottle?	Yes ☑	No ☐		
Sample containers intact?	Yes ☑	No ☐		
Sufficient sample volume for indicated test?	Yes ☑	No ☐		
All samples received within holding time?	Yes ☑	No ☐		
Reported field parameters measured:	Field ☐	Lab ☐	NA ☑	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐		

When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.

Water – at least one vial per sample has zero headspace?	Yes ☐	No ☐	No VOA vials ☑
Water - TOX containers have zero headspace?	Yes ☐	No ☐	No TOX containers ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☑	NA ☐
NPDES/CWA TCN interferences checked/treated in the field?	Yes ☐	No ☐	NA ☑

Any No responses must be detailed below or on the COC.

pH strip #75145/75146. - EH/MKemp - 5/13/2021 4:30:32 PM

Additional sodium hydroxide (76347) was needed upon arrival at the laboratory. - EH/MKemp - 5/13/2021 4:30:45 PM

Samples were preserved with bromine chloride (76381) for low level mercury analysis upon arrival at the laboratory. - MKemp - 5/13/2021 4:31:24 PM

CHAIN OF CUSTODY

pg. ____ of ____ Work order # 21050850

TEKLAB, INC. 5445 Horseshoe Lake Road - Collinsville, IL 62234 - Phone: (618) 344-1004 - Fax: (618) 344-1005

Client: Hanson Professional Services, Inc.
Address: 1525 South Sixth Street
City / State / Zip Springfield, IL 62703
Contact: Rhon Hasenyager **Phone:** (217) 788-2450
E-Mail: rhasenyager@hanson-inc.com **Fax:**

Samples on: ☒ ICE ▨ BLUE ICE ▨ NO ICE 4.2 °C **LTG#** 3
Preserved in: ☒ LAB ▨ FIELD EH 5/13/21 **FOR LAB USE ONLY**
Lab Notes added ~~H2SO4~~ NaOH (7L8347) to Evap. Pond 75145 / 75140 EH 5/13/21

Client Comments:
Metals: As Ba B Ca Cr Cu Fe Pb Mg Mn Ni K Na Zn ICP/MS: Cd Se Ag

Are these samples known to be involved in litigation? If yes, a surcharge will apply ☐ Yes ☐ No
Are these samples known to be hazardous? ☐ Yes ☐ No
Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section. ☐ Yes ☐ No

Project Name/Number
CWLP - Antidegradation Samples

Sample Collector's Name
Rhon Hasenyager

Results Requested
☐ Standard ☐ 1-2 Day (100% Surcharge)
☐ Other ____ ☐ 3 Day (50% Surcharge)

Billing Instructions

			# and Type of Containers								MATRIX						INDICATE ANALYSIS REQUESTED														
Lab Use Only	Sample Identification	Date/Time Sampled	UNPRES	HNO3	NaOH	H2SO4	HCL	MeOH	NaHSO4	OTHER	Aqueous	Drinking Water	Soil	Sludge	Special Waste	Groundwater	Alkalinity (B/C)	Ammonia	Chloride/Sulfate	Cyanide (T)	Fluoride/Nitrite	Hex. Chromium	Mercury 1631	Metals	Nitrate	Oil and Grease	Phenol	TDS/TSS	TKN/Phos		
21050850001	Outfall Evaporation Pond	13 May 21 @ 10:15									X						x	x	x	x	x	x	x	x	x	x	x	x	x		
↓ 002	Field Blank Evap. Pond Blank	13 May 21 @ 10:15																					x								

Relinquished By	Date/Time	Received By	Date/Time
RW Hasenyager	13 May 21 @ 4:08	Alex Smith	5/13/21 2:08
Alex Smith	5/13/21 3:36		5/13/21 3:36

The individual signing this agreement on behalf of the client, acknowledges that he/she has read and understands the terms and conditions of this agreement, and that he/she has the authority to sign on behalf of the client. See www.teklabinc.com for terms and conditions.

BottleOrder: 65570

EH 5/13/21

DOCUMENT 7: DAP - CCR - UNIT 31 32 AND 33 BOTTOM ASH

Lab No. : 201800252-001

Date Rec'd. : 1/22/2018

Date Sampled : 1/17/2018

Sampled By : CLIENT

STANDARD LABORATORIES, INC.
8451 River King Drive
Freeburg, IL 62243

ANAB ACCREDITED TESTING LABORATORY

Certificate # L2179.02-1 Testing

CITY WATER, LIGHT AND POWER
MUNICIPAL CENTER, EAST
800 EAST MONROE ST., 4TH FLOOR
SPRINGFIELD, IL 62757
ATTN: BRANDEN POWELL

Page 1 of 3

Report Date: 2/1/2018 12:36:52 PM

Sample ID : 201800252-001

P.O. #: SCM100 CAB 00000557637

Remark: CWLP SPRINGFIELD - UNIT 31 - BOTTOM ASH

TEST	DRY BASIS CONCENTRATION	UNITS	METHOD	DATE	TECH
Antimony	0.47	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
Arsenic	1.5	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
Barium	466	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
Beryllium	11.1	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
* Boron	308	µg/g	ICPMS	1/30/2018	JMW
Cadmium	0.14	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
Chlorine	11	µg/g	ASTM D6721	1/31/2018	CJH
Chromium	716	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
Cobalt	20.7	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
Copper	33	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
Fluorine	< 10	µg/g	ASTM D5987 - IC	1/25/2018	RLR
Lead	2.6	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
* Magnesium	3990	µg/g	ASTM D6357 - ICP-AES	1/29/2018	JMW
Manganese	621	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
Mercury	< 0.010	µg/g	ASTM D6722	1/25/2018	CJH
Molybdenum	82.1	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
Nickel	390	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
Selenium	< 0.1	µg/g	ASTM D4606	1/30/2018	JMW
Silver	0.04	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
Thallium	0.12	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
Vanadium	164	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
Zinc	78	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW

Respectfully Submitted, Jeremy Weiss

* Not an Accredited Test

Lab No : 201800252-002

Date Rec'd : 1/22/2018

Date Sampled 1/17/2018 to 1/17/2018

Sampled By: CLIENT

STANDARD LABORATORIES, INC.
8451 River King Drive
Freeburg, IL 62243

ANAB
ACCREDITED
TESTING LABORATORY

Certificate # L2179.02-1 Testing

CITY WATER, LIGHT AND POWER
MUNICIPAL CENTER, EAST
800 EAST MONROE ST., 4TH FLOOR
SPRINGFIELD, IL 62757
ATTN: BRANDEN POWELL

Page : 2 of 3
Date : 2/12/2018 9:16:33 AM
P.O.# : SCM100 CAB 00000557637

Remark: CWLP SPRINGFIELD - UNIT 32 - BOTTOM ASH

PROXIMATE ANALYSIS		As-Received	Dry Basis
% Moisture	D3302	25.29	******
% Ash	D3174	74.78	100.1
% Volatile	D3175	0.04	0.06
% Fixed Carbon	D3172	< 0.01	< 0.01
BTU	D5865	212	284
MAF BTU	D3180		< 1
% Total Sulfur	D4239	0.18	0.24

SULFUR FORMS			
% Pyritic	D2492MOD	0.04	0.06
% Sulfate	D2492MOD	0.13	0.18
% Organic	D2492MOD	< 0.01	< 0.01
% Total Sulfur	D4239	0.18	0.24

WATER SOLUBLE			
% Na2O	D8010	0.007	0.009
% K2O	D8010	0.004	0.005
* % Chlorine	ASME1974	******	******
Alkalies as Na2O	ASME1974	1.89	2.53

FUSION TEMP. OF ASH D1857 ℉	Reducing	Oxidizing
I.D.	1928	2279
H=W	1940	2381
H=1/2W	1950	2486
FLUID	2335	2520

GRINDABILITY INDEX D409 ****** @ ****** % Moist.

FREE SWELLING INDEX D720 ******

* Apparent Specific Gravity of Coal ModIC7113 ******

% Equilibrium Moisture D1412 ******

* % Loss on Ignition @ 950C D7348 ******

		Weight %	
ULTIMATE ANALYSIS		As-Received	Dry Basis
% Moisture	D3302	25.29	******
% Carbon	D5373	0.83	1.11
% Hydrogen	D5373	0.21	0.28
% Nitrogen	D5373	< 0.01	< 0.01
% Chlorine	D6721	< 0.01	< 0.01
% Sulfur	D4239	0.18	0.24
% Ash	D3174	74.78	100.1
% Oxygen (Diff.)	D3176	< 0.01	< 0.01

(Chlorine D6721 Dry Basis ug/g 12)

MINERAL ANALYSIS D6349		% Ignited Basis
Phos. Pentoxide, P2O5		0.07
Silica, SiO2		52.35
Ferric Oxide, Fe2O3		21.54
Alumina, Al2O3		13.32
Titania, TiO2		0.72
Lime, CaO		5.80
Magnesia, MgO		0.64
Sulfur Trioxide, SO3		0.31
Potassium Oxide, K2O		1.42
Sodium Oxide, Na2O		1.59
Barium Oxide, BaO		0.04
Strontium Oxide, SrO		0.02
Manganese Dioxide, MnO2		0.10
Undetermined		2.08
Type of Ash	ASME1974	Bituminous
Silica Value	ASME1974	65.17
T250 Deg F	BW	2338
Base/Acid Ratio	ASME1974	0.47
lb Ash/mm BTU		3524.30
lb SO2/mm BTU		< 0.01

*Using 20000 as SO2 calculation factor

Fouling Index	ASME1974	0.75
Slagging Index	ASME1974	< 0.01

(Mercury D6722 Dry Basis ug/g < 0.010)

Respectfully Submitted, Steven Arndt

* Not an Accredited Test

Lab No. : 201800252-002

Date Rec'd. : 1/22/2018

Date Sampled : 1/17/2018

Sampled By : CLIENT

STANDARD LABORATORIES, INC.
8451 River King Drive
Freeburg, IL 62243

ANAB ACCREDITED ISO/IEC 17025 TESTING LABORATORY

Certificate # L2179.02-1 Testing

CITY WATER, LIGHT AND POWER
MUNICIPAL CENTER, EAST
800 EAST MONROE ST., 4TH FLOOR
SPRINGFIELD, IL 62757
ATTN: BRANDEN POWELL

Page 2 of 3

Report Date: 2/1/2018 12:36:52 PM

Sample ID : 201800252-002

P.O. #: SCM100 CAB 00000557637

Remark: CWLP SPRINGFIELD - UNIT 32 - BOTTOM ASH

	TEST	DRY BASIS CONCENTRATION	UNITS	METHOD	DATE	TECH
	Antimony	1.47	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
	Arsenic	3.3	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
	Barium	401	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
	Beryllium	14.0	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
*	Boron	558	µg/g	ICPMS	1/30/2018	JMW
	Cadmium	0.70	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
	Chlorine	12	µg/g	ASTM D6721	1/31/2018	CJH
	Chromium	689	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
	Cobalt	22.4	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
	Copper	43	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
	Fluorine	< 10	µg/g	ASTM D5987 - IC	1/25/2018	RLR
	Lead	9.5	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
*	Magnesium	3900	µg/g	ASTM D6357 - ICP-AES	1/29/2018	JMW
	Manganese	600	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
	Mercury	< 0.010	µg/g	ASTM D6722	1/25/2018	CJH
	Molybdenum	78.2	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
	Nickel	369	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
	Selenium	< 0.1	µg/g	ASTM D4606	1/30/2018	JMW
	Silver	0.05	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
	Thallium	0.18	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
	Vanadium	185	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
	Zinc	246	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW

Respectfully Submitted, Jeremy Weiss

* Not an Accredited Test

Lab No : 201800252-003

Date Rec'd : 1/22/2018

Date Sampled 1/17/2018 to 1/17/2018

Sampled By: CLIENT

STANDARD LABORATORIES, INC.
8451 River King Drive
Freeburg, IL 62243

ANAB ACCREDITED ISO/IEC 17025 TESTING LABORATORY

Certificate # L2179.02-1 Testing

CITY WATER, LIGHT AND POWER
MUNICIPAL CENTER, EAST
800 EAST MONROE ST., 4TH FLOOR
SPRINGFIELD, IL 62757
ATTN: BRANDEN POWELL

Page : 3 of 3
Date : 2/12/2018 9:16:33 AM
P.O.# : SCM100 CAB 00000557637

Remark: CWLP SPRINGFIELD - UNIT 33 - BOTTOM ASH

PROXIMATE ANALYSIS		As-Received	Dry Basis
% Moisture	D3302	21.43	******
% Ash	D3174	78.58	100.0
% Volatile	D3175	0.31	0.39
% Fixed Carbon	D3172	< 0.01	< 0.01
BTU	D5865	222	282
MAF BTU	D3180		< 1
% Total Sulfur	D4239	0.13	0.17
SULFUR FORMS			
% Pyritic	D2492MOD	0.07	0.09
% Sulfate	D2492MOD	0.06	0.08
% Organic	D2492MOD	< 0.01	< 0.01
% Total Sulfur	D4239	0.13	0.17
WATER SOLUBLE			
% Na2O	D8010	0.006	0.007
% K2O	D8010	0.004	0.005
* % Chlorine	ASME1974	******	******
Alkalies as Na2O	ASME1974	1.52	1.93

FUSION TEMP. OF ASH D1857 °F	Reducing	Oxidizing
I.D.	1915	2291
H=W	1948	2378
H=1/2W	1990	2484
FLUID	2370	2516

GRINDABILITY INDEX D409 ****** @ ****** % Moist.

FREE SWELLING INDEX D720 ******

* Apparent Specific Gravity of Coal ModIC7113 ******

% Equilibrium Moisture D1412 ******

* % Loss on Ignition @ 950C D7348 ******

Weight %

ULTIMATE ANALYSIS		As-Received	Dry Basis
% Moisture	D3302	21.43	******
% Carbon	D5373	0.49	0.63
% Hydrogen	D5373	0.19	0.25
% Nitrogen	D5373	< 0.01	< 0.01
% Chlorine	D6721	< 0.01	< 0.01
% Sulfur	D4239	0.13	0.17
% Ash	D3174	78.58	100.0
% Oxygen (Diff.)	D3176	< 0.01	< 0.01

(Chlorine D6721 Dry Basis ug/g 15)

MINERAL ANALYSIS D6349		% Ignited Basis
Phos. Pentoxide, P2O5		0.09
Silica, SiO2		47.87
Ferric Oxide, Fe2O3		28.68
Alumina, Al2O3		12.12
Titania, TiO2		0.68
Lime, CaO		5.80
Magnesia, MgO		0.61
Sulfur Trioxide, SO3		0.23
Potassium Oxide, K2O		1.27
Sodium Oxide, Na2O		1.09
Barium Oxide, BaO		0.05
Strontium Oxide, SrO		0.02
Manganese Dioxide, MnO2		0.09
Undetermined		1.40
Type of Ash	ASME1974	Bituminous
Silica Value	ASME1974	57.70
T250 Deg F	BW	2240
Base/Acid Ratio	ASME1974	0.62
lb Ash/mm BTU		3546.45
lb SO2/mm BTU		< 0.01

*Using 20000 as SO2 calculation factor

Fouling Index	ASME1974	0.68
Slagging Index	ASME1974	< 0.01

(Mercury D6722 Dry Basis ug/g < 0.010)

Respectfully Submitted, Steven Arndt

* Not an Accredited Test

Lab No. : 201800252-003

Date Rec'd. : 1/22/2018

Date Sampled : 1/17/2018

Sampled By : CLIENT

STANDARD LABORATORIES, INC.
8451 River King Drive
Freeburg, IL 62243

ANAB ACCREDITED ISO/IEC 17025 TESTING LABORATORY

Certificate # L2179.02-1 Testing

CITY WATER, LIGHT AND POWER
MUNICIPAL CENTER, EAST
800 EAST MONROE ST., 4TH FLOOR
SPRINGFIELD, IL 62757
ATTN: BRANDEN POWELL

Page 3 of 3

Report Date: 2/1/2018 12:36:52 PM

Sample ID : 201800252-003

P.O. #: SCM100 CAB 00000557637

Remark: CWLP SPRINGFIELD - UNIT 33 - BOTTOM ASH

	TEST	DRY BASIS CONCENTRATION	UNITS	METHOD	DATE	TECH
	Antimony	1.50	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
	Arsenic	3.2	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
	Barium	432	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
	Beryllium	12.3	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
*	Boron	684	µg/g	ICPMS	1/30/2018	JMW
	Cadmium	1.17	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
	Chlorine	15	µg/g	ASTM D6721	1/31/2018	CJH
	Chromium	505	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
	Cobalt	22.9	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
	Copper	46	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
	Fluorine	< 10	µg/g	ASTM D5987 - IC	1/25/2018	RLR
	Lead	12.6	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
*	Magnesium	3780	µg/g	ASTM D6357 - ICP-AES	1/29/2018	JMW
	Manganese	579	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
	Mercury	< 0.010	µg/g	ASTM D6722	1/25/2018	CJH
	Molybdenum	60.7	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
	Nickel	294	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
	Selenium	< 0.1	µg/g	ASTM D4606	1/30/2018	JMW
	Silver	0.09	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
	Thallium	0.28	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
	Vanadium	171	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW
	Zinc	248	µg/g	ASTM D6357 - ICP-MS	1/29/2018	JMW

Respectfully Submitted, Jeremy Weiss

* Not an Accredited Test

DOCUMENT 8: DAP - CCR - JAN 2017 COMBINED FLY ASH TRACE METALS - REPRESENT ALL ASH GOING TO DAP

Lab No. : 201700339-001

Date Rec'd. : 2/1/2017

Date Sampled : 1/30/2017

Sampled By : CLIENT

STANDARD LABORATORIES, INC.
8451 River King Drive
Freeburg, IL 62243

LABORATORY ACCREDITATION BUREAU
ACCREDITED ISO/IEC 17025
Certificate # L2179.02-1 Testing

CITY WATER, LIGHT AND POWER
MUNICIPAL CENTER, EAST
800 EAST MONROE ST., 4TH FLOOR
SPRINGFIELD, IL 62757
ATTN: BRANDEN POWELL

Page 1 of 1

Report Date: 2/10/2017 3:47:53 PM

Sample ID : 201700339-001

P.O. #: SCM100 557233

Remark: CWLP SPRINGFIELD - COMBINE FLY ASH: D31,32,33

	TEST	DRY BASIS CONCENTRATION	UNITS	METHOD	DATE	TECH
	Antimony	17.1	µg/g	ASTM D6357 - ICP-MS	2/7/2017	JMW
	Arsenic	74.7	µg/g	ASTM D6357 - ICP-MS	2/7/2017	JMW
	Barium	402	µg/g	ASTM D6357 - ICP-MS	2/7/2017	JMW
	Beryllium	20.2	µg/g	ASTM D6357 - ICP-MS	2/7/2017	JMW
*	Boron	1950	µg/g	ICPMS	2/7/2017	JMW
	Cadmium	24.3	µg/g	ASTM D6357 - ICP-MS	2/7/2017	JMW
	Chlorine	332	µg/g	ASTM D6721	2/6/2017	CJH
	Chromium	687	µg/g	ASTM D6357 - ICP-MS	2/7/2017	JMW
	Cobalt	25.1	µg/g	ASTM D6357 - ICP-MS	2/7/2017	JMW
	Copper	103	µg/g	ASTM D6357 - ICP-MS	2/7/2017	JMW
	Fluorine	363	µg/g	ASTM D5987 - IC	2/6/2017	RLR
	Lead	85.5	µg/g	ASTM D6357 - ICP-MS	2/7/2017	JMW
*	Magnesium	3910	µg/g	ASTM D6357 - ICP-AES	2/7/2017	JMW
	Manganese	522	µg/g	ASTM D6357 - ICP-MS	2/7/2017	JMW
	Mercury	0.335	µg/g	ASTM D6722	2/2/2017	CJH
	Molybdenum	157	µg/g	ASTM D6357 - ICP-MS	2/7/2017	JMW
	Nickel	334	µg/g	ASTM D6357 - ICP-MS	2/7/2017	JMW
	Selenium	140	µg/g	ASTM D4606	2/6/2017	JMW
	Silver	0.69	µg/g	ASTM D6357 - ICP-MS	2/7/2017	JMW
	Thallium	17.9	µg/g	ASTM D6357 - ICP-MS	2/7/2017	JMW
	Vanadium	326	µg/g	ASTM D6357 - ICP-MS	2/7/2017	JMW
	Zinc	1140	µg/g	ASTM D6357 - ICP-MS	2/7/2017	JMW

Respectfully Submitted, Jeremy Weiss

* Not an Accredited Test

DOCUMENT 9: DAP - CCR - JAN 2017 COMBINED FLY ASH TOTALS DALLMAN ASH POND - REPRESENT ALL ASH GOING TO DAP

Lab No :	201700339-001		
Date Rec'd :	2/1/2017		
Date Sampled	1/30/2017	to	1/30/2017
Sampled By:	CLIENT		

STANDARD LABORATORIES, INC.
8451 River King Drive
Freeburg, IL 62243

LABORATORY
ACCREDITATION
BUREAU
ACCREDITED ISO/IEC 17025
Certificate # L2179.02-1 Testing

CITY WATER, LIGHT AND POWER
MUNICIPAL CENTER, EAST
800 EAST MONROE ST., 4TH FLOOR
SPRINGFIELD, IL 62757
ATTN: BRANDEN POWELL

Page : 1 of 1
Date : 2/15/2017   6:11:06 AM
P.O.# : SCM100 557233

Remark: CWLP SPRINGFIELD - COMBINE FLY ASH: D31,32,33

PROXIMATE ANALYSIS		As-Received	Dry Basis
% Moisture	D3302	0.83	******
% Ash	D3174	86.74	87.47
% Volatile	D3175	15.44	15.57
% Fixed Carbon	D3172	< 0.01	< 0.01
BTU	D5865	< 1	< 1
MAF BTU	D3180		< 1
% Total Sulfur	D4239	5.47	5.52

SULFUR FORMS			
% Pyritic	D2492MOD	0.09	0.09
% Sulfate	D2492MOD	5.55	5.60
% Organic	D2492MOD	< 0.01	< 0.01
% Total Sulfur	D4239	5.47	5.52

WATER SOLUBLE			
% Na2O	ASME1974	0.891	0.898
% K2O	ASME1974	0.270	0.272
* % Chlorine	ASME1974	******	******
Alkalies as Na2O	ASME1974	3.27	3.30

FUSION TEMP. OF ASH D1857 °F	Reducing	Oxidizing
I.D.	1963	2249
H=W	1983	2319
H=1/2W	1994	2362
FLUID	2193	2596

GRINDABILITY INDEX D409   ****** @   ****** % Moist.

FREE SWELLING INDEX D720   ******

* Apparent Specific Gravity of Coal ModIC7113   ******

% Equilibrium Moisture D1412   ******

* % Loss on Ignition @ 950C D7348   ******

Weight %

ULTIMATE ANALYSIS		As-Received	Dry Basis
% Moisture	D3302	0.83	******
% Carbon	D5373	0.69	0.70
% Hydrogen	D5373	0.75	0.75
% Nitrogen	D5373	0.99	1.00
% Chlorine	D6721	0.03	0.03
% Sulfur	D4239	5.47	5.52
% Ash	D3174	86.74	87.47
% Oxygen (Diff.)	D3176	4.50	4.53

(Chlorine D6721 Dry Basis ug/g   332   )

MINERAL ANALYSIS D6349		% Ignited Basis
Phos. Pentoxide, P2O5		0.13
Silica, SiO2		47.75
Ferric Oxide, Fe2O3		21.07
Alumina, Al2O3		13.76
Titania, TiO2		1.04
Lime, CaO		5.39
Magnesia, MgO		0.75
Sulfur Trioxide, SO3		5.54
Potassium Oxide, K2O		2.18
Sodium Oxide, Na2O		2.34
Barium Oxide, BaO		0.05
Strontium Oxide, SrO		0.04
Manganese Dioxide, MnO2		0.09
Undetermined		-0.13
Type of Ash	ASME1974	Bituminous
Silica Value	ASME1974	63.70
T250 Deg F	BW	2302
Base/Acid Ratio	ASME1974	0.51
lb Ash/mm BTU		< 0.01
lb SO2/mm BTU		< 0.01

*Using 20000 as SO2 calculation factor

Fouling Index	ASME1974	1.19
Slagging Index	ASME1974	2.82

(Mercury D6722 Dry Basis ug/g   0.335   )

Respectfully Submitted,   Steven Arndt

* Not an Accredited Test

Teklab, Inc.
Environmental Laboratory
http://www.teklabinc.com/

December 01, 2021

Eric Staley
City Water, Light & Power
3100 Stevenson Drive
2nd Floor Maintenance Building
Springfield, IL 62712
TEL: (217) 757-8610
FAX: (217) 757-8615

NELAP ACCREDITED TNI LABORATORY

Illinois	100226
Kansas	E-10374
Louisiana	05002
Louisiana	05003
Oklahoma	9978

RE: Landfill Leachate

WorkOrder: 21110023

Dear Eric Staley:

TEKLAB, INC received 1 sample on 11/11/2021 7:45:00 AM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. Unless otherwise documented within this report, Teklab Inc. analyzes samples utilizing the most current methods in compliance with 40CFR. All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Shelly A Hennessy

Shelly A. Hennessy
Project Manager
(618)344-1004 ex 36
SHennessy@teklabinc.com

Report Contents

http://www.teklabinc.com/

Client: City Water, Light & Power

Work Order: 21110023

Client Project: Landfill Leachate

Report Date: 01-Dec-21

This reporting package includes the following:

Definitions

http://www.teklabinc.com/

Client: City Water, Light & Power **Work Order:** 21110023

Client Project: Landfill Leachate **Report Date:** 01-Dec-21

Abbr	Definition
*	Analytes on report marked with an asterisk are not NELAP accredited
CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
CRQL	A Client Requested Quantitation Limit is a reporting limit that varies according to customer request. The CRQL may not be less than the MDL.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilution factors.
DNI	Did not ignite
DUP	Laboratory duplicate is a replicate aliquot prepared under the same laboratory conditions and independently analyzed to obtain a measure of precision.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample is a sample matrix, free from the analytes of interest,spiked with verified known amounts of analytes and analyzed exactly like a sample to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MBLK	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	"The method detection limit is defined as the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results."
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method’s recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
NC	Data is not acceptable for compliance purposes
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions.
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes.
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TIC	Tentatively identified compound: Analytes tentatively identified in the sample by using a library search. Only results not in the calibration standard will be reported as tentatively identified compounds. Results for tentatively identified compounds that are not present in the calibration standard, but are assigned a specific chemical name based upon the library search, are calculated using total peak areas from reconstructed ion chromatograms and a response factor of one. The nearest Internal Standard is used for the calculation. The results of any TICs must be considered estimated, and are flagged with a "T". If the estimated result is above the calibration range it is flagged "ET"
TNTC	Too numerous to count (> 200 CFU)

Definitions

Client: City Water, Light & Power

Client Project: Landfill Leachate

Work Order: 21110023

Report Date: 01-Dec-21

Qualifiers

- Unknown hydrocarbon
C - RL shown is a Client Requested Quantitation Limit
H - Holding times exceeded
J - Analyte detected below quantitation limits
ND - Not Detected at the Reporting Limit
S - Spike Recovery outside recovery limits
X - Value exceeds Maximum Contaminant Level
B - Analyte detected in associated Method Blank
E - Value above quantitation range
I - Associated internal standard was outside method criteria
M - Manual Integration used to determine area response
R - RPD outside accepted recovery limits
T - TIC(Tentatively identified compound)

Case Narrative

Client: City Water, Light & Power
Work Order: 21110023
Client Project: Landfill Leachate
Report Date: 01-Dec-21

Cooler Receipt Temp: 1.8 °C

An employee of Teklab, Inc. collected the sample(s).

Locations

Collinsville

Address 5445 Horseshoe Lake Road
Collinsville, IL 62234-7425
Phone (618) 344-1004
Fax (618) 344-1005
Email jhriley@teklabinc.com

Springfield

Address 3920 Pintail Dr
Springfield, IL 62711-9415
Phone (217) 698-1004
Fax (217) 698-1005
Email KKlostermann@teklabinc.com

Kansas City

Address 8421 Nieman Road
Lenexa, KS 66214
Phone (913) 541-1998
Fax (913) 541-1998
Email jhriley@teklabinc.com

Collinsville Air

Address 5445 Horseshoe Lake Road
Collinsville, IL 62234-7425
Phone (618) 344-1004
Fax (618) 344-1005
Email EHurley@teklabinc.com

Chicago

Address 1319 Butterfield Rd.
Downers Grove, IL 60515
Phone (630) 324-6855
Fax
Email arenner@teklabinc.com

Accreditations

Client: City Water, Light & Power
Work Order: 21110023
Client Project: Landfill Leachate
Report Date: 01-Dec-21

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2022	Collinsville
Kansas	KDHE	E-10374	NELAP	4/30/2022	Collinsville
Louisiana	LDEQ	05002	NELAP	6/30/2022	Collinsville
Louisiana	LDEQ	05003	NELAP	6/30/2022	Collinsville
Oklahoma	ODEQ	9978	NELAP	8/31/2022	Collinsville
Arkansas	ADEQ	88-0966		3/14/2022	Collinsville
Illinois	IDPH	17584		5/31/2023	Collinsville
Kentucky	UST	0073		1/31/2022	Collinsville
Missouri	MDNR	00930		5/31/2023	Collinsville
Missouri	MDNR	930		1/31/2022	Collinsville

Client: City Water, Light & Power
Work Order: 21110023
Client Project: Landfill Leachate
Report Date: 01-Dec-21
Lab ID: 21110023-001
Client Sample ID: L303
Matrix: LEACHATE
Collection Date: 11/10/2021 13:28

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to leachate from measuring point	*	0		**9.87**	ft	1	11/10/2021 13:28	R303136
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**58.3**	°F	1	11/10/2021 13:28	R303136
SW-846 9040B								
pH, Field	*	1.00		**7.51**		1	11/10/2021 13:28	R303136
SW-846 9050A								
Spec. Conductance, Field	*	1.00		**6340**	µmhos/cm @25C	1	11/10/2021 13:28	R303136
EPA 1664A								
Hexane Extractable Material	NELAP	6		**12**	mg/L	1	11/16/2021 8:32	R302757
STANDARD METHODS 2540 C (TOTAL) 1997, 2011								
Total Dissolved Solids	*	50		**6900**	mg/L	2.5	11/15/2021 14:59	R302731
STANDARD METHODS 2540 D 1997, 2011								
Total Suspended Solids	NELAP	12		**302**	mg/L	2	11/15/2021 12:49	R302678
STANDARD METHODS 4500-NH3 G (TOTAL) 1997, 2011								
Nitrogen, Ammonia (as N)	NELAP	1.00		**10.9**	mg/L	10	11/15/2021 17:19	R302667
STANDARD METHODS 4500-NO3 F (TOTAL) 2000, 2011								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	11/12/2021 13:01	R302669
SW-846 9012A (TOTAL)								
Cyanide	NELAP	0.005		**< 0.005**	mg/L	1	11/18/2021 12:05	185110
SW-846 9036 (TOTAL)								
Sulfate	NELAP	1000		**4950**	mg/L	100	11/15/2021 20:31	R302737
SW-846 9066 (TOTAL)								
Phenols	NELAP	5		**5**	µg/L	1	11/18/2021 11:55	R302843
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**4.98**	mg/L	1	11/11/2021 11:16	R302521
SW-846 9251 (TOTAL)								
Chloride	NELAP	10		**233**	mg/L	10	11/15/2021 20:27	R302744
SW-846 3005A, 6010B, METALS BY ICP (DISSOLVED)								
Iron	NELAP	40.0		**120**	µg/L	1	11/11/2021 22:17	184923
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)								
Aluminum	NELAP	25.0		**260**	µg/L	1	11/12/2021 21:58	184917
Arsenic	NELAP	25.0		**< 25.0**	µg/L	1	11/12/2021 21:58	184917
Barium	NELAP	2.5		**43.7**	µg/L	1	11/12/2021 21:58	184917
Beryllium	NELAP	0.5		**< 0.5**	µg/L	1	11/12/2021 21:58	184917
Boron	NELAP	200		**23800**	µg/L	10	11/16/2021 15:40	184917
Cadmium	NELAP	2.0		**< 2.0**	µg/L	1	11/12/2021 21:58	184917
Calcium	NELAP	0.100		**592**	mg/L	1	11/12/2021 21:58	184917
Cobalt	NELAP	5.0		**< 5.0**	µg/L	1	11/12/2021 21:58	184917
Iron	NELAP	40.0		**2660**	µg/L	1	11/12/2021 21:58	184917
Lead	NELAP	15.0		**< 15.0**	µg/L	1	11/12/2021 21:58	184917
Magnesium	NELAP	0.050		**1060**	mg/L	1	11/12/2021 21:58	184917
Manganese	NELAP	7.0		**1080**	µg/L	1	11/12/2021 21:58	184917
Sodium	NELAP	0.050		**117**	mg/L	1	11/12/2021 21:58	184917
Zinc	NELAP	10.0		**< 10.0**	µg/L	1	11/12/2021 21:58	184917

Laboratory Results

Client: City Water, Light & Power

Work Order: 21110023

Client Project: Landfill Leachate

Report Date: 01-Dec-21

Lab ID: 21110023-001

Client Sample ID: L303

Matrix: LEACHATE

Collection Date: 11/10/2021 13:28

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)								
Sample result(s) for B exceed 10 times the CCB. Data is reportable per the TNI Standard.								
SW-846 3510C, 8081B, CHLORINATED PESTICIDES BY GC/ECD								
4,4´-DDE	NELAP	0.50		**ND**	µg/L	5	11/17/2021 20:19	185068
Dieldrin	NELAP	0.50		**ND**	µg/L	5	11/17/2021 20:19	185068
Endosulfan I	NELAP	0.50		**ND**	µg/L	5	11/17/2021 20:19	185068
Methoxychlor	NELAP	0.50		**ND**	µg/L	5	11/17/2021 20:19	185068
Chlordane	NELAP	1.00		**ND**	µg/L	5	11/17/2021 20:19	185068
Surr: Decachlorobiphenyl	*	5-135		**91.6**	%REC	5	11/17/2021 20:19	185068
Surr: Tetrachloro-m-xylene	*	12-145		**27.9**	%REC	5	11/17/2021 20:19	185068
Elevated reporting limit due to sample composition.								
SW-846 3510C, 8151A, CHLORINATED HERBICIDES BY GC/ECD								
2,4,5-TP (Silvex)	NELAP	1.00		**ND**	µg/L	1	11/19/2021 20:31	185062
Pentachlorophenol	NELAP	0.50		**ND**	µg/L	1	11/19/2021 20:31	185062
Surr: 2,4-Dichlorophenylacetic acid	*	18.4-136		**66.6**	%REC	1	11/19/2021 20:31	185062
Elevated reporting limit due to sample composition.								
SW-846 3510C, 8270C, SEMI-VOLATILE ORGANIC COMPOUNDS BY GC/MS (TOTAL)								
2-Nitrophenol	NELAP	200		**ND**	µg/L	1	11/17/2021 16:32	185023
Parathion	NELAP	90.0		**ND**	µg/L	1	11/17/2021 13:29	185023
Phenanthrene	NELAP	100		**ND**	µg/L	1	11/17/2021 16:32	185023
Surr: 2,4,6-Tribromophenol	*	28.4-122		**50.0**	%REC	1	11/17/2021 16:32	185023
Surr: 2-Fluorobiphenyl	*	36.3-102	S	**35.8**	%REC	1	11/17/2021 16:32	185023
Surr: 2-Fluorophenol	*	12.3-72.5		**21.4**	%REC	1	11/17/2021 16:32	185023
Surr: Nitrobenzene-d5	*	32.3-100	S	**30.8**	%REC	1	11/17/2021 16:32	185023
Surr: Phenol-d5	*	10-62.5		**16.5**	%REC	1	11/17/2021 16:32	185023
Surr: p-Terphenyl-d14	*	10-112		**41.4**	%REC	1	11/17/2021 16:32	185023
Surrogate recovery is outside QC limits due to sample composition.								
SW-846 5030, 8260B, VOLATILE ORGANIC COMPOUNDS BY GC/MS								
Bromomethane	NELAP	2.00		**ND**	µg/L	1	11/13/2021 0:43	184975
Carbon disulfide	NELAP	2.00		**3.61**	µg/L	1	11/13/2021 0:43	184975
Chloroethane	NELAP	2.00		**ND**	µg/L	1	11/13/2021 0:43	184975
Vinyl acetate	NELAP	5.00		**ND**	µg/L	1	11/13/2021 0:43	184975
Surr: 1,2-Dichloroethane-d4	*	80-120		**113.7**	%REC	1	11/13/2021 0:43	184975
Surr: 4-Bromofluorobenzene	*	80-120		**103.8**	%REC	1	11/13/2021 0:43	184975
Surr: Dibromofluoromethane	*	80-120		**98.5**	%REC	1	11/13/2021 0:43	184975
Surr: Toluene-d8	*	80-120		**103.8**	%REC	1	11/13/2021 0:43	184975

Teklab Inc. Environmental Laboratory

Receiving Check List

http://www.teklabinc.com/

Client: City Water, Light & Power
Client Project: Landfill Leachate

Work Order: 21110023
Report Date: 01-Dec-21

Carrier: Joseph Riley

Received By: PWR

Completed by: Marvin L. Darling II
On:
11-Nov-21
Marvin L. Darling

Reviewed by: Elizabeth A. Hurley
On:
11-Nov-21
Elizabeth A. Hurley

Pages to follow: Chain of custody 1 Extra pages included 1

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	Temp °C 1.8
Type of thermal preservation?	None ☐	Ice ☑	Blue Ice ☐	Dry Ice ☐
Chain of custody present?	Yes ☑	No ☐		
Chain of custody signed when relinquished and received?	Yes ☑	No ☐		
Chain of custody agrees with sample labels?	Yes ☑	No ☐		
Samples in proper container/bottle?	Yes ☑	No ☐		
Sample containers intact?	Yes ☑	No ☐		
Sufficient sample volume for indicated test?	Yes ☑	No ☐		
All samples received within holding time?	Yes ☑	No ☐		
Reported field parameters measured:	Field ☑	Lab ☐	NA ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐		

When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.

Water – at least one vial per sample has zero headspace?	Yes ☑	No ☐	No VOA vials ☐
Water - TOX containers have zero headspace?	Yes ☐	No ☐	No TOX containers ☑
Water - pH acceptable upon receipt?	Yes ☐	No ☑	NA ☐
NPDES/CWA TCN interferences checked/treated in the field?	Yes ☐	No ☐	NA ☑

Any No responses must be detailed below or on the COC.

pH strip# 77625/76907. PR 11/11/21

Additional sodium hydroxide (78386) was needed upon arrival at the laboratory. PR 11/11/21

Sample was filtered and preserved with nitric acid (79318) for the dissolved metals analysis upon arrival at the laboratory. MLDII 111/11/21

CHAIN OF CUSTODY

Pg 1 of 1 Workorder # 21110023

TEKLAB INC, 5445 Horseshoe Lake Road, Collinsville, IL 62234 Phone (618) 344-1004 Fax (618) 344-1005

Client: City Water, Light & Power
Address: 3100 Stevenson Drive, 2nd Floor Maintenance Building
City/State/Zip: Springfield IL 62712
Contact: Eric Staley Phone: (217) 757-8610
Email: eric.staley@cwlp.com Fax:

Samples on: ☒ ICE ☐ BLUE ICE ☐ NO ICE 1.8 °C LTG 1
Preserved in: ☒ LAB ☐ FIELD 77625 76907 PR 11/11/21 **FOR LAB USE ONLY**

LAB NOTES:
Add NaOH (78386) PR 11/11/21 ¢ff8. mL0 II 11/11/21

Client Comments: ⊗ Filter in LAB
2nd/4th quarter
*elevations, pH, conductivity, temperature
**Al As Ba Be B Cd Co Fe Pb Mn Zn Ca Mg Na

Are these samples known to be involved in litigation? If yes, a surcharge will apply: ☐ Yes ☑ No
Are these samples known to be hazardous? ☐ Yes ☑ No
Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section: ☑ Yes ☐ No Permit on file

PROJECT NAME/NUMBER
Landfill Leachate

SAMPLE COLLECTOR'S NAME
J. RILEY ABRIDGES

RESULTS REQUESTED
☑ Standard ☐ 1-2 Day (100% Surcharge)
☐ Other ________ ☐ 3 Day (50% Surcharge)

BILLING INSTRUCTIONS

Lab Use Only	Sample ID	Date/Time Sampled	Matrix	# and Type of Containers									INDICATE ANALYSIS REQUESTED													
				UNP	HNO3	NaOH	H2SO4	HCL	MeOH	NaHSO4	TSP	Other	Field parameters*	Cl F SO4 TSS TDS	Metals (T)**	Iron (D)	Cyanide Phenols	Nitrate Ammonia (T)	Oil and Grease	SVOC	Pest Herb	VOC				
21110023-001	L303 ⊗	11/10/21 1328	Leachate	5	2	1	3	3					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
			Aqueous																							
			Aqueous																							
			Aqueous																							
			Aqueous																							
			Aqueous																							
			Aqueous																							
			Aqueous																							
			Aqueous																							
			Aqueous																							
			Aqueous																							

Relinquished By	Date/Time	Received By	Date/Time
	11/11/21 0145		11/11/21 0745

*The individual signing this agreement on behalf of the client, acknowledges that he/she has read and understands the terms and conditions of this agreement, and that he/she has the authority to sign on behalf of the client. See www.teklabinc.com for terms and conditions

PR 11/11/21

Well ID			Final	Units
L303	DTW	9.87		ft
	DTB			ft
	MP Elev			ft
	Time	1328		
	Temp	14.6		C
	D.O.			Mg/l
	Cond	6343		uS/cm
	pH	7.51		
	Orp			mV
	Turbidity			NTU
	Drawdn			ft
	Volume			Gallon

MODERATE TURB
STRONG ODOR
FILTER IN LAB
CLOUDY
BROWN/GREY COLOR
BAILER

DOCUMENT 10: DAP - CCR - FLUE GAS DESULFURIZATION SLUDGE ENTERING DAP

Client: Hanson Professional Services, Inc. **Work Order:** 20111337

Client Project: CWLP analysis **Report Date:** 01-Dec-2020

Lab ID: 20111337-003 **Client Sample ID:** FGD SD

Matrix: AQUEOUS **Collection Date:** 11/20/2020 11:50

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
EPA 1664A								
Hexane Extractable Material	NELAP	6		**< 6**	mg/L	1	11/25/2020 7:25	R284609
EPA 600 351.2								
Total Kjeldahl Nitrogen (as N)	NELAP	25		**200**	mg/L	1	11/24/2020 8:57	171484
EPA 600 365.4 (TOTAL)								
Phosphorus, Total (as P)	NELAP	2.50		**74.6**	mg/L	1	11/24/2020 8:56	171486
EPA 600 420.4 R1.0 (TOTAL)								
Phenols	NELAP	0.010		**< 0.010**	mg/L	2	11/30/2020 10:53	R284625
Elevated reporting limit due to sample composition.								
STANDARD METHOD 4500-H B 2000, LABORATORY ANALYZED								
Lab pH	NELAP	1.00		**7.56**		1	11/23/2020 15:42	R284492
STANDARD METHODS 2320 B (TOTAL) 1997								
Alkalinity, Bicarbonate (as CaCO3)	NELAP	0		**1750**	mg/L	1	11/25/2020 11:32	R284575
STANDARD METHODS 2320 B 1997								
Alkalinity, Carbonate (as CaCO3)	NELAP	0		**0**	mg/L	1	11/25/2020 11:32	R284575
STANDARD METHODS 2540 C (TOTAL) 1997								
Total Dissolved Solids	NELAP	400		**26100**	mg/L	20	11/23/2020 16:52	R284524
STANDARD METHODS 2540 D 1997								
Total Suspended Solids	NELAP	545		**71100**	mg/L	90.91	11/23/2020 13:29	R284469
STANDARD METHODS 4500-CL E (TOTAL) 1997								
Chloride	NELAP	2000		**5300**	mg/L	500	11/23/2020 19:56	R284496
STANDARD METHODS 4500-NH3 G (TOTAL) 1997								
Nitrogen, Ammonia (as N)	NELAP	0.50		**3.99**	mg/L	5	11/24/2020 15:39	R284521
STANDARD METHODS 4500-NO2 B (TOTAL) 2000								
Nitrogen, Nitrite (as N)	NELAP	0.05		**< 0.05**	mg/L	1	11/20/2020 20:52	R284404
STANDARD METHODS 4500-NO3 F (DISSOLVED) 2000								
Nitrogen, Nitrate-Nitrite (as N)	NELAP	0.100		**< 0.100**	mg/L	1	11/24/2020 13:49	R284515
SW-846 7196A								
Chromium, Hexavalent	NELAP	0.005	S	**< 0.005**	mg/L	5	11/20/2020 18:58	R284371
Matrix spike did not recover within control limits due to matrix interference. *Elevated reporting limit due to matrix interference.*								
SW-846 9012A (TOTAL)								
Cyanide	NELAP	0.100		**0.412**	mg/L	20	11/24/2020 15:54	171466
SW-846 9036 (TOTAL)								
Sulfate	NELAP	500		**1130**	mg/L	50	11/23/2020 19:51	R284495
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**3.22**	mg/L	1	11/24/2020 12:56	R284532
EPA 600 4.1.4, 200.7R4.4, METALS BY ICP (TOTAL)								
Arsenic	NELAP	0.125		**1.10**	mg/L	5	11/25/2020 17:27	171423
Barium	NELAP	0.0125		**1.57**	mg/L	5	11/25/2020 17:27	171423
Boron	NELAP	1.00		**202**	mg/L	50	11/30/2020 23:38	171423
Calcium	NELAP	0.500	B	**6600**	mg/L	5	11/25/2020 17:27	171423
Chromium	NELAP	0.0250		**3.99**	mg/L	5	11/25/2020 17:27	171423
Copper	NELAP	0.0250		**3.52**	mg/L	5	11/25/2020 17:27	171423
Iron	NELAP	0.200		**1490**	mg/L	5	11/25/2020 17:27	171423
Lead	NELAP	0.0750		**1.32**	mg/L	5	11/25/2020 17:27	171423

Laboratory Results

Client: Hanson Professional Services, Inc.
Work Order: 20111337
Client Project: CWLP analysis
Report Date: 01-Dec-2020
Lab ID: 20111337-003
Client Sample ID: FGD SD
Matrix: AQUEOUS
Collection Date: 11/20/2020 11:50

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
EPA 600 4.1.4, 200.7R4.4, METALS BY ICP (TOTAL)								
Magnesium	NELAP	0.250		**780**	mg/L	5	11/25/2020 17:27	171423
Manganese	NELAP	0.0350		**51.6**	mg/L	5	11/25/2020 17:27	171423
Nickel	NELAP	0.0250		**6.46**	mg/L	5	11/25/2020 17:27	171423
Potassium	NELAP	2.00		**153**	mg/L	20	11/25/2020 17:23	171423
Sodium	NELAP	0.250	B	**303**	mg/L	5	11/25/2020 17:27	171423
Zinc	NELAP	0.0500		**2.26**	mg/L	5	11/25/2020 17:27	171423
Sample results for Ca and Na exceed 10 times the method blank contamination. Data is reportable per the TNI Standard.								
EPA 600 4.1.4, 200.8 R5.4, METALS BY ICPMS (TOTAL)								
Cadmium	NELAP	0.0010		**0.176**	mg/L	5	11/25/2020 14:52	171424
Selenium	NELAP	0.0010		**4.84**	mg/L	5	11/25/2020 14:52	171424
Silver	NELAP	0.0010		**0.0030**	mg/L	5	11/25/2020 14:52	171424
MERCURY BY EPA METHOD 1631E (TOTAL)								
Mercury	NELAP	400		**30800**	ng/L	500	11/24/2020 13:29	171455

DOCUMENT 11: FGDS DEVELOPMENT LANDFILL LEACHATE ENTERING DAP

Teklab, Inc.
Environmental Laboratory
http://www.teklabinc.com/

December 01, 2021

Eric Staley
City Water, Light & Power
3100 Stevenson Drive
2nd Floor Maintenance Building
Springfield, IL 62712
TEL: (217) 757-8610
FAX: (217) 757-8615

NELAP ACCREDITED TNI LABORATORY

Illinois	100226
Kansas	E-10374
Louisiana	05002
Louisiana	05003
Oklahoma	9978

RE: Landfill Leachate **WorkOrder:** 21110023

Dear Eric Staley:

TEKLAB, INC received 1 sample on 11/11/2021 7:45:00 AM for the analysis presented in the following report.

Samples are analyzed on an as received basis unless otherwise requested and documented. The sample results contained in this report relate only to the requested analytes of interest as directed on the chain of custody. NELAP accredited fields of testing are indicated by the letters NELAP under the Certification column. Unless otherwise documented within this report, Teklab Inc. analyzes samples utilizing the most current methods in compliance with 40CFR. All tests are performed in the Collinsville, IL laboratory unless otherwise noted in the Case Narrative.

All quality control criteria applicable to the test methods employed for this project have been satisfactorily met and are in accordance with NELAP except where noted. The following report shall not be reproduced, except in full, without the written approval of Teklab, Inc.

If you have any questions regarding these tests results, please feel free to call.

Sincerely,

Shelly A Hennessy

Shelly A. Hennessy
Project Manager
(618)344-1004 ex 36
SHennessy@teklabinc.com

Report Contents

Client: City Water, Light & Power

Client Project: Landfill Leachate

Work Order: 21110023

Report Date: 01-Dec-21

This reporting package includes the following:

Definitions

Client: City Water, Light & Power
Work Order: 21110023
Client Project: Landfill Leachate
Report Date: 01-Dec-21

Abbr	Definition
*	Analytes on report marked with an asterisk are not NELAP accredited
CCV	Continuing calibration verification is a check of a standard to determine the state of calibration of an instrument between recalibration.
CRQL	A Client Requested Quantitation Limit is a reporting limit that varies according to customer request. The CRQL may not be less than the MDL.
DF	Dilution factor is the dilution performed during analysis only and does not take into account any dilutions made during sample preparation. The reported result is final and includes all dilution factors.
DNI	Did not ignite
DUP	Laboratory duplicate is a replicate aliquot prepared under the same laboratory conditions and independently analyzed to obtain a measure of precision.
ICV	Initial calibration verification is a check of a standard to determine the state of calibration of an instrument before sample analysis is initiated.
IDPH	IL Dept. of Public Health
LCS	Laboratory control sample is a sample matrix, free from the analytes of interest,spiked with verified known amounts of analytes and analyzed exactly like a sample to establish intra-laboratory or analyst specific precision and bias or to assess the performance of all or a portion of the measurement system.
LCSD	Laboratory control sample duplicate is a replicate laboratory control sample that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MBLK	Method blank is a sample of a matrix similar to the batch of associated sample (when available) that is free from the analytes of interest and is processed simultaneously with and under the same conditions as samples through all steps of the analytical procedures, and in which no target analytes or interferences should present at concentrations that impact the analytical results for sample analyses.
MDL	"The method detection limit is defined as the minimum measured concentration of a substance that can be reported with 99% confidence that the measured concentration is distinguishable from method blank results."
MS	Matrix spike is an aliquot of matrix fortified (spiked) with known quantities of specific analytes that is subjected to the entire analytical procedures in order to determine the effect of the matrix on an approved test method’s recovery system. The acceptable recovery range is listed in the QC Package (provided upon request).
MSD	Matrix spike duplicate means a replicate matrix spike that is prepared and analyzed in order to determine the precision of the approved test method. The acceptable recovery range is listed in the QC Package (provided upon request).
MW	Molecular weight
NC	Data is not acceptable for compliance purposes
ND	Not Detected at the Reporting Limit
NELAP	NELAP Accredited
PQL	Practical quantitation limit means the lowest level that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operation conditions.
RL	The reporting limit the lowest level that the data is displayed in the final report. The reporting limit may vary according to customer request or sample dilution. The reporting limit may not be less than the MDL.
RPD	Relative percent difference is a calculated difference between two recoveries (ie. MS/MSD). The acceptable recovery limit is listed in the QC Package (provided upon request).
SPK	The spike is a known mass of target analyte added to a blank sample or sub-sample; used to determine recovery deficiency or for other quality control purposes.
Surr	Surrogates are compounds which are similar to the analytes of interest in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples.
TIC	Tentatively identified compound: Analytes tentatively identified in the sample by using a library search. Only results not in the calibration standard will be reported as tentatively identified compounds. Results for tentatively identified compounds that are not present in the calibration standard, but are assigned a specific chemical name based upon the library search, are calculated using total peak areas from reconstructed ion chromatograms and a response factor of one. The nearest Internal Standard is used for the calculation. The results of any TICs must be considered estimated, and are flagged with a "T". If the estimated result is above the calibration range it is flagged "ET"
TNTC	Too numerous to count (> 200 CFU)

Definitions

Client: City Water, Light & Power

Client Project: Landfill Leachate

Work Order: 21110023

Report Date: 01-Dec-21

Qualifiers

# -	Unknown hydrocarbon	B -	Analyte detected in associated Method Blank
C -	RL shown is a Client Requested Quantitation Limit	E -	Value above quantitation range
H -	Holding times exceeded	I -	Associated internal standard was outside method criteria
J -	Analyte detected below quantitation limits	M -	Manual Integration used to determine area response
ND -	Not Detected at the Reporting Limit	R -	RPD outside accepted recovery limits
S -	Spike Recovery outside recovery limits	T -	TIC(Tentatively identified compound)
X -	Value exceeds Maximum Contaminant Level		

Case Narrative

Client: City Water, Light & Power

Work Order: 21110023

Client Project: Landfill Leachate

Report Date: 01-Dec-21

Cooler Receipt Temp: 1.8 °C

An employee of Teklab, Inc. collected the sample(s).

Locations

Collinsville

Address	5445 Horseshoe Lake Road Collinsville, IL 62234-7425
Phone	(618) 344-1004
Fax	(618) 344-1005
Email	jhriley@teklabinc.com

Springfield

Address	3920 Pintail Dr Springfield, IL 62711-9415
Phone	(217) 698-1004
Fax	(217) 698-1005
Email	KKlostermann@teklabinc.com

Kansas City

Address	8421 Nieman Road Lenexa, KS 66214
Phone	(913) 541-1998
Fax	(913) 541-1998
Email	jhriley@teklabinc.com

Collinsville Air

Address	5445 Horseshoe Lake Road Collinsville, IL 62234-7425
Phone	(618) 344-1004
Fax	(618) 344-1005
Email	EHurley@teklabinc.com

Chicago

Address	1319 Butterfield Rd. Downers Grove, IL 60515
Phone	(630) 324-6855
Fax	
Email	arenner@teklabinc.com

Accreditations

Client: City Water, Light & Power
Work Order: 21110023
Client Project: Landfill Leachate
Report Date: 01-Dec-21

State	Dept	Cert #	NELAP	Exp Date	Lab
Illinois	IEPA	100226	NELAP	1/31/2022	Collinsville
Kansas	KDHE	E-10374	NELAP	4/30/2022	Collinsville
Louisiana	LDEQ	05002	NELAP	6/30/2022	Collinsville
Louisiana	LDEQ	05003	NELAP	6/30/2022	Collinsville
Oklahoma	ODEQ	9978	NELAP	8/31/2022	Collinsville
Arkansas	ADEQ	88-0966		3/14/2022	Collinsville
Illinois	IDPH	17584		5/31/2023	Collinsville
Kentucky	UST	0073		1/31/2022	Collinsville
Missouri	MDNR	00930		5/31/2023	Collinsville
Missouri	MDNR	930		1/31/2022	Collinsville

Laboratory Results

Client: City Water, Light & Power
Work Order: 21110023
Client Project: Landfill Leachate
Report Date: 01-Dec-21
Lab ID: 21110023-001
Client Sample ID: L303
Matrix: LEACHATE
Collection Date: 11/10/2021 13:28

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
FIELD ELEVATION MEASUREMENTS								
Depth to leachate from measuring point	*	0		**9.87**	ft	1	11/10/2021 13:28	R303136
STANDARD METHODS 2550 B FIELD								
Temperature	*	0		**58.3**	°F	1	11/10/2021 13:28	R303136
SW-846 9040B								
pH, Field	*	1.00		**7.51**		1	11/10/2021 13:28	R303136
SW-846 9050A								
Spec. Conductance, Field	*	1.00		**6340**	µmhos/cm @25C	1	11/10/2021 13:28	R303136
EPA 1664A								
Hexane Extractable Material	NELAP	6		**12**	mg/L	1	11/16/2021 8:32	R302757
STANDARD METHODS 2540 C (TOTAL) 1997, 2011								
Total Dissolved Solids	*	50		**6900**	mg/L	2.5	11/15/2021 14:59	R302731
STANDARD METHODS 2540 D 1997, 2011								
Total Suspended Solids	NELAP	12		**302**	mg/L	2	11/15/2021 12:49	R302678
STANDARD METHODS 4500-NH3 G (TOTAL) 1997, 2011								
Nitrogen, Ammonia (as N)	NELAP	1.00		**10.9**	mg/L	10	11/15/2021 17:19	R302667
STANDARD METHODS 4500-NO3 F (TOTAL) 2000, 2011								
Nitrogen, Nitrate (as N)	NELAP	0.050		**< 0.050**	mg/L	1	11/12/2021 13:01	R302669
SW-846 9012A (TOTAL)								
Cyanide	NELAP	0.005		**< 0.005**	mg/L	1	11/18/2021 12:05	185110
SW-846 9036 (TOTAL)								
Sulfate	NELAP	1000		**4950**	mg/L	100	11/15/2021 20:31	R302737
SW-846 9066 (TOTAL)								
Phenols	NELAP	5		**5**	µg/L	1	11/18/2021 11:55	R302843
SW-846 9214 (TOTAL)								
Fluoride	NELAP	0.10		**4.98**	mg/L	1	11/11/2021 11:16	R302521
SW-846 9251 (TOTAL)								
Chloride	NELAP	10		**233**	mg/L	10	11/15/2021 20:27	R302744
SW-846 3005A, 6010B, METALS BY ICP (DISSOLVED)								
Iron	NELAP	40.0		**120**	µg/L	1	11/11/2021 22:17	184923
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)								
Aluminum	NELAP	25.0		**260**	µg/L	1	11/12/2021 21:58	184917
Arsenic	NELAP	25.0		**< 25.0**	µg/L	1	11/12/2021 21:58	184917
Barium	NELAP	2.5		**43.7**	µg/L	1	11/12/2021 21:58	184917
Beryllium	NELAP	0.5		**< 0.5**	µg/L	1	11/12/2021 21:58	184917
Boron	NELAP	200		**23800**	µg/L	10	11/16/2021 15:40	184917
Cadmium	NELAP	2.0		**< 2.0**	µg/L	1	11/12/2021 21:58	184917
Calcium	NELAP	0.100		**592**	mg/L	1	11/12/2021 21:58	184917
Cobalt	NELAP	5.0		**< 5.0**	µg/L	1	11/12/2021 21:58	184917
Iron	NELAP	40.0		**2660**	µg/L	1	11/12/2021 21:58	184917
Lead	NELAP	15.0		**< 15.0**	µg/L	1	11/12/2021 21:58	184917
Magnesium	NELAP	0.050		**1060**	mg/L	1	11/12/2021 21:58	184917
Manganese	NELAP	7.0		**1080**	µg/L	1	11/12/2021 21:58	184917
Sodium	NELAP	0.050		**117**	mg/L	1	11/12/2021 21:58	184917
Zinc	NELAP	10.0		**< 10.0**	µg/L	1	11/12/2021 21:58	184917

Client: City Water, Light & Power **Work Order:** 21110023

Client Project: Landfill Leachate **Report Date:** 01-Dec-21

Lab ID: 21110023-001 **Client Sample ID:** L303

Matrix: LEACHATE **Collection Date:** 11/10/2021 13:28

Analyses	Certification	RL	Qual	Result	Units	DF	Date Analyzed	Batch
SW-846 3005A, 6010B, METALS BY ICP (TOTAL)								
Sample result(s) for B exceed 10 times the CCB. Data is reportable per the TNI Standard.								
SW-846 3510C, 8081B, CHLORINATED PESTICIDES BY GC/ECD								
4,4´-DDE	NELAP	0.50		**ND**	µg/L	5	11/17/2021 20:19	185068
Dieldrin	NELAP	0.50		**ND**	µg/L	5	11/17/2021 20:19	185068
Endosulfan I	NELAP	0.50		**ND**	µg/L	5	11/17/2021 20:19	185068
Methoxychlor	NELAP	0.50		**ND**	µg/L	5	11/17/2021 20:19	185068
Chlordane	NELAP	1.00		**ND**	µg/L	5	11/17/2021 20:19	185068
Surr: Decachlorobiphenyl	*	5-135		**91.6**	%REC	5	11/17/2021 20:19	185068
Surr: Tetrachloro-m-xylene	*	12-145		**27.9**	%REC	5	11/17/2021 20:19	185068
Elevated reporting limit due to sample composition.								
SW-846 3510C, 8151A, CHLORINATED HERBICIDES BY GC/ECD								
2,4,5-TP (Silvex)	NELAP	1.00		**ND**	µg/L	1	11/19/2021 20:31	185062
Pentachlorophenol	NELAP	0.50		**ND**	µg/L	1	11/19/2021 20:31	185062
Surr: 2,4-Dichlorophenylacetic acid	*	18.4-136		**66.6**	%REC	1	11/19/2021 20:31	185062
Elevated reporting limit due to sample composition.								
SW-846 3510C, 8270C, SEMI-VOLATILE ORGANIC COMPOUNDS BY GC/MS (TOTAL)								
2-Nitrophenol	NELAP	200		**ND**	µg/L	1	11/17/2021 16:32	185023
Parathion	NELAP	90.0		**ND**	µg/L	1	11/17/2021 13:29	185023
Phenanthrene	NELAP	100		**ND**	µg/L	1	11/17/2021 16:32	185023
Surr: 2,4,6-Tribromophenol	*	28.4-122		**50.0**	%REC	1	11/17/2021 16:32	185023
Surr: 2-Fluorobiphenyl	*	36.3-102	S	**35.8**	%REC	1	11/17/2021 16:32	185023
Surr: 2-Fluorophenol	*	12.3-72.5		**21.4**	%REC	1	11/17/2021 16:32	185023
Surr: Nitrobenzene-d5	*	32.3-100	S	**30.8**	%REC	1	11/17/2021 16:32	185023
Surr: Phenol-d5	*	10-62.5		**16.5**	%REC	1	11/17/2021 16:32	185023
Surr: p-Terphenyl-d14	*	10-112		**41.4**	%REC	1	11/17/2021 16:32	185023
Surrogate recovery is outside QC limits due to sample composition.								
SW-846 5030, 8260B, VOLATILE ORGANIC COMPOUNDS BY GC/MS								
Bromomethane	NELAP	2.00		**ND**	µg/L	1	11/13/2021 0:43	184975
Carbon disulfide	NELAP	2.00		**3.61**	µg/L	1	11/13/2021 0:43	184975
Chloroethane	NELAP	2.00		**ND**	µg/L	1	11/13/2021 0:43	184975
Vinyl acetate	NELAP	5.00		**ND**	µg/L	1	11/13/2021 0:43	184975
Surr: 1,2-Dichloroethane-d4	*	80-120		**113.7**	%REC	1	11/13/2021 0:43	184975
Surr: 4-Bromofluorobenzene	*	80-120		**103.8**	%REC	1	11/13/2021 0:43	184975
Surr: Dibromofluoromethane	*	80-120		**98.5**	%REC	1	11/13/2021 0:43	184975
Surr: Toluene-d8	*	80-120		**103.8**	%REC	1	11/13/2021 0:43	184975

Teklab Inc.
Environmental Laboratory

Receiving Check List

http://www.teklabinc.com/

Client: City Water, Light & Power

Client Project: Landfill Leachate

Work Order: 21110023

Report Date: 01-Dec-21

Carrier: Joseph Riley

Received By: PWR

Completed by: Marvin L. Darling II
On:
11-Nov-21
Marvin L. Darling

Reviewed by: Elizabeth A. Hurley
On:
11-Nov-21
Elizabeth A. Hurley

Pages to follow: Chain of custody 1 Extra pages included 1

Shipping container/cooler in good condition?	Yes ☑	No ☐	Not Present ☐	Temp °C 1.8
Type of thermal preservation?	None ☐	Ice ☑	Blue Ice ☐	Dry Ice ☐
Chain of custody present?	Yes ☑	No ☐		
Chain of custody signed when relinquished and received?	Yes ☑	No ☐		
Chain of custody agrees with sample labels?	Yes ☑	No ☐		
Samples in proper container/bottle?	Yes ☑	No ☐		
Sample containers intact?	Yes ☑	No ☐		
Sufficient sample volume for indicated test?	Yes ☑	No ☐		
All samples received within holding time?	Yes ☑	No ☐		
Reported field parameters measured:	Field ☑	Lab ☐	NA ☐	
Container/Temp Blank temperature in compliance?	Yes ☑	No ☐		

When thermal preservation is required, samples are compliant with a temperature between 0.1°C - 6.0°C, or when samples are received on ice the same day as collected.

Water – at least one vial per sample has zero headspace?	Yes ☑	No ☐	No VOA vials ☐	
Water - TOX containers have zero headspace?	Yes ☐	No ☐	No TOX containers ☑	
Water - pH acceptable upon receipt?	Yes ☐	No ☑	NA ☐	
NPDES/CWA TCN interferences checked/treated in the field?	Yes ☐	No ☐	NA ☑	

Any No responses must be detailed below or on the COC.

pH strip# 77625/76907. PR 11/11/21

Additional sodium hydroxide (78386) was needed upon arrival at the laboratory. PR 11/11/21

Sample was filtered and preserved with nitric acid (79318) for the dissolved metals analysis upon arrival at the laboratory. MLDII 111/11/21

CHAIN OF CUSTODY

Pg 1 of 1 Workorder # 21110023

TEKLAB INC, 5445 Horseshoe Lake Road, Collinsville, IL 62234 Phone (618) 344-1004 Fax (618) 344-1005

Client: City Water, Light & Power
Address: 3100 Stevenson Drive, 2nd Floor Maintenance Building
City/State/Zip: Springfield IL 62712
Contact: Eric Staley
Phone: (217) 757-8610
Email: eric.staley@cwlp.com
Fax:

Samples on: ☒ ICE ☐ BLUE ICE ☐ NO ICE 1.8 °C LTG 1
Preserved in: ☒ LAB ☐ FIELD 77625 76907 PR 11/11/21 **FOR LAB USE ONLY**

LAB NOTES:
Add NaOH (78386) PR 11/11/21 @145. [illegible] 11/11/21

Are these samples known to be involved in litigation? If yes, a surcharge will apply: ☐ Yes ☑ No
Are these samples known to be hazardous? ☐ Yes ☑ No
Are there any required reporting limits to be met on the requested analysis?. If yes, please provide limits in the comment section: ☑ Yes ☐ No Permit on file

Client Comments: ⊗ Filter in LAB
2nd/4th quarter
*elevations, pH, conductivity, temperature
**Al As Ba Be B Cd Co Fe Pb Mn Zn Ca Mg Na

PROJECT NAME/NUMBER
Landfill Leachate

SAMPLE COLLECTOR'S NAME
J. RILEY ABRIDGES

RESULTS REQUESTED
☑ Standard ☐ 1-2 Day (100% Surcharge)
☐ Other ______ ☐ 3 Day (50% Surcharge)

BILLING INSTRUCTIONS

				# and Type of Containers									INDICATE ANALYSIS REQUESTED													
Lab Use Only	**Sample ID**	**Date/Time Sampled**	**Matrix**	**UNP**	**HNO3**	**NaOH**	**H2SO4**	**HCL**	**MeOH**	**NaHSO4**	**TSP**	**Other**	Field parameters*	Cl F SO4 TSS TDS	Metals (T)**	Iron (D)	Cyanide Phenols	Nitrate Ammonia (T)	Oil and Grease	SVOC	Pest Herb	VOC				
21110023-001	L303 ⊗	11/10/21 1328	Leachate	5	2	1	3	3					✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
			Aqueous																							
			Aqueous																							
			Aqueous																							
			Aqueous																							
			Aqueous																							
			Aqueous																							
			Aqueous																							
			Aqueous																							
			Aqueous																							
			Aqueous																							

Relinquished By	Date/Time	Received By	Date/Time
	11/11/21 0145		11/11/21 0745

*The individual signing this agreement on behalf of the client, acknowledges that he/she has read and understands the terms and conditions of this agreement, and that he/she has the authority to sign on behalf of the client. See www.teklabinc.com for terms and conditions

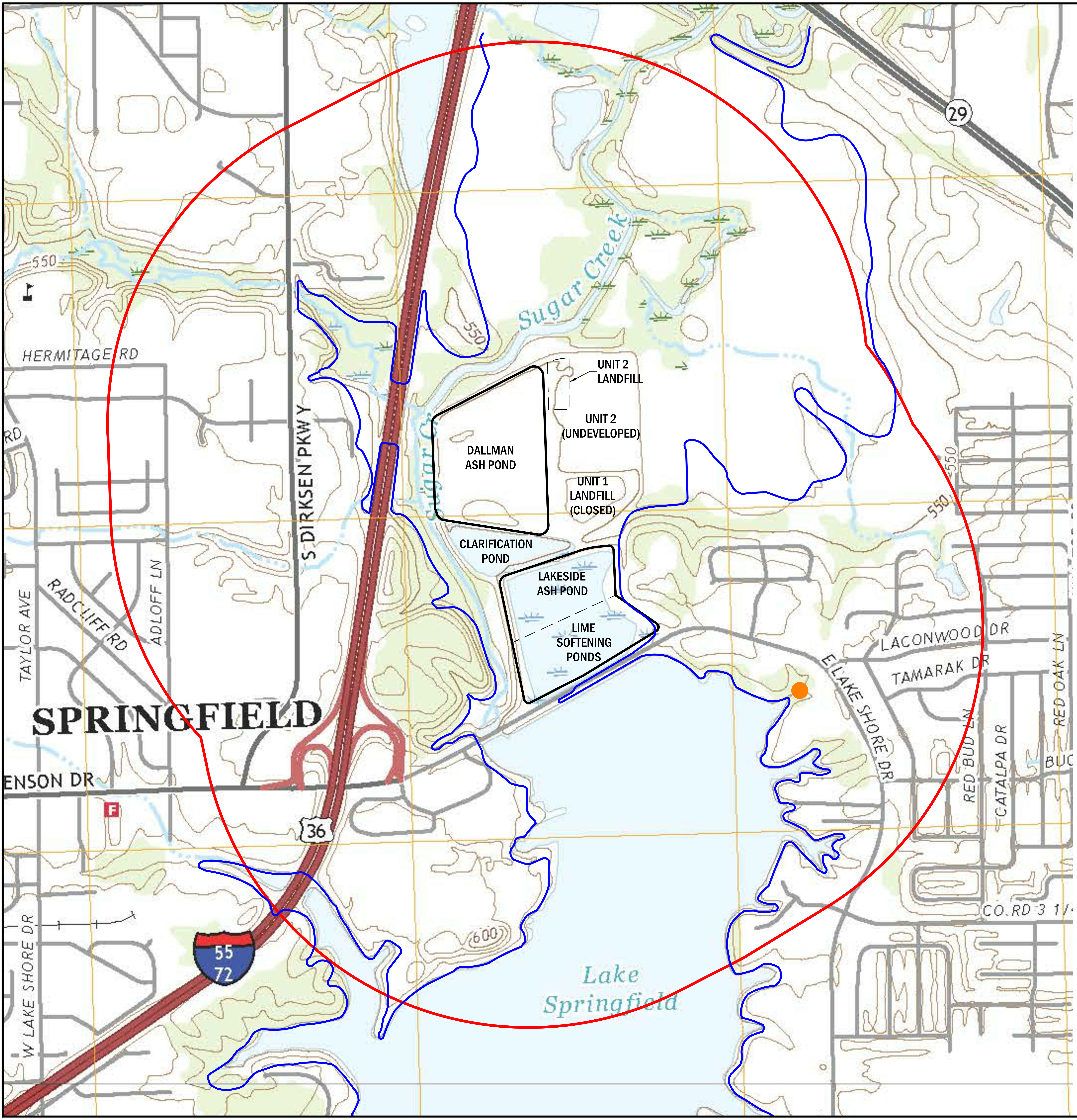
PR 11/11/21

Well ID			Final	Units
L303	DTW	9.87		ft
	DTB			ft
	MP Elev			ft
	Time	1328		
	Temp	14.6		C
	D.O.			Mg/l
	Cond	6343		uS/cm
	pH	7.51		
	Orp			mV
	Turbidity			NTU
	Drawdn			ft
	Volume			Gallon

MODERATE TURB
STRONG ODOR
FILTER IN LAB
CLOUDY
BROWN/GREY COLOR
BAILER

ATTACHMENT 6

SITE LOCATION MAP



LEGEND

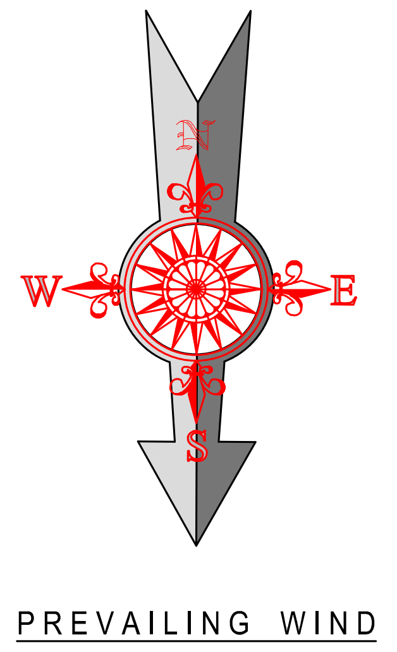
▬	CCR SURFACE IMPOUNDMENT
▬	100–YEAR FLOOD PLANE
▬	FACILITY BOUNDARY (3280 FT RADIUS)
●	CRITICAL HABITATS

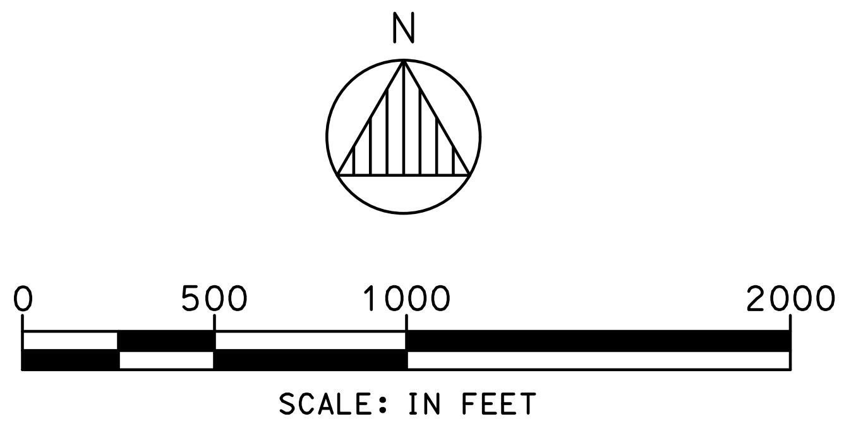
NOTES

1. NO ALL–NATURAL AREAS DESIGNATED AS A DEDICATED ILLINOIS NATURE PRESERVE UNDER THE ILLINOIS NATURAL AREAS PRESERVATION ACT ARE LOCATED NEAR THE FACILITY.
2. NO HISTORIC OR ARCHAEOLOGICAL SITES DESIGNATED BY THE NATIONAL HISTORIC PRESERVATION ACT AND THE ILLINOIS HISTORIC SITES ADVISORY COUNCIL ACT ARE LOCATED NEAR THE FACILITY.
3. 7.5 MINUTE QUADRANGLES FROM ILLINOIS NATURAL RESOURCES GEOSPATIAL DATA CLEARINGHOUSE.

SOURCES

1. PREVAILING WIND DIRECTION – ILLINOIS STATE WATER SURVEY
2. 100–YEAR FLOODPLAIN – FEMA
3. ALL–NATURAL AREAS – DEPARTMENT OF NATURAL RESOURCES
4. HISTORIC AND ARCHAEOLOGICAL SITES – HARGIS
5. CRITICAL HABITATS – DEPARTMENT OF NATURAL RESOURCES





NO.	DATE	REVISION DESCRIPTION	BY

ANDREWS ENGINEERING
3300 GINGER CREEK DRIVE
SPRINGFIELD, ILLINOIS 62711-7233
PH (217) 787-2334 WWW.ANDREWS-ENG.COM
PONTIAC, IL • LOMBARD, IL • INDIANAPOLIS, IN • WARRENTON, MD

APPROVED BY: BJH | DESIGNED BY: BJH | DRAWN BY: BCK

SITE LOCATION MAP

PREPARED FOR
CITY, WATER, LIGHT, AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE:
FEBRUARY 2022

PROJECT ID:
200387/0002

SHEET NUMBER:
FIG. 1

Tab: Layout1 Last Saved: January 28, 2022, by Mike Nguyen Plotted: Friday, January 28, 2022 8:45:03 AM
J:\S\Springfield CWLP\CWLP Ash Pond\DWG\2022\Site Location Map.dwg

ATTACHMENT 7

SITE PLAN MAP

LEGEND

- 🟥 CCR SURFACE IMPOUNDMENT
- ▨ EXISTING MONITORING WELL
- ◐ TEMPORARY ASSESSMENT WELL

NOTES

1. IMAGE SOURCE: GOOGLE EARTH PRO, IMAGE DATE OCTOBER 16, 2018.
2. CROSS SECTIONS ILLUSTRATING VERTICAL BOUNDARIES OF THE IMPOUNDMENTS ARE PROVIDED IN ATTACHMENT 8.

NO.	DATE	REVISION DESCRIPTION	BY

ANDREWS ENGINEERING
3300 GINGER CREEK DRIVE
SPRINGFIELD, ILLINOIS 62711-7233
PH (217) 787-2334 WWW.ANDREWS-ENG.COM
PONTIAC, IL • LOMBARD, IL • INDIANAPOLIS, IN • WARRENTON, MO

APPROVED BY: BJH
DESIGNED BY: BJH
DRAWN BY: MPN

SITE PLAN MAP

PLANS PREPARED FOR
CITY, WATER, LIGHT AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: FEBRUARY 2022
PROJECT ID: 200387/0026
SHEET NUMBER: SPM

Tab: Layout1 Last Saved: January 27, 2022, by Mike Nguyen Plotted: Thursday, January 27, 2022 5:01:05 PM
J:\S\Springfield CWLP\CWLP\dwg\2021\Groundwater Monitoring Network.dwg

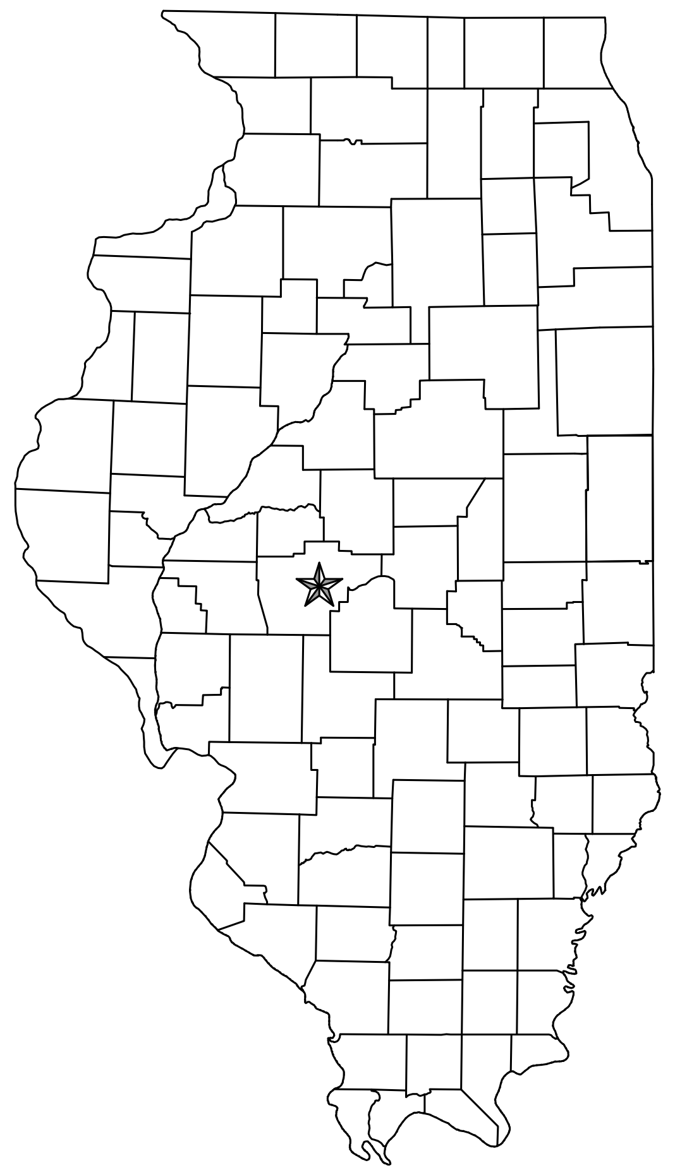
ATTACHMENT 8

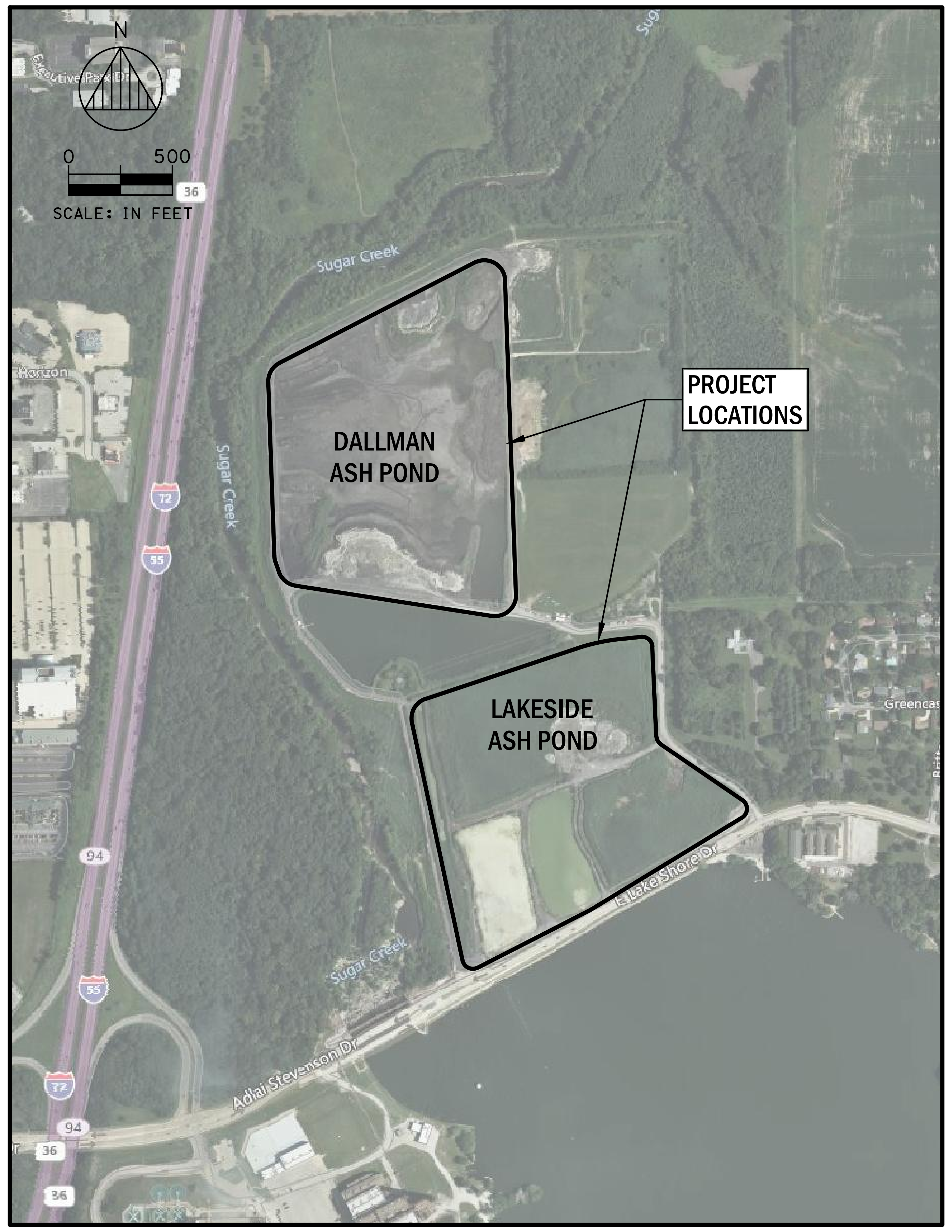
PLANS AND SPECIFICATIONS
AND
CONSTRUCTION QUALITY ASSURANCE PLAN

PLANS AND SPECIFICATIONS

NO.	DATE	REVISION DESCRIPTION	BY

CLOSURE PLANS
CITY WATER, LIGHT, AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS
FEBRUARY 2022





VICINITY MAP

INDEX OF SHEETS

NO.		TITLE
1	–	COVER SHEET
2	–	SITE MAP
3	–	DALLMAN ASH POND TOP OF FINAL COVER
4	–	LAKESIDE ASH POND TOP OF FINAL COVER
5	–	DALLMAN ASH POND N 1129600 AND E 2455900 PROFILES
6	–	LAKESIDE ASH POND N 1127900 AND E 2456700 PROFILES
7	–	GENERALIZED CROSS–SECTIONS
8	–	DETAILS

PREPARED FOR:

CITY WATER, LIGHT, AND POWER
3100 STEVENSON DRIVE
SPRINGFIELD, ILLINOIS 62702

PREPARED BY:

ANDREWS
ENGINEERING
215 W. WASHINGTON STREET
PONTIAC, ILLINOIS 61764-1805
PH (815) 842-2042 FAX (815) 842-2159
SPRINGFIELD, IL • LOMBARD, IL • INDIANAPOLIS, IN • WARRENTON, MO

I HEREBY AFFIRM THAT ALL INFORMATION CONTAINED ON THESE DRAWINGS ARE TRUE AND ACCURATE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

PAUL VAN METRE, P.E. DATE
ILLINOIS LICENSE NO. 062–064175

SEAL:

EXPIRATION DATE: 11/30/2023

DATE:
FEBRUARY 2022

PROJECT ID:
200387/0032

SHEET NUMBER:
1

Tab: Layout1 Last Saved: January 28, 2022, by Mike Nguyen Plotted: Friday, January 28, 2022 11:22:10 AM
J:\S\Springfield CWLP\CWLP Ash Pond\DWG\2022\Closure Construction plans\COVER.dwg

NOTES

1. ALL BOUNDARIES SHOWN ARE APPROXIMATE. ACTUAL LOCATIONS WILL BE DETERMINED IN THE FIELD.
2. ALL WEATHER ROADWAYS SHALL BE PROVIDED TO PREVENT TRACKING OF MUD ONTO OFFSITE ROADS. LOCATION AND SIZE OF ROADS ARE APPROXIMATE AND MAY DIFFER DUE TO FIELD CONDITIONS AND SITE REQUIREMENTS.
3. MONITORING WELLS HAVE BEEN INSTALLED IN ACCORDANCE WITH GROUNDWATER MONITORING PROGRAM.
4. BACKGROUND IMAGE DERIVED FROM BING.

LEGEND

▬	POND/LANDFILL BOUNDARY
─	ACCESS ROADS
▬	IMPOUNDMENT BOUNDARY
▣	MONITORING WELLS

N

0 250 500 1000

SCALE: IN FEET

NO.	DATE	REVISION DESCRIPTION	BY

ANDREWS ENGINEERING
3300 GINGER CREEK DRIVE
SPRINGFIELD, ILLINOIS 62711-7233
PH (217) 787-2334 WWW.ANDREWS-ENG.COM
PONTIAC, IL • LOMBARD, IL • INDIANAPOLIS, IN • WARRENTON, MO

APPROVED BY: BJH DESIGNED BY: BJH DRAWN BY: BCK

SITE MAP

PREPARED FOR

CITY, WATER, LIGHT AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE:
FEBRUARY 2022

PROJECT ID:
200387/0002

SHEET NUMBER:
2

Tab: Layout1 Last Saved: January 28, 2022, by Mike Nguyen Plotted: Friday, January 28, 2022 10:00:03 AM
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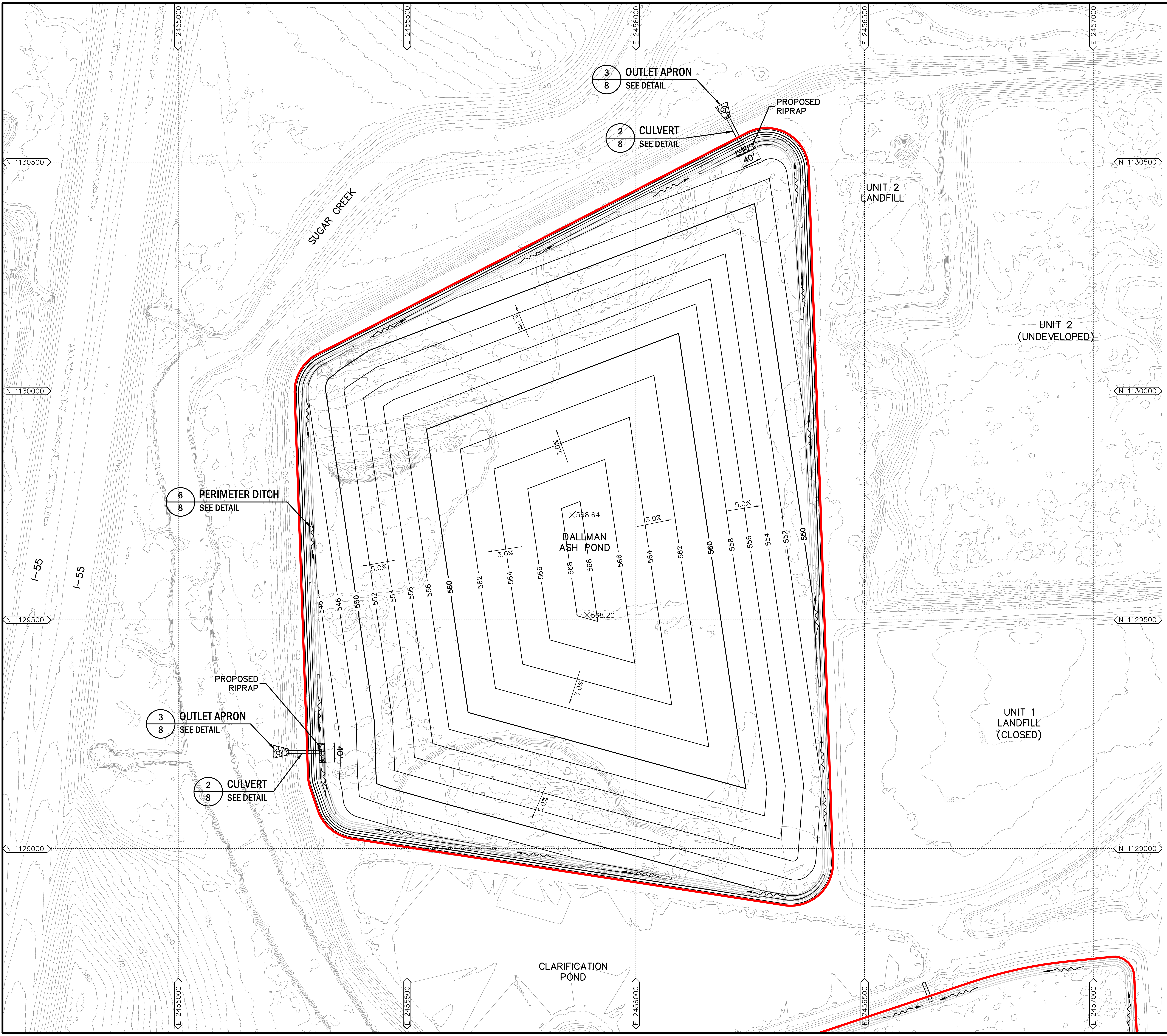
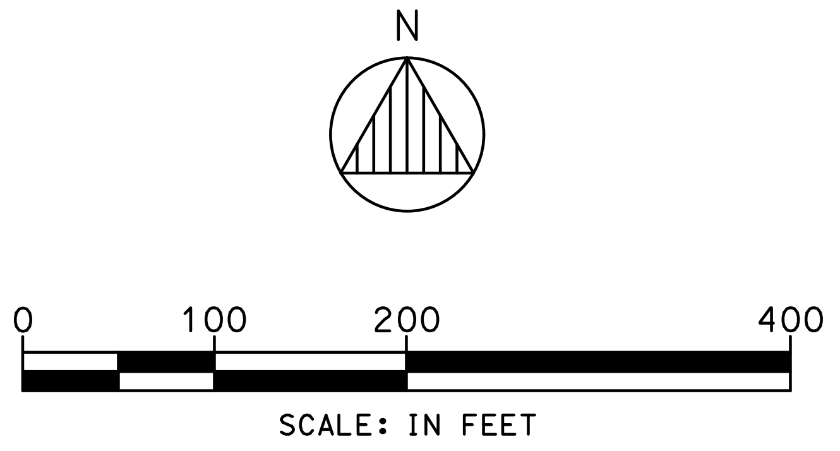


LEGEND

- IMPOUNDMENT BOUNDARY
- EXISTING 10' CONTOUR
- EXISTING 2' CONTOUR
- PROPOSED 10' CONTOUR
- PROPOSED 2' CONTOUR
- PROPOSED DITCH FLOW
- PROPOSED RIPRAP

NOTES

1. EXISTING AERIAL TOPOGRAPHY WAS GENERATED FROM LIDAR DATA TAKEN ON OCTOBER 15, 2018 FROM NATIONALMAP.GOV WEBSITE. CONTOUR INTERVAL SHOWN IS 2 FEET.
2. CURRENT TOPOGRAPHY MAY DIFFER FROM THAT SHOWN DUE TO MAINTENANCE ACTIVIES ON-GOING AT THE FACILITY.
3. FOR CLARITY, NOT ALL SITE FEATURES ARE SHOWN.
4. IMPOUNDMENT BOUNDARY SHOWN IS APPROXIMATE. ACTUAL LOCATIONS WILL BE DETERMINED IN THE FIELD.
5. ALL WEATHER ROADWAYS SHALL BE PROVIDED TO PREVENT TRACKING OF MUD ONTO OFFSITE ROADS. LOCATION AND SIZE OF ROADS ARE APPROXIMATE AND MAY DIFFER DUE TO FIELD CONDITIONS AND SITE REQUIREMENTS.
6. TEMPORARY DRAINAGE DIVERSION BERMS, DITCHES, CULVERTS, ETC., WILL BE USED AS NECESSARY TO DIVERT STORMWATER. EXCAVATED AREAS WILL BE PUMPED TO TEMPORARY OR PERIMETER DITCHES.
7. FINAL CONTOURS SHOWN ARE APPROXIMATE AND WILL BE AMENDED BASED UPON THE FINAL VOLUME OF MATERIAL PLACED IN THE IMPOUNDMENTS. A MINIMUM SLOPE OF TWO PERCENT SHALL BE MAINTAINED TO PROMOTE DRAINAGE AND PREVENT PONDING DUE TO SETTLEMENT ON THE TOP SLOPES.



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PONTIAC, IL • LOMBARD, IL • INDIANAPOLIS, IN • WARRENTON, MO

APPROVED BY: DWM
DESIGNED BY: DWM
DRAWN BY: MPN

DALLMAN ASH POND
TOP OF FINAL COVER

PREPARED FOR

CITY WATER, LIGHT, AND POWER

SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE:
FEBRUARY 2022

PROJECT ID:
200387/0032

SHEET NUMBER:
3

Tab: DALLMAN Last Saved: January 28, 2022, by Mike Nguyen Plotted: Friday, January 28, 2022 10:01:02 AM
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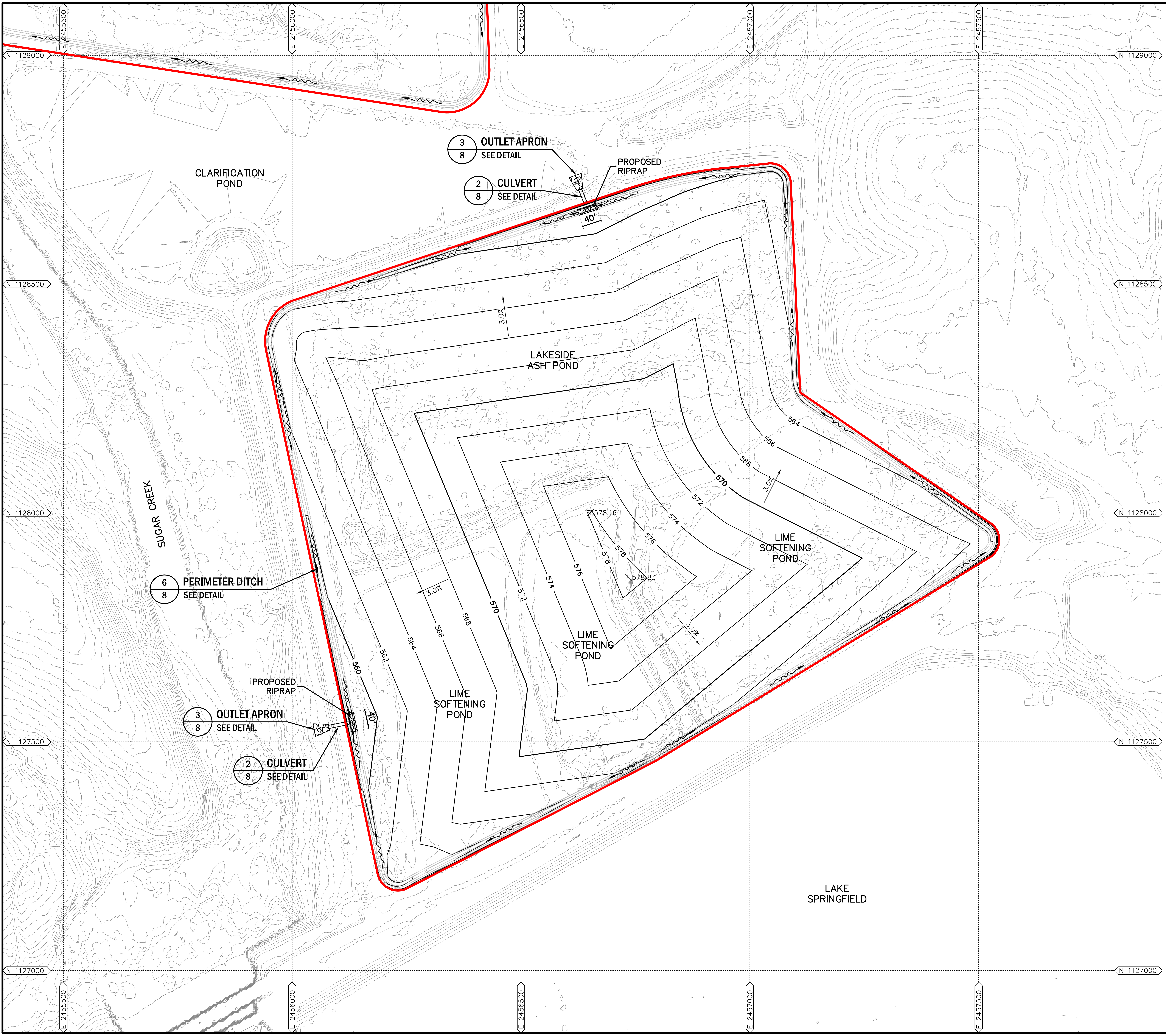

LEGEND

▬	IMPOUNDMENT BOUNDARY
500	EXISTING 10' CONTOUR
—	EXISTING 2' CONTOUR
500	PROPOSED 10' CONTOUR
—	PROPOSED 2' CONTOUR
→	PROPOSED DITCH FLOW
▨	PROPOSED RIPRAP

NOTES

1. EXISTING AERIAL TOPOGRAPHY WAS GENERATED FROM LIDAR DATA TAKEN ON OCTOBER 15, 2018 FROM NATIONALMAP.GOV WEBSITE. CONTOUR INTERVAL SHOWN IS 2 FEET.
2. CURRENT TOPOGRAPHY MAY DIFFER FROM THAT SHOWN DUE TO MAINTENANCE ACTIVIES ON–GOING AT THE FACILITY.
3. FOR CLARITY, NOT ALL SITE FEATURES ARE SHOWN.
4. IMPOUNDMENT BOUNDARY SHOWN IS APPROXIMATE. ACTUAL LOCATIONS WILL BE DETERMINED IN THE FIELD.
5. ALL WEATHER ROADWAYS SHALL BE PROVIDED TO PREVENT TRACKING OF MUD ONTO OFFSITE ROADS. LOCATION AND SIZE OF ROADS ARE APPROXIMATE AND MAY DIFFER DUE TO FIELD CONDITIONS AND SITE REQUIREMENTS.
6. TEMPORARY DRAINAGE DIVERSION BERMS, DITCHES, CULVERTS, ETC., WILL BE USED AS NECESSARY TO DIVERT STORMWATER. EXCAVATED AREAS WILL BE PUMPED TO TEMPORARY OR PERIMETER DITCHES.
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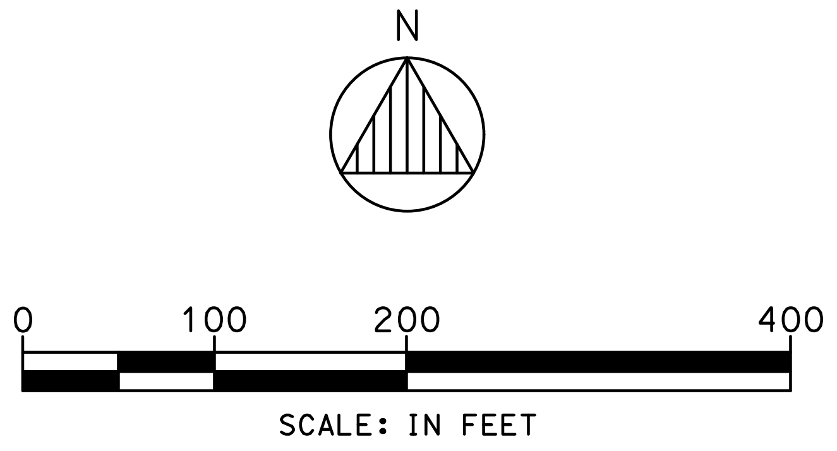

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APPROVED BY: DWM | DESIGNED BY: DWM | DRAWN BY: MPN

LAKESIDE ASH POND
TOP OF FINAL COVER

PREPARED FOR
CITY WATER, LIGHT, AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE:
FEBRUARY 2022

PROJECT ID:
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SHEET NUMBER:
4

Tab: LAKESIDE Last Saved: January 28, 2022, by Mike Nguyen Plotted: Friday, January 28, 2022 8:01:33 AM
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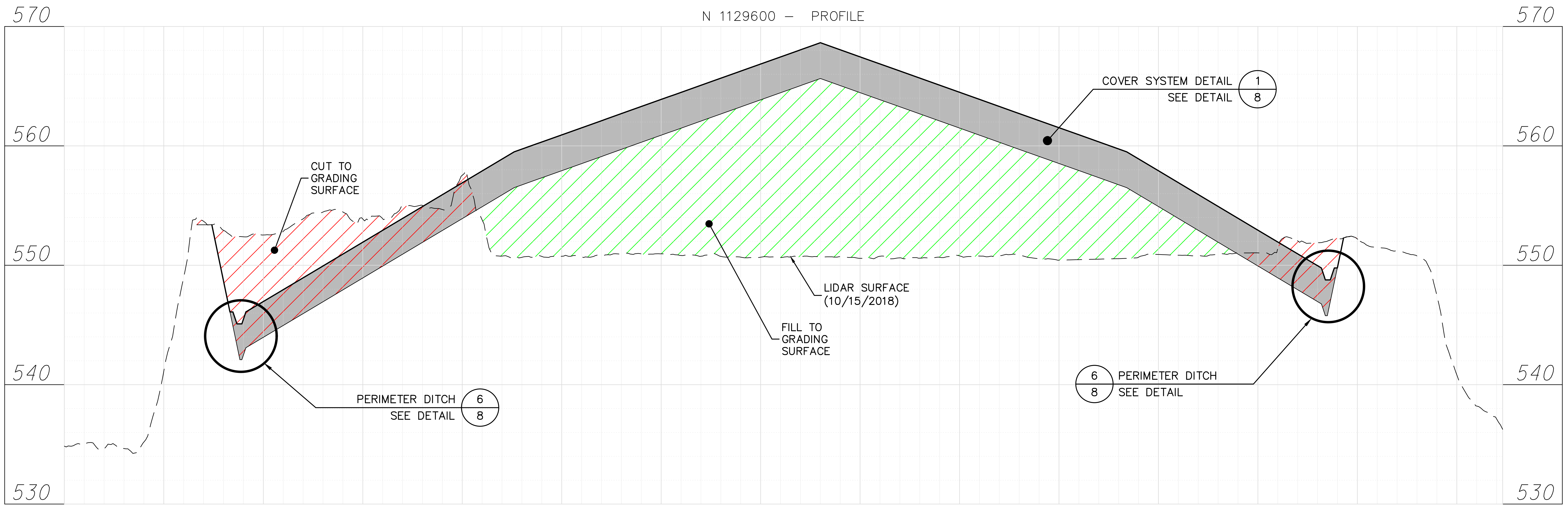
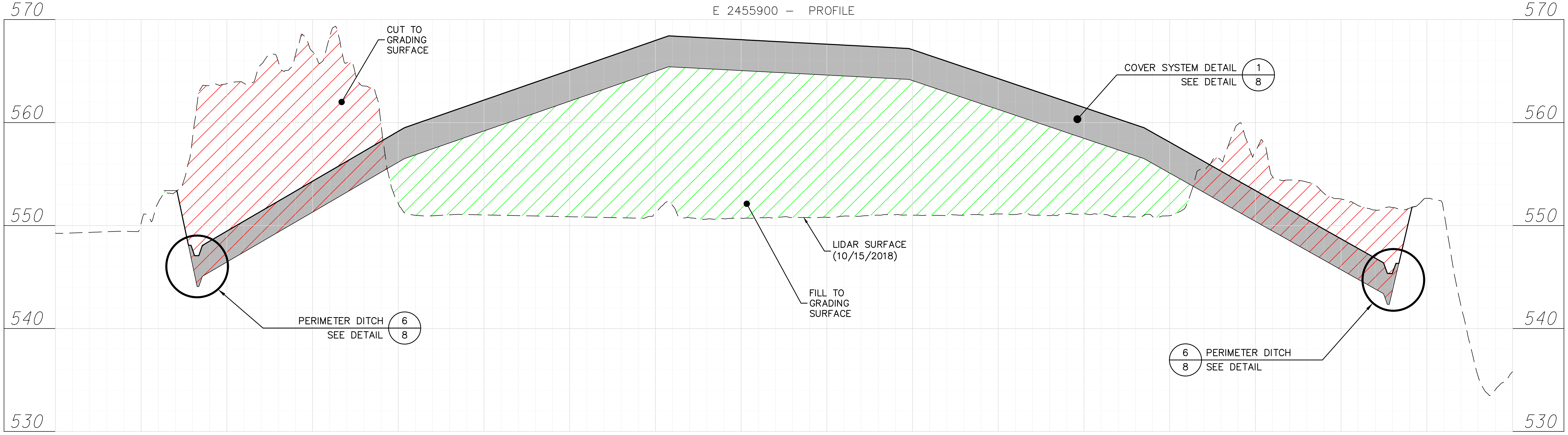


NOTES

1. TOP OF FINAL COVER GRADES WERE DERIVED FROM THE CONTOURS ON SHEET NUMBER 3.
2. FOR CLARITY NOT ALL EXISTING SITE FEATURES ARE SHOWN.
3. FOR CLARITY IN DEPICTING THE FEATURES SHOWN ON THIS SHEET, THE PROFILES HAVE BEEN DISTORTED BY A FACTOR OF 12 IN THE VERTICAL SCALE.
4. FINAL CONTOURS SHOWN ARE APPROXIMATE AND WILL BE AMENDED BASED UPON THE FINAL VOLUME OF MATERIAL PLACED IN THE IMPOUNDMENTS. A MINIMUM SLOPE OF TWO PERCENT SHALL BE MAINTAINED TO PROMOTE DRAINAGE AND PREVENT PONDING DUE TO SETTLEMENT ON THE TOP SLOPES.

HORIZ. 0 60 120 240
VERT. 0 5 10 20
SCALE: IN FEET
12X VERTICAL EXAGGERATION



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APPROVED BY: DWM DESIGNED BY: DWM DRAWN BY: MPN

DALLMAN ASH POND
N 1129600 AND E 2455900 PROFILES

PREPARED FOR
CITY WATER, LIGHT, AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: FEBRUARY 2022
PROJECT ID: 200387/0032
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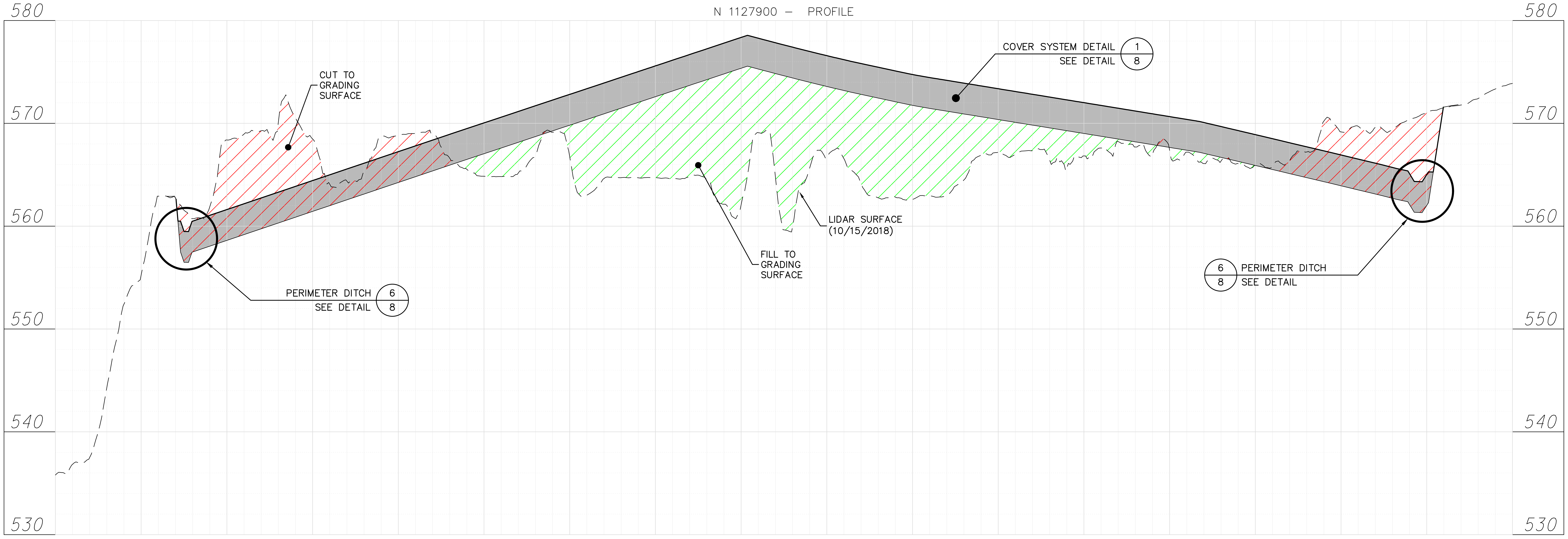
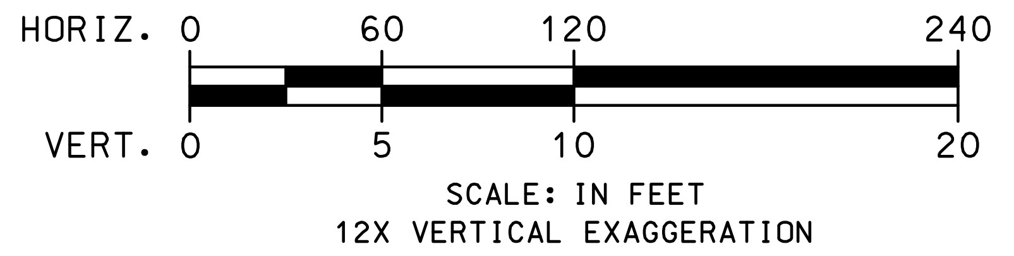
N 1127900 – PROFILE



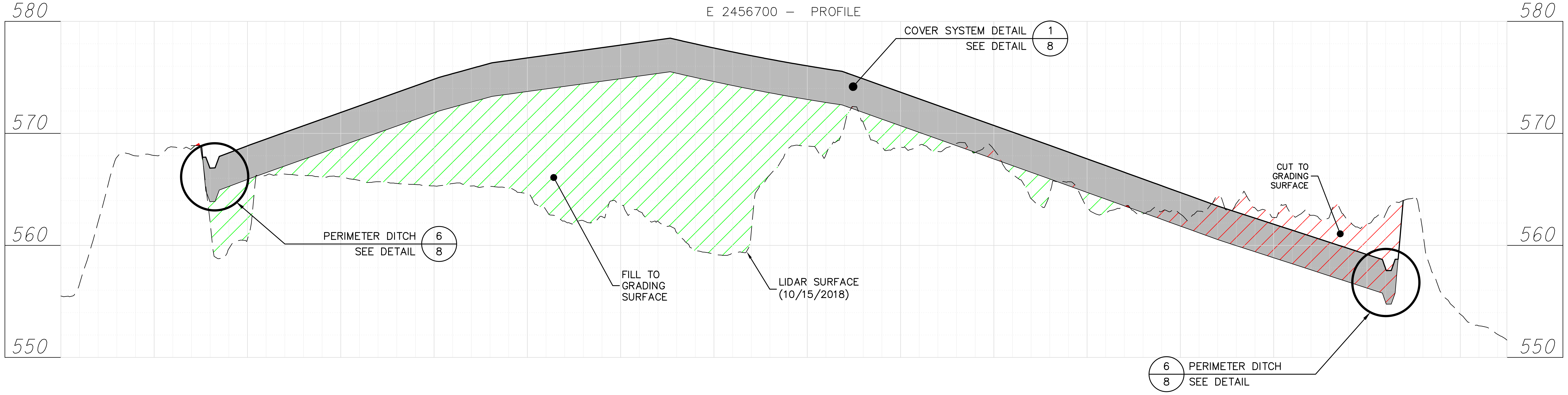
NOTES

1. TOP OF FINAL COVER GRADES WERE DERIVED FROM THE CONTOURS ON SHEET NUMBER 4.
2. FOR CLARITY NOT ALL EXISTING SITE FEATURES ARE SHOWN.
3. FOR CLARITY IN DEPICTING THE FEATURES SHOWN ON THIS SHEET, THE PROFILES HAVE BEEN DISTORTED BY A FACTOR OF 12 IN THE VERTICAL SCALE.
4. FINAL CONTOURS SHOWN ARE APPROXIMATE AND WILL BE AMENDED BASED UPON THE FINAL VOLUME OF MATERIAL PLACED IN THE IMPOUNDMENTS. A MINIMUM SLOPE OF TWO PERCENT SHALL BE MAINTAINED TO PROMOTE DRAINAGE AND PREVENT PONDING DUE TO SETTLEMENT ON THE TOP SLOPES.



SCALE: IN FEET
12X VERTICAL EXAGGERATION

E 2456700 – PROFILE



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DRAWN BY: MPN

LAKESIDE ASH POND
N 1127900 AND E 2456700 PROFILES

PREPARED FOR

CITY WATER, LIGHT, AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE:
FEBRUARY 2022

PROJECT ID:
200387/0032

SHEET NUMBER:
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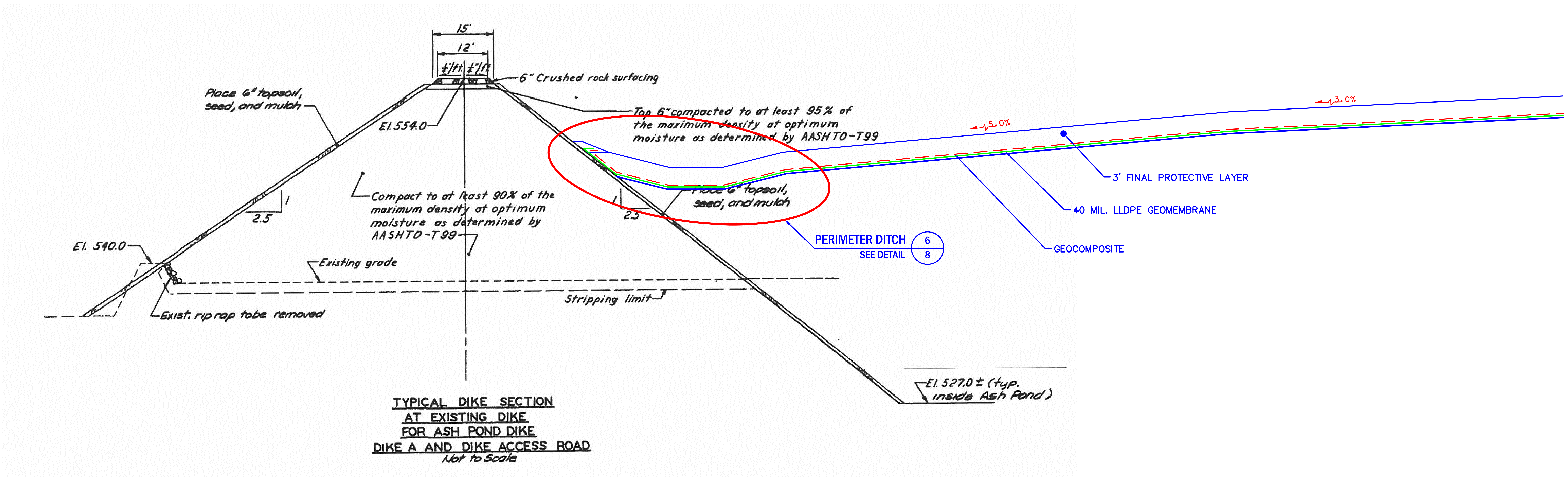
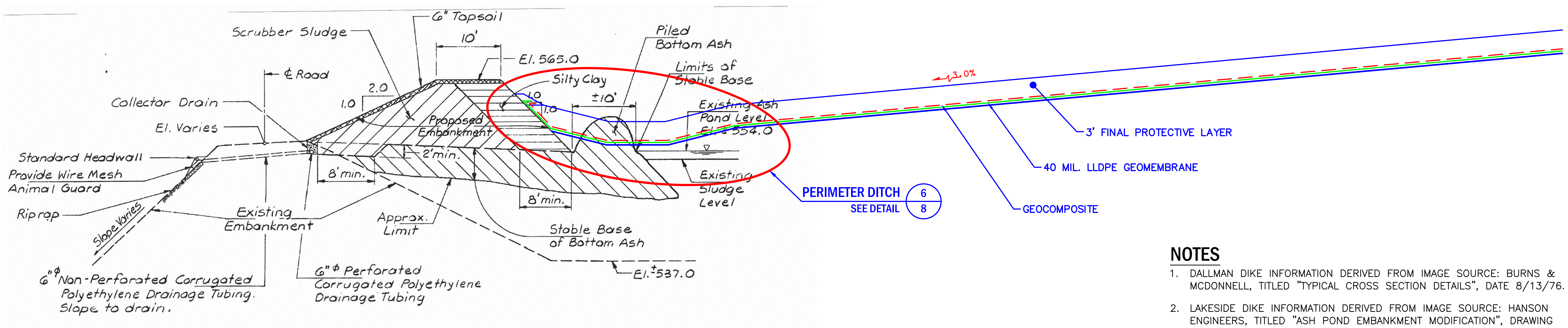


1/7 DALLMAN ASH POND GENERALIZED CROSS-SECTION
SCALE: NONE



2/7 LAKESIDE ASH POND GENERALIZED CROSS-SECTION
SCALE: NONE

NOTES

1. DALLMAN DIKE INFORMATION DERIVED FROM IMAGE SOURCE: BURNS & MCDONNELL, TITLED "TYPICAL CROSS SECTION DETAILS", DATE 8/13/76.
2. LAKESIDE DIKE INFORMATION DERIVED FROM IMAGE SOURCE: HANSON ENGINEERS, TITLED "ASH POND EMBANKMENT MODIFICATION", DRAWING SHEET 1, DATE 8/03/87.
3. FINAL COVER GRADES WERE DERIVED FROM THE CONTOURS SHOWN ON SHEET NUMBER 3 AND 4, RESPECTIVELY.
4. FINAL CONTOURS SHOWN ARE APPROXIMATE AND WILL BE AMENDED BASED UPON THE FINAL VOLUME OF MATERIAL PLACED IN THE IMPOUNDMENTS. A MINIMUM SLOPE OF TWO PERCENT SHALL BE MAINTAINED TO PROMOTE DRAINAGE AND PREVENT PONDING DUE TO SETTLEMENT ON THE TOP SLOPES.

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DESIGNED BY: DWM
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GENERALIZED CROSS-SECTIONS

PREPARED FOR
CITY WATER, LIGHT, AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE:
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PROJECT ID:
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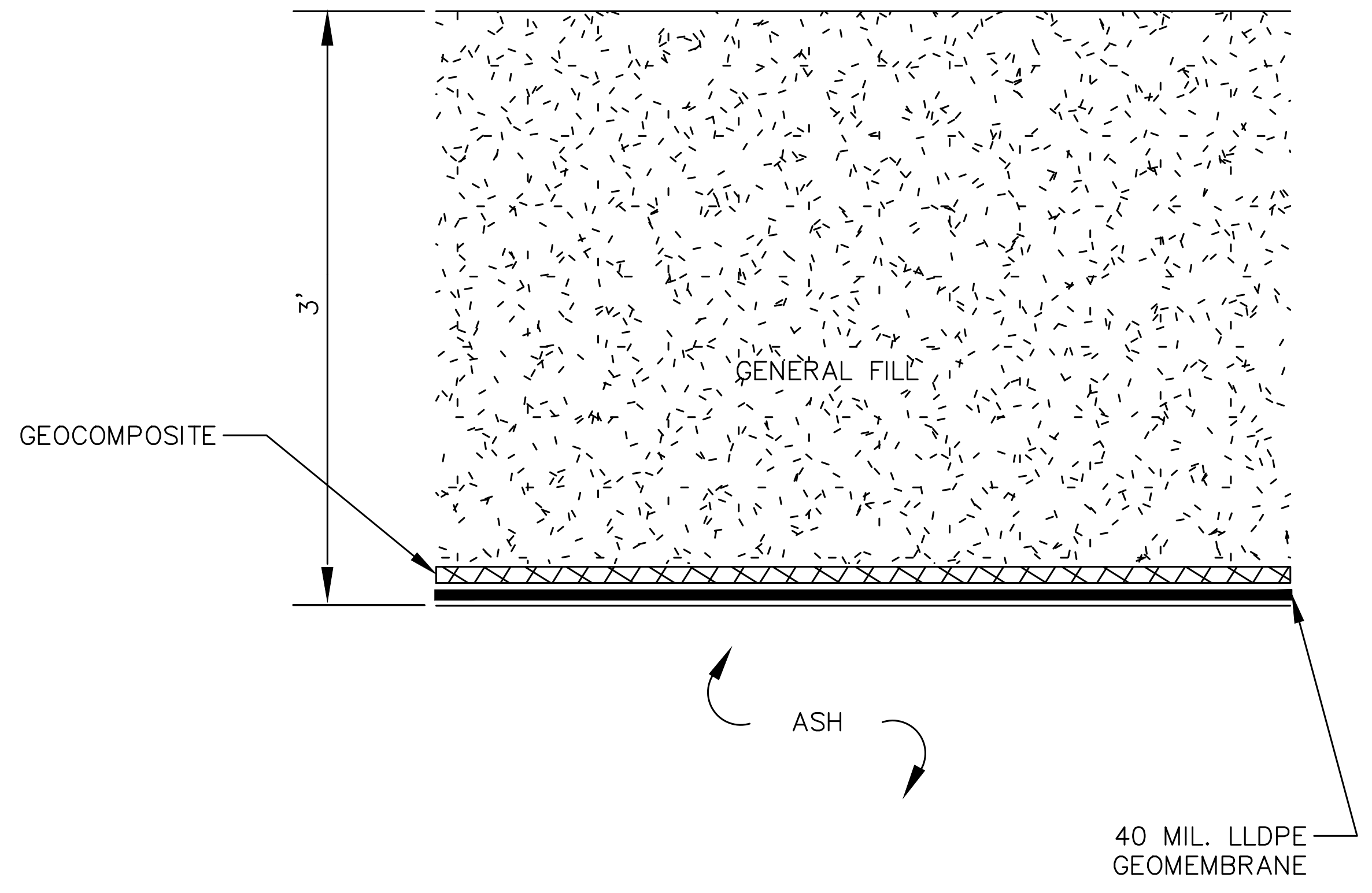
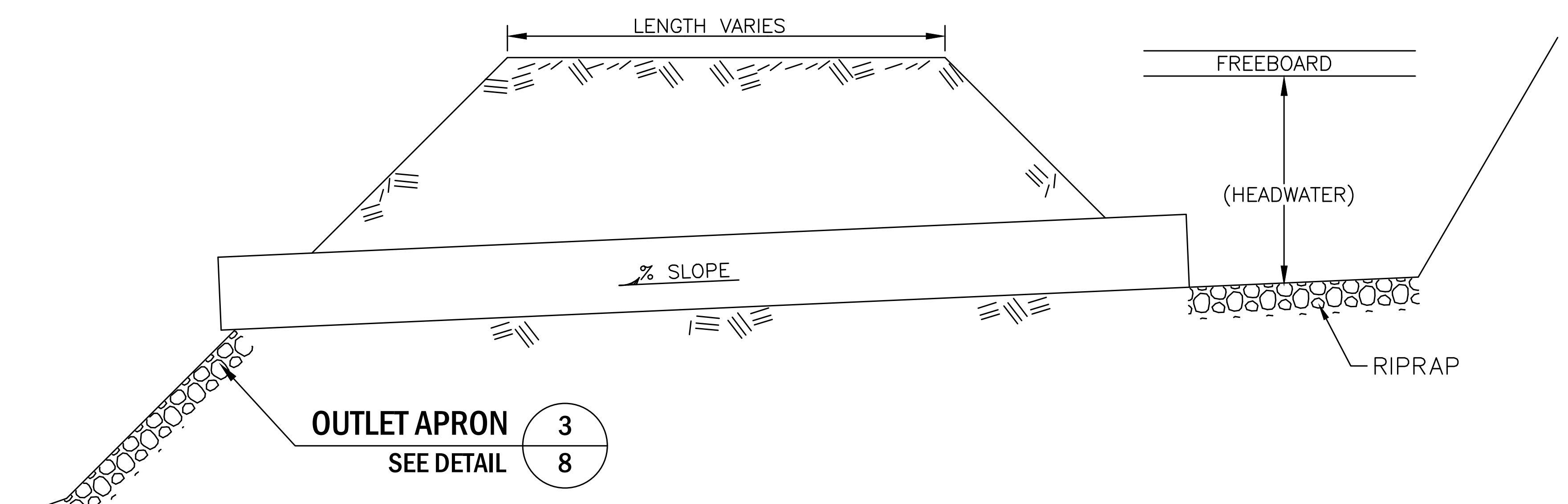


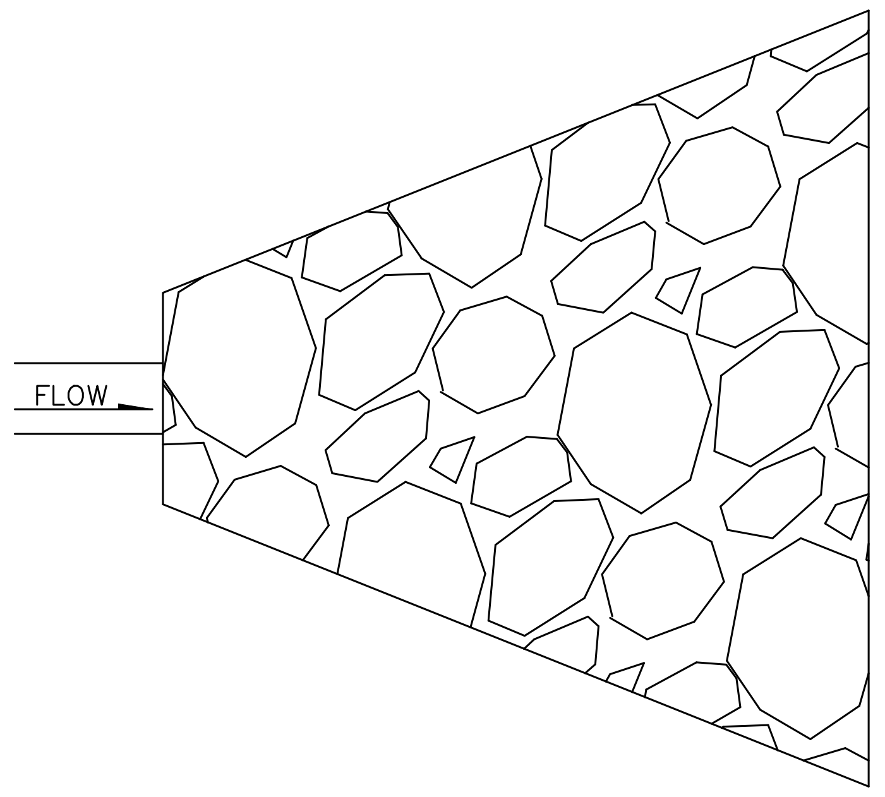
1/8 FINAL COVER SYSTEM
SCALE: NONE



NOTES:

1. MINIMUM SLOPE OF CULVERTS SHALL BE THE SAME AS THE DITCHES ON WHICH THEY ARE PLACED.
2. THE DESIGN CAPACITIES OF THE CULVERTS ARE BASED UPON THE SAME CRITERIA AS THE DITCHES THE SERVE.
3. RIPAP OR OTHER SUITABLE EROSION CONTROL MEASURES SHALL BE UTILIZED AROUND THE CULVERTS INLET AND OUTLET AS NECESSARY TO PREVENT SCOURING.
4. FINAL CULVERT DESIGN WILL BE DETERMINED AFTER DESIGN OF THE FINAL COVER HAS BEEN COMPLETED.

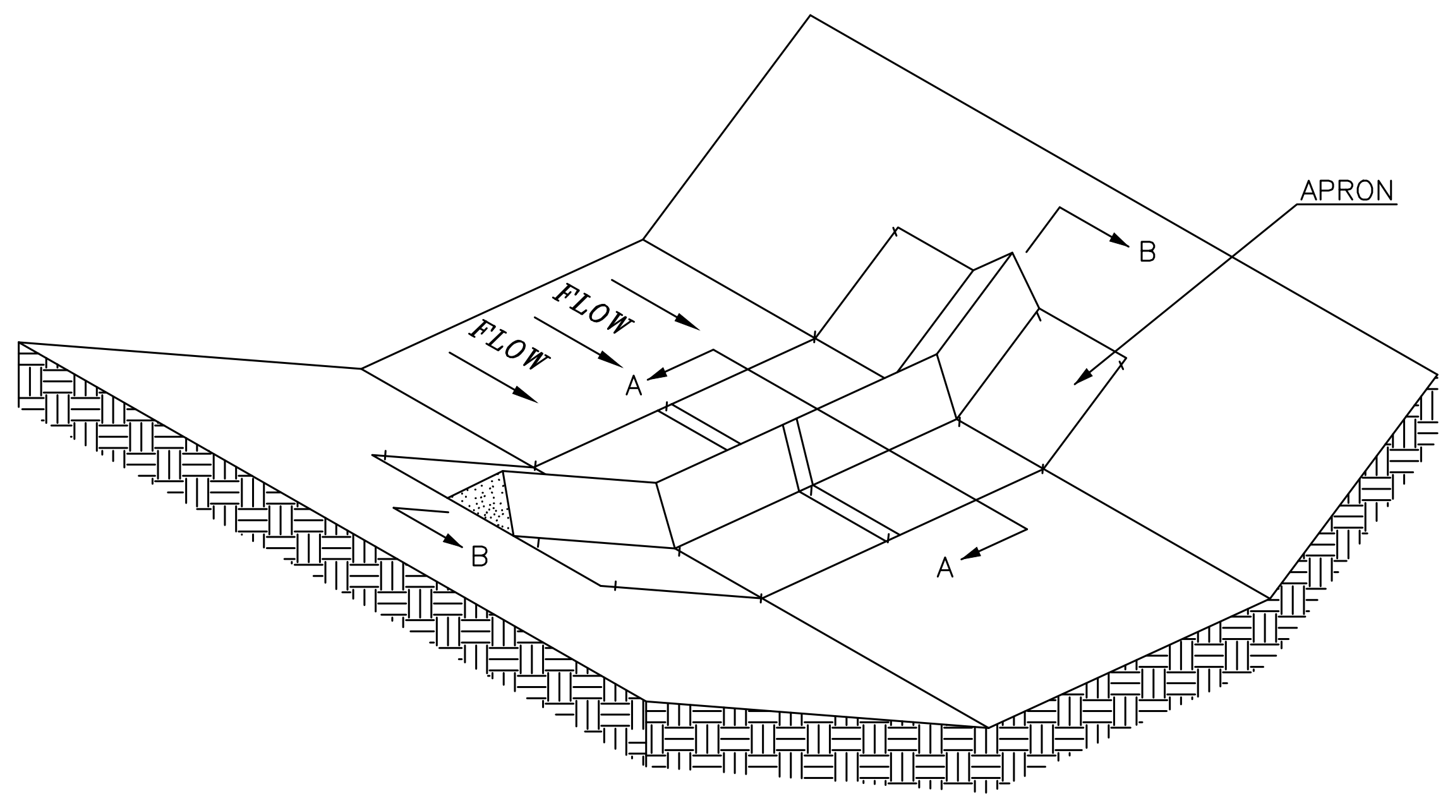
2/8 CULVERT DETAIL
SCALE: NONE



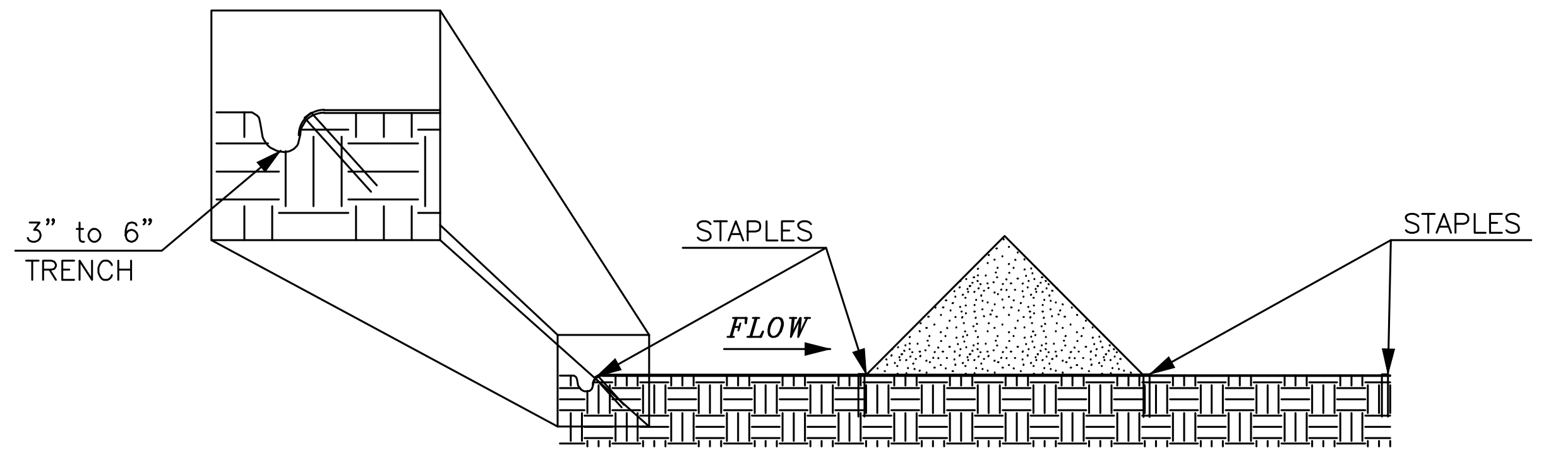
NOTES:

1. RIPRAP SIZING WILL BE DETERMINED AFTER DESIGN OF THE FINAL COVER AND CULVERT(S) HAVE BEEN COMPLETED.
2. RIPRAP PLACEMENT SHALL BE IN ACCORDANCE WITH IDOT SPECIFICATIONS.
3. RIPRAP OR AN EQUIVALENT EROSION CONTROL PRODUCT MAY BE UTILIZED WITH APPROVAL OF AN ILLINOIS REGISTERED PROFESSIONAL ENGINEER.

3/8 OUTLET APRON DETAIL
SCALE: NONE

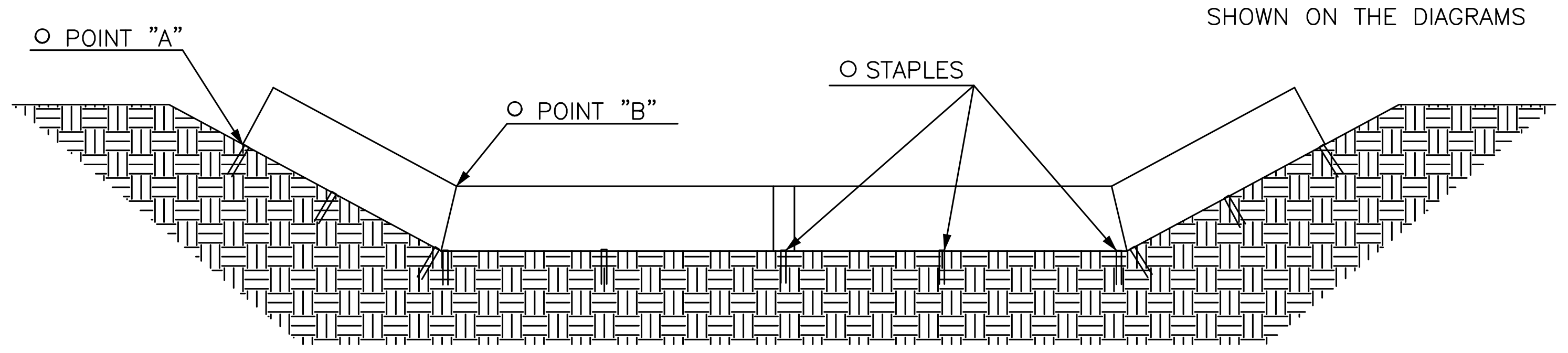


SILT DIKE UNIT
CUT SECTION



DETAIL A–A

○ STAPLES SHALL BE PLACED WHERE THE UNITS OVERLAP AND IN THE CENTER OF THE UNIT AS SHOWN ON THE DIAGRAMS



DIKE SECTION
DETAIL B–B

NOTES:

1. AS DETERMINED BY AN ILLINOIS REGISTERED PROFESSIONAL ENGINEER, THE DITCH DIMENSIONS AND GRADES MAY BE VARIED FROM THAT SHOWN IF THE DESIGN CAPACITY IS MAINTAINED AND EROSION WILL NOT RESULT.
2. TRIANGULAR SILT FENCE OR EQUIVALENT DITCH CHECK MAY BE USED AS NECESSARY FOR EROSION CONTROL IN THE PERIMETER DITCHES WITH APPROVAL OF AN ILLINOIS REGISTERED PROFESSIONAL ENGINEER.

○ POINT "A" MUST BE HIGHER THAN POINT "B" TO ENSURE THAT WATER FLOWS OVER THE DIKE AND NOT AROUND THE ENDS.

4/8 TRIANGULAR SILT DIKE INSTALLATION FOR DRAINAGE DITCH
SCALE: NONE

SLOPE INSTALLATION

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EROSION CONTROL *Products*
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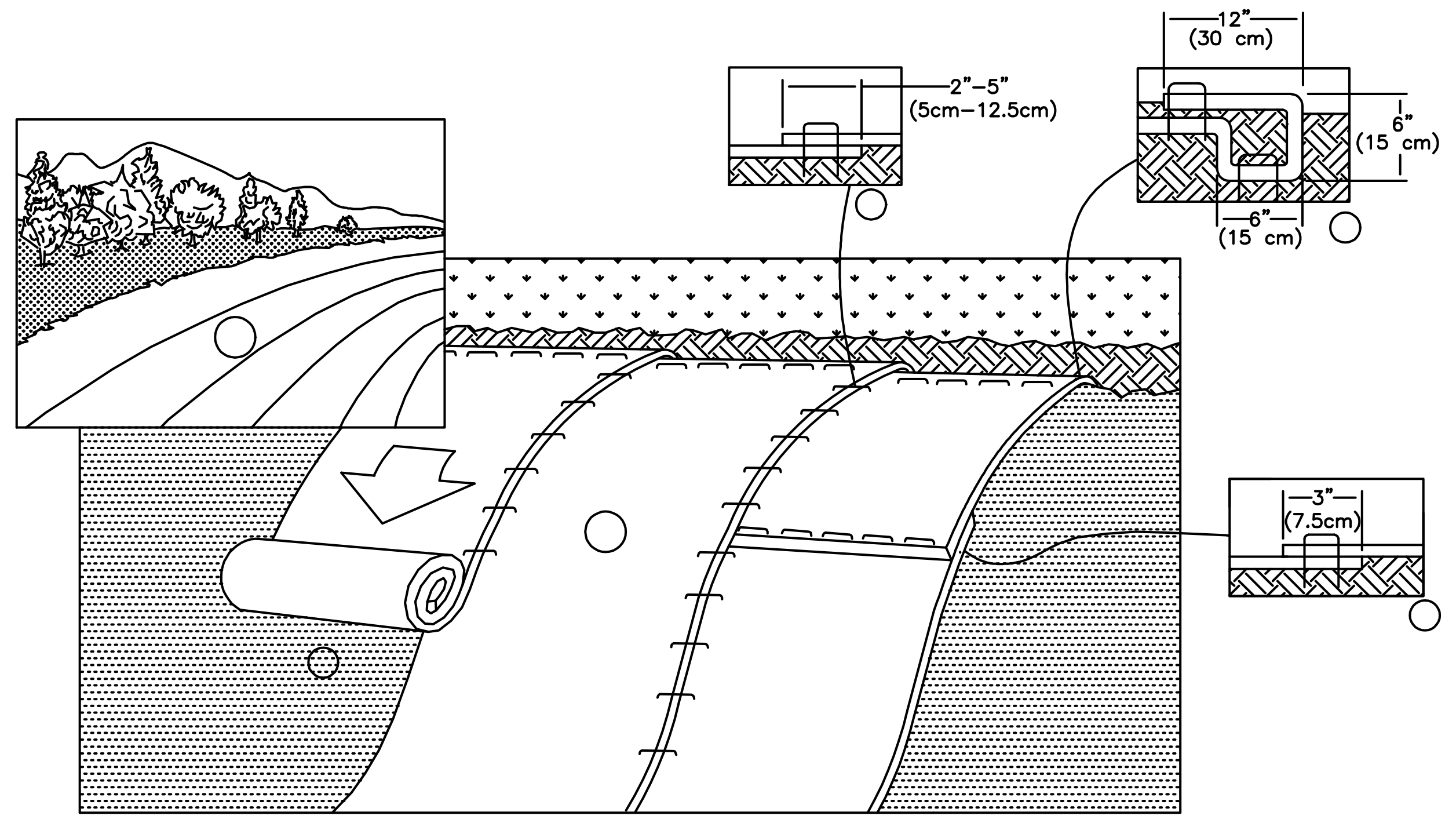
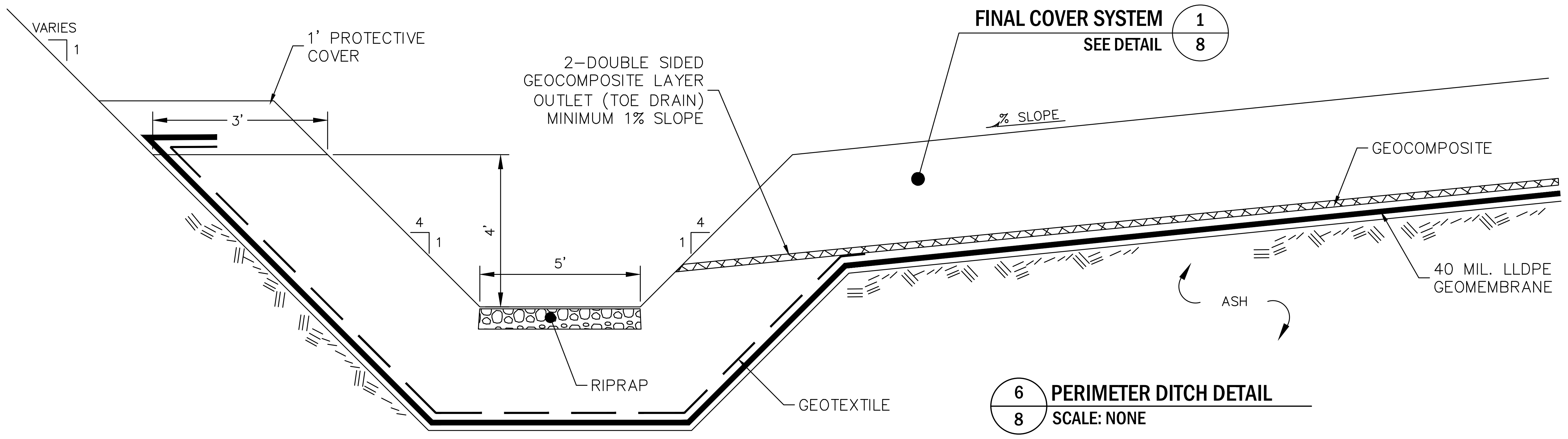


NOTES:

1. PREPARE SOIL BEFORE INSTALLING ROLLED EROSION CONTROL PRODUCTS (RECP's), INCLUDING ANY NECESSARY APPLICATION OF LIME, FERTILIZER, AND SEED.
   NOTE: WHEN USING CELL–O–SEED DO NOT SEED PREPARED AREA. CELL–O–SEED MUST BE INSTALLED WITH PAPER SIDE DOWN.
2. BEGIN AT THE TOP OF THE SLOPE BY ANCHORING THE RECP's IN A 6" (15 CM) DEEP X 6" (15 CM) WIDE TRENCH WITH APPROXIMATELY 12" (30cm) OF RECP's EXTENDED BEYOND THE UP–SLOPE PORTION OF THE TRENCH. ANCHOR THE RECP's WITH A ROW OF STAPLES/STAKES APPROXIMATELY 12" (30 CM) APART IN THE BOTTOM OF THE TRENCH. BACKFILL AND COMPACT THE TRENCH AFTER STAPLING. APPLY SEED TO COMPACTED SOIL AND FOLD REMAINING 12" (30 CM) PORTION OF RECP's BACK OVER SEED AND COMPACTED SOIL. SECURE RECP's OVER COMPACTED SOIL WITH A ROW OF STAPLES/STAKES SPACED APPROXIMATELY 12" (30 CM) APART ACROSS THE WIDTH OF THE RECP's.
3. ROLL THE RECP's (A.) DOWN OR (B.) HORIZONTALLY ACROSS THE SLOPE. RECP's WILL UNROLL WITH APPROPRIATE SIDE AGAINST THE SOIL SURFACE. ALL RECP's MUST BE SECURELY FASTENED TO SOIL SURFACE BY PLACING STAPLES/STAKES IN APPROPRIATE LOCATIONS AS SHOWN IN THE STAPLE PATTERN GUIDE. WHEN USING THE DOT SYSTEM™ , STAPLES/STAKES SHOULD BE PLACED THROUGH EACH OF THE COLORED DOTS CORRESPONDING TO THE APPROPRIATE STAPLE PATTERN.
4. THE EDGES OF PARALLEL RECP's MUST BE STAPLED WITH APPROXIMATELY 2" – 5" (5 CM – 12.5 CM) OVERLAP DEPENDING ON RECP's TYPE.
5. CONSECUTIVE RECP's SPLICED DOWN THE SLOPE MUST BE PLACED END OVER END (SHINGLE STYLE) WITH AN APPROXIMATE 3" (7.5 CM) OVERLAP. STAPLE THROUGH OVERLAPPED AREA, APPROXIMATELY 12" (30 CM) APART ACROSS ENTIRE RECP's WIDTH.
   NOTE:
   *IN LOOSE SOIL CONDITIONS, THE USE OF STAPLE OR STAKE LENGTHS GREATER THAN 6" (15 CM) MAY BE NECESSARY TO PROPERLY SECURE THE RECP's.

5/8 EROSION CONTROL BLANKET
SCALE: NONE



6/8 PERIMETER DITCH DETAIL
SCALE: NONE

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DESIGNED BY: DWM
DRAWN BY: MPN

DETAILS

PREPARED FOR
CITY WATER, LIGHT, AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: FEBRUARY 2022
PROJECT ID: 200387/0032
SHEET NUMBER: 8

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CONSTRUCTION QUALITY ASSURANCE PLAN

City Water, Light & Power

CCR Impoundments – Lakeside and Dallman Ash Ponds

Springfield, Sangamon County, Illinois

Construction Quality Assurance Plan

February 2022

Submitted to:
Illinois Environmental Protection Agency
Bureau of Land
Springfield, Illinois

Prepared for:
City Water, Light & Power
3100 Stevenson Drive
Springfield, Illinois 62703

ANDREWS
ENGINEERING

3300 Ginger Creek Drive, Springfield, IL 62711 | 217.787.2334

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TABLE OF CONTENTS

1. INTRODUCTION

Characteristics of the Lakeside and Dallman Ash Ponds have been evaluated pursuant to 35 Illinois Administrative Code (IAC) 845.300 (Subpart C – Location Restrictions). Based on extensive hydrogeologic investigations at and in the near proximity to the impoundments, it has been determined the impoundments do not meet the requirements of Section 845.300 (Placement above the Uppermost Aquifer). Therefore, pursuant to Section 845.350, the closure process defined in Section 845.700 must be implemented.

The closure construction permit application contains information specific to both closure of the impoundments and corrective action pursuant to 35 IAC 845.220(f). A closure alternatives analysis (CAA) was completed pursuant to Section 845.710. In addition, the facility anticipates conducting closure activities simultaneously with corrective action based on location restrictions and results from groundwater sampling and analyses. Therefore, the Corrective Measures Assessment was conducted pursuant to 35 IAC 845.660. Pursuant to the Closure Alternatives Assessment and Assessment of Corrective Measures provided in Attachment 11 of the Closure Construction Permit Application, the Construction Quality Assurance (CQA) Plan is specific to closure by final cover system defined in Section 845.750. Any specific reference to the closure process or components will also infer reference to corrective measures.

This CQA Plan reflects the requirements of 35 IAC Part 845, Subpart B. All structures necessary to comply with the requirements of Section 845.750 shall be constructed pursuant to the monitoring and certification activities summarized in this CQA Plan.

This program provides an outline of inspection activities and responsibilities to ensure proper performance of the closure components. The Owner or Operator will designate a qualified professional engineer as the CQA Officer. The CQA Officer will supervise, approve, and be responsible for all inspections, testing, and other activities required in this plan. The CQA Officer will be an Illinois Registered Professional Engineer with experience in geosynthetics. In addition, the CQA Officer will be responsible for providing documentation and as-built record drawings of completed construction and maintaining records of the construction sequences throughout the development, operation, and closure of the impoundments. The CQA Officer will comply with the regulations of Section 845.290(b) and will accept full responsibility for all inspections performed and reports prepared by the designated CQA Officer-in-Absentia during the absence of the CQA Officer. The CQA Officer may utilize one or more inspectors to assist the CQA Officer with the various inspections and testing to be conducted in the field. Any such inspector will work under the direct supervision of the CQA Officer and will be properly trained and/or experienced, as appropriate.

2. INSPECTION ACTIVITIES

The CQA Officer will be present to provide supervision and assume responsibility for performing all inspections of the following activities:

1. Excavation in Borrow Areas, including topsoil and vegetation stripping.
2. CCR grading of the final cover area and compaction of subgrade.
3. Erosion control, storm water pollution prevention and all required pumping.

4. Construction of Final Cover including geomembrane installation.
5. Seed, fertilize, and mulch Final Cover and borrow pits.
6. Construction of ditches, culverts, and letdowns.

If the CQA Officer is unable to be present, the CQA Officer will designate a person who will exercise professional judgment in carrying out the duties of a CQA Officer as the designated CQA Officer-in-absentia. The CQA Officer should be present at least one day of every week.

3. SAMPLING PLAN

A sampling plan will be implemented as part of the CQA Plan for all construction activities.

The CQA Officer will review all specifications and requirements for the manufactured items used in the construction of those components requiring inspection. (See Inspection Activities section previously presented herein.) The CQA Officer will approve all materials based on satisfaction of their individual specification. Furthermore, the CQA Officer will ensure that proper installation methods are used. Structural fill may not be necessary. However, if needed, the specifications are provided in Table 1.

Facility Component	**Sample Program Location**
Structural Fill (if needed)/Compacted Subgrade	Table 1
Protective/Vegetative Cover Layer	Table 2
Textured Geomembrane Cover Liner (40-mil)	Table 3
Final Cover Drainage Layer	Table 4
Ditches, Drainage Structures	Table 5

Additional testing and sampling may be required at the discretion of the CQA Officer, if in the CQA Officer's judgment they are necessary to ensure proper materials usage and construction procedures set forth by Federal and State Regulations. Furthermore, the CQA Officer will authorize additional sampling or sampling frequencies as necessary to ensure statistical sampling techniques are employed.

TABLE 1

STRUCTURAL FILL/COMPACTED SUBGRADE CQA SAMPLING PROGRAM

STRUCTURAL FILL CONFORMANCE TESTING		
Test/Procedure	**Minimum Frequency**	**Acceptable Values**
Grain Size Distribution (ASTM D422)	1 per 10,000 cy	$P_{200} > 50\%$
Atterberg Limits (ASTM D4318)	1 per 10,000 cy (fine-grained soils only)	CL, ML, CH CL-ML
Standard Proctor (ASTM D698)	1 per 10,000 cy or soil change	> 95% Max. Dry Density by ASTM D698
CONSTRUCTION TESTING		
Test/Procedure	**Minimum Frequency**	**Acceptable Values**
Nuclear Density (ASTM D6938)	5 per Acre-Lift	> 95% Max. Dry Density by ASTM D698
In-Place Moisture Content (ASTM D6938)	5 per Acre-Lift	-3 to +3 % of by ASTM D698
Base Elevation	100-ft grid	$\leq$ As necessary
Top Elevation	100-ft grid	$\leq$ As necessary

Table 2

Protective/Vegetative Cover Layer CQA Sampling Program

Test/Procedure	Minimum Frequency	Acceptable Values
Base Elevation	100-ft grid	$\leq$ Final Permitted Elevation – 36 inches
Top Elevation	100-ft grid	$\leq$ Final Permitted Elevation
Thickness	100-ft grid	$\geq$ 36 inches normal to surface

TABLE 3

TEXTURED GEOMEMBRANE BASE LINER CQA SAMPLING PROGRAM
(40-mil LLDPE Geomembrane)

MANUFACTURER QUALITY CONTROL (MQC) TESTING

Test/Procedure	Minimum Frequency	Acceptable Values
Geosynthetic Research Institute (GRI) GM-17 Testing Standard	Per GRI GM17	Per GRI GM17

CONFORMANCE TESTING

Test/Procedure	Minimum Frequency	Acceptable Values
Thickness (ASTM D5994)	1 per 100,000 ft^2 per lot	38 mil
Asperity Heights (ASTM D7466)	1 per 100,000 ft^2 per lot	≥ 16 mil
Density (ASTM D1505 or ASTM D792)	1 per lot	≥ 0.939
Tensile Strength at Break (ASTM D6693)	1 per 100,000 ft^2 per lot	≥ 60 ppi
Elongation at Break (ASTM D6693)	1 per 100,000 ft^2 per lot	≥ 250%
Tear Resistance (ASTM D1004)	1 per 100,000 ft^2 per lot	≥ 22 lbs
Puncture Resistance (ASTM D4833)	1 per 100,000 ft^2 per lot	≥ 44 lbs
Carbon Black Content (ASTM D4218)	1 per lot	2.0 to 3.0%
Carbon Black Dispersion (ASTM D5596)	1 per lot	9 in 10 Views Cat. 1 Or 2 1 in 10 Views Cat. 3

TABLE 4

FINAL COVER DRAINAGE LAYER CQA SAMPLING PROGRAM

Geocomposite Drainage Layer Configuration
(200-mil. Double Sided Geotextile)

MANUFACTURER QUALITY CONTROL (MQC) TESTING

Double-Sided Geocomposite

Test/Procedure	Minimum Frequency	Acceptable Values
Tests and Procedures in accordance with the manufacturer's product specification sheet	Testing Frequency in accordance with manufacturer's product specification sheet	Acceptable Values in accordance with the manufacturer's product specification sheet

MANUFACTURER QUALITY ASSURANCE (MQA) TESTING

Double-Sided Geocomposite

Test/Procedure	Minimum Frequency	Acceptable Values
100-Hour Transmissivity* (ASTM D4716)	1 test per Manufacturer of Double Sided Geocomposite	> 1.0 x 10^{-4} m^2/sec (min)

*Test to be completed using 200-mil. GSE FabriNet Double Sided Geocomposite (or equivalent) layered between samples of a 40-mil. HPDE geomembrane and the project specific general protective layer material. The sample shall be presoaked for 24 hours, loaded with a 1,000 psf normal load, and run at a flow gradient of 0.1.

Ply Adhesion (ASTM D7005)	1 per 100,000 ft^2 per lot	> 1 ppi

Geonet Core

Test/Procedure	Minimum Frequency	Acceptable Values
Thickness (ASTM D5199)	1 per 100,000 ft^2 per lot	200 mil. avg.
Density (ASTM D1505)	1 per 100,000 ft^2 per lot	> 0.940
Carbon Black Content (ASTM D1603)	1 per 100,000 ft^2 per lot	> 2.0%

TABLE 4 (cont.)
CONFORMANCE TESTING

Geotextile (Prior to Lamination)

Test/Procedure	**Minimum Frequency**	**Acceptable Values**
Mass per unit Area (ASTM D5261)	1 per 100,000 ft^2 per lot	6 oz./yd^2
Grab Tensile (ASTM D4632)	1 per 100,000 ft^2 per lot	160 lbs.
Puncture Strength (ASTM D4833)	1 per 100,000 ft^2 per lot	90 lbs.
AOS, US Sieve (ASTM D4751)	1 per 540,000 ft^2 per lot	70
Permittivity (ASTM D4491)	1 per 540,000 ft^2 per lot	1.5 sec^{-1}

Table 5

Ponds, Ditches, Drainage Structures CQA Sampling Program

MANUFACTURER DATA SHEETS AND QUALITY CONTROL (MQC) TESTING

Drainage Structures (Inlet/Outlet Structures, Culverts, Drainage Tile)

Test/Procedure	Minimum Frequency	Acceptable Values
Obtain Manufacturer's product specification sheets and MQC testing (if available)	Per Material Order and Product Type	At discretion of CQA Officer per design applicability

Channel Lining Material (Armored Channel Lining, Erosion Control Material, Rip Rap)

Test/Procedure	Minimum Frequency	Acceptable Values
Obtain Manufacturer's product specification sheets and MQC testing (if available)	Per Material Order and Product Type	At discretion of CQA Officer per design applicability
Rip Rap Supplier Gradation Certification	Per Material Order and Product Type	At discretion of CQA Officer per design applicability

CONFORMANCE TESTING

Pond Berm Construction

Test/Procedure	Minimum Frequency	Acceptable Values
Grain Size Distribution (ASTM D422)	1 per 10,000 cy	$P_{200} > 50\%$
Atterberg Limits (ASTM D4318)	1 per 10,000 cy (fine-grained soils only)	CL, ML, CH CL-ML
Standard Proctor (ASTM D698)	1 per 10,000 cy or soil change	> 95% Max. Dry Density by ASTM D698

CONSTRUCTION TESTING

Drainage Structures (Inlet/Outlet Structures, Culverts, Drainage Tile)

Test/Procedure	Minimum Frequency	Acceptable Values
Survey of Drainage Structure Location (Northing, Easting, and Elevation)	Inlets, Outlets, Joints Other pertinent features	In accordance with the design

Table 5 (cont.)
CONSTRUCTION TESTING (cont.)

Detention Pond Berms

Test/Procedure	Minimum Frequency	Acceptable Values
Nuclear Density (ASTM D2922)	5 per Acre-Lift	> 95% Max. Dry Density by ASTM D698
In-Place Moisture Content (ASTM D3017 or ASTM D2216)	5 per Acre-Lift	0 to +6 % of optimum moisture content by ASTM D698
Base Elevation	100-ft grid	≤ As necessary
Top Elevation	100-ft grid	≤ As necessary
Survey Discharge and Effluent Elevations	At discretion of CQA Officer	At discretion of CQA Officer

Ditches

Test/Procedure	Minimum Frequency	Acceptable Values
Survey Centerline Profiles	100-foot intervals or at major breaks in grade	At discretion of CQA Officer
Cross-Sections	200-foot intervals or at major breaks in grade	At discretion of CQA Officer

4. CONSTRUCTION MEETINGS

The CQA Officer may hold meetings prior to, and during, construction to ensure proper construction techniques, understanding of the specifications and plans, the proper handling of deviations from the plans necessitated by site-specific field conditions and to review the appropriate chain-of-command used if unsuitable work is discovered. Meetings shall be held with Owner, all Contractors, and Operator representatives involved with the project to discuss their individual responsibilities.

5. DOCUMENTATION

5.1 Daily Summary Report

A daily summary report will be prepared by the CQA Officer, or under the direct supervision of the CQA Officer, during each day of activity. The report will contain, at a minimum:

1. The date
2. A summary of the weather conditions
3. A summary of locations where construction is occurring
4. Equipment and personnel on the project
5. A summary of any meetings held and attendees
6. A description of all materials used and references or results of testing and documentation
7. The calibration and recalibration (if needed) of test equipment
8. The daily inspection report from each inspector

5.2 Daily Inspection Reports

Each inspector will complete a daily inspection report containing the following information:

1. The location
2. The type of inspection
3. The procedure used
4. Test data
5. Acceptable limits for construction testing analysis
6. In the event of unsuitable materials or construction techniques, documentation regarding corrective action taken and causes for the incongruity
7. Results of the activity
8. Personnel involved in the inspection and sampling activities
9. The signature of the inspector

5.3 Weekly Summary Report

A weekly summary report will be prepared by the CQA Officer, or under the direct supervision of the CQA Officer at the end of each week of construction until the end of construction. The CQA Officer must review and approve the report. The owner/operator of the facility must place the weekly reports in the facility's operating record, which is specified under Section 845.800(d)(3). The report will contain, at a minimum:

1. The dates of the week
2. Descriptions of the weather
3. Locations where construction occurred during the week
4. Materials used
5. Testing results
6. Inspection reports
7. Procedures used to perform the inspections

5.4 Photographic Records

Photographs may be used as tools to document the progress and acceptability of the work and may be incorporated into a daily summary report, a daily inspection report, and an acceptance report.

5.5 Acceptance Report

Upon completion of the construction of each major phase, the CQA Officer will submit an acceptance report to the Illinois Environmental Protection Agency (Illinois EPA) and the Owner and Operator. The acceptance report will be submitted before the structure is placed into service and will contain the following:

1. A certification by the CQA Officer that the construction has been prepared and constructed in accordance with the engineering design
2. As-built record drawings
3. All daily summary, inspection, and work location reports

6. FINAL COVER SYSTEM

6.1 Geomembrane

The CQA Officer will thoroughly inspect the subgrade surface layer on which the geomembrane cover is to be laid prior to proof rolling. The inspector will concentrate on the following and completion of the corrective action required:

1. The subgrade surface layer will be inspected and surveyed ensuring the grades and lines are consistent with those on the design plans.
2. The surface will be examined ensuring that all rocks, litter, construction debris, and/or undesirable objects are not present that could weaken the support of the geomembrane cover or puncture it.

3. All depressions will be filled and raised areas leveled.
4. Any desiccation cracks will be corrected as necessary to ensure proper performance of the subgrade layer.
5. No vegetative growth will be present.
6. All surfaces are firm and have not been wetted excessively in local areas in the preceding period before the geomembrane installation.

It is expected that fine finishing of the final surface will be required, starting from the top and working down. Uniform application of additional moisture to the surface may provide a smoother surface if grading is required. The geomembrane installer will conduct an additional inspection near the time of geomembrane placement, and any necessary repairs to its supporting layer will be made.

Prior to any geomembrane installation, the installer will provide the CQA Officer with a panel layout plan for the specific area included in his construction bid. The installer or manufacturer will also provide assurance that the geomembrane material is compatible with the soils to be contacted, and furthermore, that the liner is believed to have sufficient strength and durability to function at the site for the design period under the maximum expected loadings imposed by heavy equipment and stresses imposed by settlement, temperature, construction, and operation. These assurances will be approved by the CQA Officer. Alternatively, the CQA Officer may perform and/or subcontract performance of tests and/or calculations, as necessary to realize such assurances independent of the installer/manufacturer. The CQA Officer will also ensure that the geomembrane utilized has an adequate angle of friction based upon the actual materials/products that it will have contact with. As necessary, alternative products, materials, and/or thicknesses may be used to meet or exceed the geomembrane specifications, presented in Table 3.

A 40-mil LLDPE geomembrane cover will be installed on top of the subgrade layer in accordance with the drawings, specifications, and manufacturer's instructions by persons experienced in similar cover installation. Furthermore, the geomembrane cover will be installed in accordance with the installer's panel layout plan, and it may be revised with the approval of the CQA Officer to suit field conditions at the time of installation. All field seaming will be in accordance with the manufacturer's specifications. Any necessary revisions during installation will be reflected on the record as-built drawings.

Geomembrane bonding will use fusion welding when possible and extrusion welding as a secondary means. Fusion welding will typically consist of applying dynamic energy and heat between two overlapped panels. This will allow panel-to-panel bonding, providing a homogenous mass along the area of the seam. Extrusion welding will be completed via an extrudate gun equipped with an extrusion head and pre-heat blower to ensure proper pre-heating of the geomembrane seams.

Equipment used to bond the LLDPE geomembrane cover will be equipped with monitors capable of providing instantaneous temperature readings regarding the zone of contact. This will allow the operator to manually or automatically alter the bonding process to ensure integrity based on changes in environment.

The quality control aspects of LLDPE geomembrane cover installation will include, but not necessarily be limited to:

1. Inspection of the procedures and adequacy used for cleaning and/or drying the surfaces of the geomembrane to be seamed.
2. Monitoring of the temperature and speed of welding.
3. Only smooth soled shoes will be allowed on the geomembrane cover.

   No vehicles will be allowed directly on the geomembrane cover. Subsequent placement of the final protective layer will be with a LGP dozer or other suitable equipment and the materials advanced in front of the equipment so that operation directly on the cover does not occur.

The quality assurance aspects of LLDPE geomembrane cover installation will include, but not necessarily be limited to:

1. Conformance testing of the geomembrane material meets the minimum requirements of Table 3.
2. Test welds on scrap geomembrane cover materials will be produced by each seamer at least twice daily, in the early morning and afternoon, under the same conditions as production seaming to verify conditions are adequate.
3. All field seams will be pressure or vacuum tested over their full length.
4. Samples of actual field seams will be tested on an average basis of at least once every 500 feet of seam length by sample removal and laboratory testing for bonded seam strength and peel adhesion as recommended in the Geosynthetic Research Institutes' (GRI) GM-19 Technical Guidance. The test results will be considered acceptable if they meet the minimum requirements of the GRI GM-19 standards (Patches will be welded over holes created by sampling.)
5. Inadequate seams will be cut out and rewelded or an additional layer of geomembrane will be welded over the suspect seam.
6. Documentation of the location of each panel, sample point, repaired areas, and the test results.

Using the above-mentioned procedures and others that may be required or deemed appropriate by the CQA Officer, upon completion of the cover installation, the CQA Officer will exercise professional judgment to certify:

1. The bedding material contained no undesirable objects.
2. The placement plan has been followed.
3. The final protective layer was applied to prevent damage to the geomembrane cover.
4. All tears, rips, punctures, and other damages were repaired.
5. The anchor trench and backfill are constructed to prevent damage to the geosynthetic membrane.
6. All geomembrane seams were properly constructed and tested in accordance with the manufacturer's specifications.

6.2 Geocomposite Drainage Layer and Geocomposite Toe Drain

Installation of the geocomposite drainage layer and toe drain shall be made in accordance with the manufacturer's specifications. The geocomposite shall be installed in the direction of the slope and flow unless specified by the design engineer. The toe drain will be installed as shown on the drawings and care will be used when spreading the protective cover layer over the entire length of the geocomposite. Seams and edges of the geocomposite shall be butted against each other and joined with ties placed no greater than every five feet along the seam. End-to-end seams shall be overlapped by a minimum of 12 inches, shingled in the direction of flow with ties no greater than five feet along the seam. Testing requirements for the geocomposite will be conducted in accordance with Table 4.

6.3 Final Protective Layer

The final protective layer will consist of a minimum 36 inch thickness of soil. A layer of double-sided geocomposite will be placed directly over the geomembrane layer to provide a free-draining element to remove moisture from the final cover system. The soils overlaying the double-sided geocomposite will not be compacted, with the top 6 inches being the best onsite, readily available soil for supporting vegetation. The thickness of the final protective layer will be documented by comparing the finished elevation of the low permeability layer with the final surface. The minimum thickness of the final protective layer will be placed as soon as possible after placement of the geomembrane low permeability layer.

Loams of the United States Department of Agriculture (USDA) soils classification system or USCS classes GM, GC, SM, SC, ML, and CL are all considered suitable protective soils. The final protective layer may include soils from on- and/or offsite sources and compost. Other products that may be considered waste besides compost (such as sewage treatment sludge) may be used as a soil amendment if all necessary permits/authorizations are secured.

The finished surface of the final cover system will be surveyed on a spacing, which will not exceed 100 feet in any ordinate direction. This survey and acceptance criteria will apply to final protective layers of the final cover system, with allowance for the minimum three-foot difference between their surfaces.

In conjunction with the monitoring activities described above, the CQA Officer will implement the sampling program summarized in Table 2.

6.4 Vegetative Cover

Finalized areas will be prepared and seeded as soon as reasonably possible to prevent potential erosion impacts. Composite soil sample testing should be done to determine the amount of lime and/or fertilizer needed. Seed will typically be incorporated into the upper surface of the final protective layer using a disk or harrow, or by using hydroseeding techniques. The seed mixture selected must be amenable to the soil quality/thickness, slopes, and moisture/climatological conditions that exist without the need for continued maintenance and with minimal potential for root penetration into the low permeability layer. Such vegetation will be established by seeding with a dry prairie mix or dry-mesic prairie mix as recommended by the local Soil and Water Conservation Office. Fertilizer, lime, and straw mulch should be used at rates necessary to establish proper growth of the seed.

Landscaping or seeding professionals knowledgeable of Springfield area climatological conditions will be consulted in determining necessary soil amendments and application rates based upon specific seasonal conditions at the time of closure. As a guide, the design procedures and specifications presented in the handbook *Procedures and Standards for Urban Soil Erosion and Sediment Control in Illinois* may be utilized. Mulch consisting of straw, jute, and/or wood excelsior will be used as necessary to hold the seed in place and conserve moisture. The CQA Officer should record the amount of amendments and seed, and the boundaries of the completed areas on the as-built record drawings.

6.5 Drainage Control Structures

The CQA Officer shall inspect the final cover ditches, berms, and related drainage features to ensure proper construction of these structures as indicated by the drawings. Deviations from the plans shall be noted on the as-built record drawings with the appropriate erosion control covering as soon as reasonably possible. Repairs as warranted should be done prior to applying the coverings.

7. ROADWAYS

The CQA Officer will inspect the location of the roadways in relation to the transportation plan. The CQA Officer's primary responsibility will be to ensure proper grading of the roadway surfaces enabling runoff water to enter the stormwater runoff collection ditching as appropriate.

8. SURFACE WATER CONTROL

The CQA Officer will inspect the ditches, culverts, and sediment control devices to ensure proper construction of these structures as indicated by the drawings. Deviations from the plans will be noted on the as-built record drawings with the appropriate calculations showing that the hydraulic carrying capacity remains sufficient. All ditches will be completed with the appropriate erosion control coverings as soon as practicable. Repairs, as warranted, should be done prior to applying the coverings.

In conjunction with the monitoring activities described above, the CQA Officer will implement the sampling program summarized in Table 5.

9. EXCEPTIONS

The CQA Officer shall have the authority to modify the design shown on the plans based upon unexpected conditions encountered in the field. Small changes or modifications are historically required on any construction job of this size. Accordingly, the changes or modifications should be incorporated into the Acceptance Report and/or record drawings. Calculations, supporting discussion, etc. shall also be included to authenticate the adequacy of the changes in relation to the original design.

ATTACHMENT 9

SIGNATURE AND SEAL OF QUALIFIED ENGINEER

Certification Statement

Pursuant to Section 4 of IEPA Form CCR 2CC – Closure Construction, the undersigned has reviewed this Coal Combustion Residuals (CCR) Surface Impoundment Permit Application for Closure Construction and has determined that the contents are true to the best of their knowledge and belief, and fulfill the requirements for Closure of CCR Surface Impoundments under 35 Ill. Adm Code 845 Subpart G.

1-28-2022

Paul Van Metre, P.E.

Date

STATE OF ILLINOIS
PAUL
VAN METRE
062-064175
REGISTERED
PROFESSIONAL ENGINEER

ATTACHMENT 10

COMPLETION OF PUBLIC NOTICE AND PUBLIC MEETINGS CERTIFICATION

City Water, Light and Power
Coal Combustion Residuals
Surface Impoundments

Documentation of Public Meeting
35 Ill. Adm. Code 845.240(d) and 845.800(d)(2)

December 2021

City Water, Light and Power (CWLP) owns and operates two existing coal combustion residual (CCR) surface impoundments, operating as a single multi-unit system for purposes of groundwater monitoring and closure. These CCR surface impoundments are identified as the Lakeside Ash Pond and the Dallman Ash Pond and are located northeast of the power plant complex in Springfield, Illinois. Because the location of the ash ponds is designated as a potential area of environmental justice concern in the Illinois Environmental Protection Agency's (Agency) EJ Start screening tool, CWLP is required to submit a combined construction permit application for closure and corrective action with the Agency by February 1, 2022.

Pursuant to Section 845.240, CWLP held a public meeting on the tentative application and as required by subsection (d) of that section, CWLP is placing documentation of the meeting in its operating record consisting of the following Exhibits:

Exhibit A: Public Notice (November 1, 2021)

Exhibit B: Map of 1-mile radius of impoundments

Exhibit C: Mailing list of residents and property owners within 1-mile radius

Exhibit D: Map and list of incorporated areas within 10-miles of the impoundments

Exhibit E: Letter to Clerks of incorporated communities

Exhibit F: Posting of notice in conspicuous locations in incorporated communities

Exhibit G: Email to Illinois EPA requesting notice be sent to listserv for CWLP

Exhibit H: City's Neighborhood newsletter (November 24, 2021)

Exhibit I: Web Copy for CWLP's Public Notices

Exhibit J: List of attendees requesting summary of meeting or placement on Agency listserv

Exhibit K: List of attendees and email addresses requesting addition to Agency's listserv for facility

Exhibit L: Public Meeting Panel Members

Exhibit M: Power Point presentation for December 2, 2021 public meetings

Exhibit N: Summary of Public Meetings

Exhibit A

Public Notice (November 1, 2021)

1840

NOTICE OF PUBLIC MEETINGS

CITY OF SPRINGFIELD, ILLINOIS OFFIICE OF PUBLIC UTILITIES, CITY WATER, LIGHT AND POWER

Notice is Hereby Given that the City of Springfield Office of Public Utilities Will Hold Public Meetings on Coal Combustion Residuals (CCR) Surface Impoundments Closure Alternatives Analysis and Assessment of Corrective Measures. Prior to submitting a construction permit application to Illinois EPA to be granted permission to close its Lakeside and Dallman ash ponds, 35 Illinois Administrative Code Section 845.240 requires the Office of Public Utilities to hold two public meetings to discuss the proposed construction project.

The Meetings Will Take Place:

Thursday, December 2, 2021
Meeting 1: 2:00 - 4:00 p.m.
Meeting 2: 5:30 - 7:30 p.m.
Municipal Center West
City Council Chambers, 3nd Floor
300 S. Seventh St. Springfield, IL

What is the meeting about? These public meetings will present the closure alternatives analysis and assessment of corrective measures relating to the City Water, Light and Power (CWLP) ash ponds located near 3100 Stevenson Drive in Springfield, Illinois.

CWLP evaluated two ash pond closure scenarios: (1) closure with a final cover system and (2) closure by removal that includes removing all coal combustion residual material from the ash pond site and transporting it to a permitted landfill.

In the meeting CWLP representatives will describe each closure scenario, the groundwater impacts of each alternative, explain the basis for choice of the preferred alternative and respond to questions from the public. The meeting will also cover various corrective action alternatives.

A copy of supporting documentation, CWLP's Closure Alternatives Assessment and Assessment of Corrective Measures and related materials will be posted online at https://www.cwlp.com/IllinoisCCRCompliance.aspx 30 days in advance of the public meetings and a printed copy will be made available for inspection upon request.

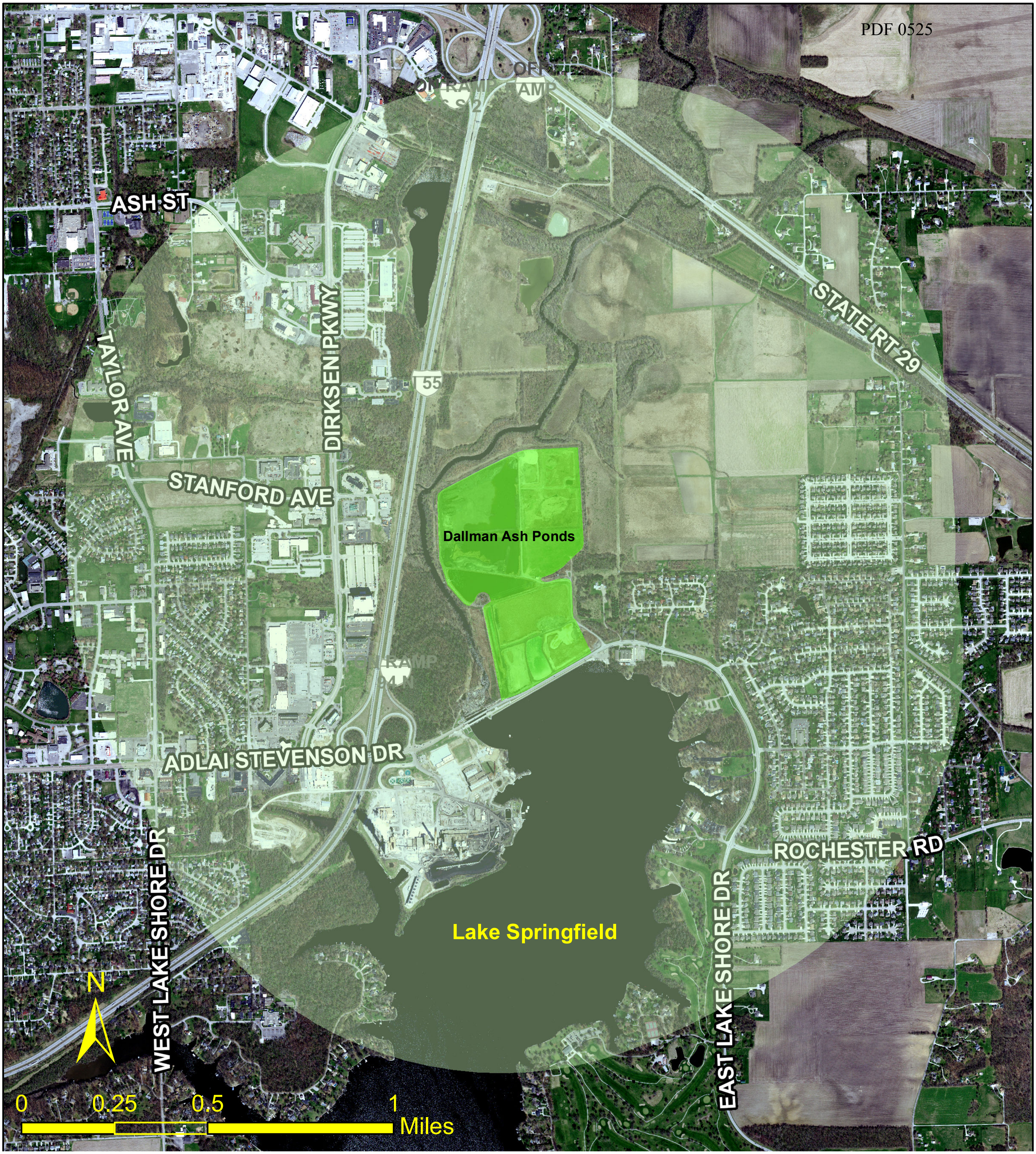
Meeting Accommodations: In accordance with the provisions of the Americans with Disabilities Act, any individual who is in need of a reasonable accommodation in order to participate in or benefit from attendance at a public hearing of the City of Springfield should contact the ADA Coordinator, at (217) 789-2270 prior to the meeting date.

Questions? Contact Deborah Williams at 217-789-2116 ext. 2636 or publicinformation@cwlp.com.

Notice Dated: November 1, 2021

Exhibit B

Map of 1-mile radius impoundments



Dallman Ash Ponds with a 1 Mile Buffer

Legend

🟩 Dallman Ash Ponds

🟩 Dallman Ash Ponds 1 Mile Buffer

City Water Light and Power
Geographic Information System
1008 East Miller Street
Springfield, Il 62702
Voice 217.757.8520
Fax 217.789.2082
Compiled by Mark Stone 01/06/2020 Dallman Ash Ponds.mxd

Exhibit C

Mailing list of residents and property owners within 1-mile radius

Owner1	PropHouse	PropDir	PropStreet	PropBuildN	PropUnitN	PropCity	PropState	PropZip	BillingAddress1	BillingAddress2	BillingCity	BillingState	BillingZip
Current Resident	3120		3120 PALMYRA RD			HANNIBAL	MO	63401	3120 PALMYRA RD		HANNIBAL	MO	63401
Current Resident	2703		ADLAI STEVENSON DR			SPRINGFIELD	IL	62703	1 CVS DR		WOONSOCKET	RI	2895
PREHN PLAZA INC	3090		ADLAI STEVENSON DR			SPRINGFIELD	IL	62703	102 BELLARDIA CT		MONTGOMERY	TX	77316
LUI INVESTMENT LLC	2636		ADLAI STEVENSON DR			SPRINGFIELD	IL	62703	129 HIDDEN POND CIR		AURORA	IL	60504
Current Resident	2501		ADLAI STEVENSON DR			SPRINGFIELD	IL	62703	216 KING DANIEL LN		GOLETA	CA	93117
EROP LLC	2905		ADLAI STEVENSON DR			SPRINGFIELD	IL	62703	2390 E FEDERAL DR		DECATUR	IL	62526
EXTREME CLEAN CAR WASH	2620		ADLAI STEVENSON DR			SPRINGFIELD	IL	62703	25 REDBUD LN		LINCOLN	IL	62656
Current Resident	2840		ADLAI STEVENSON DR			SPRINGFIELD	IL	62703	26 HOSPERS DR		SPRINGFIELD	IL	62712
BANK OF SPRINGFIELD	2600		ADLAI STEVENSON DR			SPRINGFIELD	IL	62703	2600 ADLAI STEVENSON DR		SPRINGFIELD	IL	62703
Current Resident	2720		ADLAI STEVENSON DR			SPRINGFIELD	IL	62703	2720 ADLAI STEVENSON DR		SPRINGFIELD	IL	62703
Current Resident	2800		ADLAI STEVENSON DR			SPRINGFIELD	IL	62703	2800 ADLAI STEVENSON DR		SPRINGFIELD	IL	62703
Current Resident	2700		ADLAI STEVENSON DR			SPRINGFIELD	IL	62703	4080 W JONATHAN MOORE PIKE		COLUMBUS	IN	47201
PREHN PLAZA INC	3050		ADLAI STEVENSON DR			SPRINGFIELD	IL	62703	8111 SMITHS MILL RD		NEW ALBANY	OH	43054
Current Resident	2830		ADLAI STEVENSON DR			SPRINGFIELD	IL	62703	836 W MAIN ST		TROY	OH	45373
Current Resident	2860		ADLAI STEVENSON DR			SPRINGFIELD	IL	62703	ATTN: ANIL SUTHAR	2860 ADLAI STEVENS	SPRINGFIELD	IL	62703
Current Resident	2625		ADLAI STEVENSON DR			SPRINGFIELD	IL	62703	PO BOX 1159		DEERFIELD	IL	60015
PATRIOT PLAZA LLC	2601		ADLAI STEVENSON DR			SPRINGFIELD	IL	62703	PO BOX 13167		SPRINGFIELD	IL	62791
Illinois Baptist State Associa	3085		ADLAI STEVENSON DR			SPRINGFIELD	IL	62703	PO BOX 19247		SPRINGFIELD	IL	62794
COUTAR REMAINDER III LLC	2901		ADLAI STEVENSON DR			SPRINGFIELD	IL	62703	PO BOX 347		COLUMBUS	IN	47202
Current Resident	2713		ADLAI STEVENSON DR			SPRINGFIELD	IL	62703	PO BOX 9169		SPRINGFIELD	IL	62791
Current Resident	3200		ADLAI STEVENSON DR			SPRINGFIELD	IL	62703	REAL ESTATE DEPARTMENT	200 E LAKE SHORE DR	SPRINGFIELD	IL	62712
Current Resident	3000		ADLAI STEVENSON DR			SPRINGFIELD	IL	62703	REAL ESTATE DEPARTMENT	200 E LAKE SHORE DR	SPRINGFIELD	IL	62712
Current Resident	2810		ADLAI STEVENSON DR			SPRINGFIELD	IL	62703	REAL ESTATE DEPARTMENT	200 E LAKE SHORE DR	SPRINGFIELD	IL	62712
Current Resident	2810		ADLAI STEVENSON DR			SPRINGFIELD	IL	62703	REAL ESTATE DEPARTMENT	200 E LAKE SHORE DR	SPRINGFIELD	IL	62712
Current Resident	3000		ADLAI STEVENSON DR			SPRINGFIELD	IL	62703	REAL ESTATE DEPARTMENT	200 E LAKE SHORE DR	SPRINGFIELD	IL	62712
Current Resident	1		ADLOFF LN			SPRINGFIELD	IL	62703	1 ADLOFF LN		SPRINGFIELD	IL	62703
Current Resident	101		ADLOFF LN			SPRINGFIELD	IL	62703	101 ADLOFF LN		SPRINGFIELD	IL	62703
SPRINGFIELD CLINIC LLP	3180		ADLOFF LN			SPRINGFIELD	IL	62072	1025 S 6TH ST		SPRINGFIELD	IL	62703
Current Resident	105		ADLOFF LN			SPRINGFIELD	IL	62703	105 ADLOFF LN		SPRINGFIELD	IL	62703
Current Resident	109		ADLOFF LN			SPRINGFIELD	IL	62703	109 ADLOFF LN		SPRINGFIELD	IL	62703
Current Resident	113		ADLOFF LN			SPRINGFIELD	IL	62703	113 ADLOFF LN		SPRINGFIELD	IL	62703
Current Resident	117		ADLOFF LN			SPRINGFIELD	IL	62703	117 ADLOFF LN		SPRINGFIELD	IL	62703
Current Resident	2644		ADLOFF LN			SPRINGFIELD	IL	62703	1207 DORCHESTER DR		CHAMPAIGN	IL	61821
Current Resident	125		ADLOFF LN			SPRINGFIELD	IL	62703	125 ADLOFF LN		SPRINGFIELD	IL	62703
Current Resident	13		ADLOFF LN			SPRINGFIELD	IL	62703	13 ADLOFF LN		SPRINGFIELD	IL	62703
Current Resident	17		ADLOFF LN			SPRINGFIELD	IL	62703	17 ADLOFF LN		SPRINGFIELD	IL	62703
Current Resident	21		ADLOFF LN			SPRINGFIELD	IL	62703	21 ADLOFF LN		SPRINGFIELD	IL	62703
Current Resident	85		ADLOFF LN			SPRINGFIELD	IL	62703	2101 LEXINGTON DR APT 3		SPRINGFIELD	IL	62704
Current Resident	89		ADLOFF LN			SPRINGFIELD	IL	62703	2251 W WASHINGTON ST APT 1002		SPRINGFIELD	IL	62702
Current Resident	25		ADLOFF LN			SPRINGFIELD	IL	62703	25 ADLOFF LN		SPRINGFIELD	IL	62703
Current Resident	57		ADLOFF LN			SPRINGFIELD	IL	62703	2500 WESTFIELD DR STE 102		ELGIN	IL	60124
Current Resident	29		ADLOFF LN			SPRINGFIELD	IL	62703	29 ADLOFF LN		SPRINGFIELD	IL	62703
Current Resident	62		ADLOFF LN			SPRINGFIELD	IL	62703	312 GARVEY LN		CHATHAM	IL	62629
Current Resident	60		ADLOFF LN			SPRINGFIELD	IL	62703	3120 PALMYRA RD		HANNIBAL	MO	63401
Current Resident	33		ADLOFF LN			SPRINGFIELD	IL	62703	33 ADLOFF LN		SPRINGFIELD	IL	62703
Current Resident	40		ADLOFF LN			SPRINGFIELD	IL	62703	412 E 700TH AVE		ALTAMONT	IL	62411
Current Resident	50		ADLOFF LN			SPRINGFIELD	IL	62703	468 HALLE PARK DR		COLLIERVILLE	TN	38017
Current Resident	49		ADLOFF LN			SPRINGFIELD	IL	62703	49 ADLOFF LN		SPRINGFIELD	IL	62703
Current Resident	5		ADLOFF LN			SPRINGFIELD	IL	62703	5 ADLOFF LN		SPRINGFIELD	IL	62703
Current Resident	53		ADLOFF LN			SPRINGFIELD	IL	62703	53 ADLOFF LN		SPRINGFIELD	IL	62703
Current Resident	61		ADLOFF LN			SPRINGFIELD	IL	62703	61 ADLOFF LN		SPRINGFIELD	IL	62703

Current Resident	45	ADLOFF LN	SPRINGFIELD	IL	62703	631 WHITE OAK DR		CHATHAM	IL	62629
Current Resident	77	ADLOFF LN	SPRINGFIELD	IL	62703	77 ADLOFF LN		SPRINGFIELD	IL	62703
Current Resident	81	ADLOFF LN	SPRINGFIELD	IL	62703	81 ADLOFF LN		SPRINGFIELD	IL	62703
Current Resident	9	ADLOFF LN	SPRINGFIELD	IL	62703	9 ADLOFF LN		SPRINGFIELD	IL	62703
Current Resident	93	ADLOFF LN	SPRINGFIELD	IL	62703	93 ADLOFF LN		SPRINGFIELD	IL	62703
Current Resident	97	ADLOFF LN	SPRINGFIELD	IL	62703	97 ADLOFF LN		SPRINGFIELD	IL	62703
Current Resident	2900	ADLOFF LN	SPRINGFIELD	IL	62703	MC210	PO BOX 66149	SAINT LOUIS	MO	63166
Current Resident	121	ADLOFF LN	SPRINGFIELD	IL	62703	PO BOX 1820		DAYTON	OH	45401
Current Resident	3700	ALDER WOOD DR	SPRINGFIELD	IL	62712	3700 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3701	ALDER WOOD DR	SPRINGFIELD	IL	62712	3701 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3702	ALDER WOOD DR	SPRINGFIELD	IL	62712	3702 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3703	ALDER WOOD DR	SPRINGFIELD	IL	62712	3703 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3704	ALDER WOOD DR	SPRINGFIELD	IL	62712	3704 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3705	ALDER WOOD DR	SPRINGFIELD	IL	62712	3705 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3706	ALDER WOOD DR	SPRINGFIELD	IL	62712	3706 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3707	ALDER WOOD DR	SPRINGFIELD	IL	62712	3707 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3708	ALDER WOOD DR	SPRINGFIELD	IL	62712	3708 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3709	ALDER WOOD DR	SPRINGFIELD	IL	62712	3709 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3710	ALDER WOOD DR	SPRINGFIELD	IL	62712	3710 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3711	ALDER WOOD DR	SPRINGFIELD	IL	62712	3711 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3712	ALDER WOOD DR	SPRINGFIELD	IL	62712	3712 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3713	ALDER WOOD DR	SPRINGFIELD	IL	62712	3713 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3714	ALDER WOOD DR	SPRINGFIELD	IL	62712	3714 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3715	ALDER WOOD DR	SPRINGFIELD	IL	62712	3715 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3718	ALDER WOOD DR	SPRINGFIELD	IL	62712	3718 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3720	ALDER WOOD DR	SPRINGFIELD	IL	62712	3720 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3722	ALDER WOOD DR	SPRINGFIELD	IL	62712	3722 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3724	ALDER WOOD DR	SPRINGFIELD	IL	62712	3724 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3726	ALDER WOOD DR	SPRINGFIELD	IL	62712	3726 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3728	ALDER WOOD DR	SPRINGFIELD	IL	62712	3728 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3730	ALDER WOOD DR	SPRINGFIELD	IL	62712	3730 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3800	ALDER WOOD DR	SPRINGFIELD	IL	62712	3800 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3801	ALDER WOOD DR	SPRINGFIELD	IL	62712	3801 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3802	ALDER WOOD DR	SPRINGFIELD	IL	62712	3802 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3803	ALDER WOOD DR	SPRINGFIELD	IL	62712	3803 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3804	ALDER WOOD DR	SPRINGFIELD	IL	62712	3804 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3805	ALDER WOOD DR	SPRINGFIELD	IL	62712	3805 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3806	ALDER WOOD DR	SPRINGFIELD	IL	62712	3806 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3807	ALDER WOOD DR	SPRINGFIELD	IL	62712	3807 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3808	ALDER WOOD DR	SPRINGFIELD	IL	62712	3808 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3809	ALDER WOOD DR	SPRINGFIELD	IL	62712	3809 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3810	ALDER WOOD DR	SPRINGFIELD	IL	62712	3810 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3811	ALDER WOOD DR	SPRINGFIELD	IL	62712	3811 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3812	ALDER WOOD DR	SPRINGFIELD	IL	62712	3812 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3813	ALDER WOOD DR	SPRINGFIELD	IL	62712	3813 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3814	ALDER WOOD DR	SPRINGFIELD	IL	62712	3814 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3815	ALDER WOOD DR	SPRINGFIELD	IL	62712	3815 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3817	ALDER WOOD DR	SPRINGFIELD	IL	62712	3817 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3819	ALDER WOOD DR	SPRINGFIELD	IL	62712	3819 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3821	ALDER WOOD DR	SPRINGFIELD	IL	62712	3821 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3823	ALDER WOOD DR	SPRINGFIELD	IL	62712	3823 ALDER WOOD DR		SPRINGFIELD	IL	62712
Current Resident	3716	ALDER WOOD DR	SPRINGFIELD	IL	62712	PO BOX 4895		SPRINGFIELD	IL	62708

Current Resident	4001	ALMAHURST DR	SPRINGFIELD	IL	62712	4001 ALMAHURST DR		SPRINGFIELD	IL	62712
Current Resident	4005	ALMAHURST DR	SPRINGFIELD	IL	62712	4005 ALMAHURST DR		SPRINGFIELD	IL	62712
Current Resident	2900	ALPINE DR	SPRINGFIELD	IL	62707	2737 DELAWARE DR		SPRINGFIELD	IL	62702
Current Resident	2870	ALPINE DR	SPRINGFIELD	IL	62712	2870 ALPINE DR		SPRINGFIELD	IL	62712
Current Resident	2972	ALPINE DR	SPRINGFIELD	IL	62712	2972 ALPINE DR		SPRINGFIELD	IL	62712
SHERMAN INVESTORS LLC	3064	ASH ST	SPRINGFIELD	IL	62703	2345 S DIRKSEN PKWY		SPRINGFIELD	IL	62703
AGREE LIMITED PARTNERSH	3040	ASH ST	SPRINGFIELD	IL	62703	70 E LONG LAKE RD		BLOOMFIELD HI	MI	48304
Current Resident	3600	BANYAN DR	SPRINGFIELD	IL	62712	% CHASE BANK NA	PO BOX 78420	PHOENIX	AZ	85062
Current Resident	3500	BANYAN DR	SPRINGFIELD	IL	62712	3500 BANYAN DR		SPRINGFIELD	IL	62712
Current Resident	3504	BANYAN DR	SPRINGFIELD	IL	62712	3504 BANYAN DR		SPRINGFIELD	IL	62712
Current Resident	3508	BANYAN DR	SPRINGFIELD	IL	62712	3508 BANYAN DR		SPRINGFIELD	IL	62712
Current Resident	3509	BANYAN DR	SPRINGFIELD	IL	62712	3509 BANYAN DR		SPRINGFIELD	IL	62712
Current Resident	3512	BANYAN DR	SPRINGFIELD	IL	62712	3512 BANYAN DR		SPRINGFIELD	IL	62712
Current Resident	3516	BANYAN DR	SPRINGFIELD	IL	62711	3516 BANYAN DR		SPRINGFIELD	IL	62712
Current Resident	3517	BANYAN DR	SPRINGFIELD	IL	62712	3517 BANYAN DR		SPRINGFIELD	IL	62712
Current Resident	3520	BANYAN DR	SPRINGFIELD	IL	62707	3520 BANYAN DR		SPRINGFIELD	IL	62712
Current Resident	3524	BANYAN DR	SPRINGFIELD	IL	62707	3524 BANYAN DR		SPRINGFIELD	IL	62712
Current Resident	3525	BANYAN DR	SPRINGFIELD	IL	62712	3525 BANYAN DR		SPRINGFIELD	IL	62712
Current Resident	3528	BANYAN DR	SPRINGFIELD	IL	62712	3528 BANYAN DR		SPRINGFIELD	IL	62712
Current Resident	3601	BANYAN DR	SPRINGFIELD	IL	62707	PO BOX 2513		SPRINGFIELD	IL	62708
Current Resident	105	BASSWOOD RD	SPRINGFIELD	IL	62712	105 BASSWOOD RD		SPRINGFIELD	IL	62712
Current Resident	106	BASSWOOD RD	SPRINGFIELD	IL	62707	106 BASSWOOD RD		SPRINGFIELD	IL	62712
Current Resident	109	BASSWOOD RD	SPRINGFIELD	IL	62712	109 BASSWOOD RD		SPRINGFIELD	IL	62712
Current Resident	110	BASSWOOD RD	SPRINGFIELD	IL	62712	110 BASSWOOD RD		SPRINGFIELD	IL	62712
Current Resident	113	BASSWOOD RD	SPRINGFIELD	IL	62712	113 BASSWOOD RD		SPRINGFIELD	IL	62712
Current Resident	114	BASSWOOD RD	SPRINGFIELD	IL	62707	114 BASSWOOD RD		SPRINGFIELD	IL	62712
Current Resident	117	BASSWOOD RD	SPRINGFIELD	IL	62712	117 BASSWOOD RD		SPRINGFIELD	IL	62712
Current Resident	120	BASSWOOD RD	SPRINGFIELD	IL	62712	120 BASSWOOD RD		SPRINGFIELD	IL	62712
Current Resident	121	BASSWOOD RD	SPRINGFIELD	IL	62712	121 BASSWOOD RD		SPRINGFIELD	IL	62712
Current Resident	124	BASSWOOD RD	SPRINGFIELD	IL	62707	124 BASSWOOD RD		SPRINGFIELD	IL	62712
Current Resident	125	BASSWOOD RD	SPRINGFIELD	IL	62712	125 BASSWOOD RD		SPRINGFIELD	IL	62712
Current Resident	128	BASSWOOD RD	SPRINGFIELD	IL	62707	128 BASSWOOD RD		SPRINGFIELD	IL	62712
Current Resident	129	BASSWOOD RD	SPRINGFIELD	IL	62712	129 BASSWOOD RD		SPRINGFIELD	IL	62712
Current Resident	132	BASSWOOD RD	SPRINGFIELD	IL	62712	132 BASSWOOD RD		SPRINGFIELD	IL	62712
Current Resident	133	BASSWOOD RD	SPRINGFIELD	IL	62712	133 BASSWOOD RD		SPRINGFIELD	IL	62712
Current Resident	136	BASSWOOD RD	SPRINGFIELD	IL	62712	136 BASSWOOD RD		SPRINGFIELD	IL	62712
Current Resident	137	BASSWOOD RD	SPRINGFIELD	IL	62712	137 BASSWOOD RD		SPRINGFIELD	IL	62712
Current Resident	3101	BEAVER CREEK LN	SPRINGFIELD	IL	62707	3101 BEAVER CREEK LN		SPRINGFIELD	IL	62712
Current Resident	3104	BEAVER CREEK LN	SPRINGFIELD	IL	62712	3104 BEAVER CREEK LN		SPRINGFIELD	IL	62712
Current Resident	3109	BEAVER CREEK LN	SPRINGFIELD	IL	62712	3109 BEAVER CREEK LN		SPRINGFIELD	IL	62712
Current Resident	3110	BEAVER CREEK LN	SPRINGFIELD	IL	62712	3110 BEAVER CREEK LN		SPRINGFIELD	IL	62712
Current Resident	3116	BEAVER CREEK LN	SPRINGFIELD	IL	62712	3116 BEAVER CREEK LN		SPRINGFIELD	IL	62712
Current Resident	3128	BEAVER CREEK LN	SPRINGFIELD	IL	62712	3128 BEAVER CREEK LN		SPRINGFIELD	IL	62712
Current Resident	3132	BEAVER CREEK LN	SPRINGFIELD	IL	62712	3132 BEAVER CREEK LN		SPRINGFIELD	IL	62712
Current Resident	3133	BEAVER CREEK LN	SPRINGFIELD	IL	62707	3133 BEAVER CREEK LN		SPRINGFIELD	IL	62712
Current Resident	3136	BEAVER CREEK LN	SPRINGFIELD	IL	62707	3136 BEAVER CREEK LN		SPRINGFIELD	IL	62712
Current Resident	3140	BEAVER CREEK LN	SPRINGFIELD	IL	62707	3140 BEAVER CREEK LN		SPRINGFIELD	IL	62712
Current Resident	3141	BEAVER CREEK LN	SPRINGFIELD	IL	62712	3141 BEAVER CREEK LN		SPRINGFIELD	IL	62712
Current Resident	3146	BEAVER CREEK LN	SPRINGFIELD	IL	62712	3146 BEAVER CREEK LN		SPRINGFIELD	IL	62712
Current Resident	3149	BEAVER CREEK LN	SPRINGFIELD	IL	62712	3149 BEAVER CREEK LN		SPRINGFIELD	IL	62712
Current Resident	3154	BEAVER CREEK LN	SPRINGFIELD	IL	62712	3154 BEAVER CREEK LN		SPRINGFIELD	IL	62712
Current Resident	3157	BEAVER CREEK LN	SPRINGFIELD	IL	62712	3157 BEAVER CREEK LN		SPRINGFIELD	IL	62712

Current Resident	3160	BEAVER CREEK LN	SPRINGFIELD	IL	62707	3160 BEAVER CREEK LN	SPRINGFIELD	IL	62712
Current Resident	3165	BEAVER CREEK LN	SPRINGFIELD	IL	62707	3165 BEAVER CREEK LN	SPRINGFIELD	IL	62712
Current Resident	3168	BEAVER CREEK LN	SPRINGFIELD	IL	62707	3168 BEAVER CREEK LN	SPRINGFIELD	IL	62712
Current Resident	3173	BEAVER CREEK LN	SPRINGFIELD	IL	62707	3173 BEAVER CREEK LN	SPRINGFIELD	IL	62712
Current Resident	3178	BEAVER CREEK LN	SPRINGFIELD	IL	62712	3178 BEAVER CREEK LN	SPRINGFIELD	IL	62712
Current Resident	3181	BEAVER CREEK LN	SPRINGFIELD	IL	62712	3181 BEAVER CREEK LN	SPRINGFIELD	IL	62712
Current Resident	3186	BEAVER CREEK LN	SPRINGFIELD	IL	62712	3186 BEAVER CREEK LN	SPRINGFIELD	IL	62712
Current Resident	3189	BEAVER CREEK LN	SPRINGFIELD	IL	62707	3189 BEAVER CREEK LN	SPRINGFIELD	IL	62712
Current Resident	3194	BEAVER CREEK LN	SPRINGFIELD	IL	62712	3194 BEAVER CREEK LN	SPRINGFIELD	IL	62712
Current Resident	3198	BEAVER CREEK LN	SPRINGFIELD	IL	62707	3198 BEAVER CREEK LN	SPRINGFIELD	IL	62712
Current Resident	2645	BEECHLER CT	SPRINGFIELD	IL	62703	1207 DORCHESTER DR	CHAMPAIGN	IL	61821
Current Resident	2600	BEECHLER CT	SPRINGFIELD	IL	62703	1207 DORCHESTER DR	CHAMPAIGN	IL	61821
Current Resident	2626	BEECHLER CT	SPRINGFIELD	IL	62703	1207 DORCHESTER DR	CHAMPAIGN	IL	61821
SANGAMON COUNTY FARM	2631	BEECHLER CT	SPRINGFIELD	IL	62703	2631 BEECHLER CT	SPRINGFIELD	IL	62703
Current Resident	2648	BEECHLER CT	SPRINGFIELD	IL	62703	2648 BEECHLER CT	SPRINGFIELD	IL	62703
Current Resident	1	BEL AIRE DR	SPRINGFIELD	IL	62703	1 BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	12	BEL AIRE DR	SPRINGFIELD	IL	62704	12 BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	13	BEL AIRE DR	SPRINGFIELD	IL	62703	13 BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	14	BEL AIRE DR	SPRINGFIELD	IL	62703	14 W BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	16	BEL AIRE DR	SPRINGFIELD	IL	62703	16 BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	17	BEL AIRE DR	SPRINGFIELD	IL	62703	17 BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	18	BEL AIRE DR	SPRINGFIELD	IL	62702	18 W BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	45	BEL AIRE DR	SPRINGFIELD	IL	62703	1801 E 9TH ST STE 200	CLEVELAND	OH	44114
Current Resident	61	BEL AIRE DR	SPRINGFIELD	IL	62703	1905 CREIGHTON RD	SPRINGFIELD	IL	62703
Current Resident	21	BEL AIRE DR	SPRINGFIELD	IL	62703	21 BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	22	BEL AIRE DR	SPRINGFIELD	IL	62707	22 W BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	24	BEL AIRE DR	SPRINGFIELD	IL	62703	24 BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	25	BEL AIRE DR	SPRINGFIELD	IL	62703	25 BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	64	BEL AIRE DR	SPRINGFIELD	IL	62703	2500 WESTFIELD DR STE 102	ELGIN	IL	60124
Current Resident	26	BEL AIRE DR	SPRINGFIELD	IL	62703	26 W BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	28	BEL AIRE DR	SPRINGFIELD	IL	62703	28 BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	29	BEL AIRE DR	SPRINGFIELD	IL	62703	29 BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	32	BEL AIRE DR	SPRINGFIELD	IL	62703	32 BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	33	BEL AIRE DR	SPRINGFIELD	IL	62703	33 BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	36	BEL AIRE DR	SPRINGFIELD	IL	62703	36 BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	37	BEL AIRE DR	SPRINGFIELD	IL	62703	37 BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	4	BEL AIRE DR	SPRINGFIELD	IL	62703	4 BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	40	BEL AIRE DR	SPRINGFIELD	IL	62703	40 BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	41	BEL AIRE DR	SPRINGFIELD	IL	62703	41 BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	77	BEL AIRE DR	SPRINGFIELD	IL	62703	4109 RUSSELL DR	SPRINGFIELD	IL	62703
Current Resident	44	BEL AIRE DR	SPRINGFIELD	IL	62703	44 BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	48	BEL AIRE DR	SPRINGFIELD	IL	62703	48 BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	49	BEL AIRE DR	SPRINGFIELD	IL	62703	49 BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	5	BEL AIRE DR	SPRINGFIELD	IL	62703	5 BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	23	BEL AIRE DR	SPRINGFIELD	IL	62703	5005 CRANE DR	SPRINGFIELD	IL	62711
Current Resident	52	BEL AIRE DR	SPRINGFIELD	IL	62703	52 BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	53	BEL AIRE DR	SPRINGFIELD	IL	62703	53 BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	56	BEL AIRE DR	SPRINGFIELD	IL	62703	56 BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	57	BEL AIRE DR	SPRINGFIELD	IL	62703	57 BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	6	BEL AIRE DR	SPRINGFIELD	IL	62703	6 BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	65	BEL AIRE DR	SPRINGFIELD	IL	62703	65 BEL AIRE DR	SPRINGFIELD	IL	62703
Current Resident	68	BEL AIRE DR	SPRINGFIELD	IL	62703	68 BEL AIRE DR	SPRINGFIELD	IL	62703

Current Resident	69	BEL AIRE DR	SPRINGFIELD	IL	62703	69 BEL AIRE DR		SPRINGFIELD	IL	62703
Current Resident	72	BEL AIRE DR	SPRINGFIELD	IL	62703	72 BEL AIRE DR		SPRINGFIELD	IL	62703
Current Resident	73	BEL AIRE DR	SPRINGFIELD	IL	62703	73 BEL AIRE DR		SPRINGFIELD	IL	62703
Current Resident	8	BEL AIRE DR	SPRINGFIELD	IL	62703	8 BEL AIRE DR		SPRINGFIELD	IL	62703
Current Resident	9	BEL AIRE DR	SPRINGFIELD	IL	62703	9 BEL AIRE DR		SPRINGFIELD	IL	62703
Current Resident	60	BEL AIRE DR	SPRINGFIELD	IL	62703	PO BOX 20005		OWENSBORO	KY	42304
Current Resident	3705	BERGAMOT DR	SPRINGFIELD	IL	62712	% LEADER ONE FINANCIAL CORP	11020 KING ST STE 3	OVERLAND PAR	KS	66210
Current Resident	3725	BERGAMOT DR	SPRINGFIELD	IL	62707	212 S 2ND ST		SPRINGFIELD	IL	62701
Current Resident	3720	BERGAMOT DR	SPRINGFIELD	IL	62707	2500 WESTFIELD DR STE 102		ELGIN	IL	60124
Current Resident	3700	BERGAMOT DR	SPRINGFIELD	IL	62712	3700 BERGAMOT DR		SPRINGFIELD	IL	62712
Current Resident	3701	BERGAMOT DR	SPRINGFIELD	IL	62712	3701 BERGAMOT DR		SPRINGFIELD	IL	62712
Current Resident	3709	BERGAMOT DR	SPRINGFIELD	IL	62712	3709 BERGAMOT DR		SPRINGFIELD	IL	62712
Current Resident	3713	BERGAMOT DR	SPRINGFIELD	IL	62712	3713 BERGAMOT DR		SPRINGFIELD	IL	62712
Current Resident	3716	BERGAMOT DR	SPRINGFIELD	IL	62707	3716 BERGAMOT DR		SPRINGFIELD	IL	62712
Current Resident	3717	BERGAMOT DR	SPRINGFIELD	IL	62712	3717 BERGAMOT DR		SPRINGFIELD	IL	62712
Current Resident	3721	BERGAMOT DR	SPRINGFIELD	IL	62712	3721 BERGAMOT DR		SPRINGFIELD	IL	62712
Current Resident	3724	BERGAMOT DR	SPRINGFIELD	IL	62712	3724 BERGAMOT DR		SPRINGFIELD	IL	62712
Current Resident	3728	BERGAMOT DR	SPRINGFIELD	IL	62712	3728 BERGAMOT DR		SPRINGFIELD	IL	62712
Current Resident	3729	BERGAMOT DR	SPRINGFIELD	IL	62712	3729 BERGAMOT DR		SPRINGFIELD	IL	62712
Current Resident	3801	BERGAMOT DR	SPRINGFIELD	IL	62707	3801 BERGAMOT DR		SPRINGFIELD	IL	62712
Current Resident	3600	BIRKDALE DR	SPRINGFIELD	IL	62712	3600 BIRKDALE DR		SPRINGFIELD	IL	62712
Current Resident	3601	BIRKDALE DR	SPRINGFIELD	IL	62712	3601 BIRKDALE DR		SPRINGFIELD	IL	62712
Current Resident	3604	BIRKDALE DR	SPRINGFIELD	IL	62712	3604 BIRKDALE DR		SPRINGFIELD	IL	62712
Current Resident	3608	BIRKDALE DR	SPRINGFIELD	IL	62712	3608 BIRKDALE DR		SPRINGFIELD	IL	62712
Current Resident	3609	BIRKDALE DR	SPRINGFIELD	IL	62712	3609 BIRKDALE DR		SPRINGFIELD	IL	62712
Current Resident	3612	BIRKDALE DR	SPRINGFIELD	IL	62712	3612 BIRKDALE DR		SPRINGFIELD	IL	62712
Current Resident	3616	BIRKDALE DR	SPRINGFIELD	IL	62712	3616 BIRKDALE DR		SPRINGFIELD	IL	62712
Current Resident	3620	BIRKDALE DR	SPRINGFIELD	IL	62712	3620 BIRKDALE DR		SPRINGFIELD	IL	62712
Current Resident	3624	BIRKDALE DR	SPRINGFIELD	IL	62712	3624 BIRKDALE DR		SPRINGFIELD	IL	62712
Current Resident	3627	BIRKDALE DR	SPRINGFIELD	IL	62701	3627 BIRKDALE DR		SPRINGFIELD	IL	62712
Current Resident	3628	BIRKDALE DR	SPRINGFIELD	IL	62712	3628 BIRKDALE DR		SPRINGFIELD	IL	62712
Current Resident	3632	BIRKDALE DR	SPRINGFIELD	IL	62707	3632 BIRKDALE DR		SPRINGFIELD	IL	62712
Current Resident	3636	BIRKDALE DR	SPRINGFIELD	IL	62712	3636 BIRKDALE DR		SPRINGFIELD	IL	62712
Current Resident	3640	BIRKDALE DR	SPRINGFIELD	IL	62707	3640 BIRKDALE DR		SPRINGFIELD	IL	62712
Current Resident	3644	BIRKDALE DR	SPRINGFIELD	IL	62712	3644 BIRKDALE DR		SPRINGFIELD	IL	62712
Current Resident	3648	BIRKDALE DR	SPRINGFIELD	IL	62712	3648 BIRKDALE DR		SPRINGFIELD	IL	62712
Current Resident	2829	BLACKWATER BLVD	SPRINGFIELD	IL	62712	222 2ND AVE SE		CEDAR RAPIDS	IA	52401
Current Resident	2601	BLACKWATER BLVD	SPRINGFIELD	IL	62712	2601 BLACKWATER BLVD		SPRINGFIELD	IL	62712
Current Resident	2605	BLACKWATER BLVD	SPRINGFIELD	IL	62712	2605 BLACKWATER BLVD		SPRINGFIELD	IL	62712
Current Resident	2613	BLACKWATER BLVD	SPRINGFIELD	IL	62712	2613 BLACKWATER BLVD		SPRINGFIELD	IL	62712
Current Resident	2617	BLACKWATER BLVD	SPRINGFIELD	IL	62712	2617 BLACKWATER BLVD		SPRINGFIELD	IL	62712
Current Resident	2701	BLACKWATER BLVD	SPRINGFIELD	IL	62712	2701 BLACKWATER BLVD		SPRINGFIELD	IL	62712
Current Resident	2705	BLACKWATER BLVD	SPRINGFIELD	IL	62707	2705 BLACKWATER BLVD		SPRINGFIELD	IL	62712
Current Resident	2709	BLACKWATER BLVD	SPRINGFIELD	IL	62712	2709 BLACKWATER BLVD		SPRINGFIELD	IL	62712
Current Resident	2801	BLACKWATER BLVD	SPRINGFIELD	IL	62712	2801 BLACKWATER BLVD		SPRINGFIELD	IL	62712
Current Resident	2805	BLACKWATER BLVD	SPRINGFIELD	IL	62707	2805 BLACKWATER BLVD		SPRINGFIELD	IL	62712
Current Resident	2809	BLACKWATER BLVD	SPRINGFIELD	IL	62712	2809 BLACKWATER BLVD		SPRINGFIELD	IL	62712
Current Resident	2813	BLACKWATER BLVD	SPRINGFIELD	IL	62707	2813 BLACKWATER BLVD		SPRINGFIELD	IL	62712
Current Resident	2817	BLACKWATER BLVD	SPRINGFIELD	IL	62712	2817 BLACKWATER BLVD		SPRINGFIELD	IL	62712
Current Resident	2821	BLACKWATER BLVD	SPRINGFIELD	IL	62712	2821 BLACKWATER BLVD		SPRINGFIELD	IL	62712
Current Resident	2825	BLACKWATER BLVD	SPRINGFIELD	IL	62712	2825 BLACKWATER BLVD		SPRINGFIELD	IL	62712
Current Resident	2609	BLACKWATER BLVD	SPRINGFIELD	IL	62712	401 N MADISON ST	PO BOX 410	LITCHFIELD	IL	62056

Current Resident	2501	BLUEBIRD CT	SPRINGFIELD	IL	62703	PO BOX 2216		SPRINGFIELD	IL	62705
Current Resident	2511	BLUEBIRD CT	SPRINGFIELD	IL	62703	PO BOX 2216		SPRINGFIELD	IL	62705
Current Resident	2601	BLUEBIRD CT	SPRINGFIELD	IL	62703	PO BOX 2216		SPRINGFIELD	IL	62705
Current Resident	2510	BLUEBIRD CT	SPRINGFIELD	IL	62703	PO BOX 2216		SPRINGFIELD	IL	62705
Current Resident	2611	BLUEBIRD CT	SPRINGFIELD	IL	62703	PO BOX 2216		SPRINGFIELD	IL	62705
Current Resident	2621	BLUEBIRD CT	SPRINGFIELD	IL	62703	PO BOX 2216		SPRINGFIELD	IL	62705
Current Resident	2500	BLUEBIRD CT	SPRINGFIELD	IL	62703	PO BOX 3363		SPRINGFIELD	IL	62708
Current Resident	2631	BLUEBIRD CT	SPRINGFIELD	IL	62703	PO BOX 3363		SPRINGFIELD	IL	62708
Current Resident	2610	BLUEBIRD CT	SPRINGFIELD	IL	62703	PO BOX 3363		SPRINGFIELD	IL	62708
Current Resident	2620	BLUEBIRD CT	SPRINGFIELD	IL	62703	PO BOX 3363		SPRINGFIELD	IL	62708
Current Resident	2630	BLUEBIRD CT	SPRINGFIELD	IL	62703	PO BOX 3363		SPRINGFIELD	IL	62708
Hope School	3728	BLUESTEM CT	SPRINGFIELD	IL	62707	15 EAST HAZEL DELL LN		SPRINGFIELD	IL	62712
Current Resident	3700	BLUESTEM CT	SPRINGFIELD	IL	62712	3700 BLUESTEM CT		SPRINGFIELD	IL	62712
Current Resident	3701	BLUESTEM CT	SPRINGFIELD	IL	62712	3701 BLUESTEM CT		SPRINGFIELD	IL	62712
Current Resident	3704	BLUESTEM CT	SPRINGFIELD	IL	62712	3704 BLUESTEM CT		SPRINGFIELD	IL	62712
Current Resident	3705	BLUESTEM CT	SPRINGFIELD	IL	62712	3705 BLUESTEM CT		SPRINGFIELD	IL	62712
Current Resident	3708	BLUESTEM CT	SPRINGFIELD	IL	62712	3708 BLUESTEM CT		SPRINGFIELD	IL	62712
Current Resident	3709	BLUESTEM CT	SPRINGFIELD	IL	62707	3709 BLUESTEM CT		SPRINGFIELD	IL	62712
Current Resident	3712	BLUESTEM CT	SPRINGFIELD	IL	62707	3712 BLUESTEM CT		SPRINGFIELD	IL	62712
Current Resident	3713	BLUESTEM CT	SPRINGFIELD	IL	62712	3713 BLUESTEM CT		SPRINGFIELD	IL	62712
Current Resident	3716	BLUESTEM CT	SPRINGFIELD	IL	62712	3716 BLUESTEM CT		SPRINGFIELD	IL	62712
Current Resident	3717	BLUESTEM CT	SPRINGFIELD	IL	62712	3717 BLUESTEM CT		SPRINGFIELD	IL	62712
Current Resident	3720	BLUESTEM CT	SPRINGFIELD	IL	62712	3720 BLUESTEM CT		SPRINGFIELD	IL	62712
Current Resident	3721	BLUESTEM CT	SPRINGFIELD	IL	62712	3721 BLUESTEM CT		SPRINGFIELD	IL	62712
Current Resident	3724	BLUESTEM CT	SPRINGFIELD	IL	62712	3724 BLUESTEM CT		SPRINGFIELD	IL	62712
Current Resident	3725	BLUESTEM CT	SPRINGFIELD	IL	62712	3725 BLUESTEM CT		SPRINGFIELD	IL	62712
Current Resident	3732	BLUESTEM CT	SPRINGFIELD	IL	62712	3732 BLUESTEM CT		SPRINGFIELD	IL	62712
Current Resident	3804	BLUESTEM CT	SPRINGFIELD	IL	62712	3804 BLUESTEM CT		SPRINGFIELD	IL	62712
Current Resident	3805	BLUESTEM CT	SPRINGFIELD	IL	62712	3805 BLUESTEM CT		SPRINGFIELD	IL	62712
Current Resident	3808	BLUESTEM CT	SPRINGFIELD	IL	62712	3808 BLUESTEM CT		SPRINGFIELD	IL	62712
Current Resident	3809	BLUESTEM CT	SPRINGFIELD	IL	62712	3809 BLUESTEM CT		SPRINGFIELD	IL	62712
Current Resident	3812	BLUESTEM CT	SPRINGFIELD	IL	62712	3812 BLUESTEM CT		SPRINGFIELD	IL	62712
Current Resident	3813	BLUESTEM CT	SPRINGFIELD	IL	62712	3813 BLUESTEM CT		SPRINGFIELD	IL	62712
Current Resident	3816	BLUESTEM CT	SPRINGFIELD	IL	62707	3816 BLUESTEM CT		SPRINGFIELD	IL	62712
Current Resident	3801	BLUESTEM CT	SPRINGFIELD	IL	62707	PO BOX 1820		DAYTON	OH	45401
Current Resident	3204	BOWWOOD DR	SPRINGFIELD	IL	62712	3204 BOWWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3205	BOWWOOD DR	SPRINGFIELD	IL	62712	3205 BOWWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3208	BOWWOOD DR	SPRINGFIELD	IL	62712	3208 BOWWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3209	BOWWOOD DR	SPRINGFIELD	IL	62712	3209 BOWWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3212	BOWWOOD DR	SPRINGFIELD	IL	62712	3212 BOWWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3213	BOWWOOD DR	SPRINGFIELD	IL	62712	3213 BOWWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3217	BOWWOOD DR	SPRINGFIELD	IL	62712	3217 BOWWOOD DR		SPRINGFIELD	IL	62712
Current Resident	7950	BRANER RD	ROCHESTER	IL	62563	7950 BRANER RD	PO BOX 350	ROCHESTER	IL	62563
Current Resident	3704	BRISTLECONE DR	SPRINGFIELD	IL	62712	2812 WHITESIDE PL		SPRINGFIELD	IL	62711
Current Resident	3706	BRISTLECONE DR	SPRINGFIELD	IL	62712	2812 WHITESIDE PL		SPRINGFIELD	IL	62711
Current Resident	3805	BRISTLECONE DR	SPRINGFIELD	IL	62712	3225 RED OAK LN		SPRINGFIELD	IL	62712
Current Resident	3700	BRISTLECONE DR	SPRINGFIELD	IL	62712	3700 BRISTLECONE DR		SPRINGFIELD	IL	62712
Current Resident	3708	BRISTLECONE DR	SPRINGFIELD	IL	62712	3708 BRISTLECONE DR		SPRINGFIELD	IL	62712
Current Resident	3710	BRISTLECONE DR	SPRINGFIELD	IL	62712	3710 BRISTLECONE DR		SPRINGFIELD	IL	62712
Current Resident	3800	BRISTLECONE DR	SPRINGFIELD	IL	62712	3800 BRISTLECONE DR		SPRINGFIELD	IL	62712
Current Resident	3802	BRISTLECONE DR	SPRINGFIELD	IL	62712	3802 BRISTLECONE DR		SPRINGFIELD	IL	62712
Current Resident	3804	BRISTLECONE DR	SPRINGFIELD	IL	62712	3804 BRISTLECONE DR		SPRINGFIELD	IL	62712

Current Resident	3806	BRISTLECONE DR	SPRINGFIELD	IL	62712	3806 BRISTLECONE DR		SPRINGFIELD	IL	62712
Current Resident	3808	BRISTLECONE DR	SPRINGFIELD	IL	62712	3808 BRISTLECONE DR		SPRINGFIELD	IL	62712
Current Resident	3810	BRISTLECONE DR	SPRINGFIELD	IL	62707	3810 BRISTLECONE DR		SPRINGFIELD	IL	62712
Current Resident	2	BRITTANY ST	SPRINGFIELD	IL	62712	2 BRITTANY ST		SPRINGFIELD	IL	62712
Current Resident	3601	BUCKEYE DR	SPRINGFIELD	IL	62707	22ND FLR	50 E NORTH TEMPLE	SALT LAKE CITY	UT	84150
Current Resident	3500	BUCKEYE DR	SPRINGFIELD	IL	62712	3500 BUCKEYE DR		SPRINGFIELD	IL	62712
Current Resident	3501	BUCKEYE DR	SPRINGFIELD	IL	62712	3501 BUCKEYE DR		SPRINGFIELD	IL	62712
Current Resident	3508	BUCKEYE DR	SPRINGFIELD	IL	62712	3508 BUCKEYE DR		SPRINGFIELD	IL	62712
Current Resident	3509	BUCKEYE DR	SPRINGFIELD	IL	62712	3509 BUCKEYE DR		SPRINGFIELD	IL	62712
Current Resident	3512	BUCKEYE DR	SPRINGFIELD	IL	62712	3512 BUCKEYE DR		SPRINGFIELD	IL	62712
Current Resident	3600	BUCKEYE DR	SPRINGFIELD	IL	62712	3600 BUCKEYE DR		SPRINGFIELD	IL	62712
Current Resident	3604	BUCKEYE DR	SPRINGFIELD	IL	62712	3604 BUCKEYE DR		SPRINGFIELD	IL	62712
Current Resident	3605	BUCKEYE DR	SPRINGFIELD	IL	62712	3605 BUCKEYE DR		SPRINGFIELD	IL	62712
Current Resident	3701	BUCKEYE DR	SPRINGFIELD	IL	62712	3701 BUCKEYE DR		SPRINGFIELD	IL	62712
Current Resident	3704	BUCKEYE DR	SPRINGFIELD	IL	62707	3704 BUCKEYE DR		SPRINGFIELD	IL	62712
Current Resident	3709	BUCKEYE DR	SPRINGFIELD	IL	62707	3709 BUCKEYE DR		SPRINGFIELD	IL	62712
Current Resident	3711	BUCKEYE DR	SPRINGFIELD	IL	62712	3711 BUCKEYE DR		SPRINGFIELD	IL	62712
Current Resident	3800	BUCKEYE DR	SPRINGFIELD	IL	62712	3800 BUCKEYE DR		SPRINGFIELD	IL	62712
Current Resident	3801	BUCKEYE DR	SPRINGFIELD	IL	62712	3801 BUCKEYE DR		SPRINGFIELD	IL	62712
Current Resident	3804	BUCKEYE DR	SPRINGFIELD	IL	62707	3804 BUCKEYE DR		SPRINGFIELD	IL	62712
Current Resident	3809	BUCKEYE DR	SPRINGFIELD	IL	62712	3809 BUCKEYE DR		SPRINGFIELD	IL	62712
Current Resident	3900	BUCKEYE DR	SPRINGFIELD	IL	62707	3900 BUCKEYE DR		SPRINGFIELD	IL	62712
Current Resident	3905	BUCKEYE DR	SPRINGFIELD	IL	62712	3905 BUCKEYE DR		SPRINGFIELD	IL	62712
Current Resident	3910	BUCKEYE DR	SPRINGFIELD	IL	62707	3910 BUCKEYE DR		SPRINGFIELD	IL	62712
Current Resident	3916	BUCKEYE DR	SPRINGFIELD	IL	62712	3916 BUCKEYE DR		SPRINGFIELD	IL	62712
Current Resident	3925	BUCKEYE DR	SPRINGFIELD	IL	62707	3925 BUCKEYE DR		SPRINGFIELD	IL	62712
Current Resident	3926	BUCKEYE DR	SPRINGFIELD	IL	62707	3926 BUCKEYE DR		SPRINGFIELD	IL	62712
Current Resident	3932	BUCKEYE DR	SPRINGFIELD	IL	62707	3932 BUCKEYE DR		SPRINGFIELD	IL	62712
Current Resident	3603	BUCKEYE DR	SPRINGFIELD	IL	62712	PO BOX 4895		SPRINGFIELD	IL	62708
Current Resident	3920	BUCKEYE DR	SPRINGFIELD	IL	62712	PO BOX 9219		COPPELL	TX	75019
Current Resident	2720	CARL PRAIRIE DR	SPRINGFIELD	IL	62703	% BP ADVISOR	1800 JOHN F KENNED	PHILADELPHIA	PA	19103
Current Resident	2609	CARL PRAIRIE DR	SPRINGFIELD	IL	62703	2500 WESTFIELD DR STE 102		ELGIN	IL	60124
Current Resident	2600	CARL PRAIRIE DR	SPRINGFIELD	IL	62703	2600 CARL PRAIRIE DR		SPRINGFIELD	IL	62703
Current Resident	2604	CARL PRAIRIE DR	SPRINGFIELD	IL	62703	2604 CARL PRAIRIE DR		SPRINGFIELD	IL	62703
Current Resident	2605	CARL PRAIRIE DR	SPRINGFIELD	IL	62703	2605 CARL PRAIRIE DR		SPRINGFIELD	IL	62703
Current Resident	2608	CARL PRAIRIE DR	SPRINGFIELD	IL	62703	2608 CARL PRAIRIE DR		SPRINGFIELD	IL	62703
Current Resident	2612	CARL PRAIRIE DR	SPRINGFIELD	IL	62703	2612 CARL PRAIRIE DR		SPRINGFIELD	IL	62703
Current Resident	2613	CARL PRAIRIE DR	SPRINGFIELD	IL	62703	2613 CARL PRAIRIE DR		SPRINGFIELD	IL	62703
Current Resident	2616	CARL PRAIRIE DR	SPRINGFIELD	IL	62703	2616 CARL PRAIRIE DR		SPRINGFIELD	IL	62703
Current Resident	2617	CARL PRAIRIE DR	SPRINGFIELD	IL	62703	2617 CARL PRAIRIE DR		SPRINGFIELD	IL	62703
Current Resident	2620	CARL PRAIRIE DR	SPRINGFIELD	IL	62703	2620 CARL PRAIRIE DR		SPRINGFIELD	IL	62703
Current Resident	2621	CARL PRAIRIE DR	SPRINGFIELD	IL	62703	2621 CARL PRAIRIE DR		SPRINGFIELD	IL	62703
Current Resident	2700	CARL PRAIRIE DR	SPRINGFIELD	IL	62703	2700 CARL PRAIRIE DR		SPRINGFIELD	IL	62703
Current Resident	2701	CARL PRAIRIE DR	SPRINGFIELD	IL	62703	2701 CARL PRAIRIE DR		SPRINGFIELD	IL	62703
Current Resident	2704	CARL PRAIRIE DR	SPRINGFIELD	IL	62703	2704 CARL PRAIRIE DR		SPRINGFIELD	IL	62703
Current Resident	2705	CARL PRAIRIE DR	SPRINGFIELD	IL	62703	2705 CARL PRAIRIE DR		SPRINGFIELD	IL	62703
Current Resident	2708	CARL PRAIRIE DR	SPRINGFIELD	IL	62703	2708 CARL PRAIRIE DR		SPRINGFIELD	IL	62703
Current Resident	2709	CARL PRAIRIE DR	SPRINGFIELD	IL	62703	2709 CARL PRAIRIE DR		SPRINGFIELD	IL	62703
Current Resident	2712	CARL PRAIRIE DR	SPRINGFIELD	IL	62703	2712 CARL PRAIRIE DR		SPRINGFIELD	IL	62703
Current Resident	2713	CARL PRAIRIE DR	SPRINGFIELD	IL	62703	2713 CARL PRAIRIE DR		SPRINGFIELD	IL	62703
Current Resident	2716	CARL PRAIRIE DR	SPRINGFIELD	IL	62703	2716 CARL PRAIRIE DR		SPRINGFIELD	IL	62703
Current Resident	2717	CARL PRAIRIE DR	SPRINGFIELD	IL	62703	2717 CARL PRAIRIE DR		SPRINGFIELD	IL	62703

Current Resident	2721	CARL PRAIRIE DR	SPRINGFIELD	IL	62703	2721 CARL PRAIRIE DR	SPRINGFIELD	IL	62703
Current Resident	2724	CARL PRAIRIE DR	SPRINGFIELD	IL	62703	2724 CARL PRAIRIE DR	SPRINGFIELD	IL	62703
Current Resident	2725	CARL PRAIRIE DR	SPRINGFIELD	IL	62703	2725 CARL PRAIRIE DR	SPRINGFIELD	IL	62703
Current Resident	2601	CARL PRAIRIE DR	SPRINGFIELD	IL	62703	PO BOX 961291	FORT WORTH	TX	76161
Current Resident	3829	CARNEY BLVD	SPRINGFIELD	IL	62707	14955 E 1600TH ST	MACOMB	IL	61455
Current Resident	3700	CARNEY BLVD	SPRINGFIELD	IL	62712	3700 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3701	CARNEY BLVD	SPRINGFIELD	IL	62712	3701 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3704	CARNEY BLVD	SPRINGFIELD	IL	62712	3704 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3705	CARNEY BLVD	SPRINGFIELD	IL	62712	3705 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3708	CARNEY BLVD	SPRINGFIELD	IL	62712	3708 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3709	CARNEY BLVD	SPRINGFIELD	IL	62712	3709 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3712	CARNEY BLVD	SPRINGFIELD	IL	62712	3712 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3713	CARNEY BLVD	SPRINGFIELD	IL	62712	3713 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3716	CARNEY BLVD	SPRINGFIELD	IL	62712	3716 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3717	CARNEY BLVD	SPRINGFIELD	IL	62707	3717 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3720	CARNEY BLVD	SPRINGFIELD	IL	62712	3720 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3721	CARNEY BLVD	SPRINGFIELD	IL	62712	3721 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3724	CARNEY BLVD	SPRINGFIELD	IL	62712	3724 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3725	CARNEY BLVD	SPRINGFIELD	IL	62712	3725 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3729	CARNEY BLVD	SPRINGFIELD	IL	62707	3729 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3800	CARNEY BLVD	SPRINGFIELD	IL	62712	3800 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3801	CARNEY BLVD	SPRINGFIELD	IL	62707	3801 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3804	CARNEY BLVD	SPRINGFIELD	IL	62712	3804 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3805	CARNEY BLVD	SPRINGFIELD	IL	62712	3805 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3808	CARNEY BLVD	SPRINGFIELD	IL	62712	3808 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3809	CARNEY BLVD	SPRINGFIELD	IL	62712	3809 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3812	CARNEY BLVD	SPRINGFIELD	IL	62712	3812 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3813	CARNEY BLVD	SPRINGFIELD	IL	62712	3813 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3816	CARNEY BLVD	SPRINGFIELD	IL	62712	3816 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3817	CARNEY BLVD	SPRINGFIELD	IL	62712	3817 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3820	CARNEY BLVD	SPRINGFIELD	IL	62712	3820 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3821	CARNEY BLVD	SPRINGFIELD	IL	62707	3821 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3824	CARNEY BLVD	SPRINGFIELD	IL	62712	3824 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3825	CARNEY BLVD	SPRINGFIELD	IL	62712	3825 CARNEY BLVD	SPRINGFIELD	IL	62712
Current Resident	3500	CARNOUSTIE DR	SPRINGFIELD	IL	62712	3500 CARNOUSTIE DR	SPRINGFIELD	IL	62712
Current Resident	3501	CARNOUSTIE DR	SPRINGFIELD	IL	62712	3501 CARNOUSTIE DR	SPRINGFIELD	IL	62712
Current Resident	3504	CARNOUSTIE DR	SPRINGFIELD	IL	62712	3504 CARNOUSTIE DR	SPRINGFIELD	IL	62712
Current Resident	3505	CARNOUSTIE DR	SPRINGFIELD	IL	62712	3505 CARNOUSTIE DR	SPRINGFIELD	IL	62712
Current Resident	3508	CARNOUSTIE DR	SPRINGFIELD	IL	62712	3508 CARNOUSTIE DR	SPRINGFIELD	IL	62712
Current Resident	3509	CARNOUSTIE DR	SPRINGFIELD	IL	62712	3509 CARNOUSTIE DR	SPRINGFIELD	IL	62712
Current Resident	3512	CARNOUSTIE DR	SPRINGFIELD	IL	62712	3512 CARNOUSTIE DR	SPRINGFIELD	IL	62712
Current Resident	3513	CARNOUSTIE DR	SPRINGFIELD	IL	62712	3513 CARNOUSTIE DR	SPRINGFIELD	IL	62712
Current Resident	3516	CARNOUSTIE DR	SPRINGFIELD	IL	62712	3516 CARNOUSTIE DR	SPRINGFIELD	IL	62712
Current Resident	3517	CARNOUSTIE DR	SPRINGFIELD	IL	62712	3517 CARNOUSTIE DR	SPRINGFIELD	IL	62712
Current Resident	3520	CARNOUSTIE DR	SPRINGFIELD	IL	62712	3520 CARNOUSTIE DR	SPRINGFIELD	IL	62712
Current Resident	3521	CARNOUSTIE DR	SPRINGFIELD	IL	62712	3521 CARNOUSTIE DR	SPRINGFIELD	IL	62712
Current Resident	3600	CARNOUSTIE DR	SPRINGFIELD	IL	62707	3600 CARNOUSTIE DR	SPRINGFIELD	IL	62712
Current Resident	3601	CARNOUSTIE DR	SPRINGFIELD	IL	62712	3601 CARNOUSTIE DR	SPRINGFIELD	IL	62712
Current Resident	3604	CARNOUSTIE DR	SPRINGFIELD	IL	62712	3604 CARNOUSTIE DR	SPRINGFIELD	IL	62712
Current Resident	3605	CARNOUSTIE DR	SPRINGFIELD	IL	62712	3605 CARNOUSTIE DR	SPRINGFIELD	IL	62712
Current Resident	3608	CARNOUSTIE DR	SPRINGFIELD	IL	62712	3608 CARNOUSTIE DR	SPRINGFIELD	IL	62712
Current Resident	3609	CARNOUSTIE DR	SPRINGFIELD	IL	62712	3609 CARNOUSTIE DR	SPRINGFIELD	IL	62712

Current Resident	3612	CARNOUSTIE DR	SPRINGFIELD	IL	62712	3612 CARNOUSTIE DR	SPRINGFIELD	IL	62712
Current Resident	3613	CARNOUSTIE DR	SPRINGFIELD	IL	62707	3613 CARNOUSTIE DR	SPRINGFIELD	IL	62712
Current Resident	3616	CARNOUSTIE DR	SPRINGFIELD	IL	62712	3616 CARNOUSTIE DR	SPRINGFIELD	IL	62712
Current Resident	3617	CARNOUSTIE DR	SPRINGFIELD	IL	62712	3617 CARNOUSTIE DR	SPRINGFIELD	IL	62712
Current Resident	3708	CASTLE HILL BLVD	SPRINGFIELD	IL	62712	2050 PARKWAY OFFICE CIR	BIRMINGHAM	AL	35244
Current Resident	3717	CASTLE HILL BLVD	SPRINGFIELD	IL	62712	2500 WESTFIELD DR STE 102	ELGIN	IL	60124
Current Resident	3713	CASTLE HILL BLVD	SPRINGFIELD	IL	62712	3341 OLD JACKSONVILLE RD	SPRINGFIELD	IL	62711
Current Resident	3725	CASTLE HILL BLVD	SPRINGFIELD	IL	62712	3350 PEACHTREE RD NE STE 1000	ATLANTA	GA	30326
Current Resident	3700	CASTLE HILL BLVD	SPRINGFIELD	IL	62712	3700 CASTLE HILL BLVD	SPRINGFIELD	IL	62712
Current Resident	3701	CASTLE HILL BLVD	SPRINGFIELD	IL	62712	3701 CASTLE HILL BLVD	SPRINGFIELD	IL	62712
Current Resident	3704	CASTLE HILL BLVD	SPRINGFIELD	IL	62707	3704 CASTLE HILL BLVD	SPRINGFIELD	IL	62712
Current Resident	3705	CASTLE HILL BLVD	SPRINGFIELD	IL	62712	3705 CASTLE HILL BLVD	SPRINGFIELD	IL	62712
Current Resident	3709	CASTLE HILL BLVD	SPRINGFIELD	IL	62712	3709 CASTLE HILL BLVD	SPRINGFIELD	IL	62712
Current Resident	3712	CASTLE HILL BLVD	SPRINGFIELD	IL	62712	3712 CASTLE HILL BLVD	SPRINGFIELD	IL	62712
Current Resident	3716	CASTLE HILL BLVD	SPRINGFIELD	IL	62712	3716 CASTLE HILL BLVD	SPRINGFIELD	IL	62712
Current Resident	3720	CASTLE HILL BLVD	SPRINGFIELD	IL	62712	3720 CASTLE HILL BLVD	SPRINGFIELD	IL	62712
Current Resident	3724	CASTLE HILL BLVD	SPRINGFIELD	IL	62712	3724 CASTLE HILL BLVD	SPRINGFIELD	IL	62712
Current Resident	3800	CASTLE HILL BLVD	SPRINGFIELD	IL	62712	3800 CASTLE HILL BLVD	SPRINGFIELD	IL	62712
Current Resident	3801	CASTLE HILL BLVD	SPRINGFIELD	IL	62707	3801 CASTLE HILL BLVD	SPRINGFIELD	IL	62712
Current Resident	3804	CASTLE HILL BLVD	SPRINGFIELD	IL	62707	3804 CASTLE HILL BLVD	SPRINGFIELD	IL	62712
Current Resident	3805	CASTLE HILL BLVD	SPRINGFIELD	IL	62712	3805 CASTLE HILL BLVD	SPRINGFIELD	IL	62712
Current Resident	3808	CASTLE HILL BLVD	SPRINGFIELD	IL	62712	3808 CASTLE HILL BLVD	SPRINGFIELD	IL	62712
Current Resident	3809	CASTLE HILL BLVD	SPRINGFIELD	IL	62712	3809 CASTLE HILL BLVD	SPRINGFIELD	IL	62712
Current Resident	3812	CASTLE HILL BLVD	SPRINGFIELD	IL	62712	3812 CASTLE HILL BLVD	SPRINGFIELD	IL	62712
Current Resident	3813	CASTLE HILL BLVD	SPRINGFIELD	IL	62712	3813 CASTLE HILL BLVD	SPRINGFIELD	IL	62712
Current Resident	3816	CASTLE HILL BLVD	SPRINGFIELD	IL	62712	3816 CASTLE HILL BLVD	SPRINGFIELD	IL	62712
Current Resident	3817	CASTLE HILL BLVD	SPRINGFIELD	IL	62712	3817 CASTLE HILL BLVD	SPRINGFIELD	IL	62712
Current Resident	3820	CASTLE HILL BLVD	SPRINGFIELD	IL	62712	3820 CASTLE HILL BLVD	SPRINGFIELD	IL	62712
Current Resident	3821	CASTLE HILL BLVD	SPRINGFIELD	IL	62707	3821 CASTLE HILL BLVD	SPRINGFIELD	IL	62712
Current Resident	3824	CASTLE HILL BLVD	SPRINGFIELD	IL	62712	3824 CASTLE HILL BLVD	SPRINGFIELD	IL	62712
Current Resident	3825	CASTLE HILL BLVD	SPRINGFIELD	IL	62712	3825 CASTLE HILL BLVD	SPRINGFIELD	IL	62712
Current Resident	3721	CASTLE HILL BLVD	SPRINGFIELD	IL	62707	7811 N 11TH AVE	PHOENIX	AZ	85021
Current Resident	3000	CATALPA DR	SPRINGFIELD	IL	62712	3000 CATALPA DR	SPRINGFIELD	IL	62712
Current Resident	3001	CATALPA DR	SPRINGFIELD	IL	62712	3001 CATALPA DR	SPRINGFIELD	IL	62712
Current Resident	3004	CATALPA DR	SPRINGFIELD	IL	62712	3004 CATALPA DR	SPRINGFIELD	IL	62712
Current Resident	3005	CATALPA DR	SPRINGFIELD	IL	62712	3005 CATALPA DR	SPRINGFIELD	IL	62712
Current Resident	3008	CATALPA DR	SPRINGFIELD	IL	62712	3008 CATALPA DR	SPRINGFIELD	IL	62712
Current Resident	3009	CATALPA DR	SPRINGFIELD	IL	62712	3009 CATALPA DR	SPRINGFIELD	IL	62712
Current Resident	3012	CATALPA DR	SPRINGFIELD	IL	62712	3012 CATALPA DR	SPRINGFIELD	IL	62712
Current Resident	3013	CATALPA DR	SPRINGFIELD	IL	62712	3013 CATALPA DR	SPRINGFIELD	IL	62712
Current Resident	3016	CATALPA DR	SPRINGFIELD	IL	62707	3016 CATALPA DR	SPRINGFIELD	IL	62712
Current Resident	3017	CATALPA DR	SPRINGFIELD	IL	62707	3017 CATALPA DR	SPRINGFIELD	IL	62712
Current Resident	3100	CATALPA DR	SPRINGFIELD	IL	62707	3100 CATALPA DR	SPRINGFIELD	IL	62712
Current Resident	3101	CATALPA DR	SPRINGFIELD	IL	62707	3101 CATALPA DR	SPRINGFIELD	IL	62712
Current Resident	3104	CATALPA DR	SPRINGFIELD	IL	62707	3104 CATALPA DR	SPRINGFIELD	IL	62712
Current Resident	3105	CATALPA DR	SPRINGFIELD	IL	62707	3105 CATALPA DR	SPRINGFIELD	IL	62712
Current Resident	3108	CATALPA DR	SPRINGFIELD	IL	62712	3108 CATALPA DR	SPRINGFIELD	IL	62712
Current Resident	3109	CATALPA DR	SPRINGFIELD	IL	62712	3109 CATALPA DR	SPRINGFIELD	IL	62712
Current Resident	3112	CATALPA DR	SPRINGFIELD	IL	62712	3112 CATALPA DR	SPRINGFIELD	IL	62712
Current Resident	3113	CATALPA DR	SPRINGFIELD	IL	62712	3113 CATALPA DR	SPRINGFIELD	IL	62712
Current Resident	3116	CATALPA DR	SPRINGFIELD	IL	62712	3116 CATALPA DR	SPRINGFIELD	IL	62712
Current Resident	3117	CATALPA DR	SPRINGFIELD	IL	62712	3117 CATALPA DR	SPRINGFIELD	IL	62712

Current Resident	3120	CATALPA DR	SPRINGFIELD	IL	62707	3120 CATALPA DR		SPRINGFIELD	IL	62712
Current Resident	3121	CATALPA DR	SPRINGFIELD	IL	62707	3121 CATALPA DR		SPRINGFIELD	IL	62712
Current Resident	3125	CATALPA DR	SPRINGFIELD	IL	62712	3125 CATALPA DR		SPRINGFIELD	IL	62712
Current Resident	3204	CATALPA DR	SPRINGFIELD	IL	62712	3204 CATALPA DR		SPRINGFIELD	IL	62712
Current Resident	3205	CATALPA DR	SPRINGFIELD	IL	62712	3205 CATALPA DR		SPRINGFIELD	IL	62712
Current Resident	3208	CATALPA DR	SPRINGFIELD	IL	62712	3208 CATALPA DR		SPRINGFIELD	IL	62712
Current Resident	3212	CATALPA DR	SPRINGFIELD	IL	62712	3212 CATALPA DR		SPRINGFIELD	IL	62712
Current Resident	3213	CATALPA DR	SPRINGFIELD	IL	62712	3213 CATALPA DR		SPRINGFIELD	IL	62712
Current Resident	3216	CATALPA DR	SPRINGFIELD	IL	62707	3216 CATALPA DR		SPRINGFIELD	IL	62712
Current Resident	3217	CATALPA DR	SPRINGFIELD	IL	62712	3217 CATALPA DR		SPRINGFIELD	IL	62712
Current Resident	3220	CATALPA DR	SPRINGFIELD	IL	62712	3220 CATALPA DR		SPRINGFIELD	IL	62712
Current Resident	3221	CATALPA DR	SPRINGFIELD	IL	62712	3221 CATALPA DR		SPRINGFIELD	IL	62712
Current Resident	3224	CATALPA DR	SPRINGFIELD	IL	62707	3224 CATALPA DR		SPRINGFIELD	IL	62712
Current Resident	3225	CATALPA DR	SPRINGFIELD	IL	62707	3225 CATALPA DR		SPRINGFIELD	IL	62712
Current Resident	3228	CATALPA DR	SPRINGFIELD	IL	62707	3228 CATALPA DR		SPRINGFIELD	IL	62712
Current Resident	3229	CATALPA DR	SPRINGFIELD	IL	62707	3229 CATALPA DR		SPRINGFIELD	IL	62712
Current Resident	3300	CATALPA DR	SPRINGFIELD	IL	62712	3300 CATALPA DR		SPRINGFIELD	IL	62712
Current Resident	3301	CATALPA DR	SPRINGFIELD	IL	62707	3301 CATALPA DR		SPRINGFIELD	IL	62712
Current Resident	3304	CATALPA DR	SPRINGFIELD	IL	62707	3304 CATALPA DR		SPRINGFIELD	IL	62712
Current Resident	3200	CATALPA DR	SPRINGFIELD	IL	62707	3708 BUCKEYE DR		SPRINGFIELD	IL	62712
Current Resident	3209	CATALPA DR	SPRINGFIELD	IL	62707	62 LAMAR CT		RIVERTON	IL	62561
Current Resident	2725	CATHERINE LN	SPRINGFIELD	IL	62703	151 TWIN OAKS DR		CHATHAM	IL	62629
Current Resident	2721	CATHERINE LN	SPRINGFIELD	IL	62703	2721 CATHERINE LN		SPRINGFIELD	IL	62703
Current Resident	2801	CATHERINE LN	SPRINGFIELD	IL	62703	2801 CATHERINE LN		SPRINGFIELD	IL	62703
Current Resident	2807	CATHERINE LN	SPRINGFIELD	IL	62703	2807 CATHERINE LN		SPRINGFIELD	IL	62703
Current Resident	2805	CATHERINE LN	SPRINGFIELD	IL	62703	2912 TAYLOR AVE APT 3		SPRINGFIELD	IL	62703
Current Resident	2809	CATHERINE LN	SPRINGFIELD	IL	62703	2912 TAYLOR AVE APT 3		SPRINGFIELD	IL	62703
Current Resident	4439	CESSNA LN	SPRINGFIELD	IL	62707	4439 CESSNA LN		SPRINGFIELD	IL	62707
Current Resident	30	CHAMPLAIN DR	SPRINGFIELD	IL	62707	30 CHAMPLAIN DR		SPRINGFIELD	IL	62707
Current Resident	2724	CHESHIRE RD	SPRINGFIELD	IL	62703	% NAVY FEDERAL CREDIT UNION	5550 HERITAGE OAKS	PENSACOLA	FL	32526
Current Resident	2701	CHESHIRE RD	SPRINGFIELD	IL	62703	2701 CHESHIRE RD		SPRINGFIELD	IL	62703
Current Resident	2704	CHESHIRE RD	SPRINGFIELD	IL	62703	2704 CHESHIRE RD		SPRINGFIELD	IL	62703
Current Resident	2708	CHESHIRE RD	SPRINGFIELD	IL	62703	2708 CHESHIRE RD		SPRINGFIELD	IL	62703
Current Resident	2709	CHESHIRE RD	SPRINGFIELD	IL	62703	2709 CHESHIRE RD		SPRINGFIELD	IL	62703
Current Resident	2712	CHESHIRE RD	SPRINGFIELD	IL	62703	2712 CHESHIRE RD		SPRINGFIELD	IL	62703
Current Resident	2713	CHESHIRE RD	SPRINGFIELD	IL	62703	2713 CHESHIRE RD		SPRINGFIELD	IL	62703
Current Resident	2716	CHESHIRE RD	SPRINGFIELD	IL	62703	2716 CHESHIRE RD		SPRINGFIELD	IL	62703
Current Resident	2720	CHESHIRE RD	SPRINGFIELD	IL	62703	2720 CHESHIRE RD		SPRINGFIELD	IL	62703
Current Resident	3000	CHICKADEE CT	SPRINGFIELD	IL	62703	PO BOX 2216		SPRINGFIELD	IL	62705
Current Resident	3020	CHICKADEE CT	SPRINGFIELD	IL	62703	PO BOX 2216		SPRINGFIELD	IL	62705
Current Resident	17998	CHSTRFLD APRT RD STE 200	CHESTERFIELD	MO	63005	17998 CHSTRFLD APRT RD STE 200		CHESTERFIELD	MO	63005
Current Resident	2804	CLARK ST	SPRINGFIELD	IL	62703	3941 TAMIAMI TRL		PUNTA GORDA	FL	33950
Current Resident	1	COLUMBINE LN	SPRINGFIELD	IL	62712	1 COLUMBINE LN		SPRINGFIELD	IL	62712
Current Resident	15	COLUMBINE LN	SPRINGFIELD	IL	62707	15 COLUMBINE LN		SPRINGFIELD	IL	62712
Current Resident	20	COLUMBINE LN	SPRINGFIELD	IL	62712	20 COLUMBINE LN		SPRINGFIELD	IL	62712
Current Resident	21	COLUMBINE LN	SPRINGFIELD	IL	62712	21 COLUMBINE LN		SPRINGFIELD	IL	62712
Current Resident	33	COLUMBINE LN	SPRINGFIELD	IL	62712	33 COLUMBINE LN		SPRINGFIELD	IL	62712
Current Resident	14	COLUMBINE LN	SPRINGFIELD	IL	62707	3341 OLD JACKSONVILLE RD		SPRINGFIELD	IL	62711
Current Resident	39	COLUMBINE LN	SPRINGFIELD	IL	62707	39 COLUMBINE LN		SPRINGFIELD	IL	62712
Current Resident	45	COLUMBINE LN	SPRINGFIELD	IL	62712	45 COLUMBINE LN		SPRINGFIELD	IL	62712
Current Resident	50	COLUMBINE LN	SPRINGFIELD	IL	62712	50 COLUMBINE LN		SPRINGFIELD	IL	62712
Current Resident	51	COLUMBINE LN	SPRINGFIELD	IL	62712	51 COLUMBINE LN		SPRINGFIELD	IL	62712

Current Resident	57	COLUMBINE LN	SPRINGFIELD	IL	62712	57 COLUMBINE LN		SPRINGFIELD	IL	62712
Current Resident	6	COLUMBINE LN	SPRINGFIELD	IL	62712	6 COLUMBINE LN		SPRINGFIELD	IL	62712
Current Resident	60	COLUMBINE LN	SPRINGFIELD	IL	62707	60 COLUMBINE LN		SPRINGFIELD	IL	62712
Current Resident	63	COLUMBINE LN	SPRINGFIELD	IL	62712	63 COLUMBINE LN		SPRINGFIELD	IL	62712
Current Resident	66	COLUMBINE LN	SPRINGFIELD	IL	62712	66 COLUMBINE LN		SPRINGFIELD	IL	62712
Current Resident	69	COLUMBINE LN	SPRINGFIELD	IL	62707	69 COLUMBINE LN		SPRINGFIELD	IL	62712
Current Resident	7	COLUMBINE LN	SPRINGFIELD	IL	62712	7 COLUMBINE LN		SPRINGFIELD	IL	62712
Current Resident	75	COLUMBINE LN	SPRINGFIELD	IL	62707	75 COLUMBINE LN		SPRINGFIELD	IL	62712
Current Resident	2500	COLUMBUS CIR	SPRINGFIELD	IL	62703	2500 COLUMBUS CIR		SPRINGFIELD	IL	62703
Current Resident	2505	COLUMBUS CIR	SPRINGFIELD	IL	62703	2505 COLUMBUS CIR		SPRINGFIELD	IL	62703
Current Resident	2508	COLUMBUS CIR	SPRINGFIELD	IL	62703	2508 COLUMBUS CIR		SPRINGFIELD	IL	62703
Current Resident	2509	COLUMBUS CIR	SPRINGFIELD	IL	62703	2509 COLUMBUS CIR		SPRINGFIELD	IL	62703
Current Resident	2512	COLUMBUS CIR	SPRINGFIELD	IL	62703	2512 COLUMBUS CIR		SPRINGFIELD	IL	62703
Current Resident	2513	COLUMBUS CIR	SPRINGFIELD	IL	62703	2513 COLUMBUS CIR		SPRINGFIELD	IL	62703
Current Resident	2516	COLUMBUS CIR	SPRINGFIELD	IL	62703	2516 COLUMBUS CIR		SPRINGFIELD	IL	62703
Current Resident	2517	COLUMBUS CIR	SPRINGFIELD	IL	62703	2517 COLUMBUS CIR		SPRINGFIELD	IL	62703
Current Resident	2520	COLUMBUS CIR	SPRINGFIELD	IL	62703	2520 COLUMBUS CIR		SPRINGFIELD	IL	62703
Current Resident	2521	COLUMBUS CIR	SPRINGFIELD	IL	62703	2521 COLUMBUS CIR		SPRINGFIELD	IL	62703
Current Resident	2524	COLUMBUS CIR	SPRINGFIELD	IL	62703	2524 COLUMBUS CIR		SPRINGFIELD	IL	62703
Current Resident	2525	COLUMBUS CIR	SPRINGFIELD	IL	62703	2525 COLUMBUS CIR		SPRINGFIELD	IL	62703
Current Resident	2532	COLUMBUS CIR	SPRINGFIELD	IL	62703	2532 COLUMBUS CIR		SPRINGFIELD	IL	62703
Current Resident	2504	COLUMBUS CIR	SPRINGFIELD	IL	62703	3180 RIDER TRL S		EARTH CITY	MO	63045
Current Resident	2528	COLUMBUS CIR	SPRINGFIELD	IL	62703	PO BOX 23689		ROCHESTER	NY	14692
Current Resident	2536	COLUMBUS CIR	SPRINGFIELD	IL	62703	PO BOX 8800		DAYTON	OH	45401
Current Resident	3820	CRANLEIGH BLVD	SPRINGFIELD	IL	62712	% LEADERONE	11020 KING ST STE 3	OVERLAND PAR	KS	66210
Current Resident	3716	CRANLEIGH BLVD	SPRINGFIELD	IL	62707	% REGIONS BANK	1 INDIANA SQ STE 70	INDIANAPOLIS	IN	46204
Current Resident	3724	CRANLEIGH BLVD	SPRINGFIELD	IL	62707	3600 WABASH AVE		SPRINGFIELD	IL	62711
Current Resident	3700	CRANLEIGH BLVD	SPRINGFIELD	IL	62712	3700 CRANLEIGH BLVD		SPRINGFIELD	IL	62712
Current Resident	3701	CRANLEIGH BLVD	SPRINGFIELD	IL	62712	3701 CRANLEIGH BLVD		SPRINGFIELD	IL	62712
Current Resident	3704	CRANLEIGH BLVD	SPRINGFIELD	IL	62712	3704 CRANLEIGH BLVD		SPRINGFIELD	IL	62712
Current Resident	3705	CRANLEIGH BLVD	SPRINGFIELD	IL	62712	3705 CRANLEIGH BLVD		SPRINGFIELD	IL	62712
Current Resident	3708	CRANLEIGH BLVD	SPRINGFIELD	IL	62712	3708 CRANLEIGH BLVD		SPRINGFIELD	IL	62712
Current Resident	3709	CRANLEIGH BLVD	SPRINGFIELD	IL	62712	3709 CRANLEIGH BLVD		SPRINGFIELD	IL	62712
Current Resident	3717	CRANLEIGH BLVD	SPRINGFIELD	IL	62712	3717 CRANLEIGH BLVD		SPRINGFIELD	IL	62712
Current Resident	3720	CRANLEIGH BLVD	SPRINGFIELD	IL	62712	3720 CRANLEIGH BLVD		SPRINGFIELD	IL	62712
Current Resident	3721	CRANLEIGH BLVD	SPRINGFIELD	IL	62712	3721 CRANLEIGH BLVD		SPRINGFIELD	IL	62712
Current Resident	3725	CRANLEIGH BLVD	SPRINGFIELD	IL	62712	3725 CRANLEIGH BLVD		SPRINGFIELD	IL	62712
Current Resident	3800	CRANLEIGH BLVD	SPRINGFIELD	IL	62712	3800 CRANLEIGH BLVD		SPRINGFIELD	IL	62712
Current Resident	3801	CRANLEIGH BLVD	SPRINGFIELD	IL	62712	3801 CRANLEIGH BLVD		SPRINGFIELD	IL	62712
Current Resident	3804	CRANLEIGH BLVD	SPRINGFIELD	IL	62712	3804 CRANLEIGH BLVD		SPRINGFIELD	IL	62712
Current Resident	3805	CRANLEIGH BLVD	SPRINGFIELD	IL	62707	3805 CRANLEIGH BLVD		SPRINGFIELD	IL	62712
Current Resident	3808	CRANLEIGH BLVD	SPRINGFIELD	IL	62712	3808 CRANLEIGH BLVD		SPRINGFIELD	IL	62712
Current Resident	3809	CRANLEIGH BLVD	SPRINGFIELD	IL	62712	3809 CRANLEIGH BLVD		SPRINGFIELD	IL	62712
Current Resident	3812	CRANLEIGH BLVD	SPRINGFIELD	IL	62712	3812 CRANLEIGH BLVD		SPRINGFIELD	IL	62712
Current Resident	3813	CRANLEIGH BLVD	SPRINGFIELD	IL	62712	3813 CRANLEIGH BLVD		SPRINGFIELD	IL	62712
Current Resident	3816	CRANLEIGH BLVD	SPRINGFIELD	IL	62712	3816 CRANLEIGH BLVD		SPRINGFIELD	IL	62712
Current Resident	3817	CRANLEIGH BLVD	SPRINGFIELD	IL	62712	3817 CRANLEIGH BLVD		SPRINGFIELD	IL	62712
Current Resident	3821	CRANLEIGH BLVD	SPRINGFIELD	IL	62712	3821 CRANLEIGH BLVD		SPRINGFIELD	IL	62712
Current Resident	3824	CRANLEIGH BLVD	SPRINGFIELD	IL	62712	3824 CRANLEIGH BLVD		SPRINGFIELD	IL	62712
Current Resident	3825	CRANLEIGH BLVD	SPRINGFIELD	IL	62712	3825 CRANLEIGH BLVD		SPRINGFIELD	IL	62712
Current Resident	3713	CRANLEIGH BLVD	SPRINGFIELD	IL	62712	401 N MADISON ST	PO BOX 410	LITCHFIELD	IL	62056
Current Resident	3712	CRANLEIGH BLVD	SPRINGFIELD	IL	62712	PO BOX 20005		OWENSBORO	KY	42304

Current Resident	96		DEL MAR DR	SPRINGFIELD	IL	62703	% CASCADE FINANCIAL SERV ISAOA	3345 S VAL VISTA DR	GILBERT	AZ	85297
Current Resident	103		DEL MAR DR	SPRINGFIELD	IL	62703	% NATIONAL CITY MTG	PO BOX 1820	DAYTON	OH	45401
Current Resident	16		DEL MAR DR	SPRINGFIELD	IL	62703	% PNC MORTGAGE	3232 NEWMARK DR	MIAMISBURG	OH	45342
Current Resident	11		DEL MAR DR	SPRINGFIELD	IL	62703	11 DEL MAR DR		SPRINGFIELD	IL	62703
Current Resident	12		DEL MAR DR	SPRINGFIELD	IL	62703	12 DEL MAR DR		SPRINGFIELD	IL	62703
Current Resident	15		DEL MAR DR	SPRINGFIELD	IL	62703	15 DEL MAR DR		SPRINGFIELD	IL	62703
Current Resident	76		DEL MAR DR	SPRINGFIELD	IL	62704	1527 W HOMEWOOD AVE		SPRINGFIELD	IL	62704
Current Resident	19		DEL MAR DR	SPRINGFIELD	IL	62703	19 DEL MAR DR		SPRINGFIELD	IL	62703
Current Resident	23		DEL MAR DR	SPRINGFIELD	IL	62703	23 DEL MAR DR		SPRINGFIELD	IL	62703
Current Resident	24		DEL MAR DR	SPRINGFIELD	IL	62703	24 DEL MAR DR		SPRINGFIELD	IL	62703
Current Resident	20		DEL MAR DR	SPRINGFIELD	IL	62703	2500 WESTFIELD DR STE 102		ELGIN	IL	60124
Current Resident	107		DEL MAR DR	SPRINGFIELD	IL	62703	25186 LAKE ST		HEMET	CA	92544
Current Resident	28		DEL MAR DR	SPRINGFIELD	IL	62703	28 DEL MAR DR		SPRINGFIELD	IL	62703
Current Resident	31		DEL MAR DR	SPRINGFIELD	IL	62703	31 DEL MAR DR		SPRINGFIELD	IL	62703
Current Resident	35		DEL MAR DR	SPRINGFIELD	IL	62703	35 DEL MAR DR		SPRINGFIELD	IL	62703
Current Resident	27		DEL MAR DR	SPRINGFIELD	IL	62703	3801 WEST BLUFFS RD		SPRINGFIELD	IL	62711
Current Resident	100		DEL MAR DR	SPRINGFIELD	IL	62703	400 NATIONAL WAY		SIMI VALLEY	CA	93065
Current Resident	63		DEL MAR DR	SPRINGFIELD	IL	62703	63 DEL MAR DR		SPRINGFIELD	IL	62703
Current Resident	67		DEL MAR DR	SPRINGFIELD	IL	62703	67 DEL MAR DR		SPRINGFIELD	IL	62703
Current Resident	68		DEL MAR DR	SPRINGFIELD	IL	62703	68 DEL MAR DR		SPRINGFIELD	IL	62703
Current Resident	7		DEL MAR DR	SPRINGFIELD	IL	62703	7 DEL MAR DR		SPRINGFIELD	IL	62703
Current Resident	71		DEL MAR DR	SPRINGFIELD	IL	62703	71 DEL MAR DR		SPRINGFIELD	IL	62703
Current Resident	72		DEL MAR DR	SPRINGFIELD	IL	62703	72 DEL MAR DR		SPRINGFIELD	IL	62703
Current Resident	75		DEL MAR DR	SPRINGFIELD	IL	62703	75 DEL MAR DR		SPRINGFIELD	IL	62703
Current Resident	8		DEL MAR DR	SPRINGFIELD	IL	62703	8 DEL MAR DR		SPRINGFIELD	IL	62703
Current Resident	87		DEL MAR DR	SPRINGFIELD	IL	62703	87 DEL MAR DR		SPRINGFIELD	IL	62703
Current Resident	88		DEL MAR DR	SPRINGFIELD	IL	62703	88 DEL MAR DR		SPRINGFIELD	IL	62703
Current Resident	91		DEL MAR DR	SPRINGFIELD	IL	62703	91 DEL MAR DR		SPRINGFIELD	IL	62703
Current Resident	92		DEL MAR DR	SPRINGFIELD	IL	62703	92 DEL MAR DR		SPRINGFIELD	IL	62703
Current Resident	95		DEL MAR DR	SPRINGFIELD	IL	62703	95 DEL MAR DR		SPRINGFIELD	IL	62703
Current Resident	99		DEL MAR DR	SPRINGFIELD	IL	62703	99 DEL MAR DR		SPRINGFIELD	IL	62703
Current Resident	3901		DESTINY DR	SPRINGFIELD	IL	62707	3901 DESTINY DR		SPRINGFIELD	IL	62712
Current Resident	3905		DESTINY DR	SPRINGFIELD	IL	62712	3905 DESTINY DR		SPRINGFIELD	IL	62712
Current Resident	3908		DESTINY DR	SPRINGFIELD	IL	62707	3908 DESTINY DR		SPRINGFIELD	IL	62712
Current Resident	3909		DESTINY DR	SPRINGFIELD	IL	62712	3909 DESTINY DR		SPRINGFIELD	IL	62712
Current Resident	3912		DESTINY DR	SPRINGFIELD	IL	62712	3912 DESTINY DR		SPRINGFIELD	IL	62712
Current Resident	3913		DESTINY DR	SPRINGFIELD	IL	62712	3913 DESTINY DR		SPRINGFIELD	IL	62712
Current Resident	3916		DESTINY DR	SPRINGFIELD	IL	62712	3916 DESTINY DR		SPRINGFIELD	IL	62712
Current Resident	3917		DESTINY DR	SPRINGFIELD	IL	62712	3917 DESTINY DR		SPRINGFIELD	IL	62712
Current Resident	4000		DESTINY DR	SPRINGFIELD	IL	62712	4000 DESTINY DR		SPRINGFIELD	IL	62712
Current Resident	4001		DESTINY DR	SPRINGFIELD	IL	62712	4001 DESTINY DR		SPRINGFIELD	IL	62712
Current Resident	4004		DESTINY DR	SPRINGFIELD	IL	62712	4004 DESTINY DR		SPRINGFIELD	IL	62712
Current Resident	4005		DESTINY DR	SPRINGFIELD	IL	62712	4005 DESTINY DR		SPRINGFIELD	IL	62712
Current Resident	4008		DESTINY DR	SPRINGFIELD	IL	62707	4008 DESTINY DR		SPRINGFIELD	IL	62712
Current Resident	4009		DESTINY DR	SPRINGFIELD	IL	62707	4009 DESTINY DR		SPRINGFIELD	IL	62712
Current Resident	4012		DESTINY DR	SPRINGFIELD	IL	62707	4012 DESTINY DR		SPRINGFIELD	IL	62712
Current Resident	4013		DESTINY DR	SPRINGFIELD	IL	62712	4013 DESTINY DR		SPRINGFIELD	IL	62712
Current Resident	2601		DEVONSHIRE RD	SPRINGFIELD	IL	62703	2601 E DEVONSHIRE RD		SPRINGFIELD	IL	62703
Current Resident	2608		DEVONSHIRE RD	SPRINGFIELD	IL	62703	2608 E DEVONSHIRE RD		SPRINGFIELD	IL	62703
D I HOTELS CORP	3180	S	DIRKSEN PKY	SPRINGFIELD	IL	62703	101 S FARRAR DR		CAPE GIRARDEA	MO	63701
DIRKSEN PARKWAY VENTUR	3130	S	DIRKSEN PKY	SPRINGFIELD	IL	62703	2144 S MACARTHUR BLVD		SPRINGFIELD	IL	62704
KARMA REAL ESTATE LLC	3152	S	DIRKSEN PKY	SPRINGFIELD	IL	62703	2480 E MAIN ST STE E		JACKSON	MO	63755

ETPE LLC	1820		DIRKSEN PKY	SPRINGFIELD	IL	62703	4825 SAGE RD		ROCHESTER	IL	62563
AMERIVEST LLC SERIES 1800	1800	S	DIRKSEN PKY	SPRINGFIELD	IL	62703	PO BOX 9169		SPRINGFIELD	IL	62791
Current Resident	1207		DORCHESTER RD	CHAMPAIGN	IL	61821	1207 DORCHESTER DR		CHAMPAIGN	IL	61821
Current Resident	3105		DOTMAR DR	SPRINGFIELD	IL	62703	4825 SAGE RD		ROCHESTER	IL	62563
Current Resident	3115		DOTMAR DR	SPRINGFIELD	IL	62703	7700 BLACKBERRY ROW		WATERLOO	IL	62298
Current Resident	2900		DOTMAR DR	SPRINGFIELD	IL	62707	UNIT 3157 PMB 304	3941 TAMIAMI TRL	PUNTA GORDA	FL	33950
Current Resident	2922		DOTMAR DR	SPRINGFIELD	IL	62707	UNIT 3157 PMB 304	3941 TAMIAMI TRL	PUNTA GORDA	FL	33950
Current Resident	3000		DOTMAR DR	SPRINGFIELD	IL	62707	UNIT 3157 PMB 304	3941 TAMIAMI TRL	PUNTA GORDA	FL	33950
Current Resident	2901		DOTMAR DR	SPRINGFIELD	IL	62540	UNIT 3157 PMB 304	3941 TAMIAMI TRL	PUNTA GORDA	FL	33950
Current Resident	2924		E 45TH CT	DAVENPORT	IA	52807	2924 E 45TH CT		DAVENPORT	IA	52807
IDOT	126		E ASH ST	SPRINGFIELD	IL	62704	126 E ASH ST		SPRINGFIELD	IL	62704
Current Resident	126		E ASH ST	SPRINGFIELD	IL	62704	126 E ASH ST		SPRINGFIELD	IL	62704
Current Resident	3010		E ASH ST	SPRINGFIELD	IL	62703	148 WELDON PKWY		MARYLAND HEI	MO	63043
Current Resident	2929		E ASH ST	SPRINGFIELD	IL	62703	200 S 9TH ST STE 201		SPRINGFIELD	IL	62701
Current Resident	2640		E ASH ST	SPRINGFIELD	IL	62703	2640 E ASH ST		SPRINGFIELD	IL	62703
Current Resident	2700		E ASH ST	SPRINGFIELD	IL	62703	2700 E ASH ST		SPRINGFIELD	IL	62703
Current Resident	3045		E ASH ST	SPRINGFIELD	IL	62703	815 N DIRKSEN PKWY		SPRINGFIELD	IL	62702
Current Resident	3001		E ASH ST	SPRINGFIELD	IL	62703	PO BOX 1092		PAWNEE	IL	62558
Current Resident	2701		E ASH ST	SPRINGFIELD	IL	62703	UNIT 3157 PMB 304	3941 TAMIAMI TRL	PUNTA GORDA	FL	33950
Current Resident	4350		E BASELINE RD	BELGRADE	MT	59714	4350 E BASELINE RD		BELGRADE	MT	59714
Current Resident	2600		E CORNELL AVE	SPRINGFIELD	IL	62703	2600 E CORNELL AVE		SPRINGFIELD	IL	62703
Current Resident	300		E LAKE SHORE DR	SPRINGFIELD	IL	62712	REAL ESTATE DEPARTMENT	200 E LAKE SHORE DR	SPRINGFIELD	IL	62712
Current Resident	2860		E STATE ROUTE 29	SPRINGFIELD	IL	62712	2860 E STATE ROUTE 29		SPRINGFIELD	IL	62712
Current Resident	3250		E STATE ROUTE 29	SPRINGFIELD	IL	62712	3250 E STATE ROUTE 29		SPRINGFIELD	IL	62712
Current Resident	2950		E STATE RT 29	SPRINGFIELD	IL	62707	2623 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	3438		E STATE RT 29	SPRINGFIELD	IL	62712	3438 E STATE ROUTE 29		SPRINGFIELD	IL	62712
Current Resident	3502		E STATE RT 29	SPRINGFIELD	IL	62712	3502 E STATE ROUTE 29		SPRINGFIELD	IL	62712
Current Resident	3548		E STATE RT 29	SPRINGFIELD	IL	62712	3548 E STATE ROUTE 29		SPRINGFIELD	IL	62712
Current Resident	3807		E STATE RT 29	SPRINGFIELD	IL	62712	3807 E STATE ROUTE 29		SPRINGFIELD	IL	62712
Current Resident	3596		E STATE RT 29	SPRINGFIELD	IL	62712	5015 SPAULDING ORCHARD RD		CHATHAM	IL	62629
Current Resident	3532		E STATE RT 29	SPRINGFIELD	IL	62707	7211 RAMBLEWOOD DR		ROCHESTER	IL	62563
Current Resident	3626		E STATE RT 29	SPRINGFIELD	IL	62707	9515 GORDON DR		CHATHAM	IL	62629
Current Resident	3000		E STATE RT 29	SPRINGFIELD	IL	62712	LAND & WATER RESOURCES	200 E LAKE SHORE DR	SPRINGFIELD	IL	62712
Current Resident	2840		E STATE RT 29	SPRINGFIELD	IL	62712	PO BOX 1804		DAYTON	OH	45401
Hope School	15		EAST HAZEL DELL LN	SPRINGFIELD	IL	62712	15 EAST HAZEL DELL LN		SPRINGFIELD	IL	62712
Current Resident	152		EAST HAZEL DELL LN	SPRINGFIELD	IL	62712	152 EAST HAZEL DELL LN		SPRINGFIELD	IL	62712
Current Resident	156		EAST HAZEL DELL LN	SPRINGFIELD	IL	62712	156 EAST HAZEL DELL LN		SPRINGFIELD	IL	62712
Current Resident	160		EAST HAZEL DELL LN	SPRINGFIELD	IL	62707	156 EAST HAZEL DELL LN		SPRINGFIELD	IL	62712
Current Resident	156		EAST HAZEL DELL LN	SPRINGFIELD	IL	62712	156 EAST HAZEL DELL LN		SPRINGFIELD	IL	62712
Current Resident	168		EAST HAZEL DELL LN	SPRINGFIELD	IL	62707	168 EAST HAZEL DELL LN		SPRINGFIELD	IL	62712
Current Resident	172		EAST HAZEL DELL LN	SPRINGFIELD	IL	62712	172 EAST HAZEL DELL LN		SPRINGFIELD	IL	62712
Current Resident	176		EAST HAZEL DELL LN	SPRINGFIELD	IL	62712	176 EAST HAZEL DELL LN		SPRINGFIELD	IL	62712
Current Resident	180		EAST HAZEL DELL LN	SPRINGFIELD	IL	62712	180 EAST HAZEL DELL LN		SPRINGFIELD	IL	62712
Current Resident	184		EAST HAZEL DELL LN	SPRINGFIELD	IL	62712	184 EAST HAZEL DELL LN		SPRINGFIELD	IL	62712
Current Resident	188		EAST HAZEL DELL LN	SPRINGFIELD	IL	62712	188 EAST HAZEL DELL LN		SPRINGFIELD	IL	62712
Current Resident	192		EAST HAZEL DELL LN	SPRINGFIELD	IL	62712	192 EAST HAZEL DELL LN		SPRINGFIELD	IL	62712
Current Resident	196		EAST HAZEL DELL LN	SPRINGFIELD	IL	62712	196 EAST HAZEL DELL LN		SPRINGFIELD	IL	62712
Current Resident	200		EAST HAZEL DELL LN	SPRINGFIELD	IL	62712	200 EAST HAZEL DELL LN		SPRINGFIELD	IL	62712
Current Resident	204		EAST HAZEL DELL LN	SPRINGFIELD	IL	62712	204 EAST HAZEL DELL LN		SPRINGFIELD	IL	62712
Current Resident	208		EAST HAZEL DELL LN	SPRINGFIELD	IL	62712	208 EAST HAZEL DELL LN		SPRINGFIELD	IL	62712
Current Resident	212		EAST HAZEL DELL LN	SPRINGFIELD	IL	62712	212 EAST HAZEL DELL LN		SPRINGFIELD	IL	62712
Current Resident	216		EAST HAZEL DELL LN	SPRINGFIELD	IL	62712	216 EAST HAZEL DELL LN		SPRINGFIELD	IL	62712

Current Resident	220	EAST HAZEL DELL LN	SPRINGFIELD	IL	62712	220 EAST HAZEL DELL LN		SPRINGFIELD	IL	62712
Current Resident	222	EAST HAZEL DELL LN	SPRINGFIELD	IL	62712	222 EAST HAZEL DELL LN		SPRINGFIELD	IL	62712
Current Resident	224	EAST HAZEL DELL LN	SPRINGFIELD	IL	62712	224 EAST HAZEL DELL LN		SPRINGFIELD	IL	62712
Current Resident	228	EAST HAZEL DELL LN	SPRINGFIELD	IL	62712	228 EAST HAZEL DELL LN		SPRINGFIELD	IL	62712
Current Resident	205	EAST LAKE SHORE DR	SPRINGFIELD	IL	62712	205 E LAKE SHORE DR		SPRINGFIELD	IL	62712
Current Resident	209	EAST LAKE SHORE DR	SPRINGFIELD	IL	62712	209 E LAKE SHORE DR		SPRINGFIELD	IL	62712
SPRINGFIELD PARK DISTRICT	701	EAST LAKE SHORE DR	SPRINGFIELD	IL	62712	2500 S 11TH ST		SPRINGFIELD	IL	62703
Current Resident	420	EAST LAKE SHORE DR	SPRINGFIELD	IL	62712	2613 QUEENSWAY RD		SPRINGFIELD	IL	62703
Sangamo Surf Club	405	EAST LAKE SHORE DR	SPRINGFIELD	IL	62712	405 E LAKE SHORE DR		SPRINGFIELD	IL	62712
Current Resident	407	EAST LAKE SHORE DR	SPRINGFIELD	IL	62707	407 E LAKE SHORE DR		SPRINGFIELD	IL	62712
BPOE LODGE 158	409	EAST LAKE SHORE DR	SPRINGFIELD	IL	62712	409 E LAKE SHORE DR		SPRINGFIELD	IL	62712
BLUE RIDGE CLUB	411	EAST LAKE SHORE DR	SPRINGFIELD	IL	62712	411 E LAKE SHORE DR		SPRINGFIELD	IL	62712
Current Resident	418	EAST LAKE SHORE DR	SPRINGFIELD	IL	62712	418 E LAKE SHORE DR		SPRINGFIELD	IL	62712
Current Resident	560	EAST LAKE SHORE DR	SPRINGFIELD	IL	62712	560 E LAKE SHORE DR		SPRINGFIELD	IL	62712
Current Resident	570	EAST LAKE SHORE DR	SPRINGFIELD	IL	62712	570 E LAKE SHORE DR		SPRINGFIELD	IL	62712
Current Resident	580	EAST LAKE SHORE DR	SPRINGFIELD	IL	62712	580 E LAKE SHORE DR		SPRINGFIELD	IL	62712
Current Resident	700	EAST LAKE SHORE DR	SPRINGFIELD	IL	62712	700 E LAKE SHORE DR		SPRINGFIELD	IL	62712
Current Resident	177	EAST LAKE SHORE DR	SPRINGFIELD	IL	62712	LAND & WATER RESOURCES	200 E LAKE SHORE DF	SPRINGFIELD	IL	62712
Current Resident	100	EAST LAKE SHORE DR	SPRINGFIELD	IL	62712	REAL ESTATE DEPARTMENT	200 E LAKE SHORE DF	SPRINGFIELD	IL	62712
Current Resident	171	EAST LAKE SHORE DR	SPRINGFIELD	IL	62712	REAL ESTATE DEPARTMENT	200 E LAKE SHORE DF	SPRINGFIELD	IL	62712
Current Resident	181	EAST LAKE SHORE DR	SPRINGFIELD	IL	62712	REAL ESTATE DEPARTMENT	200 E LAKE SHORE DF	SPRINGFIELD	IL	62712
Current Resident	182	EAST LAKE SHORE DR	SPRINGFIELD	IL	62712	REAL ESTATE DEPARTMENT	200 E LAKE SHORE DF	SPRINGFIELD	IL	62712
Current Resident	2154	EASTDALE AVE	SPRINGFIELD	IL	62703	10 LAKE KNOLLS DR		CHATHAM	IL	62629
Current Resident	2178	EASTDALE AVE	SPRINGFIELD	IL	62703	10 LAKE KNOLLS DR		CHATHAM	IL	62629
Current Resident	2182	EASTDALE AVE	SPRINGFIELD	IL	62703	112 KINGSPOINT		SHERMAN	IL	62684
Current Resident	2166	EASTDALE AVE	SPRINGFIELD	IL	62703	2804 CLARK ST		SPRINGFIELD	IL	62703
Current Resident	2170	EASTDALE AVE	SPRINGFIELD	IL	62703	2804 CLARK ST		SPRINGFIELD	IL	62703
Current Resident	2142	EASTDALE AVE	SPRINGFIELD	IL	62703	2974 TUSCARORA TRL		MIDDLEBURG	FL	32068
Current Resident	2146	EASTDALE AVE	SPRINGFIELD	IL	62703	2974 TUSCARORA TRL		MIDDLEBURG	FL	32068
Current Resident	2530	EMPOWERMENT RD	SPRINGFIELD	IL	62703	2525 TAYLOR AVE		SPRINGFIELD	IL	62703
Current Resident	2500	EMPOWERMENT RD	SPRINGFIELD	IL	62703	2525 TAYLOR AVE		SPRINGFIELD	IL	62703
GOVERNMENT PROPERTY FI	3215	EXECUTIVE PARK DR	SPRINGFIELD	IL	62703	1530 J ST STE 200		SACRAMENTO	CA	95814
Current Resident	3250	EXECUTIVE PARK DR	SPRINGFIELD	IL	62703	20 S CLARK ST STE 1600		CHICAGO	IL	60603
BI PETRO INC	3150	EXECUTIVE PARK DR	SPRINGFIELD	IL	62703	3150 EXECUTIVE PARK DR		SPRINGFIELD	IL	62703
ASSOCIATED GENERAL	3219	EXECUTIVE PARK DR	SPRINGFIELD	IL	62703	3219 EXECUTIVE PARK DR		SPRINGFIELD	IL	62703
DIRKSEN DRIVE ASSOCIATES	3220	EXECUTIVE PARK DR	SPRINGFIELD	IL	62703	3220 EXECUTIVE PARK DR		SPRINGFIELD	IL	62703
PETTYWORKS II LLC	3220	EXECUTIVE PARK DR	SPRINGFIELD	IL	62703	3220 EXECUTIVE PARK DR		SPRINGFIELD	IL	62703
Current Resident	31	FAIRVIEW LN	SPRINGFIELD	IL	62711	31 FAIRVIEW LN		SPRINGFIELD	IL	62711
Current Resident	4308	FOX HALL LN	SPRINGFIELD	IL	62711	4308 FOXHALL LN		SPRINGFIELD	IL	62711
Current Resident	312	GARVEY LANE	CHATHAM	IL	62629	312 GARVEY LN		CHATHAM	IL	62629
Current Resident	312	GARVEY LANE	CHATHAM	IL	62629	312 GARVEY LN		CHATHAM	IL	62629
Current Resident	77	GLEN AIRE DR	SPRINGFIELD	IL	62703	% US BANK NA	PO BOX 7298	SPRINGFIELD	OH	45501
Current Resident	100	GLEN AIRE DR	SPRINGFIELD	IL	62703	100 GLEN AIRE DR		SPRINGFIELD	IL	62703
Current Resident	101	GLEN AIRE DR	SPRINGFIELD	IL	62703	101 GLEN AIRE DR		SPRINGFIELD	IL	62703
Current Resident	104	GLEN AIRE DR	SPRINGFIELD	IL	62703	104 GLEN AIRE DR		SPRINGFIELD	IL	62703
Current Resident	105	GLEN AIRE DR	SPRINGFIELD	IL	62703	105 GLEN AIRE DR		SPRINGFIELD	IL	62703
Current Resident	108	GLEN AIRE DR	SPRINGFIELD	IL	62703	108 GLEN AIRE DR		SPRINGFIELD	IL	62703
Current Resident	109	GLEN AIRE DR	SPRINGFIELD	IL	62703	109 GLEN AIRE DR		SPRINGFIELD	IL	62703
Current Resident	113	GLEN AIRE DR	SPRINGFIELD	IL	62703	113 GLEN AIRE DR		SPRINGFIELD	IL	62703
Current Resident	114	GLEN AIRE DR	SPRINGFIELD	IL	62703	114 GLEN AIRE DR		SPRINGFIELD	IL	62703
Current Resident	116	GLEN AIRE DR	SPRINGFIELD	IL	62703	116 GLEN AIRE DR		SPRINGFIELD	IL	62703
Current Resident	117	GLEN AIRE DR	SPRINGFIELD	IL	62703	117 GLEN AIRE DR		SPRINGFIELD	IL	62703

Current Resident	12	GLEN AIRE DR	SPRINGFIELD	IL	62703	12 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	120	GLEN AIRE DR	SPRINGFIELD	IL	62703	120 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	125	GLEN AIRE DR	SPRINGFIELD	IL	62703	125 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	126	GLEN AIRE DR	SPRINGFIELD	IL	62703	126 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	129	GLEN AIRE DR	SPRINGFIELD	IL	62703	129 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	133	GLEN AIRE DR	SPRINGFIELD	IL	62703	133 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	134	GLEN AIRE DR	SPRINGFIELD	IL	62703	134 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	137	GLEN AIRE DR	SPRINGFIELD	IL	62703	137 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	138	GLEN AIRE DR	SPRINGFIELD	IL	62703	138 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	141	GLEN AIRE DR	SPRINGFIELD	IL	62703	141 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	142	GLEN AIRE DR	SPRINGFIELD	IL	62703	142 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	146	GLEN AIRE DR	SPRINGFIELD	IL	62703	146 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	15	GLEN AIRE DR	SPRINGFIELD	IL	62703	15 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	40	GLEN AIRE DR	SPRINGFIELD	IL	62703	1801 E 9TH ST STE 200	CLEVELAND	OH	44114
Current Resident	2	GLEN AIRE DR	SPRINGFIELD	IL	62703	2 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	20	GLEN AIRE DR	SPRINGFIELD	IL	62703	20 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	21	GLEN AIRE DR	SPRINGFIELD	IL	62703	21 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	24	GLEN AIRE DR	SPRINGFIELD	IL	62703	24 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	25	GLEN AIRE DR	SPRINGFIELD	IL	62703	25 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	53	GLEN AIRE DR	SPRINGFIELD	IL	62703	2500 WESTFIELD DR STE 102	ELGIN	IL	60124
Current Resident	28	GLEN AIRE DR	SPRINGFIELD	IL	62703	28 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	29	GLEN AIRE DR	SPRINGFIELD	IL	62703	29 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	44	GLEN AIRE DR	SPRINGFIELD	IL	62703	307 ASPEN DR	CHATHAM	IL	62629
Current Resident	32	GLEN AIRE DR	SPRINGFIELD	IL	62703	32 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	33	GLEN AIRE DR	SPRINGFIELD	IL	62703	33 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	36	GLEN AIRE DR	SPRINGFIELD	IL	62703	36 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	37	GLEN AIRE DR	SPRINGFIELD	IL	62703	37 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	41	GLEN AIRE DR	SPRINGFIELD	IL	62703	41 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	45	GLEN AIRE DR	SPRINGFIELD	IL	62703	45 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	48	GLEN AIRE DR	SPRINGFIELD	IL	62703	48 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	49	GLEN AIRE DR	SPRINGFIELD	IL	62703	49 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	56	GLEN AIRE DR	SPRINGFIELD	IL	62703	56 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	60	GLEN AIRE DR	SPRINGFIELD	IL	62703	60 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	61	GLEN AIRE DR	SPRINGFIELD	IL	62703	61 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	64	GLEN AIRE DR	SPRINGFIELD	IL	62703	64 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	65	GLEN AIRE DR	SPRINGFIELD	IL	62703	65 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	68	GLEN AIRE DR	SPRINGFIELD	IL	62703	68 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	69	GLEN AIRE DR	SPRINGFIELD	IL	62703	69 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	73	GLEN AIRE DR	SPRINGFIELD	IL	62703	73 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	8	GLEN AIRE DR	SPRINGFIELD	IL	62703	8 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	85	GLEN AIRE DR	SPRINGFIELD	IL	62703	85 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	89	GLEN AIRE DR	SPRINGFIELD	IL	62703	89 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	9	GLEN AIRE DR	SPRINGFIELD	IL	62703	9 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	90	GLEN AIRE DR	SPRINGFIELD	IL	62703	90 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	93	GLEN AIRE DR	SPRINGFIELD	IL	62703	93 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	94	GLEN AIRE DR	SPRINGFIELD	IL	62703	94 GLEN AIRE DR	SPRINGFIELD	IL	62703
Current Resident	130	GLEN AIRE DR	SPRINGFIELD	IL	62703	PO BOX 1804	DAYTON	OH	45401
Current Resident	81	GLEN AIRE DR	SPRINGFIELD	IL	62703	PO BOX 183	LOAMI	IL	62661
Current Resident	121	GLEN AIRE DR	SPRINGFIELD	IL	62703	PO BOX 20005	OWENSBORO	KY	42304
Current Resident	17	GLEN AIRE DR	SPRINGFIELD	IL	62703	PO BOX 20005	OWENSBORO	KY	42304
Current Resident	1	GLEN AIRE DR	SPRINGFIELD	IL	62703	PO BOX 650043	DALLAS	TX	75265
Current Resident	57	GLEN AIRE DR	SPRINGFIELD	IL	62703	PO BOX 650043	DALLAS	TX	75265

Current Resident	100	GREENCASTLE CIR	SPRINGFIELD	IL	62712	100 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	101	GREENCASTLE CIR	SPRINGFIELD	IL	62712	101 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	105	GREENCASTLE CIR	SPRINGFIELD	IL	62712	105 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	109	GREENCASTLE CIR	SPRINGFIELD	IL	62707	109 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	113	GREENCASTLE CIR	SPRINGFIELD	IL	62707	113 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	117	GREENCASTLE CIR	SPRINGFIELD	IL	62707	117 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	120	GREENCASTLE CIR	SPRINGFIELD	IL	62712	120 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	121	GREENCASTLE CIR	SPRINGFIELD	IL	62712	121 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	124	GREENCASTLE CIR	SPRINGFIELD	IL	62712	124 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	125	GREENCASTLE CIR	SPRINGFIELD	IL	62712	125 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	129	GREENCASTLE CIR	SPRINGFIELD	IL	62707	129 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	13	GREENCASTLE CIR	SPRINGFIELD	IL	62707	13 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	132	GREENCASTLE CIR	SPRINGFIELD	IL	62712	132 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	133	GREENCASTLE CIR	SPRINGFIELD	IL	62712	133 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	136	GREENCASTLE CIR	SPRINGFIELD	IL	62712	136 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	17	GREENCASTLE CIR	SPRINGFIELD	IL	62712	17 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	21	GREENCASTLE CIR	SPRINGFIELD	IL	62712	21 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	25	GREENCASTLE CIR	SPRINGFIELD	IL	62712	25 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	29	GREENCASTLE CIR	SPRINGFIELD	IL	62712	29 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	30	GREENCASTLE CIR	SPRINGFIELD	IL	62712	30 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	33	GREENCASTLE CIR	SPRINGFIELD	IL	62712	33 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	128	GREENCASTLE CIR	SPRINGFIELD	IL	62707	3512 BUCKEYE DR	SPRINGFIELD	IL	62712
Current Resident	36	GREENCASTLE CIR	SPRINGFIELD	IL	62712	36 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	37	GREENCASTLE CIR	SPRINGFIELD	IL	62712	37 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	4	GREENCASTLE CIR	SPRINGFIELD	IL	62712	4 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	41	GREENCASTLE CIR	SPRINGFIELD	IL	62712	41 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	45	GREENCASTLE CIR	SPRINGFIELD	IL	62712	45 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	49	GREENCASTLE CIR	SPRINGFIELD	IL	62712	49 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	5	GREENCASTLE CIR	SPRINGFIELD	IL	62712	5 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	52	GREENCASTLE CIR	SPRINGFIELD	IL	62712	52 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	53	GREENCASTLE CIR	SPRINGFIELD	IL	62712	53 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	56	GREENCASTLE CIR	SPRINGFIELD	IL	62712	56 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	57	GREENCASTLE CIR	SPRINGFIELD	IL	62712	57 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	60	GREENCASTLE CIR	SPRINGFIELD	IL	62707	60 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	61	GREENCASTLE CIR	SPRINGFIELD	IL	62712	61 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	64	GREENCASTLE CIR	SPRINGFIELD	IL	62707	64 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	65	GREENCASTLE CIR	SPRINGFIELD	IL	62712	65 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	68	GREENCASTLE CIR	SPRINGFIELD	IL	62712	68 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	72	GREENCASTLE CIR	SPRINGFIELD	IL	62707	72 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	73	GREENCASTLE CIR	SPRINGFIELD	IL	62707	73 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	76	GREENCASTLE CIR	SPRINGFIELD	IL	62707	76 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	77	GREENCASTLE CIR	SPRINGFIELD	IL	62712	77 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	8	GREENCASTLE CIR	SPRINGFIELD	IL	62712	8 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	80	GREENCASTLE CIR	SPRINGFIELD	IL	62712	80 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	81	GREENCASTLE CIR	SPRINGFIELD	IL	62712	81 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	85	GREENCASTLE CIR	SPRINGFIELD	IL	62707	85 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	88	GREENCASTLE CIR	SPRINGFIELD	IL	62707	88 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	89	GREENCASTLE CIR	SPRINGFIELD	IL	62712	89 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	9	GREENCASTLE CIR	SPRINGFIELD	IL	62707	9 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	93	GREENCASTLE CIR	SPRINGFIELD	IL	62712	93 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	97	GREENCASTLE CIR	SPRINGFIELD	IL	62707	97 GREENCASTLE CIR	SPRINGFIELD	IL	62712
Current Resident	84	GREENCASTLE CIR	SPRINGFIELD	IL	62707	PO BOX 1804	DAYTON	OH	45401

Current Resident	12	GREENCASTLE CIR	SPRINGFIELD	IL	62712	PO BOX 20005		OWENSBORO	KY	42304
Current Resident	69	GREENCASTLE CIR	SPRINGFIELD	IL	62707	PO BOX 320		ATHENS	IL	62613
Current Resident	3151	GREENHEAD DR STE A	SPRINGFIELD	IL	62711	3151 GREENHEAD DR STE A		SPRINGFIELD	IL	62711
Current Resident	2200	GROTH ST	SPRINGFIELD	IL	62703	2200 GROTH		SPRINGFIELD	IL	62703
Current Resident	2051	GROTH ST	SPRINGFIELD	IL	62703	2211 GROTH		SPRINGFIELD	IL	62703
Current Resident	2101	GROTH ST	SPRINGFIELD	IL	62703	2211 GROTH		SPRINGFIELD	IL	62703
Current Resident	2211	GROTH ST	SPRINGFIELD	IL	62703	2211 GROTH		SPRINGFIELD	IL	62703
Current Resident	2215	GROTH ST	SPRINGFIELD	IL	62703	2215 GROTH		SPRINGFIELD	IL	62703
Current Resident	2241	GROTH ST	SPRINGFIELD	IL	62703	2215 GROTH		SPRINGFIELD	IL	62703
Current Resident	2215	GROTH ST	SPRINGFIELD	IL	62703	2215 GROTH		SPRINGFIELD	IL	62703
Current Resident	2236	GROTH ST	SPRINGFIELD	IL	62703	2236 GROTH		SPRINGFIELD	IL	62703
Current Resident	2210	GROTH ST	SPRINGFIELD	IL	62703	PO BOX 20005		OWENSBORO	KY	42304
Current Resident	2005	GROTH ST	SPRINGFIELD	IL	62703	PO BOX 723597		ATLANTA	GA	31139
Current Resident	25	HAWTHORN LANE	SPRINGFIELD	IL	62712	25 HAWTHORNE LN		SPRINGFIELD	IL	62712
Current Resident	37	HAWTHORN LANE	SPRINGFIELD	IL	62712	37 HAWTHORNE LN		SPRINGFIELD	IL	62712
Current Resident	13	HAWTHORN LN	SPRINGFIELD	IL	62712	13 HAWTHORNE LN		SPRINGFIELD	IL	62712
Current Resident	17	HAWTHORN LN	SPRINGFIELD	IL	62712	17 HAWTHORNE LN		SPRINGFIELD	IL	62712
Current Resident	21	HAWTHORN LN	SPRINGFIELD	IL	62712	21 HAWTHORNE LN		SPRINGFIELD	IL	62712
Current Resident	33	HAWTHORN LN	SPRINGFIELD	IL	62712	33 HAWTHORNE LN		SPRINGFIELD	IL	62712
Current Resident	9	HAWTHORN LN	SPRINGFIELD	IL	62712	9 HAWTHORNE LN		SPRINGFIELD	IL	62712
Current Resident	29	HAWTHORNE LANE	SPRINGFIELD	IL	62712	29 HAWTHORNE LN		SPRINGFIELD	IL	62712
Current Resident	21	HAWTHORNE LN	SPRINGFIELD	IL	62712	21 HAWTHORNE LN		SPRINGFIELD	IL	62712
Current Resident	41	HAWTHORNE LN	SPRINGFIELD	IL	62712	41 HAWTHORNE LN		SPRINGFIELD	IL	62712
Current Resident	5	HAWTHORNE LN	SPRINGFIELD	IL	62712	5 HAWTHORNE LN		SPRINGFIELD	IL	62712
Current Resident	49	HAZEL LN	SPRINGFIELD	IL	62707	49 HAZEL LN		SPRINGFIELD	IL	62712
Current Resident	2890	HERMITAGE RD	SPRINGFIELD	IL	62703	%RALPH C MCGEE	2890 HERMITAGE RD	SPRINGFIELD	IL	62703
FIRST GENERAL BAPTIST CH	2701	HERMITAGE RD	SPRINGFIELD	IL	62703	2450 TAYLOR AVE		SPRINGFIELD	IL	62703
Current Resident	2883	HERMITAGE RD	SPRINGFIELD	IL	62703	2888 HERMITAGE RD		SPRINGFIELD	IL	62703
Current Resident	2895	HERMITAGE RD	SPRINGFIELD	IL	62703	2890 HERMITAGE RD		SPRINGFIELD	IL	62703
SHEPPARD AUTO SALES & P	2755	HERMITAGE RD	SPRINGFIELD	IL	62703	3201 OLD 36		ALEXANDER	IL	62601
SHEPPARD AUTO SALES & P	2765	HERMITAGE RD	SPRINGFIELD	IL	62703	3201 OLD 36		ALEXANDER	IL	62601
Current Resident	2632	HILLTOP RD	SPRINGFIELD	IL	62712	%EDWARD J ECK	2632 HILLTOP RD	SPRINGFIELD	IL	62712
Current Resident	2610	HILLTOP RD	SPRINGFIELD	IL	62712	2610 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	2611	HILLTOP RD	SPRINGFIELD	IL	62712	2611 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	2623	HILLTOP RD	SPRINGFIELD	IL	62712	2623 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	2635	HILLTOP RD	SPRINGFIELD	IL	62712	2635 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	2641	HILLTOP RD	SPRINGFIELD	IL	62707	2641 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	2647	HILLTOP RD	SPRINGFIELD	IL	62707	2647 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	2659	HILLTOP RD	SPRINGFIELD	IL	62707	2659 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	2683	HILLTOP RD	SPRINGFIELD	IL	62707	2683 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	2695	HILLTOP RD	SPRINGFIELD	IL	62712	2695 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	2696	HILLTOP RD	SPRINGFIELD	IL	62712	2696 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	2712	HILLTOP RD	SPRINGFIELD	IL	62712	2712 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	2721	HILLTOP RD	SPRINGFIELD	IL	62712	2721 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	2724	HILLTOP RD	SPRINGFIELD	IL	62707	2724 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	2736	HILLTOP RD	SPRINGFIELD	IL	62712	2736 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	2741	HILLTOP RD	SPRINGFIELD	IL	62712	2741 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	2748	HILLTOP RD	SPRINGFIELD	IL	62712	2748 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	2760	HILLTOP RD	SPRINGFIELD	IL	62712	2760 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	2784	HILLTOP RD	SPRINGFIELD	IL	62712	2784 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	2816	HILLTOP RD	SPRINGFIELD	IL	62712	2816 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	2848	HILLTOP RD	SPRINGFIELD	IL	62707	2848 HILLTOP RD		SPRINGFIELD	IL	62712

Current Resident	2864	HILLTOP RD	SPRINGFIELD	IL	62712	2864 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	2880	HILLTOP RD	SPRINGFIELD	IL	62712	2880 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	3200	HILLTOP RD	SPRINGFIELD	IL	62712	3200 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	3226	HILLTOP RD	SPRINGFIELD	IL	62712	3226 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	3250	HILLTOP RD	SPRINGFIELD	IL	62712	3250 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	3266	HILLTOP RD	SPRINGFIELD	IL	62712	3266 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	3286	HILLTOP RD	SPRINGFIELD	IL	62707	3286 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	3300	HILLTOP RD	SPRINGFIELD	IL	62707	3300 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	3324	HILLTOP RD	SPRINGFIELD	IL	62707	3324 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	3348	HILLTOP RD	SPRINGFIELD	IL	62712	3348 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	3352	HILLTOP RD	SPRINGFIELD	IL	62707	3352 HILLTOP RD		SPRINGFIELD	IL	62712
Current Resident	2905	HILLTOP RD	SPRINGFIELD	IL	62712	MC210	PO BOX 66149	SAINT LOUIS	MO	63166
Current Resident	2909	HILLTOP RD	SPRINGFIELD	IL	62707	MC210	PO BOX 66149	SAINT LOUIS	MO	63166
Current Resident	3241	HORIZON DR	SPRINGFIELD	IL	62707	%CENTRECORP MANAGEMENT SERVICE	2718 FAIRMOUNT ST	DALLAS	TX	75201
CAPITAL HOSPITALITY GROU	3121	HORIZON DR	SPRINGFIELD	IL	62703	2 MELGROVE LN		HANNIBAL	MO	63401
Current Resident	3120	HORIZON DR	SPRINGFIELD	IL	62703	3131 MCKINNEY AVE STE L10		DALLAS	TX	75204
WEST LAKE ANIMAL LLC	3220	HORIZON DR	SPRINGFIELD	IL	62703	3220 HORIZON		SPRINGFIELD	IL	62703
Current Resident	3151	HORIZON DR	SPRINGFIELD	IL	62703	43 DEERFIELD LN		CHARLESTON	IL	61920
AWH SPRINGFIELD LLC	3201	HORIZON DR	SPRINGFIELD	IL	62707	500 TOTTEN POND RD		WALTHAM	MA	2451
Bi-Petro Inc.	3240	HORIZON DR	SPRINGFIELD	IL	62703	PO BOX 19246		SPRINGFIELD	IL	62794
Bi-Petro Inc.	3120	HORIZON DR	SPRINGFIELD	IL	62703	PO BOX 19246		SPRINGFIELD	IL	62794
Current Resident	3500	HOYLAKE DR	SPRINGFIELD	IL	62712	3500 HOYLAKE DR		SPRINGFIELD	IL	62712
Current Resident	3504	HOYLAKE DR	SPRINGFIELD	IL	62712	3504 HOYLAKE DR		SPRINGFIELD	IL	62712
Current Resident	3505	HOYLAKE DR	SPRINGFIELD	IL	62712	3505 HOYLAKE DR		SPRINGFIELD	IL	62712
Current Resident	3508	HOYLAKE DR	SPRINGFIELD	IL	62712	3508 HOYLAKE DR		SPRINGFIELD	IL	62712
Current Resident	3512	HOYLAKE DR	SPRINGFIELD	IL	62712	3512 HOYLAKE DR		SPRINGFIELD	IL	62712
Current Resident	3513	HOYLAKE DR	SPRINGFIELD	IL	62712	3513 HOYLAKE DR		SPRINGFIELD	IL	62712
Current Resident	3516	HOYLAKE DR	SPRINGFIELD	IL	62712	3516 HOYLAKE DR		SPRINGFIELD	IL	62712
Current Resident	3600	HOYLAKE DR	SPRINGFIELD	IL	62712	3600 HOYLAKE DR		SPRINGFIELD	IL	62712
Current Resident	3601	HOYLAKE DR	SPRINGFIELD	IL	62712	3601 HOYLAKE DR		SPRINGFIELD	IL	62712
Current Resident	3604	HOYLAKE DR	SPRINGFIELD	IL	62712	3604 HOYLAKE DR		SPRINGFIELD	IL	62712
Current Resident	3605	HOYLAKE DR	SPRINGFIELD	IL	62712	3605 HOYLAKE DR		SPRINGFIELD	IL	62712
Current Resident	3608	HOYLAKE DR	SPRINGFIELD	IL	62712	3608 HOYLAKE DR		SPRINGFIELD	IL	62712
Current Resident	3609	HOYLAKE DR	SPRINGFIELD	IL	62712	3609 HOYLAKE DR		SPRINGFIELD	IL	62712
Current Resident	3612	HOYLAKE DR	SPRINGFIELD	IL	62712	3612 HOYLAKE DR		SPRINGFIELD	IL	62712
Current Resident	3613	HOYLAKE DR	SPRINGFIELD	IL	62707	44 RITA RD		SPRINGFIELD	IL	62712
Current Resident	3509	HOYLAKE DR	SPRINGFIELD	IL	62712	PO BOX 20005		OWENSBORO	KY	42304
Current Resident	2635	HUNTINGTON RD	SPRINGFIELD	IL	62703	2500 WESTFIELD DR STE 102		ELGIN	IL	60124
Current Resident	2607	HUNTINGTON RD	SPRINGFIELD	IL	62703	2607 HUNTINGTON RD		SPRINGFIELD	IL	62703
Current Resident	2611	HUNTINGTON RD	SPRINGFIELD	IL	62703	2611 HUNTINGTON RD		SPRINGFIELD	IL	62703
Current Resident	2615	HUNTINGTON RD	SPRINGFIELD	IL	62703	2615 HUNTINGTON RD		SPRINGFIELD	IL	62703
Current Resident	2619	HUNTINGTON RD	SPRINGFIELD	IL	62703	2619 HUNTINGTON RD		SPRINGFIELD	IL	62703
Current Resident	2626	HUNTINGTON RD	SPRINGFIELD	IL	62703	2626 HUNTINGTON RD		SPRINGFIELD	IL	62703
Current Resident	2627	HUNTINGTON RD	SPRINGFIELD	IL	62703	2627 HUNTINGTON RD		SPRINGFIELD	IL	62703
Current Resident	2630	HUNTINGTON RD	SPRINGFIELD	IL	62703	2630 HUNTINGTON RD		SPRINGFIELD	IL	62703
Current Resident	2631	HUNTINGTON RD	SPRINGFIELD	IL	62703	2631 HUNTINGTON RD		SPRINGFIELD	IL	62703
Current Resident	2702	HUNTINGTON RD	SPRINGFIELD	IL	62703	2702 HUNTINGTON RD		SPRINGFIELD	IL	62703
Current Resident	2703	HUNTINGTON RD	SPRINGFIELD	IL	62703	2703 HUNTINGTON RD		SPRINGFIELD	IL	62703
Current Resident	2706	HUNTINGTON RD	SPRINGFIELD	IL	62703	2706 HUNTINGTON RD		SPRINGFIELD	IL	62703
Current Resident	2707	HUNTINGTON RD	SPRINGFIELD	IL	62703	2707 HUNTINGTON RD		SPRINGFIELD	IL	62703
Current Resident	2710	HUNTINGTON RD	SPRINGFIELD	IL	62703	2710 HUNTINGTON RD		SPRINGFIELD	IL	62703
Current Resident	2714	HUNTINGTON RD	SPRINGFIELD	IL	62703	2714 HUNTINGTON RD		SPRINGFIELD	IL	62703

Current Resident	2721	HUNTINGTON RD	SPRINGFIELD	IL	62703	2721 HUNTINGTON RD		SPRINGFIELD	IL	62703
Current Resident	2725	HUNTINGTON RD	SPRINGFIELD	IL	62703	2725 HUNTINGTON RD		SPRINGFIELD	IL	62703
Current Resident	2711	HUNTINGTON RD	SPRINGFIELD	IL	62703	63 DANBURY DR		SPRINGFIELD	IL	62704
Current Resident	2622	HUNTINGTON RD	SPRINGFIELD	IL	62703	PO BOX 20005		OWENSBORO	KY	42304
Current Resident	2623	HUNTINGTON RD	SPRINGFIELD	IL	62703	PO BOX 6371		SPRINGFIELD	IL	62708
Current Resident	3700	INDIAN GRASS LN	SPRINGFIELD	IL	62712	3700 INDIAN GRASS LN		SPRINGFIELD	IL	62712
Current Resident	3701	INDIAN GRASS LN	SPRINGFIELD	IL	62707	3701 INDIAN GRASS LN		SPRINGFIELD	IL	62712
Current Resident	3704	INDIAN GRASS LN	SPRINGFIELD	IL	62712	3704 INDIAN GRASS LN		SPRINGFIELD	IL	62712
Current Resident	3705	INDIAN GRASS LN	SPRINGFIELD	IL	62712	3705 INDIAN GRASS LN		SPRINGFIELD	IL	62712
Current Resident	3708	INDIAN GRASS LN	SPRINGFIELD	IL	62712	3708 INDIAN GRASS LN		SPRINGFIELD	IL	62712
Current Resident	3709	INDIAN GRASS LN	SPRINGFIELD	IL	62712	3709 INDIAN GRASS LN		SPRINGFIELD	IL	62712
Current Resident	3712	INDIAN GRASS LN	SPRINGFIELD	IL	62707	3712 INDIAN GRASS LN		SPRINGFIELD	IL	62712
Current Resident	3716	INDIAN GRASS LN	SPRINGFIELD	IL	62712	3716 INDIAN GRASS LN		SPRINGFIELD	IL	62712
Current Resident	3717	INDIAN GRASS LN	SPRINGFIELD	IL	62712	3717 INDIAN GRASS LN		SPRINGFIELD	IL	62712
Current Resident	3720	INDIAN GRASS LN	SPRINGFIELD	IL	62712	3720 INDIAN GRASS LN		SPRINGFIELD	IL	62712
Current Resident	3721	INDIAN GRASS LN	SPRINGFIELD	IL	62712	3721 INDIAN GRASS LN		SPRINGFIELD	IL	62712
Current Resident	3724	INDIAN GRASS LN	SPRINGFIELD	IL	62712	3724 INDIAN GRASS LN		SPRINGFIELD	IL	62712
Current Resident	3725	INDIAN GRASS LN	SPRINGFIELD	IL	62712	3725 INDIAN GRASS LN		SPRINGFIELD	IL	62712
Current Resident	3728	INDIAN GRASS LN	SPRINGFIELD	IL	62712	3728 INDIAN GRASS LN		SPRINGFIELD	IL	62712
Current Resident	3729	INDIAN GRASS LN	SPRINGFIELD	IL	62712	3729 INDIAN GRASS LN		SPRINGFIELD	IL	62712
Current Resident	3732	INDIAN GRASS LN	SPRINGFIELD	IL	62712	3732 INDIAN GRASS LN		SPRINGFIELD	IL	62712
Current Resident	3800	INDIAN GRASS LN	SPRINGFIELD	IL	62712	3800 INDIAN GRASS LN		SPRINGFIELD	IL	62712
Current Resident	3804	INDIAN GRASS LN	SPRINGFIELD	IL	62707	3804 INDIAN GRASS LN		SPRINGFIELD	IL	62712
Current Resident	3805	INDIAN GRASS LN	SPRINGFIELD	IL	62712	3805 INDIAN GRASS LN		SPRINGFIELD	IL	62712
Current Resident	3809	INDIAN GRASS LN	SPRINGFIELD	IL	62707	3809 INDIAN GRASS LN		SPRINGFIELD	IL	62712
Current Resident	3813	INDIAN GRASS LN	SPRINGFIELD	IL	62712	3813 INDIAN GRASS LN		SPRINGFIELD	IL	62712
Current Resident	3713	INDIAN GRASS LN	SPRINGFIELD	IL	62712	7676 TIVERTON DR		SPRINGFIELD	VA	22152
Current Resident	3112	IRONHILL DR	SPRINGFIELD	IL	62711	3112 IRONHILL DR		SPRINGFIELD	IL	62711
Current Resident	316	KENNEDY RD	ELKHART	IL	62634	316 KENNEDY RD		ELKHART	IL	62634
Current Resident	2629	KENT DR	SPRINGFIELD	IL	62703	2629 KENT DR		SPRINGFIELD	IL	62703
Current Resident	3704	KERRY BLVD	SPRINGFIELD	IL	62707	% PRIMELENDING	18111 PRESTON RD S	DALLAS	TX	75252
Current Resident	3700	KERRY BLVD	SPRINGFIELD	IL	62712	3700 KERRY BLVD		SPRINGFIELD	IL	62712
Current Resident	3701	KERRY BLVD	SPRINGFIELD	IL	62712	3701 KERRY BLVD		SPRINGFIELD	IL	62712
Current Resident	3708	KERRY BLVD	SPRINGFIELD	IL	62712	3708 KERRY BLVD		SPRINGFIELD	IL	62712
Current Resident	3709	KERRY BLVD	SPRINGFIELD	IL	62712	3709 KERRY BLVD		SPRINGFIELD	IL	62712
Current Resident	3712	KERRY BLVD	SPRINGFIELD	IL	62712	3712 KERRY BLVD		SPRINGFIELD	IL	62712
Current Resident	3716	KERRY BLVD	SPRINGFIELD	IL	62712	3716 KERRY BLVD		SPRINGFIELD	IL	62712
Current Resident	3717	KERRY BLVD	SPRINGFIELD	IL	62712	3717 KERRY BLVD		SPRINGFIELD	IL	62712
Current Resident	3720	KERRY BLVD	SPRINGFIELD	IL	62712	3720 KERRY BLVD		SPRINGFIELD	IL	62712
Current Resident	3721	KERRY BLVD	SPRINGFIELD	IL	62712	3721 KERRY BLVD		SPRINGFIELD	IL	62712
Current Resident	3724	KERRY BLVD	SPRINGFIELD	IL	62712	3724 KERRY BLVD		SPRINGFIELD	IL	62712
Current Resident	3725	KERRY BLVD	SPRINGFIELD	IL	62712	3725 KERRY BLVD		SPRINGFIELD	IL	62712
Current Resident	3801	KERRY BLVD	SPRINGFIELD	IL	62712	3801 KERRY BLVD		SPRINGFIELD	IL	62712
Current Resident	3804	KERRY BLVD	SPRINGFIELD	IL	62712	3804 KERRY BLVD		SPRINGFIELD	IL	62712
Current Resident	3805	KERRY BLVD	SPRINGFIELD	IL	62712	3805 KERRY BLVD		SPRINGFIELD	IL	62712
Current Resident	3808	KERRY BLVD	SPRINGFIELD	IL	62712	3808 KERRY BLVD		SPRINGFIELD	IL	62712
Current Resident	3809	KERRY BLVD	SPRINGFIELD	IL	62712	3809 KERRY BLVD		SPRINGFIELD	IL	62712
Current Resident	3812	KERRY BLVD	SPRINGFIELD	IL	62712	3812 KERRY BLVD		SPRINGFIELD	IL	62712
Current Resident	3813	KERRY BLVD	SPRINGFIELD	IL	62712	3813 KERRY BLVD		SPRINGFIELD	IL	62712
Current Resident	3816	KERRY BLVD	SPRINGFIELD	IL	62707	3816 KERRY BLVD		SPRINGFIELD	IL	62712
Current Resident	3817	KERRY BLVD	SPRINGFIELD	IL	62712	3817 KERRY BLVD		SPRINGFIELD	IL	62712
Current Resident	3820	KERRY BLVD	SPRINGFIELD	IL	62712	3820 KERRY BLVD		SPRINGFIELD	IL	62712

Current Resident	3821	KERRY BLVD	SPRINGFIELD	IL	62712	3821 KERRY BLVD		SPRINGFIELD	IL	62712
Current Resident	3824	KERRY BLVD	SPRINGFIELD	IL	62712	3824 KERRY BLVD		SPRINGFIELD	IL	62712
Current Resident	3825	KERRY BLVD	SPRINGFIELD	IL	62712	3825 KERRY BLVD		SPRINGFIELD	IL	62712
Current Resident	3800	KERRY BLVD	SPRINGFIELD	IL	62707	401 N MADISON ST	PO BOX 410	LITCHFIELD	IL	62056
Current Resident	3713	KERRY BLVD	SPRINGFIELD	IL	62712	PO BOX 1804		DAYTON	OH	45401
Current Resident	3705	KERRY BLVD	SPRINGFIELD	IL	62712	PO BOX 20005		OWENSBORO	KY	42304
Current Resident	56	LACONWOOD DR	SPRINGFIELD	IL	62707	% FREEDOM MORTGAGE CORP	PO BOX 8001	FISHERS	IN	46038
Current Resident	100	LACONWOOD DR	SPRINGFIELD	IL	62712	100 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	102	LACONWOOD DR	SPRINGFIELD	IL	62712	102 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	107	LACONWOOD DR	SPRINGFIELD	IL	62712	107 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	108	LACONWOOD DR	SPRINGFIELD	IL	62712	108 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	74	LACONWOOD DR	SPRINGFIELD	IL	62707	11020 KING ST STE 390		OVERLAND PAR	KS	66210
Current Resident	112	LACONWOOD DR	SPRINGFIELD	IL	62712	112 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	113	LACONWOOD DR	SPRINGFIELD	IL	62712	113 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	116	LACONWOOD DR	SPRINGFIELD	IL	62712	116 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	85	LACONWOOD DR	SPRINGFIELD	IL	62712	116 S FOX MILL LN		SPRINGFIELD	IL	62712
Current Resident	119	LACONWOOD DR	SPRINGFIELD	IL	62712	119 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	120	LACONWOOD DR	SPRINGFIELD	IL	62712	120 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	123	LACONWOOD DR	SPRINGFIELD	IL	62712	123 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	124	LACONWOOD DR	SPRINGFIELD	IL	62712	124 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	127	LACONWOOD DR	SPRINGFIELD	IL	62707	127 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	128	LACONWOOD DR	SPRINGFIELD	IL	62707	128 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	132	LACONWOOD DR	SPRINGFIELD	IL	62712	132 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	135	LACONWOOD DR	SPRINGFIELD	IL	62707	135 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	136	LACONWOOD DR	SPRINGFIELD	IL	62712	136 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	139	LACONWOOD DR	SPRINGFIELD	IL	62712	139 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	140	LACONWOOD DR	SPRINGFIELD	IL	62712	140 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	143	LACONWOOD DR	SPRINGFIELD	IL	62707	143 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	144	LACONWOOD DR	SPRINGFIELD	IL	62707	144 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	31	LACONWOOD DR	SPRINGFIELD	IL	62712	31 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	23	LACONWOOD DR	SPRINGFIELD	IL	62712	3600 TAMARAK DR		SPRINGFIELD	IL	62712
Current Resident	55	LACONWOOD DR	SPRINGFIELD	IL	62712	55 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	61	LACONWOOD DR	SPRINGFIELD	IL	62707	61 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	62	LACONWOOD DR	SPRINGFIELD	IL	62707	62 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	73	LACONWOOD DR	SPRINGFIELD	IL	62712	73 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	79	LACONWOOD DR	SPRINGFIELD	IL	62707	79 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	80	LACONWOOD DR	SPRINGFIELD	IL	62712	80 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	86	LACONWOOD DR	SPRINGFIELD	IL	62712	86 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	91	LACONWOOD DR	SPRINGFIELD	IL	62712	91 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	92	LACONWOOD DR	SPRINGFIELD	IL	62707	92 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	94	LACONWOOD DR	SPRINGFIELD	IL	62712	94 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	95	LACONWOOD DR	SPRINGFIELD	IL	62707	95 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	96	LACONWOOD DR	SPRINGFIELD	IL	62712	96 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	98	LACONWOOD DR	SPRINGFIELD	IL	62712	98 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	99	LACONWOOD DR	SPRINGFIELD	IL	62712	99 LACONWOOD DR		SPRINGFIELD	IL	62712
Current Resident	68	LACONWOOD DR	SPRINGFIELD	IL	62707	ONE SPARCENTER PLAZA	232 N BRUNS LN	SPRINGFIELD	IL	62702
Current Resident	131	LACONWOOD DR	SPRINGFIELD	IL	62707	PO BOX 1804		DAYTON	OH	45401
Current Resident	67	LACONWOOD DR	SPRINGFIELD	IL	62707	PO BOX 6250		SPRINGFIELD	IL	62708
Current Resident	2473	LADLEY CT	SPRINGFIELD	IL	62703	17998 CHSTRFLD APRT RD STE 200		CHESTERFIELD	MO	63005
Current Resident	2430	LADLEY CT	SPRINGFIELD	IL	62703	17998 CHSTRFLD APRT RD STE 200		CHESTERFIELD	MO	63005
Current Resident	3220	LAKE PLAZA DR	SPRINGFIELD	IL	62704	8252 E LANSING RD		DURAND	MI	48429
Current Resident	113	LINDEN LN	SPRINGFIELD	IL	62712	113 LINDEN LN		SPRINGFIELD	IL	62712

Current Resident	3205	LOBELL DR	SPRINGFIELD	IL	62712	3205 LOBELL DR		SPRINGFIELD	IL	62712
Current Resident	3209	LOBELL DR	SPRINGFIELD	IL	62712	3209 LOBELL DR		SPRINGFIELD	IL	62712
Current Resident	3213	LOBELL DR	SPRINGFIELD	IL	62712	3213 LOBELL DR		SPRINGFIELD	IL	62712
Current Resident	3301	LOBELL DR	SPRINGFIELD	IL	62712	3301 LOBELL DR		SPRINGFIELD	IL	62712
Current Resident	3201	LOBELL DR	SPRINGFIELD	IL	62712	WEITZEL TERESA MARGARET	3201 LOBELL DR	SPRINGFIELD	IL	62712
Current Resident	3602	LYTHAM DR	SPRINGFIELD	IL	62712	% CEFCU	5401 W EVERETT M D	PEORIA	IL	61607
Current Resident	3505	LYTHAM DR	SPRINGFIELD	IL	62712	12 RED OAK LN		SPRINGFIELD	IL	62712
Current Resident	3500	LYTHAM DR	SPRINGFIELD	IL	62712	3500 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3501	LYTHAM DR	SPRINGFIELD	IL	62707	3501 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3504	LYTHAM DR	SPRINGFIELD	IL	62712	3504 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3506	LYTHAM DR	SPRINGFIELD	IL	62707	3506 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3507	LYTHAM DR	SPRINGFIELD	IL	62712	3507 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3508	LYTHAM DR	SPRINGFIELD	IL	62712	3508 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3509	LYTHAM DR	SPRINGFIELD	IL	62712	3509 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3510	LYTHAM DR	SPRINGFIELD	IL	62712	3510 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3511	LYTHAM DR	SPRINGFIELD	IL	62712	3511 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3512	LYTHAM DR	SPRINGFIELD	IL	62712	3512 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3513	LYTHAM DR	SPRINGFIELD	IL	62712	3513 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3514	LYTHAM DR	SPRINGFIELD	IL	62712	3514 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3515	LYTHAM DR	SPRINGFIELD	IL	62712	3515 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3516	LYTHAM DR	SPRINGFIELD	IL	62712	3516 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3517	LYTHAM DR	SPRINGFIELD	IL	62712	3517 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3518	LYTHAM DR	SPRINGFIELD	IL	62707	3518 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3519	LYTHAM DR	SPRINGFIELD	IL	62712	3519 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3600	LYTHAM DR	SPRINGFIELD	IL	62707	3600 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3601	LYTHAM DR	SPRINGFIELD	IL	62712	3601 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3603	LYTHAM DR	SPRINGFIELD	IL	62712	3603 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3604	LYTHAM DR	SPRINGFIELD	IL	62707	3604 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3605	LYTHAM DR	SPRINGFIELD	IL	62712	3605 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3606	LYTHAM DR	SPRINGFIELD	IL	62712	3606 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3607	LYTHAM DR	SPRINGFIELD	IL	62712	3607 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3608	LYTHAM DR	SPRINGFIELD	IL	62712	3608 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3609	LYTHAM DR	SPRINGFIELD	IL	62707	3609 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3610	LYTHAM DR	SPRINGFIELD	IL	62712	3610 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3611	LYTHAM DR	SPRINGFIELD	IL	62712	3611 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3613	LYTHAM DR	SPRINGFIELD	IL	62712	3613 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3615	LYTHAM DR	SPRINGFIELD	IL	62712	3615 LYTHAM DR		SPRINGFIELD	IL	62712
Current Resident	3612	LYTHAM DR	SPRINGFIELD	IL	62712	PO BOX 21948		EAGAN	MN	55121
Current Resident	3608	MAGDELENA	SPRINGFIELD	IL	62707	3608 MAGDELENA		SPRINGFIELD	IL	62707
Current Resident	3900	MAPLESHADE CT	SPRINGFIELD	IL	62707	3900 MAPLESHADE CT		SPRINGFIELD	IL	62712
Current Resident	3901	MAPLESHADE CT	SPRINGFIELD	IL	62707	3901 MAPLESHADE CT		SPRINGFIELD	IL	62712
Current Resident	3904	MAPLESHADE CT	SPRINGFIELD	IL	62712	3904 MAPLESHADE CT		SPRINGFIELD	IL	62712
Current Resident	3905	MAPLESHADE CT	SPRINGFIELD	IL	62707	3905 MAPLESHADE CT		SPRINGFIELD	IL	62712
Current Resident	3908	MAPLESHADE CT	SPRINGFIELD	IL	62712	3908 MAPLESHADE CT		SPRINGFIELD	IL	62712
Current Resident	3909	MAPLESHADE CT	SPRINGFIELD	IL	62712	3909 MAPLESHADE CT		SPRINGFIELD	IL	62712
Current Resident	3912	MAPLESHADE CT	SPRINGFIELD	IL	62707	3912 MAPLESHADE CT		SPRINGFIELD	IL	62712
Current Resident	3913	MAPLESHADE CT	SPRINGFIELD	IL	62707	3913 MAPLESHADE CT		SPRINGFIELD	IL	62712
Current Resident	3916	MAPLESHADE CT	SPRINGFIELD	IL	62712	3916 MAPLESHADE CT		SPRINGFIELD	IL	62712
Current Resident	3917	MAPLESHADE CT	SPRINGFIELD	IL	62712	3917 MAPLESHADE CT		SPRINGFIELD	IL	62712
Current Resident	3920	MAPLESHADE CT	SPRINGFIELD	IL	62712	3920 MAPLESHADE CT		SPRINGFIELD	IL	62712
Current Resident	3921	MAPLESHADE CT	SPRINGFIELD	IL	62712	3921 MAPLESHADE CT		SPRINGFIELD	IL	62712
Current Resident	3924	MAPLESHADE CT	SPRINGFIELD	IL	62712	3924 MAPLESHADE CT		SPRINGFIELD	IL	62712

Current Resident	1	MARKWOOD LN	SPRINGFIELD	IL	62712	1 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	2	MARKWOOD LN	SPRINGFIELD	IL	62712	2 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	3000	MARKWOOD LN	SPRINGFIELD	IL	62712	3000 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	3001	MARKWOOD LN	SPRINGFIELD	IL	62712	3001 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	3004	MARKWOOD LN	SPRINGFIELD	IL	62712	3004 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	3005	MARKWOOD LN	SPRINGFIELD	IL	62712	3005 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	3008	MARKWOOD LN	SPRINGFIELD	IL	62712	3008 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	3009	MARKWOOD LN	SPRINGFIELD	IL	62712	3009 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	3100	MARKWOOD LN	SPRINGFIELD	IL	62712	3100 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	3101	MARKWOOD LN	SPRINGFIELD	IL	62707	3101 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	3104	MARKWOOD LN	SPRINGFIELD	IL	62707	3104 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	3105	MARKWOOD LN	SPRINGFIELD	IL	62712	3105 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	3108	MARKWOOD LN	SPRINGFIELD	IL	62712	3108 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	3109	MARKWOOD LN	SPRINGFIELD	IL	62712	3109 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	3112	MARKWOOD LN	SPRINGFIELD	IL	62707	3112 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	3113	MARKWOOD LN	SPRINGFIELD	IL	62712	3113 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	3116	MARKWOOD LN	SPRINGFIELD	IL	62712	3116 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	3117	MARKWOOD LN	SPRINGFIELD	IL	62707	3117 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	3120	MARKWOOD LN	SPRINGFIELD	IL	62712	3120 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	3121	MARKWOOD LN	SPRINGFIELD	IL	62707	3121 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	3124	MARKWOOD LN	SPRINGFIELD	IL	62712	3124 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	3204	MARKWOOD LN	SPRINGFIELD	IL	62712	3204 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	3205	MARKWOOD LN	SPRINGFIELD	IL	62712	3205 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	3208	MARKWOOD LN	SPRINGFIELD	IL	62712	3208 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	3209	MARKWOOD LN	SPRINGFIELD	IL	62712	3209 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	3212	MARKWOOD LN	SPRINGFIELD	IL	62712	3212 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	3213	MARKWOOD LN	SPRINGFIELD	IL	62712	3213 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	3216	MARKWOOD LN	SPRINGFIELD	IL	62712	3216 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	3217	MARKWOOD LN	SPRINGFIELD	IL	62712	3217 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	3221	MARKWOOD LN	SPRINGFIELD	IL	62707	3221 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	7	MARKWOOD LN	SPRINGFIELD	IL	62712	7 MARKWOOD LN		SPRINGFIELD	IL	62712
Current Resident	2432	MAYFAIR RD	SPRINGFIELD	IL	62703	12401 RAMONA AVE		HAWTHORNE	CA	90250
Current Resident	2409	MAYFAIR RD	SPRINGFIELD	IL	62703	2409 MAYFAIR RD		SPRINGFIELD	IL	62703
Current Resident	2412	MAYFAIR RD	SPRINGFIELD	IL	62703	2412 MAYFAIR RD		SPRINGFIELD	IL	62703
Current Resident	2413	MAYFAIR RD	SPRINGFIELD	IL	62703	2413 MAYFAIR RD		SPRINGFIELD	IL	62703
Current Resident	2420	MAYFAIR RD	SPRINGFIELD	IL	62703	2420 MAYFAIR RD		SPRINGFIELD	IL	62703
Current Resident	2421	MAYFAIR RD	SPRINGFIELD	IL	62703	2421 MAYFAIR RD		SPRINGFIELD	IL	62703
Current Resident	2425	MAYFAIR RD	SPRINGFIELD	IL	62703	2425 MAYFAIR RD		SPRINGFIELD	IL	62703
Current Resident	2428	MAYFAIR RD	SPRINGFIELD	IL	62703	2428 MAYFAIR RD		SPRINGFIELD	IL	62703
Current Resident	2429	MAYFAIR RD	SPRINGFIELD	IL	62703	2429 MAYFAIR RD		SPRINGFIELD	IL	62703
Current Resident	2436	MAYFAIR RD	SPRINGFIELD	IL	62703	2436 MAYFAIR RD		SPRINGFIELD	IL	62703
Current Resident	2440	MAYFAIR RD	SPRINGFIELD	IL	62703	2440 MAYFAIR RD		SPRINGFIELD	IL	62703
Current Resident	2444	MAYFAIR RD	SPRINGFIELD	IL	62703	2444 MAYFAIR RD		SPRINGFIELD	IL	62703
Current Resident	44	MELODY LN	SPRINGFIELD	IL	62702	44 MELODY LN		SPRINGFIELD	IL	62702
Current Resident	3313	MOORGATE DR	SPRINGFIELD	IL	62703	% JACKSONVILLE SAVINGS BANK	PO BOX 880	JACKSONVILLE	IL	62651
Current Resident	3420	MOORGATE DR	SPRINGFIELD	IL	62703	10482 WINCHESTER CT		FORT MYERS	FL	33908
Current Resident	3312	MOORGATE DR	SPRINGFIELD	IL	62703	113 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	3424	MOORGATE DR	SPRINGFIELD	IL	62703	1273 KYSOR DR		BYRON	IL	61010
Current Resident	3400	MOORGATE DR	SPRINGFIELD	IL	62703	18 N VILLA GRV		SPRINGFIELD	IL	62712
Current Resident	3328	MOORGATE DR	SPRINGFIELD	IL	62703	2408 JOYCE LN		NAPERVILLE	IL	60564
Current Resident	3432	MOORGATE DR	SPRINGFIELD	IL	62703	29 MIDLAND CT		SPRINGFIELD	IL	62702
Current Resident	3300	MOORGATE DR	SPRINGFIELD	IL	62703	3300 MOORGATE DR		SPRINGFIELD	IL	62703

Current Resident	3305	MOORGATE DR	SPRINGFIELD	IL	62703	3305 MOORGATE DR		SPRINGFIELD	IL	62703
Current Resident	3308	MOORGATE DR	SPRINGFIELD	IL	62703	3308 MOORGATE DR		SPRINGFIELD	IL	62703
Current Resident	3309	MOORGATE DR	SPRINGFIELD	IL	62703	3309 MOORGATE DR		SPRINGFIELD	IL	62703
Current Resident	3316	MOORGATE DR	SPRINGFIELD	IL	62703	3316 MOORGATE DR		SPRINGFIELD	IL	62703
Current Resident	3320	MOORGATE DR	SPRINGFIELD	IL	62703	3320 MOORGATE DR		SPRINGFIELD	IL	62703
Current Resident	3321	MOORGATE DR	SPRINGFIELD	IL	62703	3321 MOORGATE DR		SPRINGFIELD	IL	62703
Current Resident	3324	MOORGATE DR	SPRINGFIELD	IL	62703	3324 MOORGATE DR		SPRINGFIELD	IL	62703
Current Resident	3332	MOORGATE DR	SPRINGFIELD	IL	62703	3332 MOORGATE DR		SPRINGFIELD	IL	62703
Current Resident	3336	MOORGATE DR	SPRINGFIELD	IL	62703	3336 MOORGATE DR		SPRINGFIELD	IL	62703
Current Resident	3340	MOORGATE DR	SPRINGFIELD	IL	62703	3340 MOORGATE DR		SPRINGFIELD	IL	62703
Current Resident	3401	MOORGATE DR	SPRINGFIELD	IL	62703	3401 MOORGATE DR		SPRINGFIELD	IL	62703
Current Resident	3408	MOORGATE DR	SPRINGFIELD	IL	62703	3408 MOORGATE DR		SPRINGFIELD	IL	62703
Current Resident	3409	MOORGATE DR	SPRINGFIELD	IL	62703	3409 MOORGATE DR		SPRINGFIELD	IL	62703
Current Resident	3412	MOORGATE DR	SPRINGFIELD	IL	62703	3412 MOORGATE DR		SPRINGFIELD	IL	62703
Current Resident	3413	MOORGATE DR	SPRINGFIELD	IL	62703	3413 MOORGATE DR		SPRINGFIELD	IL	62703
Current Resident	3416	MOORGATE DR	SPRINGFIELD	IL	62703	3416 MOORGATE DR		SPRINGFIELD	IL	62703
Current Resident	3428	MOORGATE DR	SPRINGFIELD	IL	62703	3428 MOORGATE DR		SPRINGFIELD	IL	62703
Current Resident	3509	MOORGATE DR	SPRINGFIELD	IL	62703	3509 MOORGATE DR		SPRINGFIELD	IL	62703
Current Resident	3517	MOORGATE DR	SPRINGFIELD	IL	62703	3517 MOORGATE DR		SPRINGFIELD	IL	62703
Current Resident	3304	MOORGATE DR	SPRINGFIELD	IL	62703	3600 WABASH AVE		SPRINGFIELD	IL	62711
Current Resident	3404	MOORGATE DR	SPRINGFIELD	IL	62703	3600 WABASH AVE		SPRINGFIELD	IL	62711
Current Resident	3605	MOORGATE DR	SPRINGFIELD	IL	62703	3601 SHEFFIELD RD		SPRINGFIELD	IL	62703
Current Resident	3609	MOORGATE DR	SPRINGFIELD	IL	62703	3609 MOORGATE DR		SPRINGFIELD	IL	62703
Current Resident	3405	MOORGATE DR	SPRINGFIELD	IL	62703	395 CAMPUS VIEW DR		LINCOLN	IL	62656
Current Resident	3317	MOORGATE DR	SPRINGFIELD	IL	62703	PO BOX 8800		DAYTON	OH	45401
Sangamon County Water Re	3000	N 8TH ST RD	SPRINGFIELD	IL	62707	RECLAMATION DISTRICT	3000 N 8TH ST RD	SPRINGFIELD	IL	62707
SOUTH CONGREGATION OF	3076	NORMANDY RD	SPRINGFIELD	IL	62703	% RODNEY HODGE	3076 NORMANDY RD	SPRINGFIELD	IL	62703
Current Resident	3090	NORMANDY RD	SPRINGFIELD	IL	62704	1 COLUMBUS CTR STE 700		VIRGINIA BEAC	VA	23462
Current Resident	2967	NORMANDY RD	SPRINGFIELD	IL	62703	17998 CHESTERFIELD AIRPORT RD		CHESTERFIELD	MO	63005
Current Resident	2971	NORMANDY RD	SPRINGFIELD	IL	62703	17998 CHESTERFIELD AIRPORT RD		CHESTERFIELD	MO	63005
Current Resident	2951	NORMANDY RD	SPRINGFIELD	IL	62703	17998 CHSTRFLD APRT RD STE 200		CHESTERFIELD	MO	63005
Current Resident	2947	NORMANDY RD	SPRINGFIELD	IL	62703	17998 CHSTRFLD APRT RD STE 200		CHESTERFIELD	MO	63005
Current Resident	2939	NORMANDY RD	SPRINGFIELD	IL	62703	17998 CHSTRFLD APRT RD STE 200		CHESTERFIELD	MO	63005
Current Resident	2943	NORMANDY RD	SPRINGFIELD	IL	62703	17998 CHSTRFLD APRT RD STE 200		CHESTERFIELD	MO	63005
Current Resident	2955	NORMANDY RD	SPRINGFIELD	IL	62703	17998 CHSTRFLD APRT RD STE 200		CHESTERFIELD	MO	63005
Current Resident	2959	NORMANDY RD	SPRINGFIELD	IL	62703	17998 CHSTRFLD APRT RD STE 200		CHESTERFIELD	MO	63005
Current Resident	2963	NORMANDY RD	SPRINGFIELD	IL	62703	17998 CHSTRFLD APRT RD STE 200		CHESTERFIELD	MO	63005
Current Resident	2975	NORMANDY RD	SPRINGFIELD	IL	62703	17998 CHSTRFLD APRT RD STE 200		CHESTERFIELD	MO	63005
Current Resident	2959	NORMANDY RD	SPRINGFIELD	IL	62703	17998 CHSTRFLD APRT RD STE 200		CHESTERFIELD	MO	63005
YOUTH SERVICE & BUREAU	2901	NORMANDY RD	SPRINGFIELD	IL	62703	2901 NORMANDY RD		SPRINGFIELD	IL	62703
Current Resident	3112	NORMANDY RD	SPRINGFIELD	IL	62704	3800 WOODHAVEN DR		SPRINGFIELD	IL	62712
Current Resident	3086	NORMANDY RD	SPRINGFIELD	IL	62703	401 N MADISON ST	PO BOX 410	LITCHFIELD	IL	62056
Current Resident	3086	NORMANDY RD	SPRINGFIELD	IL	62703	401 N MADISON ST	PO BOX 410	LITCHFIELD	IL	62056
Current Resident	3100	NORMANDY RD	SPRINGFIELD	IL	62704	606 DRAKE LN		WASHINGTON	IL	61571
Current Resident	490	NORTH ST	SPRINGFIELD	IL	62704	490 NORTH ST		SPRINGFIELD	IL	62704
WOODSIDE TOWNSHIP	490	NORTH ST	SPRINGFIELD	IL	62704	490 NORTH ST		SPRINGFIELD	IL	62704
Current Resident	9	OAK LN	SPRINGFIELD	IL	62712	9 OAK LN		SPRINGFIELD	IL	62712
Current Resident	103	OAKMONT DR	SPRINGFIELD	IL	62704	103 OAKMONT DR		SPRINGFIELD	IL	62704
Current Resident	103	OAKMONT DR	SPRINGFIELD	IL	62704	103 OAKMONT DR		SPRINGFIELD	IL	62704
Current Resident	3901	OAKVIEW DR	SPRINGFIELD	IL	62707	3901 OAKVIEW DR		SPRINGFIELD	IL	62712
Current Resident	3905	OAKVIEW DR	SPRINGFIELD	IL	62712	3905 OAKVIEW DR		SPRINGFIELD	IL	62712
Current Resident	3908	OAKVIEW DR	SPRINGFIELD	IL	62712	3908 OAKVIEW DR		SPRINGFIELD	IL	62712

Current Resident	3909	OAKVIEW DR	SPRINGFIELD	IL	62712	3909 OAKVIEW DR		SPRINGFIELD	IL	62712
Current Resident	3912	OAKVIEW DR	SPRINGFIELD	IL	62707	3912 OAKVIEW DR		SPRINGFIELD	IL	62712
Current Resident	3913	OAKVIEW DR	SPRINGFIELD	IL	62712	3913 OAKVIEW DR		SPRINGFIELD	IL	62712
Current Resident	3916	OAKVIEW DR	SPRINGFIELD	IL	62712	3916 OAKVIEW DR		SPRINGFIELD	IL	62712
Current Resident	3917	OAKVIEW DR	SPRINGFIELD	IL	62712	3917 OAKVIEW DR		SPRINGFIELD	IL	62712
Current Resident	4000	OAKVIEW DR	SPRINGFIELD	IL	62712	4000 OAKVIEW DR		SPRINGFIELD	IL	62712
Current Resident	4001	OAKVIEW DR	SPRINGFIELD	IL	62707	4001 OAKVIEW DR		SPRINGFIELD	IL	62712
Current Resident	4004	OAKVIEW DR	SPRINGFIELD	IL	62712	4004 OAKVIEW DR		SPRINGFIELD	IL	62712
Current Resident	4005	OAKVIEW DR	SPRINGFIELD	IL	62712	4005 OAKVIEW DR		SPRINGFIELD	IL	62712
Current Resident	4012	OAKVIEW DR	SPRINGFIELD	IL	62712	4012 OAKVIEW DR		SPRINGFIELD	IL	62712
Current Resident	4013	OAKVIEW DR	SPRINGFIELD	IL	62712	4013 OAKVIEW DR		SPRINGFIELD	IL	62712
Current Resident	2721	OLD ASH ST	SPRINGFIELD	IL	62703	% CATHLEEN HANDLEY	3643 SOUTH GRAND	SPRINGFIELD	IL	62712
Current Resident	2725	OLD ASH ST	SPRINGFIELD	IL	62703	% CATHLEEN HANDLEY	3643 SOUTH GRAND	SPRINGFIELD	IL	62712
Current Resident	2735	OLD ASH ST	SPRINGFIELD	IL	62703	2735 E OLD ASH ST		SPRINGFIELD	IL	62703
Current Resident	2937	OLD ROCHESTER RD STE 1	SPRINGFIELD	IL	62703	2937 OLD ROCHESTER RD STE 1		SPRINGFIELD	IL	62703
Current Resident	3127	OTTER LN	SPRINGFIELD	IL	62707	3127 OTTER LN		SPRINGFIELD	IL	62712
Current Resident	3135	OTTER LN	SPRINGFIELD	IL	62712	3135 OTTER LN		SPRINGFIELD	IL	62712
Current Resident	3142	OTTER LN	SPRINGFIELD	IL	62712	3142 OTTER LN		SPRINGFIELD	IL	62712
Current Resident	3143	OTTER LN	SPRINGFIELD	IL	62707	3143 OTTER LN		SPRINGFIELD	IL	62712
Current Resident	3150	OTTER LN	SPRINGFIELD	IL	62712	3150 OTTER LN		SPRINGFIELD	IL	62712
Current Resident	3151	OTTER LN	SPRINGFIELD	IL	62712	3151 OTTER LN		SPRINGFIELD	IL	62712
Current Resident	3158	OTTER LN	SPRINGFIELD	IL	62707	3158 OTTER LN		SPRINGFIELD	IL	62712
Current Resident	3159	OTTER LN	SPRINGFIELD	IL	62107	3159 OTTER LN		SPRINGFIELD	IL	62712
Current Resident	3166	OTTER LN	SPRINGFIELD	IL	62712	3166 OTTER LN		SPRINGFIELD	IL	62712
Current Resident	3167	OTTER LN	SPRINGFIELD	IL	62707	3167 OTTER LN		SPRINGFIELD	IL	62712
Current Resident	3174	OTTER LN	SPRINGFIELD	IL	62707	3174 OTTER LN		SPRINGFIELD	IL	62712
Current Resident	3175	OTTER LN	SPRINGFIELD	IL	62712	3175 OTTER LN		SPRINGFIELD	IL	62712
Current Resident	3182	OTTER LN	SPRINGFIELD	IL	62707	3182 OTTER LN		SPRINGFIELD	IL	62712
Current Resident	3183	OTTER LN	SPRINGFIELD	IL	62712	3183 OTTER LN		SPRINGFIELD	IL	62712
Current Resident	3190	OTTER LN	SPRINGFIELD	IL	62712	3190 OTTER LN		SPRINGFIELD	IL	62712
Current Resident	3191	OTTER LN	SPRINGFIELD	IL	62712	3191 OTTER LN		SPRINGFIELD	IL	62712
Current Resident	3196	OTTER LN	SPRINGFIELD	IL	62712	3196 OTTER LN		SPRINGFIELD	IL	62712
Current Resident	1	PARKVIEW PLZ FL 9	OAKBROOK TERRAC	IL	60181	1 PARKVIEW PLZ FL 9		OAKBROOK TER	IL	60181
Current Resident	3600	PERSIMMON DR	SPRINGFIELD	IL	62712	% FARMERS STATE BANK & TR CO	PO BOX 1330	JACKSONVILLE	IL	62651
Current Resident	3605	PERSIMMON DR	SPRINGFIELD	IL	62712	1959 E 2150 NORTH RD		CONGERVILLE	IL	61729
Current Resident	3500	PERSIMMON DR	SPRINGFIELD	IL	62712	3500 PERSIMMON DR		SPRINGFIELD	IL	62712
Current Resident	3501	PERSIMMON DR	SPRINGFIELD	IL	62712	3501 PERSIMMON DR		SPRINGFIELD	IL	62712
Current Resident	3504	PERSIMMON DR	SPRINGFIELD	IL	62712	3504 PERSIMMON DR		SPRINGFIELD	IL	62712
Current Resident	3508	PERSIMMON DR	SPRINGFIELD	IL	62712	3508 PERSIMMON DR		SPRINGFIELD	IL	62712
Current Resident	3511	PERSIMMON DR	SPRINGFIELD	IL	62707	3511 PERSIMMON DR		SPRINGFIELD	IL	62712
Current Resident	3512	PERSIMMON DR	SPRINGFIELD	IL	62712	3512 PERSIMMON DR		SPRINGFIELD	IL	62712
Current Resident	3516	PERSIMMON DR	SPRINGFIELD	IL	62712	3516 PERSIMMON DR		SPRINGFIELD	IL	62712
Current Resident	3601	PERSIMMON DR	SPRINGFIELD	IL	62712	3601 PERSIMMON DR		SPRINGFIELD	IL	62712
Current Resident	3604	PERSIMMON DR	SPRINGFIELD	IL	62707	3608 PERSIMMON DR		SPRINGFIELD	IL	62712
Current Resident	3608	PERSIMMON DR	SPRINGFIELD	IL	62712	3608 PERSIMMON DR		SPRINGFIELD	IL	62712
Current Resident	60	PINE COVE	SPRINGFIELD	IL	62712	% HICKORY POINT BANK	3131 WABASH AVE	SPRINGFIELD	IL	62704
Current Resident	54	PINE COVE	SPRINGFIELD	IL	62712	3637 SENTARA WAY		VIRGINIA BEAC	VA	23452
Current Resident	55	PINE COVE	SPRINGFIELD	IL	62712	55 PINE CV		SPRINGFIELD	IL	62712
Current Resident	61	PINE COVE	SPRINGFIELD	IL	62712	61 PINE CV		SPRINGFIELD	IL	62712
Current Resident	66	PINE COVE	SPRINGFIELD	IL	62712	66 PINE CV		SPRINGFIELD	IL	62712
Current Resident	67	PINE COVE	SPRINGFIELD	IL	62707	67 PINE CV		SPRINGFIELD	IL	62712
Current Resident	72	PINE COVE	SPRINGFIELD	IL	62712	72 PINE CV		SPRINGFIELD	IL	62712

Current Resident	73	PINE COVE	SPRINGFIELD	IL	62712	73 PINE CV		SPRINGFIELD	IL	62712
EVERS DEVELOPMENT INC	3900	PINTAIL DR STE C	SPRINGFIELD	IL	62711	3900 PINTAIL DR STE C		SPRINGFIELD	IL	62711
Waste Management		PO BOX 1450	CHICAGO	IL	60690	WASTE MGMT	PO BOX 1450	CHICAGO	IL	60690
Bi-Petro Inc.		PO BOX 19246	SPRINGFIELD	IL	62794	PO BOX 19246		SPRINGFIELD	IL	62794
FIRSTBANK CO		PO BOX 19264	SPRINGFIELD	IL	62794	205 S 5TH STREET	PO BOX 19264	SPRINGFIELD	IL	62794
Current Resident		PO BOX 20005	OWENSBORO	KY	42304	PO BOX 20005		OWENSBORO	KY	42304
LAMOUR GROUP LLC		PO BOX 20345	SPRINGFIELD	IL	62708	PO BOX 20345		SPRINGFIELD	IL	62708
DOTMAR INC		PO BOX 2549	SPRINGFIELD	IL	62708	%DRAKE ROBERT	PO BOX 2549	SPRINGFIELD	IL	62708
DOTMAR INC		PO BOX 2549	SPRINGFIELD	IL	62708	PO BOX 2549		SPRINGFIELD	IL	62708
BJD PROPERTIES LLC		PO BOX 450	LITCHFIELD	IL	62056	324 N STATE	PO BOX 450	LITCHFIELD	IL	62056
WPFL LLC		PO BOX 79	SPRINGFIELD	IL	62705	PO BOX 79		SPRINGFIELD	IL	62705
SANGAMON COUNTY TRUSTEE		PO BOX 96	EDWARDSVILLE	IL	62025	PO BOX 96		EDWARDSVILLE	IL	62025
Current Resident	2500	PORTSMOUTH CIR	SPRINGFIELD	IL	62703	2500 PORTSMOUTH CIR		SPRINGFIELD	IL	62703
Current Resident	2504	PORTSMOUTH CIR	SPRINGFIELD	IL	62703	2504 PORTSMOUTH CIR		SPRINGFIELD	IL	62703
Current Resident	2508	PORTSMOUTH CIR	SPRINGFIELD	IL	62703	2508 PORTSMOUTH CIR		SPRINGFIELD	IL	62703
Current Resident	2509	PORTSMOUTH CIR	SPRINGFIELD	IL	62703	2509 PORTSMOUTH CIR		SPRINGFIELD	IL	62703
Current Resident	2512	PORTSMOUTH CIR	SPRINGFIELD	IL	62703	2512 PORTSMOUTH CIR		SPRINGFIELD	IL	62703
Current Resident	2513	PORTSMOUTH CIR	SPRINGFIELD	IL	62703	2513 PORTSMOUTH CIR		SPRINGFIELD	IL	62703
Current Resident	2516	PORTSMOUTH CIR	SPRINGFIELD	IL	62703	2516 PORTSMOUTH CIR		SPRINGFIELD	IL	62703
Current Resident	2517	PORTSMOUTH CIR	SPRINGFIELD	IL	62703	2517 PORTSMOUTH CIR		SPRINGFIELD	IL	62703
Current Resident	2520	PORTSMOUTH CIR	SPRINGFIELD	IL	62703	2520 PORTSMOUTH CIR		SPRINGFIELD	IL	62703
Current Resident	2524	PORTSMOUTH CIR	SPRINGFIELD	IL	62703	2524 PORTSMOUTH CIR		SPRINGFIELD	IL	62703
Current Resident	2525	PORTSMOUTH CIR	SPRINGFIELD	IL	62703	2525 PORTSMOUTH CIR		SPRINGFIELD	IL	62703
Current Resident	2528	PORTSMOUTH CIR	SPRINGFIELD	IL	62703	2528 PORTSMOUTH CIR		SPRINGFIELD	IL	62703
Current Resident	2529	PORTSMOUTH CIR	SPRINGFIELD	IL	62703	2529 PORTSMOUTH CIR		SPRINGFIELD	IL	62703
Current Resident	2532	PORTSMOUTH CIR	SPRINGFIELD	IL	62703	2532 PORTSMOUTH CIR		SPRINGFIELD	IL	62703
Current Resident	2533	PORTSMOUTH CIR	SPRINGFIELD	IL	62703	2533 PORTSMOUTH CIR		SPRINGFIELD	IL	62703
Current Resident	2505	PORTSMOUTH CIR	SPRINGFIELD	IL	62703	PO BOX 1804		DAYTON	OH	45401
Current Resident	2521	PORTSMOUTH CIR	SPRINGFIELD	IL	62703	PO BOX 268888		OKLAHOMA CIT	OK	73126
Current Resident	3600	PRAIRIE SMOKE CT	SPRINGFIELD	IL	62712	3600 PRAIRIE SMOKE CT		SPRINGFIELD	IL	62712
Current Resident	3604	PRAIRIE SMOKE CT	SPRINGFIELD	IL	62712	3604 PRAIRIE SMOKE CT		SPRINGFIELD	IL	62712
Current Resident	3605	PRAIRIE SMOKE CT	SPRINGFIELD	IL	62707	3605 PRAIRIE SMOKE CT		SPRINGFIELD	IL	62712
Current Resident	3608	PRAIRIE SMOKE CT	SPRINGFIELD	IL	62707	3608 PRAIRIE SMOKE CT		SPRINGFIELD	IL	62712
Current Resident	3609	PRAIRIE SMOKE CT	SPRINGFIELD	IL	62712	3609 PRAIRIE SMOKE CT		SPRINGFIELD	IL	62712
Current Resident	3612	PRAIRIE SMOKE CT	SPRINGFIELD	IL	62707	3612 PRAIRIE SMOKE CT		SPRINGFIELD	IL	62712
Current Resident	3613	PRAIRIE SMOKE CT	SPRINGFIELD	IL	62712	3613 PRAIRIE SMOKE CT		SPRINGFIELD	IL	62712
Current Resident	3616	PRAIRIE SMOKE CT	SPRINGFIELD	IL	62712	3616 PRAIRIE SMOKE CT		SPRINGFIELD	IL	62712
Current Resident	3620	PRAIRIE SMOKE CT	SPRINGFIELD	IL	62712	3620 PRAIRIE SMOKE CT		SPRINGFIELD	IL	62712
Current Resident	2705	QUEENSWAY RD	SPRINGFIELD	IL	62703	% US BANK	4801 FREDERICA ST	OWENSBORO	KY	42301
Current Resident	2600	QUEENSWAY RD	SPRINGFIELD	IL	62703	2600 QUEENSWAY RD		SPRINGFIELD	IL	62703
Current Resident	2604	QUEENSWAY RD	SPRINGFIELD	IL	62703	2604 QUEENSWAY RD		SPRINGFIELD	IL	62703
Current Resident	2605	QUEENSWAY RD	SPRINGFIELD	IL	62703	2605 QUEENSWAY RD		SPRINGFIELD	IL	62703
Current Resident	2608	QUEENSWAY RD	SPRINGFIELD	IL	62703	2608 QUEENSWAY RD		SPRINGFIELD	IL	62703
Current Resident	2609	QUEENSWAY RD	SPRINGFIELD	IL	62703	2609 QUEENSWAY RD		SPRINGFIELD	IL	62703
Current Resident	2613	QUEENSWAY RD	SPRINGFIELD	IL	62703	2613 QUEENSWAY RD		SPRINGFIELD	IL	62703
Current Resident	2616	QUEENSWAY RD	SPRINGFIELD	IL	62703	2616 QUEENSWAY RD		SPRINGFIELD	IL	62703
Current Resident	2620	QUEENSWAY RD	SPRINGFIELD	IL	62703	2620 QUEENSWAY RD		SPRINGFIELD	IL	62703
Current Resident	2617	QUEENSWAY RD	SPRINGFIELD	IL	62703	2621 QUEENSWAY RD		SPRINGFIELD	IL	62703
Current Resident	2621	QUEENSWAY RD	SPRINGFIELD	IL	62703	2621 QUEENSWAY RD		SPRINGFIELD	IL	62703
Current Resident	2624	QUEENSWAY RD	SPRINGFIELD	IL	62703	2624 QUEENSWAY RD		SPRINGFIELD	IL	62703
Current Resident	2625	QUEENSWAY RD	SPRINGFIELD	IL	62703	2625 QUEENSWAY RD		SPRINGFIELD	IL	62703
Current Resident	2700	QUEENSWAY RD	SPRINGFIELD	IL	62703	2700 QUEENSWAY RD		SPRINGFIELD	IL	62703

Current Resident	2701	QUEENSWAY RD	SPRINGFIELD	IL	62703	2701 QUEENSWAY RD		SPRINGFIELD	IL	62703
Current Resident	2704	QUEENSWAY RD	SPRINGFIELD	IL	62703	2704 QUEENSWAY RD		SPRINGFIELD	IL	62703
Current Resident	2708	QUEENSWAY RD	SPRINGFIELD	IL	62703	2708 QUEENSWAY RD		SPRINGFIELD	IL	62703
Current Resident	2709	QUEENSWAY RD	SPRINGFIELD	IL	62703	2709 QUEENSWAY RD		SPRINGFIELD	IL	62703
Current Resident	2712	QUEENSWAY RD	SPRINGFIELD	IL	62703	2712 QUEENSWAY RD		SPRINGFIELD	IL	62703
Current Resident	2716	QUEENSWAY RD	SPRINGFIELD	IL	62703	2716 QUEENSWAY RD		SPRINGFIELD	IL	62703
Current Resident	2717	QUEENSWAY RD	SPRINGFIELD	IL	62703	2717 QUEENSWAY RD		SPRINGFIELD	IL	62703
Current Resident	2720	QUEENSWAY RD	SPRINGFIELD	IL	62703	2720 QUEENSWAY RD		SPRINGFIELD	IL	62703
Current Resident	2721	QUEENSWAY RD	SPRINGFIELD	IL	62703	2721 QUEENSWAY RD		SPRINGFIELD	IL	62703
Current Resident	2725	QUEENSWAY RD	SPRINGFIELD	IL	62703	2725 QUEENSWAY RD		SPRINGFIELD	IL	62703
Current Resident	2728	QUEENSWAY RD	SPRINGFIELD	IL	62703	2728 QUEENSWAY RD		SPRINGFIELD	IL	62703
Current Resident	2729	QUEENSWAY RD	SPRINGFIELD	IL	62703	2729 QUEENSWAY RD		SPRINGFIELD	IL	62703
Current Resident	2732	QUEENSWAY RD	SPRINGFIELD	IL	62703	2732 QUEENSWAY RD		SPRINGFIELD	IL	62703
Current Resident	2736	QUEENSWAY RD	SPRINGFIELD	IL	62703	2736 QUEENSWAY RD		SPRINGFIELD	IL	62703
Current Resident	2612	QUEENSWAY RD	SPRINGFIELD	IL	62703	3300 MOORGATE DR		SPRINGFIELD	IL	62703
Current Resident	2724	QUEENSWAY RD	SPRINGFIELD	IL	62703	5151 CORPORATE DR		TROY	MI	48098
Current Resident	2713	QUEENSWAY RD	SPRINGFIELD	IL	62703	PO BOX 79041		BALTIMORE	MD	21279
Current Resident	38	RADCLIFF RD	SPRINGFIELD	IL	62703	% FREEDOM MORTGAGE CORP	907 PLEASANT VALLE	MOUNT LAUREI	NJ	8054
Current Resident	100	RADCLIFF RD	SPRINGFIELD	IL	62703	100 RADCLIFF RD		SPRINGFIELD	IL	62703
Current Resident	103	RADCLIFF RD	SPRINGFIELD	IL	62703	103 RADCLIFF RD		SPRINGFIELD	IL	62703
Current Resident	107	RADCLIFF RD	SPRINGFIELD	IL	62703	107 RADCLIFF RD		SPRINGFIELD	IL	62703
Current Resident	14	RADCLIFF RD	SPRINGFIELD	IL	62703	13 RAMBLEWOOD DR		CHATHAM	IL	62629
Current Resident	18	RADCLIFF RD	SPRINGFIELD	IL	62703	18 RADCLIFF RD		SPRINGFIELD	IL	62703
Current Resident	87	RADCLIFF RD	SPRINGFIELD	IL	62703	19387 HURRICANE DR		CARLINVILLE	IL	62626
Current Resident	22	RADCLIFF RD	SPRINGFIELD	IL	62703	22 RADCLIFF RD		SPRINGFIELD	IL	62703
Current Resident	34	RADCLIFF RD	SPRINGFIELD	IL	62703	2516 W 83RD ST		CHICAGO	IL	60652
Current Resident	23	RADCLIFF RD	SPRINGFIELD	IL	62703	2516 W 83RD ST		CHICAGO	IL	60652
Current Resident	26	RADCLIFF RD	SPRINGFIELD	IL	62703	26 RADCLIFF RD		SPRINGFIELD	IL	62703
Current Resident	27	RADCLIFF RD	SPRINGFIELD	IL	62703	27 RADCLIFF RD		SPRINGFIELD	IL	62703
Current Resident	30	RADCLIFF RD	SPRINGFIELD	IL	62703	30 RADCLIFF RD		SPRINGFIELD	IL	62703
Current Resident	31	RADCLIFF RD	SPRINGFIELD	IL	62703	31 RADCLIFF RD		SPRINGFIELD	IL	62703
Current Resident	95	RADCLIFF RD	SPRINGFIELD	IL	62703	3221 SAINT FRANCIS DR		SPRINGFIELD	IL	62703
Current Resident	35	RADCLIFF RD	SPRINGFIELD	IL	62703	35 RADCLIFF RD		SPRINGFIELD	IL	62703
Current Resident	39	RADCLIFF RD	SPRINGFIELD	IL	62703	39 RADCLIFF RD		SPRINGFIELD	IL	62703
Current Resident	10	RADCLIFF RD	SPRINGFIELD	IL	62073	3912 BARTLEY DR		SACRAMENTO	CA	95822
Current Resident	42	RADCLIFF RD	SPRINGFIELD	IL	62703	42 RADCLIFF RD		SPRINGFIELD	IL	62703
Current Resident	43	RADCLIFF RD	SPRINGFIELD	IL	62703	43 RADCLIFF RD		SPRINGFIELD	IL	62703
Current Resident	46	RADCLIFF RD	SPRINGFIELD	IL	62703	46 RADCLIFF RD		SPRINGFIELD	IL	62703
Current Resident	47	RADCLIFF RD	SPRINGFIELD	IL	62703	47 RADCLIFF RD		SPRINGFIELD	IL	62703
Current Resident	54	RADCLIFF RD	SPRINGFIELD	IL	62703	54 RADCLIFF RD		SPRINGFIELD	IL	62703
Current Resident	58	RADCLIFF RD	SPRINGFIELD	IL	62703	58 RADCLIFF RD		SPRINGFIELD	IL	62703
Current Resident	59	RADCLIFF RD	SPRINGFIELD	IL	62703	59 RADCLIFF RD		SPRINGFIELD	IL	62703
Current Resident	62	RADCLIFF RD	SPRINGFIELD	IL	62703	62 RADCLIFF RD		SPRINGFIELD	IL	62703
Current Resident	63	RADCLIFF RD	SPRINGFIELD	IL	62703	63 RADCLIFF RD		SPRINGFIELD	IL	62703
Current Resident	66	RADCLIFF RD	SPRINGFIELD	IL	62703	66 RADCLIFF RD		SPRINGFIELD	IL	62703
Current Resident	67	RADCLIFF RD	SPRINGFIELD	IL	62703	67 RADCLIFF RD		SPRINGFIELD	IL	62703
Current Resident	70	RADCLIFF RD	SPRINGFIELD	IL	62703	70 RADCLIFF RD		SPRINGFIELD	IL	62703
Current Resident	71	RADCLIFF RD	SPRINGFIELD	IL	62703	71 RADCLIFF RD		SPRINGFIELD	IL	62703
Current Resident	74	RADCLIFF RD	SPRINGFIELD	IL	62703	74 RADCLIFF RD		SPRINGFIELD	IL	62703
Current Resident	75	RADCLIFF RD	SPRINGFIELD	IL	62703	75 RADCLIFF RD		SPRINGFIELD	IL	62703
Current Resident	78	RADCLIFF RD	SPRINGFIELD	IL	62703	78 RADCLIFF RD		SPRINGFIELD	IL	62703
Current Resident	79	RADCLIFF RD	SPRINGFIELD	IL	62703	79 RADCLIFF RD		SPRINGFIELD	IL	62703

Current Resident	82	RADCLIFF RD	SPRINGFIELD	IL	62703	82 RADCLIFF RD	SPRINGFIELD	IL	62703
Current Resident	90	RADCLIFF RD	SPRINGFIELD	IL	62703	90 RADCLIFF RD	SPRINGFIELD	IL	62703
Current Resident	91	RADCLIFF RD	SPRINGFIELD	IL	62703	91 RADCLIFF RD	SPRINGFIELD	IL	62703
Current Resident	94	RADCLIFF RD	SPRINGFIELD	IL	62703	94 RADCLIFF RD	SPRINGFIELD	IL	62703
Current Resident	99	RADCLIFF RD	SPRINGFIELD	IL	62703	99 RADCLIFF RD	SPRINGFIELD	IL	62703
Current Resident	1	RED BUD LN	SPRINGFIELD	IL	62707	1 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	12	RED BUD LN	SPRINGFIELD	IL	62707	12 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	13	RED BUD LN	SPRINGFIELD	IL	62712	13 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	15	RED BUD LN	SPRINGFIELD	IL	62712	15 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	16	RED BUD LN	SPRINGFIELD	IL	62712	16 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	18	RED BUD LN	SPRINGFIELD	IL	62712	18 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	2	RED BUD LN	SPRINGFIELD	IL	62712	2 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	22	RED BUD LN	SPRINGFIELD	IL	62707	22 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3001	RED BUD LN	SPRINGFIELD	IL	62712	3001 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3008	RED BUD LN	SPRINGFIELD	IL	62707	3008 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3009	RED BUD LN	SPRINGFIELD	IL	62707	3009 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3012	RED BUD LN	SPRINGFIELD	IL	62712	3012 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3013	RED BUD LN	SPRINGFIELD	IL	62712	3013 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3016	RED BUD LN	SPRINGFIELD	IL	62712	3016 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3100	RED BUD LN	SPRINGFIELD	IL	62707	3100 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3101	RED BUD LN	SPRINGFIELD	IL	62712	3101 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3104	RED BUD LN	SPRINGFIELD	IL	62712	3104 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3108	RED BUD LN	SPRINGFIELD	IL	62707	3108 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3109	RED BUD LN	SPRINGFIELD	IL	62712	3109 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3112	RED BUD LN	SPRINGFIELD	IL	62712	3112 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3113	RED BUD LN	SPRINGFIELD	IL	62707	3113 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3116	RED BUD LN	SPRINGFIELD	IL	62707	3116 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3117	RED BUD LN	SPRINGFIELD	IL	62712	3117 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3120	RED BUD LN	SPRINGFIELD	IL	62712	3120 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3121	RED BUD LN	SPRINGFIELD	IL	62712	3121 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3200	RED BUD LN	SPRINGFIELD	IL	62712	3200 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3204	RED BUD LN	SPRINGFIELD	IL	62712	3204 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3205	RED BUD LN	SPRINGFIELD	IL	62712	3205 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3208	RED BUD LN	SPRINGFIELD	IL	62712	3208 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3209	RED BUD LN	SPRINGFIELD	IL	62712	3209 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3212	RED BUD LN	SPRINGFIELD	IL	62712	3212 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3213	RED BUD LN	SPRINGFIELD	IL	62712	3213 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3216	RED BUD LN	SPRINGFIELD	IL	62712	3216 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3217	RED BUD LN	SPRINGFIELD	IL	62707	3217 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3220	RED BUD LN	SPRINGFIELD	IL	62712	3220 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3300	RED BUD LN	SPRINGFIELD	IL	62712	3300 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3301	RED BUD LN	SPRINGFIELD	IL	62712	3301 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3311	RED BUD LN	SPRINGFIELD	IL	62712	3304 LAUXMONT DR	SPRINGFIELD	IL	62712
Current Resident	3305	RED BUD LN	SPRINGFIELD	IL	62712	3305 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3316	RED BUD LN	SPRINGFIELD	IL	62712	3316 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3318	RED BUD LN	SPRINGFIELD	IL	62712	3316 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3319	RED BUD LN	SPRINGFIELD	IL	62707	3319 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3321	RED BUD LN	SPRINGFIELD	IL	62712	3321 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3320	RED BUD LN	SPRINGFIELD	IL	62712	3322 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3322	RED BUD LN	SPRINGFIELD	IL	62712	3322 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3324	RED BUD LN	SPRINGFIELD	IL	62712	3324 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3326	RED BUD LN	SPRINGFIELD	IL	62707	3326 RED BUD LN	SPRINGFIELD	IL	62712

Current Resident	3328	RED BUD LN	SPRINGFIELD	IL	62712	3328 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	3330	RED BUD LN	SPRINGFIELD	IL	62712	3330 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	34	RED BUD LN	SPRINGFIELD	IL	62712	34 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	35	RED BUD LN	SPRINGFIELD	IL	62707	35 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	5	RED BUD LN	SPRINGFIELD	IL	62712	5 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	6	RED BUD LN	SPRINGFIELD	IL	62712	6 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	9	RED BUD LN	SPRINGFIELD	IL	62712	9 RED BUD LN	SPRINGFIELD	IL	62712
Current Resident	5	RED BUD LN	SPRINGFIELD	IL	62707	90 WHITE PINE DR	SPRINGFIELD	IL	62712
Current Resident	3308	RED BUD LN	SPRINGFIELD	IL	62712	PO BOX 12830	JACKSON	MS	39236
Current Resident	3304	RED BUD LN	SPRINGFIELD	IL	62707	PO BOX 652	ROCHESTER	IL	62563
Current Resident	3219	RED OAK LN	SPRINGFIELD	IL	62712	1 HARLAN CT	SPRINGFIELD	IL	62712
Current Resident	10	RED OAK LN	SPRINGFIELD	IL	62712	10 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	12	RED OAK LN	SPRINGFIELD	IL	62712	12 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	13	RED OAK LN	SPRINGFIELD	IL	62712	13 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	14	RED OAK LN	SPRINGFIELD	IL	62712	14 RED OAK LN	SPRINGFIELD	IL	62712
Hope School	3113	RED OAK LN	SPRINGFIELD	IL	62707	15 EAST HAZEL DELL LN	SPRINGFIELD	IL	62712
Current Resident	16	RED OAK LN	SPRINGFIELD	IL	62707	16 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	18	RED OAK LN	SPRINGFIELD	IL	62712	18 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	20	RED OAK LN	SPRINGFIELD	IL	62712	20 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	21	RED OAK LN	SPRINGFIELD	IL	62712	21 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	22	RED OAK LN	SPRINGFIELD	IL	62712	22 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	24	RED OAK LN	SPRINGFIELD	IL	62707	24 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	26	RED OAK LN	SPRINGFIELD	IL	62707	26 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	28	RED OAK LN	SPRINGFIELD	IL	62712	28 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	2916	RED OAK LN	SPRINGFIELD	IL	62712	2916 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	2920	RED OAK LN	SPRINGFIELD	IL	62712	2920 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	30	RED OAK LN	SPRINGFIELD	IL	62712	30 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	3000	RED OAK LN	SPRINGFIELD	IL	62712	3000 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	3004	RED OAK LN	SPRINGFIELD	IL	62707	3004 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	3005	RED OAK LN	SPRINGFIELD	IL	62712	3005 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	3008	RED OAK LN	SPRINGFIELD	IL	62712	3008 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	3012	RED OAK LN	SPRINGFIELD	IL	62707	3012 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	3013	RED OAK LN	SPRINGFIELD	IL	62712	3013 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	3016	RED OAK LN	SPRINGFIELD	IL	62712	3016 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	3017	RED OAK LN	SPRINGFIELD	IL	62712	3017 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	3020	RED OAK LN	SPRINGFIELD	IL	62712	3020 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	3100	RED OAK LN	SPRINGFIELD	IL	62712	3100 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	3101	RED OAK LN	SPRINGFIELD	IL	62707	3101 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	3105	RED OAK LN	SPRINGFIELD	IL	62707	3105 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	3108	RED OAK LN	SPRINGFIELD	IL	62712	3108 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	3109	RED OAK LN	SPRINGFIELD	IL	62712	3109 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	3112	RED OAK LN	SPRINGFIELD	IL	62712	3112 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	3116	RED OAK LN	SPRINGFIELD	IL	62712	3116 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	3117	RED OAK LN	SPRINGFIELD	IL	62707	3117 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	3121	RED OAK LN	SPRINGFIELD	IL	62712	3121 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	3200	RED OAK LN	SPRINGFIELD	IL	62712	3200 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	3202	RED OAK LN	SPRINGFIELD	IL	62712	3202 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	3204	RED OAK LN	SPRINGFIELD	IL	62712	3204 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	3205	RED OAK LN	SPRINGFIELD	IL	62707	3205 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	3206	RED OAK LN	SPRINGFIELD	IL	62712	3206 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	3207	RED OAK LN	SPRINGFIELD	IL	62707	3207 RED OAK LN	SPRINGFIELD	IL	62712
Current Resident	3209	RED OAK LN	SPRINGFIELD	IL	62712	3209 RED OAK LN	SPRINGFIELD	IL	62712

Current Resident	3211	RED OAK LN	SPRINGFIELD	IL	62712	3211 RED OAK LN		SPRINGFIELD	IL	62712
Current Resident	3215	RED OAK LN	SPRINGFIELD	IL	62712	3212 RED OAK LN		SPRINGFIELD	IL	62712
Current Resident	3212	RED OAK LN	SPRINGFIELD	IL	62707	3212 RED OAK LN		SPRINGFIELD	IL	62712
Current Resident	3213	RED OAK LN	SPRINGFIELD	IL	62712	3213 RED OAK LN		SPRINGFIELD	IL	62712
Current Resident	3214	RED OAK LN	SPRINGFIELD	IL	62712	3214 RED OAK LN		SPRINGFIELD	IL	62712
Current Resident	3216	RED OAK LN	SPRINGFIELD	IL	62712	3216 RED OAK LN		SPRINGFIELD	IL	62712
Current Resident	3217	RED OAK LN	SPRINGFIELD	IL	62712	3217 RED OAK LN		SPRINGFIELD	IL	62712
Current Resident	3218	RED OAK LN	SPRINGFIELD	IL	62712	3218 RED OAK LN		SPRINGFIELD	IL	62712
Current Resident	3220	RED OAK LN	SPRINGFIELD	IL	62712	3220 RED OAK LN		SPRINGFIELD	IL	62712
Current Resident	3221	RED OAK LN	SPRINGFIELD	IL	62712	3221 RED OAK LN		SPRINGFIELD	IL	62712
Current Resident	3222	RED OAK LN	SPRINGFIELD	IL	62712	3222 RED OAK LN		SPRINGFIELD	IL	62712
Current Resident	3223	RED OAK LN	SPRINGFIELD	IL	62712	3223 RED OAK LN		SPRINGFIELD	IL	62712
Current Resident	3224	RED OAK LN	SPRINGFIELD	IL	62707	3224 RED OAK LN		SPRINGFIELD	IL	62712
Current Resident	3225	RED OAK LN	SPRINGFIELD	IL	62712	3225 RED OAK LN		SPRINGFIELD	IL	62712
Current Resident	3226	RED OAK LN	SPRINGFIELD	IL	62707	3226 RED OAK LN		SPRINGFIELD	IL	62712
Current Resident	3228	RED OAK LN	SPRINGFIELD	IL	62712	3228 RED OAK LN		SPRINGFIELD	IL	62712
Current Resident	3230	RED OAK LN	SPRINGFIELD	IL	62712	3230 RED OAK LN		SPRINGFIELD	IL	62712
Current Resident	3009	RED OAK LN	SPRINGFIELD	IL	62712	3600 BUCKEYE DR		SPRINGFIELD	IL	62712
Current Resident	4	RED OAK LN	SPRINGFIELD	IL	62712	4 RED OAK LN		SPRINGFIELD	IL	62712
Current Resident	6	RED OAK LN	SPRINGFIELD	IL	62707	6 RED OAK LN		SPRINGFIELD	IL	62712
Current Resident	8	RED OAK LN	SPRINGFIELD	IL	62712	8 RED OAK LN		SPRINGFIELD	IL	62712
Current Resident	3208	RED OAK LN	SPRINGFIELD	IL	62707	8 THE ELMS		SPRINGFIELD	IL	62712
Current Resident	9	RED OAK LN	SPRINGFIELD	IL	62712	9 RED OAK LN		SPRINGFIELD	IL	62712
Current Resident	3001	REILLY DR	SPRINGFIELD	IL	62703	1400 S RANEY ST		EFFINGHAM	IL	62401
Current Resident	3031	REILLY DR	SPRINGFIELD	IL	62703	1400 S RANEY ST		EFFINGHAM	IL	62401
Current Resident	3000	REILLY DR	SPRINGFIELD	IL	62703	3000 REILLY DR		SPRINGFIELD	IL	62703
Current Resident	3051	REILLY DR	SPRINGFIELD	IL	62703	723 PRAIRIE LAKE DR		SHERMAN	IL	62684
Current Resident	3050	REILLY DR	SPRINGFIELD	IL	62703	PO BOX 3326		SPRINGFIELD	IL	62708
Current Resident	3070	REILLY DR	SPRINGFIELD	IL	62703	PO BOX 3326		SPRINGFIELD	IL	62708
Current Resident	70	RITA RD	SPRINGFIELD	IL	62707	1106 N 32ND ST		SPRINGFIELD	IL	62702
Current Resident	50	RITA RD	SPRINGFIELD	IL	62712	50 RITA RD		SPRINGFIELD	IL	62712
Current Resident	54	RITA RD	SPRINGFIELD	IL	62712	54 RITA RD		SPRINGFIELD	IL	62712
Current Resident	62	RITA RD	SPRINGFIELD	IL	62712	62 RITA RD		SPRINGFIELD	IL	62712
LAKESIDE CHURCH OF CHRIS	65	RITA RD	SPRINGFIELD	IL	62703	65 RITA RD		SPRINGFIELD	IL	62712
Current Resident	66	RITA RD	SPRINGFIELD	IL	62712	66 RITA RD		SPRINGFIELD	IL	62712
Current Resident	58	RITA RD	SPRINGFIELD	IL	62712	7600 E ORCHARD RD STE 250N		GREENWOOD V	CO	80111
Current Resident	2500	ROADRUNNER CT	SPRINGFIELD	IL	62703	PO BOX 2216		SPRINGFIELD	IL	62705
Current Resident	2510	ROADRUNNER CT	SPRINGFIELD	IL	62703	PO BOX 2216		SPRINGFIELD	IL	62705
Current Resident	2520	ROADRUNNER CT	SPRINGFIELD	IL	62703	PO BOX 2216		SPRINGFIELD	IL	62705
Current Resident	3655	ROCHESTER RD	SPRINGFIELD	IL	62712	3655 ROCHESTER RD		SPRINGFIELD	IL	62712
SPRINGFIELD PARK DISTRICT	2500	S 11TH ST	SPRINGFIELD	IL	62703	2500 S 11TH ST		SPRINGFIELD	IL	62703
Current Resident	1321	S 8TH ST	SPRINGFIELD	IL	62703	1321 S 8TH ST		SPRINGFIELD	IL	62703
Current Resident	2805	S CLARK ST	SPRINGFIELD	IL	62703	2805 CLARK ST		SPRINGFIELD	IL	62703
Current Resident	20	S CLARK ST STE 1600	CHICAGO	IL	60603	20 S CLARK ST STE 1600		CHICAGO	IL	60603
Current Resident	20	S CLARK ST STE 1600	CHICAGO	IL	60603	20 S CLARK ST STE 1600		CHICAGO	IL	60603
Sangamon County	2201	S DIRKSEN PKY	SPRINGFIELD	IL	62703	% COUNTY ADMINISTRATOR	200 S 9TH ST STE 201	SPRINGFIELD	IL	62701
Red Lobster	2696	S DIRKSEN PKY	SPRINGFIELD	IL	62703	% RED LOBSTER	PO BOX 6467	ORLANDO	FL	32802
DRURY INNS INC	3190	S DIRKSEN PKY	SPRINGFIELD	IL	62707	101 S FARRAR DR		CAPE GIRARDEA	MO	63701
Current Resident	3000	S DIRKSEN PKY	SPRINGFIELD	IL	62703	11770 US HIGHWAY 1 STE 202		NORTH PALM B	FL	33408
Current Resident	3050	S DIRKSEN PKY	SPRINGFIELD	IL	62704	11770 US HIGHWAY 1 STE 202		NORTH PALM B	FL	33408
Current Resident	2550	S DIRKSEN PKY	SPRINGFIELD	IL	62704	1207 DORCHESTER DR		CHAMPAIGN	IL	61821
Current Resident	2100	S DIRKSEN PKY	SPRINGFIELD	IL	62703	126 E ASH ST		SPRINGFIELD	IL	62704

Current Resident	2300	S DIRKSEN PKY	SPRINGFIELD	IL	62702	126 E ASH ST		SPRINGFIELD	IL	62704
Current Resident	1730	S DIRKSEN PKY	SPRINGFIELD	IL	62703	1730 S DIRKSEN PKWY		SPRINGFIELD	IL	62703
Comfort Suites	2620	S DIRKSEN PKY	SPRINGFIELD	IL	62703	2 MELGROVE LN		HANNIBAL	MO	63401
TRES AMIGOS PROPERTIES L	3100	S DIRKSEN PKY	SPRINGFIELD	IL	62703	2144 S MACARTHUR BLVD		SPRINGFIELD	IL	62704
TRES AMIGOS PROPERTIES L	3104	S DIRKSEN PKY	SPRINGFIELD	IL	62703	2144 S MACARTHUR BLVD		SPRINGFIELD	IL	62704
TRES AMIGOS PROPERTIES L	3108	S DIRKSEN PKY	SPRINGFIELD	IL	62703	2144 S MACARTHUR BLVD		SPRINGFIELD	IL	62704
TRES AMIGOS PROPERTIES L	3112	S DIRKSEN PKY	SPRINGFIELD	IL	62703	2144 S MACARTHUR BLVD		SPRINGFIELD	IL	62704
TRES AMIGOS PROPERTIES L	3118	S DIRKSEN PKY	SPRINGFIELD	IL	62703	2144 S MACARTHUR BLVD		SPRINGFIELD	IL	62704
TRES AMIGOS PROPERTIES L	3124	S DIRKSEN PKY	SPRINGFIELD	IL	62703	2144 S MACARTHUR BLVD		SPRINGFIELD	IL	62704
Current Resident	2351	S DIRKSEN PKY	SPRINGFIELD	IL	62703	2310 OLD STATE RD		JACKSONVILLE	IL	62650
Long John Silver's	2929	S DIRKSEN PKY	SPRINGFIELD	IL	62703	252 S BEVERLY DR		BEVERLY HILLS	CA	90212
Arby's	3009	S DIRKSEN PKY	SPRINGFIELD	IL	62703	252 S BEVERLY DR		BEVERLY HILLS	CA	90212
BAD BOYZ OF ILLINOIS PRO	2600	S DIRKSEN PKY	SPRINGFIELD	IL	62703	2600 S DIRKSEN PKWY		SPRINGFIELD	IL	62703
Current Resident	3165	S DIRKSEN PKY	SPRINGFIELD	IL	62703	2809 KIPLING DR		SPRINGFIELD	IL	62711
Smokey Bones	2660	S DIRKSEN PKY	SPRINGFIELD	IL	62703	2999 NE 191ST ST STE 500		AVENTURA	FL	33180
JOHNSON SPRINGFIELD VEN	3185	S DIRKSEN PKY	SPRINGFIELD	IL	62702	3207 MATHERS RD STE A		SPRINGFIELD	IL	62711
DEW CHILLI	2690	S DIRKSEN PKY	SPRINGFIELD	IL	62703	4003 YUCAN DR		SPRINGFIELD	IL	62711
Current Resident	1960	S DIRKSEN PKY	SPRINGFIELD	IL	62702	4825 SAGE RD		ROCHESTER	IL	62563
Current Resident	3186	S DIRKSEN PKY	SPRINGFIELD	IL	62702	5457 OLD JACKSONVILLE RD		SPRINGFIELD	IL	62711
Current Resident	2251	S DIRKSEN PKY	SPRINGFIELD	IL	62703	815 N DIRKSEN PKWY		SPRINGFIELD	IL	62702
Current Resident	2945	S DIRKSEN PKY	SPRINGFIELD	IL	62703	ATTN LEASE ADMIN -R E TAX	11550 ASH ST STE 20	LEAWOOD	KS	66211
Current Resident	3151	S DIRKSEN PKY	SPRINGFIELD	IL	62703	MCGRAW ENTERPRISES	6450 6TH STREET FR	SPRINGFIELD	IL	62712
Current Resident	2000	S DIRKSEN PKY	SPRINGFIELD	IL	62703	PO BOX 2549		SPRINGFIELD	IL	62708
Sangamon County Water Re	2554	S DIRKSEN PKY	SPRINGFIELD	IL	62702	RECLAMATION DISTRICT	3000 N 8TH ST RD	SPRINGFIELD	IL	62707
Current Resident	1819	S DIRKSEN PKY	SPRINGFIELD	IL	62703	UNIT 3157 PMB 304	3941 TAMIAMI TRL	PUNTA GORDA	FL	33950
Current Resident	3289	S STATE RT 29	SPRINGFIELD	IL	62712	3289 E STATE ROUTE 29		SPRINGFIELD	IL	62712
Current Resident	4825	SAGE RD	ROCHESTER	IL	62563	4825 SAGE RD		ROCHESTER	IL	62563
Current Resident	4825	SAGE RD	ROCHESTER	IL	62563	4825 SAGE RD		ROCHESTER	IL	62563
Current Resident	4825	SAGE RD	ROCHESTER	IL	62563	4825 SAGE RD		ROCHESTER	IL	62563
Current Resident	6110	SAINT HILAIRE RD	ROCHESTER	IL	62563	6110 SAINT HILAIRE RD		ROCHESTER	IL	62563
Current Resident	915	SAN JOSE DR SE	GRAND RAPIDS	MI	49506	915 SAN JOSE DR SE		GRAND RAPIDS	MI	49506
Current Resident	3708	SATINWOOD DR	SPRINGFIELD	IL	62712	% MORTGAGE SERVICES III LLC	502 N HERSHEY RD	BLOOMINGTON	IL	61704
Current Resident	3524	SATINWOOD DR	SPRINGFIELD	IL	62712	222 2ND AVE SE		CEDAR RAPIDS	IA	52401
Current Resident	3616	SATINWOOD DR	SPRINGFIELD	IL	62707	3304 LAUXMONT DR		SPRINGFIELD	IL	62712
Current Resident	3500	SATINWOOD DR	SPRINGFIELD	IL	62712	3500 SATINWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3501	SATINWOOD DR	SPRINGFIELD	IL	62707	3501 SATINWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3505	SATINWOOD DR	SPRINGFIELD	IL	62712	3505 SATINWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3509	SATINWOOD DR	SPRINGFIELD	IL	62712	3509 SATINWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3513	SATINWOOD DR	SPRINGFIELD	IL	62712	3513 SATINWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3516	SATINWOOD DR	SPRINGFIELD	IL	62712	3516 SATINWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3517	SATINWOOD DR	SPRINGFIELD	IL	62712	3517 SATINWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3521	SATINWOOD DR	SPRINGFIELD	IL	62707	3521 SATINWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3525	SATINWOOD DR	SPRINGFIELD	IL	62712	3525 SATINWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3600	SATINWOOD DR	SPRINGFIELD	IL	62712	3600 SATINWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3601	SATINWOOD DR	SPRINGFIELD	IL	62712	3601 SATINWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3604	SATINWOOD DR	SPRINGFIELD	IL	62712	3604 SATINWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3605	SATINWOOD DR	SPRINGFIELD	IL	62707	3605 SATINWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3608	SATINWOOD DR	SPRINGFIELD	IL	62712	3608 SATINWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3609	SATINWOOD DR	SPRINGFIELD	IL	62707	3609 SATINWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3612	SATINWOOD DR	SPRINGFIELD	IL	62712	3612 SATINWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3613	SATINWOOD DR	SPRINGFIELD	IL	62707	3613 SATINWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3700	SATINWOOD DR	SPRINGFIELD	IL	62712	3700 SATINWOOD DR		SPRINGFIELD	IL	62712

Current Resident	3702	SATINWOOD DR	SPRINGFIELD	IL	62712	3702 SATINWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3704	SATINWOOD DR	SPRINGFIELD	IL	62712	3704 SATINWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3705	SATINWOOD DR	SPRINGFIELD	IL	62712	3705 SATINWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3709	SATINWOOD DR	SPRINGFIELD	IL	62712	3709 SATINWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3712	SATINWOOD DR	SPRINGFIELD	IL	62712	3712 SATINWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3219	SEQUOIA DR	SPRINGFIELD	IL	62712	2316 LAKE CREST DR		SPRINGFIELD	IL	62712
Current Resident	3004	SEQUOIA DR	SPRINGFIELD	IL	62712	3004 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3005	SEQUOIA DR	SPRINGFIELD	IL	62712	3005 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3008	SEQUOIA DR	SPRINGFIELD	IL	62712	3008 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3009	SEQUOIA DR	SPRINGFIELD	IL	62712	3009 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3012	SEQUOIA DR	SPRINGFIELD	IL	62707	3012 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3015	SEQUOIA DR	SPRINGFIELD	IL	62707	3015 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3016	SEQUOIA DR	SPRINGFIELD	IL	62707	3016 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3100	SEQUOIA DR	SPRINGFIELD	IL	62707	3100 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3101	SEQUOIA DR	SPRINGFIELD	IL	62712	3101 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3104	SEQUOIA DR	SPRINGFIELD	IL	62712	3104 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3105	SEQUOIA DR	SPRINGFIELD	IL	62707	3105 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3108	SEQUOIA DR	SPRINGFIELD	IL	62707	3108 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3109	SEQUOIA DR	SPRINGFIELD	IL	62712	3109 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3112	SEQUOIA DR	SPRINGFIELD	IL	62712	3112 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3113	SEQUOIA DR	SPRINGFIELD	IL	62707	3113 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3116	SEQUOIA DR	SPRINGFIELD	IL	62712	3116 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3117	SEQUOIA DR	SPRINGFIELD	IL	62712	3117 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3121	SEQUOIA DR	SPRINGFIELD	IL	62712	3121 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3201	SEQUOIA DR	SPRINGFIELD	IL	62712	3201 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3203	SEQUOIA DR	SPRINGFIELD	IL	62712	3203 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3204	SEQUOIA DR	SPRINGFIELD	IL	62712	3204 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3206	SEQUOIA DR	SPRINGFIELD	IL	62707	3206 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3207	SEQUOIA DR	SPRINGFIELD	IL	62712	3207 SEQUOIA DR # 2		SPRINGFIELD	IL	62712
Current Resident	3208	SEQUOIA DR	SPRINGFIELD	IL	62712	3208 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3209	SEQUOIA DR	SPRINGFIELD	IL	62712	3209 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3210	SEQUOIA DR	SPRINGFIELD	IL	62712	3210 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3211	SEQUOIA DR	SPRINGFIELD	IL	62707	3211 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3212	SEQUOIA DR	SPRINGFIELD	IL	62712	3212 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3213	SEQUOIA DR	SPRINGFIELD	IL	62712	3213 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3214	SEQUOIA DR	SPRINGFIELD	IL	62707	3214 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3215	SEQUOIA DR	SPRINGFIELD	IL	62712	3215 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3216	SEQUOIA DR	SPRINGFIELD	IL	62707	3216 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3217	SEQUOIA DR	SPRINGFIELD	IL	62712	3217 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3218	SEQUOIA DR	SPRINGFIELD	IL	62712	3218 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3220	SEQUOIA DR	SPRINGFIELD	IL	62712	3220 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3221	SEQUOIA DR	SPRINGFIELD	IL	62712	3221 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3222	SEQUOIA DR	SPRINGFIELD	IL	62712	3222 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3223	SEQUOIA DR	SPRINGFIELD	IL	62707	3223 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3224	SEQUOIA DR	SPRINGFIELD	IL	62707	3224 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3226	SEQUOIA DR	SPRINGFIELD	IL	62707	3226 SEQUOIA DR		SPRINGFIELD	IL	62712
Current Resident	3205	SEQUOIA DR	SPRINGFIELD	IL	62712	700 RESERVE BLVD APT 103		EVANSVILLE	IN	47715
Current Resident	3225	SEQUOIA DR	SPRINGFIELD	IL	62707	8 THE ELMS		SPRINGFIELD	IL	62712
Sangamon County	2000	SHALE ST	SPRINGFIELD	IL	62703	% COUNTY ADMINISTRATOR	200 S 9TH ST STE 201	SPRINGFIELD	IL	62701
Current Resident	2100	SHALE ST	SPRINGFIELD	IL	62703	% COUNTY BOARD CHAIRMAN	200 S 9TH ST RM 200	SPRINGFIELD	IL	62701
Current Resident	2147	SHALE ST	SPRINGFIELD	IL	62703	2147 SHALE ST		SPRINGFIELD	IL	62703
Current Resident	2165	SHALE ST	SPRINGFIELD	IL	62703	2165 SHALE ST		SPRINGFIELD	IL	62703

Current Resident	2179	SHALE ST	SPRINGFIELD	IL	62703	2179 SHALE ST		SPRINGFIELD	IL	62703
Current Resident	2195	SHALE ST	SPRINGFIELD	IL	62703	2195 SHALE ST		SPRINGFIELD	IL	62703
Current Resident	2141	SHALE ST	SPRINGFIELD	IL	62703	815 N DIRKSEN PKWY		SPRINGFIELD	IL	62702
Current Resident	2219	SHALE ST	SPRINGFIELD	IL	62703	UNIT 3157 PMB 304	3941 TAMIAMI TRL	PUNTA GORDA	FL	33950
Current Resident	1101 1/2	SOUTH GRAND AVE E	SPRINGFIELD	IL	62703	1101 1/2 SOUTH GRAND AVE E		SPRINGFIELD	IL	62703
Current Resident	2913	SPRINGWOOD DR	SPRINGFIELD	IL	62712	1115 N MONTGOMERY AVE		BREMERTON	WA	98312
Current Resident	2925	SPRINGWOOD DR	SPRINGFIELD	IL	62707	143 LACONWOOD DR		SPRINGFIELD	IL	62712
Hope School	2917	SPRINGWOOD DR	SPRINGFIELD	IL	62707	15 EAST HAZEL DELL LN		SPRINGFIELD	IL	62712
Current Resident	2901	SPRINGWOOD DR	SPRINGFIELD	IL	62712	2901 SPRINGWOOD DR		SPRINGFIELD	IL	62712
Current Resident	2905	SPRINGWOOD DR	SPRINGFIELD	IL	62712	2905 SPRINGWOOD DR		SPRINGFIELD	IL	62712
Current Resident	2909	SPRINGWOOD DR	SPRINGFIELD	IL	62712	2909 SPRINGWOOD DR		SPRINGFIELD	IL	62712
Current Resident	2921	SPRINGWOOD DR	SPRINGFIELD	IL	62712	2921 SPRINGWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3000	SPRINGWOOD DR	SPRINGFIELD	IL	62712	3000 SPRINGWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3001	SPRINGWOOD DR	SPRINGFIELD	IL	62712	3001 SPRINGWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3005	SPRINGWOOD DR	SPRINGFIELD	IL	62707	3005 SPRINGWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3008	SPRINGWOOD DR	SPRINGFIELD	IL	62712	3008 SPRINGWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3009	SPRINGWOOD DR	SPRINGFIELD	IL	62712	3009 SPRINGWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3013	SPRINGWOOD DR	SPRINGFIELD	IL	62712	3013 SPRINGWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3016	SPRINGWOOD DR	SPRINGFIELD	IL	62712	3016 SPRINGWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3017	SPRINGWOOD DR	SPRINGFIELD	IL	62712	3017 SPRINGWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3020	SPRINGWOOD DR	SPRINGFIELD	IL	62712	3020 SPRINGWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3021	SPRINGWOOD DR	SPRINGFIELD	IL	62712	3021 SPRINGWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3024	SPRINGWOOD DR	SPRINGFIELD	IL	62712	3024 SPRINGWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3025	SPRINGWOOD DR	SPRINGFIELD	IL	62707	3025 SPRINGWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3029	SPRINGWOOD DR	SPRINGFIELD	IL	62712	3029 SPRINGWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3500	ST ANNES DR	SPRINGFIELD	IL	62712	3500 SAINT ANNES DR		SPRINGFIELD	IL	62712
Current Resident	3504	ST ANNES DR	SPRINGFIELD	IL	62712	3504 SAINT ANNES DR		SPRINGFIELD	IL	62712
Current Resident	3505	ST ANNES DR	SPRINGFIELD	IL	62712	3505 SAINT ANNES DR		SPRINGFIELD	IL	62712
Current Resident	3508	ST ANNES DR	SPRINGFIELD	IL	62712	3508 SAINT ANNES DR		SPRINGFIELD	IL	62712
Current Resident	3509	ST ANNES DR	SPRINGFIELD	IL	62712	3509 SAINT ANNES DR		SPRINGFIELD	IL	62712
Current Resident	3512	ST ANNES DR	SPRINGFIELD	IL	62712	3512 SAINT ANNES DR		SPRINGFIELD	IL	62712
Current Resident	3516	ST ANNES DR	SPRINGFIELD	IL	62712	3516 SAINT ANNES DR		SPRINGFIELD	IL	62712
Current Resident	3517	ST ANNES DR	SPRINGFIELD	IL	62712	3517 SAINT ANNES DR		SPRINGFIELD	IL	62712
Current Resident	3520	ST ANNES DR	SPRINGFIELD	IL	62707	3520 SAINT ANNES DR		SPRINGFIELD	IL	62712
Current Resident	3521	ST ANNES DR	SPRINGFIELD	IL	62712	3521 SAINT ANNES DR		SPRINGFIELD	IL	62712
Current Resident	3524	ST ANNES DR	SPRINGFIELD	IL	62707	3524 SAINT ANNES DR		SPRINGFIELD	IL	62712
Current Resident	3525	ST ANNES DR	SPRINGFIELD	IL	62712	3525 SAINT ANNES DR		SPRINGFIELD	IL	62712
Current Resident	3528	ST ANNES DR	SPRINGFIELD	IL	62712	3528 SAINT ANNES DR		SPRINGFIELD	IL	62712
Current Resident	3600	ST ANNES DR	SPRINGFIELD	IL	62712	3600 SAINT ANNES DR		SPRINGFIELD	IL	62712
Current Resident	3513	ST ANNES DR	SPRINGFIELD	IL	62712	3600 WABASH AVE		SPRINGFIELD	IL	62711
Current Resident	3601	ST ANNES DR	SPRINGFIELD	IL	62712	3601 SAINT ANNES DR		SPRINGFIELD	IL	62712
Current Resident	3604	ST ANNES DR	SPRINGFIELD	IL	62707	3604 SAINT ANNES DR		SPRINGFIELD	IL	62712
Current Resident	3605	ST ANNES DR	SPRINGFIELD	IL	62712	3605 SAINT ANNES DR		SPRINGFIELD	IL	62712
Current Resident	3608	ST ANNES DR	SPRINGFIELD	IL	62712	3608 SAINT ANNES DR		SPRINGFIELD	IL	62712
Current Resident	3609	ST ANNES DR	SPRINGFIELD	IL	62712	3609 SAINT ANNES DR		SPRINGFIELD	IL	62712
Current Resident	3612	ST ANNES DR	SPRINGFIELD	IL	62712	3612 SAINT ANNES DR		SPRINGFIELD	IL	62712
Current Resident	3616	ST ANNES DR	SPRINGFIELD	IL	62712	3616 SAINT ANNES DR		SPRINGFIELD	IL	62712
Current Resident	3617	ST ANNES DR	SPRINGFIELD	IL	62712	3617 SAINT ANNES DR		SPRINGFIELD	IL	62712
Current Resident	2920	STANFORD AVE	SPRINGFIELD	IL	62703	1207 DORCHESTER DR		CHAMPAIGN	IL	61821
Current Resident	2601	STANFORD AVE	SPRINGFIELD	IL	62703	1207 DORCHESTER DR		CHAMPAIGN	IL	61821
Current Resident	2619	STANFORD AVE	SPRINGFIELD	IL	62703	1207 DORCHESTER DR		CHAMPAIGN	IL	61821
Current Resident	2659	STANFORD AVE	SPRINGFIELD	IL	62703	1207 DORCHESTER DR		CHAMPAIGN	IL	61821

Current Resident	2701		STANFORD AVE	SPRINGFIELD	IL	62703	1207 DORCHESTER DR	CHAMPAIGN	IL	61821
Current Resident	2717		STANFORD AVE	SPRINGFIELD	IL	62703	1207 DORCHESTER DR	CHAMPAIGN	IL	61821
CANCO INC	2729		STANFORD AVE	SPRINGFIELD	IL	62703	1207 DORCHESTER DR	CHAMPAIGN	IL	61821
CANCO INC	2801		STANFORD AVE	SPRINGFIELD	IL	62703	1207 DORCHESTER DR	CHAMPAIGN	IL	61821
CANCO INC	2817		STANFORD AVE	SPRINGFIELD	IL	62703	1207 DORCHESTER DR	CHAMPAIGN	IL	61821
CANCO INC	2833		STANFORD AVE	SPRINGFIELD	IL	62703	1207 DORCHESTER DR	CHAMPAIGN	IL	61821
CANCO INC	2832		STANFORD AVE	SPRINGFIELD	IL	62703	1207 DORCHESTER DR	CHAMPAIGN	IL	61821
CANCO INC	2816		STANFORD AVE	SPRINGFIELD	IL	62703	1207 DORCHESTER DR	CHAMPAIGN	IL	61821
CANCO INC	2800		STANFORD AVE	SPRINGFIELD	IL	62703	1207 DORCHESTER DR	CHAMPAIGN	IL	61821
CANCO INC	2730		STANFORD AVE	SPRINGFIELD	IL	62703	1207 DORCHESTER DR	CHAMPAIGN	IL	61821
CANCO INC	2716		STANFORD AVE	SPRINGFIELD	IL	62703	1207 DORCHESTER DR	CHAMPAIGN	IL	61821
CANCO INC	2700		STANFORD AVE	SPRINGFIELD	IL	62703	1207 DORCHESTER DR	CHAMPAIGN	IL	61821
CANCO INC	2658		STANFORD AVE	SPRINGFIELD	IL	62703	1207 DORCHESTER DR	CHAMPAIGN	IL	61821
CANCO INC	2646		STANFORD AVE	SPRINGFIELD	IL	62703	1207 DORCHESTER DR	CHAMPAIGN	IL	61821
CANCO INC	2634		STANFORD AVE	SPRINGFIELD	IL	62703	1207 DORCHESTER DR	CHAMPAIGN	IL	61821
CANCO INC	2620		STANFORD AVE	SPRINGFIELD	IL	62703	1207 DORCHESTER DR	CHAMPAIGN	IL	61821
CANCO INC	2600		STANFORD AVE	SPRINGFIELD	IL	62703	1207 DORCHESTER DR	CHAMPAIGN	IL	61821
EHRHARDT HOSPITALITY LL	2915		STANFORD AVE	SPRINGFIELD	IL	62703	2 MELGROVE LN	HANNIBAL	MO	63401
CANCUN III INC	3028		STANFORD AVE	SPRINGFIELD	IL	62703	420 CROSSING DR	SHERMAN	IL	62684
Current Resident	2900		STANTON ST	SPRINGFIELD	IL	62703	12422 W DOWNING PL	BRIMFIELD	IL	61517
Current Resident	2821		STANTON ST	SPRINGFIELD	IL	62703	200 N 11TH ST	SPRINGFIELD	IL	62703
Current Resident	2854		STANTON ST	SPRINGFIELD	IL	62703	200 N 11TH ST	SPRINGFIELD	IL	62703
WATTS COPY REAL ESTATE L	2860		STANTON ST	SPRINGFIELD	IL	62703	2860 STANTON ST	SPRINGFIELD	IL	62703
Current Resident	2911		STANTON ST	SPRINGFIELD	IL	62703	2911 STANTON ST	SPRINGFIELD	IL	62703
Current Resident	2832		STANTON ST	SPRINGFIELD	IL	62703	4350 E BASELINE RD	BELGRADE	MT	59714
Current Resident	2836		STANTON ST	SPRINGFIELD	IL	62704	4350 E BASELINE RD	BELGRADE	MT	59714
Current Resident	2844		STANTON ST	SPRINGFIELD	IL	62704	4350 E BASELINE RD	BELGRADE	MT	59714
Current Resident	2848		STANTON ST	SPRINGFIELD	IL	62704	4350 E BASELINE RD	BELGRADE	MT	59714
Current Resident	2852		STANTON ST	SPRINGFIELD	IL	62703	4350 E BASELINE RD	BELGRADE	MT	59714
SPRINGFIELD MECHANICAL	2861		STANTON ST	SPRINGFIELD	IL	62703	44 MELODY LN	SPRINGFIELD	IL	62702
Current Resident	2861		STANTON ST	SPRINGFIELD	IL	62703	44 MELODY LN	SPRINGFIELD	IL	62702
Current Resident	2871		STANTON ST	SPRINGFIELD	IL	62703	8208 HUNT RD	SPRINGFIELD	IL	62712
Current Resident	2901		STANTON ST	SPRINGFIELD	IL	62703	823 WHISPERING PINES DR	CHATHAM	IL	62629
Current Resident	2850	E	STATE RT 29	SPRINGFIELD	IL	62707	2850 E STATE ROUTE 29	SPRINGFIELD	IL	62712
Current Resident	2625		STEILER PL	SPRINGFIELD	IL	62703	2500 WESTFIELD DR	ELGIN	IL	60124
Current Resident	2600		STEILER PL	SPRINGFIELD	IL	62703	2600 STEILER PL	SPRINGFIELD	IL	62703
Current Resident	2601		STEILER PL	SPRINGFIELD	IL	62704	2601 STEILER PL	SPRINGFIELD	IL	62703
Current Resident	2608		STEILER PL	SPRINGFIELD	IL	62703	2608 STEILER PL	SPRINGFIELD	IL	62703
Current Resident	2612		STEILER PL	SPRINGFIELD	IL	62703	2612 STEILER PL	SPRINGFIELD	IL	62703
Current Resident	2613		STEILER PL	SPRINGFIELD	IL	62703	2613 STEILER PL	SPRINGFIELD	IL	62703
Current Resident	2616		STEILER PL	SPRINGFIELD	IL	62703	2616 STEILER PL	SPRINGFIELD	IL	62703
Current Resident	2617		STEILER PL	SPRINGFIELD	IL	62703	2617 STEILER PL	SPRINGFIELD	IL	62703
Current Resident	2620		STEILER PL	SPRINGFIELD	IL	62703	2620 STEILER PL	SPRINGFIELD	IL	62703
Current Resident	2621		STEILER PL	SPRINGFIELD	IL	62703	2621 STEILER PL	SPRINGFIELD	IL	62703
Current Resident	2624		STEILER PL	SPRINGFIELD	IL	62703	2624 STEILER PL	SPRINGFIELD	IL	62703
Current Resident	2628		STEILER PL	SPRINGFIELD	IL	62703	2628 STEILER PL	SPRINGFIELD	IL	62703
Current Resident	2632		STEILER PL	SPRINGFIELD	IL	62703	2632 STEILER PL	SPRINGFIELD	IL	62703
Current Resident	2633		STEILER PL	SPRINGFIELD	IL	62703	2633 STEILER PL	SPRINGFIELD	IL	62703
Current Resident	2700		STEILER PL	SPRINGFIELD	IL	62703	2700 STEILER PL	SPRINGFIELD	IL	62703
Current Resident	2701		STEILER PL	SPRINGFIELD	IL	62703	2701 STEILER PL	SPRINGFIELD	IL	62703
Current Resident	2704		STEILER PL	SPRINGFIELD	IL	62703	2704 STEILER PL	SPRINGFIELD	IL	62703
Current Resident	2705		STEILER PL	SPRINGFIELD	IL	62703	2705 STEILER PL	SPRINGFIELD	IL	62703

Current Resident	2708	STEILER PL	SPRINGFIELD	IL	62703	2708 STEILER PL		SPRINGFIELD	IL	62703
Current Resident	2709	STEILER PL	SPRINGFIELD	IL	62703	2709 STEILER PL		SPRINGFIELD	IL	62703
Current Resident	2712	STEILER PL	SPRINGFIELD	IL	62703	2712 STEILER PL		SPRINGFIELD	IL	62703
Current Resident	2713	STEILER PL	SPRINGFIELD	IL	62703	2713 STEILER PL		SPRINGFIELD	IL	62703
Current Resident	2716	STEILER PL	SPRINGFIELD	IL	62703	2716 STEILER PL		SPRINGFIELD	IL	62703
Current Resident	2717	STEILER PL	SPRINGFIELD	IL	62703	2717 STEILER PL		SPRINGFIELD	IL	62703
Current Resident	2720	STEILER PL	SPRINGFIELD	IL	62703	2720 STEILER PL		SPRINGFIELD	IL	62703
Current Resident	2721	STEILER PL	SPRINGFIELD	IL	62703	2721 STEILER PL		SPRINGFIELD	IL	62703
Current Resident	2724	STEILER PL	SPRINGFIELD	IL	62703	2724 STEILER PL		SPRINGFIELD	IL	62703
Current Resident	2725	STEILER PL	SPRINGFIELD	IL	62703	2725 STEILER PL		SPRINGFIELD	IL	62703
Current Resident	2732	STEILER PL	SPRINGFIELD	IL	62703	2732 STEILER PL		SPRINGFIELD	IL	62703
Current Resident	2728	STEILER PL	SPRINGFIELD	IL	62703	3341 OLD JACKSONVILLE RD		SPRINGFIELD	IL	62711
Current Resident	2629	STEILER PL	SPRINGFIELD	IL	62703	PO BOX 961227		FORT WORTH	TX	76161
Current Resident	2604	STEILER PL	SPRINGFIELD	IL	62703	PO BOX 961227		FORT WORTH	TX	76161
Current Resident	3013	SUMMERWOOD DR	SPRINGFIELD	IL	62712	3013 SUMMERWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3017	SUMMERWOOD DR	SPRINGFIELD	IL	62712	3017 SUMMERWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3021	SUMMERWOOD DR	SPRINGFIELD	IL	62712	3021 SUMMERWOOD DR		SPRINGFIELD	IL	62712
Current Resident	2554	SUNRISE DR	SPRINGFIELD	IL	62703	% ANDREW ROBERTSON	1127 QUEENSBOROU	MT PLEASANT	SC	29464
Current Resident	2536	SUNRISE DR	SPRINGFIELD	IL	62703	% ANDREW ROBERTSON	1127 QUEENSBOROU	MT PLEASANT	SC	29464
Current Resident	2623	SUNRISE DR	SPRINGFIELD	IL	62704	11703 IL HIGHWAY 1		PARIS	IL	61944
EHRHARDT HOSPITALITY LLC	2501	SUNRISE DR	SPRINGFIELD	IL	62703	2 MELGROVE LN		HANNIBAL	MO	63401
EHRHARDT HOSPITALITY LLC	2521	SUNRISE DR	SPRINGFIELD	IL	62703	2 MELGROVE LN		HANNIBAL	MO	63401
EHRHARDT HOSPITALITY LLC	2535	SUNRISE DR	SPRINGFIELD	IL	62703	2 MELGROVE LN		HANNIBAL	MO	63401
EHRHARDT HOSPITALITY LLC	2555	SUNRISE DR	SPRINGFIELD	IL	62703	2 MELGROVE LN		HANNIBAL	MO	63401
Current Resident	2636	SUNRISE DR	SPRINGFIELD	IL	62703	2636 SUNRISE DR		SPRINGFIELD	IL	62703
Current Resident	2520	SUNRISE DR	SPRINGFIELD	IL	62703	785 S 1ST ST		SHERMAN	IL	62684
Current Resident	2500	SUNRISE DR	SPRINGFIELD	IL	62703	785 S 1ST ST		SHERMAN	IL	62684
Current Resident	2600	SUNRISE DR	SPRINGFIELD	IL	62704	PO BOX 59470		SCHAUMBURG	IL	60159
Current Resident	2618	SUNRISE DR	SPRINGFIELD	IL	62703	PO BOX 59470		SCHAUMBURG	IL	60159
Current Resident	32	SUTTON PL	SPRINGFIELD	IL	62703	32 SUTTON PL		SPRINGFIELD	IL	62703
Current Resident	36	SUTTON PL	SPRINGFIELD	IL	62703	36 SUTTON PL		SPRINGFIELD	IL	62703
Current Resident	40	SUTTON PL	SPRINGFIELD	IL	62703	40 SUTTON PL		SPRINGFIELD	IL	62703
Current Resident	44	SUTTON PL	SPRINGFIELD	IL	62703	44 SUTTON PL		SPRINGFIELD	IL	62703
Current Resident	48	SUTTON PL	SPRINGFIELD	IL	62703	48 SUTTON PL		SPRINGFIELD	IL	62703
Current Resident	52	SUTTON PL	SPRINGFIELD	IL	62703	52 SUTTON PL		SPRINGFIELD	IL	62703
Current Resident	56	SUTTON PL	SPRINGFIELD	IL	62703	56 SUTTON PL		SPRINGFIELD	IL	62703
Current Resident	60	SUTTON PL	SPRINGFIELD	IL	62703	60 SUTTON PL		SPRINGFIELD	IL	62703
Current Resident	64	SUTTON PL	SPRINGFIELD	IL	62703	64 SUTTON PL		SPRINGFIELD	IL	62703
Current Resident	3700	SWITCHGRASS CT	SPRINGFIELD	IL	62712	3700 SWITCHGRASS CT		SPRINGFIELD	IL	62712
Current Resident	3701	SWITCHGRASS CT	SPRINGFIELD	IL	62712	3701 SWITCHGRASS CT		SPRINGFIELD	IL	62712
Current Resident	3705	SWITCHGRASS CT	SPRINGFIELD	IL	62707	3705 SWITCHGRASS CT		SPRINGFIELD	IL	62712
Current Resident	3401	TALLGRASS DR	SPRINGFIELD	IL	62707	3401 TALLGRASS DR		SPRINGFIELD	IL	62712
Current Resident	3404	TALLGRASS DR	SPRINGFIELD	IL	62707	3404 TALLGRASS DR		SPRINGFIELD	IL	62712
Current Resident	3408	TALLGRASS DR	SPRINGFIELD	IL	62712	3408 TALLGRASS DR		SPRINGFIELD	IL	62712
Current Resident	3800	TAMARAK DR	SPRINGFIELD	IL	62712	% FREEDOM MORTGAGE CORP	907 PLEASANT VALLE	MOUNT LAUREL	NJ	8054
Current Resident	3505	TAMARAK DR	SPRINGFIELD	IL	62712	3505 TAMARAK DR		SPRINGFIELD	IL	62712
Current Resident	3509	TAMARAK DR	SPRINGFIELD	IL	62712	3509 TAMARAK DR		SPRINGFIELD	IL	62712
Current Resident	3513	TAMARAK DR	SPRINGFIELD	IL	62712	3513 TAMARAK DR		SPRINGFIELD	IL	62712
Current Resident	3516	TAMARAK DR	SPRINGFIELD	IL	62712	3516 TAMARAK DR		SPRINGFIELD	IL	62712
Current Resident	3517	TAMARAK DR	SPRINGFIELD	IL	62712	3517 TAMARAK DR		SPRINGFIELD	IL	62712
Current Resident	3520	TAMARAK DR	SPRINGFIELD	IL	62712	3520 TAMARAK DR		SPRINGFIELD	IL	62712
Current Resident	3521	TAMARAK DR	SPRINGFIELD	IL	62712	3521 TAMARAK DR		SPRINGFIELD	IL	62712

Current Resident	3524	TAMARAK DR		SPRINGFIELD	IL	62712	3524 TAMARAK DR		SPRINGFIELD	IL	62712
Current Resident	3525	TAMARAK DR		SPRINGFIELD	IL	62712	3525 TAMARAK DR		SPRINGFIELD	IL	62712
Current Resident	3528	TAMARAK DR		SPRINGFIELD	IL	62712	3528 TAMARAK DR		SPRINGFIELD	IL	62712
Current Resident	3529	TAMARAK DR		SPRINGFIELD	IL	62707	3529 TAMARAK DR		SPRINGFIELD	IL	62712
Current Resident	3533	TAMARAK DR		SPRINGFIELD	IL	62712	3533 TAMARAK DR		SPRINGFIELD	IL	62712
Current Resident	3537	TAMARAK DR		SPRINGFIELD	IL	62712	3537 TAMARAK DR		SPRINGFIELD	IL	62712
Current Resident	3600	TAMARAK DR		SPRINGFIELD	IL	62712	3600 TAMARAK DR		SPRINGFIELD	IL	62712
Current Resident	3601	TAMARAK DR		SPRINGFIELD	IL	62712	3601 TAMARAK DR		SPRINGFIELD	IL	62712
Current Resident	3700	TAMARAK DR		SPRINGFIELD	IL	62712	3700 TAMARAK DR		SPRINGFIELD	IL	62712
Current Resident	3705	TAMARAK DR		SPRINGFIELD	IL	62707	3705 TAMARAK DR		SPRINGFIELD	IL	62712
Current Resident	3709	TAMARAK DR		SPRINGFIELD	IL	62707	3709 TAMARAK DR		SPRINGFIELD	IL	62712
Current Resident	3717	TAMARAK DR		SPRINGFIELD	IL	62707	3717 TAMARAK DR		SPRINGFIELD	IL	62712
Current Resident	3720	TAMARAK DR		SPRINGFIELD	IL	62712	3720 TAMARAK DR		SPRINGFIELD	IL	62712
Current Resident	3721	TAMARAK DR		SPRINGFIELD	IL	62707	3721 TAMARAK DR		SPRINGFIELD	IL	62712
Current Resident	3725	TAMARAK DR		SPRINGFIELD	IL	62712	3725 TAMARAK DR		SPRINGFIELD	IL	62712
Current Resident	3801	TAMARAK DR		SPRINGFIELD	IL	62707	3801 TAMARAK DR		SPRINGFIELD	IL	62712
Current Resident	3805	TAMARAK DR		SPRINGFIELD	IL	62707	3805 TAMARAK DR		SPRINGFIELD	IL	62712
Current Resident	3809	TAMARAK DR		SPRINGFIELD	IL	62712	3809 TAMARAK DR		SPRINGFIELD	IL	62712
Current Resident	3810	TAMARAK DR		SPRINGFIELD	IL	62712	3810 TAMARAK DR		SPRINGFIELD	IL	62712
Current Resident	3941	TAMIAMI TRL UNIT 3157		PUNTA GORDA	FL	33950	UNIT 3157 PMB 304	3941 TAMIAMI TRL	PUNTA GORDA	FL	33950
Current Resident	3100	TAYLOR AVE		SPRINGFIELD	IL	62703	1 CVS DR		WOONSOCKET	RI	2895
UCP Land of Lincoln	2917	TAYLOR AVE		SPRINGFIELD	IL	62703	101 N 16TH ST		SPRINGFIELD	IL	62703
KROGER MANAGEMENT-	3101	TAYLOR AVE		SPRINGFIELD	IL	62703	1014 VINE ST STE 1000		CINCINNATI	OH	45202
Current Resident	2423	TAYLOR AVE		SPRINGFIELD	IL	62703	111 E WACKER DR STE 1000		CHICAGO	IL	60601
Current Resident	2449	TAYLOR AVE		SPRINGFIELD	IL	62703	111 E WACKER DR STE 1000		CHICAGO	IL	60601
Current Resident	2325	TAYLOR AVE		SPRINGFIELD	IL	62703	2323 TAYLOR AVE		SPRINGFIELD	IL	62703
Current Resident	2403	TAYLOR AVE		SPRINGFIELD	IL	62703	2403 TAYLOR AVE		SPRINGFIELD	IL	62703
Current Resident	2400	TAYLOR AVE		SPRINGFIELD	IL	62703	2410 TAYLOR AVE		SPRINGFIELD	IL	62703
Current Resident	2410	TAYLOR AVE		SPRINGFIELD	IL	62703	2410 TAYLOR AVE		SPRINGFIELD	IL	62703
FIRST GENERAL BAPTIST CHI	2450	TAYLOR AVE		SPRINGFIELD	IL	62703	2450 TAYLOR AVE		SPRINGFIELD	IL	62703
SANGAMON AREA SPECIAL I	2300	TAYLOR AVE		SPRINGFIELD	IL	62702	2500 S 11TH ST		SPRINGFIELD	IL	62703
Current Resident	2500	TAYLOR AVE		SPRINGFIELD	IL	62703	2500 TAYLOR AVE		SPRINGFIELD	IL	62703
Current Resident	2875	TAYLOR AVE		SPRINGFIELD	IL	62703	2524 W LAKE SHORE DR		SPRINGFIELD	IL	62712
Current Resident	2525	TAYLOR AVE		SPRINGFIELD	IL	62703	2525 TAYLOR AVE		SPRINGFIELD	IL	62703
Current Resident	2601	TAYLOR AVE		SPRINGFIELD	IL	62703	2601 TAYLOR AVE		SPRINGFIELD	IL	62703
Current Resident	2883	TAYLOR AVE		SPRINGFIELD	IL	62703	285 S FARNHAM ST		GALESBURG	IL	61401
Current Resident	3021	TAYLOR AVE		SPRINGFIELD	IL	62703	285 S FARNHAM ST		GALESBURG	IL	61401
Current Resident	2906	TAYLOR AVE	7	SPRINGFIELD	IL	62703	2906 TAYLOR AVE APT 7		SPRINGFIELD	IL	62703
Current Resident	2403	TAYLOR AVE		SPRINGFIELD	IL	62703	3003 TERMINAL AVE		SPRINGFIELD	IL	62707
Current Resident	2851	TAYLOR AVE		SPRINGFIELD	IL	62703	5275 WOLF CREEK HWY		ADRIAN	MI	49221
LINCOLN LAND DEV CO &	3041	TAYLOR AVE		SPRINGFIELD	IL	62703	PO BOX 13167		SPRINGFIELD	IL	62791
Current Resident	2925	TAYLOR AVE		SPRINGFIELD	IL	62703	PO BOX 2216		SPRINGFIELD	IL	62705
Current Resident	2947	TAYLOR AVE		SPRINGFIELD	IL	62703	PO BOX 2216		SPRINGFIELD	IL	62705
Current Resident	2935	TAYLOR AVE		SPRINGFIELD	IL	62703	PO BOX 3363		SPRINGFIELD	IL	62708
Current Resident	2900	TAYLOR AVENUE 1-01		SPRINGFIELD	IL	62703	2900 TAYLOR AVE APT 1-01		SPRINGFIELD	IL	62703
Current Resident	2900	TAYLOR AV 2		SPRINGFIELD	IL	62703	2900 TAYLOR AVE APT 9		SPRINGFIELD	IL	62703
Current Resident	2900	TAYLOR AV 3		SPRINGFIELD	IL	62703	2900 TAYLOR AVE APT 11		SPRINGFIELD	IL	62703
Current Resident	2900	TAYLOR AV 4		SPRINGFIELD	IL	62703	2900 TAYLOR AVE APT 7		SPRINGFIELD	IL	62703
Current Resident	2900	TAYLOR AV 5		SPRINGFIELD	IL	62703	2900 TAYLOR AVE APT 5		SPRINGFIELD	IL	62703
Current Resident	2900	TAYLOR AV 6		SPRINGFIELD	IL	62703	2900 TAYLOR AVE APT 8		SPRINGFIELD	IL	62703
Current Resident	2900	TAYLOR AV 7		SPRINGFIELD	IL	62703	2900 TAYLOR AVE APT 6		SPRINGFIELD	IL	62703
Current Resident	2900	TAYLOR AV 8		SPRINGFIELD	IL	62703	39 BUNN DR		SPRINGFIELD	IL	62703

Current Resident	2900	TAYLOR AV	9		SPRINGFIELD	IL	62703	2900 TAYLOR AVE APT 1		SPRINGFIELD	IL	62703
Current Resident	2900	TAYLOR AV	10		SPRINGFIELD	IL	62703	% WILLIAM & MICHELLE KAESEBIER	2900 TAYLOR AVE AP	SPRINGFIELD	IL	62703
Current Resident	2900	TAYLOR AV	11		SPRINGFIELD	IL	62703	PO BOX 10614		PEORIA	IL	61612
Current Resident	2906	TAYLOR AVENUE	2-12		SPRINGFIELD	IL	62703	2906 TAYLOR AVE APT 10		SPRINGFIELD	IL	62703
Current Resident	2906	TAYLOR AV	2		SPRINGFIELD	IL	62703	5466 MILD DR		SAINT LOUIS	MO	63129
Current Resident	2906	TAYLOR AV	3		SPRINGFIELD	IL	62703	2906 TAYLOR AVE APT 11		SPRINGFIELD	IL	62703
Current Resident	2906	TAYLOR AV	5		SPRINGFIELD	IL	62703	11928 N CR 1450E		HAVANA	IL	62644
Current Resident	2906	TAYLOR AV	6		SPRINGFIELD	IL	62703	2906 TAYLOR AVE APT 2-17		SPRINGFIELD	IL	62703
Current Resident	2906	TAYLOR AV	7		SPRINGFIELD	IL	62703	322 E CAPITOL AVE		SPRINGFIELD	IL	62701
Current Resident	2906	TAYLOR AV	8		SPRINGFIELD	IL	62703	2906 TAYLOR AVE		SPRINGFIELD	IL	62703
Current Resident	2906	TAYLOR AV	9		SPRINGFIELD	IL	62703	2906 TAYLOR AVE APT 9 2-20		SPRINGFIELD	IL	62703
Current Resident	2906	TAYLOR AV	10		SPRINGFIELD	IL	62703	2147 W 107TH ST		CHICAGO	IL	60643
Current Resident	2906	TAYLOR AV	11		SPRINGFIELD	IL	62703	2906 TAYLOR AVE APT 2		SPRINGFIELD	IL	62703
Current Resident	2912	TAYLOR AVENUE	3-23	10	SPRINGFIELD	IL	62703	2912 TAYLOR AVE APT 10		SPRINGFIELD	IL	62703
Current Resident	2912	TAYLOR AV	2		SPRINGFIELD	IL	62703	% BILLY SELMAN	5600 GRANITE PKWY	PLANO	TX	75024
Current Resident	2912	TAYLOR AV	3		SPRINGFIELD	IL	62703	PO BOX 1804		DAYTON	OH	45401
Current Resident	2912	TAYLOR AV	4		SPRINGFIELD	IL	62704	2912 TAYLOR AVE APT 4 3-26		SPRINGFIELD	IL	62703
Current Resident	2912	TAYLOR AV	5		SPRINGFIELD	IL	62703	9 ALKEN CT		SPRINGFIELD	IL	62703
Current Resident	2912	TAYLOR AV	6		SPRINGFIELD	IL	62704	2912 TAYLOR AVE APT 8		SPRINGFIELD	IL	62703
Current Resident	2912	TAYLOR AV	7		SPRINGFIELD	IL	62703	PO BOX 107		MIDDLETOWN	IL	62666
Current Resident	2912	TAYLOR AV	8		SPRINGFIELD	IL	62703	2912 TAYLOR AVE APT 3		SPRINGFIELD	IL	62703
Current Resident	2912	TAYLOR AV	9		SPRINGFIELD	IL	62703	401 N MADISON ST	PO BOX 410	LITCHFIELD	IL	62056
Current Resident	2912	TAYLOR AV	10		SPRINGFIELD	IL	62703	2912 TAYLOR AVE APT 4		SPRINGFIELD	IL	62703
Current Resident	2912	TAYLOR AV	11		SPRINGFIELD	IL	62703	BUILDING 3 UNIT 33 (APT 2)	2912 TAYLOR AVE	SPRINGFIELD	IL	62703
Current Resident	3000	TAYLOR AVENUE	4-34		SPRINGFIELD	IL	62703	3000 TAYLOR AVE # 4-34		SPRINGFIELD	IL	62703
Current Resident	3000	TAYLOR AV	2		SPRINGFIELD	IL	62703	3000 TAYLOR AVE APT 35		SPRINGFIELD	IL	62703
Current Resident	3000	TAYLOR AV	3		SPRINGFIELD	IL	62703	5050 S INDIANA AVE		CHICAGO	IL	60615
Current Resident	3000	TAYLOR AV	4		SPRINGFIELD	IL	62704	3000 TAYLOR AVE APT 37		SPRINGFIELD	IL	62703
Current Resident	3000	TAYLOR AV	5		SPRINGFIELD	IL	62703	3000 TAYLOR AVE APT 38		SPRINGFIELD	IL	62703
Current Resident	3000	TAYLOR AV	6		SPRINGFIELD	IL	62703	3000 TAYLOR AVE APT 39		SPRINGFIELD	IL	62703
Current Resident	3000	TAYLOR AV	7		SPRINGFIELD	IL	62703	3000 TAYLOR AVE BLDG 7		SPRINGFIELD	IL	62703
Current Resident	3000	TAYLOR AV	8		SPRINGFIELD	IL	62703	3000 TAYLOR AVE APT 41		SPRINGFIELD	IL	62703
Current Resident	3000	TAYLOR AV	9		SPRINGFIELD	IL	62703	2500 WESTFIELD DR STE 102		ELGIN	IL	60124
Current Resident	3000	TAYLOR AV	10		SPRINGFIELD	IL	62703	3000 TAYLOR AVE 4-43		SPRINGFIELD	IL	62703
Current Resident	3000	TAYLOR AV	11		SPRINGFIELD	IL	62703	3000 TAYLOR AVE 4-44		SPRINGFIELD	IL	62703
Current Resident	3006	TAYLOR AVENUE	5-45		SPRINGFIELD	IL	62703	9000 SOUTHSIDE BLVD		JACKSONVILLE	FL	32256
Current Resident	3006	TAYLOR AV	2		SPRINGFIELD	IL	62703	3006 TAYLOR AVE APT 46		SPRINGFIELD	IL	62703
Current Resident	3006	TAYLOR AV	3		SPRINGFIELD	IL	62703	3006 TAYLOR AVE APT 47		SPRINGFIELD	IL	62703
Current Resident	3006	TAYLOR AV	4		SPRINGFIELD	IL	62703	3006 TAYLOR AVE APT 48		SPRINGFIELD	IL	62703
Current Resident	3006	TAYLOR AV	5		SPRINGFIELD	IL	62703	3006 TAYLOR AVE APT 49		SPRINGFIELD	IL	62703
Current Resident	3006	TAYLOR AV	6		SPRINGFIELD	IL	62703	3006 TAYLOR AVE APT 50		SPRINGFIELD	IL	62703
Current Resident	3006	TAYLOR AV	7		SPRINGFIELD	IL	62703	3006 TAYLOR AVE APT 51		SPRINGFIELD	IL	62703
Current Resident	3006	TAYLOR AV	8		SPRINGFIELD	IL	62703	3006 TAYLOR AVE # 5-52		SPRINGFIELD	IL	62703
Current Resident	3006	TAYLOR AV	9		SPRINGFIELD	IL	62703	3006 TAYLOR AVE APT 53		SPRINGFIELD	IL	62703
Current Resident	3006	TAYLOR AV	10		SPRINGFIELD	IL	62703	2423 TAYLOR AVE APT 217		SPRINGFIELD	IL	62703
Current Resident	3006	TAYLOR AV	11		SPRINGFIELD	IL	62703	3006 TAYLOR AVE # 99		SPRINGFIELD	IL	62703
Current Resident	3012	TAYLOR AVENUE	6-56		SPRINGFIELD	IL	62704	3012 TAYLOR AVE APT 56		SPRINGFIELD	IL	62703
Current Resident	3012	TAYLOR AV	2		SPRINGFIELD	IL	62702	2912 TAYLOR AVE APT 3		SPRINGFIELD	IL	62703
Current Resident	3012	TAYLOR AV	3		SPRINGFIELD	IL	62703	853 CHILE CT		LAS CRUCES	NM	88001
Current Resident	3012	TAYLOR AV	4		SPRINGFIELD	IL	62703	3012 TAYLOR AVE APT 6-59		SPRINGFIELD	IL	62703
Current Resident	3012	TAYLOR AV	5		SPRINGFIELD	IL	62703	3RD FL	5604 S PRAIRIE AVE	CHICAGO	IL	60637
Current Resident	3012	TAYLOR AV	6		SPRINGFIELD	IL	62703	3012 TAYLOR AVE APT 61		SPRINGFIELD	IL	62703

Current Resident	3012	TAYLOR AV	7	SPRINGFIELD	IL	62703	13 RAMBLEWOOD DR		CHATHAM	IL	62629
Current Resident	3012	TAYLOR AV	8	SPRINGFIELD	IL	62703	3012 TAYLOR AVE 6-63		SPRINGFIELD	IL	62703
Current Resident	3012	TAYLOR AVENUE	6-64	SPRINGFIELD	IL	62703	2050 W DUNLAP AVE M 276		PHOENIX	AZ	85021
Current Resident	3012	TAYLOR AV	10	SPRINGFIELD	IL	62703	% WILLIAMS LETITIA	3012 TAYLOR AVE AP	SPRINGFIELD	IL	62703
Current Resident	3012	TAYLOR AV	11	SPRINGFIELD	IL	62703	3012 TAYLOR AVE APT 66		SPRINGFIELD	IL	62703
Current Resident	3612	TEAKWOOD DR		SPRINGFIELD	IL	62707	1907 E NORTH GRAND AVE		SPRINGFIELD	IL	62702
Current Resident	3510	TEAKWOOD DR		SPRINGFIELD	IL	62712	219 N MAIN ST		RIVERTON	IL	62561
Current Resident	3605	TEAKWOOD DR		SPRINGFIELD	IL	62712	2308 SYLVAN RD		SPRINGFIELD	IL	62704
Current Resident	3500	TEAKWOOD DR		SPRINGFIELD	IL	62712	3500 TEAKWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3504	TEAKWOOD DR		SPRINGFIELD	IL	62712	3504 TEAKWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3509	TEAKWOOD DR		SPRINGFIELD	IL	62712	3509 TEAKWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3515	TEAKWOOD DR		SPRINGFIELD	IL	62712	3515 TEAKWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3516	TEAKWOOD DR		SPRINGFIELD	IL	62712	3516 TEAKWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3517	TEAKWOOD DR		SPRINGFIELD	IL	62712	3517 TEAKWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3518	TEAKWOOD DR		SPRINGFIELD	IL	62707	3518 TEAKWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3520	TEAKWOOD DR		SPRINGFIELD	IL	62707	3520 TEAKWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3522	TEAKWOOD DR		SPRINGFIELD	IL	62712	3522 TEAKWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3523	TEAKWOOD DR		SPRINGFIELD	IL	62712	3523 TEAKWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3524	TEAKWOOD DR		SPRINGFIELD	IL	62712	3524 TEAKWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3521	TEAKWOOD DR		SPRINGFIELD	IL	62712	3601 BANYAN DR		SPRINGFIELD	IL	62712
Current Resident	3601	TEAKWOOD DR		SPRINGFIELD	IL	62707	3601 TEAKWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3603	TEAKWOOD DR		SPRINGFIELD	IL	62712	3603 TEAKWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3604	TEAKWOOD DR		SPRINGFIELD	IL	62712	3604 TEAKWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3606	TEAKWOOD DR		SPRINGFIELD	IL	62712	3606 TEAKWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3607	TEAKWOOD DR		SPRINGFIELD	IL	62712	3607 TEAKWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3608	TEAKWOOD DR		SPRINGFIELD	IL	62712	3608 TEAKWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3609	TEAKWOOD DR		SPRINGFIELD	IL	62712	3609 TEAKWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3610	TEAKWOOD DR		SPRINGFIELD	IL	62712	3610 TEAKWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3611	TEAKWOOD DR		SPRINGFIELD	IL	62712	3611 TEAKWOOD DR		SPRINGFIELD	IL	62712
Current Resident	3508	TEAKWOOD DR		SPRINGFIELD	IL	62707	510 OLD TIMBERS		ROCHESTER	IL	62563
Current Resident	3600	TEAKWOOD DR		SPRINGFIELD	IL	62707	6 FOX MILL LN		SPRINGFIELD	IL	62712
Current Resident	3526	TEAKWOOD DR		SPRINGFIELD	IL	62712	6 FOX MILL LN		SPRINGFIELD	IL	62712
Current Resident	3512	TEAKWOOD DR		SPRINGFIELD	IL	62707	PO BOX 4895		SPRINGFIELD	IL	62708
Current Resident	3514	TEAKWOOD DR		SPRINGFIELD	IL	62707	PO BOX 4895		SPRINGFIELD	IL	62708
Sangamon County	3003	TERMINAL AVE		SPRINGFIELD	IL	62707	3003 TERMINAL AVE		SPRINGFIELD	IL	62707
Current Resident	500	TOTTEN POND RD		WALTHAM	MA	02451	500 TOTTEN POND RD		WALTHAM	MA	2451
Current Resident	3605	TROON DR		SPRINGFIELD	IL	62707	26 HOSPERS DR		SPRINGFIELD	IL	62712
Current Resident	3609	TROON DR		SPRINGFIELD	IL	62707	26 HOSPERS DR		SPRINGFIELD	IL	62712
Current Resident	3613	TROON DR		SPRINGFIELD	IL	62707	2840 ADLAI STEVENSON DR		SPRINGFIELD	IL	62703
Current Resident	3601	TROON DR		SPRINGFIELD	IL	62712	3601 TROON DR		SPRINGFIELD	IL	62712
Current Resident	3603	TROON DR		SPRINGFIELD	IL	62712	3603 TROON DR		SPRINGFIELD	IL	62712
Current Resident	3610	TROON DR		SPRINGFIELD	IL	62712	3610 TROON DR		SPRINGFIELD	IL	62712
Current Resident	3617	TROON DR		SPRINGFIELD	IL	62712	3617 TROON DR		SPRINGFIELD	IL	62712
Current Resident	3618	TROON DR		SPRINGFIELD	IL	62707	3618 TROON DR		SPRINGFIELD	IL	62712
Current Resident	3619	TROON DR		SPRINGFIELD	IL	62712	3619 TROON DR		SPRINGFIELD	IL	62712
Current Resident	3621	TROON DR		SPRINGFIELD	IL	62712	3621 TROON DR		SPRINGFIELD	IL	62712
Current Resident	3623	TROON DR		SPRINGFIELD	IL	62712	3623 TROON DR		SPRINGFIELD	IL	62712
Current Resident	3629	TROON DR		SPRINGFIELD	IL	62712	3629 TROON DR		SPRINGFIELD	IL	62712
Current Resident	3637	TROON DR		SPRINGFIELD	IL	62712	3637 TROON DR		SPRINGFIELD	IL	62712
Current Resident	3640	TROON DR		SPRINGFIELD	IL	62712	3640 TROON DR		SPRINGFIELD	IL	62712
Current Resident	3641	TROON DR		SPRINGFIELD	IL	62712	3641 TROON DR		SPRINGFIELD	IL	62712
Current Resident	3645	TROON DR		SPRINGFIELD	IL	62712	3645 TROON DR		SPRINGFIELD	IL	62712

Current Resident	3649	TROON DR	SPRINGFIELD	IL	62712	3649 TROON DR		SPRINGFIELD	IL	62712
Current Resident	3437	TUXHORN RD	SPRINGFIELD	IL	62712	3415 TUXHORN RD		SPRINGFIELD	IL	62712
Current Resident	3415	TUXHORN RD	SPRINGFIELD	IL	62712	3415 TUXHORN RD		SPRINGFIELD	IL	62712
Current Resident	3422	TUXHORN RD	SPRINGFIELD	IL	62712	3422 TUXHORN RD		SPRINGFIELD	IL	62712
Current Resident	3426	TUXHORN RD	SPRINGFIELD	IL	62712	3426 TUXHORN RD		SPRINGFIELD	IL	62712
Current Resident	3427	TUXHORN RD	SPRINGFIELD	IL	62712	3427 TUXHORN RD		SPRINGFIELD	IL	62712
Current Resident	3430	TUXHORN RD	SPRINGFIELD	IL	62712	3430 TUXHORN RD		SPRINGFIELD	IL	62712
Current Resident	3431	TUXHORN RD	SPRINGFIELD	IL	62712	3431 TUXHORN RD		SPRINGFIELD	IL	62712
Current Resident	3436	TUXHORN RD	SPRINGFIELD	IL	62712	3436 TUXHORN RD		SPRINGFIELD	IL	62712
Current Resident	3535	TUXHORN RD	SPRINGFIELD	IL	62712	3535 TUXHORN RD		SPRINGFIELD	IL	62712
Current Resident	3614	TUXHORN RD	SPRINGFIELD	IL	62712	3614 TUXHORN RD		SPRINGFIELD	IL	62712
Current Resident	3656	TUXHORN RD	SPRINGFIELD	IL	62712	3656 TUXHORN RD		SPRINGFIELD	IL	62712
Current Resident	3716	VIKING BLVD	SPRINGFIELD	IL	62707	% PENNY MAC	6101 CONDOR DR	MOORPARK	CA	93021
Current Resident	3813	VIKING BLVD	SPRINGFIELD	IL	62707	% PRIMELENDING	18111 PRESTON RD S	DALLAS	TX	75252
Current Resident	3700	VIKING BLVD	SPRINGFIELD	IL	62712	3700 VIKING BLVD		SPRINGFIELD	IL	62712
Current Resident	3701	VIKING BLVD	SPRINGFIELD	IL	62712	3701 VIKING BLVD		SPRINGFIELD	IL	62712
Current Resident	3704	VIKING BLVD	SPRINGFIELD	IL	62712	3704 VIKING BLVD		SPRINGFIELD	IL	62712
Current Resident	3705	VIKING BLVD	SPRINGFIELD	IL	62712	3705 VIKING BLVD		SPRINGFIELD	IL	62712
Current Resident	3708	VIKING BLVD	SPRINGFIELD	IL	62712	3708 VIKING BLVD		SPRINGFIELD	IL	62712
Current Resident	3709	VIKING BLVD	SPRINGFIELD	IL	62712	3709 VIKING BLVD		SPRINGFIELD	IL	62712
Current Resident	3712	VIKING BLVD	SPRINGFIELD	IL	62712	3712 VIKING BLVD		SPRINGFIELD	IL	62712
Current Resident	3713	VIKING BLVD	SPRINGFIELD	IL	62712	3713 VIKING BLVD		SPRINGFIELD	IL	62712
Current Resident	3717	VIKING BLVD	SPRINGFIELD	IL	62712	3717 VIKING BLVD		SPRINGFIELD	IL	62712
Current Resident	3720	VIKING BLVD	SPRINGFIELD	IL	62707	3720 VIKING BLVD		SPRINGFIELD	IL	62712
Current Resident	3721	VIKING BLVD	SPRINGFIELD	IL	62712	3721 VIKING BLVD		SPRINGFIELD	IL	62712
Current Resident	3724	VIKING BLVD	SPRINGFIELD	IL	62712	3724 VIKING BLVD		SPRINGFIELD	IL	62712
Current Resident	3725	VIKING BLVD	SPRINGFIELD	IL	62712	3725 VIKING BLVD		SPRINGFIELD	IL	62712
Current Resident	3728	VIKING BLVD	SPRINGFIELD	IL	62712	3728 VIKING BLVD		SPRINGFIELD	IL	62712
Current Resident	3732	VIKING BLVD	SPRINGFIELD	IL	62712	3732 VIKING BLVD		SPRINGFIELD	IL	62712
Current Resident	3800	VIKING BLVD	SPRINGFIELD	IL	62712	3800 VIKING BLVD		SPRINGFIELD	IL	62712
Current Resident	3801	VIKING BLVD	SPRINGFIELD	IL	62712	3801 VIKING BLVD		SPRINGFIELD	IL	62712
Current Resident	3804	VIKING BLVD	SPRINGFIELD	IL	62712	3804 VIKING BLVD		SPRINGFIELD	IL	62712
Current Resident	3805	VIKING BLVD	SPRINGFIELD	IL	62712	3805 VIKING BLVD		SPRINGFIELD	IL	62712
Current Resident	3808	VIKING BLVD	SPRINGFIELD	IL	62712	3808 VIKING BLVD		SPRINGFIELD	IL	62712
Current Resident	3809	VIKING BLVD	SPRINGFIELD	IL	62712	3809 VIKING BLVD		SPRINGFIELD	IL	62712
Current Resident	3817	VIKING BLVD	SPRINGFIELD	IL	62712	3817 VIKING BLVD		SPRINGFIELD	IL	62712
Current Resident	3820	VIKING BLVD	SPRINGFIELD	IL	62712	3820 VIKING BLVD		SPRINGFIELD	IL	62712
Current Resident	3821	VIKING BLVD	SPRINGFIELD	IL	62712	3821 VIKING BLVD		SPRINGFIELD	IL	62712
Current Resident	3824	VIKING BLVD	SPRINGFIELD	IL	62707	3824 VIKING BLVD		SPRINGFIELD	IL	62712
Current Resident	3825	VIKING BLVD	SPRINGFIELD	IL	62712	3825 VIKING BLVD		SPRINGFIELD	IL	62712
Current Resident	3828	VIKING BLVD	SPRINGFIELD	IL	62712	3828 VIKING BLVD		SPRINGFIELD	IL	62712
Current Resident	3816	VIKING BLVD	SPRINGFIELD	IL	62712	PO BOX 1804		DAYTON	OH	45401
Current Resident	3812	VIKING BLVD	SPRINGFIELD	IL	62712	PO BOX 8800		DAYTON	OH	45401
Current Resident	55	VILLANOVA DR	SPRINGFIELD	IL	62703	% CENTRAL LOAN ADMIN & REPORT	PO BOX 986	NEWARK	NJ	7184
Current Resident	1	VILLANOVA DR	SPRINGFIELD	IL	62703	1 VILLANOVA DR		SPRINGFIELD	IL	62703
Current Resident	15	VILLANOVA DR	SPRINGFIELD	IL	62703	15 VILLANOVA DR		SPRINGFIELD	IL	62703
Current Resident	24	VILLANOVA DR	SPRINGFIELD	IL	62703	19387 HURRICANE DR		CARLINVILLE	IL	62626
Current Resident	2	VILLANOVA DR	SPRINGFIELD	IL	62703	2 VILLANOVA DR		SPRINGFIELD	IL	62703
Current Resident	23	VILLANOVA DR	SPRINGFIELD	IL	62703	23 VILLANOVA DR		SPRINGFIELD	IL	62703
Current Resident	33	VILLANOVA DR	SPRINGFIELD	IL	62703	2500 WESTFIELD DR STE 102		ELGIN	IL	60124
Current Resident	64	VILLANOVA DR	SPRINGFIELD	IL	62703	2628 E GRIFFITHS AVE		SPRINGFIELD	IL	62702
Current Resident	27	VILLANOVA DR	SPRINGFIELD	IL	62703	27 VILLANOVA DR		SPRINGFIELD	IL	62703

Current Resident	28	VILLANOVA DR	SPRINGFIELD	IL	62703	28 VILLANOVA DR		SPRINGFIELD	IL	62703
Current Resident	32	VILLANOVA DR	SPRINGFIELD	IL	62703	32 VILLANOVA DR		SPRINGFIELD	IL	62703
Current Resident	19	VILLANOVA DR	SPRINGFIELD	IL	62703	3341 OLD JACKSONVILLE RD		SPRINGFIELD	IL	62711
Current Resident	35	VILLANOVA DR	SPRINGFIELD	IL	62703	35 VILLANOVA DR		SPRINGFIELD	IL	62703
Current Resident	36	VILLANOVA DR	SPRINGFIELD	IL	62703	36 VILLANOVA DR		SPRINGFIELD	IL	62703
Current Resident	40	VILLANOVA DR	SPRINGFIELD	IL	62703	40 VILLANOVA DR		SPRINGFIELD	IL	62703
Current Resident	43	VILLANOVA DR	SPRINGFIELD	IL	62703	43 VILLANOVA DR		SPRINGFIELD	IL	62703
Current Resident	44	VILLANOVA DR	SPRINGFIELD	IL	62703	44 VILLANOVA DR		SPRINGFIELD	IL	62703
Current Resident	47	VILLANOVA DR	SPRINGFIELD	IL	62703	47 VILLANOVA DR		SPRINGFIELD	IL	62703
Current Resident	5	VILLANOVA DR	SPRINGFIELD	IL	62703	5 VILLANOVA DR		SPRINGFIELD	IL	62703
Current Resident	51	VILLANOVA DR	SPRINGFIELD	IL	62703	51 VILLANOVA DR		SPRINGFIELD	IL	62703
Current Resident	63	VILLANOVA DR	SPRINGFIELD	IL	62703	63 VILLANOVA DR		SPRINGFIELD	IL	62703
Current Resident	67	VILLANOVA DR	SPRINGFIELD	IL	62703	67 VILLANOVA DR		SPRINGFIELD	IL	62703
Current Resident	71	VILLANOVA DR	SPRINGFIELD	IL	62703	71 VILLANOVA DR		SPRINGFIELD	IL	62703
Current Resident	75	VILLANOVA DR	SPRINGFIELD	IL	62703	75 VILLANOVA DR		SPRINGFIELD	IL	62703
Current Resident	9	VILLANOVA DR	SPRINGFIELD	IL	62703	PO BOX 1804		DAYTON	OH	45401
Current Resident	39	VILLANOVA DR	SPRINGFIELD	IL	62703	PO BOX 1820		DAYTON	OH	45401
Current Resident	48	VILLANOVA DR	SPRINGFIELD	IL	62703	PO BOX 1820		DAYTON	OH	45401
Current Resident	59	VILLANOVA DR	SPRINGFIELD	IL	62703	PO BOX 20005		OWENSBORO	KY	42304
Current Resident	2475	W MONROE ST	SPRINGFIELD	IL	62704	2475 W MONROE ST		SPRINGFIELD	IL	62704
Springfield Public Schools #	530	W REYNOLDS	SPRINGFIELD	IL	62702	OPERATIONS & MAINT	530 W REYNOLDS ST	SPRINGFIELD	IL	62702
Little Flower	1615	W WASHINGTON ST	SPRINGFIELD	IL	62702	1615 W WASHINGTON ST		SPRINGFIELD	IL	62702
Current Resident	3850	WAGON TRL	SPRINGFIELD	IL	62707	3850 WAGON TRL		SPRINGFIELD	IL	62712
Current Resident	3870	WAGON TRL	SPRINGFIELD	IL	62712	3870 WAGON TRL		SPRINGFIELD	IL	62712
Current Resident	2720	WALTER RD	SPRINGFIELD	IL	62703	2720 WALTER RD		SPRINGFIELD	IL	62703
Current Resident	2722	WALTER RD	SPRINGFIELD	IL	62703	2722 WALTER RD		SPRINGFIELD	IL	62703
Current Resident	2724	WALTER RD	SPRINGFIELD	IL	62703	2724 WALTER RD		SPRINGFIELD	IL	62703
Current Resident	2804	WALTER RD	SPRINGFIELD	IL	62703	2804 WALTER RD		SPRINGFIELD	IL	62703
Current Resident	2808	WALTER RD	SPRINGFIELD	IL	62703	2808 WALTER RD		SPRINGFIELD	IL	62703
Current Resident	2812	WALTER RD	SPRINGFIELD	IL	62703	2812 WALTER RD		SPRINGFIELD	IL	62703
Current Resident	2800	WALTER RD	SPRINGFIELD	IL	62703	PO BOX 21162		SPRINGFIELD	IL	62708
Current Resident	3205	WARNER DR	SPRINGFIELD	IL	62703	3205 WARNER DR		SPRINGFIELD	IL	62703
Current Resident	3209	WARNER DR	SPRINGFIELD	IL	62703	3209 WARNER DR		SPRINGFIELD	IL	62703
Current Resident	3213	WARNER DR	SPRINGFIELD	IL	62703	3213 WARNER DR		SPRINGFIELD	IL	62703
Current Resident	3217	WARNER DR	SPRINGFIELD	IL	62703	3217 WARNER DR		SPRINGFIELD	IL	62703
Current Resident	3225	WARNER DR	SPRINGFIELD	IL	62703	3225 WARNER DR		SPRINGFIELD	IL	62703
Current Resident	3232	WARNER DR	SPRINGFIELD	IL	62703	3232 WARNER DR		SPRINGFIELD	IL	62703
Current Resident	3233	WARNER DR	SPRINGFIELD	IL	62703	3233 WARNER DR		SPRINGFIELD	IL	62703
Current Resident	3236	WARNER DR	SPRINGFIELD	IL	62703	3236 WARNER DR		SPRINGFIELD	IL	62703
Current Resident	3237	WARNER DR	SPRINGFIELD	IL	62703	3237 WARNER DR		SPRINGFIELD	IL	62703
Current Resident	3240	WARNER DR	SPRINGFIELD	IL	0	3240 WARNER DR		SPRINGFIELD	IL	62703
Current Resident	3241	WARNER DR	SPRINGFIELD	IL	62703	3241 WARNER DR		SPRINGFIELD	IL	62703
Current Resident	3244	WARNER DR	SPRINGFIELD	IL	62703	3244 WARNER DR		SPRINGFIELD	IL	62703
Current Resident	3221	WARNER DR	SPRINGFIELD	IL	62703	631 WHITE OAK DR		CHATHAM	IL	62629
Current Resident	3229	WARNER DR	SPRINGFIELD	IL	62703	800 E NORTH GRAND AVE		SPRINGFIELD	IL	62702
Current Resident	2700	WARRIOR BLVD	SPRINGFIELD	IL	62712	2242 W AUGUSTA DR		DUNLAP	IL	61525
Current Resident	2600	WARRIOR BLVD	SPRINGFIELD	IL	62712	2600 WARRIOR BLVD		SPRINGFIELD	IL	62712
Current Resident	2604	WARRIOR BLVD	SPRINGFIELD	IL	62712	2604 WARRIOR BLVD		SPRINGFIELD	IL	62712
Current Resident	2608	WARRIOR BLVD	SPRINGFIELD	IL	62712	2608 WARRIOR BLVD		SPRINGFIELD	IL	62712
Current Resident	2612	WARRIOR BLVD	SPRINGFIELD	IL	62707	2612 WARRIOR BLVD		SPRINGFIELD	IL	62712
Current Resident	2704	WARRIOR BLVD	SPRINGFIELD	IL	62707	2704 WARRIOR BLVD		SPRINGFIELD	IL	62712
Current Resident	2708	WARRIOR BLVD	SPRINGFIELD	IL	62712	2708 WARRIOR BLVD		SPRINGFIELD	IL	62712

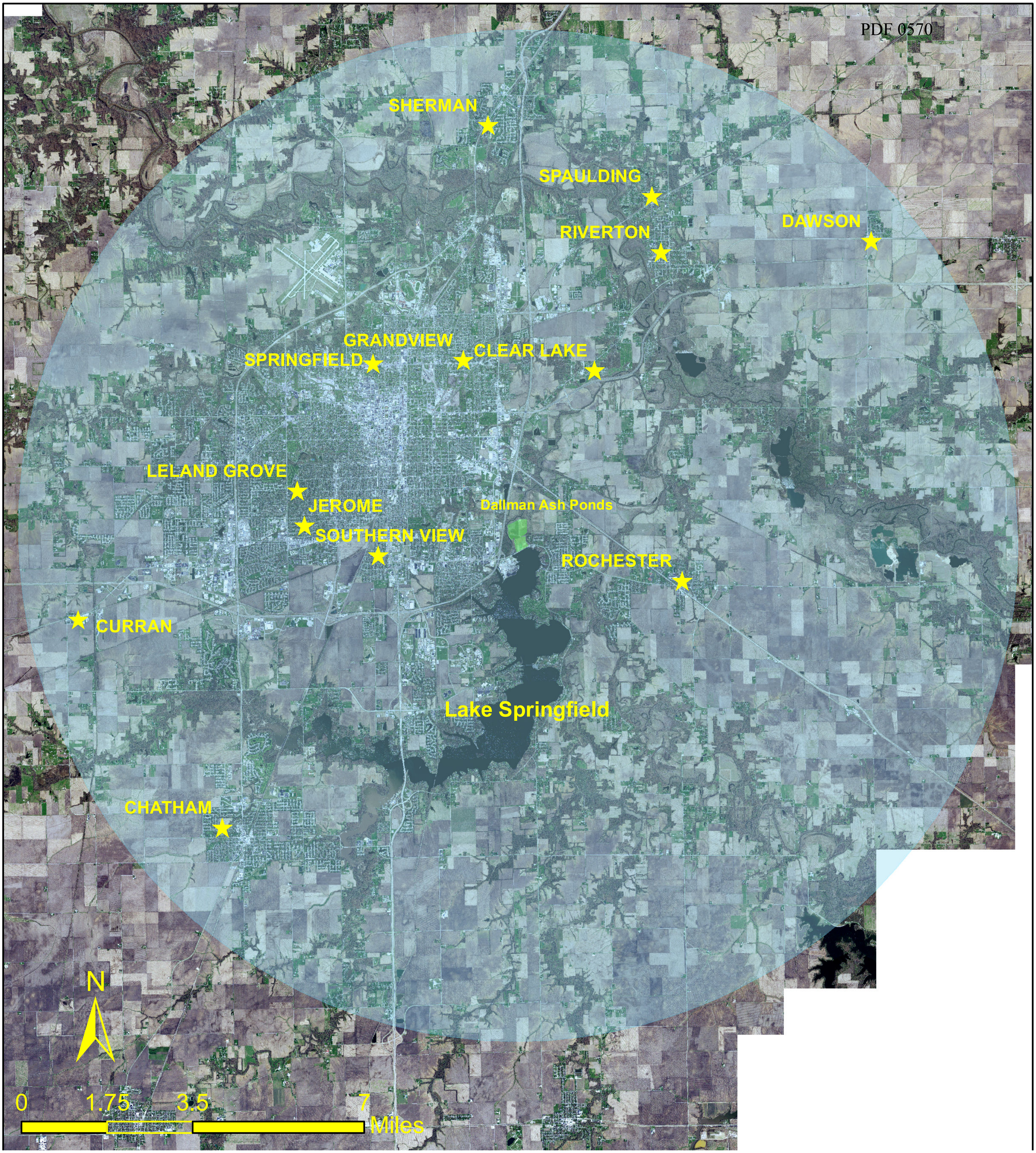
Current Resident	2800	WARRIOR BLVD	SPRINGFIELD	IL	62712	2800 WARRIOR BLVD		SPRINGFIELD	IL	62712
Current Resident	2804	WARRIOR BLVD	SPRINGFIELD	IL	62712	2804 WARRIOR BLVD		SPRINGFIELD	IL	62712
Current Resident	2808	WARRIOR BLVD	SPRINGFIELD	IL	62712	2808 WARRIOR BLVD		SPRINGFIELD	IL	62712
Current Resident	2812	WARRIOR BLVD	SPRINGFIELD	IL	62712	2812 WARRIOR BLVD		SPRINGFIELD	IL	62712
Current Resident	2816	WARRIOR BLVD	SPRINGFIELD	IL	62712	2816 WARRIOR BLVD		SPRINGFIELD	IL	62712
Current Resident	2820	WARRIOR BLVD	SPRINGFIELD	IL	62712	2820 WARRIOR BLVD		SPRINGFIELD	IL	62712
Current Resident	2824	WARRIOR BLVD	SPRINGFIELD	IL	62712	2824 WARRIOR BLVD		SPRINGFIELD	IL	62712
Current Resident	2838	WELLINGTON DR	SPRINGFIELD	IL	62703	2500 WESTFIELD DR STE 102		ELGIN	IL	60124
Current Resident	2820	WELLINGTON DR	SPRINGFIELD	IL	62703	2820 WELLINGTON DR		SPRINGFIELD	IL	62703
Current Resident	2824	WELLINGTON DR	SPRINGFIELD	IL	62703	2824 WELLINGTON DR		SPRINGFIELD	IL	62703
Current Resident	2828	WELLINGTON DR	SPRINGFIELD	IL	62703	2828 WELLINGTON DR		SPRINGFIELD	IL	62703
Current Resident	2833	WELLINGTON DR	SPRINGFIELD	IL	62703	2833 WELLINGTON DR		SPRINGFIELD	IL	62703
Current Resident	2837	WELLINGTON DR	SPRINGFIELD	IL	62703	2837 WELLINGTON DR		SPRINGFIELD	IL	62703
Current Resident	2404	WEMBLY RD	SPRINGFIELD	IL	62703	2404 WEMBLY RD		SPRINGFIELD	IL	62703
Current Resident	2408	WEMBLY RD	SPRINGFIELD	IL	62703	2408 WEMBLY RD		SPRINGFIELD	IL	62703
Current Resident	2412	WEMBLY RD	SPRINGFIELD	IL	62703	2412 WEMBLY RD		SPRINGFIELD	IL	62703
Current Resident	2416	WEMBLY RD	SPRINGFIELD	IL	62703	2416 WEMBLY RD		SPRINGFIELD	IL	62703
Current Resident	2420	WEMBLY RD	SPRINGFIELD	IL	62703	2420 WEMBLY RD		SPRINGFIELD	IL	62703
Current Resident	2424	WEMBLY RD	SPRINGFIELD	IL	62703	2424 WEMBLY RD		SPRINGFIELD	IL	62703
Current Resident	110	WEST LAKE SHORE DR	SPRINGFIELD	IL	62703	1110 NEWCASTLE LN		AURORA	IL	60506
Current Resident	135	WEST LAKE SHORE DR	SPRINGFIELD	IL	62703	135 W LAKE SHORE DR		SPRINGFIELD	IL	62703
Current Resident	148	WEST LAKE SHORE DR	SPRINGFIELD	IL	62703	148 W LAKE SHORE DR		SPRINGFIELD	IL	62703
Current Resident	142	WEST LAKE SHORE DR	SPRINGFIELD	IL	62703	1640 N 46TH ST		EAST SAINT LOU	IL	62204
Current Resident	155	WEST LAKE SHORE DR	SPRINGFIELD	IL	62707	1705 OLD IVY DR		SPRINGFIELD	IL	62711
Current Resident	300	WEST LAKE SHORE DR	SPRINGFIELD	IL	62703	300 W LAKE SHORE DR		SPRINGFIELD	IL	62703
Current Resident	154	WEST LAKE SHORE DR	SPRINGFIELD	IL	62703	468 BALSAM CT		MARCO ISLAND	FL	34145
Current Resident	154	WEST LAKE SHORE DR	SPRINGFIELD	IL	62703	468 BALSAM CT		MARCO ISLAND	FL	34145
MENTAL HEALTH CENTERS	220	WEST LAKE SHORE DR	SPRINGFIELD	IL	62703	710 N 8TH ST		SPRINGFIELD	IL	62702
MENTAL HEALTH CENTERS	200	WEST LAKE SHORE DR	SPRINGFIELD	IL	62703	710 N 8TH ST		SPRINGFIELD	IL	62702
Current Resident	136	WEST LAKE SHORE DR	SPRINGFIELD	IL	62703	9 OAK LN		SPRINGFIELD	IL	62712
Current Resident	12	WHITE BIRCH RD	SPRINGFIELD	IL	62707	% HINDIEH AKRAM & BOBBIE	77 LINDEN LN	SPRINGFIELD	IL	62712
Current Resident	33	WHITE BIRCH RD	SPRINGFIELD	IL	62712	% LEADER ONE	11020 KING ST STE 3	OVERLAND PAR	KS	66210
Current Resident	33	WHITE BIRCH RD	SPRINGFIELD	IL	62712	% LEADER ONE	11020 KING ST STE 3	OVERLAND PAR	KS	66210
Current Resident	106	WHITE BIRCH RD	SPRINGFIELD	IL	62703	106 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	107	WHITE BIRCH RD	SPRINGFIELD	IL	62712	107 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	112	WHITE BIRCH RD	SPRINGFIELD	IL	62712	112 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	113	WHITE BIRCH RD	SPRINGFIELD	IL	62712	113 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	118	WHITE BIRCH RD	SPRINGFIELD	IL	62712	118 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	119	WHITE BIRCH RD	SPRINGFIELD	IL	62707	119 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	122	WHITE BIRCH RD	SPRINGFIELD	IL	62712	122 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	123	WHITE BIRCH RD	SPRINGFIELD	IL	62707	123 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	126	WHITE BIRCH RD	SPRINGFIELD	IL	62712	126 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	127	WHITE BIRCH RD	SPRINGFIELD	IL	62712	127 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	130	WHITE BIRCH RD	SPRINGFIELD	IL	62712	130 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	131	WHITE BIRCH RD	SPRINGFIELD	IL	62712	131 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	134	WHITE BIRCH RD	SPRINGFIELD	IL	62712	134 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	135	WHITE BIRCH RD	SPRINGFIELD	IL	62712	135 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	138	WHITE BIRCH RD	SPRINGFIELD	IL	62712	138 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	139	WHITE BIRCH RD	SPRINGFIELD	IL	62712	139 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	143	WHITE BIRCH RD	SPRINGFIELD	IL	62712	143 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	18	WHITE BIRCH RD	SPRINGFIELD	IL	62712	18 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	24	WHITE BIRCH RD	SPRINGFIELD	IL	62712	24 WHITE BIRCH RD		SPRINGFIELD	IL	62712

Current Resident	30	WHITE BIRCH RD	SPRINGFIELD	IL	62712	30 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	55	WHITE BIRCH RD	SPRINGFIELD	IL	62707	3341 OLD JACKSONVILLE RD		SPRINGFIELD	IL	62711
Current Resident	36	WHITE BIRCH RD	SPRINGFIELD	IL	62712	36 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	91	WHITE BIRCH RD	SPRINGFIELD	IL	62712	3721 TUXHORN RD		SPRINGFIELD	IL	62712
Current Resident	42	WHITE BIRCH RD	SPRINGFIELD	IL	62707	42 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	43	WHITE BIRCH RD	SPRINGFIELD	IL	62712	43 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	43	WHITE BIRCH RD	SPRINGFIELD	IL	62712	43 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	49	WHITE BIRCH RD	SPRINGFIELD	IL	62712	49 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	60	WHITE BIRCH RD	SPRINGFIELD	IL	62707	60 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	61	WHITE BIRCH RD	SPRINGFIELD	IL	62702	61 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	67	WHITE BIRCH RD	SPRINGFIELD	IL	62707	67 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	72	WHITE BIRCH RD	SPRINGFIELD	IL	62707	72 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	73	WHITE BIRCH RD	SPRINGFIELD	IL	62712	73 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	78	WHITE BIRCH RD	SPRINGFIELD	IL	62712	78 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	79	WHITE BIRCH RD	SPRINGFIELD	IL	62712	79 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	84	WHITE BIRCH RD	SPRINGFIELD	IL	62712	84 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	85	WHITE BIRCH RD	SPRINGFIELD	IL	62712	85 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	90	WHITE BIRCH RD	SPRINGFIELD	IL	62712	90 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	66	WHITE BIRCH RD	SPRINGFIELD	IL	62712	9335 OLD INDIAN TRL		CHATHAM	IL	62629
Current Resident	94	WHITE BIRCH RD	SPRINGFIELD	IL	62712	94 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	98	WHITE BIRCH RD	SPRINGFIELD	IL	62712	98 WHITE BIRCH RD		SPRINGFIELD	IL	62712
Current Resident	6551	WHITE DEER TRAIL RD	ROCHESTER	IL	62563	6551 WHITE DEER TRAIL RD		ROCHESTER	IL	62563
Current Resident	125	WHITE PINE DR	SPRINGFIELD	IL	62712	% OHIO SAVINGS BANK	1801 E 9TH ST	CLEVELAND	OH	44114
Current Resident	105	WHITE PINE DR	SPRINGFIELD	IL	62712	105 WHITE PINE DR		SPRINGFIELD	IL	62712
Current Resident	106	WHITE PINE DR	SPRINGFIELD	IL	62712	106 WHITE PINE DR		SPRINGFIELD	IL	62712
Current Resident	101	WHITE PINE DR	SPRINGFIELD	IL	62707	109 GREENCASTLE CIR		SPRINGFIELD	IL	62712
Current Resident	109	WHITE PINE DR	SPRINGFIELD	IL	62712	109 WHITE PINE DR		SPRINGFIELD	IL	62712
Current Resident	110	WHITE PINE DR	SPRINGFIELD	IL	62712	110 WHITE PINE DR		SPRINGFIELD	IL	62712
Current Resident	114	WHITE PINE DR	SPRINGFIELD	IL	62712	114 WHITE PINE DR		SPRINGFIELD	IL	62712
Current Resident	117	WHITE PINE DR	SPRINGFIELD	IL	62712	117 WHITE PINE DR		SPRINGFIELD	IL	62712
Current Resident	118	WHITE PINE DR	SPRINGFIELD	IL	62707	118 WHITE PINE DR		SPRINGFIELD	IL	62712
Current Resident	113	WHITE PINE DR	SPRINGFIELD	IL	62712	1206 JEFFERSON ST		PAWNEE	IL	62558
Current Resident	121	WHITE PINE DR	SPRINGFIELD	IL	62712	121 WHITE PINE DR		SPRINGFIELD	IL	62712
Current Resident	122	WHITE PINE DR	SPRINGFIELD	IL	62712	122 WHITE PINE DR		SPRINGFIELD	IL	62712
Current Resident	126	WHITE PINE DR	SPRINGFIELD	IL	62707	126 WHITE PINE DR		SPRINGFIELD	IL	62712
Current Resident	129	WHITE PINE DR	SPRINGFIELD	IL	62712	129 WHITE PINE DR		SPRINGFIELD	IL	62712
Current Resident	130	WHITE PINE DR	SPRINGFIELD	IL	62712	130 WHITE PINE DR		SPRINGFIELD	IL	62712
Current Resident	133	WHITE PINE DR	SPRINGFIELD	IL	62712	133 WHITE PINE DR		SPRINGFIELD	IL	62712
Current Resident	134	WHITE PINE DR	SPRINGFIELD	IL	62704	134 WHITE PINE DR		SPRINGFIELD	IL	62712
Current Resident	137	WHITE PINE DR	SPRINGFIELD	IL	62712	137 WHITE PINE DR		SPRINGFIELD	IL	62712
Current Resident	138	WHITE PINE DR	SPRINGFIELD	IL	62712	138 WHITE PINE DR		SPRINGFIELD	IL	62712
Current Resident	141	WHITE PINE DR	SPRINGFIELD	IL	62712	141 WHITE PINE DR		SPRINGFIELD	IL	62712
Current Resident	142	WHITE PINE DR	SPRINGFIELD	IL	62712	142 WHITE PINE DR		SPRINGFIELD	IL	62712
Current Resident	145	WHITE PINE DR	SPRINGFIELD	IL	62712	145 WHITE PINE DR		SPRINGFIELD	IL	62712
Current Resident	149	WHITE PINE DR	SPRINGFIELD	IL	62712	149 WHITE PINE DR		SPRINGFIELD	IL	62712
Current Resident	97	WHITE PINE DR	SPRINGFIELD	IL	62712	2500 WESTFIELD DR STE 102		ELGIN	IL	60124
Current Resident	85	WHITE PINE DR	SPRINGFIELD	IL	62712	85 WHITE PINE DR		SPRINGFIELD	IL	62712
Current Resident	86	WHITE PINE DR	SPRINGFIELD	IL	62712	86 WHITE PINE DR		SPRINGFIELD	IL	62712
Current Resident	89	WHITE PINE DR	SPRINGFIELD	IL	62712	89 WHITE PINE DR		SPRINGFIELD	IL	62712
Current Resident	90	WHITE PINE DR	SPRINGFIELD	IL	62712	90 WHITE PINE DR		SPRINGFIELD	IL	62712
Current Resident	93	WHITE PINE DR	SPRINGFIELD	IL	62712	93 WHITE PINE DR		SPRINGFIELD	IL	62712
Current Resident	94	WHITE PINE DR	SPRINGFIELD	IL	62712	94 WHITE PINE DR		SPRINGFIELD	IL	62712

Current Resident	145	WHITE PINE DR	SPRINGFIELD	IL	62707	PO BOX 1804	DAYTON	OH	45401
Current Resident	3071	WHITE TIMBER RD	SPRINGFIELD	IL	62712	3071 WHITE TIMBER RD	SPRINGFIELD	IL	62712
Current Resident	3081	WHITE TIMBER RD	SPRINGFIELD	IL	62712	3081 WHITE TIMBER RD	SPRINGFIELD	IL	62712
IBEW Local 193	3150	WIDE TRACK DR	SPRINGFIELD	IL	62703	3150 WIDE TRACK DR	SPRINGFIELD	IL	62703
Current Resident	1573	WILDROSE LN	SPRINGFIELD	IL	62707	1573 WILDROSE LN	SPRINGFIELD	IL	62712
Current Resident	1605	WILDROSE LN	SPRINGFIELD	IL	62712	1605 WILDROSE LN	SPRINGFIELD	IL	62712
Current Resident	1622	WILDROSE LN	SPRINGFIELD	IL	62712	1622 WILDROSE LN	SPRINGFIELD	IL	62712
Current Resident	1639	WILDROSE LN	SPRINGFIELD	IL	62707	1639 WILDROSE LN	SPRINGFIELD	IL	62712
Current Resident	1646	WILDROSE LN	SPRINGFIELD	IL	62712	1646 WILDROSE LN	SPRINGFIELD	IL	62712
Current Resident	1678	WILDROSE LN	SPRINGFIELD	IL	62712	1678 WILDROSE LN	SPRINGFIELD	IL	62712
Current Resident	1685	WILDROSE LN	SPRINGFIELD	IL	62712	1685 WILDROSE LN	SPRINGFIELD	IL	62712
Current Resident	1743	WILDROSE LN	SPRINGFIELD	IL	62707	1743 WILDROSE LN	SPRINGFIELD	IL	62712
Current Resident	1744	WILDROSE LN	SPRINGFIELD	IL	62712	1744 WILDROSE LN	SPRINGFIELD	IL	62712
Current Resident	1770	WILDROSE LN	SPRINGFIELD	IL	62707	1770 WILDROSE LN	SPRINGFIELD	IL	62712
Current Resident	1785	WILDROSE LN	SPRINGFIELD	IL	62707	1785 WILDROSE LN	SPRINGFIELD	IL	62712
Current Resident	1800	WILDROSE LN	SPRINGFIELD	IL	62712	1800 WILDROSE LN	SPRINGFIELD	IL	62712
Current Resident	1815	WILDROSE LN	SPRINGFIELD	IL	62712	1815 WILDROSE LN	SPRINGFIELD	IL	62712
Current Resident	1716	WILDROSE LN	SPRINGFIELD	IL	62707	3341 OLD JACKSONVILLE RD	SPRINGFIELD	IL	62711
Current Resident	2548	WILSHIRE RD	SPRINGFIELD	IL	62703	2548 E WILSHIRE RD	SPRINGFIELD	IL	62703
Current Resident	2552	WILSHIRE RD	SPRINGFIELD	IL	62703	617 VISCAYA AVE	ORLANDO	FL	32839
Current Resident	5275	WOLF CREEK HWY	ADRIAN	MI	49221	5275 WOLF CREEK HWY	ADRIAN	MI	49221
Current Resident	2700	YORK RD	SPRINGFIELD	IL	62703	2500 WESTFIELD DR STE 102	ELGIN	IL	60124
Current Resident	2701	YORK RD	SPRINGFIELD	IL	62703	2701 YORK RD	SPRINGFIELD	IL	62703
Current Resident	2705	YORK RD	SPRINGFIELD	IL	62703	2705 YORK RD	SPRINGFIELD	IL	62703
Current Resident	2712	YORK RD	SPRINGFIELD	IL	62703	2712 YORK RD	SPRINGFIELD	IL	62703
Current Resident	2713	YORK RD	SPRINGFIELD	IL	62703	2713 YORK RD	SPRINGFIELD	IL	62703
Current Resident	2716	YORK RD	SPRINGFIELD	IL	62703	2716 YORK RD	SPRINGFIELD	IL	62703
Current Resident	2717	YORK RD	SPRINGFIELD	IL	62703	2717 YORK RD	SPRINGFIELD	IL	62703
Current Resident	2720	YORK RD	SPRINGFIELD	IL	62703	2720 YORK RD	SPRINGFIELD	IL	62703
Current Resident	2721	YORK RD	SPRINGFIELD	IL	62703	2721 YORK RD	SPRINGFIELD	IL	62703
Current Resident	2724	YORK RD	SPRINGFIELD	IL	62703	2724 YORK RD	SPRINGFIELD	IL	62703
Current Resident	2725	YORK RD	SPRINGFIELD	IL	62703	2725 YORK RD	SPRINGFIELD	IL	62703
Current Resident	2728	YORK RD	SPRINGFIELD	IL	62703	2728 YORK RD	SPRINGFIELD	IL	62703
Current Resident	2729	YORK RD	SPRINGFIELD	IL	62703	2729 YORK RD	SPRINGFIELD	IL	62703
Current Resident	2732	YORK RD	SPRINGFIELD	IL	62703	2732 YORK RD	SPRINGFIELD	IL	62703
Current Resident	2733	YORK RD	SPRINGFIELD	IL	62703	2733 YORK RD	SPRINGFIELD	IL	62703
Current Resident	2735	YORK RD	SPRINGFIELD	IL	62703	2735 YORK RD	SPRINGFIELD	IL	62703
Current Resident	2736	YORK RD	SPRINGFIELD	IL	62703	2736 YORK RD	SPRINGFIELD	IL	62703
Current Resident	2801	YORK RD	SPRINGFIELD	IL	62703	2801 YORK RD	SPRINGFIELD	IL	62703
Current Resident	2805	YORK RD	SPRINGFIELD	IL	62703	2805 YORK RD	SPRINGFIELD	IL	62703
Current Resident	2820	YORK RD	SPRINGFIELD	IL	62703	2837 WELLINGTON DR	SPRINGFIELD	IL	62703
Current Resident	2830	YORK RD	SPRINGFIELD	IL	62703	2837 WELLINGTON DR	SPRINGFIELD	IL	62703
Current Resident	2840	YORK RD	SPRINGFIELD	IL	62703	2840 YORK RD	SPRINGFIELD	IL	62703
Current Resident	2841	YORK RD	SPRINGFIELD	IL	62703	2841 YORK RD	SPRINGFIELD	IL	62703
Current Resident	2851	YORK RD	SPRINGFIELD	IL	62703	2851 YORK RD	SPRINGFIELD	IL	62703
Current Resident	2859	YORK RD	SPRINGFIELD	IL	62703	2859 YORK RD	SPRINGFIELD	IL	62703
Current Resident	2867	YORK RD	SPRINGFIELD	IL	62703	2867 YORK RD	SPRINGFIELD	IL	62703
Current Resident	2810	YORK RD	SPRINGFIELD	IL	62703	6200 NORTHAMPTON LN	SPRINGFIELD	IL	62711
Current Resident	2709	YORK RD	SPRINGFIELD	IL	62703	PO BOX 1820	DAYTON	OH	45401

Exhibit D

Map and list of incorporated areas within 10-miles of the impoundments



Dallman Ash Ponds with a 10 Mile Buffer

Legend

★ Incorporated Area

🟦 Dallman Ash Ponds 10 mile Buffer

🟩 Dallman Ash Ponds

City Water Light and Power
Geographic Information System
1008 East Miller Street
Springfield, Il 62702
Voice 217.757.8520
Fax 217.789.2082

Compiled by Mark Stone 10/20/2021 Dallman Ash Ponds 10 mile buffer.mxd

List of Incorporated Areas within 10-miles of the Impoundments

1. Chatham
2. Clearlake
3. Curran
4. Dawson
5. Grandview
6. Jerome
7. Leland Grove
8. Riverton
9. Sherman
10. Southern View
11. Spaulding
12. Springfield

Exhibit E

Letter to Clerks of incorporated communities

OFFICE OF PUBLIC UTILITIES
CITY OF SPRINGFIELD, ILLINOIS

JAMES O. LANGFELDER, MAYOR
DOUG BROWN, CHIEF UTILITY ENGINEER

November 1, 2021

Attn: Notice to City, Town and Village Clerks within a 10-mile radius

Greetings,

Enclosed please find a Notice of Public Meetings to be held by the City of Springfield, Office of Public Utilities (City Water Light & Power). These public meetings are in regards to the ash pond closures located near the Dallman power plant at 3100 Stevenson Drive, Springfield, Illinois.

We are required by the Illinois EPA to give notice of these meetings in towns that are within a 10 mile radius of the Dallman power plant. We would appreciate your cooperation in posting this notice in an appropriate manner so that it would be available to your citizens if it is of interest to them.

If you have any questions please feel free to reach out. My email and phone number are provided below.

Sincerely,

Deborah J. Williams
Regulatory Affairs Director
City Water Light and Power
Deborah.Williams@cwlp.com
217-789-2116 ext. 2636

Exhibit F

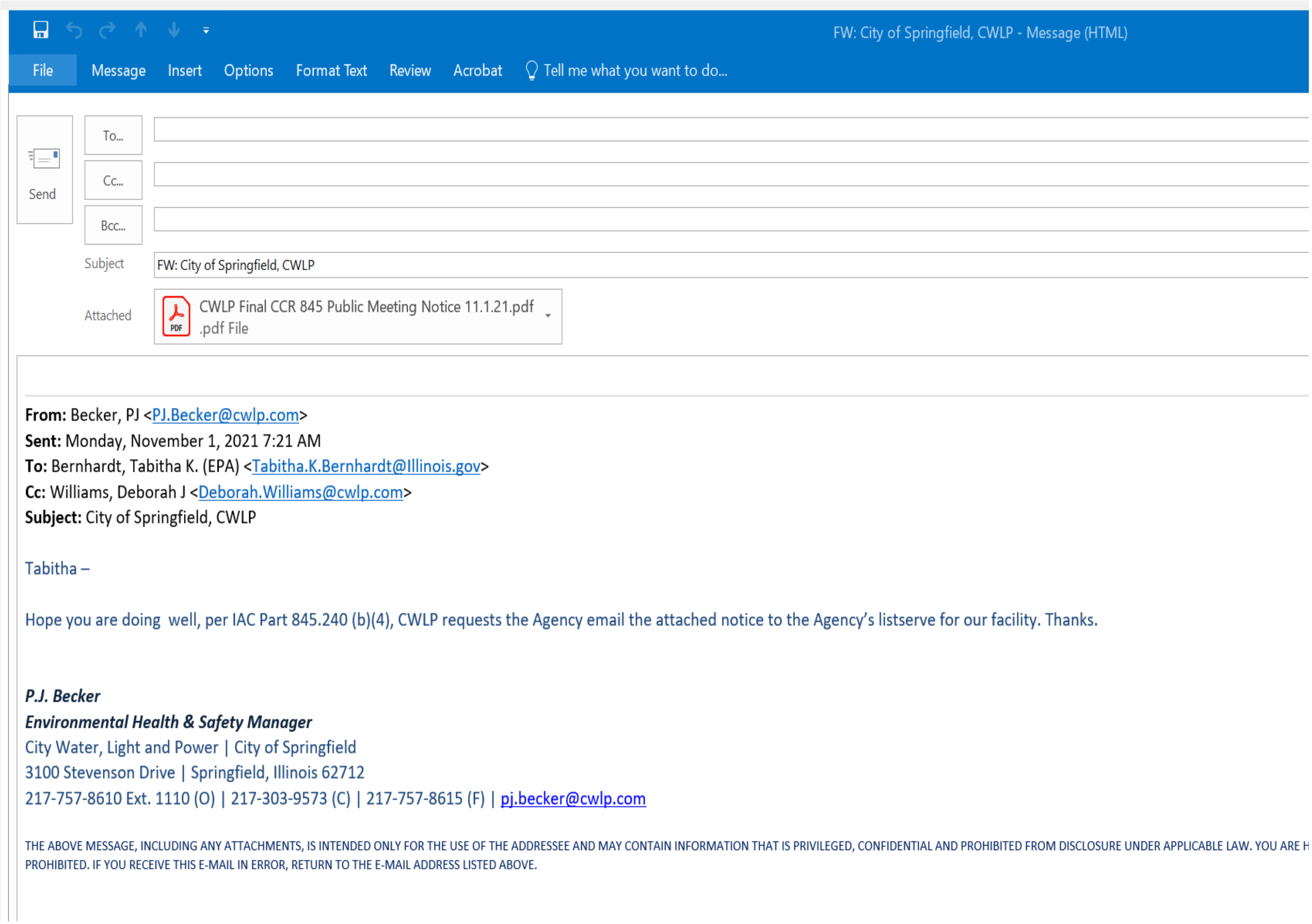
Posting of notice in conspicuous locations in incorporated communities

Posting of Notice in Conspicuous locations in Incorporated Communities

1. Chatham
    a. Village Clerk
    b. Public Library
    c. Post Office
    d. County Market Grocery Store
2. Clearlake
    a. Village Clerk
    b. Township Office
3. Curran
    a. Village Clerk
    b. Post Office
4. Dawson
    a. Village Clerk
    b. Post Office
5. Grandview
    a. Village Clerk
    b. Municipal Building
6. Jerome
    a. Village Clerk
    b. Village Library
    c. Schnucks Grocery store
7. Leland Grove
    a. Village Clerk
8. Riverton
    a. Village Clerk
9. Rochester
    a. Village Clerk
    b. Sherman County Market grocery store
10. Southern View
    a. Village Clerk
    b. Hyvee Grocery Store
11. Spaulding
    a. Village Clerk
    b. IGA Grocery Store

Exhibit G

Email to Illinois EPA requesting notice be sent to listserv for CWLP



Subject FW: City of Springfield, CWLP

Attached CWLP Final CCR 845 Public Meeting Notice 11.1.21.pdf
.pdf File

From: Becker, PJ <PJ.Becker@cwlp.com>
Sent: Monday, November 1, 2021 7:21 AM
To: Bernhardt, Tabitha K. (EPA) <Tabitha.K.Bernhardt@Illinois.gov>
Cc: Williams, Deborah J <Deborah.Williams@cwlp.com>
Subject: City of Springfield, CWLP

Tabitha –

Hope you are doing well, per IAC Part 845.240 (b)(4), CWLP requests the Agency email the attached notice to the Agency's listserve for our facility. Thanks.

P.J. Becker
Environmental Health & Safety Manager
City Water, Light and Power | City of Springfield
3100 Stevenson Drive | Springfield, Illinois 62712
217-757-8610 Ext. 1110 (O) | 217-303-9573 (C) | 217-757-8615 (F) | pj.becker@cwlp.com

Exhibit H

City’s Neighborhood newsletter (November 24, 2021)

City of Springfield Neighborhood News emailed newsletter mailed on 11-24-21 to 1,870 subscribers. This includes individual residents, plus 68 neighborhood associations, and various news outlets, businesses and organizations.

City of Springfield, Illinois
James O. Langfelder – Mayor

Neighborhood News **November 24, 2021**

CWLP'S ASH POND PUBLIC MEETING

City Water, Light, and Power (CWLP) will host **two public meetings** on **Thursday, December 2** to discuss closure plans for its ash ponds. The meetings are required for a permit application from the Illinois EPA in order to proceed with the closure of the ash ponds.

The meetings will take place in the **City Council Chambers, 300 S. 7th Street, 3rd floor.** It will also be broadcast live on Comcast Cable Channel 18 and AT&T U-verse Channel 99. You may also **stream the meeting** on the City's **website**.

- **Meeting 1**: 2:00 - 4:00 p.m.
- **Meeting 2**: 5:30 - 7:30 p.m.

CWLP's ash, a byproduct of the coal combustion process from the Lakeside and Dallman Power Plants, was sent to the ash pond site across from the Dallman Power Plant Complex on the north side of E. Lake Drive **or** delivered off site for various beneficial re-use such as for road fill or use in concrete and cement.

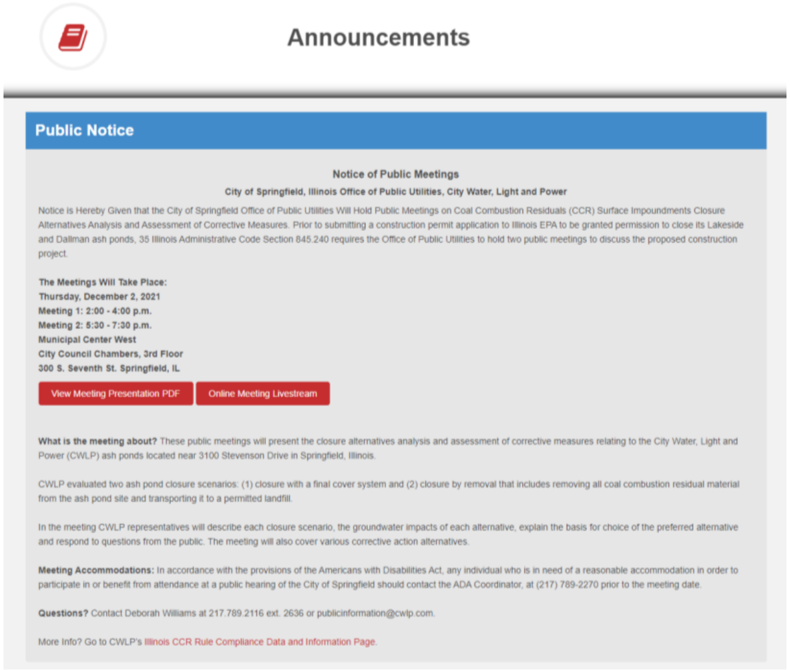
The public meetings will present the closure alternatives analysis and assessment of corrective measures among two ash pond closure scenarios: (1) closure in place with a final cover system and (2) closure by removal of all material to an off-site landfill. In the meeting CWLP representatives will describe each closure scenario, the groundwater impacts of each alternative, explain the basis for choice of a preferred alternative and respond to questions from the public. A copy of supporting documentation, CWLP's Closure Alternatives Assessment and Assessment of Corrective Measures and related materials is posted online.

In accordance with the provisions of the Americans with Disabilities Act, any individual who is in need of a reasonable accommodation in order to participate in or benefit from attendance at a public hearing of the City of Springfield should contact the ADA Coordinator at 217.789.2270 prior to the meeting date.

Exhibit I

Web Copy for CWLP’s Public Notices

https://www.cwlp.com/announcements.aspx



Announcements

Public Notice

Notice of Public Meetings

City of Springfield, Illinois Office of Public Utilities, City Water, Light and Power

Notice is Hereby Given that the City of Springfield Office of Public Utilities Will Hold Public Meetings on Coal Combustion Residuals (CCR) Surface Impoundments Closure Alternatives Analysis and Assessment of Corrective Measures. Prior to submitting a construction permit application to Illinois EPA to be granted permission to close its Lakeside and Dallman ash ponds, 35 Illinois Administrative Code Section 845.240 requires the Office of Public Utilities to hold two public meetings to discuss the proposed construction project.

The Meetings Will Take Place:
Thursday, December 2, 2021
Meeting 1: 2:00 - 4:00 p.m.
Meeting 2: 5:30 - 7:30 p.m.
Municipal Center West
City Council Chambers, 3rd Floor
300 S. Seventh St. Springfield, IL

What is the meeting about? These public meetings will present the closure alternatives analysis and assessment of corrective measures relating to the City Water, Light and Power (CWLP) ash ponds located near 3100 Stevenson Drive in Springfield, Illinois.

CWLP evaluated two ash pond closure scenarios: (1) closure with a final cover system and (2) closure by removal that includes removing all coal combustion residual material from the ash pond site and transporting it to a permitted landfill.

In the meeting CWLP representatives will describe each closure scenario, the groundwater impacts of each alternative, explain the basis for choice of the preferred alternative and respond to questions from the public. The meeting will also cover various corrective action alternatives.

Meeting Accommodations: In accordance with the provisions of the Americans with Disabilities Act, any individual who is in need of a reasonable accommodation in order to participate in or benefit from attendance at a public hearing of the City of Springfield should contact the ADA Coordinator, at (217) 789-2270 prior to the meeting date.

Questions? Contact Deborah Williams at 217.789.2116 ext. 2636 or publicinformation@cwlp.com.

More Info? Go to CWLP's Illinois CCR Rule Compliance Data and Information Page.

https://www.cwlp.com/IllinoisCCRCompliance.aspx

Illinois CCR Rule Compliance Data and Information

This page is maintained in accordance with IAC Part 845 for the Dallman and Lakeside Coal Combustion Residuals Surface Impoundments.
*For Federal CCR Rule Compliance Data and Information visit: **CCR Compliance***

Public Notice

Notice of Public Meetings

City of Springfield, Illinois Office of Public Utilities, City Water, Light and Power

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Questions? Contact Deborah Williams at 217.789.2116 ext. 2636 or publicinformation@cwlp.com.

Reports

CWLP Closure Alternative Analysis 10-25-2021	View Document
CWLP Public Meeting Notice 12-2-2021	View Document

Exhibit J

List of attendees requesting summary of meeting or placement on Agency listserv

NAME	EPA LISTSERV	Meeting Summary
Steven Simpson Black	x	x
Jason Jacobs	no	x
Christine Nannicelli	x	x
Joshua Irvine	x	x
John Watt	x	x
Tabitha Bernhardt	no	x
Bill Lamarla	x	x
Charlene Falco	no	x
Judy Nichols	no	x
Barton Lorzmor	x	x
Sam Cahnman	x	x
Don Hanrahan	x	x
Andrew Rehn	x	x
Aaron Brown	no	x
Kiana Courtney	x	x
Faith Bugel	x	x
Kendra Waide	x	x
Jane McBride	x	x
Nathan Fields	no	x
Kim & Bruce Bradbury	x	x
Nick Dodson	x	x
Teresa Haley	x	x
Scott Allen	x	x
Jim Leach	x	x
Matt Stuttle	x	no
Carrie Niemann	no	x
Sally Burgess	no	x
Ann Charland	no	x
Al Pieper	no	x
Deb Russell	no	x

Exhibit K

List of attendees and email address requesting addition to Agency's listserv for facility

NAME	EMAIL ADDRESS	EPA LISTSERV
Steven Simpson Black	Stevensimpsonblack@icloud.com	x
Christine Nannicelli	christine.nannicelli@sierrclub.org	x
Joshua Irvine	joshuairvine2022@u.northwestern.edu	x
John Watt	john.watt@comcast.net	x
Bill Lamarla	Bill1953@sbcglobal.net	x
Barton Lorzmor	blorzmor@morrealecomm.com	x
Sam Cahnman	samcahnman@yahoo.com	x
Don Hanrahan	djhan486@gmail.com	x
Andrew Rehn	arehn@prairierivers.org	x
Kiana Courtney	kcourtney@elpc.org	x
Faith Bugel	fbugel@gmail.com	x
Kendra Waide	kendra.waide@peoplesparty.org	x
Jane McBride	jaane.e.mcbride95@gmail.com	x
Kim & Bruce Bradbury	kbradbury5@sbcgobal.net	x
Nick Dodson	nickdodson@gmail.com	x
Teresa Haley	thaley@illinoisnaacp.org	x
Scott Allen	6salle333@gmail.com	x
Jim Leach	jimleach@mwfbmedia.com	x
Matt Stuttle	mstuttle@wm.com	x

Exhibit L

Public Meeting Panel Members

Public Meeting Panel Members

Brad Hunsberg, L.P.G., Andrews Engineering

Scott Rogers, Electric Division Manager

Deborah Williams, Regulatory Affairs Manager

P.J. Becker, Environmental Health & Safety Director

Jim Ketchum, Environmental Health & Safety, Technical Specialist

Bill Antonacci, Ash Pond Operations

Mike Gorsek, General Superintendent of Generation

Todd LaFountain, Water Division Manager

Amber Sabin, Supervisor of Consumer Services

Eric Staley, Environmental Health & Safety, Technical Specialist

Exhibit M

Power Point presentation for December 2, 2021 public meetings

City Water, Light & Power

Coal Combustion Residual Surface Impoundment Closure Alternatives & Corrective Measures Assessments

December 2, 2021

Please sign-in and take a seat.

Agenda

- Meeting Purpose Overview
- Technical Presentation by Andrews Engineering
- Question & Answer Session
- Comment Period (time permitting)

Meeting Overview

- Purpose of Pre-application Public meeting
- Meeting Requirements
  - Public Notice and Timing
  - CWLP Illinois CCR Website https://www.cwlp.com/IllinoisCCRCompliance.aspx
  - Question and Answer Session
- Technical Presentation Requirements
  - Closure Alternatives
  - Corrective Action

Meeting Overview

PUBLIC PARTICIPTION

- Did you sign in? 3 purposes
    - Meeting Summary
    - Illinois EPA Listserv
    - Q & A Session - questions from those who did not sign can be asked after those that signed up
    - Sign in before you leave or email public publicinformation@cwlp.com

Meet The Panel

- **Andrews Engineering**, Brad Hunsberger, LPG
- **CWLP Regulatory Affairs, Environmental Health & Safety**
  - Deborah Williams, P.J. Becker, Eric Staley, Jim Ketchum
- **CWLP Electric Division**
  - Bill Antonacci, Ash Pond Operations
  - Mike Gorsek, General Superintendent of Generation
  - Scott Rogers, Electric Division Manager

After This Meeting

- Summary of Meeting Compiled by December 17
- Construction Permit Application for closure plan to be submitted by February 1, 2022

Reminders

- Did you sign up?
  - Meeting Summary & Illinois EPA Listserv
  - Sign Up at Table Outside of Chambers
- After the Meeting Questions?

  Deborah Williams, 217-789-2116 ext. 2636

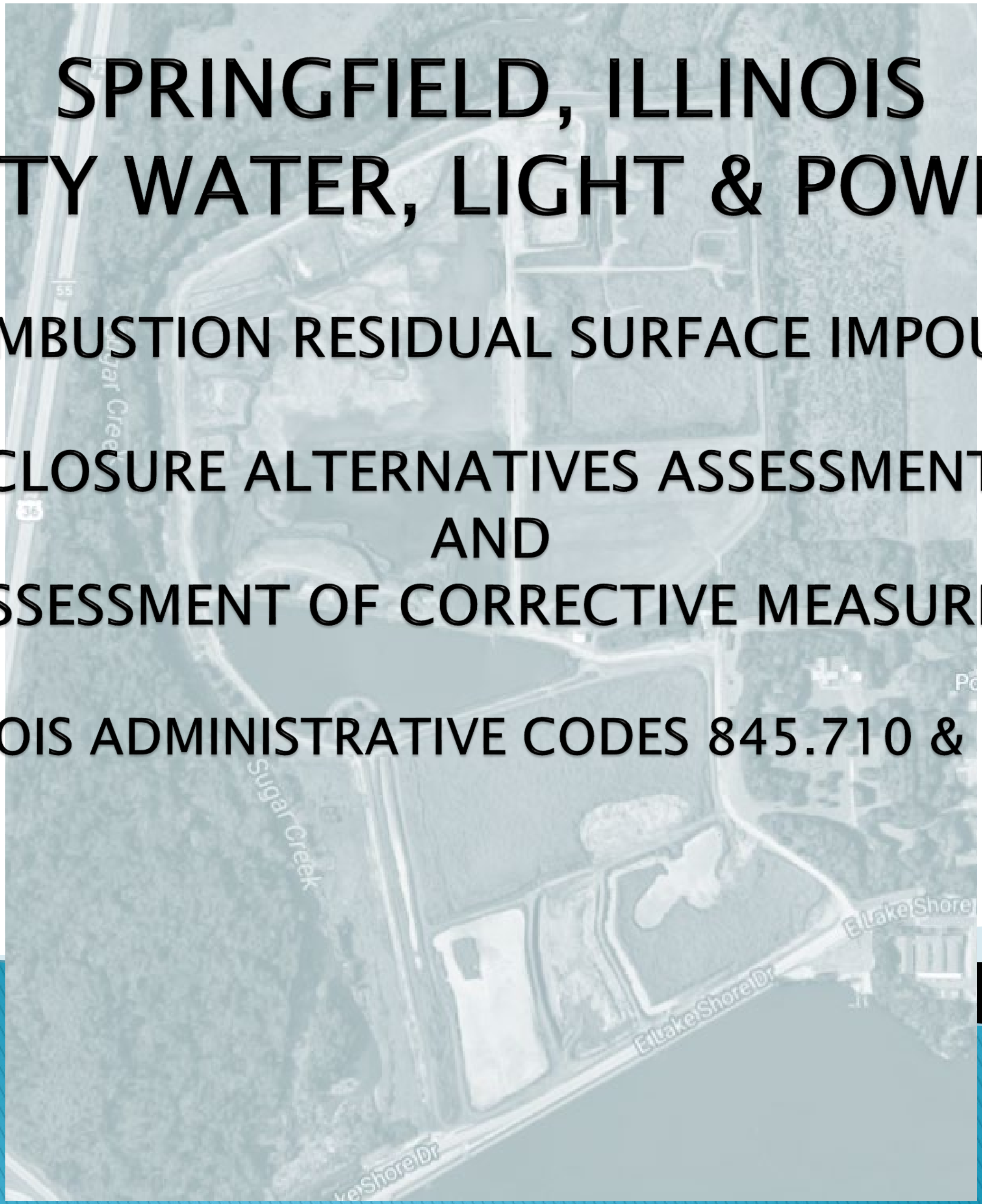
  publicinformation@cwlp.com
- CWLP Illinois CCR Website
  https://www.cwlp.com/IllinoisCCRCompliance.aspx

SPRINGFIELD, ILLINOIS
CITY WATER, LIGHT & POWER

COAL COMBUSTION RESIDUAL SURFACE IMPOUNDMENT

CLOSURE ALTERNATIVES ASSESSMENT
AND
ASSESSMENT OF CORRECTIVE MEASURES

35 ILLINOIS ADMINISTRATIVE CODES 845.710 & 845.660



December 2, 2021

SUMMARY OF REGULATORY FRAMEWORK

- 35 Illinois Administrative Code Part 845 – Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments – Approved April 2021.

LEGEND

🟥 CCR SURFACE IMPOUNDMENT

NOTE

IMAGE SOURCE: GOOGLE EARTH PRO. IMAGE DATE JUNE 7, 2016.

REVISION DESCRIPTION

ANDREWS
ENGINEERING
3300 GINGER CREEK DRIVE
SPRINGFIELD, ILLINOIS 62711-7233
[illegible]
[illegible]

APPROVED BY: DB DESIGNED BY: DG DRAWN BY: MPN

SITE DETAILS

PLANS PREPARED FOR
CITY, WATER, LIGHT AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: JULY 2021

PROJECT ID: [illegible]

SHEET NUMBER:

FIG. 2

Tab: Layout1 Last Saved: July 28, 2021, by Mike Nguyen Plotted: Wednesday, July 28, 2021 9:34:48 AM
[illegible]

FACILITY DESCRIPTION

- CWLP maintains two CCR impoundments.
- The impoundments operate as a single multi-unit system for purposes of groundwater monitoring and closure.
- Lakeside Ash Pond was placed into service prior to 1958 and contains three lime softening ponds and a settling pond, totaling approximately 35 acres.
- Lakeside Ash Pond ceased receiving ash in 2009.
- The Dallman Ash Pond was activated in 1976 and still operates. It totals approximately 34.5 acres in area.

SUBPART C – LOCATION RESTRICTIONS

- **Existing operating impoundments must meet the following location restrictions or close or retrofit:**
  - A. Uppermost aquifer location (see Section 845.300);
  - B. Wetlands (see Section 845.310);
  - C. Fault areas (see Section 845.320);
  - D. Seismic impact zones (see Section 845.330); or
  - E. Unstable areas and floodplains (see Section 845.340).
- **The impoundments meet all location restrictions except A (placement above the uppermost aquifer).**
- **Section 845.300 requires the base of an existing impoundment to be a minimum 5 feet above the upper limit of the uppermost aquifer, including the seasonal high water table. This cannot be met.**
- **Closure or retrofit must occur pursuant to Section 845.700.**

CLOSURE ALTERNATIVES

- **Section 845.710 (Closure Alternatives) allows for closure of the surface impoundments to be completed by either:**
  - Leaving the CCR in place and installing a final cover system, or
  - Through removal of the CCR and decontamination of the surface impoundments.
- **The US EPA stated in the preamble to the 40 CFR Part 257 rules that "both methods of closure (i.e., clean closure and closure with waste in place) can be equally protective, provided they are conducted properly."**
- **The Illinois Pollution Control Board stated that "while the rules require the evaluation of closure by removal as one of the alternatives, there is no presumption that it is the preferred closure method".**

CLOSURE ALTERNATIVES

Closure by Removal:

- Physically exhume and transport the CCR and any residually impacted material to a permitted disposal facility.

Closure by Installation of a Final Cover System

- Leave the CCR in place.
- Install an engineered cover system which may include:
    - 40 mil low density polyethylene layer
    - 200 mil geonet lateral drainage layer
    - 36 inches of protective cover (soil)

CLOSURE ALTERNATIVES

- **1) Long- and Short-Term Effectiveness and Protectiveness of the Closure Method, Including Identification and Analyses of the Following Factors:**

  A. The Magnitude of Reduction of Existing Risks

  - Both methods provide similar long-term effectiveness based on the results of the groundwater contaminant transport model. Either closure method will result in achievement of the groundwater protection standards.
  - In the short term, closure by installation of a final cover system will be more effective and protective of the environment.
  - Excavation of the CCR will cause inherent exposure risks due to the nature of the process. Closure in place will minimize or negate those risks.

CLOSURE ALTERNATIVES

- **1) Long- and Short-Term Effectiveness and Protectiveness of the Closure Method, Including Identification and Analyses of the Following Factors: (continued)**
  B. The Magnitude of Residual Risks in Terms of Likelihood of Future Releases of CCR
  - Closure by removal physically removes the CCR and impacted material. There should be no future release after completion of removal.
  - Closure by final cover system, as maintained pursuant to the rules and closure plan, should negate the likelihood of a future release.

CLOSURE ALTERNATIVES

- **1) Long- and Short-Term Effectiveness and Protectiveness of the Closure Method, Including Identification and Analyses of the Following Factors: (continued)**

C. The Type and Degree of Long-Term Management Required, Including Monitoring, Operation, and Maintenance

- Closure by removal:
  - Groundwater monitoring will be required for a minimum 3 years and until the groundwater protection standards are achieved.
- Closure by final cover system:
  - Required groundwater monitoring for a minimum of 30 years.
  - Routine inspections of the impoundments will be required.
  - Maintenance of the final cover and impoundment will be required as necessary.

CLOSURE ALTERNATIVES

- **1) Long- and Short-Term Effectiveness and Protectiveness of the Closure Method, Including Identification and Analyses of the Following Factors: (continued)**

  D. The Short-Term Risks That Might be posed to the Community or the Environment during Implementation of a Closure, Including Potential Threats to Human Health and the Environment Associated with Excavation, Transportation, and Re-Disposal of Contaminants

  - Closure by removal:
    - Increased truck traffic on local and state roadways hauling CCR. Approximately 96 trucks per day for 7.5 years.
    - Disturbance of underlying stratigraphy during excavation may cause an increase of solutes in the groundwater.
    - Excavation and hauling will increase the number of receptors. Exposure may include inhalation of dust, ingestion, or dermal contact from onsite workers. Dust or spillage during transportation can impact local waterways through precipitation runoff.

CLOSURE ALTERNATIVES

- **1) Long- and Short-Term Effectiveness and Protectiveness of the Closure Method, Including Identification and Analyses of the Following Factors: (continued)**
        - Disposal activities may create dust during placement. Placement activities typically cause residual material to end up on local roadways near the disposal facility.
        - Disposal activities at municipal solid waste (MSW) facilities, when mixed with MSW, typically will promote the generation of sulfur in the landfill gas.
        - Excavation of the Lakeside and Dalman Ash Ponds may cause structural integrity issues for the Spaulding Dam, clarification pond, and FGDS Development Landfill.
    - Closure by final cover system:
        - Grading of the CCR prior for cover placement may create dust. This will be limited in extent and may occur in phases.
        - Increased truck traffic may occur if borrow soils are hauled to the site.

CLOSURE ALTERNATIVES

- **1) Long- and Short-Term Effectiveness and Protectiveness of the Closure Method, Including Identification and Analyses of the Following Factors: (continued)**

  E. The time until closure and post-closure care or the completion of groundwater monitoring under Section 845.740(b) is completed

  - Closure by removal:
    - Groundwater monitoring is required for a minimum of 3 years after removal has been completed.
  - Closure by final cover system:
    - Groundwater monitoring is required for a minimum 30-year post-closure care period.

CLOSURE ALTERNATIVES

- **1) Long- and Short-Term Effectiveness and Protectiveness of the Closure Method, Including Identification and Analyses of the Following Factors: (continued)**

  F. The 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

  - Closure by removal:
    - The potential of exposure is greatest during excavation (7.5 years).
    - The potential includes site worker exposure (excavation, loading and disposal activities).
    - There should be minimal affects to groundwater movement.
    - Increase in solute concentrations may occur.
  - Closure by final cover system:
    - The potential of exposure is greatest during grading preparation and installation of the final cover (3 years).
    - There should be minimal to no affects to groundwater movement or solute concentrations.

CLOSURE ALTERNATIVES

- **1) Long- and Short-Term Effectiveness and Protectiveness of the Closure Method, Including Identification and Analyses of the Following Factors: (continued)**

G. The Long-Term Reliability of the Engineering and Institutional Controls, Including an Analysis of any Off-Site, nearby Destabilizing Activities

- Closure by removal:
  - There are no institutional controls for closure by removal.
  - There are no off-site, nearby destabilizing activities, nor will there be.
- Closure by final cover system:
  - The final cover system will provide long-term protectiveness with proper installation and post-closure care maintenance.
  - No destabilizing activities will occur in the proximity of the impoundments.

CLOSURE ALTERNATIVES

- **1) Long- and Short-Term Effectiveness and Protectiveness of the Closure Method, Including Identification and Analyses of the Following Factors: (continued)**

H. Potential Need for Future Corrective Action of the Closure Alternative

- Closure by removal:
  - The CCR and affected materials will have been removed. There should be no need for future corrective action.
- Closure by final cover system:
  - With post-closure maintenance and monitoring, the potential need for future corrective action is remote.
- Excavation and transportation contractors for such projects are typically scheduled one year in advance.

CLOSURE ALTERNATIVES

- **2) The Effectiveness of the Closure Method In Controlling Future Releases:**

A. The Extent to Which Containment Practices will Reduce Further Releases

- Closure by removal:
  - The CCR will have been removed. No future release will occur.
- Closure by final cover system:
  - The contaminant transport model as required by Section 845.710(d)(2) show that placement of the final cover will be protective of human health and the environment on a long-term basis.
  - Post-closure care maintenance will ensure the cover is functional long-term.

CLOSURE ALTERNATIVES

- **2) The Effectiveness of the Closure Method In Controlling Future Releases: (continued)**

  B. The Extent to Which Treatment Technologies May be Used
  - Closure by removal:
    - Since the CCR would be removed, and contaminant transport modeling predicts the groundwater quality will achieve the groundwater protection standards, use of treatment technologies is not needed.
  - Closure by final cover system:
    - The contaminant transport model shows achievement of the groundwater protection standards with the installation of the final cover system alone. Treatment technologies are not necessary.

CLOSURE ALTERNATIVES

- **3) The Ease or Difficulty of Implementing a Potential Closure Method:**
  A. Degree of Difficulty Associated with Constructing the Technology
  - Closure by removal:
    - Dewatering the CCR for handling
    - Construction of staging areas for dewatering stockpiles and load-out areas
    - Construction of temporary access roads within the CCR area
    - Suppression of water levels near the bottom of the impoundments
    - Structural backfill may be needed

CLOSURE ALTERNATIVES

- **3) The Ease or Difficulty of Implementing a Potential Closure Method: (continued)**
  - Closure by final cover:
    - Lowering of the water level in the pond allowing for regrading of the CCR. It does not need fully dewatered.
    - Placement of the geomembrane and geotextile.
    - Placement of the final protective layer – requires truck and heavy equipment access which can be easily accommodated.

CLOSURE ALTERNATIVES

- **3) The Ease or Difficulty of Implementing a Potential Closure Method: (continued)**

B. Expected Operational Reliability of the Technologies

- Closure by removal:
  - Excavation of CCR and affected materials will result in achievement of the groundwater protection standards. The technology is reliable, however difficult to implement.
- Closure by final cover system:
  - The technology utilized for the final cover is well documented at a large number of disposal facilities at the State and Federal level.
  - Computer modeling and real-time data are available to show the effectiveness of the final cover system.

CLOSURE ALTERNATIVES

- **3) The Ease or Difficulty of Implementing a Potential Closure Method: (continued)**

C. Need to Coordinate with and Obtain Necessary Approvals and Permits from other Agencies

- Closure by removal:
  - Any discharge of surface water may require modification of the existing NPDES permit.
- Closure by final cover system:
  - If a creek crossing is necessary for borrow material, a permit from the US Army Corps of Engineers may be required.
  - Any discharge of surface water may require modification of the existing NPDES permit.

CLOSURE ALTERNATIVES

- **3) The Ease or Difficulty of Implementing a Potential Closure Method: (continued)**

D. Availability of Necessary Equipment and Specialists

- Closure by removal:
  - Most equipment and operators are available through third-party contractors. Depending upon soil conditions near the bottom of the impoundment, specialized equipment, such as a drag line, may be needed.
- Closure by final cover system:
  - As with the closure by removal, most equipment and operators will be available through local or nearby third-party contractors.

CLOSURE ALTERNATIVES

- **3) The Ease or Difficulty of Implementing a Potential Closure Method: (continued)**

  E. Available Capacity and Location of Needed Treatment, Storage, and Disposal Services

  - Closure by removal:
    - There are approximately 2.8 million cubic yards of CCR material.
    - Excavation requires multiple staging areas for stockpiling for dewatering prior to loading and transportation.
    - Offsite disposal will require significant coordination with waste companies.
    - There would be approximately 161,600 truckloads of material for disposal.

CLOSURE ALTERNATIVES

- **3) The Ease or Difficulty of Implementing a Potential Closure Method: (continued)**
  - Closure by final cover system:
    - No additional capacity is needed for installation of a final cover system.
    - No treatment, storage or disposal services are needed.

CLOSURE ALTERNATIVES

- **4) The Degree to which the Concerns of the Residents Living within Communities where the CCR will be Handled, Transported and Disposed of are addressed by the Closure Method.**
  - Closure by removal will create the largest potential for ancillary affects.

  - Closure by final cover system
    - The CCR will be graded and then covered with a 40 mil LDPE, or similar.
    - Once covered, no additional exposure potential exists.

CLOSURE ALTERNATIVES

Transportation and On Site Capacity

1. Evaluation of Transportation Modes Assuming Closure by Removal

- Several facilities that may take CCR are located within 65 miles
  - No barge terminals
  - No rail spur readily available
  - Use of tractor trailers is the most feasible transportation method
    - Most trucks use low sulfur or biodiesel fuels – are readily available
    - Electric or hybrid trucks are in test markets but are not readily available
    - Recharge stations would be needed for electric vehicles
    - Hydrogen fuel celled trucks are limited in availability and accommodations for fueling stations would be needed
    - Natural gas or compressed natural gas vehicles are available in certain areas – fueling stations would be required
  - Contracting with local disposal companies – typically utilize diesel engines

CLOSURE ALTERNATIVES

- **Transportation and On Site Capacity (continued)**

2. On-Site Capacity

- On-site FGDS Development Landfill contains approximately 1,137,000 cubic yards of available disposal capacity
- Most of the landfill has not been developed
- Due to hydrogeologic conditions, construction of remaining capacity is difficult
- Borrow source clayey material is limited
- Borrow source is north of the creek
- Construction of new disposal area north of the creek is limited
  - Depth of potential cells will be shallow due to saturated sand deposits
  - Limited clay soils for liner construction and final cover

CLOSURE ALTERNATIVES

- **Additional Analyses Criteria**

1. Meet or Exceed Class 4 Estimate, or comparable – Section 845.710(d)(1)

- Closure by Removal
  - Includes CCR excavation, loading, transportation and disposal fees, and property maintenance.
  - Estimated costs – $145,458,000
- Closure by final cover system
  - Includes design, permitting, regrading, placement of low permeability layer (clay or geomembrane), drainage layer and protective cover, and construction oversight and reporting.
  - Estimated costs – $8,340,000
- Closure by final cover system is approximately $137,118,000 less than closure by removal

CLOSURE ALTERNATIVES

- **Additional Analyses Criteria (continued)**

2. Results of the Contaminant Transport Model

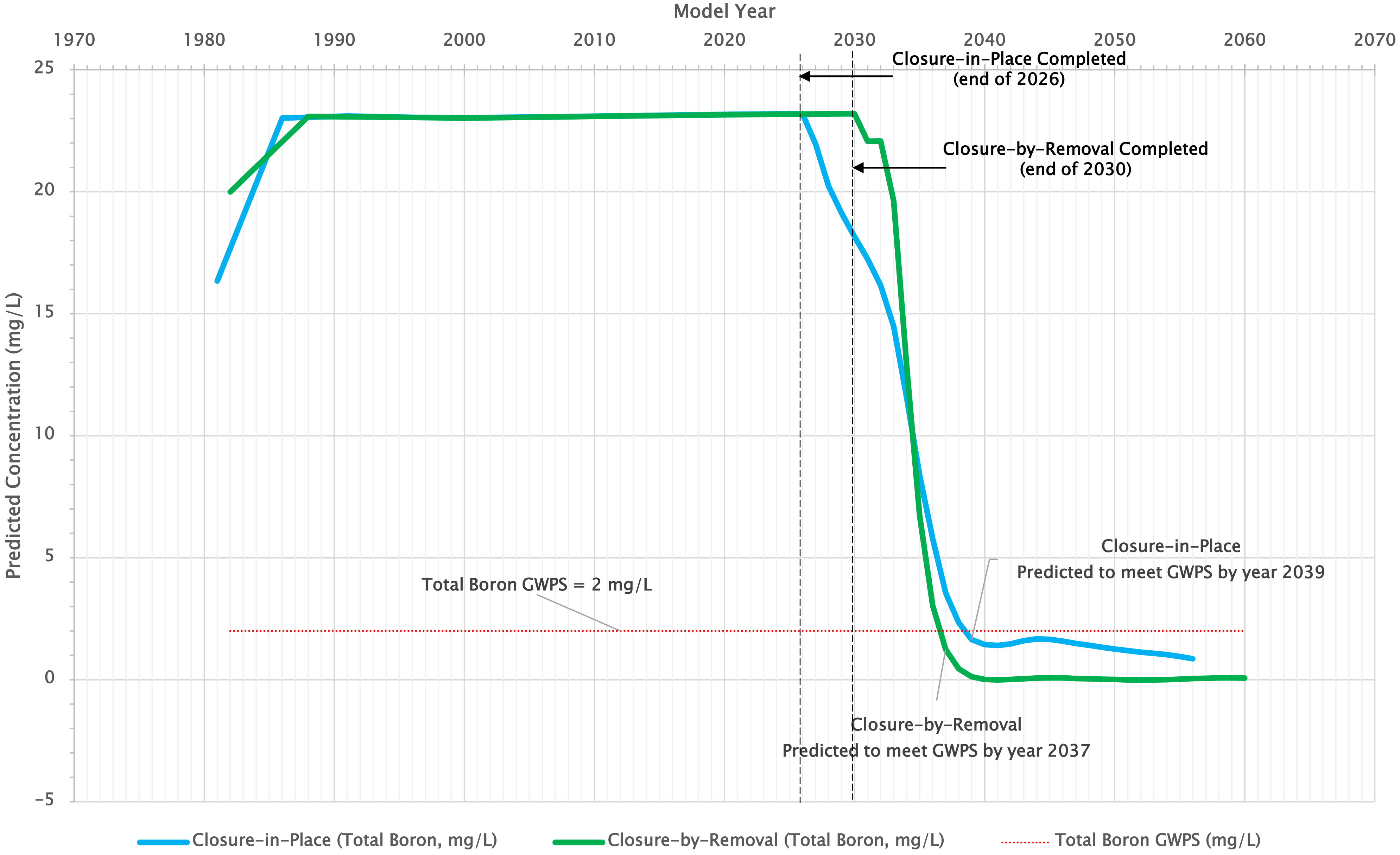
- Two-dimensional advection/diffusion model (MIGRATE).
- Site hydrogeologic characteristics were used to derive input parameters for the model.
- Underlying soils – 10^{-6} to 10^{-8} cm/sec vertical hydraulic conductivity
- Boron was used as the surrogate parameter
  - Least attenuated
  - Most mobile
  - No degradation used in model
- Closure by final cover system – Constant source; however the vertical velocity (HELP) decreases over time due to cover restriction of precipitation infiltration.
- Seasonal variation – Assumed fully saturated (worst case scenario)

CLOSURE ALTERNATIVES

- **Additional Analyses Criteria (continued)**
  3. Description of the Fate and Transport of Contaminants Comparing the Two Methods, including consideration of seasonal variations
  - Closure by removal – completed by 2030, source was removed (became 0) at completion of closure (2030).
  - The model results show achievement of the groundwater protection standards can be met within 7 years (2037).
  - Closure in place can be completed by about 2026.
  - The model results show compliance with the groundwater protection standards within 13 years (2039).
- **Either closure method will achieve the groundwater protection standards, and within 2 years of either method.**

CWLP – CLOSURE ALTERNATIVES ASSESSMENT

Total Boron Concentration versus Time



CLOSURE ALTERNATIVES

- **Additional Analyses Criteria (continued)**

4. Assess Impacts to Waters of the State

- Either method will achieve the groundwater protection standards.
- Dewatering may be necessary to a limited extent for closure by a final cover system.
- Dewatering will be needed extensively for closure by removal. A significant quantity of water may have to be discharged via an NPDES permit to allow for excavation of the CCR and affected soils.
- Removal of the CCR is invasive. The potential for precipitation runoff containing CCR residuals is significant.
- Closure by a final cover system greatly reduces the potential for impacts to waters of the State via precipitation runoff.

SELECTION OF CLOSURE METHOD

CWLP will submit a construction permit application for closure by installing a final cover system by February 1, 2022.

ASSESSMENT OF CORRECTIVE MEASURES

- **Conducted pursuant to Section 845.660**
  - Due to exceedences of Groundwater Protection Standards

- **Pursuant to Section 845.660(e), the Assessment of Corrective Measures is being conducted simultaneously with the Closure Alternatives Analysis since corrective action will be conducted simultaneously with facility closure activities**

ASSESSMENT OF CORRECTIVE MEASURES

- **Groundwater Monitoring Program**
  - Revised 2020/2021 to comply with Part 845, Subpart F.
  - Currently consists of 11 detection monitoring wells and 4 assessment monitoring wells.
- **Groundwater Monitoring Results**
  - Exceedences of the Groundwater Protection Standards at Wells AP-1, AP-2, AP-3, AP-10, AP -14 and RW-3.
  - Assessment activities initiated under 845.650, including 4 additional wells installed west of Sugar Creek.

NOTE
IMAGE SOURCE: GOOGLE EARTH PRO, IMAGE DATE JUNE 7, 2018.

ANDREWS ENGINEERING

GROUNDWATER MONITORING NETWORK

PLANS PREPARED FOR
CITY, WATER, LIGHT AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: JULY 2021
PROJECT ID:
SHEET NUMBER:
FIG. 3

ASSESSMENT OF CORRECTIVE MEASURES

- **Groundwater Monitoring Results (continued)**
  - All wells exhibiting exceedences are along the west side of the impoundments except RW-3 (north).
  - The main exceeding parameters are boron, calcium and sulfate. Limited in extent.
- **Assessment of Corrective Measures Purpose – To Evaluate Potential Corrective Measures That:**
  - Will be protective of human health and the environment;
  - Attain the groundwater protection standards;
  - Control the sources of release to reduce or eliminate, to the maximum extent feasible, further releases of constituents;
  - Remove from the environment as much of the contaminated material that was released from the CCR surface Impoundment as feasible, taking into account factors such as avoiding inappropriate disturbance of sensitive ecosystems; and
  - Comply with standards for management of wastes as specified in Section 845.680.

ASSESSMENT OF CORRECTIVE MEASURES

- **The Assessment Analyzed:**
  - The performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination;
  - The time required to begin and complete the corrective action plan; and
  - The institutional requirements, such as State or local permit requirements of other environmental or public health requirements that may substantially affect implementation of the corrective action plan.

ASSESSMENT OF CORRECTIVE MEASURES

Specific Corrective Measures Evaluated

Section 845.710 requires that the closure of a CCR ash pond must be completed by one of two methods:

- Through removal of the CCR and decontamination of the CCR ash pond (Section 845.740) or,
- Leaving the CCR in place and installing a final cover system pursuant to Section 845.750.
- Each of these were addressed in detail as part of the Closure Alternatives Analysis.

Any variant will be an augmentation of either closure by removal or closure by installation of a final cover system.

The contaminant transport model results showed that closure by removal and closure by installation of a final cover system would result in achievement of the Groundwater Protection Standards within a reasonable time frame without any augmentation to those methods.

ASSESSMENT OF CORRECTIVE MEASURES

- **Vertical Barriers, Groundwater Extraction and Groundwater Treatment**
  - **Vertical Barriers**
    - Impede movement of groundwater beneath and/or adjacent to the impoundments.
    - Often combined with other corrective measures such as groundwater extraction to control the hydraulic gradient of affected groundwater, and groundwater treatment.
    - Hydrogeologic conditions and lack of space availability can significantly hinder proper installation of such barriers.
    - Excavation for installation of certain vertical barriers can create a structural weakness along the toe of the perimeter berms. Slope stability could become an issue.

ASSESSMENT OF CORRECTIVE MEASURES

- **Groundwater Extraction**
  - Typically conducted simultaneously with a vertical barrier to control the hydraulic gradients within the contaminant migration pathway.
  - Discharge volumes can be significant.
  - Requires installation of electric lines or airlines for pumps and installation of a forcemain.
  - An excavation for an interceptor trench may be impractical due to structural integrity issues and restricted operating areas.

ASSESSMENT OF CORRECTIVE MEASURES

- **Groundwater Treatment**
  - Ancillary to groundwater extraction.
  - Methods of treatment include discharge via NPDES permit, treatment at a POTWS, spray irrigation and natural attenuation.
  - Performance of methods can vary dependent upon many factors, including actual water quality, volume of groundwater produced, available area (spray irrigation), and infrastructure needs (electrical source, force mains).
  - Most methods are reliable with the possible exception of spray irrigation which will have seasonal variability.
  - Ease of implementation is variable depending upon method. Natural attenuation requires only monitoring. All other methods require groundwater storage and/or conveyance to treatment or disposal structures. Installation of such structures must account for facility infrastructure and possibly geotechnical constraints.

SELECTION OF REMEDY

Based on the Assessment of Corrective Measures, and based on the Closure Alternatives Analyses, closure by installation of a final cover system will be protective of human health and the environment. Therefore, installation of a final cover system as described in Section 845.750 will also suffice as a corrective action. CWLP will submit the design specifications in a construction permit application to be submitted to the Illinois EPA by February 1, 2022.

Question & Answer Session

Reminders

- Did you sign up?
    - Meeting Summary & Illinois EPA Listserv
    - Sign Up at Table Outside of Chambers
- After the Meeting Questions?

  Deborah Williams, 217-789-2116 ext. 2636

  publicinformation@cwlp.com
- CWLP Illinois CCR Website https://www.cwlp.com/IllinoisCCRCompliance.aspx

Exhibit N

Summary of Public Meetings

City Water, Light and Power, City of Springfield, Illinois

PUBLIC MEETING SUMMARY

Coal Combustion Residual Surface Impoundments
Closure Alternatives Assessment and Assessment of Corrective Measures

PUBLIC NOTICE

As provided in Section 845.240 of the Pollution Control Board regulations, a notice of public meetings on the Closure Alternatives Assessment and Assessment of Corrective Measures was prepared and placed on City Water, Light & Power's (CWLP) publicly available web page for Illinois CCR compliance data and provided to the Illinois Environmental Protection Agency ("Agency" or "Illinois EPA") for emailing to its listserv for this facility. This notice was also added CWLP's general announcements home page. The notice was mailed on November 1st to all residents within 1 mile of the facility which came to 2,181 residents and property owners. The public notice also was mailed to the Clerks and posted in conspicuous locations of all incorporated areas within 10 miles of the site which included 12 towns, cities and villages including Springfield. The meeting was also announced in the City's neighborhood newsletter and at the preceding City Council meeting and CWLP assisted the local newspaper, the State Journal-Register, with a story the day of the meeting which was published on the front page announcing the meeting.

CONDUCT OF MEETINGS

On December 2, 2021, the first meeting was held from 2 p.m. to 4 p.m. and the second meeting was held from 5:30 p.m. to 7:20 p.m. in the Springfield City Council chambers. Approximately 40 people attended the first meeting and approximately 25 attended the second meeting. In addition to in-person attendance, the meeting was live-streamed on public access television and the City's website. Residents were given an opportunity to ask questions by email if they were viewing the meeting remotely. Questions were asked by 10 people at the first meeting, 8 people asked questions at the second meeting (4 of whom also asked questions at the first meeting) and two residents submitted questions by email that were answered at the second meeting. During the second meeting, there was enough time remaining to take public comments from the four members of the public who wanted to make comments, including three people who had already asked questions and one person who just made comments.

During sign in and at the opening of each meeting, residents were encouraged to sign up to receive by email the summary of the meeting and/or be placed on the Illinois EPA's Listserv for additional information on the permitting process. Twenty-nine people signed up to receive the meeting summary and 19 people asked to be placed on the Illinois EPA's Listserv for the facility.

Andrews Engineering gave an approximately 40 minute presentation on the closure alternatives and corrective action analysis. The power point presentation was posted on CWLP's announcement home page at https://www.cwlp.com/announcements.aspx along with a link to the online livestream of the meeting.

In addition to the technical expert from Andrews Engineering, CWLP had a panel of experts from various areas of the utility: Water Division, Electric Division, and Regulatory Affairs Division, including staff from environmental specialties, ash pond operations, water plant operations/lake management, power plant operations and senior policy staff.

SUMMARY OF ISSUES AND QUESTIONS RAISED AT THE MEETINGS

Groundwater Modeling

Andrews explained how the proposed cap for the ash ponds would stop precipitation from entering the system and that natural seepage would continue for a limited period of time, which was the subject of the modeling. Legal and technical staff from Sierra Club and Prairie Rivers Network asked a number of detailed, substantive questions about the tools used (HELP and MIGRATE) to develop the contaminant transport model.   Andrews Engineering was generally able to provide answers to all of these questions. CWLP and Andrews were asked about a 2001 EPRI study which the panel was not able to answer questions about. CWLP requested a copy of the study but has not yet received it or determined which specific 2001 EPRI study was being referenced.

One important issue raised in this discussion was the fact the 40 mil LDPE liner for the cover system described in the closure alternatives analysis and used in the model did not match the closure plan developed prior to this analysis and included with the operating permit application. CWLP will ensure this closure plan is updated to reflect the alternative studied and intended to be used.

Another issue that was discussed in some detail is the basis for Andrews' conclusions that the connection to groundwater is created by liquid levels in the ponds causing an outward gradient that influences the potentiometric elevations. Once the ponds are closed and a steady state is achieved, the potentiometric surfaces will revert to near-natural levels. Andrews explained there will be no horizontal movement of groundwater through the ash following closure.

There were several questions about the material underneath the ash ponds and the extent and location of the semi-confined sand layer in comparison to the bedrock and the silty clay material.

Another issue raised was that the contaminant transport model assumed a natural draining of the water in the ponds and no mechanical dewatering of the ponds. It was explained that this assumption was used in the modeling because it was the more conservative assumption and groundwater standards were still able to be met. CWLP explained that engineering studies of how much dewatering may be needed will be done once the Agency accepts the closure alternatives analysis conclusions. Representatives for Sierra Club expressed their preference that CWLP mechanically remove water from the ponds and discharge this water to Sugar Creek rather than allowing it to naturally drain. CWLP appreciates this input and will take this into account during the next phase of the closure process through the NPDES permit.

There was a detailed discussion between Prairie Rivers staff, Andrews and CWLP staff regarding the relationship between Lake Springfield and the ash ponds in terms of influence on groundwater. Andrews explained that the inflow into the model on the dam side of the ash ponds was assumed to be zero based on the design of the dam and the concrete cut off wall. CWLP explained that the scenario described by Prairie Rivers staff of water getting below the dam would be a very serious sign of potential dam failure, which is not the case. The questioner indicated that it would be helpful to have cross-sectional drawings of the dam (constructed in the 1930s) to analyze this conclusion. Although CWLP indicated some such drawings exist, these documents cannot be included in a public meeting summary for homeland security reasons. CWLP was also asked if the ash ponds impede maintenance of the dam and the Water Division Manager explained the earthen portion of the dam being discussed is maintenance free.

Beneficial Reuse of Ash

There were a few questions asked about beneficial reuse of the ash in the ponds for concrete or other applications and whether that could be an alternative to landfilling in the closure by removal alternative. CWLP explained that this was not evaluated in the closure analysis because it would take longer to achieve groundwater standards than simply landfilling the material. CWLP also explained in detail its current beneficial use of dry fly ash from Dallman Unit 4 for concrete where a more modern handling system results in fly ash that is both dry and separated from bottom ash.

CWLP staff also explained the hurdles in the current market for beneficial reuse of wet ash, especially where bottom and fly ash are mixed as they were in the design of older units like CWLP's Dallman Units 31, 32 and 33. In the event removal is required, these options would be studied in more detail. More advanced methods of separating ash into more usable materials have the negative consequences of wastewater that would need to be managed in addition to the increased energy use and CO2 emissions that would result.

General Questions

General questions about the project included when it would begin (2023), where the material would be sent if landfilled (within 65 mile radius) and whether caps like these have been use before (for almost 30 years at landfills). The panel was also asked about whether the ponds would settle (minimal and will be monitored for) and if the potential for earthquakes was considered (not in the right seismic zone to risk damage from an earthquake).

Some questions were asked about the process for obtaining additional borrow material for the closure project if that became necessary for either option. Andrews Engineering discussed the permitting and other measures that would be taken if it were necessary to bring material across Sugar Creek for the project.

One resident asked if it would be possible to remove all the ash in stages, line the area and put the ash back in. Logistical and capacity problems with the concept in comparison to the two alternatives analyzed were discussed.

One person asked about the drainage layer described in the report as going beyond the rule requirements and Andrews explained this referred to lateral drainage on top of the LDPE liner, which was required for the contaminant transport model. This term does not refer to existence of leachate or leachate collection within the impoundments.

On-Site Landfill

Some questions were asked about the ability to construct an on-site landfill and Andrews explained the geologic issues and capacity limitations with using the current ash pond site as a location for a new landfill compliant with Federal and State regulations.

Transportation

Questions were asked about the transportation options considered in the removal alternative from the Closure Alternatives Assessment. Andrews explained in more detail the inquiry made into electric and alternative fuel vehicle availability.

CWLP explained the current status of the nearest rail line, which is currently inactive, including the scope, permitting and cost of substantial upgrades that would be needed to utilize it and bring to the plant grounds via a new crossing to go over Interstate 55. In addition, information was provided on the safety and fugitive dust concerns of loading rail cars at the current terminus in a residential neighborhood, West Laketown. CWLP recognized the value in providing additional explanation in the closure alternatives report of the basis for the conclusion that rail as a transportation option is not readily available.

Questions were asked about options for controlling dust from transportation. CWLP explained the various best management practices currently used and evaluated in the Closure Alternatives Assessment and the fact that these practices minimize dust but do not eliminate it nor the danger of spills or accidents.

Floodplains and Climate Change

CWLP was asked about the location of the ash pond site and whether it is in the floodplain. Andrews explained their analysis of this issue and the conclusion that the ponds are adjacent to the floodplain and that current FEMA maps do not accurately reflect the elevations of the berms at the site.

Some questions were asked about climate change and whether that would affect the long-term effectiveness of the cap in place closure alternative. Andrews explained their use of the most recent, real world data for the model. CWLP identified sources for current data relative to the region, which predict stable or possibly decreasing precipitation going forward for our region of central Illinois. Following the meeting, the request to ‘consider climate change’ was continued in emailed questions, which were addressed. Andrews explained that floodwaters would not be expected to enter into the bottom of the ponds vertically through the silty clay layer due to the low hydraulic conductivity properties of the soil at the site. Floodwaters would need to be sustained for long periods of time in order to increase the potentiometric surface beneath the ponds. Andrews stated that recent creek elevation data indicated flood event durations were too short to cause such events.

Local Resident Concerns

A resident living in proximity to the impoundment site expressed concerns about truck traffic and air pollution from the 96 trucks per day for 7.5 years it would take to remove all material from the impoundments. Another resident spoke in detail about their health concerns arising from CWLP’s August 31st fly ash release incident and its impacts on her health as well as her desire to safely grow vegetables in their yard.

Another resident asked about health impacts of the ash material. CWLP explained that groundwater contamination will not have any health impacts based on the location of the ash ponds downgradient from the drinking water supply and the absence of potable wells downgradient from the ash ponds as determined by a potable well survey Andrews conducted for CWLP. CWLP also explained that risk of inhalation of airborne material is the main health issue the utility works to minimize. Residents also expressed concerns about protecting the health of poor and minority communities, both in the area of the CWLP site and in the area that would be the end disposal location for the material as environmental justice areas are often located near landfills.

A resident was concerned that arsenic and mercury in the environment had caused her to develop cancer and asked that more information be made available to the public about contaminants in drinking water. CWLP explained that the ash ponds do not connect to Lake Springfield or impact the City's drinking water. CWLP's Water Division Manager also explained the utility's drinking water routinely meets or exceeds all State and Federal standards and that additional data beyond what is available on CWLP's website and in the annual water quality report can be found on the Illinois EPA's Drinking Water Watch website.

Some residents expressed concern that monitoring the ash pond site for 30 years was insufficient. CWLP explained that 30 years is only a minimum regulatory requirement and that the site would be maintained as all City of Springfield properties, into perpetuity.

Generally, there were concerns expressed that CWLP should not select an option simply because it is the cheapest or easiest, but to instead think about the long term. CWLP explained they have selected the option with the least overall environmental impacts and that achieves the groundwater protection standard. One resident asked about how CWLP is weighing the pros and cons of the two alternatives and what factors have the most weight. Another resident asked about how you balance the risk of some of the ash falling off a truck with the risk of leaving the material in place. CWLP explained that first the alternative must achieve groundwater standards and then tried to explain the weight of evidence analysis that led to selection of closure in place as the safer alternative.

One resident commented that they supported closure by removal because it would mean more jobs than closure in place and that the jobs should be union jobs. A few residents simply stated they opposed closure in place and wanted the material removed to another site.

Groundwater pollution

Some residents raised the issue of groundwater exceedances and said that CWLP reported over 600 exceedances of groundwater standards through 2017. CWLP explained that the purpose of the corrective action plan is specifically to address any groundwater exceedances. A resident asked about how the community would be notified of groundwater or drinking water impacts.

One speaker asked if any impacts of boron to vegetation are noticed downstream. Andrews and CWLP explained the extent of groundwater contamination is limited to the CWLP site and does not impact areas off-site or have a connection to CWLP drinking water or its source, Lake Springfield.

Public Participation Questions

Some residents asked about the next steps of the process beyond the question and answer session, and how they would be kept informed and be made aware of future opportunities to comment. CWLP explained the process for receiving this meeting summary and signing up for the Illinois EPA Listserv for this project. When asked if CWLP had an additional comment period, it was explained that City officials always take input from residents, but the 14-day period for developing a meeting summary did not leave room for a traditional public comment period. Some speakers also asked whether this opportunity for public input was meaningful or if CWLP's mind is made up.

Summary of Revisions, Changes and Considerations Resulting from the Public Meeting

As a result of questions and issues raised at the public meeting, CWLP will expand on its explanation of the analysis of rail transportation during the final report. It will also make sure a final closure plan is properly updated to include the use of the geomembrane liner presented in the Closure Alternatives Assessment.

CWLP will take into account the comments on preferred dewatering methods during the design phase and is likely to include some degree of mechanical dewatering as suggested. Similarly, in the event closure by removal of ash is required, CWLP will look carefully at available beneficial reuse methods at that time and whether they would be more or less environmentally damaging than landfilling.

ATTACHMENT 11

CLOSURE ALTERNATIVES ASSESSMENT AND ASSESSMENT OF CORRECTIVE MEASURES

City Water, Light & Power

CCR Impoundments – Lakeside and Dallman Ash Ponds

Springfield, Sangamon County, Illinois

Closure Alternatives Assessment and Assessment of Corrective Measures

February 2022

Submitted to:
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1. INTRODUCTION

Characteristics of the Lakeside and Dallman Ash Ponds have been evaluated pursuant to 35 Illinois Administrative Code (IAC) 845.300 (Subpart C – Location Restrictions). Based on extensive hydrogeologic investigations at and in the near proximity to the impoundments, it has been determined the impoundments do not meet the requirements of Section 845.300 (Placement above the Uppermost Aquifer). Therefore, pursuant to Section 845.350, the closure process defined in Section 845.700 must be implemented.

Prior to closure, a closure alternatives analysis (CAA) must be completed pursuant to Section 845.710. This CAA has been prepared for the two (2) existing coal combustion residual (CCR) units at the Springfield City Water, Light and Power (CWLP) facility identified as the Lakeside Ash Pond and the Dallman Ash Pond pursuant to 35 Illinois Administrative Code (IAC) 845.710. In addition, the facility anticipates conducting closure activities simultaneously with corrective action based on location restrictions and results from groundwater sampling and analyses. Therefore, the Corrective Measures Assessment has been conducted pursuant to 35 IAC 845.660 and is herein incorporated into the CAA.

The CAA dated October 2021 was placed on CWLP's public access website for review prior to two public meetings which occurred on December 2, 2021, pursuant to Section 845.240. Documentation of the public notice and summary of the public meetings addressing the Closure Alternative Assessment and Assessment of Corrective Measures is provided in Attachment 10 of the Closure Construction Permit Application. A summary of the issues raised by the public during the notification and public meetings are also provided in Attachment 10 of the Closure Construction Permit Application. Issues or questions raised by the public during the two meetings are summarized in Exhibit N of Attachment 10 to the Construction Closure Application. CWLP evaluated each of the public comments and have incorporate those accordingly in the CAA. The selected remedy is closure of the CCR ash ponds-in place by installation of a final cover system.

1.1 Facility Description/Background

CWLP owns and operates two existing CCR ash ponds and one CCR landfill (FGDS Development Landfill - Permit No. 1995-243-LFM). The CWLP CCR ash ponds and CCR landfill are located north and east of the former Lakeside Power Generating Station and Dallman Power Generating Station in the Eastern ½ of Section 12, Township 15 North, Range 5 West, in Springfield, Illinois (see Captioned Items Figure 1). The subject of this submittal, the CCR ash ponds, are identified as the Lakeside Ash Pond and the Dallman Ash Pond and will be closed as a multi-unit system. The FGDS Development Landfill is not part of the CAA.

The former Lakeside Power Generating Station and Dallman Power Generating Station are situated on the northwestern bank of Lake Springfield in Springfield, Illinois. The Lakeside Ash Pond is immediately north of Spaulding Dam at the northern end of Lake Springfield (see Figure 2). The Dallman Ash Pond is immediately northwest of the Lakeside Ash Pond. Placed into service prior to 1958, the Lakeside Ash Pond is primarily a diked embankment with an in situ soil liner. The Lakeside Ash Pond consists of four separate ponds (i.e., three lime softening ponds and a settling pond) totaling approximately 35.0 acres. The Lakeside Ash Pond ceased receiving ash in 2009. The Dallman Ash Pond was placed into service in approximately 1976 and is also a diked embankment with an in situ soil liner. The Dallman Ash Pond is approximately 34.5 acres in area.

The Lakeside Ash Pond currently receives lime sludge from the CWLP Drinking Water Purification Plant and scrubber wastewater treatment plant clarifier blowdown. The Dallman Ash Pond currently receives fly ash and bottom ash, which are sluiced with raw lake water from the power generating structures, industrial facility wastewater treatment plant clarifier blowdown and landfill leachate. Settled water from both the Lakeside Ash Pond and Dallman Ash Pond flow into opposite sides of a Clarification Pond for final treatment before being discharged to Sugar Creek at NPDES permitted Outfall 004.

In April 2019, CWLP submitted notification of intent to comply with the Alternative Closure Requirements of 40 CFR § 257.103(a) since no alternative disposal capacity is currently available. Since then, CWLP has shut down Dallman Units 31, 32 and will be shutting down Dallman Unit 33 no later than September 15, 2023. Once Dallman Unit 33 is shutdown, all fly and bottom ash will cease being sent to the Dallman Ash Pond. The lime sludge ponds associated with the water purification plant must be relocated and operational prior to completion of the closure at the Lakeside Ash Pond. CWLP will begin construction of the new lime sludge ponds in spring of 2022. It is anticipated the lime sludge ponds will be complete by October 2023, at that point closure of both the Dallman and Lakeside Ash Ponds can begin.

CWLP submitted a request to USEPA for approval of a site-specific alternative deadline in November 2020 to initiate closure pursuant to 40 CFR §257.103(f)(1). CWLP is requesting an extension to allow the Lakeside and Dallman ash ponds to continue to receive CCR and non-CCR waste streams in order to complete the retirements of Dallman Units 31, 32 and 33 and relocate the CWLP Drinking Water Purification Plant lime sludge ponds, which are currently located on the Lakeside Ash Pond. This submittal is still under review.

2. CLOSURE ALTERNATIVES ANALYSIS

Pursuant to 35 IAC 845.700, existing CCR ash pond must cease placing CCR waste stream in the ash impoundments and must initiate closure of the impoundments where the location restrictions cannot be met. 35 IAC Section 845.710 states the closure of a CCR ash pond must be completed by one of two methods: a) through removal of the CCR and decontamination of the CCR ash pond (Section 845.740) or, b) leaving the CCR in place and installing a final cover system pursuant to Section 845.750. In the preamble to the 2015 Federal CCR Rule (40 CFR Part 257), the U.S. Environmental Protection Agency (US EPA) concluded that: “both methods of closure (i.e., clean closure and closure with waste in place) can be equally protective, provided they are conducted properly.” (Federal Register, Vol. 80, No. 74, p. 21412, April 17, 2015). Additionally, in adopting Part 845, the Illinois Pollution Control Board held that “while the rules require the evaluation of closure by removal as one of the alternatives, there is no presumption that it is the preferred closure method” (In the Matter of Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments: Proposed New 35 Ill. Adm. Code 845, R20-19, February 4, 2021 at p. 91). However, before selecting a closure method, the owner or operator of the CCR ash ponds must complete a CAA. The objective of the CAA is to evaluate:

- the long- and short-term effectiveness and protectiveness of the closure method;
- the effectiveness of the closure method in controlling future releases;
- the ease or difficulty of implementing a potential closure method based; and
- the degree to which the concerns of the residents living within communities where the CCR will be handled, transported and disposed.

The CAA must; 1) evaluate the complete removal of the CCR as one closure alternative, along with the modes for transporting the removed CCR, including by rail, barge, low-polluting trucks, or a combination of these transportation modes; 2) identify 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; and 3) include any other closure method in the alternatives analysis if requested by the Agency.

2.1 Alternative 1 – Closure by Removal

In accordance with 35 IAC 845.740, closure by removal would be achieved by dewatering the CCR ash pond and excavation of the CCR and affected areas, transporting the material to a lined landfill or other appropriate disposal facility, reshaping the site and backfilling-filling/grading as necessary, with clean material to retain structural and/or hydrologic properties. Closure by removal may require a lengthy permitting process for a new or expanding an existing disposal facility, as well as construction and excavation activities which can be costly. The duration of closure by removal would be largely dependent on a number of factors, including locating and construction of an alternate processing and storage facility, locating and contracting alternate disposal facilities, the logistics associated with drying and transportation of the CCR, and the location and transportation of borrow material to back-fill the excavation.

2.2 Alternative 2 – Closure with a Final Cover System

The requirements for closure in place are outlined in 35 IAC 845.750. Closure in place is achieved by installing a final cover system over the existing CCR ash impoundments. This option requires 30 years (minimum) of post-closure care which includes cover maintenance and continued groundwater monitoring. While closure in place does not remove the source material, installation of a final cover minimizes infiltration of liquids into the waste and mitigates the potential for leaching of CCR contaminants into water-bearing deposits. This option also minimizes impacts to human health due to accidental inhalation/ingestion of wind-blown CCR from excavation and transportation activities. In addition, this option, when compared to closure-by-removal, is the most economical. The Illinois EPA CCR rules outline closure-in-place requirements at 35 IAC 845.750(c).

Generally, closure with a final cover system will include the following components:

- Site preparation, construction of haul roads and contractor laydown and stockpile areas;
- Removal of standing water in the pond;
- Dewatering of CCR to remove sufficient interstitial water to meet performance criteria, enable grading of the CCR ash, and allow installation of the final cover system);
- Placement of fill as needed to meet closure grades;
- Installation of the components of the final cover system;
- Establishment of vegetation and erosion controls on the final cover system;

Criteria for closure with CCR in place are designed to:

- Control, minimize, or eliminate, to the maximum extent feasible, future infiltration of liquids into the waste and releases of CCR, leachate, or contaminated runoff to the ground or surface waters or to the atmosphere;
- Preclude the probability of future ponding of water, sediment, or slurry;

- Prevent the sloughing or movement of the final cover system during the post-closure care period; and
- Minimize need for future maintenance.

The ability of properly designed and constructed final cover systems to meet the performance standards of Section 845.750 has been amply demonstrated through numerous technical publications, including US EPA guidance documents, and more than 35 years of industry experience. The final cover design specifications were derived from the US EPA Subtitle D regulations (40 CFR Part 258) which have been utilized for waste disposal units nationwide.

2.3 Closure Alternatives Assessment

This section compares the alternatives based on evaluation of the assessment criteria. Each of the balancing criteria consists of several sub-criteria listed in the CCR Rule (provided in detail in Section 2.3.1) which have been considered in this assessment. The goal of this assessment is to evaluate the alternatives based on whether each is technologically feasible, relevant and readily implementable, provides adequate protection to human health and the environment, and minimizes impacts to the community.

2.3.1 Assessment Criterion 1 – The Long- and Short-Term Effectiveness and Protectiveness of the Closure Method

This assessment criterion considers the following sub-criteria relative to the long-term and short-term effectiveness of the remedy, along with the anticipated success of the remedy.

2.3.1.1 The Magnitude of Reduction of Existing Risks

Given the hydrogeologic setting beneath and adjacent to the Lakeside Ash Pond and Dallman Ash Pond, and the fact there are no receptors within the Sugar Creek basin within 3,400 feet of the closest impoundment (see Attachment 1), closure in place with a final cover system does not pose a risk to human health or the environment. Groundwater monitoring results show the concentrations detected above groundwater protection standards (GWPSs) are limited in extent. Installation of a final cover system will allow concentrations to reduce constituent concentrations below the GWPSs without disturbing the existing footprint of CCR. However, closure by removal of the CCR will create significant exposure potential during many components of the process and increase the number of potential receptors. Exposure due to excavation of the CCR may occur through ingestion, inhalation, or dermal contact. The components include:

- Excavation and stockpiling of the CCR and impacted materials in order to drain intrinsic water for loading and transporting to an appropriate disposal facility.
- Loading and transporting the CCR offsite. This creates spillage at the loading site which can be tracked along the haul road and on to the local roadways. The CCR will migrate as dust particles and runoff during precipitation events.
- Disposal activities of the CCR at appropriate facilities will create dust during placement and covering. Disposal activities will typically cause residual material to end up on haul roads and local roadways near the disposal facility.
- Mixing CCR with municipal solid waste, assuming disposal is conducted at a permitted facility accepting municipal solid waste, will promote the generation of hydrogen sulfide gas for many years.

Both closure alternatives reduce existing risk by eliminating the source, either by removal or by eliminating/reducing the precipitation infiltration creating leaching and mobilization of CCR solutes from the CCR ash ponds to groundwater. However, reduction of existing risks would best be accomplished by closure in place. Disturbing the impoundments and underlying stratigraphy with heavy equipment can cause a significant impact to the groundwater (increasing contaminant concentrations) and potentially to adjacent structures such as Spaulding Dam. Also, closure by removal exposes CWLP to the risk of CCR material being washed into Sugar Creek during a heavy precipitation event. Minimizing the disturbance of the CCR and eliminating the precipitation infiltration with the placement of a final cover system will be the least intrusive. Constituent concentrations associated with the CCR impoundments should begin to decrease immediately upon completion of the final cover system.

2.3.1.2 The Magnitude of Residual Risks in Terms of Likelihood of Future Releases of CCR

Following implementation of either closure alternative will result in similar residual risks in terms of the potential for the future release of CCR contaminants. Closure by removal will leave residual influences to the groundwater which will diminish over time. Closure by final cover system will also leave residual influences that will diminish with time as the leachate level is reduced within the impoundments. Contaminant transport modeling provided in Attachment 2 shows the expected reduction in specific concentrations in the groundwater subsequent to completion of the exhumation of the CCR and the final cover system. The final cover system will be placed with stringent quality construction assurance, maintained for structural and operational integrity, with monitored groundwater for at least 30 years. The risk for a future release is limited. However, the risk for future release due to closure by removal is non-existent.

2.3.1.3 The Type and Degree of Long-Term Management Required, Including Monitoring, Operation, and Maintenance

After closure by removal, the long-term management, including monitoring, operation, and maintenance, is limited to maintaining the groundwater monitoring system and groundwater monitoring. Pursuant to Section 845.740(b), groundwater monitoring must continue for three years after the completion of closure or for three years after groundwater monitoring does not show an exceedance of the GWPS, whichever is longer. For closure in place, long-term management, including monitoring, operation, and maintenance is required for groundwater monitoring and maintenance of the final cover to ensure its continued integrity and effectiveness. Pursuant to Section 845.780(c), post-closure care for closure in place must continue for 30 years after closure and continue until groundwater monitoring does not show an exceedance of the GWPS.

2.3.1.5 The Short-Term Risks That Might be posed to the Community or the Environment during Implementation of a Closure, Including Potential Threats to Human Health and the Environment Associated with Excavation, Transportation, and Re-Disposal of Contaminants

If closure by removal were to occur for the Lakeside and Dallman Ash Ponds, offsite disposal would be necessary. Short-term risks pertaining to excavation, transportation and disposal of the CCR were partially discussed in Section 2.3.1.1 above. Excavation and offsite disposal comes with inherent potential risks to the community and environment. These risks include:

1. Increased traffic on public roads local to the impoundments and at the disposal facility/facilities would occur (96 truck/day each way for 7.5 years; a truck leaving site approximately every 5 minutes for 8 hours/day Monday through Friday).
2. Excavation of the CCR and the immediate underlying stratigraphy would likely cause short-term increase in constituent concentrations (groundwater) related to the CCR material. The length of impacts can only be estimated, dependent upon the length of the closure process and geologic deposits to be disturbed.
3. Closure by removal of the CCR will create significant exposure potential during many components of the process and increase the number of potential receptors. Exposure due to excavation of the CCR may occur through ingestion, inhalation, or dermal contact. Excavation, drainage of the CCR prior to transporting, loading and transporting, and disposal all create risks of exposure. CCR tracked on roadways will create dust and transport with runoff during precipitation events, ending up in local waterways.
4. Disposal activities of the CCR at appropriate facilities will create dust during placement and during application of daily cover. Disposal activities will typically cause residual material to end up on haul roads and local roadways near the disposal facility. Based on available landfill capacity within the region, utilization of multiple facilities will likely be necessary.
5. Mixing CCR with municipal solid waste, assuming disposal is conducted at a permitted facility accepting municipal solid waste, will promote the generation of landfill gas for many years.
6. Specific to the Lakeside and Dallman Ash Ponds, excavation of CCR may cause structural integrity issues for Spaulding Dam, the clarification pond and the FGDS Development landfill.

Closure by final cover system installation will not result in any short term risks with the possible exception of tracking of CCR during final grading preparation for cover placement.

2.3.1.6 The Time until Closure and Post-Closure Care or the Completion of Groundwater Monitoring under Section 845.740(b) is completed

The timeframes to achieve the GWPS by removal and closure in place are anticipated to be generally similar. However, the actual times can vary for both methods dependent upon several circumstances. The post-closure care (minimum of 30 years) for closure in place is much longer than that expected for closure by removal (minimum of 3 years or until the monitored constituent concentrations are below the GWPSs for 3 years).

2.3.1.8 The 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

Section 2.3.1.4 above discusses the short-term risks for both closure in place and through removal. The potential for exposure to humans and environmental receptors is greatest during the actual closure process, whether excavating and transporting the CCR, or applying the final cover system for in-place closure. As discussed in the aforementioned section, closure by removal presents the greatest potential for exposure during closure activities. Approximately 2.8 million cubic yards of CCR are contained within the Lakeside and Dallman Ash Ponds. This equates to roughly 161,600 truckloads of material to be loaded, transported and deposited at appropriate disposal facilities. Subsequent to closure by either method, the risk diminishes and becomes minimal to non-existent as the presence of residual concentrations decrease through natural attenuation.

When evaluating this regulatory requirement, contaminant transport modeling was used to predict short- and long-term effects of closure by removal and in place via a final cover system. Based on the site hydrogeologic conditions, the results from the modeling indicate the groundwater quality downgradient of the impoundments will meet GWPSs subsequent to closure. The downgradient groundwater quality is expected to meet the GWPSs as well via closure by removal. Given that both closure methods will essentially provide the same end result, the closure method with the lowest potential for exposure to human and environmental receptors is considered most favorable. Implementing a final cover system pursuant to Section 845.750 will result in the least potential for exposure of the two methods.

Based on the hydrogeologic setting beneath and adjacent to the Lakeside and Dallman Ash Ponds, closure in place or closure by removal will not significantly alter the groundwater movement within the immediate area of the impoundments. Overall groundwater movement will be to the north paralleling Sugar Creek. The existing monitoring system will be adequate to determine changes in groundwater quality coincident with closure and post-closure activities.

2.3.1.9 The Long-Term Reliability of the Engineering and Institutional Controls, Including an Analysis of any Off-Site, nearby Destabilizing Activities

The long-term reliability of the engineering and institutional controls is specific to closure by covering as the CCR would be exhumed via closure by removal. The engineering and institutional controls reference the components of the final cover system which was modeled after the final cover design contained in 40 CFR Part 258 and incorporated into the landfill regulations specific to 35 IAC 811.314. Components of the cover design specifications included in Section 845.750 have a long and vetted history as final cover designs have been permitted, installed and monitored for 30 plus years at dozens of facilities in Illinois and significantly more nationwide. The components of the final cover decrease precipitation infiltration to near negligible, thus decreasing the leachate levels within the impoundments, minimizing any outward gradient that may transport CCR-related solutes.

The 30-year post-closure care period will begin upon completion of installation of the final cover system as approved by the Illinois EPA. The impoundments will be monitored and maintained pursuant to Section 845.780 for a minimum of 30 years. Monitoring and maintenance efforts will be included in the Post-Closure Care Plan required pursuant to Section 845.780(d).

Dallman Ash Pond is bound by the FGDS Development Landfill (Units 1 and 2) to the east, Sugar Creek to the west and north, and the clarification pond to the south. No activities will occur in these areas that will destabilize the impoundment for the foreseeable future. The Lakeside Ash Pond is located adjacent to the FGDS Development Landfill (Unit 1) and the clarification pond to the north, the Spaulding Dam to the south, Sugar Creek to the west, and undeveloped property owned by CWLP to the east. No activities will occur in these areas that will destabilize the Lakeside Ash Pond.

2.3.1.10 Potential Need for Future Corrective Action of the Closure Alternative

The potential contaminant source will have been exhumed if closure by removal is conducted. Any residual effect from the process should dissipate via natural attenuation with no need for future correction. Closure in place will encapsulate the source but not physically remove it. As stated above, predictive modeling has shown closure by final cover to be protective of human health and the environment. With post-closure maintenance and monitoring, the potential need for future corrective action is remote.

2.3.2 Assessment Criterion 2 – The Effectiveness of the Closure Method In Controlling Future Releases

This assessment criterion takes into consideration the ability of the closure alternatives to control a future release. Information provided in this section was largely discussed in Section 2.3.1 above. If the source is no longer present (closure by removal), a future release should not occur once the residual effects of the impoundment have dissipated. Therefore, the following two subsections will be applicable to only closure in place.

2.3.2.1 The Extent to Which Containment Practices will Reduce Further Releases

Closure in place by implementing a final cover system will be effective in reducing the likelihood of a release by limiting infiltration of precipitation. Contaminant transport modeling completed for the Dallman and Lakeside Ash Ponds indicate placement of a final cover pursuant to Section 845.750 will result in the achievement of the groundwater quality meeting the applicable groundwater quality standards. Post-closure care maintenance conducted by the facility will ensure the final cover system will remain functional. No further releases are expected.

2.3.2.2 The Extent to Which Treatment Technologies May be Used

Pursuant to the results of the contaminant transport model, the CCR ash ponds present no risk to human health or the environment. Therefore, treatment technologies are not necessary to reduce assumed risk posed by the CCR constituents.

2.3.3 Assessment Criterion 3 - The Ease or Difficulty of Implementing a Potential Closure Method

This criterion takes into consideration technical and logistical challenges required implementing a closure alternative, including practical considerations such as equipment availability and disposal facility capacity.

2.3.3.1 Degree of Difficulty Associated with Constructing the Technology

Closure by removal and closure by installation of a final cover system are two well-used, highly studied and documented methodologies. Each method presents specific complexities that must be considered.

Closure by removal requires consideration of the following:

- Lowering the water level within the impoundment to allow for excavation and stockpiling for dewatering prior to loading into transport trailers.
- A plan must be devised that identifies staging areas for stockpiling and dewatering (of the stockpiles via gravity) and excavation progression. Dewatering sumps will need to be systematically installed to keep the water surface below the operational elevations. This will likely require temporary access roads as the excavation migrates within the impoundment boundaries.
- If adequately dewatered, the CCR can typically be moved via track hoe or rubber-tired front end loaders readily used by CWLP at this time. As excavation of the CCR nears the bottom of the impoundments, dewatering will likely become more difficult and may not be feasible in some areas. The use of a track hoe or front end loaders may not be possible. The use of a drag line will be slow and inefficient. Total removal of the CCR and impacted soils will be extremely difficult if not improbable due to groundwater elevations and dewatering issues.
- Excavation of the CCR adjacent to the Spaulding Dam and clarification pond may not be feasible due to structural integrity issues. Structural backfill or other structural reinforcement may be necessary along the clarification pond adjacent to both the Dallman and Lakeside Ash Ponds if the CCR is exhumed.

Closure by installation of a final cover system is much simpler than closure by removal. The degree of difficulty to apply the final cover system as required pursuant to Section 845.750 must consider:

- Lowering the water level within the impoundment to allow final grading of the CCR and structural soundness allowing for proper compaction of the low permeability layer, is selected versus a geomembrane.
- A grading plan must be derived identifying heavy equipment access for delivery, stockpiling, placement and compaction of final cover quality clayey soils. Heavy truck and off-road vehicles (haul trucks, track hoe, soil compacter, bull dozer, etc.) access should be easily accommodated.

2.3.3.2 Expected Operational Reliability of the Technologies

The operational reliability of the technologies as discussed in the previous section are well known as they have been utilized for many years. However, the applicability of excavation of CCR near the bottom of the impoundments will present complexities that may preclude the use of closure by removal.

The operational reliability of the technologies reference the components of the final cover system which was modeled after the final cover design contained in 40 CFR Part 258 and incorporated into the landfill regulations specific to 35 IAC 811.314 has been highly successful and well documented. The components of the final cover decrease precipitation infiltration to near negligible, thus decreasing the leachate levels within the impoundments, minimizing any outward gradient that may transport CCR-related solutes.

2.3.3.3 Need to Coordinate with and Obtain Necessary Approvals and Permits from other Agencies

Neither closure by removal or closure in place methodologies are expected to require permitting with any other entity other than the Illinois EPA. However, if clayey soil is used for the final cover (Section 845.750(c)(1)(A)) and the borrow source is located on CWLP property north of Sugar Creek, a permit from the Army Corps of Engineers may be needed for a creek crossing. If closure by removal is the method of choice, the receiving facility will likely need to construct additional disposal units or cells which require time for construction and permitting from the Illinois EPA.

2.3.3.4 Availability of Necessary Equipment and Specialists

CWLP maintains most of the equipment and operators necessary to conduct either closure by removal or closure by installation of a final cover system. However, the use of a third-party contractor may be desirable dependent upon timing and the anticipated length of the specific project. Contracting a drag line and operator, or a soils compactor and operator also may be desirable if implementing closure by removal or final cover system, respectively. Contractors and/or equipment (rental/lease) are available; the actual timing needed for such contractors/equipment will vary dependent upon usage already scheduled and the approved excavation/construction plans.

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

The available capacity and locations needed of treatment, storage and disposal services applied solely to closure by removal and does not apply to closure by final cover system. Capping the CCR in place will not require off-site disposal and will not generate a waste stream. Closure by removal requires adequate capacity, storage, and disposal services. It is estimated approximately 2.8 million cubic yards of CCR are present in the Lakeside and Dallman Ash Ponds. Ample areas within the ash pond limits exist for stockpiling for purposes of dewatering prior to loading and transportation to offsite disposal facilities. It is estimated that the weight of dry ash within the ponds is approximately 2,025 pounds per cubic yard. Assuming the ash will be fully exhumed and transported offsite, and as stated in Section 2.3.1.6, approximately 161,600 truckloads of ash will be transported to offsite facilities for disposal. Depending upon the rate of disposal, insufficient disposal capacity will exist within the area (Springfield, Taylorville, Decatur, Clinton, Baylis and Litchfield). Each of the referenced facilities project disposal volumes as part of their annual and multi-year budgets. Each of the facilities will not have sufficient available space for CCR disposal on this magnitude without prior contractual agreements and preparation. Each disposal facility will need to plan accordingly for receipt of such volumes which entails increasing permitted fill space as unbuilt cells will need to be constructed and permitted, which adds to the complexity of the removal solution.

2.3.4 Assessment Criterion 4 - The Degree to which the Concerns of the Residents Living within Communities where the CCR will be Handled, Transported and Disposed of are addressed by the Closure Method

Concerns of residents living within the communities where CCR will be handled, transported and disposed of are those largely addressed in Section 2.3.1.4 above which included local traffic issues (traffic patterns and wear and tear on the roadways), spillage from haul vehicles on public roadways, related runoff from spillage, dust, and protection of environment.

Closure in place by installation of a final cover system will not create concerns with respect to traffic patterns, wear and tear on local roadways, or spillage on local roadways as will closure by removal. Dust issues can be addressed via the fugitive dust control plan. Environmental protection was discussed with both closure methodologies and both are protective of the environment.

It is assumed that concerns of the residents living near any facilities potentially receiving the CCR will be similar to those listed above as no public meeting will occur near facilities that may receive CCR in the event closure by removal was implemented. However, any permitted disposal facility will have conducted the necessary evaluations and designed and operations to be protective of the public health and environment pursuant to the Illinois Environmental Protection Act.

2.3.5 Transportation and On-Site Capacity

2.3.5.1 Evaluation of Transportation Modes Assuming Closure by Removal

The CAA must evaluate multiple modes of transportation of the CCR, assuming the closure method is by removal. Any mode of transportation would comply with any state and federal pollution regulations.

The Lakeside and Dallman Ash Ponds are located very close to Interstates 55 and 72, well suited for transportation by tractor trailer. The likely facilities accepting CCR in the event of closure by removal are located within 65 miles of the impoundments.

There are no barge terminals in the near proximity that would allow economical transportation of the waste.

With regards to rail spurs, the nearest is owned by CWLP; however, this rail spur is no longer operational and does not meet the Federal Railroad Administration Track Safety Standards or Illinois Commercial Transportation Law safety requirements. The use of this rail spur would require rebuilding to include the replacement of all ties and the construction of four road crossings within the Village of Laketown.

The CWLP rail spur no longer crosses the bridge to the east of I-55 on the power plant property. The bridge is not capable of supporting the loading of rail cars and the State of Illinois would not allow the rebuilding of the bridge as their plans for adding a third lane to I-55 around Springfield call for the removal of this bridge.

The rail spur stops just north of Mooregate Dr., west of I-55 on the eastern side of the Village of Laketown. The use of this rail spur would require CCR loading in that general vicinity. This would require transporting the CCR via truck to this location and off-loading into rail cars within this residential area.

This activity would result in a much larger potential for fugitive dust emissions as the property lines are much closer to the transfer points in addition to the additional rail cars that would be in close vicinity of a dense residential area.

As stated in Section 2.3.3.5, approximately 161,600 truckloads of material would need to be transported to appropriate disposal facilities in the event of closure by removal. Low emission, near zero and zero emission trucks were reviewed as part of this assessment. The power trains included low sulfur and biofuel engines, hybrid (diesel and electric power), all electric, natural gas and hydrogen fuels.

The US EPA implemented a Cleaner Truck Initiative in November of 2018 for the reduction of nitrogen oxide emissions. The rule was published in January 2021 and will become affective in model year 2027; the 2027 models should be available in 2026. Current heavy trucks must meet federal emission standards, which are met with emission control devices and cleaner fuels, including low sulfur and bio diesel fuels. These vehicles are the most prevalent and readily available.

The electric semi-trucks are currently being tested by the major manufactures on a large scale. However, those are not readily available and manufacturing of those trucks have been hampered by the pandemic[1]. The range of such trucks varies significantly by model, typically from 150 to 250 miles depending upon the load. Recharge time varies as well, but published times are typically in the 3-4 hour range. Logistically, recharging stations will have to be installed to service the number of trucks required in the process. Depending upon the disposal location and recharge schedule, utilization of such vehicles may not be economical. Additionally, the cost of the electric trucks are two to three times that of a standard truck. The cost of leasing or contracting with a vendor employing such vehicles will be incorporated accordingly.

Trucks powered by hydrogen fuel cells are similar to the electric semi-truck; however, the electricity is powered by a hydrogen fuel cell versus a battery system. The availability of hydrogen fuel celled trucks is also limited. Instead of charging stations, a hydrogen fueling station will be necessary. The purpose of utilizing alternative fuel vehicles is for emission reduction. However, currently, the significant majority of hydrogen is derived from fossil fuels[2].

Trucks powered by liquid natural gas do provide better emissions than current diesel fueled trucks. Such vehicles are generally available on a wide scale. As with the electric trucks and those utilizing hydrogen fuel cells, a readily accessible fueling station will be needed.

For purposes of this section, it is assumed the CCR will be removed and transported to an appropriate disposal facility. It is probable that such facilities will have multiple locations due to disposal logistics (available constructed/permitted capacity). To accommodate such transportation needs, CWLP will likely contract a hauling company to conduct such efforts. CWLP will evaluate each item of such a contract in order to obtain all necessary services at a reasonable cost, including clean transportation as feasible. However, emissions from transportation are a key environmental downside of this closure alternative and attempts to mitigate this issue will increase the cost of closure by removal beyond current estimates.

2.3.5.2 On-Site Capacity

As part of the CAA, the owner/operator must identify any on-site landfill capacity that can legally accept CCR, and if not, whether constructing an on-site landfill is possible. FGDS Development Landfill, located adjacent to both the Lakeside and Dallman Ash Ponds, is permitted to accept flue gas desulfurization sludge, bottom ash, fly ash and lime sludge from the treatment ponds. The landfill consists of 22.3 acres of disposal area with a net capacity of 1,162,275 cubic yards. The landfill is partially filled with approximately 1,137,000 cubic yards of capacity remaining. The capacity is necessary for future operations of the power plant as operational changes are made

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[1] Vaughn, Mark, Autoweek – May 24, 2021.

[2] International Energy Agency, 2021

to address new regulatory requirements. Construction of the undeveloped airspace is not anticipated for disposal of CCR from the existing impoundments.

CWLP owns the property to the north of Sugar Creek including the substation located just south of Illinois Route 29. A geologic boring investigation was conducted on that property to 1) locate needed soils to build the foundation to the substation, and 2) identify the potential for the construction of additional disposal units for the power plant operations. Adequate borrow material was located for construction of the substation; however, it was determined that due to the presence of shallow groundwater and thin clayey deposits, construction of additional disposal units pursuant to 35 IAC Part 814, Subpart C was not feasible.

2.3.5.3 Other Closure Methods if Requested by the Agency

No closure methods have been requested by the Agency.

2.3.6 Estimated Costs, Contaminant Transport Modeling, and Assess Impacts to Waters of the State

2.3.6.1 Estimated Costs

The Illinois Pollution Control Board stated it will not consider cost as a factor for evaluating closure analysis. However, costs have been estimated for closure by removal and closure by implementation of a final cover system. The costs have been derived pursuant to Class 4 under the AACE Classification Standard.

Closure by Removal

The differing tasks necessary for closure by removal have been evaluated with respect to a third-party cost. Removal of the CCR requires lowering of the water in the impoundment, stockpiling of the ash for dewatering, loading the haul trucks, transportation costs, including disposal fees, and maintenance of the premises (structural integrity of the onsite road, sweeping, dust control). The associated costs combine for an approximate disposal cost of $50/ton, equating to approximately $145,458,000 to complete closure by removal.

Closure by Installation of a Final cover System

Costs for closure by installation of a final cover system include design, permitting, dewatering and regrading the surface, soil cover excavation and transportation to the impoundments, placement and compaction of the clay layer (or placement of the geomembrane) and protective layer, and construction quality assurance and reporting. This assumes ample clay soil exists on the property to the north of the impoundments. Combined costs for the subject tasks equate to approximately $125,000 per acre, or a total of $8,340,000.

2.3.6.2 Results of Contaminant Transport Modeling

A detailed contaminant transport model was created to evaluate closure by removal and closure by installation of a final cover system. Site-specific hydrogeologic data was utilized in the models to provide representative solute transport simulations. As discussed in Section 3.2, a small number of constituent concentrations exceed applicable GWPSs. The contaminant transport model results approximated when the exceeding concentrations would achieve background concentrations by either removing the CCR and by installing a final cover system pursuant to Section 845.750. The model results showed compliance with the background concentrations for both closure methods. The contaminant transport model utilized for this demonstration is provided in Attachment 2 of this document.

2.3.6.3 Description of Contaminant Transport Model

Using the Hydrologic Evaluation of Landfill Performance (HELP v3.07) model and the two-dimensional contaminant transport model MIGRATE v9, an evaluation of the closure-in-place option was completed for the Dallman and Lakeside Ash Ponds. The conceptual model was prepared to represent the facility design, site-specific hydrogeology and conservative performance standards for the cover. This evaluation predicts that closure-in-place will minimize infiltration and leaching of CCR constituents into the uppermost aquifer resulting in a decrease in CCR concentrations within just a few years of installation of the final cover system.

MIGRATE was also used to predict concentrations in the uppermost aquifer under the closure-by-removal option. As with the closure-in-place scenario, the conceptual model represents the facility design and site-specific hydrogeology. Under the closure-by-removal scenario, it is assumed that the CCR removal activities will be complete at the beginning of 2030. As expected, the contaminant transport model for the closure-by-removal option predicts a decrease in CCR concentrations several years after the completion of the CCR removal activities.

The contaminant transport model contained in Attachment 2 was constructed pursuant to Section 845.220(d)(3) which included:

- The results of groundwater contaminant transport modeling and calculations showing how the closure will achieve compliance with the applicable groundwater standards;
- All modeling inputs and assumptions;
- Description of the fate and transport of contaminants, with the selected closure over time;
- Any necessary licenses and software needed to review and access both the model and the data contained within the model.

All modeling inputs and assumptions are discussed in the groundwater model document. No capture zone modeling was conducted as the corrective action discussed below is assumed to include either closure by removal or by installation of a final cover system followed by natural attenuation.

The modeling representing closure by installation of a final cover system was more comprehensive than representing closure by removal. In closure by removal, the model accounts for the differing components of the cover system, the CCR, and subsurface stratigraphy. Modeling of closure by excavation accounts for residual impacts subsequent to CCR removal, which only leaves solute transport through the underlying stratigraphy. Therefore, modeling incorporating a final cover system is discussed first.

Closure with Final Cover System

The final cover system was modeled using the Hydrologic Evaluation of Landfill Performance (HELP) program and the two-dimensional contaminant transport program MIGRATE v9. The input parameters Darcy velocity, coefficient of diffusion, dispersivity, coefficient of hydrodynamic dispersion, liner leakage and layer thickness were selected to conservatively and most accurately represent the site-specific conditions/design and hydrogeologic conditions.

The model conservatively assumes that the full thickness of CCR material is present and saturated from year one. Similarly, this assumption would mean that the contaminant concentrations have reached maximum concentrations expected at a downgradient location. The model assumes no contaminant attenuation by retardation or decay. It also assumes that the entire model profile is continually saturated (i.e., no unsaturated zone between bottom of ash pond and top of aquifer). However, upon dewatering the ash pond, it is likely that an unsaturated zone will form between the bottom of the CCR ash pond and the uppermost aquifer. The potentiometric surface will likely normalize below the elevation of the bottom of the impoundments. The presence of an unsaturated zone between the ash pond and the uppermost aquifer will decrease the mass transported to the uppermost aquifer.

The groundwater contaminant transport evaluation (Attachment 2) provides a conservative representation of the expected impact of the CCR ash pond on the groundwater at the site. The evaluation predicts that closure in place will minimize infiltration and leaching of CCR constituents into the contaminant migration pathway resulting in a decrease in CCR concentrations within just a few years of installation of the final cover system. The conclusions of the study are consistent with that of the US EPA (80 Fed. Reg. 21,301, 21,342 (Apr. 17, 2015)), dewatering itself will reduce the potential for interaction with groundwater. The report was prepared to address the assessment of corrective measures requirements as provided at 40 CFR 257.26(c) and as provided in the Illinois EPA CCR rules at Section 845.710(d).

The MIGRATE model predicts compliance with the GWPS within approximately 13 years following installation of a final cover system on the Dallman and Lakeside ash ponds. Therefore, it is anticipated that CWLP will attain the GWPS in 2039. Throughout the remainder of the 30-year post-closure care period the predicted concentration remains below the GWPS. The GWPSs were determined pursuant to the 40 CFR 257 CCR final rules and the Illinois EPA's Section 845.600.

Closure by Removal

The baseline model run was modified to simulate solute transport assuming closure by removal. The model period simulates an open operational impoundment and then the source input layers are removed representing completion of CCR removal. The model conservatively represents a worst-case scenario where an outward gradient transporting solutes exists until the CCR is completely removed. In actuality, the potential for source impacts to the groundwater decreases during excavation as the impoundments are dewatered and CCR is excavated.

The results of this model scenario indicate the groundwater quality will achieve GWPSs within 7 years of completion of removal of the CCR. Therefore, it is anticipated that CWLP would attain the GWPS in 2037.

2.3.6.4 Assess Impacts to Waters of the State

The owner/operator of the impoundments must assess impacts of the closure alternatives to waters of the State. As stated previously, a small number of constituent concentrations exceed applicable groundwater protections standards. Closure utilizing a final cover system pursuant to 845.750 will result in the groundwater quality downgradient to the impoundments to be at or below background concentrations within 13 years of completion of the final cover. Likewise, closure by removal will result in the groundwater quality downgradient to the impoundments to be at or below background concentrations with 7 years of completion of removal of the CCR. Additionally, because the CCR will either be completely covered or removed, there will be no influence to nearby surface water.

3. ASSESSMENT OF CORRECTIVE MEASURES

As provided in Section 845.660(e), the owner/operator may combine the corrective action measures assessment and the closure analysis into one assessment of closure alternatives. The groundwater monitoring program has identified constituent concentrations in downgradient wells that require implementation of assessment of corrective measures. The facility anticipates conducting closure activities simultaneously with corrective action based on results from groundwater sampling and analyses. Therefore, this assessment of corrective measures (ACM) has been conducted pursuant to 35 IAC 845.660 and is herein incorporated into the CAA pursuant to 35 IAC 845.660(e).

3.1 Groundwater Monitoring System

3.1.1 Site Hydrogeologic Characteristics

3.1.1.1 Drilling Programs

The subsurface conditions of the area in and surrounding the CCR ash ponds have been characterized through multiple drilling programs, including the hydrogeologic investigation at the permitted Subtitle D CCR landfill located north of the Lakeside Ash Pond and east of the Dallman Ash Pond. These programs include:

- Professional Service Industries (PSI), June 1989. Five soil borings were advanced within the east section of the south cell (Cell 1) of the CCR landfill.
- Andrews Environmental Engineering, Inc. (AEEI), February 1990. This boring program was performed for Cell 2 of the CCR landfill and consisted of the advancement of 13 soil borings. Drilling and testing were completed by PSI.
- Andrews Environmental Engineering, Inc. (AEEI), March 1990. Six wells were installed along the perimeter of the CCR landfill. Drilling and testing were completed by PSI.
- Patrick Engineering, Inc. (PEI), July 1992. This boring program was performed to further characterize the hydrogeology of the CCR landfill setting. Approximately 44 soil borings and piezometers were installed by PEI.
- Stabilize, Inc. (SI), December 2008. Three monitoring wells were installed as part of an assessment program for the CCR landfill. Drilling, soil testing, and well construction were performed by Reynolds Well Drilling.
- City Water, Light and Power (CWLP), April 2010. Four piezometers were installed on the west side of the CCR ash ponds along Sugar Creek. Drilling and testing were completed by PSI.
- Stabilize, Inc. (SI), May 2011. Four monitoring wells were installed to further the characterization of the CCR ash ponds. Drilling, soil testing, and well construction were performed by PSI.
- Andrews Engineering, Inc. (AEI), January 2012. This boring program was performed to replace CCR ash pond wells and to install an additional background well. Drilling and well installation were completed by TerraDrill.
- Andrews Engineering, Inc. (AEI), July 2017. This project included drilling and well installation at AW-3 north of the Dallman Ash Pond.

- Andrews Engineering, Inc. (AEI), May and July 2019. This project included installation of 11 wells and piezometers peripheral to the Dallman Ash Pond.
- Andrews Engineering, Inc. (AEI), February 2021. This project included installation of 4 assessment wells located west of Sugar Creek.

The drilling programs and related work conducted to date have provided substantial information to characterize the site hydrogeologic conditions, including the uppermost aquifer and the uppermost confining unit, allowing for the design and operation of a monitoring well system which accurately represents the background groundwater quality and that passing the waste boundary of the impoundments.

3.1.1.2 Geologic Summary

The shallow stratigraphy and lithology at the CCR surface impoundments include approximately 20 to 50 feet of Pleistocene sediments, dependent upon location. In ascending order (i.e., oldest to youngest) these materials are identified as basal sand, lower cohesive deposit, shallow sand, upper cohesive deposit and fill material.

Basal Sand

In most locations, the basal sand is the lower-most surficial deposit. The basal sand is a gray colored, poorly graded, silty to clayey fine sand to well graded sand with minor amounts of fine gravel. Across the CWLP facility, the top elevation of the basal sand varies from 491 to 513 feet mean sea level (MSL) and the thickness ranges from about 0 to 12.3 feet. Along the down-gradient (northern) edge of the Dallman Ash Pond area, the basal sand was found to range from 3 to 11.5 feet in thickness, and have an average thickness of 7.3 feet. The basal sand generally overlies the bedrock surface and underlies the lower cohesive deposit. The basal sand is identified as the uppermost aquifer and the most probable migration pathway. Therefore, the monitor wells are screened within the basal sand overlying the Pennsylvanian shale.

Lower Cohesive Deposit

The lower cohesive deposit consists of brown, gray, and brownish gray silty clays, clayey silts, and clays, having very soft to stiff consistency. Across the CWLP facility, the lower cohesive deposit is as much as 22 feet thick with an average thickness of about 15 feet. However, along the down-gradient (northern) edge of the Dallman Ash Pond the thickness of the lower cohesive deposit was found to range from 12.6 to 26.3 feet in thickness, and have an average thickness of 19.4 feet. The deposit was not encountered in isolated areas along the abandoned creek, possibly due to excessive erosion of creek bottom in these areas. The bottom of the CCR surface impoundment rests directly on top of the lower cohesive deposit.

Shallow Sand

The shallow sand overlies the lower cohesive deposit and underlies the upper cohesive deposit. The unit consists of a brown to gray silty to clayey fine sand. It contains small lenses of silty clay and clayey silt. This unit is not continuous over the entire site. Its thickness ranges from one to three feet over most of the area. The shallow sand does not underlay the CCR surface impoundment.

Upper Cohesive Deposit

The upper cohesive deposit is an alluvial deposit consisting of brown, light brown to brownish-gray silty clays to clayey silts having soft to stiff consistency. The unit includes loess deposits and isolated pockets of fine-grained silty to clayey sand and at some location alluvial silts and silty clays. The upper cohesive deposit is laterally adjacent to the sidewall of the CCR surface impoundment.

Creek Fill Material

Borings advanced along the abandoned creek locations indicate that the creek fill materials consist of variable soils ranging from silty clays to silty sands. Cohesive soils characterized as silty clay to organic silty clay were typically encountered. In some areas, the cohesive fill materials extended down to the top of bedrock. Where encountered, the granular fill materials are typically poorly graded silty to clayey sands and contain organics or wood fragments. In some areas, the granular fill materials also extended down to the top of bedrock.

The creek fill materials identified during the previous landfill borings can have an effect on the site hydrogeologic conditions. In some areas the fill materials, consisting of either granular soils or organic silty clays, extend from existing grade to the bedrock surface and locally interconnect with other permeable deposits. The upper and lower cohesive deposits are considered to act as aquitards (where present) which restrict vertical flow into the water bearing units. For all practical purposes, the bedrock is considered to be an aquiclude (i.e., an impermeable body of rock or stratum of sediment that acts as a barrier to the flow of water).

Uppermost Bedrock

The bedrock at the project site consists of Pennsylvanian shales that are gray in color. The bedrock surface elevation varies from approximately 492 feet MSL near the center of the existing landfill, to approximately 554 feet MSL located on a bedrock outcrop near the landfill area (southeast corner of Cell 1). Along the down-gradient edge of the Dallman Ash Pond, the bedrock is at approximately 500 feet MSL. In general, the bedrock surface slopes from the east and west towards the center of the landfill area.

Test results indicate hydraulic conductivity values of 1.8×10^{-7} cm/sec and 1.3×10^{-6} cm/sec. This shows that the bedrock encountered at the project site is a lower confining unit to the uppermost aquifer. There is good correlation between the lithology of the rocks tested and the hydraulic conductivity values obtained. The upper bedrock beneath the impoundments is expected to exhibit the same characteristics as encountered at the landfill.

3.1.1.3 Groundwater Movement

Groundwater movement is controlled by recharge along topographic highs and discharge along the original stream valley. The pre-surface impoundment groundwater movement in the uppermost aquifer was dominantly horizontal from the adjacent banks toward the natural convergence along Sugar Creek. The overall movement was from south to north with local deviations. This dominant flow pattern persists under present day conditions but with localized variation introduced by the hydrologic discontinuity created upon construction of the CCR landfill and CCR surface impoundments.

Existing wells at the site, including wells from the CCR landfill, were used to evaluate groundwater movement in the vicinity of the impoundments. The east perimeter of the Lakeside Ash Pond is largely up-gradient, and the west side is side-gradient to downgradient. Excavated areas within the landfill boundary act as a groundwater sink along the east side of the Dallman Ash Pond. Groundwater generally moves northward under the Dallman Ash Pond but also moves easterly towards the FGDS Landfill and westerly towards Sugar Creek.

The uppermost aquifer deposits and underlying confining unit control groundwater movement and the potential for CCR impacted groundwater migration at the site. The uppermost aquifer (basal deposits) is characterized as the sand and hydraulically connected coarser-grained unconsolidated deposits overlying the shale bedrock. In some locations the creek fill materials, ranging from silty clays and organic silty clays to silty sands and clayey sands, were found to be in direct hydraulic communication with the basal sand that directly overlies the bedrock surface.

The uppermost bedrock, a Pennsylvanian age shale with isolated thin coal layers functions as a lower confining unit due to its low permeability and effective porosity. The lower confining unit represents a natural hydrogeologic barrier (i.e., aquitard) to the vertical movement of groundwater.

In-situ hydraulic conductivity tests (slug tests) indicate that the hydraulic conductivity for the upper portions of the bedrock range from 1.8×10^{-7} to 1.3×10^{-6} cm/sec. There appears to be good correlation between the rock lithology and the measured values of hydraulic conductivity. The bedrock beneath the CCR surface impoundment is considered an aquitard, preventing the downward movement of groundwater.

3.1.1.4 Monitor Well Network

The groundwater monitoring network was initially approved by the Illinois EPA, Bureau of Water, in 2012 for the Lakeside and Dallman Ash Ponds. A series of wells were installed in 2012 at which time attainment of background data and routine sampling and analyses began as approved.

With the implementation of the US EPA regulations, 40 CFR Part 257 (Hazardous and Solid Waste Management System: Disposal of Coal combustion Residuals from Electric Utilities), the groundwater monitoring program was revised to comply with §257.90 through §257.98. As required by §257.90(b), CWLP prepared and placed into the facility record a groundwater monitoring program for the CCR ash ponds in October 2017. The monitoring system was further revised to comply with approval of the Standards for the Disposal of Coal combustion Residuals in Surface Impoundments (35 IAC 845), specifically, Sections 845.600 through 845.680.

The current monitoring network includes two upgradient wells (wells AP-4 and AP-5) and nine downgradient wells (AP-1, AP-2, AP-3, RW-3, AP-6, AP-7, AP-8, AP-10, and AP-14) – see Figure 3. Wells AP-1, AP-2, AP-3, AP-4 and AP-5 were installed in 2012 or prior. As part of an alternate source investigation pursuant to §257.95; two additional wells were added in May of 2019 to the monitoring program, AP-6 and AP-7. These wells continue to be monitored as part of the monitor well network on a routine basis. Wells AP-10 and AP-14 were installed in February 2021 to augment the monitor well network along the west side of the impoundments. Temporary wells AP-9, AP-11, AP-12 and AP-13 were installed west of the creek as part of an assessment of exceedences to the GWPSs, all in conformance with Section 845.650(d)(1).

Pursuant to §257.94(b), eight independent samples were collected from each background and analyzed for the constituents listed in Appendix III to Part 257 and for the constituents listed in Appendix IV to Part 257. The initial eight independent sampling events were completed over the second quarter 2015 through first quarter 2017 (§ 257.94(b)) and included all constituents contained in Section 845.600(a). Background concentrations were statistically derived utilizing methods consistent with Sections 845.640(f-g). The GWPSs are listed in Section 845.600. As stated in Section 845.600(a)(2), for constituents with a background concentration higher than the levels identified in 845.600(a)(1), the background concentration must be the GWPS. This occurs in eight of the constituents listed in Section 845.600(a)(1). The background concentrations and GWPSs are provided in Table 1.

3.2 Existing Groundwater Quality

Prior to implementation of the rules promulgated in 35 IAC Part 845, the detection monitoring program was operated pursuant to §257.94. Constituents listed in Appendix III to 40 CFR Part 257 were monitored on a routine basis. In accordance with §257.95(b), an Assessment Monitoring Program was implemented in February 2018 in response to the statistically significant increase (SSI) over background concentrations for one or more parameters listed in Part 257, Appendix III. Subsequent investigation of the SSI completed as an alternate source demonstration pursuant to §257.95(g)(3)(ii) demonstrated compliance with the GWPS as no Appendix IV constituent concentration exceeded the GWPS. Therefore, assessment monitoring continued pursuant to §257.95(f) until implementation of 35 IAC Part 845.

The groundwater monitoring regulations of 35 IAC Part 845 are more restrictive than those implemented by 40 CFR Part 257. At least one GWPS exceedence was noted in six downgradient wells during the May 2021 sampling event. Confirmation sampling occurred in August 2021; results verified exceedence of GWPSs in six downgradient wells (see Table 2). Pursuant to 845.650(d)(1), the nature and extent of affected groundwater must be determined such that potential remedies can be evaluated and selected, if necessary.

3.2.1 Nature and Extent

Characterization of the nature and extent of affected groundwater is regulated pursuant to Section 845.650(d)(1)(A-D).

3.2.1.1 Installation of Additional Wells

As stated in Section 3.1.1.4, the current monitoring network includes two upgradient wells (wells AP-4 and AP-5) and nine downgradient wells (AP-1, AP-2, AP-3, RW-3, AP-6, AP-7, AP-8, AP-10, and AP-14). Wells AP-1, AP-2, AP-3, AP-4 and AP-5 were installed in 2012 or prior. Two additional wells were installed in May 2019 as part of an alternate source investigation (AP-6 and AP-7). Seven more wells were installed in February 2021 to augment the monitor well network and evaluate exceedences to the GWPSs, all in conformance with Section 845.650(d)(1). Wells AP-10 and AP-14 were installed along the west side of the impoundments and wells AP-9, AP-11, AP-12 and AP-13 were installed west of the creek.

3.2.1.2 Data Collection

Sampling and analyses has occurred at each of the wells list above for the parameters identified in Section 845.600 and is provided in Table 2. The most recent groundwater sampling event occurred August 24 and 25, 2021. This third quarter 2021 sampling event includes the groundwater analytical results for all 35 Ill. Adm. Code 845.600(a)(1) parameters including calcium. The results of the third quarter 2021 sampling event resulted in the exceedance GWPSs for seven parameters: arsenic, boron, calcium, lithium, sulfate, pH and TDS. The exceedances of the GWPSs for these parameters are discussed below.

Arsenic, total

The concentration of total arsenic at groundwater monitoring well RW-3 for the third quarter 2021 is 0.105 mg/L. This concentration exceeds the GWPS for total arsenic (0.0724 mg/L) and was only one of two wells where detection occurred above the method detection limit (0.025 mg/L). The total arsenic concentrations at all other CCR surface impoundment wells were reported as non-detect (<0.0250 mg/L). Total arsenic was evaluated at RW-3 pursuant to §257.95; constituent concentrations decreased below the GWPS at that time; assessment monitoring continued.

Boron, total

Total boron was detected at all groundwater monitoring wells except upgradient well AP-5, above the detection limit (0.02 mg/L). The GWPS for total boron is 2 mg/L, which was exceeded at monitoring wells AP-1 (22.0 mg/L), AP-2 (4.73 mg/L), AP-3 (17.3 mg/L), AP-10 (3.43 mg/L), and AP-14 (23.2 mg/L). The concentrations at the other CCR surface impoundment groundwater monitoring wells ranged from 0.0267 mg/L to 0.275 mg/L.

Calcium, total

Total calcium was detected at all groundwater monitoring wells. The GWPS for total calcium (176.63 mg/L) was exceeded at groundwater monitoring wells AP-1 (233 mg/L), AP-2 (294 mg/L), AP-12 (213) and AP-14 (219 mg/L). The concentrations of total calcium at other CCR surface impoundment groundwater monitoring wells ranged from 65 mg/L to 148 mg/L.

Lithium, total

Total lithium was detected above the GWPS (0.05 mg/L) in two wells, AP-12 (0.0546 mg/L) and AP-13 (0.0610 mg/L), both located west of the creek. Wells located closer to the impoundment east of AP-12 and AP-13 (AP-3 and AP-14, respectively) exhibit lower lithium concentrations than those wells across the creek suggesting that the surface impoundments are not the source of lithium. Additionally, the creek is a groundwater divide where groundwater movement is from the west to east at wells AP-12 and AP-13. This further indicated lithium concentrations as the subject wells are not the result of the surface impoundments. Lithium appears to be present sitewide as it was detected in both upgradient wells (AP-4 and AP-5).

Sulfate, total

The total sulfate concentrations reported for the third quarter 2021 at groundwater monitoring wells AP-1 (734 mg/L), AP-2 (707 mg/L), AP-12 (471 mg/L) and AP-14 (680 mg/L) exceeded the GWPS (400 mg/L). The concentration of total sulfate at other CCR surface impoundment wells ranged from non-detect (<10 mg/L) at wells AP-4, AP-6, AP-7 and AP-8 to 371 mg/L at AP-3.

pH

The field pH GWPS has a minimum value of 6.5 pH units and a maximum value of 9 pH units. The lower limit of the GWPS was exceeded at groundwater monitoring wells AP-2 (6.40 pH units) and AP-12 (6.47 pH units). The field pH at other CCR surface impoundment groundwater monitoring wells ranged from 6.52 pH units to 7.11 pH units.

Total Dissolved Solids

Total dissolved solids has a GWPS of 1200 mg/L which was exceeded at groundwater monitoring wells AP-1 (1420 mg/L), AP-2 (1460 mg/L) and AP-14 (1270 mg/L). At other CCR surface impoundment wells, TDS ranged from 396 mg/L to 1150 mg/L during the third quarter sampling event.

Turbidity

CWLP has begun to collect turbidity measurements from the CCR surface impoundment groundwater monitoring wells. No background values or GWPSs have been developed for this parameter. The turbidity measurements collected during the third quarter 2021 groundwater sampling event ranged from 4.98 NTU to 1580.98 NTU. When collecting groundwater samples, the adequacy of the purging efforts is reflected by the stabilization of the pH and specific conductance, and a turbidity that has either stabilized or is below 10 NTU. The turbidity measurements of groundwater samples from monitoring wells AP-4 (93.21 NTU), AP-11 (45.77 NTU), AP-12 (1580.98 NTU), AP-13 (1267.13 NTU) and AP-14 (57.82 NTU) were high, with four wells ranging from 15.43 to 18.61 NTU, and six wells exhibiting turbidities of 10 NTU or less. An elevated turbidity is likely due to clay and/or silt within the well screen interval. Boring logs from multiple wells indicate fine sediments are intermixed with the basal sand or are otherwise present within the strata screened by the well. The well screen sand packs cannot necessarily filter fine sediment within the screened deposit(s) and may be a consistent issue.

3.2.1.3 Facility Boundary Well

As part of the total arsenic assessment at AW-3, later replaced by RW-3, a facility boundary well was installed north of RW-3 across the creek; the well is identified as AP-7 which meets the definition of a boundary well, located within the uppermost aquifer hydraulically downgradient to a known exceedence. The well has shown no exceedences of a GWPS since installation in May 2019.

3.2.1.4 Sample All Wells to Characterize Nature and Extent

Four additional wells were installed in February 2021, screened in the uppermost aquifer at the bedrock interface. Each of these wells (AP-9, AP-11, AP-12, and AP-13) were located outside the edge of groundwater exhibiting exceedences of the GWPSs and west of the creek to define the extent of groundwater exceeding the GWPSs. Based on the site hydrogeologic conditions and correlation with the geochemistry of the groundwater, the extent of the groundwater exceeding the GWPSs is located along the west boundary of part of the Lakeside Ash Pond, and the west side of the Dallman Ash Pond.

As stated in Section 3.1.1.3, the overall groundwater movement is to the north. However, localized movement is also to the west towards the creek. Groundwater movement appears to be towards the creek from both the east and west as the creek is a natural discharge for surface water runoff in the area as it appears to follow the surface topography. Based on analytical data from wells AP-9, AP-11, AP-12 and AP-13, the western edge of groundwater concentrations exceeding the GWPSs does not extend laterally beyond the limits of the creek.

3.3 Assessment of Corrective Measures

Pursuant to Section 845.660(c), the assessment must include an analysis of the effectiveness of potential corrective measures in meeting the requirements and objectives of the corrective action plan contained in Section 845.670(d). Specifically, the corrective action must:

- be protective of human health and the environment,
- attain the GWPSs (35 Ill. Adm. Code 845.600),
- source control,
- contaminant removal, and
- compliance with standards for waste management (35 Ill. Adm. Code 845.680(d)).

Upon demonstration that the selected remedies are able to meet these criteria, the considered remedies are then compared to one another with respect to the long- and short-term effectiveness, source control, and ability for implementation.

Pursuant to 35 IAC 845.700, existing CCR ash pond must cease placing CCR or non-CCR waste stream in the CCR ash impoundments and must initiate closure of the impoundments where the location restrictions cannot be met. 35 IAC Section 845.710 states the closure of a CCR ash pond must be completed by one of two methods: a), through removal of the CCR and decontamination of the CCR ash impoundment (845.740) or, b) leaving the CCR in place and installing a final cover system (845.750). Both methods were discussed in detail in Section 2.3 above, including the evaluation factors defined in Section 845.670(e)(1)(A-H). As demonstrated by the contaminant transport modeling (Attachment 2), both methods were determined to meet the criteria provided in Section 845.670(d). Therefore, only variants of the two methods will be discussed in this section, which are limited.

Closure by removal and closure by final cover system achieve the same criteria, those listed in Section 845.670(d). However, due to the complexities of closure by removal, that method will take at least four years longer to complete than closure by utilizing a final cover system. The contaminant transport model assumes closure by final cover system will occur by 2026, and closure by removal will occur in 2030. Therefore, the GWPSs will be achieved two years quicker by implementing closure by removal. The corrective action variants can be applied to both closure methods and therefore will be discussed only once.

Success of closure by removal and closure in place by implementing a final cover system pursuant to Section 845.750 are well documented. Assessment of Corrective Measures for closure by removal and closure by final cover system analyzed:

- the performance, reliability, ease of implementation, and potential impacts of appropriate potential remedies, including safety impacts, cross-media impacts, and control of exposure to any residual contamination,
- the time required to begin and complete the corrective action, and
- institutional requirements needed to implement the corrective action.

3.3.1 Constituents of Concern

The constituents identified as exceeding the GWPSs were discussed in Section 3.2.1.2. In summary, the constituents included arsenic, boron, calcium, sulfate, total dissolved solids and pH. Each of the parameters is inorganic; therefore, any corrective action discussed herein will not apply to any organic compound.

3.3.2 Corrective Measure Variants

As discussed in detail above, due to the requirements of the Location Restrictions presented in Section 845.300, the impoundments must cease accepting CCR and begin the closure process defined in Section 845.700. The closure process will include either removal of the CCR or installation of a final cover system, or potentially a combination thereof. However, for purposes of practicality, the closure process will consist of either removal of the CCR or installation of a final cover system but unlikely a hybrid method.

Removal of the CCR or implementation of a final cover system are the corrective measures that must be implemented by regulation. Any variant discussed below will be an augmentation of the corrective measure. The contaminant transport modeling provided in Attachment 2 indicates that either corrective measure (closure by removal or by installation of a final cover system) would achieve compliance with the GWPSs; augmentation will only change the timeline to achieve compliance with the GWPSs.

It is important to note that GWPS exceedences do not occur in all downgradient wells. It is possible to implement corrective measures only in areas exhibiting exceedences.

3.3.2.1 Vertical Barriers

Vertical barriers can consists of several methods which impede the movement of groundwater beneath and/or downgradient to the impoundments. Such barriers include:

Slurry Wall

A trench is excavated from the ground surface to an underlying low hydraulic conductivity deposit. In this setting, a slurry wall would be keyed into the shale bedrock. A slurry is introduced to the trench while the trench is excavated, keeping the walls open as the trench is deepened to the bedrock. The slurry typically would consist of local clay materials intermixed with bentonite.

Grout Curtain

In lieu of an excavation, a low hydraulic conductivity material (typically a bentonite grout) is injected under high pressure through a series of boreholes drilled to bedrock. The grout mixes with higher hydraulic conductivity deposits effectively sealing potential migration pathways. The radius of the intermixing must overlap, requiring a large number of boreholes to effectively seal the perimeter. When complete, the results of the ground curtain are the typically similar to that of the slurry wall.

Compacted Clay Cutoff Wall

A cutoff wall at this location would consist of an excavation and placement of low hydraulic conductivity clay in a trench, typically compacted using a soil compactor with a sheep’s foot roller. This requires a larger excavation to maintain OSHA trenching regulations as well as dewatering as the cutoff wall would also be installed below the potentiometric surface.

Sheet Pilings

Sheets of metal are physically driven through the soils to the top of the shale bedrock. The depth of the bedrock and undulating bedrock surface will cause problems keying into the bedrock; sealing the uppermost aquifer at the bedrock surface is not probable.

Performance

Vertical barriers are used to physically control groundwater movement within water-bearing deposits which have been influenced by chemical constituents. In a conducive geologic setting, a vertical barrier can be sufficient to mitigate affected groundwater. However, often times a vertical barrier is used in conjunction with other corrective action methods to control hydraulic gradients and facilitate groundwater treatment. Each of the referenced vertical barriers can provide good performance and reliability under ideal conditions. However, as previously stated, the undulating bedrock surface will result in poor performance and reliability for the sheet piling.

Ease of Implementation and Reliability

The short lateral distance between the impoundment berms and Sugar Creek can present difficulties for the installation of certain vertical barriers. Installation of a slurry wall and compacted clay cutoff wall require ample areas for excavation and operation. Given the restricted distance at numerous points along the west periphery of the impoundments, implementation of a slurry or cutoff wall would be difficult and impractical. In addition, the structural stability of the berms could be compromised with the implementation of a slurry wall, cutoff wall, or grout curtain.

Potential Impacts of Appropriate Potential Remedies

The use of vertical barriers is well documented as a remedial measure. Other than inherent safety issues with respect to heavy equipment usage and the potential for slope stability issues (structural integrity), there are no safety impacts related to installation of a vertical barrier. Because the vertical barrier would be installed below ground adjacent to the impoundments, there would be no cross media impacts and there would be no residual contamination.

Time Required to Begin and Complete the Corrective Action Plan

The time necessary for implementation of any of the referenced vertical barriers will vary dependent upon multiple factors; however, installation can be achieved over a period of months assuming inclement weather is not significant.

The time to complete the corrective action plan depends upon when the downgradient groundwater quality meets the GWPSs. If closure by implementation of a final cover system is used, a 30-year post-closure care period is required. Contaminant transport modeling shows that achievement of the GWPSs will occur within the 30-year post-closure care period with a final cover system as the corrective action; a vertical barrier is not needed to achieve the GWPSs.

Institutional Requirements

Implementation of a vertical barrier will not result in any institutional requirements other than a construction permit required pursuant to Section 845.200. However, if a cutoff wall is constructed utilizing clay deposits, a permit from the US Army Corps of Engineers may be needed if soils will be transported from City owned property to the north across Sugar Creek.

3.3.2.2 Groundwater Extraction

Groundwater extraction is typically conducted simultaneously with a vertical barrier to control the hydraulic gradients within the contaminant migration pathway(s). In the case of the impoundments, a groundwater extraction system would be necessary in the event a vertical barrier was installed as the liquid level within the CCR would otherwise remain saturated. A groundwater extraction system would decrease the potentiometric surface promoting lowering of the liquid level within the CCR while capturing solutes from the CCR transporting in the groundwater.

Once the groundwater is captured, it must be treated prior to discharge. The combination of groundwater extraction and treatment is commonly referred to as pump and treat. Groundwater extraction and subsequent treatment methods are discussed below.

Vertical Extraction Wells

The most common method of groundwater extraction includes the installation of a series of vertical wells spaced to create overlapping capture zones (cone of depression) when utilized without a barrier wall. When used with a barrier wall, the number of wells can be reduced as the barrier wall will impede the movement of impacted groundwater. Implementation of groundwater extraction wells requires the use of electricity for submersible pumps, or airlines for pneumatic pumps, and a forcemain for conveyance of the extracted groundwater.

Groundwater Extraction Trench

A groundwater extraction trench consists of a trench excavated into the contaminant migration pathway and backfilled with a perforated pipe placed in a gravel backfill, or a solely a permeable gravel backfill. Extraction points are installed at certain intervals in the trench to remove and convey affected groundwater. Implementation of groundwater extraction trench requires the use of electricity for submersible pumps, or airlines for pneumatic pumps, and a forcemain for conveyance of the extracted groundwater.

Performance and Reliability

Both vertical wells and a groundwater extraction trench can adequately control the hydraulic gradient and convey affected groundwater to storage or treatment systems. However, discharge volumes can be significant, particularly if adjacent areas are continually saturated, such as non-CCR impoundments or other bodies of surface water in hydraulic connection with the migration pathway(s) such as Sugar Creek.

Ease of Implementation

Installation of vertical extraction wells typically is not overly difficult with possible access issues due to weather. However, the use of pumps require installation of electric lines or airlines and installation of a forcemain.

As with a slurry wall or cutoff wall, the short lateral distance between the impoundment berms and Sugar Creek can present difficulties for the installation of a groundwater extraction trench. Given the restricted distance at numerous points along the west periphery of the impoundments, trench excavation would be difficult and impractical. In addition, the structural stability of the berms could be compromised with the advancement of a trench.

Potential Impacts of Appropriate Potential Remedies

The use of groundwater extraction systems is well documented as a remedial measure. Other than inherent safety issues with respect to heavy equipment usage and the potential for slope stability issues (structural integrity for installation of an extraction trench), there are no safety impacts related to installation of a groundwater extraction system. Because the groundwater extraction systems would be installed below ground adjacent to the impoundments, there would be no cross media impacts and there would be no residual contamination.

Time Required to Begin and Complete the Corrective Action Plan

The time necessary for implementation of any of the referenced groundwater extraction systems will vary dependent upon multiple factors; however, installation can be achieved over a period of months assuming inclement weather is not significant.

The time to complete the corrective action plan depends upon when the downgradient groundwater quality meets the GWPSs. If closure by implementation of a final cover system is used, a 30-year post-closure care period is required. Contaminant transport modeling shows that achievement of the GWPSs will occur within the 30-year post-closure care period with a final cover system as the corrective action; a groundwater extraction system is not needed to achieve the GWPSs.

Institutional Requirements

Implementation of a groundwater extraction system will not result in any institutional requirements other than a construction permit required pursuant to Section 845.200. However, dependent upon how the extracted groundwater is disposed, an existing NPDES permit may need to be modified, or a new NPDES permit may be required through the Illinois EPA Bureau of Water.

3.3.2.3 Groundwater Treatment

Groundwater treatment methods are only applicable if there is groundwater extraction as a corrective measures as discussed in Section 3.3.2.2 above. Treatment is only specific to parameters that are shown to consistently exceed GWPSs, which include arsenic, boron, sulfate, calcium, total dissolved solids, and pH. It must be noted that the subject exceedences occur in a specific number of wells and not in every well installed on the periphery of the impoundments as identified in Section 3.2.

Spray Irrigation

Extracted groundwater is irrigated on vegetated areas onsite or nearby. It is possible to spray extracted groundwater on vegetated final cover if permitted. Treatment is achieved through aeration, soil absorption and photochemical reactions. Uptake of solutes by vegetation will only occur during the growing season.

Reverse Osmosis/Micro Filtration

Extracted groundwater is forced under pressure through membranes and filters. This would be applicable to most solutes as flocculants/chemical mixing can be utilized to assist in the removal process. However, chemical mixing would not be effective for boron; ion exchange resins would be needed to enhance sorption of the boron.

Surface Water Discharge via NPDES Approval

Extracted groundwater is discharged to a local stream, river or lake via NPDES permit. GWPSs are almost always lower than surface water discharge limits.

POTW

The extracted groundwater is conveyed to the local POTW for treatment and discharge via NPDES permit.

Deep Well Injection

Extracted groundwater is conveyed to an injection point where the water is forced into an isolated geologic formation for disposal.

Natural Attenuation

No physical or chemical treatment is conducted. The groundwater moves through the insitu geologic deposits where the natural geologic properties reduce solutes to achieve the GWPSs.

Such properties include hydrodynamic dispersivity (dispersion/diffusion – dilution), sorption, volatilization and degradation.

Performance and Reliability

The performance of the groundwater treatment methods can vary dependent upon many factors. First and foremost, extraction typically includes the capture of groundwater from a large area. Generally clean groundwater is comingled with groundwater containing solutes which exceed a small number of GWPSs; resulting in dilution of the solutes. Therefore, solute concentrations identified in the monitor wells are typically higher than present in the groundwater discharged to the treatment process. In the hydrogeologic setting present adjacent to the impoundments, the comingled groundwater may not exceed any GWPSs.

The performance of spray irrigation on a vegetated surface has typically been successful for the parameters and concentration exceeding the GWPSs. However, the area needed to accommodate the anticipated groundwater extraction rate will need to be sizeable and may not be available within a short distance of the impoundments making conveyance of the discharge improbable. Additionally, spray irrigation relies upon a growing season for plants to initiate uptake of solutes. During the winter months, the plant species are dormant with minimal to no uptake in the root system.

Reverse osmosis/micro filtration is a well-documented and reliable process. However, the treatment plant would have to be substantial in size to accommodate the extraction rate necessary to control the hydraulic gradients adjacent to the impoundments.

Surface water discharge via NPDES permitting can be a reliable and effective treatment method. As stated above, solutes in the groundwater comingle with clean groundwater significantly lowering the actual constituent concentrations, many times below the GWPSs, and below the discharge limits listed in the NPDES permit. Given the location of surface water bodies in the near vicinity of the impoundments, surface water discharge is a viable method.

Conveyance of the affected groundwater to a publicly owned treatment works (POTW) can be a reliable treatment method. However, the POTW does not employ reverse osmosis/micro filtration, which is needed to reduce boron concentrations. Ultimately, the treated water is discharged to a surface water body via NPDES permit.

Deep well injection is also a proven technology which is much less common than the other referenced methods. A confined geologic deposit must be used for underground injection, which then requires installation of an injection well(s). The groundwater quality at the CCR impoundments is likely significantly better than the groundwater quality of the receiving formation. The performance and reliability can vary which is dependent upon many factors related to the natural geologic formation and injection well installation.

The performance of natural attenuation is dependent upon the characteristics of the soils beneath and adjacent to the CCR impoundments. As stated previously, the contaminant transport model indicated the groundwater quality would meet the GWPSs with implementation of a final cover system.

Ease of Implementation

The complexity of implementing a spray irrigation system can vary dependent upon many factors. One factor is the location of the irrigation fields. Property to the north, which is owned by the City of Springfield is one such possibility. Acquisition of additional adjacent property may be desirable or necessary for utilizing this method. Conveyance of extracted groundwater should be completed via force main to the irrigation system. Hauling extracted groundwater to the irrigation site is very inefficient.

Utilizing reverse osmosis to treat the groundwater will work for boron; however, other treatment methods will be needed for sulfate, calcium, pH and total dissolved solids. The treatment process for sulfate, calcium and pH are interrelated and would require a separate treatment process. Therefore, implementing a reverse osmosis process will not be efficient for the combined set of solutes.

As stated above, surface water discharge via NPDES permitting can be a reliable and effective treatment method. Extracted groundwater can be conveyed to the clarification pond and discharged at an existing outfall already permitted via NPDES. Implementation of such a process is less complex than other methods described, other than natural attenuation.

Utilization of a POTW requires a force main connection with the sanitary sewer or implementation of a large storage tank where the groundwater is hauled to the POTW.

Implementation of deep well injection requires investigation and analyses of local geologic formations. Test borings are necessary for new injection wells to ensure the geologic formation can retain the injected product. Appropriate formations may not be available locally within a reasonable depth.

Natural attenuation requires no implementation other than monitoring.

Potential Impacts of Appropriate Potential Remedies

Most groundwater treatment systems are well documented as a remedial measure. Other than inherent safety issues with respect to construction and installation of such systems, there are no safety impacts related to the operation of groundwater treatment systems. However, groundwater injection can cause issues if the confining layers above or below the receiving geologic formation are hydraulically fractured; the injected groundwater can migrate to other water-bearing formations. Additionally, reverse osmosis/micro filtration will result in collection of solutes that must be disposed at a permitted disposal facility. Given the relatively low constituent concentrations in the groundwater adjacent to the impoundments, there would be no cross media impacts and there would be no residual contamination.

Time Required to Begin and Complete the Corrective Action Plan

The time necessary for implementation subsequent to the construction permitting process (Section 845.220) of any of the referenced groundwater treatment systems will vary dependent upon the treatment method. The design, permitting, financing and construction of a reverse osmosis facility will likely take approximately two to three years. Surface water discharge will require NPDES permitting which may require public meetings prior to approval. Implementation could take up to two years. Implementation of a deep injection well could take two to three years (or more) as testing of the geologic formation must be conducted in order to submit an application for a Class V injection well. Assuming this could be done locally, a conveyance system would need to be constructed as well.

Institutional Requirements

Depending upon the actual groundwater treatment system implemented, the system may require permitting from the Illinois EPA Bureau of Water (NPDES), Illinois EPA Bureau of Land/US EPA (underground injection well), and/or the US Army Corps of Engineers (forcemain across Sugar Creek). The permitting process can cause significant delays.

4. RESULTS OF PUBLIC MEETING

Two public meetings were held December 2, 2021 as required by Sections 845.710(e) and 845.660(d). Pursuant to Section 845.240 of the Pollution Control Board regulations, a public notice of the meeting was prepared and placed on CWLP's publicly available website and provided to the Illinois EPA for emailing to its listserv for this facility. This notice was also added to CWLP's general announcements home page. The information presented at the December 2, 2021 public meeting and a summary of the public meeting is posted on the facility's Illinois CCR Compliance website (https://www.cwlp.com/IllinoisCCRCompliance.aspx). In summary, the issues and questions raised at the meetings focused on:

1. Groundwater to include the groundwater modeling effort, the connectivity and general flow path of the water within the ponds and the groundwater potentiometric surface, the extent and location of the semi-confined sand layer in comparison to the bedrock and silty clay material, dewatering of the ponds, and what influence Lake Springfield has on groundwater flow and CCR surface impoundment liquid levels through Spaulding Dam;
2. The beneficial reuse of ash;
3. General questions to include timing, where the CCR would be sent if landfilled, whether a similar cap has been used before, did the assessment consider settling and the potential for damage from earthquakes, the process for obtaining additional borrow material if necessary, whether the ash could be removed and replaced in stages to allow lining of the current CCR surface impoundments, and about the use of the drainage layer on top of the LDPE liner to minimize infiltration;
4. The ability to construct an on-site landfill;
5. Transportation to include electric and alternative fuel vehicle availability, the nearest rail spurs, the safety and fugitive dust concerns of loading rail cars and the options for controlling fugitive dust; (6) floodplains and climate change to include the location of the CCR surface impoundments with respect to the nearest floodplain, and the long term effectiveness of the selected closure alternative with respect to flood levels given the effects of climate change on precipitation rates and duration;
6. Local residents concerns to include truck traffic and fugitive dust associated with the closure-by-removal alternative, health concerns from historic fugitive dusts releases and the potential for the ingestion of groundwater impaired by CCR constituents, duration of monitoring of the closed CCR surface impoundments, and the criteria for final remedy selection;
7. Groundwater pollution to include historical exceedances of groundwater standards, public notification of future exceedances and whether vegetation downstream of the facility exhibits stress; and
8. Next steps and how the public would be kept informed and made aware of opportunities to comment.

As a result of the meeting, CWLP has updated this CAA expanding on the explanation of the analysis of rail transportation, has committed to updating the final closure plan to include the use of a geomembrane liner as presented in the CAA, will consider mechanical dewatering methods for closure-in-place, and if beneficial reuse would be appropriate if closure-by-removal is required. Additional details are provided in Exhibit N of the Documentation of Public Meeting provided in Attachment 10 of the Construction Closure Application.

5. SELECTION OF CLOSURE METHOD

Based on the information provided in this CAA and the results of the public meetings, Closure with a Final Cover System pursuant to Section 845.750 has been selected. Plans and specifications for the final cover system are provided in Attachment 8 and Attachment 13 of the Construction Closure Application.

6. CLOSURE CONSTRUCTION PROCESS

Pursuant to 35 IAC 845.200(a)(4) closure of a CCR ash pond requires a construction permit. In accordance with Section 845.220(d), the closure construction permit application requires the information and documents outlined in Section 845.220(a) and the items in Section 845.220(d)(1) through (d)(5). These items are as follows:

- Closure prioritization category pursuant to 35 IAC 845.700(g);
- Final closure plan (35 IAC 845.720(b)) and closure alternatives analysis (845.710);
- Groundwater modeling;
- Proposed schedule to complete closure; and
- Post-closure care plan specified in 845.780(d).

6.1 Closure Prioritization

Pursuant to 35 IAC 845.700(g) CCR ash pond required to close under Section 845 must assign the CCR ash ponds to one of 7 categories, with the Category 1 being the highest priority for closure and Category 7, the lowest priority for closure.

The characteristics and location of the CCR ash ponds at the CWLP facility meet the criteria outlined by Categories 3. Category 3 applies to an area of environmental justice concern. In accordance with 35 IAC 845.700(g)(2), the highest priority category must be assigned to the CCR ash pond where more than one category applies, that being Category 3.

6.2 Final Closure Plan

In accordance with Section 845.720(b) the final closure plan must be submitted before installation of the final cover system or removal of the CCR from the ash pond for purpose of closure. The final closure plan identifies the proposed selected closure model and must include the information required in subsection (a)(1) and the CAA in Section 845.710. The Final Closure Plan is contained in Attachment 13 of the Construction Closure Application.

6.3 Closure Schedule

In April 2019, CWLP submitted a notification of intent to comply with the Alternative Closure Requirements 257.103(a) since no alternative disposal capacity is currently available. Since then, CWLP has shut down Dallman Units 31, 32 and will be shutting down Dallman Unit 33 no later than September 15, 2023. Once these Dallman units are shutdown, all fly and bottom ash will cease being sent to the Dallman Ash Pond. Additionally, CWLP will commence with the permanent closure of the Dallman and Lakeside ash ponds once the Dallman Units 31, 32 and 33 are shutdown and the CWLP water purification plant lime sludge Ponds are relocated.

Concerning the lime sludge Ponds, CWLP will begin construction in spring of 2022 and the lime sludge Ponds will be complete in the fall of 2023. Additionally in November of 2020, CWLP submitted our request to US EPA for approval for a site-specific alternative deadline to initiate closure pursuant to 40 CFR §257.103(f)(1). CWLP is requesting an extension to allow the two ponds to continue to receive CCR and non-CCR waste streams in order to complete the retirements of Dallman Units 31, 32 and 33 and relocate the CWLP drinking water purification plant lime sludge ponds, which are currently located on the Lakeside Ash Pond. This submittal is still active.

7. SUMMARY

This CAA has evaluated the following alternatives:

- Alternative 1 – Closure by Removal
- Alternative 2 – Closure in Place

In accordance with 35 Ill. Adm. Code 845.710(g) each of these alternatives has been confirmed to meet the following threshold:

- Meet the requirements and standards of part 35 Ill. Adm. Code 845;
- Ensure protection of human health and the environment; and
- Achieve compliance with the GWPSs in 35 IAC Code 845.600.

Each of the closure alternatives have been evaluated in context of the following criteria:

- The long- and short-term effectiveness and protectiveness of the closure method;
- The effectiveness of the closure method in controlling future releases;
- The ease or difficulty of implementing a potential closure method; and
- The degree to which the concerns of the residents living within communities where the CCR will be handled, transported and disposed of are addressed by the closure method.

Alternative 1, removal of the CCR from the ash ponds will require large-scale construction with transportation of CCR over public roadways, which creates potential impacts to the community. Alternative 1 also creates a greater potential for airborne exposure to humans and the environment during excavation and loading of the CCR constituents relative to Alternative 2 (closure in place). Implementation considerations are:

- CCR ash ponds stay open for 4.5 years longer (2 year design/permit/construct, remaining to transport) increases safety risk and results in prolonged duration for dewatering/water treatment

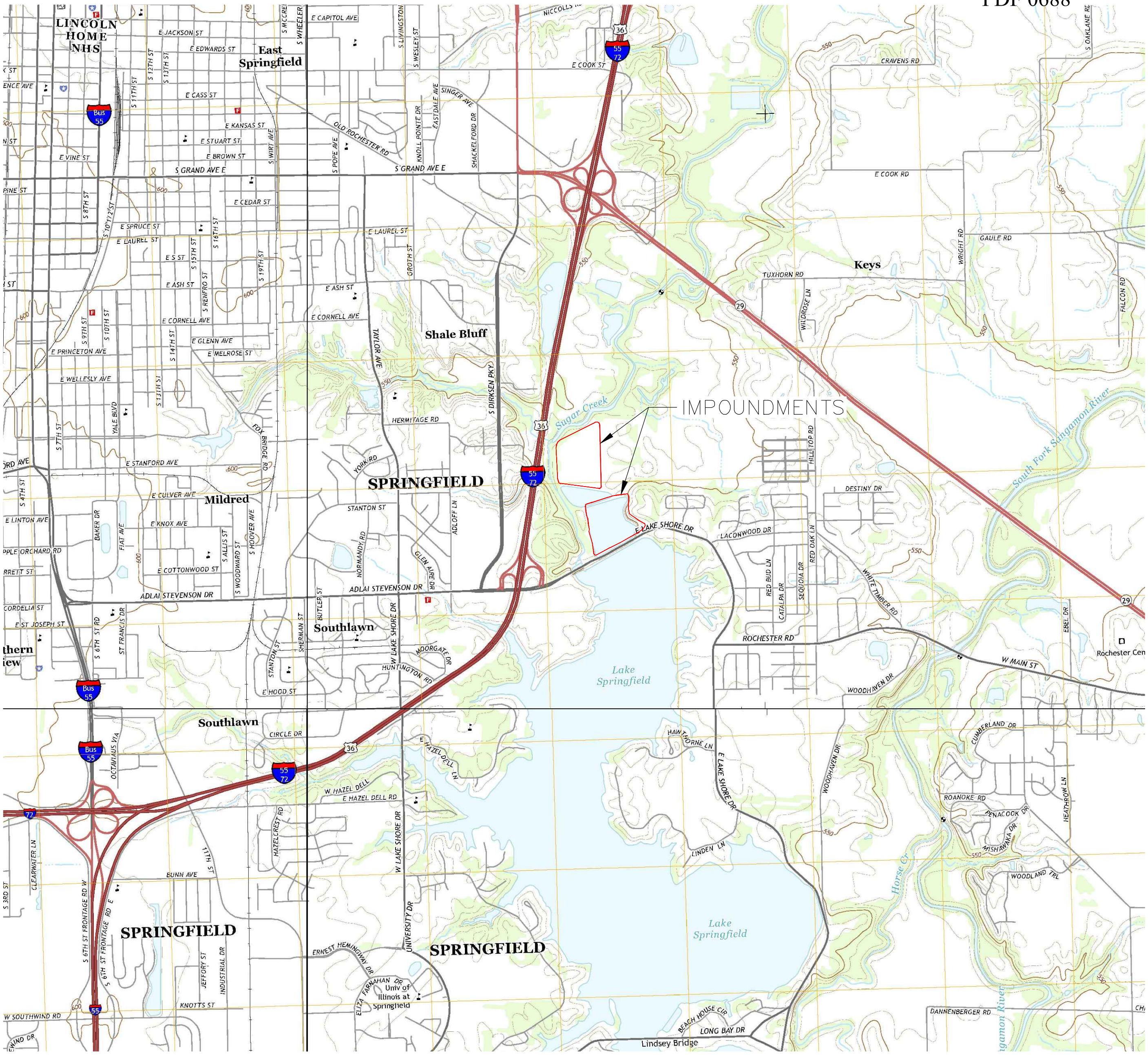
- Safety and community risks from excavation and over-the road hauling due to significant volume and multi-year duration removal project (96 truck/day each way for 7.5 years; truck leaving site approximately every 5 minutes for 8 hours/day Monday through Friday).
- Truck traffic will increase noise pollution, emissions, traffic congestion and vehicle accidents
- Removes source of potential groundwater impacts
- Greater potential for groundwater migration during CCR removal
- Engineering challenges for CCR dewatering and excavation
- Minimum 3 year post-closure care period for groundwater monitoring

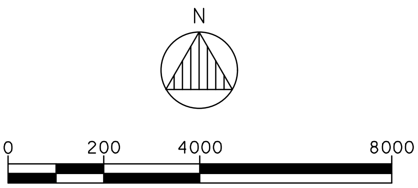
Alternative 2 (closure in place) resulting in isolation of the CCR is proven and known to successfully minimize releases, although isolation will require substantial construction efforts and require ongoing cap and groundwater system maintenance. This alternative leaves the potential for a release following the capping activities. Implementation considerations are:

- No impacts for CCR removal or off-site hauling
- Lowest risk for safety, community, schedule and cost
- Lower groundwater migration potential for CCR remaining in place for once closure is complete
- 2 year for grading and capping activities
- Minimum 30 year post closure care period for cap system and groundwater system maintenance and groundwater monitoring

As stated in Section 5, CWLP has selected to implement closure with a final cover system.

FIGURES





SCALE: IN FEET

NOTE:

BACKGROUND IMAGE COURTESY OF
UNITED STATES GEOLOGICAL SURVEY.

ANDREWS ENGINEERING
3300 GINGER CREEK DRIVE
SPRINGFIELD, ILLINOIS 62711-7233
PH (217) 787-2334 WWW.ANDREWS-ENG.COM
PONTIAC, IL • LOMBARD, IL • INDIANAPOLIS, IN • WARRENTON, MO

APPROVED BY: BJH *DESIGNED BY:* BJH *DRAWN BY:* MPN

SITE LOCATION

PLANS PREPARED FOR

CITY, WATER, LIGHT & POWER

SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: JULY 2021

PROJECT ID: 200387/0026

SHEET NUMBER:

FIGURE 1

LEGEND

🟥 CCR SURFACE IMPOUNDMENT

NOTE

IMAGE SOURCE: GOOGLE EARTH PRO, IMAGE DATE JUNE 7, 2016.

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SCALE: IN FEET

NO.	DATE	REVISION DESCRIPTION	BY

ANDREWS ENGINEERING
3300 GINGER CREEK DRIVE
SPRINGFIELD, ILLINOIS 62711-7233
PH (217) 787-2334 WWW.ANDREWS-ENG.COM
PONTIAC, IL • LOMBARD, IL • INDIANAPOLIS, IN • WARRENTON, MO

APPROVED BY: DG
DESIGNED BY: DG
DRAWN BY: MPN

SITE DETAILS

PLANS PREPARED FOR
CITY, WATER, LIGHT AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE:
JULY 2021

PROJECT ID:
200387/0026

SHEET NUMBER:

FIG. 2

Tab: Layout1 Last Saved: July 28, 2021, by Mike Nguyen Plotted: Wednesday, July 28, 2021 9:34:45 AM
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NOTE

IMAGE SOURCE: GOOGLE EARTH PRO, IMAGE DATE JUNE 7, 2016.

NO.	DATE	REVISION DESCRIPTION	BY

ANDREWS ENGINEERING
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APPROVED BY: DG
DESIGNED BY: DG
DRAWN BY: MPN

GROUNDWATER MONITORING NETWORK

PLANS PREPARED FOR
CITY, WATER, LIGHT AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: JULY 2021
PROJECT ID: 200387/0026
SHEET NUMBER:

FIG. 3

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TABLES

TABLE 1

CITY WATER, LIGHT AND POWER

GROUNDWATER PROTECTION STANDARDS

Constituent	Units	845.600 Groundwater Protection Standard	Statistical Background Concentrations	Groundwater Protection Standard[1]
Antimony	mg/L	0.006	0.016	0.016
Arsenic	mg/L	0.01	0.0724	0.0724
Barium	mg/L	2	5.24	5.24
Beryllium	mg/L	0.004	0.0164	0.0164
Boron	mg/L	2	0.787	2
Cadmium	mg/L	0.005	0.0128	0.0128
Calcium	mg/L	NA	176.63	176.63
Chloride	mg/L	200	24.2	200
Chromium	mg/L	0.1	0.811	0.811
Cobalt	mg/L	0.006	0.297	0.297
Fluoride	mg/L	4	0.62	4
Lead	mg/L	0.0075	0.638	0.638
Lithium	mg/L	0.04	0.05	0.05
Mercury	mg/L	0.002	0.002	0.002
Molybdenum	mg/L	0.1	0.025	0.1
pH, Field	Standard Units	6.5-9.0	6.76-7.63	6.5-9.0
Selenium	mg/L	0.05	0.05	0.05
Sulfate	mg/L	400	84.5	400
Thallium	mg/L	0.002	0.00556	0.00556
Total Dissolved Solids	mg/L	1200	597.94	1200

Background concentrations were derived pursuant to Section 845.640(f).

(1) Pursuant to Section 845.600(a)(2), for consitiuents with a background concentration higher than the levels identified in Section 845.600(a)(1), the background concentration must be the groundwater protection standard.

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	4/25/2012	8/23/2012	11/28/2012	2/21/2013	5/22/2013	8/28/2013	11/20/2013	2/26/2014	5/20/2014	8/26/2014	11/21/2014
AP-1	Boron, total	mg/l	2	0.787	2	10.4	15.2	4.3	3.9	7.76	14.7	18.9	< 2	17.2	18	17.9
AP-2	Boron, total	mg/l	2	0.787	2	5.51	6.88	6.24	10	5.01	5.46	4.78	4.1	4.36	4.84	4.87
AP-3	Boron, total	mg/l	2	0.787	2	18.4	20.9	8.03	29.1	18.7	21.3	20.6	19.3	19.3	19.2	19.5
AP-4	Boron, total	mg/l	2	0.787	2	0.123	0.787	< 2	< 0.687	0.75	0.665	< 2	< 2	0.0899	0.106	0.103
AP-5	Boron, total	mg/l	2	0.787	2	< 0.625	0.782	< 3.2	< 0.687	0.22	0.0954	< 2	< 2	< 0.0625	0.0936	0.0546
AP-6	Boron, total	mg/l	2	0.787	2											
AP-7	Boron, total	mg/l	2	0.787	2											
AW-3/RW-3	Boron, total	mg/l	2	0.787	2	0.162	0.689	< 2	0.706	0.22	0.187	< 2	< 2	0.166	0.144	0.156
AP-8	Boron, total	mg/l	2	0.787	2											
AP-9	Boron, total	mg/l	2	0.787	2											
AP-10	Boron, total	mg/l	2	0.787	2											
AP-11	Boron, total	mg/l	2	0.787	2											
AP-12	Boron, total	mg/l	2	0.787	2											
AP-13	Boron, total	mg/l	2	0.787	2											
AP-14	Boron, total	mg/l	2	0.787	2											
AP-1	Calcium, total	mg/l	na	176.63	176.63											
AP-2	Calcium, total	mg/l	na	176.63	176.63											
AP-3	Calcium, total	mg/l	na	176.63	176.63											
AP-4	Calcium, total	mg/l	na	176.63	176.63											
AP-5	Calcium, total	mg/l	na	176.63	176.63											
AP-6	Calcium, total	mg/l	na	176.63	176.63											
AP-7	Calcium, total	mg/l	na	176.63	176.63											
AW-3/RW-3	Calcium, total	mg/l	na	176.63	176.63											
AP-8	Calcium, total	mg/l	na	176.63	176.63											
AP-9	Calcium, total	mg/l	na	176.63	176.63											
AP-10	Calcium, total	mg/l	na	176.63	176.63											
AP-11	Calcium, total	mg/l	na	176.63	176.63											
AP-12	Calcium, total	mg/l	na	176.63	176.63											
AP-13	Calcium, total	mg/l	na	176.63	176.63											
AP-14	Calcium, total	mg/l	na	176.63	176.63											
AP-1	Chloride, total	mg/l	200	24.2	200	38.2	39.3	40.3	43.6	44.8	45.9	44.7	43.1	45.3	46.5	47.7
AP-2	Chloride, total	mg/l	200	24.2	200	13	19.9	22.8	25.2	19.8	18.9	34.8	22	24.7	24.1	23.4
AP-3	Chloride, total	mg/l	200	24.2	200	46.2	47.7	54.6	55.6	47.5	43.4	46.8	47.7	41.6	43.3	39.1
AP-4	Chloride, total	mg/l	200	24.2	200	9.85	11	10.5	10.8	11	10.7	10.9	10.6	11.2	11.3	11
AP-5	Chloride, total	mg/l	200	24.2	200	7.23	3.32	3.76	3.71	2.61	1.95	2.07	2.83	3.29	4.2	4.03
AP-6	Chloride, total	mg/l	200	24.2	200											
AP-7	Chloride, total	mg/l	200	24.2	200											
AW-3/RW-3	Chloride, total	mg/l	200	24.2	200	23	23.7	23.5	26.2	28.9	27.8	27	23.3	25.1	23.3	24.2
AP-8	Chloride, total	mg/l	200	24.2	200											
AP-9	Chloride, total	mg/l	200	24.2	200											
AP-10	Chloride, total	mg/l	200	24.2	200											
AP-11	Chloride, total	mg/l	200	24.2	200											
AP-12	Chloride, total	mg/l	200	24.2	200											
AP-13	Chloride, total	mg/l	200	24.2	200											
AP-14	Chloride, total	mg/l	200	24.2	200											
AP-1	Fluoride, total	mg/l	4	0.62	4	< 0.5	< 0.5	< 0.5	0.17	0.26	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
AP-2	Fluoride, total	mg/l	4	0.62	4	< 0.5	< 0.5	< 0.5	< 0.5	0.43	0.523	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
AP-3	Fluoride, total	mg/l	4	0.62	4	< 0.5	< 0.5	< 0.5	< 0.5	0.32	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
AP-4	Fluoride, total	mg/l	4	0.62	4	< 0.5	< 0.5	< 0.5	< 0.5	0.2	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
AP-5	Fluoride, total	mg/l	4	0.62	4	< 0.5	< 0.5	< 0.5	< 0.5	0.43	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
AP-6	Fluoride, total	mg/l	4	0.62	4											
AP-7	Fluoride, total	mg/l	4	0.62	4											
AW-3/RW-3	Fluoride, total	mg/l	4	0.62	4	0.43	< 0.5	< 0.5	< 0.5	0.42	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
AP-8	Fluoride, total	mg/l	4	0.62	4											
AP-10	Fluoride, total	mg/l	4	0.62	4											
AP-14	Fluoride, total	mg/l	4	0.62	4											
AP-1	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	7.10		7.23	7.41	6.95	7.13	6.92	7.03	7.03	6.92	7.15
AP-2	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	7.65	7	7.58	7.8	6.83	9.94	6.76	6.93	6.99	6.87	7.03
AP-3	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	7.31	6.88	7.35	7.4	7.07	6.98	6.88	6.25	7.09	7.03	6.63
AP-4	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	7.07	7.63	7.09	7.04	7.23	7.04	7.1	7.31	7.31	7.1	7.14
AP-5	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	7.19		7.29	7.23	7.46	7.15	7.32	7.48	7.53	7.31	7.31
AP-6	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0											

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	4/25/2012	8/23/2012	11/28/2012	2/21/2013	5/22/2013	8/28/2013	11/20/2013	2/26/2014	5/20/2014	8/26/2014	11/21/2014
AP-7	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0											
AW-3/RW-3	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	7.15		7.05	7.68	7.63	7.3	7.31	7.48	7.71	7.18	7.35
AP-8	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0											
AP-9	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0											
AP-10	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0											
AP-11	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0											
AP-12	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0											
AP-13	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0											
AP-14	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0											
AP-1	Sulfate, total	mg/l	400	84.5	400	463	469	488	506	603	597	581	436	615	594	619
AP-2	Sulfate, total	mg/l	400	84.5	400	201	250	293	283	240	280	< 5	252	289	364	463
AP-3	Sulfate, total	mg/l	400	84.5	400	274	315	318	292	347	353	338	298	343	356	362
AP-4	Sulfate, total	mg/l	400	84.5	400	< 5	< 5	< 5	< 5	0.3	< 5	< 5	< 5	< 5	< 5	< 5
AP-5	Sulfate, total	mg/l	400	84.5	400	43.5	76.8	84.5	83.4	55.3	66.8	59.5	63.1	62.5	56.2	68.7
AP-6	Sulfate, total	mg/l	400	84.5	400											
AP-7	Sulfate, total	mg/l	400	84.5	400											
AW-3/RW-3	Sulfate, total	mg/l	400	84.5	400	10.9	5.99	< 5	< 5	40.8	25.8	15	13.7	8.25	11	8.7
AP-8	Sulfate, total	mg/l	400	84.5	400											
AP-9	Sulfate, total	mg/l	400	84.5	400											
AP-10	Sulfate, total	mg/l	400	84.5	400											
AP-11	Sulfate, total	mg/l	400	84.5	400											
AP-12	Sulfate, total	mg/l	400	84.5	400											
AP-13	Sulfate, total	mg/l	400	84.5	400											
AP-14	Sulfate, total	mg/l	400	84.5	400											
AP-1	Total Dissolved Solids	mg/l	1200	597.94	1200	1020	788	1160	1120	1390	1380	1250	1100	1360	1300	1490
AP-2	Total Dissolved Solids	mg/l	1200	597.94	1200	866	836	1100	932	950	1000	748	870	946	1000	1080
AP-3	Total Dissolved Solids	mg/l	1200	597.94	1200	926	1000	928	624	1040	992	870	812	872	880	974
AP-4	Total Dissolved Solids	mg/l	1200	597.94	1200	560	448	574	460	578	548	316	442	510	554	492
AP-5	Total Dissolved Solids	mg/l	1200	597.94	1200	404	316	404	370	410	428	384	358	544	390	446
AP-6	Total Dissolved Solids	mg/l	1200	597.94	1200											
AP-7	Total Dissolved Solids	mg/l	1200	597.94	1200											
AW-3/RW-3	Total Dissolved Solids	mg/l	1200	597.94	1200	470	422	570	724	436	652	408	406	450	454	468
AP-8	Total Dissolved Solids	mg/l	1200	597.94	1200											
AP-9	Total Dissolved Solids	mg/l	1200	597.94	1200											
AP-10	Total Dissolved Solids	mg/l	1200	597.94	1200											
AP-11	Total Dissolved Solids	mg/l	1200	597.94	1200											
AP-12	Total Dissolved Solids	mg/l	1200	597.94	1200											
AP-13	Total Dissolved Solids	mg/l	1200	597.94	1200											
AP-14	Total Dissolved Solids	mg/l	1200	597.94	1200											
AP-1	Antimony, total	mg/l	0.006	0.016	0.016	< 0.006	0.0073	< 0.006	< 0.006	0.0118	< 0.006	< 0.006	< 0.006	< 0.0625	< 0.0312	< 0.0312
AP-2	Antimony, total	mg/l	0.006	0.016	0.016	< 0.006	< 0.006	< 0.006	< 0.006	0.026	0.006	< 0.006	< 0.006	< 0.0625	< 0.0312	< 0.0312
AP-3	Antimony, total	mg/l	0.006	0.016	0.016	< 0.006	< 0.006	< 0.006	0.00805	0.0161	< 0.006	< 0.006	< 0.006	< 0.0625	< 0.0312	< 0.0312
AP-4	Antimony, total	mg/l	0.006	0.016	0.016	< 0.006	< 0.006	< 0.006	< 0.006	0.0152	< 0.006	< 0.006	< 0.006	< 0.0625	< 0.0312	< 0.0312
AP-5	Antimony, total	mg/l	0.006	0.016	0.016	< 0.006	0.0063	< 0.0096	< 0.006	0.0160	< 0.006	< 0.006	< 0.006	< 0.0625	< 0.0312	< 0.0312
AP-6	Antimony, total	mg/l	0.006	0.016	0.016											
AP-7	Antimony, total	mg/l	0.006	0.016	0.016											
AW-3/RW-3	Antimony, total	mg/l	0.006	0.016	0.016	< 0.0075	0.0067	< 0.006	< 0.006	0.0128	< 0.006	< 0.006	< 0.006	< 0.0625	< 0.0312	< 0.0312
AP-8	Antimony, total	mg/l	0.006	0.016	0.016											
AP-9	Antimony, total	mg/l	0.006	0.016	0.016											
AP-10	Antimony, total	mg/l	0.006	0.016	0.016											
AP-11	Antimony, total	mg/l	0.006	0.016	0.016											
AP-12	Antimony, total	mg/l	0.006	0.016	0.016											
AP-13	Antimony, total	mg/l	0.006	0.016	0.016											
AP-14	Antimony, total	mg/l	0.006	0.016	0.016											

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	4/25/2012	8/23/2012	11/28/2012	2/21/2013	5/22/2013	8/28/2013	11/20/2013	2/26/2014	5/20/2014	8/26/2014	11/21/2014
AP-1	Arsenic, total	mg/l	0.01	0.0724	0.0724	< 0.05	0.0141	0.00572	< 0.05	0.00976	< 0.015	< 0.05	0.158	< 0.0625	< 0.0312	< 0.0312
AP-2	Arsenic, total	mg/l	0.01	0.0724	0.0724	< 0.05	0.0331	0.0156	0.0738	0.034	0.0224	< 0.05	< 0.05	< 0.0625	< 0.0312	< 0.0312
AP-3	Arsenic, total	mg/l	0.01	0.0724	0.0724	< 0.05	0.0254	0.0136	0.0784	0.016	< 0.015	< 0.05	< 0.05	< 0.0625	< 0.0312	< 0.0312
AP-4	Arsenic, total	mg/l	0.01	0.0724	0.0724	< 0.05	0.0294	0.00608	< 0.05	0.025	0.0193	< 0.05	< 0.05	< 0.0625	< 0.0312	< 0.0312
AP-5	Arsenic, total	mg/l	0.01	0.0724	0.0724	0.076	0.102	0.0243	< 0.05	0.0094	< 0.015	< 0.05	< 0.05	< 0.0625	0.0662	< 0.0312
AP-6	Arsenic, total	mg/l	0.01	0.0724	0.0724											
AP-7	Arsenic, total	mg/l	0.01	0.0724	0.0724											
AW-3/RW-3	Arsenic, total	mg/l	0.01	0.0724	0.0724	0.149	0.131	0.121	0.104	< 0.015	< 0.015	0.134	0.139	0.138	0.134	0.118
AP-8	Arsenic, total	mg/l	0.01	0.0724	0.0724											
AP-9	Arsenic, total	mg/l	0.01	0.0724	0.0724											
AP-10	Arsenic, total	mg/l	0.01	0.0724	0.0724											
AP-11	Arsenic, total	mg/l	0.01	0.0724	0.0724											
AP-12	Arsenic, total	mg/l	0.01	0.0724	0.0724											
AP-13	Arsenic, total	mg/l	0.01	0.0724	0.0724											
AP-14	Arsenic, total	mg/l	0.01	0.0724	0.0724											
AP-1	Barium, total	mg/l	2	5.24	5.24	< 2	0.255	< 2	< 2	0.306	0.639	< 2	< 2	0.993	0.694	0.952
AP-2	Barium, total	mg/l	2	5.24	5.24	< 2	0.731	< 2	< 2	0.200	0.282	< 2	< 2	0.355	0.242	0.276
AP-3	Barium, total	mg/l	2	5.24	5.24	< 2	0.160	< 2	< 2	0.095	0.125	< 2	< 2	0.144	0.0979	0.0939
AP-4	Barium, total	mg/l	2	5.24	5.24	< 2	0.366	< 2	< 2	0.370	0.385	< 2	< 2	0.352	0.346	0.351
AP-5	Barium, total	mg/l	2	5.24	5.24	< 2	2.760	< 3.2	< 2	0.130	0.228	< 2	< 2	0.278	0.663	0.193
AP-6	Barium, total	mg/l	2	5.24	5.24											
AP-7	Barium, total	mg/l	2	5.24	5.24											
AW-3/RW-3	Barium, total	mg/l	2	5.24	5.24	0.376	0.202	< 2	< 2	0.059	0.0843	< 2	< 2	0.274	0.183	0.18
AP-8	Barium, total	mg/l	2	5.24	5.24											
AP-9	Barium, total	mg/l	2	5.24	5.24											
AP-10	Barium, total	mg/l	2	5.24	5.24											
AP-11	Barium, total	mg/l	2	5.24	5.24											
AP-12	Barium, total	mg/l	2	5.24	5.24											
AP-13	Barium, total	mg/l	2	5.24	5.24											
AP-14	Barium, total	mg/l	2	5.24	5.24											
AP-1	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.004	< 0.004	< 0.004	< 0.004	< 0.00375	< 0.004	< 0.004	< 0.004	< 0.0625	< 0.00312	< 0.00312
AP-2	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.0625	< 0.00312	< 0.00312
AP-3	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.0625	< 0.00312	< 0.00312
AP-4	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.0625	< 0.00312	< 0.00312
AP-5	Beryllium, total	mg/l	0.004	0.0164	0.0164	0.0128	0.0092	0.0164	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.0625	0.00735	< 0.00312
AP-6	Beryllium, total	mg/l	0.004	0.0164	0.0164											
AP-7	Beryllium, total	mg/l	0.004	0.0164	0.0164											
AW-3/RW-3	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.0075	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.0625	< 0.00312	< 0.00312
AP-8	Beryllium, total	mg/l	0.004	0.0164	0.0164											
AP-9	Beryllium, total	mg/l	0.004	0.0164	0.0164											
AP-10	Beryllium, total	mg/l	0.004	0.0164	0.0164											
AP-11	Beryllium, total	mg/l	0.004	0.0164	0.0164											
AP-12	Beryllium, total	mg/l	0.004	0.0164	0.0164											
AP-13	Beryllium, total	mg/l	0.004	0.0164	0.0164											
AP-14	Beryllium, total	mg/l	0.004	0.0164	0.0164											
AP-1	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.005	< 0.0025	< 0.005	< 0.005	< 0.00125	< 0.0025	< 0.005	< 0.005	< 0.0625	< 0.00312	< 0.00312
AP-2	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.0025	< 0.005	< 0.005	< 0.0625	< 0.00312	< 0.00312
AP-3	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.0025	< 0.005	< 0.005	< 0.0625	< 0.00312	< 0.00312
AP-4	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.0025	< 0.005	< 0.005	< 0.0625	< 0.00312	< 0.00312
AP-5	Cadmium, total	mg/l	0.005	0.0128	0.0128	0.0128	0.00575	< 0.008	< 0.005	< 0.005	< 0.0025	< 0.005	< 0.005	< 0.0625	0.00525	< 0.00312
AP-6	Cadmium, total	mg/l	0.005	0.0128	0.0128											
AP-7	Cadmium, total	mg/l	0.005	0.0128	0.0128											
AW-3/RW-3	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.005	< 0.0025	< 0.00005	< 0.005	< 0.005	< 0.0025	< 0.005	< 0.005	< 0.0625	< 0.00312	< 0.00312
AP-8	Cadmium, total	mg/l	0.005	0.0128	0.0128											
AP-9	Cadmium, total	mg/l	0.005	0.0128	0.0128											
AP-10	Cadmium, total	mg/l	0.005	0.0128	0.0128											
AP-11	Cadmium, total	mg/l	0.005	0.0128	0.0128											
AP-12	Cadmium, total	mg/l	0.005	0.0128	0.0128											
AP-13	Cadmium, total	mg/l	0.005	0.0128	0.0128											
AP-14	Cadmium, total	mg/l	0.005	0.0128	0.0128											

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	4/25/2012	8/23/2012	11/28/2012	2/21/2013	5/22/2013	8/28/2013	11/20/2013	2/26/2014	5/20/2014	8/26/2014	11/21/2014
AP-1	Chromium, total	mg/l	0.1	0.811	0.811	< 0.1	< 0.0175	< 0.1	< 0.1	0.0024	< 0.01	< 0.1	< 0.1	< 0.0625	< 0.0312	< 0.0312
AP-2	Chromium, total	mg/l	0.1	0.811	0.811	< 0.1	0.111	< 0.1	< 0.1	0.0091	0.018	< 0.1	< 0.1	< 0.0625	< 0.0312	< 0.0312
AP-3	Chromium, total	mg/l	0.1	0.811	0.811	< 0.1	< 0.0175	< 0.1	< 0.1	< 0.1	< 0.01	< 0.1	< 0.1	< 0.0625	< 0.0312	< 0.0312
AP-4	Chromium, total	mg/l	0.1	0.811	0.811	< 0.1	< 0.0175	< 0.1	< 0.1	0.0039	< 0.01	< 0.1	< 0.1	< 0.0625	< 0.0312	< 0.0312
AP-5	Chromium, total	mg/l	0.1	0.811	0.811	0.328	0.449	0.42	< 0.1	0.016	0.0431	0.113	< 0.1	< 0.0625	0.174	< 0.0312
AP-6	Chromium, total	mg/l	0.1	0.811	0.811											
AP-7	Chromium, total	mg/l	0.1	0.811	0.811											
AW-3/RW-3	Chromium, total	mg/l	0.1	0.811	0.811	0.0443	< 0.0175	< 0.1	< 0.1	< 0.1	< 0.01	< 0.1	< 0.1	< 0.0625	< 0.0312	< 0.0312
AP-8	Chromium, total	mg/l	0.1	0.811	0.811											
AP-9	Chromium, total	mg/l	0.1	0.811	0.811											
AP-10	Chromium, total	mg/l	0.1	0.811	0.811											
AP-11	Chromium, total	mg/l	0.1	0.811	0.811											
AP-12	Chromium, total	mg/l	0.1	0.811	0.811											
AP-13	Chromium, total	mg/l	0.1	0.811	0.811											
AP-14	Chromium, total	mg/l	0.1	0.811	0.811											
AP-1	Cobalt, total	mg/l	0.006	0.297	0.297	< 1	< 0.0175	< 1	< 1	< 0.0075	< 0.015	< 1	< 1	< 0.0313	< 0.0156	< 0.0156
AP-2	Cobalt, total	mg/l	0.006	0.297	0.297	< 1	0.0528	< 1	< 1	0.0093	< 0.015	< 1	< 1	< 0.0313	< 0.0156	< 0.0156
AP-3	Cobalt, total	mg/l	0.006	0.297	0.297	< 1	< 0.0175	< 1	< 1	< 1	< 0.015	< 1	< 1	< 0.0313	< 0.0156	< 0.0156
AP-4	Cobalt, total	mg/l	0.006	0.297	0.297	< 1	< 0.0175	< 1	< 1	< 1	< 0.015	< 1	< 1	< 0.0313	< 0.0156	< 0.0156
AP-5	Cobalt, total	mg/l	0.006	0.297	0.297	< 1	0.297	< 1.6	< 1	0.0086	0.0223	< 1	< 1	< 0.0313	0.11	< 0.0156
AP-6	Cobalt, total	mg/l	0.006	0.297	0.297											
AP-7	Cobalt, total	mg/l	0.006	0.297	0.297											
AW-3/RW-3	Cobalt, total	mg/l	0.006	0.297	0.297	0.0278	< 0.0175	< 1	< 1	< 1	< 0.015	< 1	< 1	< 0.0313	< 0.0156	< 0.0156
AP-8	Cobalt, total	mg/l	0.006	0.297	0.297											
AP-9	Cobalt, total	mg/l	0.006	0.297	0.297											
AP-10	Cobalt, total	mg/l	0.006	0.297	0.297											
AP-11	Cobalt, total	mg/l	0.006	0.297	0.297											
AP-12	Cobalt, total	mg/l	0.006	0.297	0.297											
AP-13	Cobalt, total	mg/l	0.006	0.297	0.297											
AP-14	Cobalt, total	mg/l	0.006	0.297	0.297											
AP-1	Lead, total	mg/l	0.0075	0.638	0.638	< 0.0075	< 0.005	< 0.0075	< 0.0075	0.0019	< 0.005	< 0.0075	0.0291	< 0.0625	< 0.0312	< 0.0312
AP-2	Lead, total	mg/l	0.0075	0.638	0.638	0.047	0.0599	0.0433	< 0.0075	0.0048	0.0104	0.015	< 0.0075	< 0.0625	< 0.0312	< 0.0312
AP-3	Lead, total	mg/l	0.0075	0.638	0.638	< 0.0075	0.0118	< 0.0075	< 0.0075	< 0.0075	< 0.005	< 0.0075	< 0.0075	< 0.0625	< 0.0312	< 0.0312
AP-4	Lead, total	mg/l	0.0075	0.638	0.638	< 0.0075	< 0.005	< 0.0075	< 0.0075	0.0036	< 0.005	< 0.0075	< 0.0075	< 0.0625	< 0.0312	< 0.0312
AP-5	Lead, total	mg/l	0.0075	0.638	0.638	0.236	0.312	0.277	0.0244	0.0104	0.0312	0.638	0.032	< 0.0625	0.093	< 0.0312
AP-6	Lead, total	mg/l	0.0075	0.638	0.638											
AP-7	Lead, total	mg/l	0.0075	0.638	0.638											
AW-3/RW-3	Lead, total	mg/l	0.0075	0.638	0.638	0.0371	< 0.005	< 0.0075	< 0.0075	< 0.0075	< 0.005	< 0.0075	< 0.0075	< 0.0625	< 0.0312	< 0.0312
AP-8	Lead, total	mg/l	0.0075	0.638	0.638											
AP-9	Lead, total	mg/l	0.0075	0.638	0.638											
AP-10	Lead, total	mg/l	0.0075	0.638	0.638											
AP-11	Lead, total	mg/l	0.0075	0.638	0.638											
AP-12	Lead, total	mg/l	0.0075	0.638	0.638											
AP-13	Lead, total	mg/l	0.0075	0.638	0.638											
AP-14	Lead, total	mg/l	0.0075	0.638	0.638											
AP-1	Lithium	mg/l	0.04	0.05	0.05											
AP-2	Lithium	mg/l	0.04	0.05	0.05											
AP-3	Lithium	mg/l	0.04	0.05	0.05											
AP-4	Lithium	mg/l	0.04	0.05	0.05											
AP-5	Lithium	mg/l	0.04	0.05	0.05											
AP-6	Lithium	mg/l	0.04	0.05	0.05											
AP-7	Lithium	mg/l	0.04	0.05	0.05											
AW-3/RW-3	Lithium	mg/l	0.04	0.05	0.05											
AP-8	Lithium	mg/l	0.04	0.05	0.05											
AP-9	Lithium	mg/l	0.04	0.05	0.05											
AP-10	Lithium	mg/l	0.04	0.05	0.05											
AP-11	Lithium	mg/l	0.04	0.05	0.05											
AP-12	Lithium	mg/l	0.04	0.05	0.05											
AP-13	Lithium	mg/l	0.04	0.05	0.05											
AP-14	Lithium	mg/l	0.04	0.05	0.05											

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	4/25/2012	8/23/2012	11/28/2012	2/21/2013	5/22/2013	8/28/2013	11/20/2013	2/26/2014	5/20/2014	8/26/2014	11/21/2014
AP-1	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-2	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0006
AP-3	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-4	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-5	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005	0.0007	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-6	Mercury, total	mg/l	0.002	0.0008	0.002											
AP-7	Mercury, total	mg/l	0.002	0.0008	0.002											
AW-3/RW-3	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-8	Mercury, total	mg/l	0.002	0.0008	0.002											
AP-9	Mercury, total	mg/l	0.002	0.0008	0.002											
AP-10	Mercury, total	mg/l	0.002	0.0008	0.002											
AP-11	Mercury, total	mg/l	0.002	0.0008	0.002											
AP-12	Mercury, total	mg/l	0.002	0.0008	0.002											
AP-13	Mercury, total	mg/l	0.002	0.0008	0.002											
AP-14	Mercury, total	mg/l	0.002	0.0008	0.002											
AP-1	Molybdenum	mg/l	0.1	0.025	0.1											
AP-2	Molybdenum	mg/l	0.1	0.025	0.1											
AP-3	Molybdenum	mg/l	0.1	0.025	0.1											
AP-4	Molybdenum	mg/l	0.1	0.025	0.1											
AP-5	Molybdenum	mg/l	0.1	0.025	0.1											
AP-6	Molybdenum	mg/l	0.1	0.025	0.1											
AP-7	Molybdenum	mg/l	0.1	0.025	0.1											
AW-3/RW-3	Molybdenum	mg/l	0.1	0.025	0.1											
AP-8	Molybdenum	mg/l	0.1	0.025	0.1											
AP-9	Molybdenum	mg/l	0.1	0.025	0.1											
AP-10	Molybdenum	mg/l	0.1	0.025	0.1											
AP-11	Molybdenum	mg/l	0.1	0.025	0.1											
AP-12	Molybdenum	mg/l	0.1	0.025	0.1											
AP-13	Molybdenum	mg/l	0.1	0.025	0.1											
AP-14	Molybdenum	mg/l	0.1	0.025	0.1											
AP-1	Radium-226 + Radium-228	pCi/l	5	7.1	7.1		1.9	2.5	2.9	3.3	1.58	2.29	1.3	-21.9	4	1.66
AP-2	Radium-226 + Radium-228	pCi/l	5	7.1	7.1		2.9	1.66	2.09	4.2	1.29	2.29	1.13	1.49	-0.28	1.98
AP-3	Radium-226 + Radium-228	pCi/l	5	7.1	7.1		2.03	2.05	1.51	1.73	0.98	1.66	1.49	-1.23	1.15	0.72
AP-4	Radium-226 + Radium-228	pCi/l	5	7.1	7.1		1.68	2.71	1.4	1.53	1.97	0.98	1.47	1.73	2.22	2.2
AP-5	Radium-226 + Radium-228	pCi/l	5	7.1	7.1		12.2	2.02	3.2	1.78	1.81	3.5	1.76	0.92	0	2.14
AP-6	Radium-226 + Radium-228	pCi/l	5	7.1	7.1											
AP-7	Radium-226 + Radium-228	pCi/l	5	7.1	7.1											
AW-3/RW-3	Radium-226 + Radium-228	pCi/l	5	7.1	7.1		1.49	1.78	2.1	0.84	1.03	2.8	1.58	1.66	1.4	1.75
AP-8	Radium-226 + Radium-228	pCi/l	5	7.1	7.1											
AP-9	Radium-226 + Radium-228	pCi/l	5	7.1	7.1											
AP-10	Radium-226 + Radium-228	pCi/l	5	7.1	7.1											
AP-11	Radium-226 + Radium-228	pCi/l	5	7.1	7.1											
AP-12	Radium-226 + Radium-228	pCi/l	5	7.1	7.1											
AP-13	Radium-226 + Radium-228	pCi/l	5	7.1	7.1											
AP-14	Radium-226 + Radium-228	pCi/l	5	7.1	7.1											
AP-1	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.05	< 0.0025	< 0.05	< 0.05	0.0204	0.00274	< 0.05	< 0.05	< 0.0625	< 0.0312	< 0.0312
AP-2	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.05	< 0.0025	< 0.05	< 0.05	0.045	< 0.0025	< 0.05	< 0.05	< 0.0625	< 0.0312	< 0.0312
AP-3	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.05	< 0.0025	< 0.05	< 0.05	0.013	< 0.0025	< 0.05	< 0.05	< 0.0625	< 0.0312	< 0.0312
AP-4	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.05	0.00497	< 0.05	< 0.05	0.0079	< 0.0025	< 0.05	< 0.05	< 0.0625	< 0.0312	< 0.0312
AP-5	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.05	0.00585	< 0.08	< 0.05	0.0046	0.00523	< 0.05	< 0.05	< 0.0625	< 0.0312	< 0.0312
AP-6	Selenium, total	mg/l	0.05	0.0079	0.05											
AP-7	Selenium, total	mg/l	0.05	0.0079	0.05											
AW-3/RW-3	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.0025	< 0.0025	< 0.05	< 0.05	0.0025	< 0.0025	< 0.05	< 0.05	< 0.0625	< 0.0312	< 0.0312
AP-8	Selenium, total	mg/l	0.05	0.0079	0.05											
AP-9	Selenium, total	mg/l	0.05	0.0079	0.05											
AP-10	Selenium, total	mg/l	0.05	0.0079	0.05											
AP-11	Selenium, total	mg/l	0.05	0.0079	0.05											
AP-12	Selenium, total	mg/l	0.05	0.0079	0.05											
AP-13	Selenium, total	mg/l	0.05	0.0079	0.05											
AP-14	Selenium, total	mg/l	0.05	0.0079	0.05											

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	4/25/2012	8/23/2012	11/28/2012	2/21/2013	5/22/2013	8/28/2013	11/20/2013	2/26/2014	5/20/2014	8/26/2014	11/21/2014
AP-1	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.002	< 0.002	< 0.002	< 0.002	0.00095	< 0.002	< 0.002	< 0.002	< 0.0625	< 0.0312	< 0.0312
AP-2	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.002	< 0.002	< 0.002	< 0.002	0.0018	< 0.002	< 0.002	< 0.002	< 0.0625	< 0.0312	< 0.0312
AP-3	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.0625	< 0.0312	< 0.0312
AP-4	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.0625	< 0.0312	< 0.0312
AP-5	Thallium, total	mg/l	0.002	0.00556	0.0056	0.00258	0.00302	< 0.0032	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.0625	< 0.0312	< 0.0312
AP-6	Thallium, total	mg/l	0.002	0.00556	0.0056											
AP-7	Thallium, total	mg/l	0.002	0.00556	0.0056											
AW-3/RW-3	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.0025	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.0625	< 0.0312	< 0.0312
AP-8	Thallium, total	mg/l	0.002	0.00556	0.0056											
AP-9	Thallium, total	mg/l	0.002	0.00556	0.0056											
AP-10	Thallium, total	mg/l	0.002	0.00556	0.0056											
AP-11	Thallium, total	mg/l	0.002	0.00556	0.0056											
AP-12	Thallium, total	mg/l	0.002	0.00556	0.0056											
AP-13	Thallium, total	mg/l	0.002	0.00556	0.0056											
AP-14	Thallium, total	mg/l	0.002	0.00556	0.0056											
AP-1	Turbidity	NTU	NA	NA	NA											
AP-2	Turbidity	NTU	NA	NA	NA											
AP-3	Turbidity	NTU	NA	NA	NA											
AP-4	Turbidity	NTU	NA	NA	NA											
AP-5	Turbidity	NTU	NA	NA	NA											
AP-6	Turbidity	NTU	NA	NA	NA											
AP-7	Turbidity	NTU	NA	NA	NA											
AW-3/RW-3	Turbidity	NTU	NA	NA	NA											
AP-8	Turbidity	NTU	NA	NA	NA											
AP-9	Turbidity	NTU	NA	NA	NA											
AP-10	Turbidity	NTU	NA	NA	NA											
AP-11	Turbidity	NTU	NA	NA	NA											
AP-12	Turbidity	NTU	NA	NA	NA											
AP-13	Turbidity	NTU	NA	NA	NA											
AP-14	Turbidity	NTU	NA	NA	NA											

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	2/24/2015	5/28/2015	8/20/2015	11/13/2015	2/26/2016	5/13/2016	8/4/2016	11/18/2016	2/16/2017	5/31/2017	8/2/2017	11/9/2017
AP-1	Boron, total	mg/l	2	0.787	2	17.9	15.7	17.5	18.8	16.1	17.2	17.9	17.3	22.5	13.9	19.4	20.3
AP-2	Boron, total	mg/l	2	0.787	2	4.12	4.51	5.01		4.62	4.43	4.4	4.28	3.92	3.63	3.58	3.16
AP-3	Boron, total	mg/l	2	0.787	2	17.8	16.4	17.6	20.1	16.9	16.2	16.5	18.6		17.7	18.9	19.2
AP-4	Boron, total	mg/l	2	0.787	2	0.105	0.123	0.0779	0.119	0.0783	0.123	0.131	0.136	0.117	0.12	0.105	0.129
AP-5	Boron, total	mg/l	2	0.787	2	0.0383	0.0379	0.0298	0.053	0.0699	0.0537	0.0779	0.0733	0.0483	0.0443	0.0407	0.073
AP-6	Boron, total	mg/l	2	0.787	2												
AP-7	Boron, total	mg/l	2	0.787	2												
AW-3/RW-3	Boron, total	mg/l	2	0.787	2	0.16	0.157	0.155	0.17	0.179	0.155	0.135	0.2	0.162	0.163	0.173	0.206
AP-8	Boron, total	mg/l	2	0.787	2												
AP-9	Boron, total	mg/l	2	0.787	2												
AP-10	Boron, total	mg/l	2	0.787	2												
AP-11	Boron, total	mg/l	2	0.787	2												
AP-12	Boron, total	mg/l	2	0.787	2												
AP-13	Boron, total	mg/l	2	0.787	2												
AP-14	Boron, total	mg/l	2	0.787	2												
AP-1	Calcium, total	mg/l	na	176.63	176.63		260	241	242	234	209	228	196	266	173	15	259
AP-2	Calcium, total	mg/l	na	176.63	176.63		350	358		312	203	191	185	180	174	238	203
AP-3	Calcium, total	mg/l	na	176.63	176.63		169	168	184	190	154	161	154	198	138	198	176
AP-4	Calcium, total	mg/l	na	176.63	176.63		121	117	125	125	118	118	117	136	117	150	141
AP-5	Calcium, total	mg/l	na	176.63	176.63		103	92.2	124	98.1	77.3	158	201	155	83.5	105	118
AP-6	Calcium, total	mg/l	na	176.63	176.63												
AP-7	Calcium, total	mg/l	na	176.63	176.63												
AW-3/RW-3	Calcium, total	mg/l	na	176.63	176.63		74.6	85.4	90.7	68.6	105	74.3	72.8	96.1	69.9	5.08	77.7
AP-8	Calcium, total	mg/l	na	176.63	176.63												
AP-9	Calcium, total	mg/l	na	176.63	176.63												
AP-10	Calcium, total	mg/l	na	176.63	176.63												
AP-11	Calcium, total	mg/l	na	176.63	176.63												
AP-12	Calcium, total	mg/l	na	176.63	176.63												
AP-13	Calcium, total	mg/l	na	176.63	176.63												
AP-14	Calcium, total	mg/l	na	176.63	176.63												
AP-1	Chloride, total	mg/l	200	24.2	200	46.9	50.7	44.8	68.9	45.8	46.2	48.3	47.3	47.9	44.6	50.2	54.1
AP-2	Chloride, total	mg/l	200	24.2	200	19.6	25.6	28.1		40.7	39.7	40.2	41.1	41.5	42.1	46.6	48.6
AP-3	Chloride, total	mg/l	200	24.2	200	38.7	40.6	34.8	52.1	40.3	37.9	38.8	38.9	39.6	39.9	38.3	40.9
AP-4	Chloride, total	mg/l	200	24.2	200	10.8	15.1	10.2	16.7	11.3	12.3	11.3	9.8	10.6	12	11.9	12.1
AP-5	Chloride, total	mg/l	200	24.2	200	4.02	4.79	< 3	3.27	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 30
AP-6	Chloride, total	mg/l	200	24.2	200												
AP-7	Chloride, total	mg/l	200	24.2	200												
AW-3/RW-3	Chloride, total	mg/l	200	24.2	200	25.3	24.1	20.9	33	23.7	24.7	22.7	23	22.9	26.8	27.1	26.2
AP-8	Chloride, total	mg/l	200	24.2	200												
AP-9	Chloride, total	mg/l	200	24.2	200												
AP-10	Chloride, total	mg/l	200	24.2	200												
AP-11	Chloride, total	mg/l	200	24.2	200												
AP-12	Chloride, total	mg/l	200	24.2	200												
AP-13	Chloride, total	mg/l	200	24.2	200												
AP-14	Chloride, total	mg/l	200	24.2	200												
AP-1	Fluoride, total	mg/l	4	0.62	4	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
AP-2	Fluoride, total	mg/l	4	0.62	4	< 0.5	< 0.5	< 0.5		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
AP-3	Fluoride, total	mg/l	4	0.62	4	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
AP-4	Fluoride, total	mg/l	4	0.62	4	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
AP-5	Fluoride, total	mg/l	4	0.62	4	< 0.5	< 0.5	< 0.5	0.88	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
AP-6	Fluoride, total	mg/l	4	0.62	4												
AP-7	Fluoride, total	mg/l	4	0.62	4												
AW-3/RW-3	Fluoride, total	mg/l	4	0.62	4	< 0.5	< 0.5	< 0.5	0.6	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.5	1.1
AP-8	Fluoride, total	mg/l	4	0.62	4												
AP-10	Fluoride, total	mg/l	4	0.62	4												
AP-14	Fluoride, total	mg/l	4	0.62	4												
AP-1	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	6.73	7.07	6.92	7.13	7.22	6.76	6.57	6.85	6.96	6.72	6.59	6.89
AP-2	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	7.1	6.86	6.82		6.87	6.69	6.77	6.75	6.8	6.6	6.83	6.78
AP-3	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	6.98	7	6.88	7.07	7.01	6.78	6.91	6.8	6.92	6.55	6.78	6.95
AP-4	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	6.82	7.45	7.01	7.14	7.39	7.18	7.13	7.01	7.02	7.08	7.29	7.12
AP-5	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	7.32	7.16	6.52	7.51	7.66	7.56	6.83	7.62	7.42	7.36	7.77	7.19
AP-6	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0												

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	2/24/2015	5/28/2015	8/20/2015	11/13/2015	2/26/2016	5/13/2016	8/4/2016	11/18/2016	2/16/2017	5/31/2017	8/2/2017	11/9/2017
AP-7	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0												
AW-3/RW-3	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	7.04	7.19	6.93	7.52	7.29	7.49	7.18	7.48	7.34	7.21	7.26	6.92
AP-8	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0												
AP-9	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0												
AP-10	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0												
AP-11	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0												
AP-12	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0												
AP-13	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0												
AP-14	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0												
AP-1	Sulfate, total	mg/l	400	84.5	400	504	486	550	388	594	597	612	589	645	532	672	664
AP-2	Sulfate, total	mg/l	400	84.5	400	497	686	711		531	418	335	327	279	346	390	348
AP-3	Sulfate, total	mg/l	400	84.5	400	290	332	315	337	310	359	369	339	328	328	368	319
AP-4	Sulfate, total	mg/l	400	84.5	400	< 5	< 5	< 5	6.47	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
AP-5	Sulfate, total	mg/l	400	84.5	400	52.6	48.2	47.4	58.8	54.3	46.8	50.8	52.5	55.5	54.8	48.4	55.3
AP-6	Sulfate, total	mg/l	400	84.5	400												
AP-7	Sulfate, total	mg/l	400	84.5	400												
AW-3/RW-3	Sulfate, total	mg/l	400	84.5	400	5.62	< 5	5.05	< 5	27.5	24.2	17.3	8.74	< 5	7.75	< 5	< 5
AP-8	Sulfate, total	mg/l	400	84.5	400												
AP-9	Sulfate, total	mg/l	400	84.5	400												
AP-10	Sulfate, total	mg/l	400	84.5	400												
AP-11	Sulfate, total	mg/l	400	84.5	400												
AP-12	Sulfate, total	mg/l	400	84.5	400												
AP-13	Sulfate, total	mg/l	400	84.5	400												
AP-14	Sulfate, total	mg/l	400	84.5	400												
AP-1	Total Dissolved Solids	mg/l	1200	597.94	1200	1230	1260	1200	1280	1010	1430	1390	1320	1430	1180	1450	1420
AP-2	Total Dissolved Solids	mg/l	1200	597.94	1200	1250	1460	1520		1200	1160	1020	1070	906	1020	1060	966
AP-3	Total Dissolved Solids	mg/l	1200	597.94	1200	866	900	860	850	712	914	958	940	810	848	920	848
AP-4	Total Dissolved Solids	mg/l	1200	597.94	1200	486	502	476	470	492	514	554	558	482	538	526	544
AP-5	Total Dissolved Solids	mg/l	1200	597.94	1200	384	388	368	290	358	292	474	344	406	426	392	470
AP-6	Total Dissolved Solids	mg/l	1200	597.94	1200												
AP-7	Total Dissolved Solids	mg/l	1200	597.94	1200												
AW-3/RW-3	Total Dissolved Solids	mg/l	1200	597.94	1200	398	420	408	434	370	370	488	474	412	442	462	424
AP-8	Total Dissolved Solids	mg/l	1200	597.94	1200												
AP-9	Total Dissolved Solids	mg/l	1200	597.94	1200												
AP-10	Total Dissolved Solids	mg/l	1200	597.94	1200												
AP-11	Total Dissolved Solids	mg/l	1200	597.94	1200												
AP-12	Total Dissolved Solids	mg/l	1200	597.94	1200												
AP-13	Total Dissolved Solids	mg/l	1200	597.94	1200												
AP-14	Total Dissolved Solids	mg/l	1200	597.94	1200												
AP-1	Antimony, total	mg/l	0.006	0.016	0.016	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-2	Antimony, total	mg/l	0.006	0.016	0.016	< 0.0312	< 0.025	< 0.025		< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-3	Antimony, total	mg/l	0.006	0.016	0.016	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-4	Antimony, total	mg/l	0.006	0.016	0.016	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-5	Antimony, total	mg/l	0.006	0.016	0.016	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-6	Antimony, total	mg/l	0.006	0.016	0.016												
AP-7	Antimony, total	mg/l	0.006	0.016	0.016												
AW-3/RW-3	Antimony, total	mg/l	0.006	0.016	0.016	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-8	Antimony, total	mg/l	0.006	0.016	0.016												
AP-9	Antimony, total	mg/l	0.006	0.016	0.016												
AP-10	Antimony, total	mg/l	0.006	0.016	0.016												
AP-11	Antimony, total	mg/l	0.006	0.016	0.016												
AP-12	Antimony, total	mg/l	0.006	0.016	0.016												
AP-13	Antimony, total	mg/l	0.006	0.016	0.016												
AP-14	Antimony, total	mg/l	0.006	0.016	0.016												

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	2/24/2015	5/28/2015	8/20/2015	11/13/2015	2/26/2016	5/13/2016	8/4/2016	11/18/2016	2/16/2017	5/31/2017	8/2/2017	11/9/2017
AP-1	Arsenic, total	mg/l	0.01	0.0724	0.0724	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-2	Arsenic, total	mg/l	0.01	0.0724	0.0724	< 0.0312	< 0.025	< 0.025		< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-3	Arsenic, total	mg/l	0.01	0.0724	0.0724	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-4	Arsenic, total	mg/l	0.01	0.0724	0.0724	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	0.0266
AP-5	Arsenic, total	mg/l	0.01	0.0724	0.0724	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-6	Arsenic, total	mg/l	0.01	0.0724	0.0724												
AP-7	Arsenic, total	mg/l	0.01	0.0724	0.0724												
AW-3/RW-3	Arsenic, total	mg/l	0.01	0.0724	0.0724	0.105	0.118	0.121	0.151	0.0982	0.0939	0.231	0.224	0.21	0.0856	0.157	0.172
AP-8	Arsenic, total	mg/l	0.01	0.0724	0.0724												
AP-9	Arsenic, total	mg/l	0.01	0.0724	0.0724												
AP-10	Arsenic, total	mg/l	0.01	0.0724	0.0724												
AP-11	Arsenic, total	mg/l	0.01	0.0724	0.0724												
AP-12	Arsenic, total	mg/l	0.01	0.0724	0.0724												
AP-13	Arsenic, total	mg/l	0.01	0.0724	0.0724												
AP-14	Arsenic, total	mg/l	0.01	0.0724	0.0724												
AP-1	Barium, total	mg/l	2	5.24	5.24	0.0683	0.360	0.646	0.303	0.592	0.578	0.682	0.433	0.953	0.253	0.727	0.662
AP-2	Barium, total	mg/l	2	5.24	5.24	0.241	0.254	0.268		0.147	0.0995	0.0795	0.0691	0.0998	0.0892	0.0735	0.0765
AP-3	Barium, total	mg/l	2	5.24	5.24	0.106	0.136	0.0938	0.114	0.131	0.102	0.106	0.1	0.124	0.0849	0.0947	0.0997
AP-4	Barium, total	mg/l	2	5.24	5.24	0.329	0.301	0.348	0.355	0.322	0.373	0.381	0.357	0.413	0.405	0.391	0.41
AP-5	Barium, total	mg/l	2	5.24	5.24	0.0846	0.109	0.0955	0.158	0.0618	0.0628	0.251	0.201	0.137	0.0807	0.043	0.308
AP-6	Barium, total	mg/l	2	5.24	5.24												
AP-7	Barium, total	mg/l	2	5.24	5.24												
AW-3/RW-3	Barium, total	mg/l	2	5.24	5.24	0.166	0.185	0.181	0.213	0.177	0.164	0.208	0.197	0.271	0.202	0.221	0.23
AP-8	Barium, total	mg/l	2	5.24	5.24												
AP-9	Barium, total	mg/l	2	5.24	5.24												
AP-10	Barium, total	mg/l	2	5.24	5.24												
AP-11	Barium, total	mg/l	2	5.24	5.24												
AP-12	Barium, total	mg/l	2	5.24	5.24												
AP-13	Barium, total	mg/l	2	5.24	5.24												
AP-14	Barium, total	mg/l	2	5.24	5.24												
AP-1	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.00312	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
AP-2	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.00312	< 0.0025	< 0.0025		< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
AP-3	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.00312	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
AP-4	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.00312	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
AP-5	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.00312	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
AP-6	Beryllium, total	mg/l	0.004	0.0164	0.0164												
AP-7	Beryllium, total	mg/l	0.004	0.0164	0.0164												
AW-3/RW-3	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.00312	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
AP-8	Beryllium, total	mg/l	0.004	0.0164	0.0164												
AP-9	Beryllium, total	mg/l	0.004	0.0164	0.0164												
AP-10	Beryllium, total	mg/l	0.004	0.0164	0.0164												
AP-11	Beryllium, total	mg/l	0.004	0.0164	0.0164												
AP-12	Beryllium, total	mg/l	0.004	0.0164	0.0164												
AP-13	Beryllium, total	mg/l	0.004	0.0164	0.0164												
AP-14	Beryllium, total	mg/l	0.004	0.0164	0.0164												
AP-1	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.00312	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
AP-2	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.00312	< 0.0025	< 0.0025		< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
AP-3	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.00312	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
AP-4	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.00312	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
AP-5	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.00312	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
AP-6	Cadmium, total	mg/l	0.005	0.0128	0.0128												
AP-7	Cadmium, total	mg/l	0.005	0.0128	0.0128												
AW-3/RW-3	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.00312	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
AP-8	Cadmium, total	mg/l	0.005	0.0128	0.0128												
AP-9	Cadmium, total	mg/l	0.005	0.0128	0.0128												
AP-10	Cadmium, total	mg/l	0.005	0.0128	0.0128												
AP-11	Cadmium, total	mg/l	0.005	0.0128	0.0128												
AP-12	Cadmium, total	mg/l	0.005	0.0128	0.0128												
AP-13	Cadmium, total	mg/l	0.005	0.0128	0.0128												
AP-14	Cadmium, total	mg/l	0.005	0.0128	0.0128												

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	2/24/2015	5/28/2015	8/20/2015	11/13/2015	2/26/2016	5/13/2016	8/4/2016	11/18/2016	2/16/2017	5/31/2017	8/2/2017	11/9/2017
AP-1	Chromium, total	mg/l	0.1	0.811	0.811	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-2	Chromium, total	mg/l	0.1	0.811	0.811	< 0.0312	< 0.025	< 0.025		< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-3	Chromium, total	mg/l	0.1	0.811	0.811	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-4	Chromium, total	mg/l	0.1	0.811	0.811	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-5	Chromium, total	mg/l	0.1	0.811	0.811	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	0.0605	0.0432	< 0.025	< 0.025	< 0.025	0.0653
AP-6	Chromium, total	mg/l	0.1	0.811	0.811												
AP-7	Chromium, total	mg/l	0.1	0.811	0.811												
AW-3/RW-3	Chromium, total	mg/l	0.1	0.811	0.811	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-8	Chromium, total	mg/l	0.1	0.811	0.811												
AP-9	Chromium, total	mg/l	0.1	0.811	0.811												
AP-10	Chromium, total	mg/l	0.1	0.811	0.811												
AP-11	Chromium, total	mg/l	0.1	0.811	0.811												
AP-12	Chromium, total	mg/l	0.1	0.811	0.811												
AP-13	Chromium, total	mg/l	0.1	0.811	0.811												
AP-14	Chromium, total	mg/l	0.1	0.811	0.811												
AP-1	Cobalt, total	mg/l	0.006	0.297	0.297	< 0.0156	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-2	Cobalt, total	mg/l	0.006	0.297	0.297	< 0.0156	< 0.025	< 0.025		< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-3	Cobalt, total	mg/l	0.006	0.297	0.297	< 0.0156	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-4	Cobalt, total	mg/l	0.006	0.297	0.297	< 0.0156	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-5	Cobalt, total	mg/l	0.006	0.297	0.297	< 0.0156	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	0.029	< 0.025	< 0.025	< 0.025	< 0.025	0.0277
AP-6	Cobalt, total	mg/l	0.006	0.297	0.297												
AP-7	Cobalt, total	mg/l	0.006	0.297	0.297												
AW-3/RW-3	Cobalt, total	mg/l	0.006	0.297	0.297	< 0.0156	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-8	Cobalt, total	mg/l	0.006	0.297	0.297												
AP-9	Cobalt, total	mg/l	0.006	0.297	0.297												
AP-10	Cobalt, total	mg/l	0.006	0.297	0.297												
AP-11	Cobalt, total	mg/l	0.006	0.297	0.297												
AP-12	Cobalt, total	mg/l	0.006	0.297	0.297												
AP-13	Cobalt, total	mg/l	0.006	0.297	0.297												
AP-14	Cobalt, total	mg/l	0.006	0.297	0.297												
AP-1	Lead, total	mg/l	0.0075	0.638	0.638	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-2	Lead, total	mg/l	0.0075	0.638	0.638	< 0.0312	< 0.025	< 0.025		< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-3	Lead, total	mg/l	0.0075	0.638	0.638	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-4	Lead, total	mg/l	0.0075	0.638	0.638	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-5	Lead, total	mg/l	0.0075	0.638	0.638	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	0.0286	0.0254	< 0.025	< 0.025	< 0.025	0.0287
AP-6	Lead, total	mg/l	0.0075	0.638	0.638												
AP-7	Lead, total	mg/l	0.0075	0.638	0.638												
AW-3/RW-3	Lead, total	mg/l	0.0075	0.638	0.638	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-8	Lead, total	mg/l	0.0075	0.638	0.638												
AP-9	Lead, total	mg/l	0.0075	0.638	0.638												
AP-10	Lead, total	mg/l	0.0075	0.638	0.638												
AP-11	Lead, total	mg/l	0.0075	0.638	0.638												
AP-12	Lead, total	mg/l	0.0075	0.638	0.638												
AP-13	Lead, total	mg/l	0.0075	0.638	0.638												
AP-14	Lead, total	mg/l	0.0075	0.638	0.638												
AP-1	Lithium	mg/l	0.04	0.05	0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
AP-2	Lithium	mg/l	0.04	0.05	0.05		< 0.05	< 0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
AP-3	Lithium	mg/l	0.04	0.05	0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
AP-4	Lithium	mg/l	0.04	0.05	0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
AP-5	Lithium	mg/l	0.04	0.05	0.05		< 0.05	< 0.05	< 0.25	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
AP-6	Lithium	mg/l	0.04	0.05	0.05												
AP-7	Lithium	mg/l	0.04	0.05	0.05												
AW-3/RW-3	Lithium	mg/l	0.04	0.05	0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
AP-8	Lithium	mg/l	0.04	0.05	0.05												
AP-9	Lithium	mg/l	0.04	0.05	0.05												
AP-10	Lithium	mg/l	0.04	0.05	0.05												
AP-11	Lithium	mg/l	0.04	0.05	0.05												
AP-12	Lithium	mg/l	0.04	0.05	0.05												
AP-13	Lithium	mg/l	0.04	0.05	0.05												
AP-14	Lithium	mg/l	0.04	0.05	0.05												

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	2/24/2015	5/28/2015	8/20/2015	11/13/2015	2/26/2016	5/13/2016	8/4/2016	11/18/2016	2/16/2017	5/31/2017	8/2/2017	11/9/2017
AP-1	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-2	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005	< 0.0005	< 0.0005		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-3	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-4	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-5	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-6	Mercury, total	mg/l	0.002	0.0008	0.002												
AP-7	Mercury, total	mg/l	0.002	0.0008	0.002												
AW-3/RW-3	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-8	Mercury, total	mg/l	0.002	0.0008	0.002												
AP-9	Mercury, total	mg/l	0.002	0.0008	0.002												
AP-10	Mercury, total	mg/l	0.002	0.0008	0.002												
AP-11	Mercury, total	mg/l	0.002	0.0008	0.002												
AP-12	Mercury, total	mg/l	0.002	0.0008	0.002												
AP-13	Mercury, total	mg/l	0.002	0.0008	0.002												
AP-14	Mercury, total	mg/l	0.002	0.0008	0.002												
AP-1	Molybdenum	mg/l	0.1	0.025	0.1		< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-2	Molybdenum	mg/l	0.1	0.025	0.1		< 0.025	< 0.025		< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-3	Molybdenum	mg/l	0.1	0.025	0.1		< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-4	Molybdenum	mg/l	0.1	0.025	0.1		< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-5	Molybdenum	mg/l	0.1	0.025	0.1		< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-6	Molybdenum	mg/l	0.1	0.025	0.1												
AP-7	Molybdenum	mg/l	0.1	0.025	0.1												
AW-3/RW-3	Molybdenum	mg/l	0.1	0.025	0.1		< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-8	Molybdenum	mg/l	0.1	0.025	0.1												
AP-9	Molybdenum	mg/l	0.1	0.025	0.1												
AP-10	Molybdenum	mg/l	0.1	0.025	0.1												
AP-11	Molybdenum	mg/l	0.1	0.025	0.1												
AP-12	Molybdenum	mg/l	0.1	0.025	0.1												
AP-13	Molybdenum	mg/l	0.1	0.025	0.1												
AP-14	Molybdenum	mg/l	0.1	0.025	0.1												
AP-1	Radium-226 + Radium-228	pCi/l	5	7.1	7.1	3.4	1.62	2.3	3.8	4.8	0.26	1.94	1.79	1.53	1.34	1.18	1.99
AP-2	Radium-226 + Radium-228	pCi/l	5	7.1	7.1	2.4	1.57	2		2.9	-2.01	1.46	1.19	1.25	1.38	1.01	2.17
AP-3	Radium-226 + Radium-228	pCi/l	5	7.1	7.1	2.4	1.17	2	2	2.6	-0.06	1.37	1.34	2.06	1.07	1.21	1.4
AP-4	Radium-226 + Radium-228	pCi/l	5	7.1	7.1	2	1.07	2	2	3.2	1.15	1.6	2.31	2.52	1.36	2.03	1.99
AP-5	Radium-226 + Radium-228	pCi/l	5	7.1	7.1	2	2	2	2.5	2	0.36	1.3	2.54	1.19	1.75	2.9	3.2
AP-6	Radium-226 + Radium-228	pCi/l	5	7.1	7.1												
AP-7	Radium-226 + Radium-228	pCi/l	5	7.1	7.1												
AW-3/RW-3	Radium-226 + Radium-228	pCi/l	5	7.1	7.1	2	1.11	2	2	2.6	1.57	2.33	1.53	1.16	0.8	2.51	1.48
AP-8	Radium-226 + Radium-228	pCi/l	5	7.1	7.1												
AP-9	Radium-226 + Radium-228	pCi/l	5	7.1	7.1												
AP-10	Radium-226 + Radium-228	pCi/l	5	7.1	7.1												
AP-11	Radium-226 + Radium-228	pCi/l	5	7.1	7.1												
AP-12	Radium-226 + Radium-228	pCi/l	5	7.1	7.1												
AP-13	Radium-226 + Radium-228	pCi/l	5	7.1	7.1												
AP-14	Radium-226 + Radium-228	pCi/l	5	7.1	7.1												
AP-1	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-2	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.0312	< 0.025	< 0.025		< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-3	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-4	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-5	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-6	Selenium, total	mg/l	0.05	0.0079	0.05												
AP-7	Selenium, total	mg/l	0.05	0.0079	0.05												
AW-3/RW-3	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-8	Selenium, total	mg/l	0.05	0.0079	0.05												
AP-9	Selenium, total	mg/l	0.05	0.0079	0.05												
AP-10	Selenium, total	mg/l	0.05	0.0079	0.05												
AP-11	Selenium, total	mg/l	0.05	0.0079	0.05												
AP-12	Selenium, total	mg/l	0.05	0.0079	0.05												
AP-13	Selenium, total	mg/l	0.05	0.0079	0.05												
AP-14	Selenium, total	mg/l	0.05	0.0079	0.05												

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	2/24/2015	5/28/2015	8/20/2015	11/13/2015	2/26/2016	5/13/2016	8/4/2016	11/18/2016	2/16/2017	5/31/2017	8/2/2017	11/9/2017
AP-1	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-2	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.0312	< 0.025	< 0.025		< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-3	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-4	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-5	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-6	Thallium, total	mg/l	0.002	0.00556	0.0056												
AP-7	Thallium, total	mg/l	0.002	0.00556	0.0056												
AW-3/RW-3	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-8	Thallium, total	mg/l	0.002	0.00556	0.0056												
AP-9	Thallium, total	mg/l	0.002	0.00556	0.0056												
AP-10	Thallium, total	mg/l	0.002	0.00556	0.0056												
AP-11	Thallium, total	mg/l	0.002	0.00556	0.0056												
AP-12	Thallium, total	mg/l	0.002	0.00556	0.0056												
AP-13	Thallium, total	mg/l	0.002	0.00556	0.0056												
AP-14	Thallium, total	mg/l	0.002	0.00556	0.0056												
AP-1	Turbidity	NTU	NA	NA	NA												
AP-2	Turbidity	NTU	NA	NA	NA												
AP-3	Turbidity	NTU	NA	NA	NA												
AP-4	Turbidity	NTU	NA	NA	NA												
AP-5	Turbidity	NTU	NA	NA	NA												
AP-6	Turbidity	NTU	NA	NA	NA												
AP-7	Turbidity	NTU	NA	NA	NA												
AW-3/RW-3	Turbidity	NTU	NA	NA	NA												
AP-8	Turbidity	NTU	NA	NA	NA												
AP-9	Turbidity	NTU	NA	NA	NA												
AP-10	Turbidity	NTU	NA	NA	NA												
AP-11	Turbidity	NTU	NA	NA	NA												
AP-12	Turbidity	NTU	NA	NA	NA												
AP-13	Turbidity	NTU	NA	NA	NA												
AP-14	Turbidity	NTU	NA	NA	NA												

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	5/4/2018	6/21/2018	7/9/2018	2/13/2019	8/1/2019	2/28/2020	8/5/2020	1/21/20221	5/27/2021	8/24/2021
AP-1	Boron, total	mg/l	2	0.787	2	15.8		19.1	5.03	21	18	21.5	21.7	22.10	22.00
AP-2	Boron, total	mg/l	2	0.787	2	2.94		3.63	4.21	5.62	5.23	4.95	3.67	4.42	4.73
AP-3	Boron, total	mg/l	2	0.787	2	18.5		18.8	20.7	18.7	18.5	17.5	16.8	17.10	17.3
AP-4	Boron, total	mg/l	2	0.787	2	0.117		0.128	0.11	0.0677	0.0986	0.0939	0.0996	0.0928	0.0949
AP-5	Boron, total	mg/l	2	0.787	2	0.0616		0.0585	0.0275	0.116	0.033	0.044	0.0256	< 0.02	< 0.02
AP-6	Boron, total	mg/l	2	0.787	2						0.319	0.246	0.254		0.275
AP-7	Boron, total	mg/l	2	0.787	2						0.385	0.452	0.409	0.3870	0.387
AW-3/RW-3	Boron, total	mg/l	2	0.787	2	0.188	0.214	0.203	0.191	1.6	0.293	0.185	0.169	0.1740	0.180
AP-8	Boron, total	mg/l	2	0.787	2									0.0942	0.0887
AP-9	Boron, total	mg/l	2	0.787	2										0.0836
AP-10	Boron, total	mg/l	2	0.787	2									3.65	3.43
AP-11	Boron, total	mg/l	2	0.787	2										0.262
AP-12	Boron, total	mg/l	2	0.787	2										0.0267
AP-13	Boron, total	mg/l	2	0.787	2										0.0527
AP-14	Boron, total	mg/l	2	0.787	2									23.20	23.2
AP-1	Calcium, total	mg/l	na	176.63	176.63	190		223	98.1	243	215	242	233	242	233
AP-2	Calcium, total	mg/l	na	176.63	176.63	216		262	322	335	291	287	202	289	294
AP-3	Calcium, total	mg/l	na	176.63	176.63	145		158	180	166	158	157	139	148	148
AP-4	Calcium, total	mg/l	na	176.63	176.63	121		123	146	97.2	127	125	117	128	126
AP-5	Calcium, total	mg/l	na	176.63	176.63	99.7		101	95.1	132	78.5	357	75.4	89.1	77.8
AP-6	Calcium, total	mg/l	na	176.63	176.63						85.7	68.9	62.7		68.1
AP-7	Calcium, total	mg/l	na	176.63	176.63						66.7	63.6	55.7	63.9	65
AW-3/RW-3	Calcium, total	mg/l	na	176.63	176.63	69.7	85.2	78.9	84.1	175	247	73.8	68.2	73.74	69.7
AP-8	Calcium, total	mg/l	na	176.63	176.63									102	97.4
AP-9	Calcium, total	mg/l	na	176.63	176.63										77.6
AP-10	Calcium, total	mg/l	na	176.63	176.63									152	136
AP-11	Calcium, total	mg/l	na	176.63	176.63										0
AP-12	Calcium, total	mg/l	na	176.63	176.63										213
AP-13	Calcium, total	mg/l	na	176.63	176.63										105
AP-14	Calcium, total	mg/l	na	176.63	176.63									254	219
AP-1	Chloride, total	mg/l	200	24.2	200	45.4		51.7	40.9	52.1	49	60	58	51	55
AP-2	Chloride, total	mg/l	200	24.2	200	41.6		47	39.2	37.2	35	36	39	34	19
AP-3	Chloride, total	mg/l	200	24.2	200	38.4		36.7	36	36.3	36	35	37	33	36
AP-4	Chloride, total	mg/l	200	24.2	200	12		12.2	12.8	1.9	13	14	13	13	14
AP-5	Chloride, total	mg/l	200	24.2	200	< 5		< 5	4.45	< 12.5	< 5	7	< 4	3	5
AP-6	Chloride, total	mg/l	200	24.2	200						40	27	35		34
AP-7	Chloride, total	mg/l	200	24.2	200						50	78	67	67	66
AW-3/RW-3	Chloride, total	mg/l	200	24.2	200	28.8	28.8	29.8	28.1	25.5	36	28	26	26	28
AP-8	Chloride, total	mg/l	200	24.2	200									24	26
AP-9	Chloride, total	mg/l	200	24.2	200										29
AP-10	Chloride, total	mg/l	200	24.2	200									27	32
AP-11	Chloride, total	mg/l	200	24.2	200										99
AP-12	Chloride, total	mg/l	200	24.2	200										133
AP-13	Chloride, total	mg/l	200	24.2	200										78
AP-14	Chloride, total	mg/l	200	24.2	200									45	50
AP-1	Fluoride, total	mg/l	4	0.62	4	< 0.5		< 0.5	< 0.25	0.26	0.18	0.2	0.2	0.22	
AP-2	Fluoride, total	mg/l	4	0.62	4	< 0.5		< 0.5	< 0.25	0.28	0.21	0.22	0.22	0.25	
AP-3	Fluoride, total	mg/l	4	0.62	4	< 0.5		< 0.5	< 0.25	0.28	0.19	0.23	0.21	0.23	
AP-4	Fluoride, total	mg/l	4	0.62	4	< 0.5		< 0.5	< 0.25	0.43	0.12	0.14	0.12	0.16	
AP-5	Fluoride, total	mg/l	4	0.62	4	< 0.5		< 0.5	0.3	< 0.25	0.37	0.34	0.34	0.35	
AP-6	Fluoride, total	mg/l	4	0.62	4						0.51	0.39	0.45		
AP-7	Fluoride, total	mg/l	4	0.62	4						0.55	0.62	0.58	0.59	
AW-3/RW-3	Fluoride, total	mg/l	4	0.62	4	< 0.5	0.54	0.54	0.54	< 0.25	0.32	0.45	0.42	0.49	
AP-8	Fluoride, total	mg/l	4	0.62	4									0.33	
AP-10	Fluoride, total	mg/l	4	0.62	4									0.36	
AP-14	Fluoride, total	mg/l	4	0.62	4									0.31	
AP-1	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	6.65		6.71	7.07	6.68	6.74	6.8	6.69	6.46	6.73
AP-2	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	6.62		6.52	6.59	6.57	6.54	6.66	6.58	6.43	6.40
AP-3	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	6.77		6.61	6.76	6.77	6.67	6.78	6.73	6.69	6.52
AP-4	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	7.17		7	7.01	7.07	7.01	6.67	6.97	6.74	6.92
AP-5	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	7.23		7.05	7.42	7.32	7.46	7.36	7.27	7.05	7.08
AP-6	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0						7.11	7.45	7.21		7.10

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	5/4/2018	6/21/2018	7/9/2018	2/13/2019	8/1/2019	2/28/2020	8/5/2020	1/21/20221	5/27/2021	8/24/2021
AP-7	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0						7.24	7.3	7.2	7.03	7.11
AW-3/RW-3	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	7.41	7.31	6.82	7.52	7.34	7.23	7.29	7.13	7.00	6.73
AP-8	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0									6.90	6.92
AP-9	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0										6.89
AP-10	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0									6.53	6.73
AP-11	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0										6.60
AP-12	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0										6.47
AP-13	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0										6.68
AP-14	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0									7.21	6.98
AP-1	Sulfate, total	mg/l	400	84.5	400	573		674	179	673	616	683	976	721	734
AP-2	Sulfate, total	mg/l	400	84.5	400	467		656	725	816	686	709	367	660	707
AP-3	Sulfate, total	mg/l	400	84.5	400	355		401	402	354	345	342	388	347	371
AP-4	Sulfate, total	mg/l	400	84.5	400	< 5		< 5	< 1.5	44.7	< 10	< 10	< 10	10	< 10
AP-5	Sulfate, total	mg/l	400	84.5	400	66.8		61.7	60.8	< 1.5	37	49	46	53	65
AP-6	Sulfate, total	mg/l	400	84.5	400						< 10	18	< 10		< 10
AP-7	Sulfate, total	mg/l	400	84.5	400						< 10	< 10	< 10	10	< 10
AW-3/RW-3	Sulfate, total	mg/l	400	84.5	400	23.7	15	7.81	8.45	215	27	20	15	14	14
AP-8	Sulfate, total	mg/l	400	84.5	400									10	< 10
AP-9	Sulfate, total	mg/l	400	84.5	400										35
AP-10	Sulfate, total	mg/l	400	84.5	400									99	93
AP-11	Sulfate, total	mg/l	400	84.5	400										83
AP-12	Sulfate, total	mg/l	400	84.5	400										471
AP-13	Sulfate, total	mg/l	400	84.5	400										150
AP-14	Sulfate, total	mg/l	400	84.5	400									642	680
AP-1	Total Dissolved Solids	mg/l	1200	597.94	1200	1300		1520	550	1510	1220	1320	1500	1450	1420
AP-2	Total Dissolved Solids	mg/l	1200	597.94	1200	1170		1650	1720	1860	1430	1400	1090	1390	1460
AP-3	Total Dissolved Solids	mg/l	1200	597.94	1200	894		778	1090	913	830	794	846	784	824
AP-4	Total Dissolved Solids	mg/l	1200	597.94	1200	482		500	536	416	498	480	492	486	494
AP-5	Total Dissolved Solids	mg/l	1200	597.94	1200	404		482	420	518	314	580	362	358	422
AP-6	Total Dissolved Solids	mg/l	1200	597.94	1200						630	165	388		396
AP-7	Total Dissolved Solids	mg/l	1200	597.94	1200						432	444	478	454	462
AW-3/RW-3	Total Dissolved Solids	mg/l	1200	597.94	1200	400	438	482	412	871	880	335	364	390	404
AP-8	Total Dissolved Solids	mg/l	1200	597.94	1200									512	508
AP-9	Total Dissolved Solids	mg/l	1200	597.94	1200										434
AP-10	Total Dissolved Solids	mg/l	1200	597.94	1200									724	716
AP-11	Total Dissolved Solids	mg/l	1200	597.94	1200										636
AP-12	Total Dissolved Solids	mg/l	1200	597.94	1200										1150
AP-13	Total Dissolved Solids	mg/l	1200	597.94	1200										534
AP-14	Total Dissolved Solids	mg/l	1200	597.94	1200									1250	1270
AP-1	Antimony, total	mg/l	0.006	0.016	0.016	< 0.025		< 0.025	< 0.016	< 0.016	< 0.001	< 0.001	< 0.001	< 0.001	< 0.0010
AP-2	Antimony, total	mg/l	0.006	0.016	0.016	< 0.025		< 0.025	< 0.016	< 0.016	< 0.001	< 0.001	< 0.001	< 0.001	< 0.0010
AP-3	Antimony, total	mg/l	0.006	0.016	0.016	< 0.025		< 0.025	< 0.016	< 0.016	< 0.001	< 0.001	< 0.001	< 0.001	< 0.0010
AP-4	Antimony, total	mg/l	0.006	0.016	0.016	< 0.025		< 0.025	< 0.016	< 0.016	< 0.001	< 0.001	< 0.001	< 0.001	< 0.0010
AP-5	Antimony, total	mg/l	0.006	0.016	0.016	< 0.025		< 0.025	< 0.016	< 0.016	< 0.001	0.0011	< 0.001	< 0.001	< 0.0005
AP-6	Antimony, total	mg/l	0.006	0.016	0.016						< 0.001	< 0.001	< 0.001	< 0.001	< 0.0010
AP-7	Antimony, total	mg/l	0.006	0.016	0.016						< 0.001	< 0.001	< 0.001	< 0.001	< 0.0010
AW-3/RW-3	Antimony, total	mg/l	0.006	0.016	0.016	< 0.025	< 0.025	< 0.025	< 0.016	< 0.016	< 0.004	< 0.001	< 0.001	< 0.001	< 0.0010
AP-8	Antimony, total	mg/l	0.006	0.016	0.016									< 0.001	< 0.0010
AP-9	Antimony, total	mg/l	0.006	0.016	0.016										< 0.0010
AP-10	Antimony, total	mg/l	0.006	0.016	0.016									< 0.001	< 0.0010
AP-11	Antimony, total	mg/l	0.006	0.016	0.016										< 0.0010
AP-12	Antimony, total	mg/l	0.006	0.016	0.016										< 0.0100
AP-13	Antimony, total	mg/l	0.006	0.016	0.016										< 0.0100
AP-14	Antimony, total	mg/l	0.006	0.016	0.016									< 0.001	< 0.0010

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	5/4/2018	6/21/2018	7/9/2018	2/13/2019	8/1/2019	2/28/2020	8/5/2020	1/21/20221	5/27/2021	8/24/2021
AP-1	Arsenic, total	mg/l	0.01	0.0724	0.0724	< 0.025		< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.0250
AP-2	Arsenic, total	mg/l	0.01	0.0724	0.0724	< 0.025		< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.0250
AP-3	Arsenic, total	mg/l	0.01	0.0724	0.0724	< 0.025		< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.0250
AP-4	Arsenic, total	mg/l	0.01	0.0724	0.0724	< 0.025		< 0.025	< 0.025	< 0.025	0.0264	< 0.025	0.0359	< 0.025	< 0.0250
AP-5	Arsenic, total	mg/l	0.01	0.0724	0.0724	< 0.025		< 0.025	< 0.025	< 0.025	< 0.025	0.0937	< 0.025	< 0.025	< 0.0250
AP-6	Arsenic, total	mg/l	0.01	0.0724	0.0724						0.059	< 0.025	< 0.025	<	< 0.0250
AP-7	Arsenic, total	mg/l	0.01	0.0724	0.0724						< 0.025	0.0429	0.0415	< 0.025	< 0.0250
AW-3/RW-3	Arsenic, total	mg/l	0.01	0.0724	0.0724	0.0826	0.0935	0.136	0.124	< 0.025	0.497	0.253	0.116	0.119	0.1050
AP-8	Arsenic, total	mg/l	0.01	0.0724	0.0724									< 0.025	0.0359
AP-9	Arsenic, total	mg/l	0.01	0.0724	0.0724										< 0.0250
AP-10	Arsenic, total	mg/l	0.01	0.0724	0.0724									< 0.025	< 0.0250
AP-11	Arsenic, total	mg/l	0.01	0.0724	0.0724										< 0.0250
AP-12	Arsenic, total	mg/l	0.01	0.0724	0.0724										< 0.0250
AP-13	Arsenic, total	mg/l	0.01	0.0724	0.0724										< 0.0250
AP-14	Arsenic, total	mg/l	0.01	0.0724	0.0724									< 0.025	< 0.0250
AP-1	Barium, total	mg/l	2	5.24	5.24	0.0611		0.662	0.188	0.579	0.375	0.464	0.368	0.352	0.2040
AP-2	Barium, total	mg/l	2	5.24	5.24	0.264		0.109	0.155	0.203	0.0922	0.0994	0.0661	0.0927	0.0944
AP-3	Barium, total	mg/l	2	5.24	5.24	0.0999		0.122	0.123	0.129	0.099	0.0953	0.0858	0.0849	0.0948
AP-4	Barium, total	mg/l	2	5.24	5.24	0.356		0.359	0.416	0.0842	0.41	0.422	0.474	0.454	0.4560
AP-5	Barium, total	mg/l	2	5.24	5.24	0.0956		0.106	0.06	0.428	0.042	1.18	0.0429	0.0552	0.0473
AP-6	Barium, total	mg/l	2	5.24	5.24						0.512	0.179	0.126		0.1320
AP-7	Barium, total	mg/l	2	5.24	5.24						0.17	0.167	0.153	0.133	0.1380
AW-3/RW-3	Barium, total	mg/l	2	5.24	5.24	0.182	0.268	0.226	0.221	0.3	1.61	0.189	0.155	0.15	0.1530
AP-8	Barium, total	mg/l	2	5.24	5.24									0.363	0.3660
AP-9	Barium, total	mg/l	2	5.24	5.24										0.2960
AP-10	Barium, total	mg/l	2	5.24	5.24									0.594	0.5650
AP-11	Barium, total	mg/l	2	5.24	5.24										0.1580
AP-12	Barium, total	mg/l	2	5.24	5.24										0.2490
AP-13	Barium, total	mg/l	2	5.24	5.24										0.2620
AP-14	Barium, total	mg/l	2	5.24	5.24									0.165	0.0632
AP-1	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.0025		< 0.0025	< 0.0025	< 0.016	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-2	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.0025		< 0.0025	< 0.0025	< 0.016	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-3	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.0025		< 0.0025	< 0.0025	< 0.016	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-4	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.0025		< 0.0025	< 0.0025	< 0.016	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-5	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.0025		< 0.0025	< 0.0025	< 0.016	< 0.0005	0.0084	< 0.0005	< 0.0005	< 0.0005
AP-6	Beryllium, total	mg/l	0.004	0.0164	0.0164						0.0056	0.0007	< 0.0005		< 0.0005
AP-7	Beryllium, total	mg/l	0.004	0.0164	0.0164						< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AW-3/RW-3	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.016	0.0278	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-8	Beryllium, total	mg/l	0.004	0.0164	0.0164									< 0.0005	< 0.0005
AP-9	Beryllium, total	mg/l	0.004	0.0164	0.0164										< 0.0005
AP-10	Beryllium, total	mg/l	0.004	0.0164	0.0164									< 0.0005	< 0.0005
AP-11	Beryllium, total	mg/l	0.004	0.0164	0.0164										< 0.0005
AP-12	Beryllium, total	mg/l	0.004	0.0164	0.0164										0.0023
AP-13	Beryllium, total	mg/l	0.004	0.0164	0.0164										0.0020
AP-14	Beryllium, total	mg/l	0.004	0.0164	0.0164									0.0011	< 0.0005
AP-1	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.0025		< 0.0025	< 0.0025	< 0.012	< 0.002	< 0.002	< 0.002	< 0.002	< 0.0020
AP-2	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.0025		< 0.0025	< 0.0025	< 0.012	< 0.002	< 0.002	< 0.002	< 0.002	< 0.0020
AP-3	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.0025		< 0.0025	< 0.0025	< 0.012	< 0.002	< 0.002	< 0.002	< 0.002	< 0.0020
AP-4	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.0025		< 0.0025	< 0.0025	< 0.012	< 0.002	< 0.002	< 0.002	< 0.002	< 0.0020
AP-5	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.0025		< 0.0025	< 0.0025	< 0.012	< 0.002	0.005	< 0.002	< 0.002	< 0.0020
AP-6	Cadmium, total	mg/l	0.005	0.0128	0.0128						< 0.002	< 0.002	< 0.002		< 0.0020
AP-7	Cadmium, total	mg/l	0.005	0.0128	0.0128						< 0.002	< 0.002	< 0.002	< 0.002	< 0.0020
AW-3/RW-3	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.012	0.0059	< 0.002	< 0.002	< 0.002	< 0.0020
AP-8	Cadmium, total	mg/l	0.005	0.0128	0.0128									< 0.002	< 0.0020
AP-9	Cadmium, total	mg/l	0.005	0.0128	0.0128										< 0.0020
AP-10	Cadmium, total	mg/l	0.005	0.0128	0.0128									< 0.002	< 0.0020
AP-11	Cadmium, total	mg/l	0.005	0.0128	0.0128										< 0.0020
AP-12	Cadmium, total	mg/l	0.005	0.0128	0.0128										< 0.0020
AP-13	Cadmium, total	mg/l	0.005	0.0128	0.0128										< 0.0020
AP-14	Cadmium, total	mg/l	0.005	0.0128	0.0128									< 0.002	< 0.0020

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	5/4/2018	6/21/2018	7/9/2018	2/13/2019	8/1/2019	2/28/2020	8/5/2020	1/21/20221	5/27/2021	8/24/2021
AP-1	Chromium, total	mg/l	0.1	0.811	0.811	< 0.025		< 0.025	< 0.025	< 0.025	< 0.005	< 0.005	< 0.005	< 0.0050	< 0.0050
AP-2	Chromium, total	mg/l	0.1	0.811	0.811	< 0.025		< 0.025	< 0.025	< 0.025	< 0.005	< 0.005	< 0.005	< 0.0050	< 0.0050
AP-3	Chromium, total	mg/l	0.1	0.811	0.811	< 0.025		< 0.025	< 0.025	< 0.025	< 0.005	< 0.005	< 0.005	< 0.0050	< 0.0050
AP-4	Chromium, total	mg/l	0.1	0.811	0.811	< 0.025		< 0.025	< 0.025	< 0.025	< 0.005	< 0.005	< 0.005	0.0062	0.0068
AP-5	Chromium, total	mg/l	0.1	0.811	0.811	< 0.025		< 0.025	< 0.025	< 0.025	< 0.005	0.198	< 0.005	< 0.0050	< 0.0050
AP-6	Chromium, total	mg/l	0.1	0.811	0.811						0.147	0.0151	< 0.005		< 0.0050
AP-7	Chromium, total	mg/l	0.1	0.811	0.811						< 0.005	< 0.005	< 0.005	< 0.0050	< 0.0050
AW-3/RW-3	Chromium, total	mg/l	0.1	0.811	0.811	< 0.025	0.0413	< 0.025	< 0.025	< 0.025	0.807	0.0052	< 0.005	< 0.0050	< 0.0050
AP-8	Chromium, total	mg/l	0.1	0.811	0.811									< 0.0050	< 0.0050
AP-9	Chromium, total	mg/l	0.1	0.811	0.811										< 0.0050
AP-10	Chromium, total	mg/l	0.1	0.811	0.811									0.0067	< 0.0050
AP-11	Chromium, total	mg/l	0.1	0.811	0.811										0.0068
AP-12	Chromium, total	mg/l	0.1	0.811	0.811										0.0608
AP-13	Chromium, total	mg/l	0.1	0.811	0.811										< 0.0020
AP-14	Chromium, total	mg/l	0.1	0.811	0.811									0.0290	< 0.0050
AP-1	Cobalt, total	mg/l	0.006	0.297	0.297	< 0.025		< 0.025	< 0.025	< 0.025	< 0.005	< 0.005	< 0.005	< 0.0050	< 0.0050
AP-2	Cobalt, total	mg/l	0.006	0.297	0.297	< 0.025		< 0.025	< 0.025	< 0.025	0.0134	0.0139	0.0097	0.0135	0.0131
AP-3	Cobalt, total	mg/l	0.006	0.297	0.297	< 0.025		< 0.025	< 0.025	< 0.025	0.0058	< 0.005	< 0.005	< 0.0050	< 0.0050
AP-4	Cobalt, total	mg/l	0.006	0.297	0.297	< 0.025		< 0.025	< 0.025	< 0.025	< 0.005	< 0.005	< 0.005	0.0052	< 0.0050
AP-5	Cobalt, total	mg/l	0.006	0.297	0.297	< 0.025		< 0.025	< 0.025	< 0.025	< 0.005	0.134	< 0.005	< 0.0050	< 0.0050
AP-6	Cobalt, total	mg/l	0.006	0.297	0.297						0.089	0.0106	< 0.005		< 0.0050
AP-7	Cobalt, total	mg/l	0.006	0.297	0.297						< 0.005	< 0.005	< 0.005	< 0.0050	< 0.0050
AW-3/RW-3	Cobalt, total	mg/l	0.006	0.297	0.297	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	0.453	< 0.005	< 0.005	< 0.0050	< 0.0050
AP-8	Cobalt, total	mg/l	0.006	0.297	0.297									< 0.0050	< 0.0050
AP-9	Cobalt, total	mg/l	0.006	0.297	0.297										< 0.0050
AP-10	Cobalt, total	mg/l	0.006	0.297	0.297									< 0.0050	< 0.0050
AP-11	Cobalt, total	mg/l	0.006	0.297	0.297										< 0.0050
AP-12	Cobalt, total	mg/l	0.006	0.297	0.297										0.0356
AP-13	Cobalt, total	mg/l	0.006	0.297	0.297										0.0400
AP-14	Cobalt, total	mg/l	0.006	0.297	0.297									0.0143	< 0.0050
AP-1	Lead, total	mg/l	0.0075	0.638	0.638	< 0.025		< 0.025	< 0.025	< 0.025	< 0.015	< 0.015	< 0.015	< 0.0150	< 0.0150
AP-2	Lead, total	mg/l	0.0075	0.638	0.638	< 0.025		< 0.025	< 0.025	< 0.025	< 0.015	< 0.015	< 0.015	< 0.0150	< 0.0150
AP-3	Lead, total	mg/l	0.0075	0.638	0.638	< 0.025		< 0.025	< 0.025	< 0.025	< 0.015	< 0.015	< 0.015	< 0.0150	< 0.0150
AP-4	Lead, total	mg/l	0.0075	0.638	0.638	< 0.025		< 0.025	< 0.025	< 0.025	< 0.015	< 0.015	< 0.015	< 0.0150	< 0.0150
AP-5	Lead, total	mg/l	0.0075	0.638	0.638	< 0.025		< 0.025	< 0.025	< 0.025	< 0.015	0.132	< 0.015	< 0.0150	< 0.0150
AP-6	Lead, total	mg/l	0.0075	0.638	0.638						0.0769	< 0.015	< 0.015		< 0.0150
AP-7	Lead, total	mg/l	0.0075	0.638	0.638						< 0.015	< 0.015	< 0.015	< 0.0150	< 0.0150
AW-3/RW-3	Lead, total	mg/l	0.0075	0.638	0.638	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	0.442	< 0.015	< 0.015	< 0.0150	< 0.0150
AP-8	Lead, total	mg/l	0.0075	0.638	0.638									< 0.0150	< 0.0150
AP-9	Lead, total	mg/l	0.0075	0.638	0.638										< 0.0150
AP-10	Lead, total	mg/l	0.0075	0.638	0.638									< 0.0150	< 0.0150
AP-11	Lead, total	mg/l	0.0075	0.638	0.638										< 0.0150
AP-12	Lead, total	mg/l	0.0075	0.638	0.638										< 0.0342
AP-13	Lead, total	mg/l	0.0075	0.638	0.638										< 0.0277
AP-14	Lead, total	mg/l	0.0075	0.638	0.638									< 0.0169	< 0.0150
AP-1	Lithium	mg/l	0.04	0.05	0.05	0.00912		0.0142	< 0.05	< 0.05	0.0104	0.0098	0.0101	0.0092	0.0100
AP-2	Lithium	mg/l	0.04	0.05	0.05	0.00725		0.00762	< 0.05	< 0.05	0.0065	0.0071	0.0063	0.0057	0.0068
AP-3	Lithium	mg/l	0.04	0.05	0.05	0.006		0.00675	< 0.05	< 0.05	0.006	0.0051	0.0052	< 0.0050	< 0.0050
AP-4	Lithium	mg/l	0.04	0.05	0.05	0.00712		0.00775	< 0.05	< 0.05	0.0071	0.0071	0.0087	0.0108	0.0113
AP-5	Lithium	mg/l	0.04	0.05	0.05	0.0125		0.0131	< 0.05	< 0.05	< 0.005	0.143	< 0.005	0.006	0.0068
AP-6	Lithium	mg/l	0.04	0.05	0.05						0.153	0.0195	0.0081		0.0080
AP-7	Lithium	mg/l	0.04	0.05	0.05						0.0115	0.0137	0.0112	0.0098	0.0101
AW-3/RW-3	Lithium	mg/l	0.04	0.05	0.05	0.0119	0.0359	0.0315	< 0.05	< 0.05	0.771	0.0098	0.0071	0.0068	0.0066
AP-8	Lithium	mg/l	0.04	0.05	0.05									0.0077	0.0072
AP-9	Lithium	mg/l	0.04	0.05	0.05										0.0054
AP-10	Lithium	mg/l	0.04	0.05	0.05									0.0145	0.0091
AP-11	Lithium	mg/l	0.04	0.05	0.05										0.0104
AP-12	Lithium	mg/l	0.04	0.05	0.05										0.0546
AP-13	Lithium	mg/l	0.04	0.05	0.05										0.0610
AP-14	Lithium	mg/l	0.04	0.05	0.05									0.0253	0.0100

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	5/4/2018	6/21/2018	7/9/2018	2/13/2019	8/1/2019	2/28/2020	8/5/2020	1/21/20221	5/27/2021	8/24/2021
AP-1	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005		< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0002	< 0.00020	< 0.00020
AP-2	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005		< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0002	< 0.00020	< 0.00020
AP-3	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005		< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0002	< 0.00020	< 0.00020
AP-4	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005		< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0002	< 0.00020	< 0.00020
AP-5	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005		< 0.0005	< 0.0005	< 0.0005	< 0.0002	0.0003	< 0.0002	< 0.00020	< 0.00020
AP-6	Mercury, total	mg/l	0.002	0.0008	0.002						< 0.0002	< 0.0002	< 0.0002		< 0.00020
AP-7	Mercury, total	mg/l	0.002	0.0008	0.002						< 0.0002	< 0.0002	< 0.0002	< 0.00020	< 0.00020
AW-3/RW-3	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0005	< 0.0002	< 0.0002	< 0.00020	< 0.00020
AP-8	Mercury, total	mg/l	0.002	0.0008	0.002									< 0.00020	< 0.00020
AP-9	Mercury, total	mg/l	0.002	0.0008	0.002										< 0.00020
AP-10	Mercury, total	mg/l	0.002	0.0008	0.002									< 0.00020	< 0.00020
AP-11	Mercury, total	mg/l	0.002	0.0008	0.002										< 0.00020
AP-12	Mercury, total	mg/l	0.002	0.0008	0.002										< 0.00020
AP-13	Mercury, total	mg/l	0.002	0.0008	0.002										< 0.00020
AP-14	Mercury, total	mg/l	0.002	0.0008	0.002									< 0.00020	< 0.00020
AP-1	Molybdenum	mg/l	0.1	0.025	0.1	< 0.025		< 0.025	< 0.025	< 0.025	< 0.01	< 0.01	< 0.01	< 0.0100	< 0.0100
AP-2	Molybdenum	mg/l	0.1	0.025	0.1	< 0.025		< 0.025	< 0.025	< 0.025	< 0.01	< 0.01	< 0.01	< 0.0100	< 0.0100
AP-3	Molybdenum	mg/l	0.1	0.025	0.1	< 0.025		< 0.025	< 0.025	< 0.025	< 0.01	< 0.01	< 0.01	< 0.0100	< 0.0100
AP-4	Molybdenum	mg/l	0.1	0.025	0.1	< 0.025		< 0.025	< 0.025	< 0.025	< 0.01	< 0.01	< 0.01	< 0.0100	< 0.0100
AP-5	Molybdenum	mg/l	0.1	0.025	0.1	< 0.025		< 0.025	< 0.025	< 0.025	< 0.01	< 0.01	< 0.01	< 0.0100	< 0.0100
AP-6	Molybdenum	mg/l	0.1	0.025	0.1						< 0.01	< 0.01	< 0.01		< 0.0100
AP-7	Molybdenum	mg/l	0.1	0.025	0.1						0.0119	0.0106	< 0.01	< 0.0100	< 0.0100
AW-3/RW-3	Molybdenum	mg/l	0.1	0.025	0.1	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	0.022	0.0116	0.0109	0.0105	< 0.0100
AP-8	Molybdenum	mg/l	0.1	0.025	0.1									< 0.0100	< 0.0100
AP-9	Molybdenum	mg/l	0.1	0.025	0.1										< 0.0100
AP-10	Molybdenum	mg/l	0.1	0.025	0.1									< 0.0100	< 0.0100
AP-11	Molybdenum	mg/l	0.1	0.025	0.1										< 0.0100
AP-12	Molybdenum	mg/l	0.1	0.025	0.1										< 0.0100
AP-13	Molybdenum	mg/l	0.1	0.025	0.1										< 0.0100
AP-14	Molybdenum	mg/l	0.1	0.025	0.1									< 0.0100	< 0.0100
AP-1	Radium-226 + Radium-228	pCi/l	5	7.1	7.1	4.1		1.96	0.93	1.85	1.37	2.86	0.377	1.088	0.8400
AP-2	Radium-226 + Radium-228	pCi/l	5	7.1	7.1	2.15		1.35	2.61	1.134	0.657	1.73	1.66	1.33	1.0080
AP-3	Radium-226 + Radium-228	pCi/l	5	7.1	7.1	1.83		1.15	2.48	1.51	0.73	0.185	0.926	0.457	0.2528
AP-4	Radium-226 + Radium-228	pCi/l	5	7.1	7.1	1.5		2.36	2.57	0.59	1.47	1.96	1.96	2.38	0.4489
AP-5	Radium-226 + Radium-228	pCi/l	5	7.1	7.1	1.61		1.63	0.83	1.25	0.455	5.87	0.869	0.0571	1.5200
AP-6	Radium-226 + Radium-228	pCi/l	5	7.1	7.1						9.45	3.03	0.309	0.677	0.3600
AP-7	Radium-226 + Radium-228	pCi/l	5	7.1	7.1						1.12	1.07	1.09	0.914	0.6570
AW-3/RW-3	Radium-226 + Radium-228	pCi/l	5	7.1	7.1	2.49	2.02	3.16	1.1	0.794	18	3.81	1.37	0.573	0.7380
AP-8	Radium-226 + Radium-228	pCi/l	5	7.1	7.1									1.573	2.7900
AP-9	Radium-226 + Radium-228	pCi/l	5	7.1	7.1										
AP-10	Radium-226 + Radium-228	pCi/l	5	7.1	7.1									1.61	2.3900
AP-11	Radium-226 + Radium-228	pCi/l	5	7.1	7.1										
AP-12	Radium-226 + Radium-228	pCi/l	5	7.1	7.1										
AP-13	Radium-226 + Radium-228	pCi/l	5	7.1	7.1										
AP-14	Radium-226 + Radium-228	pCi/l	5	7.1	7.1									1.127	0.8070
AP-1	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.025		< 0.025	< 0.025	< 0.025	< 0.001	< 0.001	< 0.001	< 0.0010	< 0.0010
AP-2	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.025		< 0.025	< 0.025	< 0.025	< 0.001	< 0.001	< 0.001	< 0.0010	< 0.0010
AP-3	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.025		< 0.025	< 0.025	< 0.025	< 0.001	< 0.001	< 0.001	< 0.0010	< 0.0010
AP-4	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.025		< 0.025	< 0.025	< 0.025	< 0.001	< 0.001	< 0.001	< 0.0010	< 0.0010
AP-5	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.025		< 0.025	< 0.025	< 0.025	< 0.001	< 0.001	< 0.001	< 0.0010	< 0.0005
AP-6	Selenium, total	mg/l	0.05	0.0079	0.05						< 0.001	< 0.001	< 0.001		< 0.0010
AP-7	Selenium, total	mg/l	0.05	0.0079	0.05						< 0.001	< 0.001	< 0.001	< 0.0010	< 0.0010
AW-3/RW-3	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.001	< 0.001	< 0.001	< 0.0010	< 0.0010
AP-8	Selenium, total	mg/l	0.05	0.0079	0.05									< 0.0010	< 0.0010
AP-9	Selenium, total	mg/l	0.05	0.0079	0.05										< 0.0010
AP-10	Selenium, total	mg/l	0.05	0.0079	0.05									< 0.0010	< 0.0010
AP-11	Selenium, total	mg/l	0.05	0.0079	0.05										< 0.0010
AP-12	Selenium, total	mg/l	0.05	0.0079	0.05										< 0.0010
AP-13	Selenium, total	mg/l	0.05	0.0079	0.05										< 0.0010
AP-14	Selenium, total	mg/l	0.05	0.0079	0.05									< 0.0010	< 0.0010

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	5/4/2018	6/21/2018	7/9/2018	2/13/2019	8/1/2019	2/28/2020	8/5/2020	1/21/20221	5/27/2021	8/24/2021
AP-1	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.025		< 0.025	< 0.005	< 0.005	< 0.002	< 0.002	< 0.002	< 0.0020	0.0031
AP-2	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.025		< 0.025	< 0.005	< 0.005	< 0.002	< 0.002	< 0.002	< 0.0020	< 0.0020
AP-3	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.025		< 0.025	< 0.005	< 0.005	< 0.002	< 0.002	< 0.002	< 0.0020	< 0.0020
AP-4	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.025		< 0.025	< 0.005	< 0.005	< 0.002	< 0.002	< 0.002	< 0.0020	< 0.0020
AP-5	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.025		< 0.025	< 0.005	< 0.005	< 0.002	< 0.002	< 0.002	< 0.0020	0.0019
AP-6	Thallium, total	mg/l	0.002	0.00556	0.0056						< 0.002	< 0.002	< 0.002		< 0.0020
AP-7	Thallium, total	mg/l	0.002	0.00556	0.0056						< 0.002	< 0.002	< 0.002	< 0.0020	0.0026
AW-3/RW-3	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.025	< 0.025	< 0.025	< 0.005	< 0.005	< 0.008	< 0.002	< 0.002	< 0.0020	< 0.0020
AP-8	Thallium, total	mg/l	0.002	0.00556	0.0056									0.0020	< 0.0020
AP-9	Thallium, total	mg/l	0.002	0.00556	0.0056										< 0.0020
AP-10	Thallium, total	mg/l	0.002	0.00556	0.0056									0.0027	< 0.0020
AP-11	Thallium, total	mg/l	0.002	0.00556	0.0056										< 0.0020
AP-12	Thallium, total	mg/l	0.002	0.00556	0.0056										< 0.0200
AP-13	Thallium, total	mg/l	0.002	0.00556	0.0056										< 0.0200
AP-14	Thallium, total	mg/l	0.002	0.00556	0.0056									0.0020	< 0.0020
AP-1	Turbidity	NTU	NA	NA	NA										15.73
AP-2	Turbidity	NTU	NA	NA	NA										9.95
AP-3	Turbidity	NTU	NA	NA	NA										6.58
AP-4	Turbidity	NTU	NA	NA	NA										93.21
AP-5	Turbidity	NTU	NA	NA	NA										4.98
AP-6	Turbidity	NTU	NA	NA	NA										9.11
AP-7	Turbidity	NTU	NA	NA	NA										6.79
AW-3/RW-3	Turbidity	NTU	NA	NA	NA										15.43
AP-8	Turbidity	NTU	NA	NA	NA										7.77
AP-9	Turbidity	NTU	NA	NA	NA										18.61
AP-10	Turbidity	NTU	NA	NA	NA										15.73
AP-11	Turbidity	NTU	NA	NA	NA										45.77
AP-12	Turbidity	NTU	NA	NA	NA										1580.98
AP-13	Turbidity	NTU	NA	NA	NA										1267.13
AP-14	Turbidity	NTU	NA	NA	NA										57.82

Notes:

1. Yellow shading indicates an exceedence of the GWPS.

2. Constituents with method detection limits above the GWPS that were non-detect are not interpreted as an exceedance.

3. Section 845.600 requires Radium-226 and Radium-228 concentrations to be combined, with a GWPS of 5 pCi/L. However, these parameters require two separate analysis and have been reported separately by the analytical laboratory individually. The sum of the values has been provided and compared to the GWPS. Background values have been calculated for the individual parameters. A value of 7.1 pCi/L was calculated for Radium 226. Therefore, 7.1 pCi/L is listed as the GWPS for Radium 226 and 228 combined.

4. Well AW-3 was replaced by well RW-3 prior to the May 2018 monitoring event.

5. "<" indicates no detection at the concentration listed.

6. A blank space indicates testing was not conducted on the parameter. The well may not have been installed at that time.

ATTACHMENT 1

POTABLE WATER WELL SURVEY

CITY WATER, LIGHT AND POWER

POTABLE WATER WELL SURVEY - CCR SURFACE IMPOUNDMENTS

A potable water well survey was completed in the vicinity of the Dallman and Lakeside Ash Ponds. Based on groundwater elevation data from numerous monitoring wells and piezometers located between and adjacent to the CWLP CCR impoundments, groundwater movement in the vicinity of the CCR impoundments is generally from the south-southwest to the north-northeast, approximately paralleling the Sugar Creek basin. The search extended to the first water well encountered hydraulically downgradient of the impoundments, located near Illinois Route 29 at a distance of approximately 3,400 feet.

The survey was conducted using the Illinois EPA's web-based Geographic Information System (GIS) database[1] in the Source Water Assessment Program (SWAP) for potable water wells downgradient of the CCR impoundments.

The Illinois EPA's SWAP GIS database system identifies community water supply wells and other potable wells (private, semi-private and non-community water supply wells) include data from the following sources:

- Illinois EPA, Division of Public Water Supplies;
- Illinois State Geological Survey (ISGS);
- Illinois State Water Survey; and
- Illinois Department of Public Health.

Based upon this potable water well search, no private, semi-private and non-community water supply wells are located within 2,500 feet downgradient of the CCR impoundments. This search distance is based upon the maximum allowable setback zone for a potable water well as identified in Section 14.3(f) of the Illinois Environmental Protection Act. Appendix A includes screen-captures of the Illinois EPA's SWAP GIS database system well query for the subject CCR impoundments. These screen captures depict the two closest well locations. These wells are discussed below.

Within the Sugar Creek basin, the nearest downgradient potable water well is located approximately 3,400 feet north-northeast of the CWLP CCR impoundments. The owner of this well at the time of installation, as identified on the ISGS well record, was William Bartels (API 121672620900). Installed September 25, 2001, this well is 55 feet deep and screened within material described as "shale fracture/clay." The ISGS boring log for this well is included in Appendix A. The Sangamon County Tax Parcel Viewer & Property Tax Web Site (http://gismaps.co.sangamon.il.us/tpv/) identifies this well as being located on improved commercial property.

The other potable water well is located a little more than 2,500 feet north-northwest of the CCR impoundments (API 121670148100). The well was installed December 1, 1965, is 24 feet deep, and screened within material described as "hardpan." The ISGS boring log for this well is included in Appendix A. A review of the Sangamon County Tax Parcel Viewer & Property Tax Web Site identified the current property owner as the State of Illinois Department of Transportation. While this well is located north of the CCR impoundments, it appears to be just west and outside of the Sugar Creek basin, and as such most likely not hydraulically downgradient of the CCR impoundments.

There is no reason to believe that potable wells exist within 2,500 feet hydraulically downgradient of the CCR impoundments that were not identified as part of this potable water well survey.

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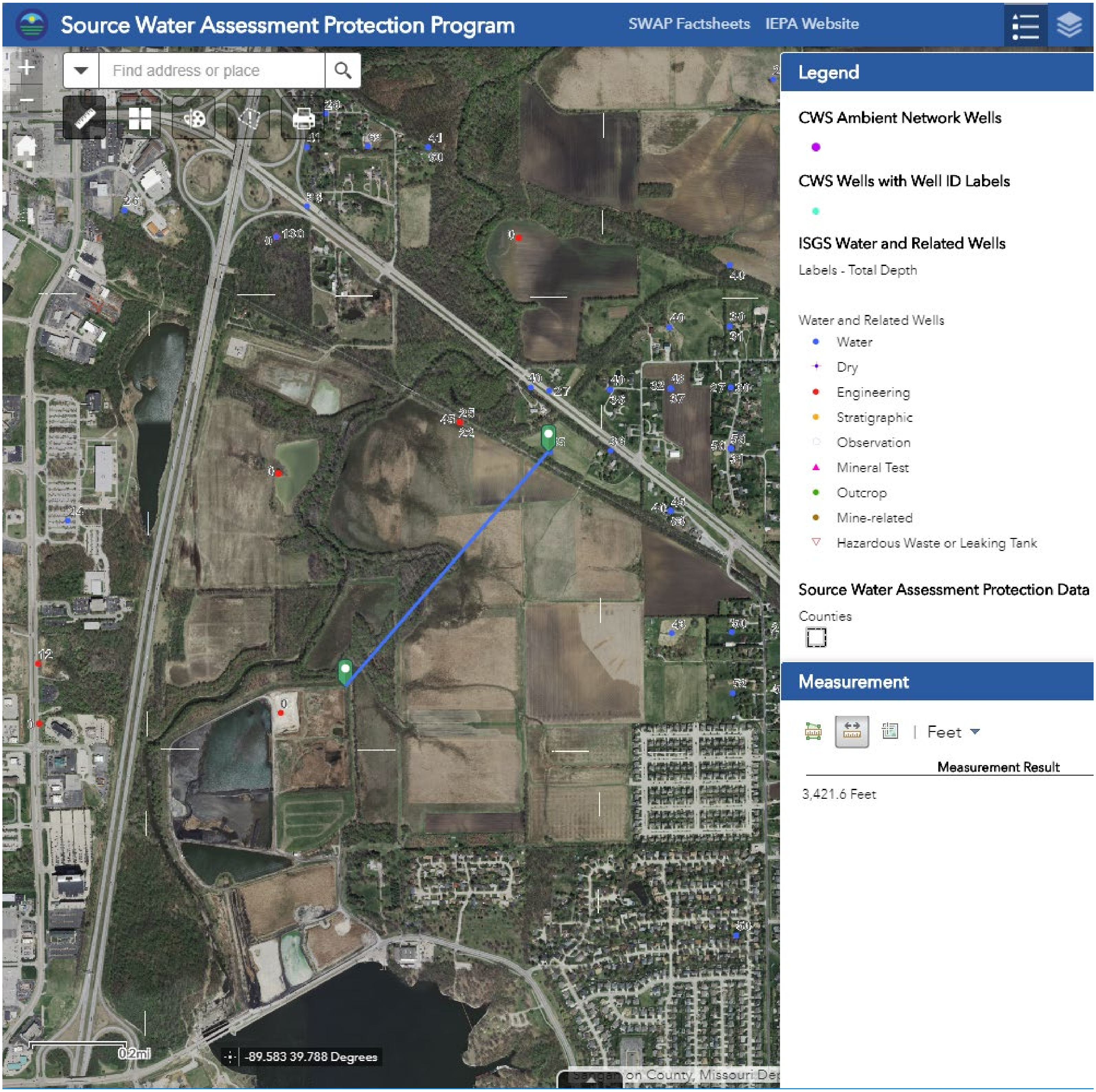
[1] (http://illinois-epa.maps.arcgis.com/apps/webappviewer/index.html?id=4d37a05f5ba441f1b30dab54ccb81fc8)

APPENDIX A

SWAP GIS Database Query and ISGS Boring Log

Illinois EPA SWAP GIS Database Query
CWLP – Springfield, Illinois
William Bartels - API 121672620900



-89.583 39.788 Degrees

Legend

CWS Ambient Network Wells

●

CWS Wells with Well ID Labels

●

ISGS Water and Related Wells

Labels - Total Depth

Water and Related Wells

- ● Water
- ✦ Dry
- ● Engineering
- ● Stratigraphic
- ○ Observation
- ▲ Mineral Test
- ● Outcrop
- ● Mine-related
- ▽ Hazardous Waste or Leaking Tank

Source Water Assessment Protection Data

Counties

☐

Measurement

Feet

Measurement Result

3,421.6 Feet

Page 1

ILLINOIS STATE GEOLOGICAL SURVEY

Private Water Well	**Top**	**Bottom**
black topsoil	0	5
gray silt	5	11
brown clay (H2o @ 18'-22')	11	22
brown till	22	25
soft gray shale	25	32
hard gray shale fracture @ 43'	32	55
Total Depth		**55**

Casing: 6" PVC SDR 21 from -1' to 18'
36" CONCRETE from 18' to 55'

Grout: HOLE PLUG from 16 to 17.

Grout: BUCKSHOT from 17 to 55.

Water from shale fracture/clay at 18' to 43'.

Owner Address: 3596 East State Rt. 29 Springfield, IL

Address of well: Rt. 29
Springfield, IL

Location source: Location from permit

Permit Date: August 13, 2001 **Permit #:**

COMPANY Wiesenhofer, Andrew

FARM Bartels, William

DATE DRILLED September 25, 2001 **NO.**

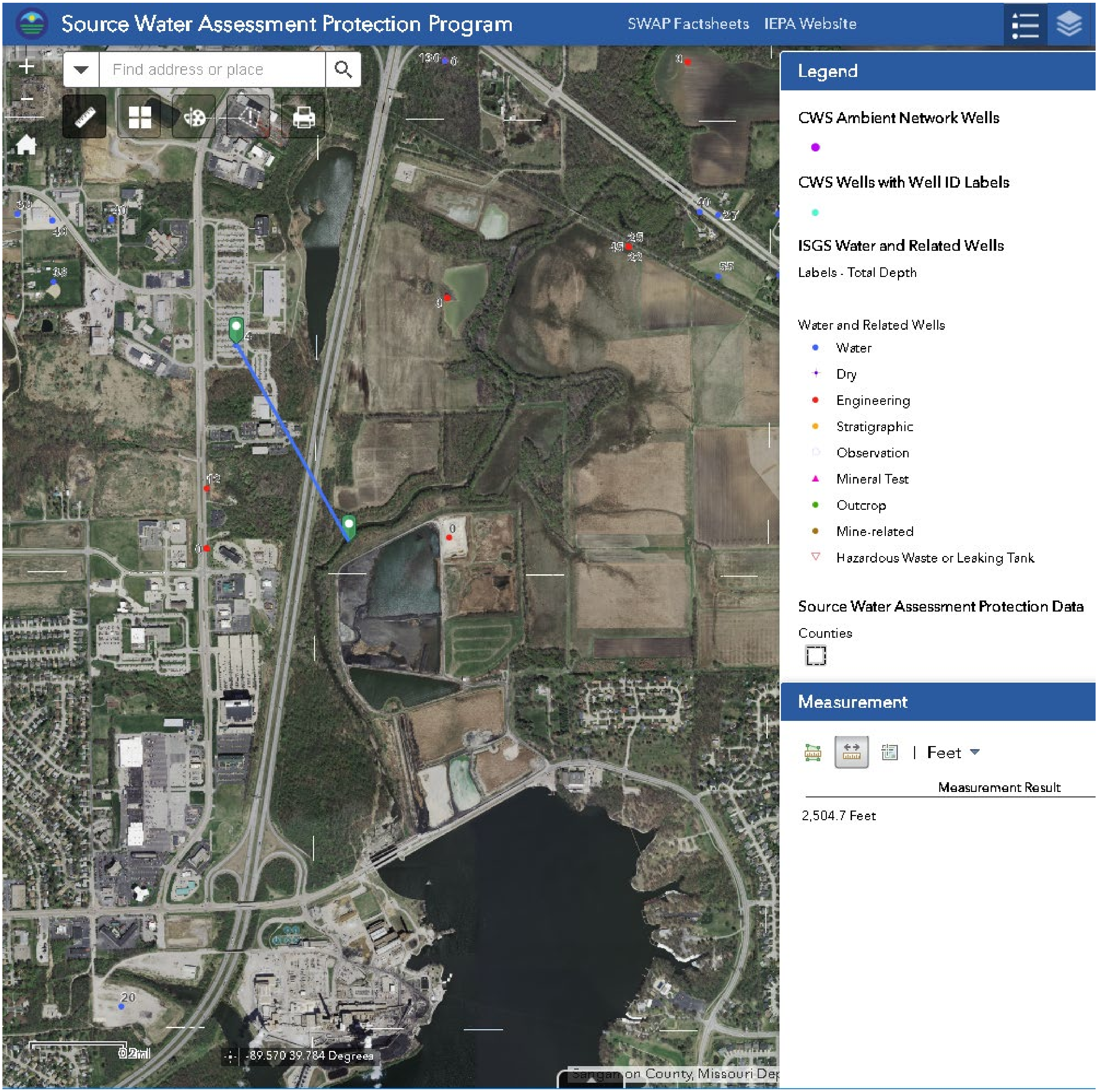
ELEVATION 0 **COUNTY NO.** 26209

LOCATION SW NE SW

LATITUDE 39.777352 **LONGITUDE** -89.587243

COUNTY **Sangamon** **API** **121672620900** **6 - 15N - 4W**

Illinois EPA SWAP GIS Database Query
CWLP – Springfield, Illinois
IDOT - API 121670148100



Legend

CWS Ambient Network Wells
●

CWS Wells with Well ID Labels
●

ISGS Water and Related Wells
Labels - Total Depth

Water and Related Wells
- ● Water
- ✦ Dry
- ● Engineering
- ● Stratigraphic
- ○ Observation
- ▲ Mineral Test
- ● Outcrop
- ● Mine-related
- ▽ Hazardous Waste or Leaking Tank

Source Water Assessment Protection Data
Counties
☐

Measurement

| Feet

Measurement Result

2,504.7 Feet

Page 1

ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	**Top**	**Bottom**
s.s. #52306	0	0
top soil	0	3
yellow clay	3	18
brown clay	18	19
hardpan	19	24
Total Depth		**24**

Casing: 36" CONCRETE from 0' to 20'

Water from hardpan at 19' to 24'.
Static level 10' below casing top which is 0' above GL
Pumping level 0' when pumping at 20 gpm for 0 hours

Driller's Log filed

Sample set # 52306 (1' - 24')

Owner Address: ,
Location source: Location from the driller

Permit Date: **Permit #:**

COMPANY owner
FARM Fiskas, Raymond L.
DATE DRILLED January 1, 1965 **NO.** 1
ELEVATION 0 **COUNTY NO.** 01481
LOCATION 430'N line, 320'E line of NW SE SW
LATITUDE 39.775264 **LONGITUDE** -89.606181
COUNTY **Sangamon** **API** **121670148100** **1 - 15N - 5W**

ATTACHMENT 2

CONTAMINANT TRANSPORT MODEL

City Water, Light & Power

CCR Impoundments – Lakeside and Dallman Ash Ponds

Springfield, Sangamon County, Illinois

Closure Alternatives Assessment - Contaminant Transport Model

October 2021

Prepared for:
City Water, Light & Power
3100 Stevenson Drive
Springfield, Illinois 62703

ANDREWS ENGINEERING

3300 Ginger Creek Drive, Springfield, IL 62711 | 217.787.2334

ILLINOIS | MISSOURI | INDIANA

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EXECUTIVE SUMMARY

The Illinois Environmental Protection Agency (Illinois EPA) Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments (35 Illinois Administrative Code (Ill. Adm. Code) 845) establishes requirements for the disposal of coal combustion residuals (CCRs or coal ash) in surface impoundments. The Illinois EPA standards for CCR surface impoundments include closure requirements. Pursuant to 35 Ill. Adm. Code 845 Subpart G, the owner or operator of an existing CCR surface impoundment must initiate closure where it cannot be demonstrated that the existing CCR surface impoundment:

- meets the location restrictions (35 Ill. Adm. Code 845.300 – 340),
- a safety factor assessment has not been completed or filed (35 Ill. Adm. Code 845.460), and/or
- is unlined (35 Ill. Adm. Code 845.400(f)).

A safety factor assessment has been completed and filed pursuant to Section 845.460(f); however, the existing CCR surface impoundments at the City Water, Light & Power (CWLP) impoundments fail to meet the location restrictions (Section 845.300) for distance from an aquifer and the lack of a liner meeting the requirements of CCR surface impoundments (Section 845.400(f)). As a result, the CWLP impoundments must initiate closure pursuant to Section 845.700.

In accordance with Section 845.700(c) the owner or operator of the CCR surface impoundment required to close under Section 845.700(a), or electing to close under Section 845.700(b), must immediately take steps to categorize the CCR surface impoundment under Section 845.700(g) and to comply with the closure alternatives analysis requirements in Section 845.710. Pursuant to Section 845.710(d)(2) for each alternative considered, the closure alternatives analysis must contain the results of groundwater contaminant transport modeling and calculations showing how the closure alternative will achieve compliance with the applicable groundwater protection standard (GWPS).

Two options for closure of a CCR surface impoundment are identified under Section 845.710(a). These options include either leaving the CCR in place and installing a final cover system ("closure-in-place") or through removal of the CCR and clean closure of the CCR surface impoundment ("closure-by-removal").

Closure-in-place is achieved by installing a final cover system over the existing CCR surface impoundments. Under this scenario, construction of the final cover system would begin October 2023 and be completed by January 2026. Following the completion of closure, a 30 year post-closure care period would commence that includes cover maintenance and continued groundwater monitoring. While closure-in-place does not remove the source material, installation of a final cover minimizes infiltration of liquids into the CCR and mitigates the potential for leaching of CCR solutes into the uppermost aquifer. This option also minimizes impacts to human health due to accidental inhalation/ingestion of wind-blown CCR from excavation and trucking activities associated with the closure-by-removal alternative.

Closure-by-removal is achieved by dewatering the surface impoundment and excavation of the CCR, transporting the material to a lined landfill or other appropriate disposal facility, reshaping the site and back-filling it, as necessary, to retain structural and/or hydrologic properties. The duration of closure-by-removal would be largely dependent on a number of factors including the logistics associated with drying out the CCR and loading it into trucks, and the amount of borrow material that must be transported to the site to back-fill the excavation in order to retain structural stability in certain areas. Under this scenario, CCR removal activities would commence October 2023 and be completed by January 2030. Closure-by-removal does not require a post-closure care period; however, pursuant to 35 Ill. Adm. Code 845.740(b) after closure-by-removal has been completed, the owner or operator must continue groundwater monitoring under 35 Ill. Adm. Code 845 Subpart F for three years after the completion of closure or for three years after groundwater monitoring does not show an exceedance of the GWPS, whichever is longer. While closure-by-removal will result in the removal of the CCR material from the surface impoundments, this alternative will likely increase the potential for leaching of CCR solutes into the uppermost aquifer during excavation activities and increase the potential for exposure due to accidental inhalation/ingestion of wind-blown CCR from dewatering, excavation and trucking activities. Other issues not addressed in this evaluation of the closure-by-removal scenario but most notable include the generation of additional green-house gases as a result of the associated trucking and excavation activities and the increased risk of accidents as a result of the increased duration and frequency of off-site trucking.

Using the Hydrologic Evaluation of Landfill Performance (HELP v3.07) model and the two-dimensional contaminant transport model MIGRATE v9, an evaluation of the closure-in-place and closure-by-removal alternatives were conducted for the CCR surface impoundments at the CWLP facility. The conceptual model was prepared to represent the impoundment design, site-specific hydrogeology and conservative performance standards for the cover. This evaluation predicts that closure-in-place will minimize infiltration and leaching of CCR constituents into the uppermost aquifer resulting in a decrease in CCR concentrations within approximately 13 years of installation of the final cover system.

MIGRATE was also used to predict concentrations in the uppermost aquifer under the closure-by-removal option. As with the closure-in-place scenario, the conceptual model represents the facility design and site-specific hydrogeology. As expected, the contaminant transport model for the closure-by-removal option predicts a decrease in CCR concentrations within approximately 7 years after the completion of the CCR removal activities.

1. INTRODUCTION

CWLP owns two existing CCR surface impoundments subject to the Illinois EPA Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments (35 Ill. Adm. Code 845).

The CWLP CCR surface impoundments are located north and east of the former Lakeside Power Generating Station and Dallman Power Generating Station in the Eastern ½ of Section 12, Township 15 North, Range 5 West, in Springfield, Illinois (see Figure 1). These CCR surface impoundments are identified as the Lakeside Ash Pond and the Dallman Ash Pond (see Figure 2).

The Lakeside Ash Pond was placed into service prior to 1958 and ceased receiving ash in 2009. It has been divided into four separate ponds, three limesludge ponds and the settling pond consisting of approximately 35.0 acres. The Lakeside Ash Pond currently receives limesludge from the CWLP Drinking Water Purification Plant, scrubber wastewater treatment plant clarifier blowdown and water from miscellaneous floor drains. Construction of new lined limesludge ponds will start in spring of 2022 and be completed by no later than fall of 2023. CWLP will initiate closure of the Lakeside Ash Pond after the water purification plant limesludge ponds are relocated.

The Dallman Ash Pond was placed into service in 1976 and is approximately 34.5 acres. The Dallman Ash Pond currently receives fly ash and bottom ash, which are sluiced with raw lake water, industrial wastewater treatment plant clarifier blowdown and landfill leachate. CWLP has shut down Dallman Units 31, 32 and will be shutting down Dallman Unit 33 no later than September 15, 2023.

The existing CCR surface impoundments fail to meet the location restrictions (Section 845.300) for distance from an aquifer and are considered unlined CCR surface impoundments (Section 845.400(f)). As a result, CWLP must initiate closure pursuant to 35 Ill. Adm. Code Subpart G.

In accordance with Section 845.700(c), the owner or operator of the CCR surface impoundments are required to close pursuant to Section 845.700(a) or Section 845.700(b) and must comply with the closure alternatives analysis requirements in Section 845.710. Pursuant to Section 845.710(d)(2), for each alternative considered, the closure alternatives analysis must contain the results of groundwater contaminant transport modeling and calculations showing how the closure alternative will achieve compliance with the applicable groundwater protection standard (GWPS).

Two options for closure of a CCR surface impoundment are identified under Section 845.710(a). These options include either by leaving the CCR in place and installing a final cover system (“closure-in-place”) or through removal of the CCR and decontamination of the CCR surface impoundment (“closure-by-removal”).

The objective of this submittal is to present the results of groundwater contaminant transport modeling and calculations showing how each closure alternative will achieve compliance with the applicable GWPS. Both closure alternatives - closure-in-place and closure-by-removal, are evaluated within this document.

For the closure-in-place contaminant transport model, vertical seepage rates as a result of installation of a final cover system were determined using the US EPA hydrologic water balance model HELP (Hydrologic Evaluation of landfill Performance v3.07). MIGRATE v9, a two-dimensional contaminant transport model, was used for predicting contaminant concentrations for both the closure-in-place and closure-by-removal scenarios.

This evaluation demonstrates that closure-in-place with a final cover system minimizes infiltration of liquids through the CCR materials significantly reducing CCR constituent concentrations to below the established GWPSs. Similarly, the closure-by-removal closure alternative results in a reduction of CCR constituent concentrations to below the established GWPS.

The following narrative provides a discussion of the design characteristics of the CCR surface impoundments, the geologic and hydrogeologic conditions present beneath the impoundments, the development of the conceptual model, contaminant transport model and the model input parameters and results. The conceptual model for this contaminant transport evaluation is based upon the hydrogeologic setting and design characteristics of the Dallman Ash Pond as it represents the worst-case scenario for determining impacts at the down-gradient perimeter of the impoundments.

2. SURFACE IMPOUNDMENT CONSTRUCTION

The Dallman Ash Pond was placed into service in approximately 1976 and is a diked embankment, covering approximately 34.5 acres in the Sugar Creek drainageway immediately down-gradient of Spaulding Dam and Lake Springfield.

Based on the 1976 Burns and McDonnell construction topographic map (see Figure 3), Sugar Creek meandered through the property. However, the creek channel was abandoned and rerouted to its present location when the surface impoundments were constructed. Abandonment of the creek channel included the placement of different types of soil, ranging from cohesive soils characterized as silty clays, to granular fill characterized as poorly graded silty to clayey sands. Soil analyses of the recompacted channel fill materials were conducted during hydrogeological investigations performed for the adjacent CCR landfill. The hydraulic conductivity of these creek fill materials was reported to range from 7.6×10^{-8} to 2.1×10^{-5} cm/sec[1].

The berms for the Dallman Ash Pond were built to a height of approximately 27 feet (554 feet MSL), using slopes of 2.5H:1V for both the inner and outer slopes. The elevation of the base of the surface impoundments is approximately 527 feet MSL.

The berms of the surface impoundment were constructed of glacial till consisting of silty clay to clayey silt soil. Recompacted silty clay samples from the native soils have exhibited hydraulic conductivities in the 1×10^{-7} to 1×10^{-9} cm/sec range. The in-place creek sediment's soil hydraulic conductivities predominantly range from 1×10^{-6} to 1×10^{-8} cm/sec.

Prior to the area development, the upper layer of soil at the site consisted of mainly brown, light brown, and brownish-gray silty clays and clayey silts having soft to stiff consistency. This includes all eolian soils (loess) deposited near the surface, isolated pockets and lenses of fine-grained silty to clayey sand at some locations and alluvial silts and silty clays. Much of the shallow soils were displaced during area development.

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[1] Patrick Engineering – Hydrogeologic Report on Flue Gas Desulfurization Sludge Landfill, June 1993.

3. SUBSURFACE CONDITIONS AT THE CCR SURFACE IMPOUNDMENTS

The subsurface conditions of the area in and surrounding the CCR surface impoundments have been characterized through multiple subsurface investigations, including those prior to the impoundment development, along the perimeter of the impoundments and including the hydrogeologic investigation at the permitted Subtitle D CCR landfill located north of the Lakeside Ash Pond and east of the Dallman Ash Pond. These investigations were as follows:

- Professional Service Industries (PSI), June 1989. Five soil borings were advanced within the east section of the south cell (Cell 1) of the CCR landfill.

- Andrews Environmental Engineering, Inc. (AEEI), February 1990. This investigation was performed for Cell 2 of the CCR landfill and consisted of the advancement of 13 soil borings. Drilling and testing were completed by PSI.

- Andrews Environmental Engineering, Inc. (AEEI), March 1990. Six wells were installed along the perimeter of the CCR landfill. Drilling and testing were completed by PSI.

- Patrick Engineering, Inc. (PEI), July 1992. This investigation was performed to further characterize the hydrogeology of the CCR landfill setting. Approximately 44 soil borings and piezometers were installed by PEI.

- Stabilize, Inc. (SI), December 2008. Three monitoring wells were installed as part of an assessment program for the CCR landfill. Drilling, soil testing, and well construction were performed by Reynolds Well Drilling.

- City Water, Light and Power (CWLP), April 2010. Four piezometers were installed on the west side of the CCR surface impoundments along Sugar Creek. Drilling and testing were completed by PSI.

- Stabilize, Inc. (SI), May 2011. Four monitoring wells were installed to further the characterization of the CCR surface impoundments. Drilling, soil testing, and well construction were performed by PSI.

- Andrews Engineering, Inc. (AEI), January 2012. This investigation was performed to replace damaged CCR surface impoundment wells and to install an additional background well. Drilling and well installation were completed by TerraDrill.

- Andrews Engineering, Inc. (AEI), July 2017. This project included drilling peripheral to the Dallman Ash Pond.

- Andrews Engineering, Inc. (AEI), September and October 2018. This project included borings peripheral to the Dallman Ash Pond.

- Andrews Engineering, Inc. (AEI), May and July 2019. This project included advancement of borings drilling peripheral to the Dallman Ash Pond.

- Andrews Engineering, Inc. (AEI), February 2021. This project included installation of four assessment wells located west of Sugar Creek.

The investigations and related work conducted to date have provided sufficient information to characterize the site hydrogeologic conditions, including the uppermost aquifer and the uppermost confining unit. Further refinement of the site-specific hydrogeologic and geochemical conditions of the site will be further enhanced with ongoing CCR groundwater monitoring and supplemental subsurface investigations.

The summary discussion below of the subsurface conditions is presented in context of 35 Ill. Adm. Code Part 845 requirements for groundwater monitoring systems. Emphasis is placed on characterizing the existing wells and hydrogeologic conditions of the uppermost aquifer and underlying confining aquitard. The uppermost aquifer is the required unit for groundwater quality monitoring pursuant 35 Ill. Adm. Code Part 845.

The occurrence of the deposits discussed below are highly variable due to the meandering nature of Sugar Creek prior to the development of Lake Springfield and Spaulding Dam. The meandering creek has resulted in sequential erosion and deposition (scour and fill) throughout much of the creek drainage system, both laterally and vertically.

3.1 Surficial Deposits

The shallow stratigraphy and lithology at the CCR surface impoundments include approximately 20 to 50 feet of Pleistocene sediments, dependent upon location. In ascending order (i.e., oldest to youngest) these materials are identified as basal sand, lower cohesive deposit, shallow sand, upper cohesive deposit and fill material. As described below, the uppermost unit directly beneath the CCR surface impoundment is the lower cohesive deposit.

The overall tendency is for the finer-grained materials (clays, silty clays and silts) to overlie the coarser-grained materials (sands and gravels). This coarsening downward is present throughout much of the site. At the majority of the borehole locations, the coarser materials rest directly on top of the weathered bedrock surface. It is this coarser material, the basal sand, which is characterized as the uppermost aquifer.

Basal Sand

In most locations, the basal sand is the lower-most surficial deposit. The basal sand is a gray colored, poorly graded, silty to clayey fine sand to well graded sand with minor amounts of fine gravel. This unit was encountered in a medium dense to dense condition. Across the CWLP facility (includes the Dallman and Lakeside Ash Ponds), the top elevation of the basal sand varies from 491 to 513 feet mean sea level (MSL) and the thickness ranges from about 0 to 12.3 feet. Along the down-gradient (northern) edge of the Dallman Ash Pond area, the basal sand was found to range from 3 to 11.5 feet in thickness, and have an average thickness of 7.3 feet. The unit was not consistently encountered, likely due to excessive erosion of the creek bottom.

The basal sand generally overlies the bedrock surface and underlies the lower cohesive deposit. There are some pockets of very hard, fine-grained silty clay to clay overlying bedrock in a few areas. The basal sand is present above these pockets of clayey deposits, thought to be weathered bedrock.

The basal sand generally consists of 0% to 34% gravel, 50% to 91% sand, and 6% to 44% silt/clay; and exhibits a horizontal hydraulic conductivity of ranging from 1.15×10^{-3} to

7.64 x 10^{-2} cm/sec. The geometric mean hydraulic conductivity is 1.25 x 10^{-2} cm/sec. The basal sand was saturated in all locations where it was encountered.

Lower Cohesive Deposit

The lower cohesive deposit consists of brown, gray, and brownish gray silty clays, clayey silts, and clays, having very soft to stiff consistency. Across the CWLP facility, the lower cohesive deposit is as much as 22 feet thick with an average thickness of about 15 feet. However, along the down-gradient (northern) edge of the Dallman Ash Pond the thickness of the lower cohesive deposit was found to range from 12.6 to 26.3 feet in thickness, and have an average thickness of 19.4 feet. The deposit was not encountered in isolated areas along the abandoned creek, possibly due to excessive erosion of the creek bottom in these areas. The bottom of the CCR surface impoundment rests directly on top of the lower cohesive deposit.

The lower cohesive deposit is generally overlain by the shallow sand and underlain by the basal sand. However, within the abandoned creek area, the lower cohesive deposit was encountered directly below the creek fill. In some areas the basal sand is not present and the lower cohesive deposit directly overlies the bedrock.

The soils in the lower cohesive deposit can be similar in color and texture to the soils in the upper cohesive deposit. The distinction between the two deposits was based on the presence or changes in soil consistency (as measured with a calibrated hand held penetrometer) and a marked difference in moisture content. The lower cohesive deposit is not exposed at the ground surface in the investigated area.

The lower cohesive deposit consists of 0% gravel, 8% to 48% sand, and 52% to 95% silt/clay; and has a low hydraulic conductivity. The vertical hydraulic conductivity ranges from 1.3 x 10^{-8} to 1.8 x 10^{-6} cm/sec (triaxial permeameter). Based on these values, the average vertical hydraulic conductivity is 9.07 x 10^{-7}. The horizontal hydraulic conductivity ranges from 4.6 x 10^{-5} to 7.6 x 10^{-5} cm/sec.

Shallow Sand

The shallow sand overlies the lower cohesive deposit and underlies the upper cohesive deposit. The unit consists of a brown to gray silty to clayey fine sand. It contains small lenses of silty clay and clayey silt. This unit is not continuous over the entire site. Its thickness ranges from one to three feet over most of the investigated area. The shallow sand does not underlay the CCR surface impoundment.

Laboratory tests performed on representative samples collected from the shallow sand unit during this and previous investigations indicate the shallow sand contains 0% gravel, 50% to 52% sand, and 48% to 50% silt/clay. Two CCR landfill piezometers were screened in the shallow sand unit to obtain potentiometric surface information and conduct field hydraulic conductivity tests. The hydraulic conductivity of this unit based on the slug test results ranges from 3.6 x 10^{-3} to 2.9 x 10^{-2} cm/sec.

Upper Cohesive Deposit

The upper cohesive deposit is an alluvial deposit consisting of brown, light brown to brownish-gray silty clays to clayey silts having soft to stiff consistency. The unit includes loess deposits and isolated pockets of fine-grained silty to clayey sand and at some location alluvial silts and silty clays. The upper cohesive deposit is laterally adjacent to the sidewall of the CCR surface impoundment.

The upper cohesive deposit has a low vertical hydraulic conductivity as determined by laboratory triaxial hydraulic conductivity tests from borings taken from the landfill investigation. The hydraulic conductivity values determined from the laboratory tests ranged from 1.6 x 10^{-5} cm/sec to 5.2 x 10^{-7} cm/sec. It is expected that the horizontal coefficient of hydraulic conductivity is greater than the vertical coefficient. Based on test results for the lower cohesive deposit, it is anticipated that the horizontal hydraulic conductivity for the upper cohesive deposit is in the range of 10^{-5} to 10^{-6} cm/sec.

Creek Fill Material

Borings conducted along the abandoned creek locations indicate that the creek fill materials consist of variable soils ranging from silty clays to silty sands. Cohesive soils characterized as silty clay to organic silty clay were typically encountered. In some areas, the cohesive fill materials extended down to the top of bedrock. Where encountered, the granular fill materials are typically poorly graded silty to clayey sands and contain organics or wood fragments. In some areas, the granular fill materials also extended down to the top of bedrock.

The cohesive fill material contains 0% gravel, 2% to 48% sand, and 52% to 98% silt/clay. The vertical hydraulic conductivity ranges from 7.6 x 10^{-8} cm/sec to.2.1x10^{-5} cm/sec. The granular fill materials contain 0 to 2% gravel, 55% to 65% sand and 33% to 45% silt/clay. Based on one laboratory hydraulic conductivity test performed on a Shelby tube sample obtained from berm fill, the hydraulic conductivity of the granular fill material is 3.3 x 10^{-8} cm/sec.

The creek fill materials identified during the previous landfill investigations have a significant effect on the site hydrogeologic conditions. In some areas the fill materials, consisting of either granular soils or organic silty clays, extend from existing grade to the bedrock surface and locally interconnect all three water bearing units. The upper and lower cohesive deposits are considered to act as aquitards (where present) which restrict vertical flow into the water bearing units. For all practical purposes, the bedrock is considered to be an aquiclude (i.e., an impermeable body of rock or stratum of sediment that acts as a barrier to the flow of water).

Fill materials encountered in the landfill borings range from silty clays and organic silty clays to silty sands and clayey sands. These water level measurements indicate that groundwater movement within the creek fill materials is complicated because of the highly variable hydraulic characteristics of the fill materials and random placement. In some areas, there appears to be in direct hydraulic communication between fill materials, shallow sand, and basal sand.

Four landfill piezometers are screened across the fill materials. Of these, one piezometer was installed across cohesive fill material and the other piezometers were installed across granular fill materials. Hydraulic conductivity of the granular fill materials is based on one field test resulting in a value of 6.1 x 10^{-2} cm/sec. The hydraulic conductivity of the cohesive fill material ranged from 7.1 x 10^{-5} cm/sec to 1.1 x 10^{-4} cm/sec. These values represent the hydraulic conductivity in the horizontal direction.

Laboratory hydraulic conductivity test performed on landfill cohesive fill materials ranged from 2.1x10^{-3} cm/sec to 3.3 x 10^{-8} cm/sec. The higher hydraulic conductivity values are believed to be typical of soils which contain organic matter (e.g. wood fragments). The hydraulic conductivity values based on laboratory tests are generally considered to be representative of the coefficient of hydraulic conductivity in the vertical direction because of the sample configuration during testing. However, because of the randomness of the fill, it is more likely that the hydraulic conductivity is within the range of 10^{-5} to 10^{-4} cm/sec.

3.2 Uppermost Bedrock

The bedrock at the project site consists of Pennsylvanian shales that are gray in color. The bedrock surface elevation varies from approximately 492 feet MSL near the center of the existing landfill, to approximately 554 feet MSL located on a bedrock outcrop near the landfill area (southeast corner of Cell 1). Along the down-gradient edge of the Dallman Ash Pond, the bedrock is at approximately 500 feet MSL. In general, the bedrock surface slopes from the east and west towards the center of the landfill area.

Rock Quality Designation (RQD) measurements were performed on all core samples taken from the CCR landfill area. RQDs measured from core samples collected during this investigation ranges from 80% to 100%. The RQD values indicate that the bedrock exhibits minimal to no fracturing. Two in situ hydraulic conductivity tests were performed to determine the hydraulic conductivity of the upper portions of the bedrock. Test results indicate hydraulic conductivity values of 1.8×10^{-7} cm/sec and 1.3×10^{-6} cm/sec. This shows that the bedrock encountered at the project site is a lower confining unit to the uppermost aquifer. There is good correlation between the lithology of the rocks tested and the hydraulic conductivity values obtained. The upper bedrock beneath the impoundments is expected to exhibit the same characteristics as encountered at the landfill.

3.3 Hydrogeologic Units

The uppermost aquifer and underlying confining unit control groundwater movement and the potential for CCR impacted groundwater migration at the site. A description of the uppermost aquifer and the underlying confining unit follows:

Uppermost Aquifer

The uppermost aquifer is characterized as the basal sand overlying the shale bedrock. In some CCR landfill locations the creek fill materials, ranging from silty clays and organic silty clays to silty sands and clayey sands, were found to be in direct hydraulic communication with the basal sand that directly overlies the bedrock surface. Due to the highly variable hydraulic characteristics and random placement of the creek fill materials, further characterization is difficult.

As indicated above, the hydraulic conductivity of the basal sand ranges from 1.15×10^{-3} to 7.64×10^{-2} cm/sec and exhibits a mean value of 1.25×10^{-2} cm/sec (3,942 m/a). The groundwater in the basal sand appears to be under confined, semi-confined, or unconfined conditions dependent upon location. The upper limit of the uppermost aquifer is dependent upon the seasonally fluctuating groundwater table. The potentiometric surface of the basal sand varies from 565 feet MSL at upgradient locations, south of the Lakeside Ash Pond, to 525 feet MSL at down-gradient locations near Sugar Creek, north of the Dallman Ash Pond. As a result, the saturated thickness is variably dependent upon the location and the seasonal variation in the groundwater table.

Lower Confining Unit

The uppermost bedrock at the project site is primarily Pennsylvanian age shale with isolated thin coal layers. The Pennsylvanian shale functions as a lower confining unit due to its low hydraulic conductivity and effective porosity. The lower confining unit represents a natural hydrogeologic barrier (i.e., aquitard) to the vertical movement of groundwater.

In situ hydraulic conductivity test (slug tests) indicate that the hydraulic conductivity for the upper portions of the bedrock range from 1.8×10^{-7} cm/sec (0.0568 m/a) to 1.3×10^{-6} cm/sec (0.410

m/a). There appears to be good correlation between the rock lithology and the measured values of hydraulic conductivity. The bedrock over most of the site will act as an aquiclude and prevent the downward movement of groundwater.

3.4 Groundwater Movement

Groundwater movement is controlled by recharge along topographic highs and discharge along the original stream valley. The pre-surface impoundment flow direction in the uppermost aquifer was dominantly horizontal from the adjacent banks toward the natural convergence along Sugar Creek, which formerly drained the site. The overall flow was from south to north with local deviations. This dominant flow pattern persists under present day conditions but with localized variation introduced by the hydrologic discontinuity created upon construction of the CCR landfill and CCR surface impoundments.

Existing wells at the site, including wells from the CCR landfill, were used to derive potentiometric surface maps. As discussed, overall groundwater flow is from south to north. The east perimeter of the Lakeside Ash Pond is largely up-gradient, and the west side is largely side-gradient where groundwater movement is parallel to the perimeter. Excavated areas within the landfill boundary act as a groundwater sink along the east side of the Dallman Ash Pond. Groundwater generally moves northward under the Dallman Ash Pond but also moves easterly towards the FGDS Landfill and westerly towards Sugar Creek. Groundwater beneath the Lakeside Ash Pond also moves northward and westerly along Sugar Creek.

The horizontal hydraulic gradient of the basal sand was calculated based on groundwater flow from well G120 to well RW-3. Using these wells, horizontal hydraulic gradients were calculated for four consecutive quarterly measurements dating from third quarter 2020 to second quarter 2021. As presented below, the horizontal hydraulic gradients within the basal sand ranges from 0.00794 to 0.0139. The average horizontal hydraulic gradient is 0.0119.

Groundwater Elevation and Hydraulic Gradient

Well	Northing	Easting	3rdQtr20	4thQtr20	1stQtr21	2ndQtr21
RW-3	5613.3	1737.4	528.49	526.82	528.25	531.51
G120	5009.4	1986.9	536.49	535.91	537.12	536.7
Hyd grad G120 to AW-3			0.0122	0.0139	0.0136	0.00794
i_{avg} = 0.0119						

4. CONCEPTUAL MODEL

This section provides an overview of the simplifications to the site geology, hydrogeology, and design that are necessary to construct the conceptual model and to identify the transport processes that should be addressed.

4.1 Conversion Assumptions

To adequately express the site geology within the context of the contaminant transport model (MIGRATE v9) and to ensure a conservative approach to the selection of input parameters, several assumptions were made in the conversion of the site geology and design to the conceptual models.

1) **All geologic units and earthen structures are homogeneous and isotropic with respect to all lithologic and hydrogeologic parameters.** Most contaminant transport models are incapable of working with small-scale changes in parameter values that are typical of most geologic materials. Average parameter values were chosen to represent the lithologic and hydrogeologic parameters where variability occurs.

2) **All layers are laterally extensive and the thickness of each layer is uniform.** Layer thicknesses used within the model are more uniform than actually present at the site. The layer thicknesses used represent the average layer thickness at the down-gradient edge of the CCR surface impoundment.

3) **The geologic and hydrogeologic parameters used are mean values of site-specific data or mean values taken from the literature for similar materials. A conservative range of values is taken into consideration for parameter sensitivity.** The mean values analyzed provide a conservative analysis of the site conditions. Transport through a geologic unit with a variability of hydraulic conductivity, transmissivity, porosity, etc., will actually produce an “average” movement through the geologic unit.

4) **The competent bedrock below the uppermost aquifer is an impermeable boundary.** Hydraulic conductivity data indicate the underlying shale is relatively impermeable with hydraulic conductivities ranging from 1.8 x 10^{-7} cm/sec (0.0568 m/a) to 1.3 x 10^{-6} cm/sec (0.410 m/a).

5) **The compacted berm material consists of overburden material having a hydraulic conductivity of 1 x 10^{-7} cm/s or less.** Based on laboratory hydraulic conductivity test performed on a Shelby tube sample obtained from berm fill, the hydraulic conductivity of the granular fill material is 3.3 x 10^{-8} cm/sec (0.0104 m/a).

6) **All groundwater flow is vertical through the lower cohesive deposit (Layer 1) and horizontal through the basal sand (uppermost aquifer).** Freeze and Cherry (1979) state that in aquifer-aquitard systems with hydraulic conductivity contrast of two orders of magnitude or more, flow lines tend to become almost horizontal in the aquifers and almost vertical in the aquitards.

7) **The contaminant flux through the base of the CCR surface impoundments (i.e., lower cohesive deposit) is conservatively based on a fully saturated thickness of CCR.** The HELP model has been used to determine the vertical seepage rate and cover

performance over a 30-year period following the installation of a final cover system. The HELP (v3.07) model was developed by the U.S. Army Engineer Waterways Experiment Station (WES), Vicksburg, MS, for the U.S. Environmental Protection Agency (EPA), Risk Reduction Engineering Laboratory, Cincinnati, OH. HELP is the most widely used model to calculate the water balance of cover and bottom liner systems for landfills and other land disposal systems. HELP uses water balance computations to simulate the storage and vertical migration of leachate through a landfill design. Based on the HELP model results, where cover soils, a 200 mil geocomposite drainage layer and a 40 mil geomembrane are used as the final cover for the CCR surface impoundment, the liquid head is estimated to average approximately 297 inches (24.8 feet) in year 1, and by year 8 average 1.44 inches. The vertical seepage rates calculated by the HELP model were used to determine the vertical Darcy velocities specified in the MIGRATE model. The HELP model output file is included as Appendix A of this submittal.

8) **All angles are assumed to be 90°.** Right angle corners removes any extra thicknesses from the layers and shortens flow distances.

9) **The external stresses on the system are constant throughout time.** Minor variations in stress on the system over time cannot be accurately accounted, or estimated, for the entire model period. Therefore, potential short-term changes in heads due to construction, weather, and other flux changes are ignored.

4.2 Transport Processes

Using the site design and hydrogeologic characteristics and combining the analysis of groundwater flow information, the transport processes through each layer can be analyzed with respect to migration of CCR leachate constituents. The primary pathways to be addressed by this evaluation can be defined as vertical migration through the lower cohesive soils and horizontal (lateral) migration within the uppermost aquifer.

Vertical and lateral spreading of contaminant concentrations is denoted by the coefficients of hydrodynamic dispersion. The coefficients consists of two parts:

$$D_{xx} = D_{ex} + D_{mx}$$
$$D_{zz} = D_{ez} + D_{mz}$$

where D_{mx} and D_{mz} are the coefficients of advective (mechanical) dispersion in the longitudinal and vertical directions, and D_{ex} and D_{ez} are the coefficients of molecular diffusion in the longitudinal and vertical directions. The coefficients of advective dispersion D_{mx} and D_{mz} are defined as the product of the average linear velocity and the dispersivity ($D_m = \overline{v}\,\alpha$ [Bear, 1972]). As the velocity becomes smaller, the advective dispersion coefficient value approaches the value of the molecular diffusion coefficient. As this occurs, diffusion becomes the dominant transport mechanism.

The contaminant transport evaluation considers a conceptual scenario that simulates both vertical and horizontal contaminant transport via advective dispersion and molecular diffusion within both the lower cohesive deposit and the basal sand.

5. MATHEMATICAL MODEL

The two-dimensional advection/diffusion model chosen to represent contaminant transport at the site is MIGRATE (v9) by Rowe and Booker. This model provides for:

- advective as well as diffusive contaminant transport;
- two-dimensional transport in a horizontal and vertical orientation;
- multiple time and distance solutions to the transport equation;
- retardation of non-conservative constituents; and
- a transport solution with no space or time discretization errors (Rowe & Booker, 1988).

The principal assumptions inherent in MIGRATE are:

1) Fick's Law applies to solute diffusion within the deposit.

2) Sorption/desorption of a non-conservative species of contaminant is linearly controlled.

3) Contaminant migration in a given direction is governed by the two-dimensional contaminant transport equation presented in Rowe & Booker, 1985.

4) Multiple layers with different properties may be specified. It is assumed that there is continuity of concentration and flux at the boundary between two layers. The question of continuity is only a problem when there is insufficient diffusion to adequately "move" the contaminant across the layer boundary.

Within a given model scenario, MIGRATE has an advantage that permits a variety of top and bottom boundary conditions. For the purposes of this study, the following assumptions have been made:

1) "Top" boundary is a constant source boundary. Presuming a constant source over the entire life and post-closure of the facility for the closure-in-place alternative is a highly conservative assumption. This implies that full CCR leachate concentrations are present from day one, and no elutriation or removal of the contaminants is occurring. Studies (Farquhar, 1989) show that leachate quality improves dramatically over a relatively short time period. For the closure-by-removal alternative, the constant source is assumed to occur throughout the active life of the facility, with the source concentration being set to zero upon the completion of the CCR removal activities.

2) "Bottom" boundary is an "Aquifer" bottom boundary. This assumes that the bottom boundary is a permeable base stratum and that there is sufficient dispersion/mixing such that the concentration is uniform across the entire thickness of the base strata. The "Aquifer" bottom boundary option is applicable where the bottom layer (i.e., the lower cohesive deposit) is underlain by a permeable base stratum (i.e., the uppermost aquifer).

Using the conservative parameters listed in the conceptual model coupled with the cautious assumptions that MIGRATE offers, the model produces a conservative representation of contaminant transport from the CCR surface impoundment for both the closure-in-place and closure-by-removal model scenarios.

5.1 Model Input and Sensitivity Analysis

Many input parameters were determined from site-specific data. Site-specific parameters include hydraulic conductivity, hydraulic gradient, unit thickness, CCR constituent concentrations and background groundwater concentrations. Where site-specific values were not available, literature values for comparable materials were selected.

5.1.1 Two-Dimensional Profile Setup

For the closure-in-place and closure-by-removal closure alternative contaminant transport evaluation, the conceptual model consists of the low permeability lower cohesive soil layer directly overlying the basal sand aquifer. The bottom of the aquifer is defined by the top of bedrock, the Pennsylvanian shale. Figure 3 depicts the cross-sectional geology and the conceptual hydrogeology of the conceptual model.

The thicknesses of the lower cohesive deposit and basal sand varies across the CWLP property. Along the down-gradient edge of the Dallman Ash Pond, the average thickness is approximately 19.4 feet (5.91 meters). The elevation of the bottom of the surface impoundment is 527 feet MSL. This places the lower cohesive deposit/basal sand interface at approximately 507.6 feet MSL. The basal sand deposit along the down-gradient edge of the Dallman Ash Pond has an average thickness of 7.3 feet (2.23 m). This places the basal sand/top of shale interface at an approximate elevation of 500 feet MSL.

Transport from the Dallman Ash Pond to the uppermost aquifer is depicted on the conceptual model drawing. Migration of the contaminants is restricted to vertical transport through the lower cohesive soils and horizontally through the basal sand, to the edge of Sugar Creek. The modeled scenario consists of 44 years of active life and 30 years of post-closure care following the placement of the final cover system.

The HELP determined seepage rates from the base of the Dallman Ash Pond were used to estimate the vertical Darcy velocities over the 30 year post-closure care period for the closure-in-place scenario.

The MIGRATE model input and output files are included in Appendix B**.**

5.1.2 Closure-In-Place Model Input Parameters

The final cover system was designed pursuant to Section 845.750. The components contained in the model are consistent with the design specified in the subject regulations.

5.1.2.1 *Source Concentration*

A surrogate concentration of 1 mg/L is assumed for the conceptual model scenario. Using a normalized concentration allows the use of the model predicted concentration as a multiplier of the current source concentrations.

5.1.2.2 Base Width and Surface Width

The base and surface widths were measured parallel to groundwater flow, along the eastern north-south edge of the Dallman Ash Pond. The base width measurement was taken from the toe at the up-gradient (south) side of the surface impoundment to the toe at the down-gradient (north) side of the CCR surface impoundment (see Figure 4). The surface width was measured from the 554 contour along the same path. This is the longest edge of the CCR surface impoundment. The modeled section, as illustrated on Figure 4, depicts the base width and surface width as 1,578 feet (481 m) and 1,663 feet (507 m).

5.1.2.3 Layer Thickness and Number of Sublayers

The thicknesses used for the conceptual model scenario are based upon an average of the thicknesses encountered along the down-gradient (northern) edge of the CCR surface impoundment.

Layer 1 - Lower Cohesive Deposit

As discussed in Section 3.0 above, the lower cohesive deposit ranges in thickness from 12.6 to 26.3 feet (3.84 to 8 m) along the down-gradient edge of the Dallman Ash Pond. The average thickness of the lower cohesive deposit is 19.4 feet (5.91 m).

MIGRATE permits a fixed number of sublayers to be entered or the model will determine the number (if the thickness is large and NSUB = 1). A sublayer (NSUB) value of 10 was chosen for the lower cohesive deposit. This provides predicted contaminant concentrations at approximately 2 foot intervals to the top of the basal sand (uppermost aquifer).

Aquifer - Basal Sand

The basal sand deposit along the down-gradient edge of the Dallman Ash Pond ranges in thickness from 3 to 7.25 feet (0.914 to 3.51 m). The average thickness of the basal sand is 7.25 feet (2.23 m).

The aquifer bottom boundary condition represents the case where the deposit is underlain by permeable base strata. For the aquifer bottom boundary condition, the underlying permeable base strata cannot be assigned a sublayer value. This boundary condition assumes that there is sufficient dispersion/mixing such that the concentration is uniform across the entire thickness of the aquifer.

5.1.2.4 Dry Density and Distribution Coefficient

MIGRATE uses the product of the density and the distribution (sorption) coefficient to simulate the adsorption of a non-conservative species. Adsorption is the attraction and adhesion of a layer of ions from an aqueous solution to the solid mineral surfaces with which it is in contact. The consequent adsorption results in the diminished concentration of that non-conservative species in groundwater. This contaminant transport evaluation assumes that there is no adsorption for all the species. Therefore, the adsorption is set to zero (0) in the contaminant transport model to ignore the adsorption of non-conservative species. This is a conservative approach that results in higher predicted concentrations for non-conservative species.

5.1.2.5 Effective Porosity

The effective porosity, as defined by Fetter (1980) is “the amount of interconnected pore space through which fluids can pass, expressed as a percent of bulk volume.” The effective porosity parameter is used to calculate the seepage velocity of a geologic unit. The specific yield or the "drainable water" approximates the effective porosity (Bear, 1972). The saturation water content of a soil, which is the total water drained by gravity from a saturated soil, provides a reasonable approximation of the effective porosity of a soil.

Layer 1 - Lower Cohesive Deposit

The effective porosity of the lower cohesive deposit is based on the saturation water content data of silt, which reportedly ranges from 35% to 57% (Sharp-Hansen et al., 1990). A mean effective porosity value of 46% was selected for the model.

Aquifer - Basal Sand

For the basal sand, the effective porosity of the lower cohesive deposit is based on the saturation water content data of sand. The range provided is from 37% to 49% (Sharp-Hansen et al., 1990). A mean effective porosity value of 43% was selected for the baseline model.

5.1.2.6 Darcy Velocity

The Darcy velocity for the conceptual model scenario was derived from the vertical percolation rates reported in the HELP model results.

Layer 1 - Lower Cohesive Deposit

Based on the HELP model results for vertical percolation (q_{HELP}), the vertical Darcy velocity (v_a) varies from an initial rate of 0.651 m/a and decreasing to a value of 0.00551 m/a by post-closure year 30 (model years 51 to 80). Darcy velocity rates were grouped to provide representative vertical velocities.

Layer 1 – Vertical Darcy Velocity

Model Period	Start Time – End Time	HELP Annual Vertical Percolcation through Layer 1, q_{HELP} (ft^3/a/acre)	Layer 1 Vertical Darcy Velocity, v_a (m/a)
1	0-50	93018	0.651
2	50-51	84545	0.592
3	51-52	76831	0.538
4	52-53	69993	0.490
5	53-54	63413	0.444
6	54-55	57616	0.403
7	55-56	45283	0.317
8	56-57	24749	0.173
9	57-58	7885	0.0552
10	58-60	5535	0.0387
11	60-62	3462	0.0242
12	62-67	2417	0.0169
13	67-72	1397	0.00979
14	72-77	874	0.00614
15	77-80	787	0.00551

Aquifer - Basal Sand

The Darcy velocity for the basal sand was determined by calculating the total horizontal flow into the up-gradient side of the uppermost aquifer combined with the vertical seepage from the overlying CCR surface impoundment. As discussed below, the total flow was used to calculate the Darcy velocity at the down-gradient edge of the CCR surface impoundment.

The horizontal Darcy velocity at the down-gradient edge of the CCR surface impoundment is termed the "Base Outflow Velocity." The "Base Outflow Velocity" is the Darcy velocity beneath the down-gradient edge of the CCR surface impoundment corresponding to the horizontal inflow at the up-gradient edge (q_{in}) plus the vertical inflow (q_a) from the overlying CCR surface impoundment.

Based on continuity of flow the initial flow in the basal sand, (q_{in}) is given by the inflow velocity ($v_{in} = Ki$ = 3,942 m/a ·0.0119 = 46.9 m/a) multiplied by the thickness of the basal sand (H = 2.23 m) and the width of the CCR surface impoundment perpendicular to the direction of groundwater flow (W = 310 m), thus:

$$q_{in} = v_{in} \cdot H \cdot W = 46.9\,\frac{m}{a} \cdot 2.23\,m \cdot 310\,m = 32{,}429\,m^3/a$$

The flow into the aquifer from the CCR surface impoundment, q_a, is the downward Darcy velocity from the overlying lower cohesive deposit (v_a = 0.651 m/a) multiplied by the length (L = 481 m) and the width (W = 310 m) of the CCR surface impoundment, thus:

$$q_a = v_a \cdot L \cdot W = 0.651\,\frac{m}{a} \cdot 481\,m \cdot 310\,m = 97{,}051\,m^3/a$$

The outflow at the down-gradient edge of the CCR surface impoundment is:

$$q_{out} = q_{in} + q_a = 32{,}429\frac{m^3}{a} + 97{,}051\frac{m^3}{a} = 129{,}480\,m^3/a$$

The "Base Outflow Velocity", v_b, is the outflow divided by the width of the CCR surface impoundment (W = 310 m) and the thickness of the aquifer (H = 2.23 m), therefore:

$$v_b = \frac{q_{out}}{(W \cdot H)} = \frac{129{,}480\frac{m^3}{a}}{310\,m\ \cdot 2.23\,m} = 187\,m/a$$

The baseline vertical Darcy velocity varies from the initial flow velocities as a result of the installation of the proposed final cover. The varying flow velocities are presented in the table below.

Aquifer – Base Velocity							
Model Period	Start Time – End Time	Layer 1 Vertical Darcy Velocity, v_a (m/a)	Layer 1 Vertical Flow In, q_a (m^3/a)	Aquifer Horizontal Darcy Velocity, v_{in} (m/a)	Aquifer Horizontal Flow In, q_{in} (m^3/a)	Aquifer Horizontal Flow Out, q_{out} (m^3/a)	Aquifer Horizontal Darcy Velocity Out, v_b (m/a)
1	0-50	0.651	97051	46.9	32429	129480	187
2	50-51	0.592	88211			120640	175
3	51-52	0.538	80161			112590	163
4	52-53	0.490	73028			105457	153
5	53-54	0.444	66163			98591	143
6	54-55	0.403	60114			92543	134
7	55-56	0.317	47246			79675	115
8	56-57	0.173	25820			58249	84
9	57-58	0.0552	8227			40656	59
10	58-60	0.0387	5776			38205	55
11	60-62	0.0242	3612			36041	52
12	62-67	0.0169	2521			34950	51
13	67-72	0.00979	1460			33888	49
14	72-77	0.00614	915			33344	48
15	77-80	0.00551	821			33250	48

5.1.2.7 Coefficients of Hydrodynamic Dispersion

As characterized in Section 4.2 above, the vertical and lateral spreading of contaminant concentrations is denoted by the coefficients of hydrodynamic dispersion, the coefficient of advective (mechanical) dispersion, D_m, and the coefficient of molecular diffusion, D_e.

Layer 1 - Lower Cohesive Deposit

Diffusion, D_e, of chemical constituents is an important contributor to dispersion where velocities are low. Freeze and Cherry (1979) characterized the one-dimensional diffusion of a non-reactive species in fine-grained geologic media. This study indicated diffusion coefficients range from 1 x 10^{-10} to 1 x 10^{-11} m^2/s. An average of 5 x 10^{-10} m^2/s or 0.0158 m^2/a was chosen for the lower cohesive deposit.

Following Illinois EPA guidance (LPC-PA2, Appendix C), acceptable sources for evaluating dispersivity, α, include Gelhar, et al (1992) for all distances, Xu and Eckstein (1995) for distances greater than 100 m, and Schulze-Makuch (2005) for distances less than 100 m. For the purposes of the Dallman Ash Pond contaminant transport model, the scale or length of flow path used to determine the vertical dispersivity for the lower cohesive deposit was assumed to be 19.4 feet (5.91 m).

Given a flow distance of 5.91 m, the following relationship between dispersivity and flow distance given by Schulze-Makuch (2005) is appropriate:

$$a_L = c(L)^m$$

where:

α = mechanical dispersivity

L = study scale (m)

c = a parameter characteristic for a geologic medium

m = scaling exponent related to the geologic medium

Schulze-Makuch (2005) developed a power law relationship relating the geologic media and study scale to dispersivity using dispersivity data compiled from 109 different authors for different types of geological media. For unconsolidated sediments, the data was divided into three reliability classes, I being high reliability, II being Intermediate reliability and III being low reliability. Over the entire range of low to high reliability data, the scaling exponent m was found to vary from 0.44 to 0.94 with the higher reliability subset of data (I) at the lower end of the observed range. For purposes of this contaminant transport model, the Schulze-Makuch (2005) high reliability values for unconsolidated deposits are c = 0.2 and m = 0.44.

Using the Schulze-Makuch (2005) power law relationship and a lower cohesive deposit flow length (vertical) of 19.4 feet (5.91 m), the longitudinal (i.e., parallel to groundwater flow) dispersivity is estimated to be:

$$a_x = c(L)^m = 0.2(5.91\,m)^{0.44} = 0.437\,m$$

In accordance with Illinois EPA, the transverse dispersivity (i.e., perpendicular to groundwater flow) was calculated by multiplying the longitudinal value by 10 percent.

$$a_z = 0.437 \cdot 0.1 = 0.0437\,m$$

The coefficient of advective dispersion for the lower cohesive deposit, D_{mx}, is defined as the product of the average linear velocity and the dispersivity (Bear, 1972).

$$D_{mx} = \frac{a_x \cdot v}{n_e} = \frac{0.437 \cdot 0.651}{0.46} = 0.618\,m^2/a$$

The horizontal coefficient of advective dispersion is:

$$D_{mz} = \frac{a_z \cdot v}{n_e} = \frac{0.0437 \cdot 0.651}{0.46} = 0.0618\,m^2/a$$

As discussed above, the hydrodynamic dispersion (D) is a result of the mechanical mixing and the molecular diffusion. The coefficient of hydrodynamic dispersion can be expressed as follows:

$$D = D_m + D_e$$

Within the lower cohesive deposit, both diffusion and dispersion are important transport processes. The coefficients of hydrodynamic dispersion, D_v and D_h, are estimated as:

$$D_v = D_{mx} + D_e = 0.618\, m^2/a + 0.0158\, m^2/a = 0.634\, m^2/a$$

$$D_h = D_{mz} + D_e = 0.0618\, m^2/a + 0.0158\, m^2/a = 0.0776\, m^2/a$$

However, as the vertical velocity changes with time, due to the decrease in infiltration due to the proposed final cover, the coefficient of hydrodynamic dispersion will vary as provided in the table below.

Layer 1 - Coefficient of Hydrodynamic Dispersion						
Model Period	Start Time – End Time	Longitudinal Mechanical Dispersion, D_{mx} (m^2/a)	Transverse Mechancial Dispersion, D_{mz} (m^2/a)	Molecular Diffusion, D_e (m^2/a)	Vertical Coefficient of Hydrodynamic Dispersion, D_v (m^2/a)	Horizontal Coefficient of Hydrodynamic Dispersion, D_h (m^2/a)
1	0-50	0.618	0.0618	0.0158	0.634	0.0776
2	50-51	0.562	0.0562		0.578	0.0720
3	51-52	0.511	0.0511		0.527	0.0669
4	52-53	0.465	0.0465		0.481	0.0623
5	53-54	0.422	0.0422		0.437	0.0580
6	54-55	0.383	0.0383		0.399	0.0541
7	55-56	0.301	0.0301		0.317	0.0459
8	56-57	0.165	0.0165		0.180	0.0323
9	57-58	0.0524	0.00524		0.0682	0.0210
10	58-60	0.0368	0.00368		0.0526	0.0195
11	60-62	0.0230	0.00230		0.0388	0.0181
12	62-67	0.0161	0.00161		0.0319	0.0174
13	67-72	0.00930	0.00093		0.0251	0.0167
14	72-77	0.00583	0.000583		0.0216	0.0164
15	77-80	0.00523	0.000523		0.0210	0.0163

Basal Sand – Uppermost Aquifer

Based on Freeze and Cherry (1997) diffusion coefficients , D_e, of a non-reactive species for coarse-grained unconsolidated materials can be somewhat higher than 1 x 10^{-10} m^2/sec but are less than the coefficients for chemical species in water (2 x 10^{-9} m^2/s). A value of 1 x 10^{-9} m^2/s or 0.0315 m^2/a was chosen to represent the basal sand diffusion.

In the basal sand the flow length is based upon the distance from the center of the CCR surface impoundment to the down-gradient edge of the CCR surface impoundment, 789 feet (240.5 m). When using the aquifer bottom boundary condition, the concentration is assumed to be the same vertically across the entire layer. As such, there is no input for the transverse dispersivity. Given a flow distance of 240.5 m, the following relationship between dispersivity and flow distance given by Xu and Eckstein (1995) is appropriate and the longitudinal dispersivity is estimated to be:

$$a_x = 0.83[log_{10}(240.5)]^{2.414} = 6.74\, m$$

The coefficient of advective dispersion for the basal sand, D_{mx}, is:

$$D_{mx} = \frac{a_x \cdot v}{n_e} = \frac{6.74 \cdot 187}{0.43} = 2{,}936\, m^2/a$$

The coefficient of hydrodynamic dispersion for the basal sand is estimated as:

$$D = D_{mx} + D_e = 2{,}936\, m^2/a + 0.0315\, m^2/a = 2{,}936\, m^2/a$$

As with the lower cohesive deposit, the base flow velocity changes with time, due to the decrease in infiltration as a result of the proposed final cover, the coefficient of hydrodynamic dispersion will vary as provided in the table below.

Aquifer - Coefficient of Hydrodynamic Dispersion					
Model Period	Start Time – End Time	Base Flow Velocity, v_b (m/a)	Longitudinal Mechanical Dispersivity, D_{mx} (m²/a)	Molecular Diffusion, D_e (m²/a)	Coefficient of Hydrodynamic Dispersivity, D_h (m²/a)
1	0-50	187	2936	0.0315	2936
2	50-51	175	2735		2735
3	51-52	163	2553		2553
4	52-53	153	2391		2391
5	53-54	143	2235		2235
6	54-55	134	2098		2098
7	55-56	115	1807		1807
8	56-57	84	1321		1321
9	57-58	59	922		922
10	58-60	55	866		866
11	60-62	52	817		817
12	62-67	51	792		792
13	67-72	49	768		768
14	72-77	48	756		756
15	77-80	48	754		754

5.1.2.8 Lateral Distances

Three lateral distances were specified for the determination of solute concentrations. The distances selected are: 1) at the inside toe of slope of the CCR surface impoundment berm of the Dallman Ash Pond; 2) at 33 meters, half of the distance from the inside toe of the slope of the CCR surface impoundment to the closest edge of Sugar Creek; and 3) at the edge of Sugar

Creek, 66 meters from the inside toe of the slope of the CCR surface impoundment. These distances in the MIGRATE model results are expressed as 240.5 m, 273.5 m and 306.5 m. These distances are from the center of the CCR surface impoundment.

5.1.2.9 Integration

To find the solution to the advective-dispersion equation MIGRATE uses a Laplace transform. The numerical inversion of the Laplace transform depends on the Talbot parameters. Default values for the for the Laplace and Gauss integration parameters can be used, or they can be specified by the user. Acceptable results will generally be produced by the default values of these parameters. Occasionally, a solution may require more than the default integration parameters if negative values are produced or if erroneous concentrations appear at the surface outside of the source area. The model authors, Rowe and Booker, acknowledge that these negative values may be merely a poor numerical approximation of zero concentration or flux and can be eliminated by increasing the integration parameters. However, using very high integration parameters usually results in an increase the computational time without significantly improving the solution.

For the model used in this evaluation it was found that the model results were unstable using the normal integration parameters, yielding negative predicted concentration values. Using the selected option and specifying an increase in Gaussian integration resulted in fewer non-negative predicted concentrations.

5.1.3 Closure-By-Removal Model Input Parameters

The baseline contaminant transport model prepared to evaluate the closure-in-place alternative, was modified to evaluate the closure-by-removal alternative. Under the closure-by-removal scenario, it is assumed that the vertical diffusion, horizontal diffusion, vertical velocity, aquifer outflow velocity and aquifer dispersion remains constant throughout the entire model life. For the closure-by-removal alternative, the model geometry, and hydrogeologic characteristics of the uppermost aquifer do not change. However, the source concentration will vary. It was assumed that the source concentration will remain constant (1 mg/L) until the completion of CCR removal, represented by model year 54 (2029), at which time the source concentration will be 0 mg/L, beginning model year 55 (2030) to the end of the after closure-by-removal period represented by model year 84 (2059).

The closure-by-removal contaminant transport model was organized into two model periods. Model period 1 represents the active life of the surface impoundment from year 1 to year 54 (1976 to 2029). Model period 2 represents year 54 through year 84 (2029 through 2059), the after closure-by-removal period.

Closure-By-Removal Input Parameters							
Model Period	Start Time – End Time	Layer 1 - Vertical Coefficient of Hydrodynamic Dispersion, D_v (m^2/a)	Layer 1 - Horizontal Coefficient of Hydrodynamic Dispersion, D_h (m^2/a)	Layer 1- Vertical Darcy Velocity, v_a (m/a)	Aquifer Horizontal Darcy Velocity Out, v_b (m/a)	Coefficient of Hydrodynamic Dispersivity, D_h (m^2/a)	Normalized Initial Concentration (mg/L)
1	0-54	0.634	0.0776	0.651	187	2936	1
2	54-84						0

The lateral distances and integration for the closure-by-removal alternative were consistent with those used for the closure-in-place alternative. This allows the direct comparison of the result for the closure-by-removal alternative.

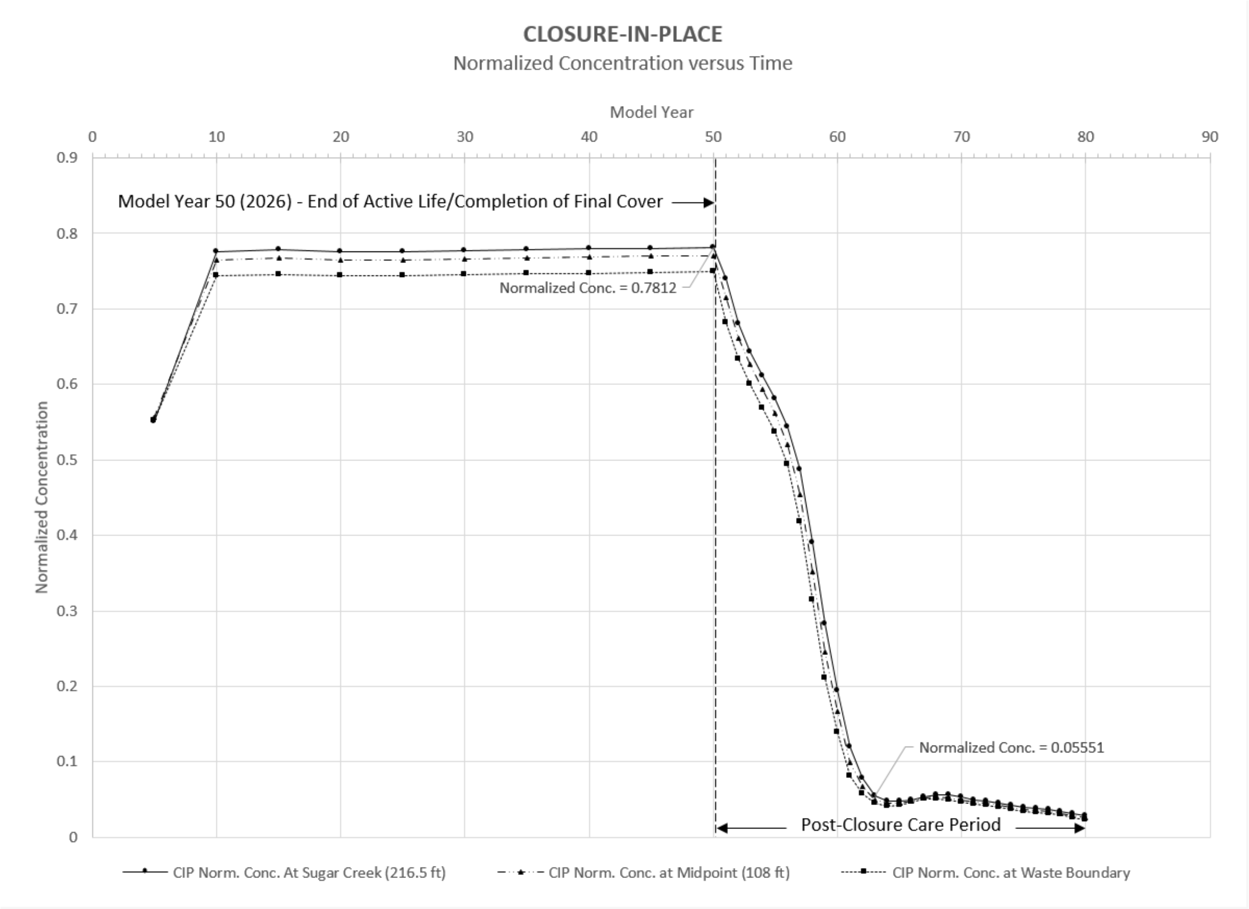
6. CONTAMINANT TRANSPORT RESULTS

The MIGRATE simulations for both the closure-in-place and the closure-by-removal alternatives were completed for the active period and the post-closure care/ after closure-by-removal period for the Dallman Ash Pond CCR surface impoundment for three locations - at the edge of the CCR surface impoundment, at one-half the distance to the nearest section of Sugar Creek, and at the edge of Sugar Creek. For the active period, concentrations were generated at five year intervals for the closure-in-place scenario and at six year intervals for the closure-by-removal scenario. For the subsequent post-closure care and after closure-by-removal periods, concentrations were generated on a yearly interval for both closure alternatives modeled.

For both model scenarios, the predicted concentration reached steady state conditions, approximately 0.78 mg/L, during the second model period (model year ten for the closure-in-place scenario and model year twelve for the closure-by-removal scenario). Subsequent predicted concentrations during the active life for both model scenarios did not continue to increase. This stabilization of the concentration within the uppermost aquifer was expected due to the flushing velocity of the uppermost aquifer. Based upon this observation, it can be reasoned that the length of the active life, at least for times beyond ten years, does not have an impact on the maximum concentration within the uppermost aquifer.

6.1 Closure-In-Place

The concentrations generated by MIGRATE are normalized. The peak normalized concentration during the first 50 years of active-life is approximately 0.7812 mg/L. Upon installation of the final cover system (model year 50 or calendar year 2026) the predicted normalized concentrations exhibit a decrease. The normalized concentrations continue to decrease to approximately one-tenth (0.0551 mg/L) of the initial concentration by model year 63 (2039), approximately 13 years after the completion of final cover construction activities.

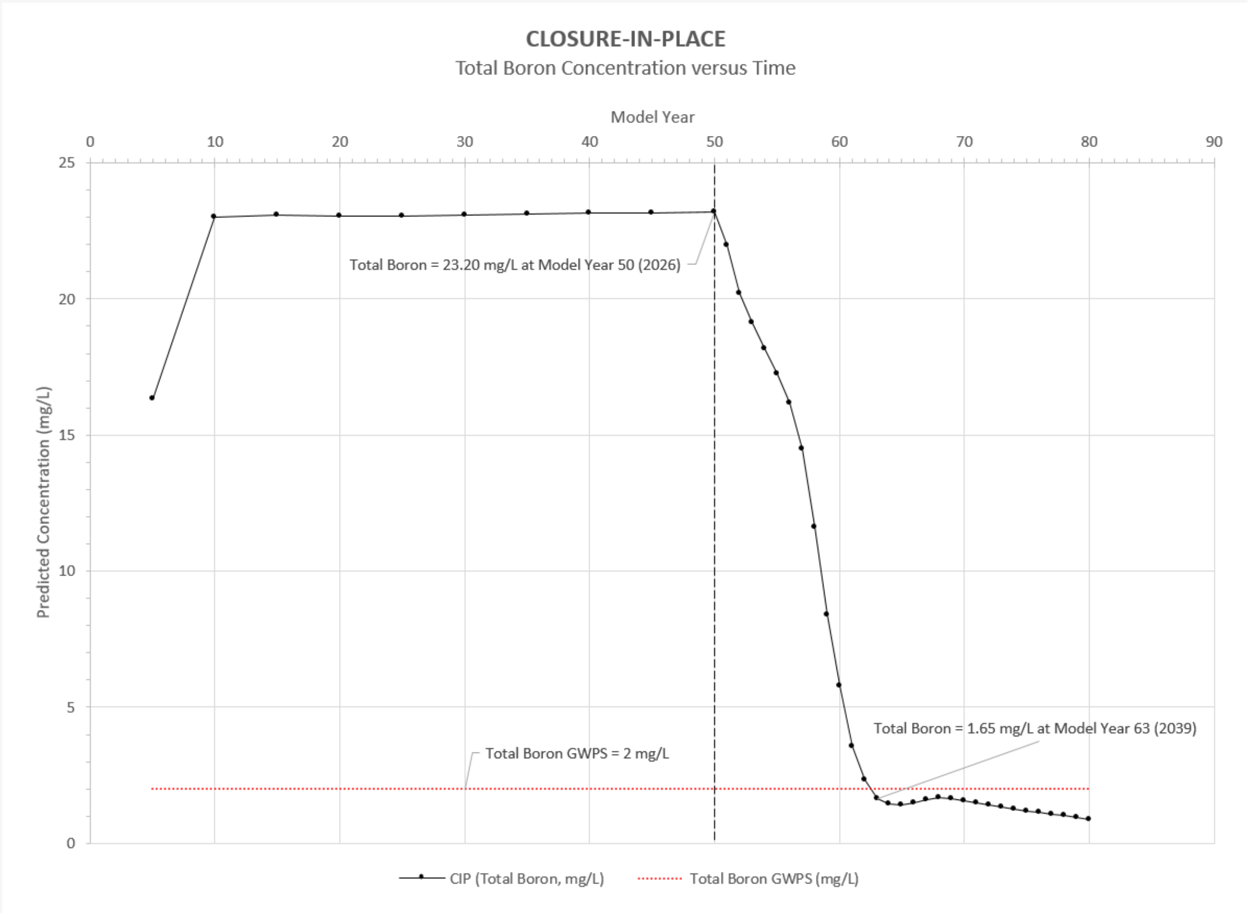


The normalized concentration (C_{norm}) at the end of the active period (0.7812 mg/L) is used with the groundwater concentration (C_{gw}) measured at AP-14 for the CCR parameter total boron (23.2 mg/L as determined for the second quarter 2021 sampling event to determine a prediction factor (F_p).

$$F_p = \frac{C_{norm}}{C_{gw}} = \frac{0.7812\,\frac{mg}{L}}{23.2\,\frac{mg}{L}} = 0.0337\ mg/L$$

Using the prediction factor, F_p, it can be seen that total boron concentration at the edge of Sugar Creek (C_{norm} = 0.05551 mg/L) is predicted to be at or below the GWPS (2 mg/L) by model year 63 (2038), approximately 13 years following the installation of the final cover system.

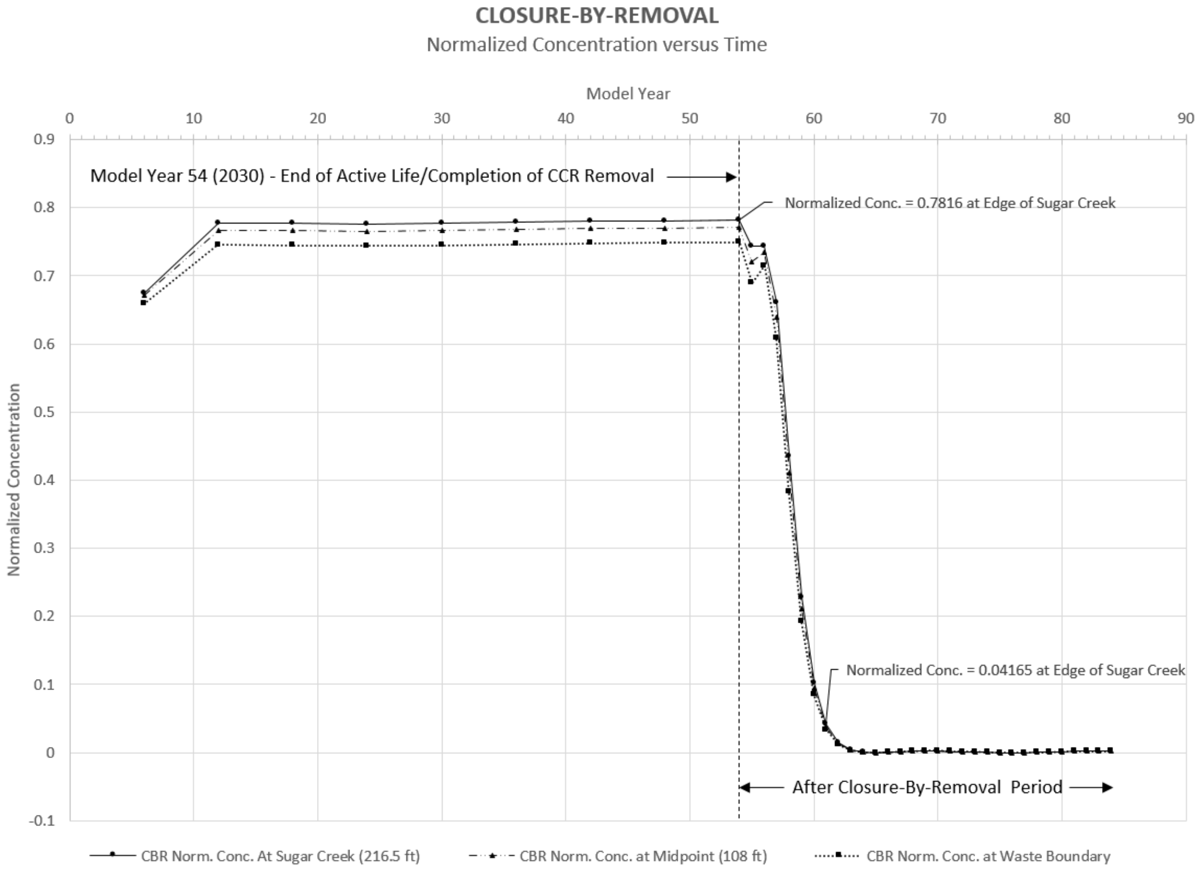
$$C_{gw} = \frac{C_{norm}}{F_p} = \frac{0.05551\,\frac{mg}{L}}{0.0337\,\frac{mg}{L}} = 1.65\ mg/L$$



Assuming that model year 50 (2026) represents the completion of the installation of a final cover system for the closure-in-place scenario, the contaminant transport model predicts compliance with the GWPS by model year 63 (2039).

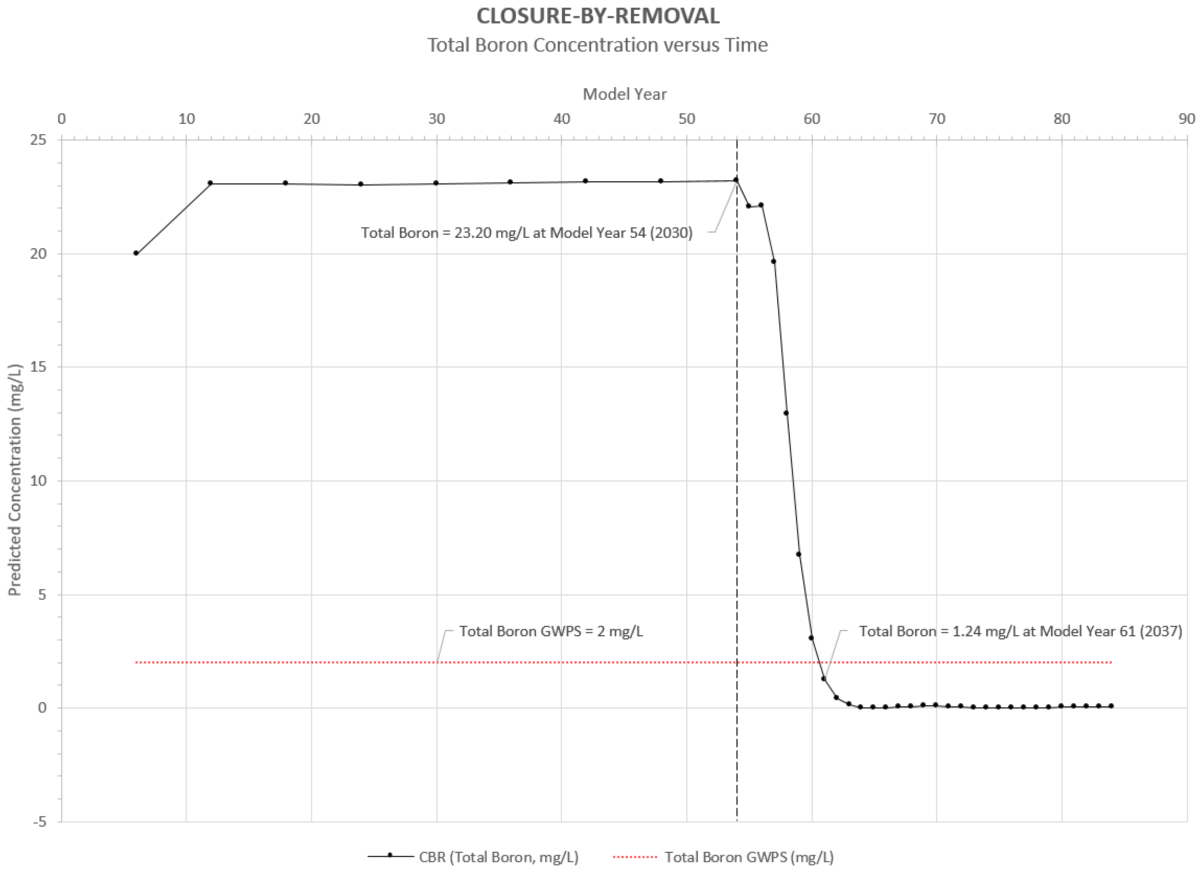
6.2 Closure-by-Removal

As with the closure-in-place contaminant transport model results, the concentrations generated by MIGRATE for the closure-by-removal evaluation are normalized. The normalized concentration at the end of the first 54 years of active-life is approximately 0.7816 mg/L. As expected, this concentration is in agreement with the active life results for the closure-in-place contaminant transport modeling effort. The predicted normalized concentrations exhibit a decrease following the removal of the source concentration and by model year 61 are approximately one-tenth of the initial concentration (0.04165 mg/L).



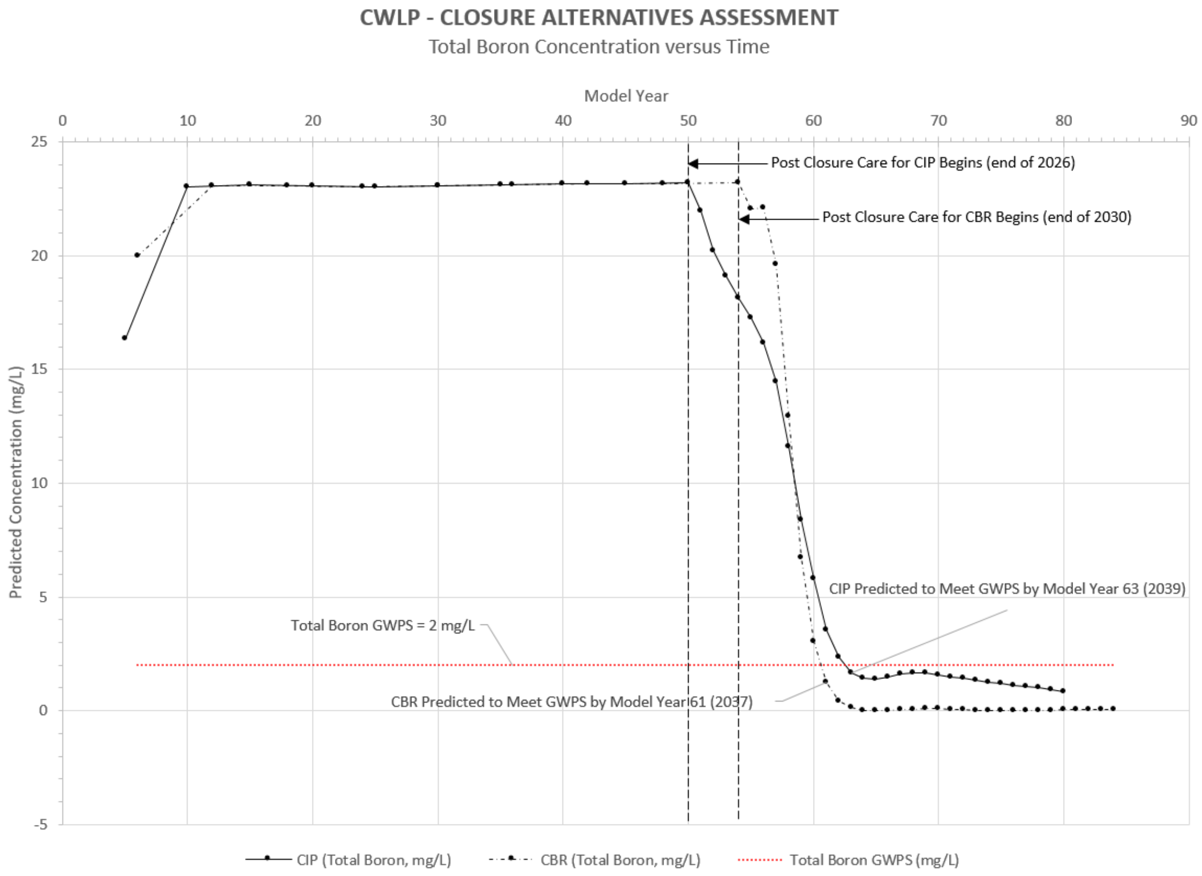
As presented above, the normalized concentration (C_{norm}) at the end of the active period (0.7816 mg/L) is used with the maximum concentration (C_{gw}) for the CCR parameter total boron (23.2 mg/L), to determine a prediction factor (F_p). As expected, F_p for this scenario is also equal to 0.0337 for this scenario.

Using the prediction factor, F_p, a graph was prepared to represent total boron concentrations following the closure-by-removal activities. As shown in the graph, concentrations following the completion of the CCR removal display a decrease. Based upon the closure-by-removal evaluation total boron concentrations are predicted to be at or below the groundwater protection standard, 2 mg/L, by model year 61 (2037).


CLOSURE-BY-REMOVAL
Total Boron Concentration versus Time
Model Year
0
10
20
30
40
50
60
70
80
90
25
20
15
10
5
0
-5
Predicted Concentration (mg/L)
Total Boron = 23.20 mg/L at Model Year 54 (2030)
Total Boron GWPS = 2 mg/L
Total Boron = 1.24 mg/L at Model Year 61 (2037)
CBR (Total Boron, mg/L)
Total Boron GWPS (mg/L)

7. CCR SURFACE IMPOUNDMENT CONTAMINANT TRANSPORT EVALUATION RESULTS

The MIGRATE model predicts compliance with the groundwater protection standard within approximately 13 years following installation of a final cover system on the Dallman Ash Pond, or 4 years following the completion of the removal of CCR from the Dallman Ash Pond. Throughout the remainder of the 30 year post-closure care/after closure-by-removal period the predicted concentrations remain below the groundwater protection standard for both alternatives evaluated. The MIGRATE input and output files are provided in Appendix B of this evaluation document. The files titled BASE005.I/O are for the closure-in-place scenario and BASE014.I/O are for the closure-by-removal scenario. The groundwater protection standards were determined pursuant to the 35 Ill. Adm. Code 845 CCR final rules.



8. CONCLUSIONS

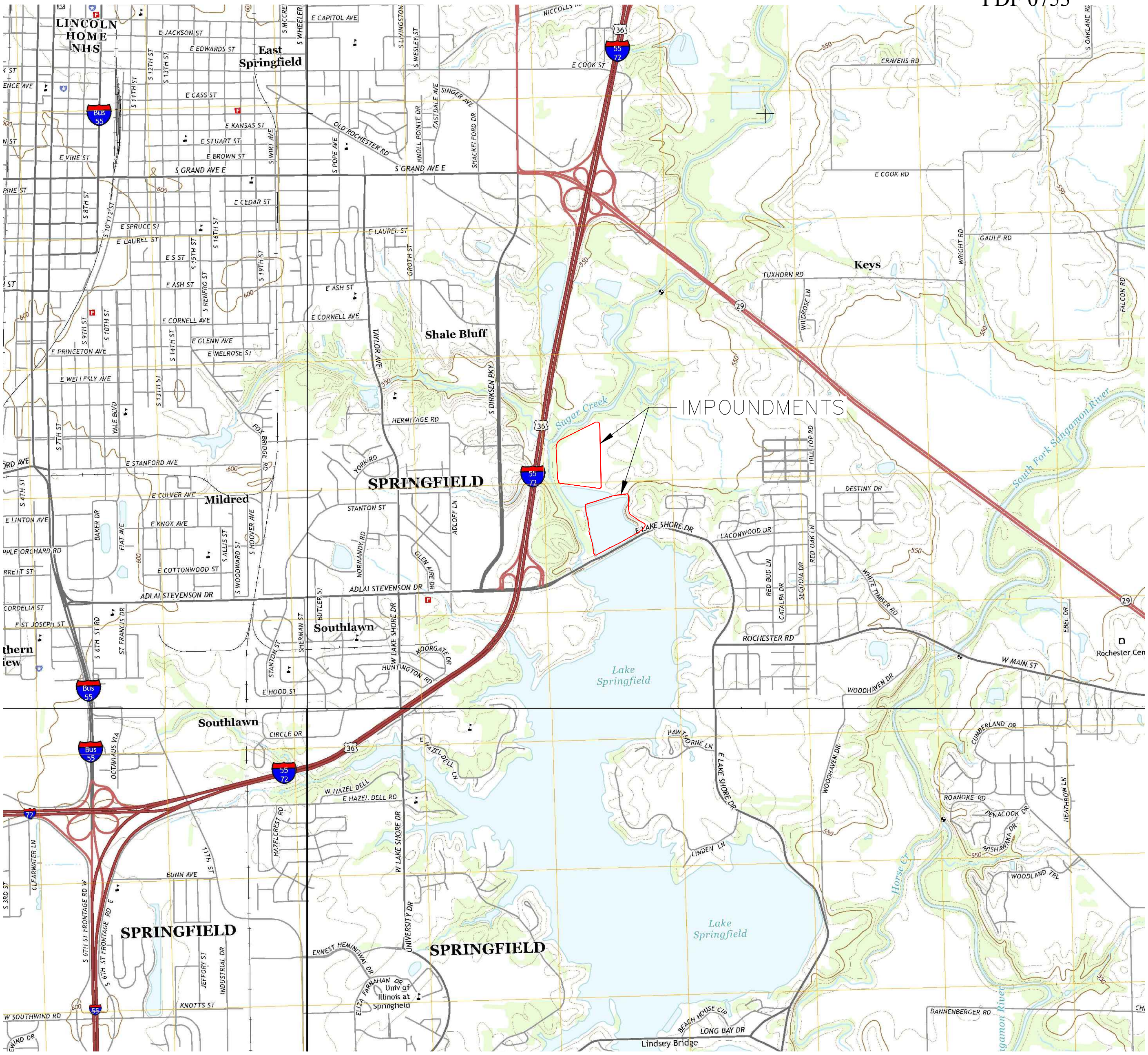
The two-dimensional contaminant transport model MIGRATE has been used to evaluate the effect on groundwater quality as a result of the installation of a final cover system for the Dallman Ash Pond CCR surface impoundment, the “closure-in-place” alternative. Additionally, the contaminant transport modeling effort includes the evaluation of the removal of the CCR material from the CCR surface impoundments, the “closure-by-removal” alternative. The input parameters Darcy velocity, coefficient of diffusion, dispersivity, coefficient of hydrodynamic dispersion, liner leakage and layer thickness were selected to conservatively and most accurately represent the site-specific design and hydrogeologic conditions for both of these closure alternatives. Therefore, this groundwater contaminant transport evaluation is a conservative representation of the expected impact of the CCR surface impoundment on the groundwater at the site.

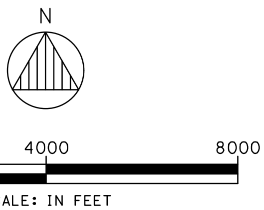
The results of the contaminant transport model simulation for both the closure-in-place alternative and the closure-by-removal demonstrate that the GWPS may be obtained through either minimizing infiltration through CCR material by the placement of a final cover system or through the removal of the CCR material. Both scenarios use total boron as the surrogate leachate parameter.

For the closure-in-place scenario, the GWPS was obtained for total boron within 13 years (2039) following implementation of the final cover system. With the installation of a final cover system, the model demonstrates that leaching of COCs from the CCR material will be reduced or eliminated and that COC concentrations in groundwater will decrease over time.

For the closure-by-removal scenario, the GWPS was obtained for total boron within approximately 7 years (2037) following completion of the CCR removal activities. The removal of the CCR material will result in a reduction and eventual elimination of the leaching of COCs to groundwater. COC concentrations in groundwater will decrease over time.

FIGURES





NOTE:
BACKGROUND IMAGE COURTESY OF
UNITED STATES GEOLOGICAL SURVEY.

ANDREWS ENGINEERING
3300 GINGER CREEK DRIVE
SPRINGFIELD, ILLINOIS 62711-7233
PH (217) 787-2334 WWW.ANDREWS-ENG.COM
PONTIAC, IL • LOMBARD, IL • INDIANAPOLIS, IN • WARRENTON, MO

APPROVED BY: BJH | DESIGNED BY: BJH | DRAWN BY: MPN

SITE LOCATION

PLANS PREPARED FOR

CITY, WATER, LIGHT & POWER

SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: JULY 2021

PROJECT ID: 200387/0026

SHEET NUMBER:

FIGURE 1

LEGEND

- CCR SURFACE IMPOUNDMENT
- ▨ EXISTING MONITORING WELL
- ● TEMPORARY ASSESSMENT WELL

NOTE

IMAGE SOURCE: GOOGLE EARTH PRO, IMAGE DATE JUNE 7, 2016.

NO.	DATE	REVISION DESCRIPTION	BY

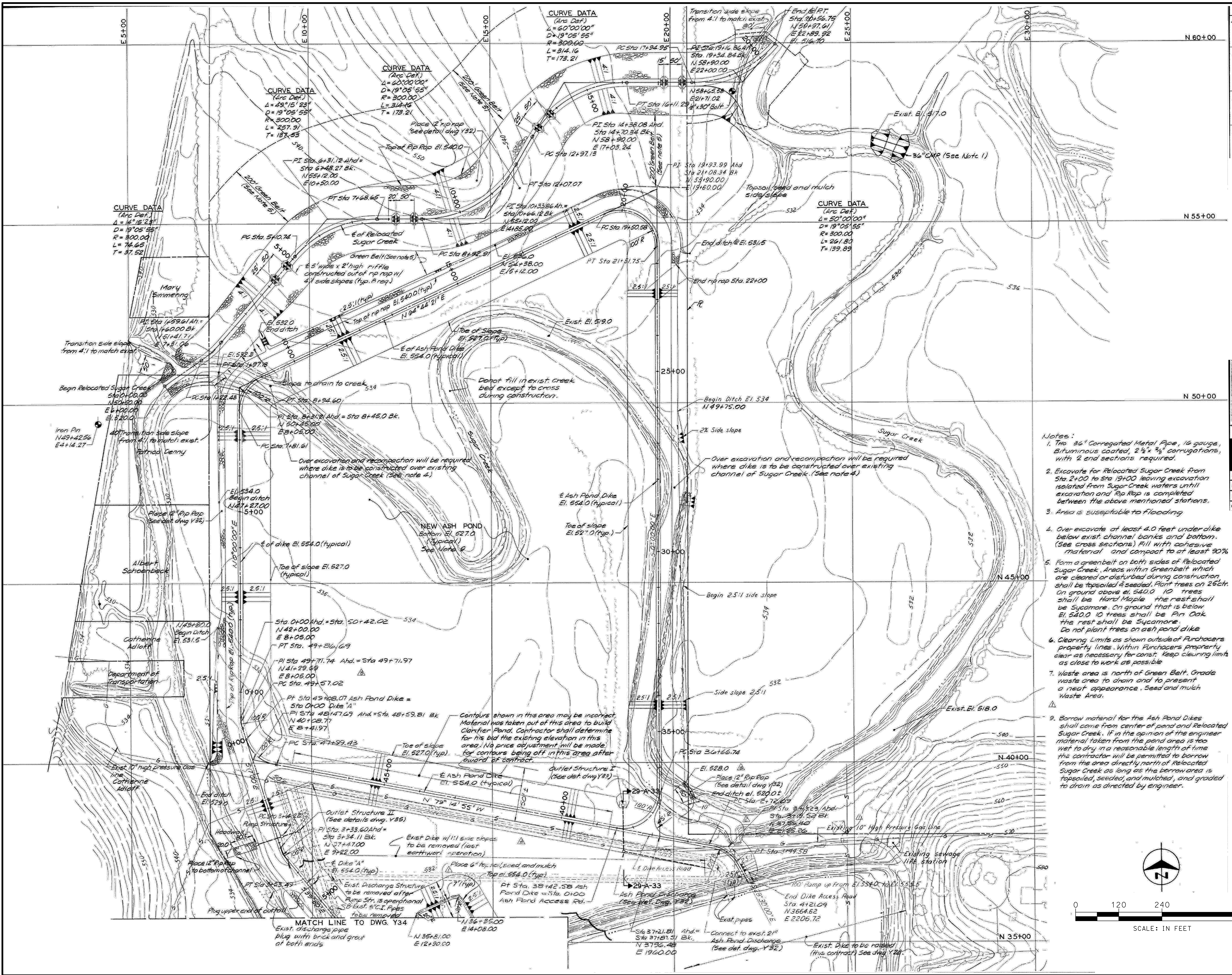
ANDREWS ENGINEERING
3300 GINGER CREEK DRIVE
SPRINGFIELD, ILLINOIS 62711-7233
PH (217) 787-2334 WWW.ANDREWS-ENG.COM
PONTIAC, IL • LOMBARD, IL • INDIANAPOLIS, IN • WARRENTON, MO

APPROVED BY: DG DESIGNED BY: DG DRAWN BY: MPN

GROUNDWATER MONITORING NETWORK

PLANS PREPARED FOR
CITY, WATER, LIGHT AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: JULY 2021
PROJECT ID: 200387/0026
SHEET NUMBER:
FIG. 2



Notes:

1. Two 36" Corregated Metal Pipe, 16 gauge, Bituminous coated, 2½"x ⅔" corrugations, with 2 end sections required.
2. Excavate for Relocated Sugar Creek from Sta. 2+00 to Sta 19+00 leaving excavation isolated from Sugar Creek waters untill excavation and Rip Rap is completed between the above mentioned stations.
3. Area is suseptable to flooding
4. Over excavate at least 4.0 feet under dike below exist. channel banks and bottom. (See cross sections) Fill with cohesive material and compact to at least 90%
5. Form a greenbelt on both sides of Relocated Sugar Creek. Areas within Greenbelt which are cleared or disturbed during construction shall be topsoiled & seeded. Plant trees on 25' ctr. On ground above el. 540.0 10 trees shall be Hard Maple the rest shall be Sycamore. On ground that is below El. 540.0 10 trees shall be Pin Oak the rest shall be Sycamore. Do not plant trees on ash pond dike
6. Clearing Limits as shown outside of Purchacers property lines. Within Purchacers proprerty clear as necessary for const. Keep clearing limits as close to work as possible
7. Waste area is north of Green Belt. Grade waste area to drain and to present a neat appearance. Seed and mulch Waste Area.

△

9. Borrow material for the Ash Pond Dikes shall come from center of pond and Relocated Sugar Creek. If in the opinion of the engineer material taken from the pond area is too wet to dry in a reasonable length of time the contractor will be permitted to borrow from the area directly north of Relocated Sugar Creek as long as the borrow area is topsoiled, seeded, and mulched, and graded to drain as directed by engineer.

NO.	DATE	BY	REVISION
△1	12-7-76	TKP	(M,7) Added 6" topsoil to dike. (L,13) Removed Bench Mark and note 8.
	12-10-76	LNB	ISSUED
△2	4-27-77	MGH	Changed Dike Access Rd. and exist. dike alignments. Removed 300' pipe. Moved exist. pipe
	4-27-77	LNB	ISSUED
△3	5-26-77	DEJ	Revised dike alignment along So. side of Ash Pond.
	5-31-77	LNB	ISSUED
△4	2-1-79	DLM	CONFORMING TO CONSTRUCTION RECORDS

CONTRACT NO. 3333
ASH POND
V.Y. DALLMAN POWER STATION - UNIT 33
SPRINGFIELD, ILLINOIS

GRADING PLAN

Burns & McDonnell
Engineers – Architects – Consultants
KANSAS CITY, MISSOURI

DATE AUG. 13, 1976	DRAWING NO. Y29 REV. 4
DESIGNED LNB	
DETAILED TRP	PROJECT 73-008-1
CHECKED	SHEET OF SHEETS

NO.	DATE	REVISION DESCRIPTION	BY

ANDREWS ENGINEERING
3300 GINGER CREEK DRIVE
SPRINGFIELD, ILLINOIS 62711-7233
PH (217) 787-2334 WWW.ANDREWS-ENG.COM
PONTIAC, IL • LOMBARD, IL • INDIANAPOLIS, IN • WARRENTON, MO

APPROVED BY: BJH
DESIGNED BY: MTH
DRAWN BY: MPN

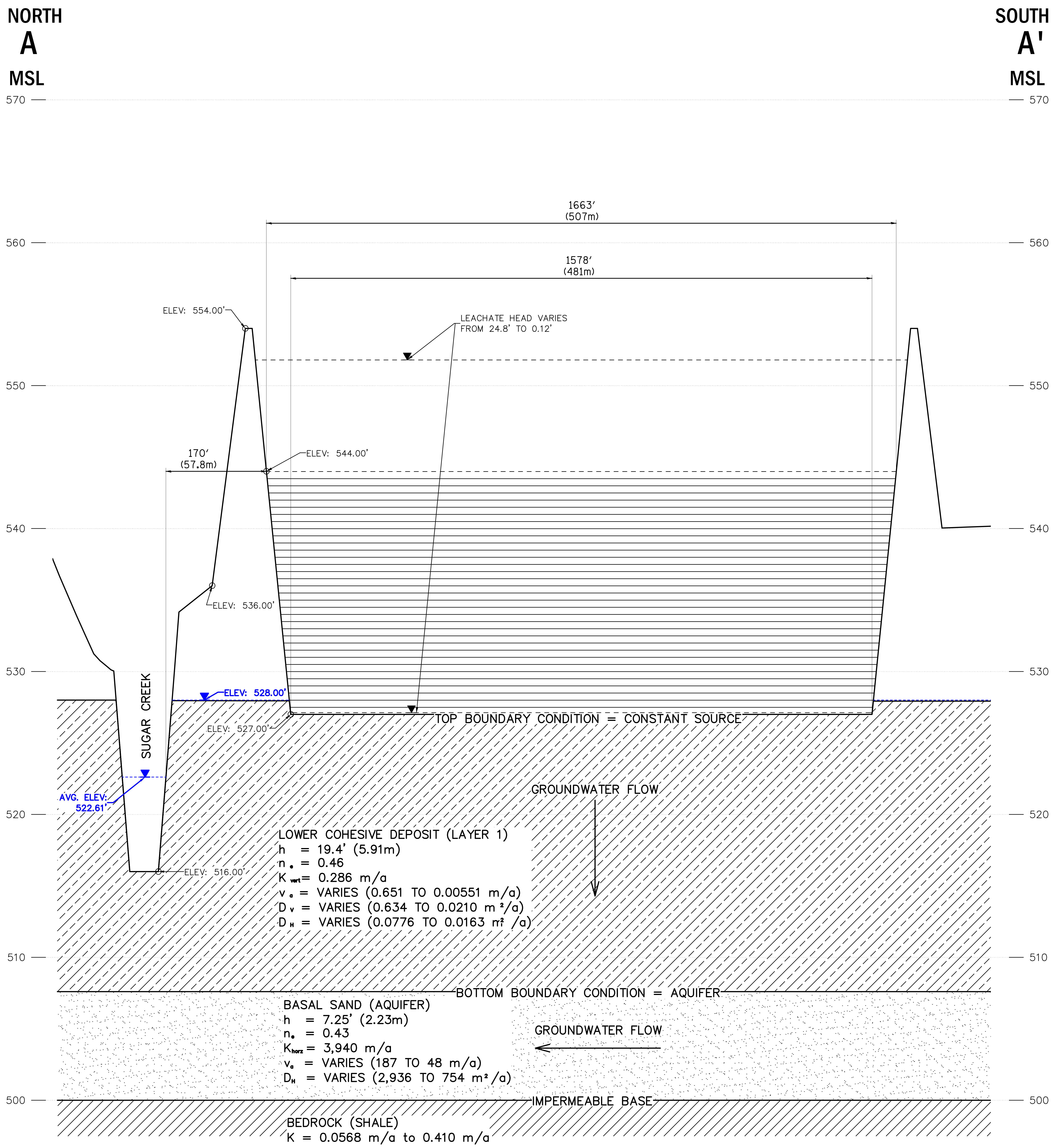
1976 SITE SURVEY

PLANS PREPARED FOR
CITY, WATER, LIGHT, AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: AUGUST 2021
PROJECT ID: 200325/0003
SHEET NUMBER:

FIG. 3

Tab: Layout1 Last Saved: August 23, 2021, by Mike Nguyen Plotted: Monday, August 23, 2021 10:07:43 AM
S:\SX\Springfield CWLP\CWLP Ash Pond\DWG\2021\1974 Site Survey.dwg



SITE MAP
SCALE: AS SHOWN

USGS 05576250 SUGAR CREEK NEAR SPRINGFIELD, IL Latitude 39°46'45", Longitude 89°35'34" NAD83												
00065, Gage height, feet,												
YEAR	Monthly mean in ft (Calculation Period: 2015-04-01 -> 2019-11-30)											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2015				11.013	12.546	17.542	15.499	9.956				14.498
2016			11.267	11.357		10.668	10.664	11.37	9.883	9.884	10.02	
2017				13.68	19.377	10.777	9.907	9.878	9.862	9.893	10.012	
2018			10.506	11.397	10.066	12.779	9.885	10.06	9.978	9.928	10.427	11.943
2019		14.74	14.911	15.704	18.004	15.983	10.691	9.978	11.178	10.884	11.482	
Mean of monthly Gage height		14.74	12.23	12.63	15	13.55	11.33	10.25	10.23	10.15	10.49	13.22
** No Incomplete data have been used for statistical calculation												
Gage Datum, feet above NAVD88												510.44
Average Gage Height, feet												12.165
Sugar Creek Average Surface Water Elevation, feet above NAVD88												522.61

NO.	DATE	REVISION DESCRIPTION	BY

ANDREWS ENGINEERING
3300 GINGER CREEK DRIVE
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APPROVED BY: BJH
DESIGNED BY: MTH
DRAWN BY: MPN

CONCEPTUAL MODEL

PLANS PREPARED FOR
CITY, WATER, LIGHT, AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: AUGUST 2021
PROJECT ID: 200325/0003
SHEET NUMBER:
FIG. 4

Tab: Layout1 Last Saved: August 23, 2021, by Mike Nguyen Plotted: Monday, August 23, 2021 9:35:14 AM
J:\S\Springfield CWLP\CWLP Ash Pond\DWG\2021\Conceptual Model.dwg

APPENDIX A

Hydrologic Evaluation of Landfill Performance (HELP) Output

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


PRECIPITATION DATA FILE:    C:\cwlp\DATA4.D4
TEMPERATURE DATA FILE:      C:\cwlp\DATA7.D7
SOLAR RADIATION DATA FILE:  C:\cwlp\DATA13.D13
EVAPOTRANSPIRATION DATA:    C:\cwlp\DATA11.D11
SOIL AND DESIGN DATA FILE:  C:\cwlp\DATA10.D10
OUTPUT DATA FILE:           C:\cwlp\OUT10.OUT


TIME:  12:58     DATE:  10/13/2021


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

     TITLE:  CWLP DALLMAN ASH POND GEOCOMPOSITE COVER WITH DRAINAGE LAYER

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


     NOTE:  INITIAL MOISTURE CONTENT OF THE LAYERS AND SNOW WATER
              WERE SPECIFIED BY THE USER.


                                 LAYER  1
                                 --------

                   TYPE 1 - VERTICAL PERCOLATION LAYER
                       MATERIAL TEXTURE NUMBER  14
           THICKNESS                  =      6.00   INCHES
           POROSITY                   =      0.4790 VOL/VOL
           FIELD CAPACITY             =      0.3710 VOL/VOL
           WILTING POINT              =      0.2510 VOL/VOL
           INITIAL SOIL WATER CONTENT =      0.3710 VOL/VOL
           EFFECTIVE SAT. HYD. COND.  =  0.249999994000E-04 CM/SEC
         NOTE:  SATURATED HYDRAULIC CONDUCTIVITY IS MULTIPLIED BY  3.00
                  FOR ROOT CHANNELS IN TOP HALF OF EVAPORATIVE ZONE.


                                 LAYER  2
                                 --------

                       TYPE 3 - BARRIER SOIL LINER
                       MATERIAL TEXTURE NUMBER   0
           THICKNESS                  =     30.00   INCHES
           POROSITY                   =      0.4270 VOL/VOL
           FIELD CAPACITY             =      0.4180 VOL/VOL
           WILTING POINT              =      0.3670 VOL/VOL
           INITIAL SOIL WATER CONTENT =      0.4270 VOL/VOL
           EFFECTIVE SAT. HYD. COND.  =  0.999999975000E-05 CM/SEC


                                 LAYER  3
                                 --------

                     TYPE 2 - LATERAL DRAINAGE LAYER
                       MATERIAL TEXTURE NUMBER  20
           THICKNESS                  =      0.20   INCHES
           POROSITY                   =      0.8500 VOL/VOL
           FIELD CAPACITY             =      0.0100 VOL/VOL
```

```
           WILTING POINT              =      0.0050 VOL/VOL
           INITIAL SOIL WATER CONTENT =      0.0100 VOL/VOL
           EFFECTIVE SAT. HYD. COND.  =   10.0000000000     CM/SEC
           SLOPE                      =      3.00   PERCENT
           DRAINAGE LENGTH            =    508.0    FEET


                                 LAYER  4
                                 --------

                     TYPE 4 - FLEXIBLE MEMBRANE LINER
                       MATERIAL TEXTURE NUMBER  36
           THICKNESS                  =      0.04   INCHES
           POROSITY                   =      0.0000 VOL/VOL
           FIELD CAPACITY             =      0.0000 VOL/VOL
           WILTING POINT              =      0.0000 VOL/VOL
           INITIAL SOIL WATER CONTENT =      0.0000 VOL/VOL
           EFFECTIVE SAT. HYD. COND.  =  0.399999993000E-12 CM/SEC
           FML PINHOLE DENSITY        =      1.00   HOLES/ACRE
           FML INSTALLATION DEFECTS   =     15.00   HOLES/ACRE
           FML PLACEMENT QUALITY      =  4 - POOR


                                 LAYER  5
                                 --------

                   TYPE 1 - VERTICAL PERCOLATION LAYER
                       MATERIAL TEXTURE NUMBER  31
           THICKNESS                  =    324.00   INCHES
           POROSITY                   =      0.5780 VOL/VOL
           FIELD CAPACITY             =      0.0760 VOL/VOL
           WILTING POINT              =      0.0250 VOL/VOL
           INITIAL SOIL WATER CONTENT =      0.5780 VOL/VOL
           EFFECTIVE SAT. HYD. COND.  =  0.410000002000E-02 CM/SEC


                                 LAYER  6
                                 --------

                       TYPE 3 - BARRIER SOIL LINER
                       MATERIAL TEXTURE NUMBER   0
           THICKNESS                  =    233.00   INCHES
           POROSITY                   =      0.4610 VOL/VOL
           FIELD CAPACITY             =      0.3600 VOL/VOL
           WILTING POINT              =      0.2030 VOL/VOL
           INITIAL SOIL WATER CONTENT =      0.4610 VOL/VOL
           EFFECTIVE SAT. HYD. COND.  =  0.907000015000E-06 CM/SEC


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

         NOTE:  SCS RUNOFF CURVE NUMBER WAS COMPUTED FROM DEFAULT
                  SOIL DATA BASE USING SOIL TEXTURE #14 WITH A
                  FAIR STAND OF GRASS, A SURFACE SLOPE OF  3.%
                  AND A SLOPE LENGTH OF  508. FEET.

        SCS RUNOFF CURVE NUMBER            =     89.50
        FRACTION OF AREA ALLOWING RUNOFF   =     95.0    PERCENT
        AREA PROJECTED ON HORIZONTAL PLANE =      1.000  ACRES
        EVAPORATIVE ZONE DEPTH             =      6.0    INCHES
        INITIAL WATER IN EVAPORATIVE ZONE  =      2.226  INCHES
        UPPER LIMIT OF EVAPORATIVE STORAGE =      2.874  INCHES
        LOWER LIMIT OF EVAPORATIVE STORAGE =      1.506  INCHES
        INITIAL SNOW WATER                 =      0.000  INCHES
        INITIAL WATER IN LAYER MATERIALS   =    309.723  INCHES
        TOTAL INITIAL WATER                =    309.723  INCHES
        TOTAL SUBSURFACE INFLOW            =      0.00   INCHES/YEAR


                   EVAPOTRANSPIRATION AND WEATHER DATA
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         NOTE:  EVAPOTRANSPIRATION DATA WAS OBTAINED FROM
                  INDIANAPOLIS          INDIANA

             STATION LATITUDE                    =  39.77 DEGREES
             MAXIMUM LEAF AREA INDEX             =   2.00
             START OF GROWING SEASON (JULIAN DATE) =   107
             END OF GROWING SEASON (JULIAN DATE)   =   293
             EVAPORATIVE ZONE DEPTH              =   6.0  INCHES
             AVERAGE ANNUAL WIND SPEED           =   9.60 MPH
             AVERAGE 1ST QUARTER RELATIVE HUMIDITY =  73.00 %
             AVERAGE 2ND QUARTER RELATIVE HUMIDITY =  68.00 %
             AVERAGE 3RD QUARTER RELATIVE HUMIDITY =  74.00 %
             AVERAGE 4TH QUARTER RELATIVE HUMIDITY =  75.00 %


         NOTE:  PRECIPITATION DATA WAS SYNTHETICALLY GENERATED USING
                  COEFFICIENTS FOR    INDIANAPOLIS        INDIANA

                  NORMAL MEAN MONTHLY PRECIPITATION (INCHES)

     JAN/JUL     FEB/AUG     MAR/SEP     APR/OCT     MAY/NOV     JUN/DEC
     -------     -------     -------     -------     -------     -------
       2.65        2.46        3.61        3.68        3.66        3.99
       4.32        3.46        2.74        2.51        3.04        3.00


         NOTE:  TEMPERATURE DATA WAS SYNTHETICALLY GENERATED USING
                  COEFFICIENTS FOR    INDIANAPOLIS        INDIANA

             NORMAL MEAN MONTHLY TEMPERATURE (DEGREES FAHRENHEIT)

     JAN/JUL     FEB/AUG     MAR/SEP     APR/OCT     MAY/NOV     JUN/DEC
     -------     -------     -------     -------     -------     -------
      26.00       29.90       40.00       52.40       62.50       71.60
      75.10       73.20       66.60       54.80       41.80       31.50


         NOTE:  SOLAR RADIATION DATA WAS SYNTHETICALLY GENERATED USING
                  COEFFICIENTS FOR    INDIANAPOLIS        INDIANA
                    AND STATION LATITUDE  =  39.77 DEGREES


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                  MONTHLY TOTALS (IN INCHES) FOR YEAR    1
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                             JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                             ------- ------- ------- ------- ------- -------

PRECIPITATION                 1.32    2.64    2.71    2.65    2.80    4.63
                              2.40    4.22    3.32    2.89    2.62    3.56

RUNOFF                        0.679   0.040   0.013   0.111   0.003   0.139
                              0.001   0.396   0.460   0.043   0.023   1.432

EVAPOTRANSPIRATION            0.170   0.970   2.135   2.038   1.990   3.799
                              2.411   2.943   1.523   2.006   1.316   0.449

PERCOLATION/LEAKAGE THROUGH   0.0000  1.6263  1.5312  0.7280  0.3825  1.0474
  LAYER  2                    0.0000  0.6822  0.7129  1.3117  1.0294  1.1144

LATERAL DRAINAGE COLLECTED    0.0000  1.5251  1.6080  0.7227  0.3312  1.0870
  FROM LAYER  3               0.0000  0.6769  0.6106  1.3987  1.0198  1.1071

PERCOLATION/LEAKAGE THROUGH   0.0000  0.0120  0.0124  0.0054  0.0030  0.0087
  LAYER  4                    0.0000  0.0054  0.0047  0.0106  0.0080  0.0090

PERCOLATION/LEAKAGE THROUGH   2.2771  2.0408  2.2349  2.1464  2.2012  2.1137
  LAYER  6                    2.1671  2.1498  2.0640  2.1159  2.0315  2.0825

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                 MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
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AVERAGE DAILY HEAD ON          0.000   0.279   0.161   0.176   0.042   0.136
  TOP OF LAYER  2              0.000   0.160   0.208   0.228   0.199   0.134

STD. DEVIATION OF DAILY        0.000   0.670   0.410   0.649   0.162   0.392
  HEAD ON TOP OF LAYER  2      0.000   0.690   0.842   0.646   0.619   0.427

AVERAGE DAILY HEAD ON          0.000   0.016   0.016   0.007   0.003   0.011
  TOP OF LAYER  4              0.000   0.007   0.006   0.013   0.010   0.011

STD. DEVIATION OF DAILY        0.000   0.028   0.029   0.023   0.010   0.021
  HEAD ON TOP OF LAYER  4      0.000   0.019   0.019   0.029   0.025   0.021

AVERAGE DAILY HEAD ON        321.747 317.454 311.457 307.345 303.254 299.097
  TOP OF LAYER  6            294.940 290.728 286.593 282.481 278.401 274.338

STD. DEVIATION OF DAILY        1.334   1.191   1.702   1.162   1.231   1.203
  HEAD ON TOP OF LAYER  6      1.228   1.233   1.188   1.215   1.179   1.206

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                        ANNUAL TOTALS FOR YEAR    1
-------------------------------------------------------------------------------
                                         INCHES         CU. FEET     PERCENT
                                        --------       ----------    -------
  PRECIPITATION                          35.76         129808.797    100.00

  RUNOFF                                  3.339         12120.322      9.34

  EVAPOTRANSPIRATION                     21.748         78946.125     60.82

  PERC./LEAKAGE THROUGH LAYER  2         10.166069      36902.832     28.43

  AVG. HEAD ON TOP OF LAYER  2            0.1437

  DRAINAGE COLLECTED FROM LAYER  3       10.0870        36615.777     28.21

  PERC./LEAKAGE THROUGH LAYER  4          0.079078        287.055      0.22

  AVG. HEAD ON TOP OF LAYER  4            0.0083

  PERC./LEAKAGE THROUGH LAYER  6         25.624743      93017.812     71.66

  AVG. HEAD ON TOP OF LAYER  6          297.3196

  CHANGE IN WATER STORAGE               -25.039        -90891.242    -70.02

  SOIL WATER AT START OF YEAR           316.659       1149471.870

  SOIL WATER AT END OF YEAR             291.620       1058580.750

  SNOW WATER AT START OF YEAR             0.000             0.000      0.00

  SNOW WATER AT END OF YEAR               0.000             0.000      0.00

  ANNUAL WATER BUDGET BALANCE             0.0000            0.000      0.00

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                  MONTHLY TOTALS (IN INCHES) FOR YEAR    2
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                             JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                             ------- ------- ------- ------- ------- -------

PRECIPITATION                 1.85    3.69    3.92    7.52    4.26    2.79
                              7.30    0.77    6.09    1.20    1.47    2.73

RUNOFF                        0.370   1.773   5.401   0.529   0.070   0.026
                              1.608   0.000   1.343   0.000   0.000   0.141

EVAPOTRANSPIRATION            0.495   0.462   1.006   3.854   3.602   2.517
                              3.033   1.568   1.825   1.013   1.176   0.590
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PERCOLATION/LEAKAGE THROUGH      0.0083  0.1534  0.8854  2.4086  1.4461  0.2445
  LAYER  2                       1.8530  0.0131  2.6522  0.1523  0.0858  0.0000

LATERAL DRAINAGE COLLECTED       0.0081  0.1515  0.8775  2.2936  1.5315  0.2424
  FROM LAYER  3                  1.7900  0.0625  2.6334  0.1506  0.0848  0.0000

PERCOLATION/LEAKAGE THROUGH      0.0001  0.0018  0.0079  0.0177  0.0121  0.0021
  LAYER  4                       0.0130  0.0006  0.0187  0.0016  0.0011  0.0000

PERCOLATION/LEAKAGE THROUGH      2.0657  1.8515  2.0341  1.9528  2.0018  1.9218
  LAYER  6                       1.9701  1.9542  1.8761  1.9232  1.8464  1.8927

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                   MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
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AVERAGE DAILY HEAD ON            0.000   0.006   0.140   0.629   0.174   0.021
  TOP OF LAYER  2                0.495   0.001   0.864   0.010   0.005   0.000

STD. DEVIATION OF DAILY          0.000   0.015   0.556   1.374   0.360   0.086
  HEAD ON TOP OF LAYER  2        1.205   0.003   1.695   0.049   0.019   0.000

AVERAGE DAILY HEAD ON            0.000   0.002   0.008   0.023   0.015   0.002
  TOP OF LAYER  4                0.017   0.001   0.026   0.001   0.001   0.000

STD. DEVIATION OF DAILY          0.000   0.004   0.017   0.034   0.025   0.007
  HEAD ON TOP OF LAYER  4        0.033   0.003   0.042   0.005   0.002   0.000

AVERAGE DAILY HEAD ON          270.253 266.391 262.551 258.605 254.687 250.809
  TOP OF LAYER  6              246.964 243.082 239.297 235.535 231.809 228.111

STD. DEVIATION OF DAILY          1.192   1.078   1.186   1.128   1.168   1.117
  HEAD ON TOP OF LAYER  6        1.143   1.132   1.096   1.120   1.076   1.096

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                          ANNUAL TOTALS FOR YEAR    2
-------------------------------------------------------------------------------
                                           INCHES          CU. FEET     PERCENT
                                          --------        ----------    -------
  PRECIPITATION                             43.59         158231.703    100.00

  RUNOFF                                    11.261         40878.320     25.83

  EVAPOTRANSPIRATION                        21.141         76740.562     48.50

  PERC./LEAKAGE THROUGH LAYER  2             9.902669      35946.687     22.72

  AVG. HEAD ON TOP OF LAYER  2               0.1955

  DRAINAGE COLLECTED FROM LAYER  3           9.8259        35667.937     22.54

  PERC./LEAKAGE THROUGH LAYER  4             0.076790        278.747      0.18

  AVG. HEAD ON TOP OF LAYER  4               0.0081

  PERC./LEAKAGE THROUGH LAYER  6            23.290606      84544.898     53.43

  AVG. HEAD ON TOP OF LAYER  6             249.0078

  CHANGE IN WATER STORAGE                  -21.928        -79600.039    -50.31

  SOIL WATER AT START OF YEAR              291.620       1058580.750

  SOIL WATER AT END OF YEAR                267.958        972687.000

  SNOW WATER AT START OF YEAR                0.000             0.000      0.00

  SNOW WATER AT END OF YEAR                  1.734          6293.645      3.98

  ANNUAL WATER BUDGET BALANCE                0.0000            0.021      0.00

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                   MONTHLY TOTALS (IN INCHES) FOR YEAR    3
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                                JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                                ------- ------- ------- ------- ------- -------

PRECIPITATION                     5.11    1.50    2.60    2.14    8.91    9.10
                                  5.25    2.05    3.42    1.52    1.65    3.11

RUNOFF                            5.170   1.754   1.605   0.001   0.852   3.241
                                  0.721   0.015   0.217   0.001   0.000   1.722

EVAPOTRANSPIRATION                0.448   0.251   1.033   2.168   4.845   5.160
                                  2.944   2.357   2.604   0.553   1.209   0.382

PERCOLATION/LEAKAGE THROUGH       0.1008  0.1376  1.0871  0.0000  2.8541  1.0467
  LAYER  2                        1.2779  0.0927  0.6086  0.5316  0.3084  0.0055

LATERAL DRAINAGE COLLECTED        0.0883  0.1386  1.0871  0.0000  2.8270  1.0443
  FROM LAYER  3                   1.2683  0.0919  0.6034  0.5276  0.3052  0.0053

PERCOLATION/LEAKAGE THROUGH       0.0011  0.0017  0.0085  0.0000  0.0215  0.0080
  LAYER  4                        0.0096  0.0009  0.0052  0.0040  0.0032  0.0001

PERCOLATION/LEAKAGE THROUGH       1.8774  1.6827  1.8486  1.7747  1.8192  1.7465
  LAYER  6                        1.7903  1.7758  1.7048  1.7476  1.6778  1.7199

-------------------------------------------------------------------------------
                   MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
-------------------------------------------------------------------------------


AVERAGE DAILY HEAD ON             0.003   0.006   0.212   0.000   0.540   0.298
  TOP OF LAYER  2                 0.340   0.006   0.102   0.045   0.031   0.000

STD. DEVIATION OF DAILY           0.011   0.014   0.672   0.000   1.097   0.971
  HEAD ON TOP OF LAYER  2         1.142   0.035   0.491   0.178   0.101   0.001

AVERAGE DAILY HEAD ON             0.001   0.001   0.010   0.000   0.027   0.010
  TOP OF LAYER  4                 0.012   0.001   0.006   0.005   0.003   0.000

STD. DEVIATION OF DAILY           0.002   0.003   0.026   0.000   0.035   0.025
  HEAD ON TOP OF LAYER  4         0.029   0.004   0.017   0.018   0.007   0.000

AVERAGE DAILY HEAD ON           224.382 220.856 217.356 213.766 210.202 206.665
  TOP OF LAYER  6               203.161 199.627 196.180 192.759 189.365 185.998

STD. DEVIATION OF DAILY           1.091   0.987   1.074   1.031   1.064   1.012
  HEAD ON TOP OF LAYER  6         1.039   1.030   0.990   1.013   0.978   0.999

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                          ANNUAL TOTALS FOR YEAR    3
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                                           INCHES          CU. FEET     PERCENT
                                          --------        ----------    -------
  PRECIPITATION                             46.36         168286.797    100.00

  RUNOFF                                    15.301         55542.309     33.00

  EVAPOTRANSPIRATION                        23.952         86946.695     51.67

  PERC./LEAKAGE THROUGH LAYER  2             8.050941      29224.914     17.37

  AVG. HEAD ON TOP OF LAYER  2               0.1321

  DRAINAGE COLLECTED FROM LAYER  3           7.9871        28993.070     17.23

  PERC./LEAKAGE THROUGH LAYER  4             0.063869        231.845      0.14

  AVG. HEAD ON TOP OF LAYER  4               0.0065

  PERC./LEAKAGE THROUGH LAYER  6            21.165426      76830.500     45.65

  AVG. HEAD ON TOP OF LAYER  6             205.0266
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  CHANGE IN WATER STORAGE                  -22.046        -80025.727    -47.55

  SOIL WATER AT START OF YEAR              267.958        972687.000

  SOIL WATER AT END OF YEAR                247.291        897664.812

  SNOW WATER AT START OF YEAR                1.734          6293.645      3.74

  SNOW WATER AT END OF YEAR                  0.355          1290.101      0.77

  ANNUAL WATER BUDGET BALANCE                0.0000           -0.048      0.00

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                   MONTHLY TOTALS (IN INCHES) FOR YEAR    4
-------------------------------------------------------------------------------

                                JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                                ------- ------- ------- ------- ------- -------

PRECIPITATION                     2.28    2.63    2.74    2.67    4.28    4.32
                                  4.99    3.83    2.28    1.16    1.47    2.15

RUNOFF                            2.135   1.422   0.012   0.017   0.116   0.130
                                  0.474   0.182   0.048   0.003   0.000   1.287

EVAPOTRANSPIRATION                0.346   0.559   1.704   2.322   3.457   3.451
                                  3.390   3.160   1.343   1.077   1.034   0.402

PERCOLATION/LEAKAGE THROUGH       0.1074  1.0908  1.6273  0.4104  0.4739  0.6727
  LAYER  2                        1.3389  0.6440  0.0000  1.0371  0.0000  0.0000

LATERAL DRAINAGE COLLECTED        0.1028  0.9945  1.7052  0.4073  0.4702  0.6676
  FROM LAYER  3                   1.3071  0.6612  0.0000  1.0291  0.0000  0.0000

PERCOLATION/LEAKAGE THROUGH       0.0012  0.0082  0.0137  0.0031  0.0037  0.0051
  LAYER  4                        0.0095  0.0052  0.0000  0.0080  0.0000  0.0000

PERCOLATION/LEAKAGE THROUGH       1.7060  1.5834  1.6793  1.6121  1.6526  1.5865
  LAYER  6                        1.6263  1.6131  1.5487  1.5875  1.5241  1.5623

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                   MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
-------------------------------------------------------------------------------


AVERAGE DAILY HEAD ON             0.004   0.249   0.204   0.046   0.084   0.111
  TOP OF LAYER  2                 0.275   0.084   0.000   0.134   0.000   0.000

STD. DEVIATION OF DAILY           0.013   0.719   0.489   0.236   0.426   0.411
  HEAD ON TOP OF LAYER  2         0.813   0.350   0.000   0.375   0.000   0.000

AVERAGE DAILY HEAD ON             0.001   0.010   0.016   0.004   0.005   0.007
  TOP OF LAYER  4                 0.013   0.006   0.000   0.010   0.000   0.000

STD. DEVIATION OF DAILY           0.003   0.023   0.025   0.015   0.016   0.019
  HEAD ON TOP OF LAYER  4         0.029   0.017   0.000   0.023   0.000   0.000

AVERAGE DAILY HEAD ON           182.604 179.342 176.101 172.837 169.602 166.390
  TOP OF LAYER  6               163.205 159.993 156.860 153.750 150.667 147.608

STD. DEVIATION OF DAILY           0.996   0.926   0.973   0.935   0.958   0.922
  HEAD ON TOP OF LAYER  6         0.948   0.938   0.899   0.926   0.884   0.909

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                          ANNUAL TOTALS FOR YEAR    4
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                                           INCHES          CU. FEET     PERCENT
                                          --------        ----------    -------
  PRECIPITATION                             34.80         126324.008    100.00
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  RUNOFF                                     5.824         21141.020     16.74

  EVAPOTRANSPIRATION                        22.245         80749.789     63.92

  PERC./LEAKAGE THROUGH LAYER  2             7.402666      26871.678     21.27

  AVG. HEAD ON TOP OF LAYER  2               0.0992

  DRAINAGE COLLECTED FROM LAYER  3           7.3449        26661.922     21.11

  PERC./LEAKAGE THROUGH LAYER  4             0.057784        209.755      0.17

  AVG. HEAD ON TOP OF LAYER  4               0.0060

  PERC./LEAKAGE THROUGH LAYER  6            19.281738      69992.711     55.41

  AVG. HEAD ON TOP OF LAYER  6             164.9134

  CHANGE IN WATER STORAGE                  -19.896        -72221.555    -57.17

  SOIL WATER AT START OF YEAR              247.291        897664.812

  SOIL WATER AT END OF YEAR                227.750        826733.375

  SNOW WATER AT START OF YEAR                0.355          1290.101      1.02

  SNOW WATER AT END OF YEAR                  0.000             0.000      0.00

  ANNUAL WATER BUDGET BALANCE                0.0000            0.125      0.00

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                   MONTHLY TOTALS (IN INCHES) FOR YEAR    5
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                                JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                                ------- ------- ------- ------- ------- -------

PRECIPITATION                     3.86    3.48    3.37    3.10    1.84    4.56
                                  5.56    2.73    2.99    1.93    2.30    2.09

RUNOFF                            3.076   2.781   0.826   0.092   0.030   0.133
                                  0.355   0.115   0.794   0.001   0.000   0.003

EVAPOTRANSPIRATION                0.380   0.313   1.604   1.741   1.912   2.679
                                  4.178   2.497   1.560   1.267   1.436   0.850

PERCOLATION/LEAKAGE THROUGH       0.0400  0.1946  1.9154  1.3878  0.2505  1.0827
  LAYER  2                        1.1220  0.6185  0.7065  0.1170  1.1040  0.7792

LATERAL DRAINAGE COLLECTED        0.0395  0.1922  1.9013  1.3778  0.2485  1.0741
  FROM LAYER  3                   1.0206  0.7066  0.7012  0.1158  1.0943  0.7593

PERCOLATION/LEAKAGE THROUGH       0.0005  0.0023  0.0141  0.0101  0.0020  0.0086
  LAYER  4                        0.0081  0.0052  0.0053  0.0013  0.0096  0.0068

PERCOLATION/LEAKAGE THROUGH       1.5496  1.3889  1.5258  1.4648  1.5015  1.4415
  LAYER  6                        1.4777  1.4657  1.4071  1.4424  1.3847  1.4195

-------------------------------------------------------------------------------
                   MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
-------------------------------------------------------------------------------


AVERAGE DAILY HEAD ON             0.001   0.008   0.407   0.336   0.027   0.128
  TOP OF LAYER  2                 0.183   0.136   0.230   0.008   0.143   0.061

STD. DEVIATION OF DAILY           0.006   0.018   0.958   0.940   0.147   0.351
  HEAD ON TOP OF LAYER  2         0.562   0.544   0.868   0.032   0.357   0.191

AVERAGE DAILY HEAD ON             0.000   0.002   0.018   0.014   0.002   0.011
  TOP OF LAYER  4                 0.010   0.007   0.007   0.001   0.011   0.007

STD. DEVIATION OF DAILY           0.002   0.004   0.035   0.033   0.010   0.022
  HEAD ON TOP OF LAYER  4         0.021   0.023   0.022   0.003   0.018   0.017
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AVERAGE DAILY HEAD ON          144.524 141.609 138.716 135.745 132.805 129.885
  TOP OF LAYER  6              126.989 124.070 121.223 118.398 115.592 112.810

STD. DEVIATION OF DAILY          0.899   0.814   0.887   0.855   0.874   0.838
  HEAD ON TOP OF LAYER  6        0.860   0.851   0.818   0.840   0.808   0.825

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                         ANNUAL TOTALS FOR YEAR    5
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                                     INCHES          CU. FEET      PERCENT
                                    --------        ----------     -------
  PRECIPITATION                       37.81         137250.250     100.00

  RUNOFF                               8.207         29790.807      21.71

  EVAPOTRANSPIRATION                  20.417         74114.805      54.00

  PERC./LEAKAGE THROUGH LAYER  2       9.318262      33825.293      24.64

  AVG. HEAD ON TOP OF LAYER  2         0.1390

  DRAINAGE COLLECTED FROM LAYER  3     9.2312        33509.437      24.41

  PERC./LEAKAGE THROUGH LAYER  4       0.073904        268.270       0.20

  AVG. HEAD ON TOP OF LAYER  4         0.0075

  PERC./LEAKAGE THROUGH LAYER  6      17.469151      63413.016      46.20

  AVG. HEAD ON TOP OF LAYER  6       128.5306

  CHANGE IN WATER STORAGE            -17.515        -63577.730     -46.32

  SOIL WATER AT START OF YEAR        227.750        826733.375

  SOIL WATER AT END OF YEAR          210.236        763155.625

  SNOW WATER AT START OF YEAR          0.000             0.000       0.00

  SNOW WATER AT END OF YEAR            0.000             0.000       0.00

  ANNUAL WATER BUDGET BALANCE          0.0000           -0.083       0.00

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                  MONTHLY TOTALS (IN INCHES) FOR YEAR    6
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                                JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
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PRECIPITATION                    1.39    3.16    2.39    6.66    4.93    2.70
                                 8.66    0.87    2.47    3.54    2.87    2.72

RUNOFF                           0.025   2.786   0.221   0.103   0.332   0.155
                                 1.501   0.000   0.004   0.681   0.790   0.457

EVAPOTRANSPIRATION               0.586   0.240   1.682   4.015   3.971   2.227
                                 4.674   1.241   2.219   1.360   0.784   0.651

PERCOLATION/LEAKAGE THROUGH      0.3405  0.0765  1.3688  2.3618  0.9892  0.4703
  LAYER  2                       2.1586  0.0000  0.2463  1.2323  0.1858  2.0281

LATERAL DRAINAGE COLLECTED       0.3505  0.0687  1.3616  2.3466  0.9807  0.4673
  FROM LAYER  3                  2.1425  0.0005  0.2441  1.2231  0.1384  2.0592

PERCOLATION/LEAKAGE THROUGH      0.0032  0.0009  0.0116  0.0179  0.0077  0.0038
  LAYER  4                       0.0155  0.0000  0.0023  0.0092  0.0011  0.0152

PERCOLATION/LEAKAGE THROUGH      1.4079  1.2619  1.3863  1.3309  1.3642  1.3097
  LAYER  6                       1.3426  1.3317  1.2785  1.3106  1.2582  1.2897



RUNOFF                           1.249   3.109   1.660   0.001   0.000   0.551
                                 0.314   0.066   0.935   0.077   1.770   0.137

EVAPOTRANSPIRATION               0.218   0.396   1.492   2.051   1.453   3.425
                                 3.753   1.243   1.915   1.715   1.221   0.812

PERCOLATION/LEAKAGE THROUGH      0.0000  0.1794  0.6023  0.1606  0.0945  0.6796
  LAYER  2                       0.7281  0.4793  0.7002  1.8078  2.2515  0.8742

LATERAL DRAINAGE COLLECTED       0.0000  0.1773  0.5973  0.1592  0.0936  0.6746
  FROM LAYER  3                  0.7228  0.4757  0.6950  1.7936  2.2354  0.8675

PERCOLATION/LEAKAGE THROUGH      0.0000  0.0021  0.0050  0.0014  0.0009  0.0050
  LAYER  4                       0.0052  0.0036  0.0051  0.0139  0.0164  0.0067

PERCOLATION/LEAKAGE THROUGH      1.2793  1.1466  1.1682  1.0051  1.0052  0.9716
  LAYER  6                       1.0019  0.9992  0.9639  0.9925  0.9567  0.9844

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                  MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
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AVERAGE DAILY HEAD ON            0.000   0.007   0.134   0.017   0.008   0.207
  TOP OF LAYER  2                0.138   0.057   0.225   0.328   0.760   0.214

STD. DEVIATION OF DAILY          0.000   0.018   0.579   0.092   0.044   0.835
  HEAD ON TOP OF LAYER  2        0.533   0.224   0.859   0.723   1.668   0.837

AVERAGE DAILY HEAD ON            0.000   0.002   0.006   0.002   0.001   0.007
  TOP OF LAYER  4                0.007   0.005   0.007   0.017   0.022   0.008

STD. DEVIATION OF DAILY          0.000   0.004   0.017   0.007   0.004   0.021
  HEAD ON TOP OF LAYER  4        0.020   0.016   0.022   0.028   0.039   0.022

AVERAGE DAILY HEAD ON           78.666  76.264  51.593  20.037  11.898  11.583
  TOP OF LAYER  6               11.081  10.422   9.652   8.787   7.842   6.825

STD. DEVIATION OF DAILY          0.743   0.668  15.322   8.626   0.063   0.120
  HEAD ON TOP OF LAYER  6        0.173   0.214   0.237   0.270   0.283   0.312

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                         ANNUAL TOTALS FOR YEAR    7
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                                     INCHES          CU. FEET      PERCENT
                                    --------        ----------     -------
  PRECIPITATION                       37.65         136669.500     100.00

  RUNOFF                               9.869         35824.977      26.21

  EVAPOTRANSPIRATION                  19.695         71493.687      52.31

  PERC./LEAKAGE THROUGH LAYER  2       8.557407      31063.389      22.73

  AVG. HEAD ON TOP OF LAYER  2         0.1746

  DRAINAGE COLLECTED FROM LAYER  3     8.4921        30826.391      22.56

  PERC./LEAKAGE THROUGH LAYER  4       0.065288        236.996       0.17

  AVG. HEAD ON TOP OF LAYER  4         0.0069

  PERC./LEAKAGE THROUGH LAYER  6      12.474615      45282.852      33.13

  AVG. HEAD ON TOP OF LAYER  6        25.3876

  CHANGE IN WATER STORAGE            -12.881        -46758.352     -34.21

  SOIL WATER AT START OF YEAR        194.636        706529.437

  SOIL WATER AT END OF YEAR          181.755        659771.125

  SNOW WATER AT START OF YEAR          0.000             0.000       0.00

  SNOW WATER AT END OF YEAR            0.000             0.000       0.00

  ANNUAL WATER BUDGET BALANCE          0.0000           -0.052       0.00
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                  MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
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AVERAGE DAILY HEAD ON            0.029   0.003   0.219   0.387   0.159   0.077
  TOP OF LAYER  2                0.581   0.000   0.017   0.299   0.046   0.465

STD. DEVIATION OF DAILY          0.109   0.010   0.592   0.804   0.509   0.307
  HEAD ON TOP OF LAYER  2        1.280   0.000   0.061   0.989   0.254   1.333

AVERAGE DAILY HEAD ON            0.003   0.001   0.013   0.023   0.009   0.005
  TOP OF LAYER  4                0.021   0.000   0.002   0.012   0.001   0.020

STD. DEVIATION OF DAILY          0.010   0.002   0.022   0.034   0.022   0.014
  HEAD ON TOP OF LAYER  4        0.035   0.000   0.007   0.028   0.008   0.037

AVERAGE DAILY HEAD ON          110.003 107.358 104.728 102.031  99.358  96.706
  TOP OF LAYER  6               94.078  91.429  88.845  86.279  83.736  81.209

STD. DEVIATION OF DAILY          0.820   0.735   0.809   0.775   0.793   0.761
  HEAD ON TOP OF LAYER  6        0.780   0.773   0.742   0.762   0.731   0.751

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                         ANNUAL TOTALS FOR YEAR    6
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                                     INCHES          CU. FEET      PERCENT
                                    --------        ----------     -------
  PRECIPITATION                       42.36         153766.781     100.00

  RUNOFF                               7.056         25612.414      16.66

  EVAPOTRANSPIRATION                  23.649         85844.070      55.83

  PERC./LEAKAGE THROUGH LAYER  2      11.458325      41593.723      27.05

  AVG. HEAD ON TOP OF LAYER  2         0.1902

  DRAINAGE COLLECTED FROM LAYER  3    11.3831        41320.656      26.87

  PERC./LEAKAGE THROUGH LAYER  4       0.088339        320.671       0.21

  AVG. HEAD ON TOP OF LAYER  4         0.0092

  PERC./LEAKAGE THROUGH LAYER  6      15.872145      57615.887      37.47

  AVG. HEAD ON TOP OF LAYER  6        95.4799

  CHANGE IN WATER STORAGE            -15.600        -56626.195     -36.83

  SOIL WATER AT START OF YEAR        210.236        763155.625

  SOIL WATER AT END OF YEAR          194.636        706529.437

  SNOW WATER AT START OF YEAR          0.000             0.000       0.00

  SNOW WATER AT END OF YEAR            0.000             0.000       0.00

  ANNUAL WATER BUDGET BALANCE          0.0000           -0.042       0.00

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                  MONTHLY TOTALS (IN INCHES) FOR YEAR    7
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                                JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                                ------- ------- ------- ------- ------- -------

PRECIPITATION                    3.85    1.60    3.34    1.62    1.73    4.24
                                 5.44    1.37    3.58    4.16    5.03    1.69



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                  MONTHLY TOTALS (IN INCHES) FOR YEAR    8
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                                JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                                ------- ------- ------- ------- ------- -------

PRECIPITATION                    1.42    4.45    4.36    1.15    3.56    2.85
                                 6.28    2.52    1.44    3.86    3.46    3.18

RUNOFF                           0.000   2.799   0.540   0.000   0.021   0.160
                                 1.796   0.006   0.012   0.046   0.158   1.558

EVAPOTRANSPIRATION               1.077   0.765   2.330   1.389   3.004   2.280
                                 2.086   2.082   2.029   1.837   1.163   0.427

PERCOLATION/LEAKAGE THROUGH      0.0000  1.1590  1.6637  0.0000  0.6774  0.4007
  LAYER  2                       1.8037  0.2981  0.1413  1.3339  2.1974  0.5940

LATERAL DRAINAGE COLLECTED       0.0000  1.1482  1.6533  0.0000  0.6722  0.3978
  FROM LAYER  3                  1.6987  0.3640  0.1637  1.2716  2.2329  0.5894

PERCOLATION/LEAKAGE THROUGH      0.0000  0.0090  0.0123  0.0000  0.0052  0.0029
  LAYER  4                       0.0119  0.0033  0.0016  0.0099  0.0169  0.0046

PERCOLATION/LEAKAGE THROUGH      0.9799  0.9125  0.9707  0.9346  0.9607  0.5062
  LAYER  6                       0.2940  0.2788  0.2569  0.2549  0.2369  0.2317

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                  MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
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AVERAGE DAILY HEAD ON            0.000   0.218   0.436   0.000   0.079   0.094
  TOP OF LAYER  2                0.488   0.025   0.012   0.244   0.455   0.073

STD. DEVIATION OF DAILY          0.000   0.636   1.237   0.000   0.289   0.505
  HEAD ON TOP OF LAYER  2        1.287   0.078   0.052   0.652   1.068   0.286

AVERAGE DAILY HEAD ON            0.000   0.012   0.016   0.000   0.006   0.004
  TOP OF LAYER  4                0.016   0.004   0.002   0.012   0.022   0.006

STD. DEVIATION OF DAILY          0.000   0.023   0.032   0.000   0.019   0.016
  HEAD ON TOP OF LAYER  4        0.036   0.009   0.005   0.025   0.036   0.019

AVERAGE DAILY HEAD ON            5.731   4.627   3.483   2.283   1.053   0.073
  TOP OF LAYER  6                0.002   0.002   0.002   0.002   0.002   0.002

STD. DEVIATION OF DAILY          0.329   0.319   0.352   0.352   0.370   0.122
  HEAD ON TOP OF LAYER  6        0.000   0.000   0.000   0.000   0.000   0.000

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                         ANNUAL TOTALS FOR YEAR    8
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                                     INCHES          CU. FEET      PERCENT
                                    --------        ----------     -------
  PRECIPITATION                       38.53         139863.891     100.00

  RUNOFF                               7.094         25752.891      18.41

  EVAPOTRANSPIRATION                  20.469         74301.789      53.12

  PERC./LEAKAGE THROUGH LAYER  2      10.269282      37277.496      26.65

  AVG. HEAD ON TOP OF LAYER  2         0.1770

  DRAINAGE COLLECTED FROM LAYER  3    10.1918        36996.066      26.45

  PERC./LEAKAGE THROUGH LAYER  4       0.077530        281.433       0.20
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   AVG. HEAD ON TOP OF LAYER  4            0.0083
   PERC./LEAKAGE THROUGH LAYER  6          6.817874      24748.883     17.69
   AVG. HEAD ON TOP OF LAYER  6            1.4386
   CHANGE IN WATER STORAGE                -6.043        -21935.756    -15.68
   SOIL WATER AT START OF YEAR           181.755        659771.125
   SOIL WATER AT END OF YEAR             175.712        637835.375
   SNOW WATER AT START OF YEAR             0.000             0.000      0.00
   SNOW WATER AT END OF YEAR               0.000             0.000      0.00
   ANNUAL WATER BUDGET BALANCE             0.0000            0.017      0.00
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                  MONTHLY TOTALS (IN INCHES) FOR YEAR    9
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                                JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
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PRECIPITATION                    2.65    2.58    8.23    3.71    7.15    1.65
                                 3.30    6.22    2.92    1.39    3.26    2.02

RUNOFF                           1.799   1.767   6.078   0.254   1.119   0.093
                                 0.182   0.469   0.237   0.021   0.000   0.042

EVAPOTRANSPIRATION               0.381   0.402   1.051   3.218   3.655   1.788
                                 2.044   4.296   1.739   1.487   0.619   0.500

PERCOLATION/LEAKAGE THROUGH      0.0763  0.1598  2.4122  0.7580  1.5717  0.5742
  LAYER  2                       0.5648  1.9643  0.5654  0.2605  0.0000  2.0991

LATERAL DRAINAGE COLLECTED       0.0753  0.1577  2.3926  0.7534  1.5382  0.5912
  FROM LAYER  3                  0.4717  2.0380  0.5488  0.2697  0.0000  2.0837

PERCOLATION/LEAKAGE THROUGH      0.0010  0.0021  0.0182  0.0061  0.0117  0.0048
  LAYER  4                       0.0042  0.0152  0.0044  0.0030  0.0000  0.0155

PERCOLATION/LEAKAGE THROUGH      0.2223  0.1945  0.2098  0.1923  0.1924  0.1785
  LAYER  6                       0.1790  0.1745  0.1612  0.1622  0.1509  0.1548

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                   MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
-------------------------------------------------------------------------------

AVERAGE DAILY HEAD ON            0.003   0.007   0.606   0.129   0.364   0.093
  TOP OF LAYER  2                0.076   0.393   0.112   0.008   0.000   0.316

STD. DEVIATION OF DAILY          0.009   0.013   1.444   0.569   0.953   0.373
  HEAD ON TOP OF LAYER  2        0.386   0.939   0.548   0.023   0.000   0.697

AVERAGE DAILY HEAD ON            0.001   0.002   0.023   0.008   0.015   0.006
  TOP OF LAYER  4                0.005   0.020   0.005   0.003   0.000   0.020

STD. DEVIATION OF DAILY          0.002   0.003   0.039   0.020   0.028   0.017
  HEAD ON TOP OF LAYER  4        0.016   0.031   0.018   0.005   0.000   0.035

AVERAGE DAILY HEAD ON            0.002   0.002   0.002   0.002   0.002   0.001
  TOP OF LAYER  6                0.001   0.001   0.001   0.001   0.001   0.001

STD. DEVIATION OF DAILY          0.000   0.000   0.000   0.000   0.000   0.000
  HEAD ON TOP OF LAYER  6        0.000   0.000   0.000   0.000   0.000   0.000

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                         ANNUAL TOTALS FOR YEAR    9
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                                           INCHES          CU. FEET     PERCENT
                                          --------        ----------    -------
   PRECIPITATION                            45.08         163640.437    100.00
   RUNOFF                                   12.061         43780.316     26.75
   EVAPOTRANSPIRATION                       21.181         76885.914     46.98
   PERC./LEAKAGE THROUGH LAYER  2           11.006237      39952.641     24.41
   AVG. HEAD ON TOP OF LAYER  2              0.1755
   DRAINAGE COLLECTED FROM LAYER  3         10.9203        39640.621     24.22
   PERC./LEAKAGE THROUGH LAYER  4            0.085954        312.011      0.19
   AVG. HEAD ON TOP OF LAYER  4              0.0088
   PERC./LEAKAGE THROUGH LAYER  6            2.172231       7885.198      4.82
   AVG. HEAD ON TOP OF LAYER  6              0.0015
   CHANGE IN WATER STORAGE                  -1.254         -4551.691     -2.78
   SOIL WATER AT START OF YEAR             175.712        637835.375
   SOIL WATER AT END OF YEAR               173.230        628823.187
   SNOW WATER AT START OF YEAR               0.000             0.000      0.00
   SNOW WATER AT END OF YEAR                 1.229          4460.498      2.73
   ANNUAL WATER BUDGET BALANCE               0.0000            0.077      0.00
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                  MONTHLY TOTALS (IN INCHES) FOR YEAR   10
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                                JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                                ------- ------- ------- ------- ------- -------

PRECIPITATION                    0.96    2.65    3.45    4.61    5.23    1.43
                                 1.95    2.49    2.90    1.53    2.92    1.65

RUNOFF                           1.493   2.119   1.480   0.247   0.134   0.005
                                 0.000   0.000   0.296   0.000   0.078   0.056

EVAPOTRANSPIRATION               0.224   0.362   1.740   2.839   3.544   1.672
                                 1.753   1.886   2.400   1.000   0.596   0.540

PERCOLATION/LEAKAGE THROUGH      0.0031  0.1693  1.4895  1.5245  1.1958  0.1054
  LAYER  2                       0.0000  0.0741  0.9333  0.5162  1.4803  0.3458

LATERAL DRAINAGE COLLECTED       0.0030  0.1610  1.4841  1.5137  1.1863  0.1044
  FROM LAYER  3                  0.0000  0.0551  0.9444  0.5120  1.3830  0.4280

PERCOLATION/LEAKAGE THROUGH      0.0001  0.0020  0.0119  0.0108  0.0096  0.0010
  LAYER  4                       0.0000  0.0005  0.0074  0.0042  0.0107  0.0043

PERCOLATION/LEAKAGE THROUGH      0.1469  0.1312  0.1427  0.1326  0.1341  0.1246
  LAYER  6                       0.1255  0.1232  0.1180  0.1187  0.1134  0.1140

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                   MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
-------------------------------------------------------------------------------

AVERAGE DAILY HEAD ON            0.000   0.007   0.275   0.324   0.172   0.010
  TOP OF LAYER  2                0.000   0.006   0.239   0.074   0.264   0.032

STD. DEVIATION OF DAILY          0.001   0.015   0.727   0.820   0.426   0.053
  HEAD ON TOP OF LAYER  2        0.000   0.030   0.846   0.299   0.759   0.102
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AVERAGE DAILY HEAD ON            0.000   0.002   0.014   0.015   0.011   0.001
  TOP OF LAYER  4                0.000   0.001   0.009   0.005   0.014   0.004

STD. DEVIATION OF DAILY          0.000   0.003   0.026   0.034   0.023   0.004
  HEAD ON TOP OF LAYER  4        0.000   0.003   0.023   0.015   0.027   0.009

AVERAGE DAILY HEAD ON            0.001   0.001   0.001   0.001   0.001   0.001
  TOP OF LAYER  6                0.001   0.001   0.001   0.001   0.001   0.001

STD. DEVIATION OF DAILY          0.000   0.000   0.000   0.000   0.000   0.000
  HEAD ON TOP OF LAYER  6        0.000   0.000   0.000   0.000   0.000   0.000

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                         ANNUAL TOTALS FOR YEAR   10
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                                           INCHES          CU. FEET     PERCENT
                                          --------        ----------    -------
   PRECIPITATION                            31.77         115325.086    100.00
   RUNOFF                                    5.909         21448.336     18.60
   EVAPOTRANSPIRATION                       18.557         67361.203     58.41
   PERC./LEAKAGE THROUGH LAYER  2            7.837364      28449.633     24.67
   AVG. HEAD ON TOP OF LAYER  2              0.1169
   DRAINAGE COLLECTED FROM LAYER  3          7.7749        28222.742     24.47
   PERC./LEAKAGE THROUGH LAYER  4            0.062504        226.891      0.20
   AVG. HEAD ON TOP OF LAYER  4              0.0064
   PERC./LEAKAGE THROUGH LAYER  6            1.524778       5534.942      4.80
   AVG. HEAD ON TOP OF LAYER  6              0.0010
   CHANGE IN WATER STORAGE                  -1.995         -7242.152     -6.28
   SOIL WATER AT START OF YEAR             173.230        628823.187
   SOIL WATER AT END OF YEAR               171.938        624133.875
   SNOW WATER AT START OF YEAR               1.229          4460.498      3.87
   SNOW WATER AT END OF YEAR                 0.526          1907.668      1.65
   ANNUAL WATER BUDGET BALANCE               0.0000            0.018      0.00
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                  MONTHLY TOTALS (IN INCHES) FOR YEAR   11
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                                JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
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PRECIPITATION                    1.47    2.88    4.25    2.26    2.14    2.66
                                 2.26    3.91    2.64    0.35    1.86    2.92

RUNOFF                           0.922   1.741   3.712   0.008   0.000   0.217
                                 0.077   0.082   0.751   0.000   0.001   0.246

EVAPOTRANSPIRATION               0.449   0.498   1.692   1.873   1.997   1.987
                                 1.649   3.372   0.388   0.944   0.902   0.715

PERCOLATION/LEAKAGE THROUGH      0.0000  0.1137  0.7492  0.4752  0.0689  0.6431
  LAYER  2                       0.5171  0.4032  0.1890  0.6131  0.5561  1.1331

LATERAL DRAINAGE COLLECTED       0.0000  0.1033  0.7516  0.4713  0.0682  0.6383
  FROM LAYER  3                  0.5134  0.3998  0.1408  0.6554  0.5483  1.1266
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PERCOLATION/LEAKAGE THROUGH      0.0000  0.0013  0.0068  0.0039  0.0007  0.0048
  LAYER  4                       0.0038  0.0033  0.0011  0.0048  0.0047  0.0096

PERCOLATION/LEAKAGE THROUGH      0.1095  0.0980  0.1079  0.1009  0.1016  0.0970
  LAYER  6                       0.0981  0.0966  0.0912  0.0929  0.0891  0.0918

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                   MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
-------------------------------------------------------------------------------

AVERAGE DAILY HEAD ON            0.000   0.005   0.139   0.054   0.005   0.171
  TOP OF LAYER  2                0.088   0.045   0.056   0.176   0.076   0.290

STD. DEVIATION OF DAILY          0.000   0.013   0.575   0.199   0.026   0.663
  HEAD ON TOP OF LAYER  2        0.353   0.178   0.304   0.823   0.251   0.984

AVERAGE DAILY HEAD ON            0.000   0.001   0.007   0.005   0.001   0.006
  TOP OF LAYER  4                0.005   0.004   0.001   0.006   0.005   0.011

STD. DEVIATION OF DAILY          0.000   0.003   0.017   0.013   0.003   0.020
  HEAD ON TOP OF LAYER  4        0.018   0.011   0.008   0.022   0.014   0.025

AVERAGE DAILY HEAD ON            0.001   0.001   0.001   0.001   0.001   0.001
  TOP OF LAYER  6                0.001   0.001   0.001   0.001   0.001   0.001

STD. DEVIATION OF DAILY          0.000   0.000   0.000   0.000   0.000   0.000
  HEAD ON TOP OF LAYER  6        0.000   0.000   0.000   0.000   0.000   0.000

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                         ANNUAL TOTALS FOR YEAR   11
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                                           INCHES          CU. FEET     PERCENT
                                          --------        ----------    -------
   PRECIPITATION                            29.60         107448.031    100.00
   RUNOFF                                    7.757         28158.586     26.21
   EVAPOTRANSPIRATION                       16.467         59775.277     55.63
   PERC./LEAKAGE THROUGH LAYER  2            5.461673      19825.873     18.45
   AVG. HEAD ON TOP OF LAYER  2              0.0919
   DRAINAGE COLLECTED FROM LAYER  3          5.4169        19663.256     18.30
   PERC./LEAKAGE THROUGH LAYER  4            0.044797        162.613      0.15
   AVG. HEAD ON TOP OF LAYER  4              0.0044
   PERC./LEAKAGE THROUGH LAYER  6            1.174539       4263.578      3.97
   AVG. HEAD ON TOP OF LAYER  6              0.0008
   CHANGE IN WATER STORAGE                  -1.216         -4412.710     -4.11
   SOIL WATER AT START OF YEAR             171.938        624133.875
   SOIL WATER AT END OF YEAR               170.639        619419.812
   SNOW WATER AT START OF YEAR               0.526          1907.668      1.78
   SNOW WATER AT END OF YEAR                 0.609          2208.984      2.06
   ANNUAL WATER BUDGET BALANCE               0.0000            0.043      0.00
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                  MONTHLY TOTALS (IN INCHES) FOR YEAR   12
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                                JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
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PRECIPITATION                    2.65    1.17    1.62    4.25    2.89    1.38
                                 3.21    1.79    3.34    4.01    3.57    1.26

RUNOFF                           0.428   2.632   0.564   0.120   0.012   0.004
                                 0.037   0.000   0.178   0.377   0.119   0.026

EVAPOTRANSPIRATION               0.485   0.333   1.690   2.881   2.552   1.346
                                 2.642   1.854   1.857   1.632   1.427   0.780

PERCOLATION/LEAKAGE THROUGH      0.0000  0.0825  0.6252  1.1798  0.3951  0.0309
  LAYER  2                       0.3774  0.0000  0.8848  2.1568  1.6320  0.6186

LATERAL DRAINAGE COLLECTED       0.0000  0.0816  0.6197  1.1707  0.3920  0.0305
  FROM LAYER  3                  0.3745  0.0000  0.8700  2.1484  1.6023  0.6304

PERCOLATION/LEAKAGE THROUGH      0.0000  0.0009  0.0055  0.0091  0.0030  0.0004
  LAYER  4                       0.0029  0.0000  0.0067  0.0164  0.0128  0.0050

PERCOLATION/LEAKAGE THROUGH      0.0871  0.0808  0.0865  0.0818  0.0821  0.0779
  LAYER  6                       0.0795  0.0778  0.0754  0.0781  0.0735  0.0730

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                  MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
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AVERAGE DAILY HEAD ON            0.000   0.004   0.132   0.225   0.064   0.002
  TOP OF LAYER  2                0.050   0.000   0.161   0.496   0.321   0.106

STD. DEVIATION OF DAILY          0.000   0.017   0.561   0.602   0.315   0.008
  HEAD ON TOP OF LAYER  2        0.207   0.000   0.502   1.158   0.848   0.403

AVERAGE DAILY HEAD ON            0.000   0.001   0.006   0.012   0.004   0.000
  TOP OF LAYER  4                0.004   0.000   0.009   0.021   0.016   0.006

STD. DEVIATION OF DAILY          0.000   0.003   0.016   0.025   0.013   0.001
  HEAD ON TOP OF LAYER  4        0.013   0.000   0.021   0.033   0.025   0.019

AVERAGE DAILY HEAD ON            0.001   0.001   0.001   0.001   0.001   0.001
  TOP OF LAYER  6                0.001   0.001   0.001   0.001   0.001   0.001

STD. DEVIATION OF DAILY          0.000   0.000   0.000   0.000   0.000   0.000
  HEAD ON TOP OF LAYER  6        0.000   0.000   0.000   0.000   0.000   0.000
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                        ANNUAL TOTALS FOR YEAR   12
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                                        INCHES          CU. FEET     PERCENT
                                       --------        ----------    -------
  PRECIPITATION                          31.14         113038.195    100.00

  RUNOFF                                  4.496         16321.656     14.44

  EVAPOTRANSPIRATION                     19.480         70714.117     62.56

  PERC./LEAKAGE THROUGH LAYER  2          7.982900      28977.928     25.64

  AVG. HEAD ON TOP OF LAYER  2            0.1300

  DRAINAGE COLLECTED FROM LAYER  3        7.9201        28749.926     25.43

  PERC./LEAKAGE THROUGH LAYER  4          0.062811        228.006      0.20

  AVG. HEAD ON TOP OF LAYER  4            0.0065

  PERC./LEAKAGE THROUGH LAYER  6          0.953799       3462.291      3.06

  AVG. HEAD ON TOP OF LAYER  6            0.0006

  CHANGE IN WATER STORAGE                -1.711         -6209.761     -5.49

  SOIL WATER AT START OF YEAR           170.639        619419.812

  SOIL WATER AT END OF YEAR             169.537        615419.062
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  SNOW WATER AT START OF YEAR             0.609          2208.984      1.95

  SNOW WATER AT END OF YEAR               0.000             0.000      0.00

  ANNUAL WATER BUDGET BALANCE             0.0000           -0.029      0.00

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                  MONTHLY TOTALS (IN INCHES) FOR YEAR   13
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                                JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
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PRECIPITATION                    1.41    1.62    2.46    4.52    3.13    4.45
                                 3.56    0.87    3.52    2.39    3.59    4.60

RUNOFF                           0.338   1.015   0.583   0.219   0.081   0.572
                                 0.059   0.000   0.294   0.280   0.086   2.248

EVAPOTRANSPIRATION               0.550   0.490   1.786   2.405   2.311   3.182
                                 3.272   0.897   1.519   1.432   1.096   0.628

PERCOLATION/LEAKAGE THROUGH      0.0000  0.0000  0.7767  2.4286  0.3709  1.0641
  LAYER  2                       0.2025  0.0000  0.4613  1.4733  1.5028  1.8830

LATERAL DRAINAGE COLLECTED       0.0000  0.0000  0.7707  2.4110  0.3676  1.0561
  FROM LAYER  3                  0.2007  0.0000  0.4133  1.5061  1.4855  1.8737

PERCOLATION/LEAKAGE THROUGH      0.0000  0.0000  0.0060  0.0175  0.0032  0.0080
  LAYER  4                       0.0019  0.0000  0.0032  0.0119  0.0121  0.0145

PERCOLATION/LEAKAGE THROUGH      0.0709  0.0634  0.0707  0.0680  0.0678  0.0654
  LAYER  6                       0.0657  0.0641  0.0621  0.0654  0.0626  0.0629

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                  MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
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AVERAGE DAILY HEAD ON            0.000   0.000   0.139   0.558   0.039   0.290
  TOP OF LAYER  2                0.015   0.000   0.059   0.286   0.282   0.503

STD. DEVIATION OF DAILY          0.000   0.000   0.546   1.123   0.186   0.962
  HEAD ON TOP OF LAYER  2        0.058   0.000   0.224   0.915   0.654   1.231

AVERAGE DAILY HEAD ON            0.000   0.000   0.007   0.024   0.004   0.011
  TOP OF LAYER  4                0.002   0.000   0.004   0.015   0.015   0.018

STD. DEVIATION OF DAILY          0.000   0.000   0.020   0.038   0.011   0.026
  HEAD ON TOP OF LAYER  4        0.006   0.000   0.014   0.029   0.026   0.033

AVERAGE DAILY HEAD ON            0.001   0.001   0.001   0.001   0.001   0.001
  TOP OF LAYER  6                0.001   0.001   0.001   0.001   0.001   0.001

STD. DEVIATION OF DAILY          0.000   0.000   0.000   0.000   0.000   0.000
  HEAD ON TOP OF LAYER  6        0.000   0.000   0.000   0.000   0.000   0.000
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                        ANNUAL TOTALS FOR YEAR   13
-------------------------------------------------------------------------------
                                        INCHES          CU. FEET     PERCENT
                                       --------        ----------    -------
  PRECIPITATION                          36.12         131115.562    100.00

  RUNOFF                                  5.774         20957.930     15.98

  EVAPOTRANSPIRATION                     19.568         71030.039     54.17

  PERC./LEAKAGE THROUGH LAYER  2         10.163085      36892.000     28.14
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  AVG. HEAD ON TOP OF LAYER  2            0.1808

  DRAINAGE COLLECTED FROM LAYER  3       10.0848        36607.770     27.92

  PERC./LEAKAGE THROUGH LAYER  4          0.078300        284.229      0.22

  AVG. HEAD ON TOP OF LAYER  4            0.0082

  PERC./LEAKAGE THROUGH LAYER  6          0.789010       2864.107      2.18

  AVG. HEAD ON TOP OF LAYER  6            0.0005

  CHANGE IN WATER STORAGE                -0.095          -344.245     -0.26

  SOIL WATER AT START OF YEAR           169.537        615419.062

  SOIL WATER AT END OF YEAR             169.442        615074.812

  SNOW WATER AT START OF YEAR             0.000             0.000      0.00

  SNOW WATER AT END OF YEAR               0.000             0.000      0.00

  ANNUAL WATER BUDGET BALANCE             0.0000           -0.033      0.00

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                  MONTHLY TOTALS (IN INCHES) FOR YEAR   14
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                                JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
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PRECIPITATION                    1.62    2.22    4.03    2.47    8.25    0.80
                                 4.96    4.16    0.36    0.17    6.84    2.21

RUNOFF                           0.205   2.833   1.682   0.000   1.952   0.000
                                 0.204   0.136   0.000   0.000   1.854   0.006

EVAPOTRANSPIRATION               0.260   0.312   1.852   2.774   2.786   1.138
                                 3.667   3.813   0.578   0.116   0.731   0.897

PERCOLATION/LEAKAGE THROUGH      0.0000  0.1665  1.4518  0.0000  2.5994  0.1702
  LAYER  2                       1.1363  0.3499  0.0000  0.0000  3.6922  0.6170

LATERAL DRAINAGE COLLECTED       0.0000  0.1646  1.4404  0.0000  2.4924  0.2568
  FROM LAYER  3                  1.1268  0.3469  0.0000  0.0000  3.6600  0.6170

PERCOLATION/LEAKAGE THROUGH      0.0000  0.0019  0.0114  0.0000  0.0184  0.0021
  LAYER  4                       0.0094  0.0030  0.0000  0.0000  0.0266  0.0055

PERCOLATION/LEAKAGE THROUGH      0.0589  0.0540  0.0605  0.0550  0.0596  0.0536
  LAYER  6                       0.0573  0.0547  0.0515  0.0530  0.0551  0.0526

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                  MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
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AVERAGE DAILY HEAD ON            0.000   0.007   0.251   0.000   0.675   0.011
  TOP OF LAYER  2                0.122   0.043   0.000   0.000   1.130   0.065

STD. DEVIATION OF DAILY          0.000   0.017   0.657   0.000   1.431   0.059
  HEAD ON TOP OF LAYER  2        0.335   0.194   0.000   0.000   1.830   0.197

AVERAGE DAILY HEAD ON            0.000   0.002   0.014   0.000   0.024   0.003
  TOP OF LAYER  4                0.011   0.003   0.000   0.000   0.036   0.006

STD. DEVIATION OF DAILY          0.000   0.004   0.026   0.000   0.038   0.012
  HEAD ON TOP OF LAYER  4        0.020   0.010   0.000   0.000   0.045   0.016

AVERAGE DAILY HEAD ON            0.000   0.000   0.000   0.000   0.000   0.000
  TOP OF LAYER  6                0.000   0.000   0.000   0.000   0.000   0.000

STD. DEVIATION OF DAILY          0.000   0.000   0.000   0.000   0.000   0.000
  HEAD ON TOP OF LAYER  6        0.000   0.000   0.000   0.000   0.000   0.000
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                        ANNUAL TOTALS FOR YEAR   14
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                                        INCHES          CU. FEET     PERCENT
                                       --------        ----------    -------
  PRECIPITATION                          38.09         138266.687    100.00

  RUNOFF                                  8.873         32209.697     23.30

  EVAPOTRANSPIRATION                     18.924         68693.641     49.68

  PERC./LEAKAGE THROUGH LAYER  2         10.183298      36965.371     26.73

  AVG. HEAD ON TOP OF LAYER  2            0.1920

  DRAINAGE COLLECTED FROM LAYER  3       10.1050        36680.977     26.53

  PERC./LEAKAGE THROUGH LAYER  4          0.078349        284.405      0.21

  AVG. HEAD ON TOP OF LAYER  4            0.0082

  PERC./LEAKAGE THROUGH LAYER  6          0.665814       2416.905      1.75

  AVG. HEAD ON TOP OF LAYER  6            0.0005

  CHANGE IN WATER STORAGE                -0.478         -1734.555     -1.25

  SOIL WATER AT START OF YEAR           169.442        615074.812

  SOIL WATER AT END OF YEAR             168.277        610845.875

  SNOW WATER AT START OF YEAR             0.000             0.000      0.00

  SNOW WATER AT END OF YEAR               0.687          2494.371      1.80

  ANNUAL WATER BUDGET BALANCE             0.0000            0.023      0.00

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                  MONTHLY TOTALS (IN INCHES) FOR YEAR   15
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                                JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
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PRECIPITATION                    5.44    2.25    4.08    2.21    2.93    4.42
                                 3.98    3.23    2.17    0.85    1.94    4.55

RUNOFF                           1.156   2.258   6.601   0.041   0.267   0.956
                                 0.157   0.107   0.054   0.000   0.002   1.285

EVAPOTRANSPIRATION               0.467   0.502   1.032   1.038   2.563   2.660
                                 3.093   2.350   2.050   0.381   1.111   0.736

PERCOLATION/LEAKAGE THROUGH      0.0000  0.1146  0.9464  0.5736  0.5819  0.8748
  LAYER  2                       0.7353  0.2724  0.5670  0.0740  0.4459  2.2814

LATERAL DRAINAGE COLLECTED       0.0000  0.1132  0.9379  0.5692  0.5775  0.8686
  FROM LAYER  3                  0.7292  0.2685  0.5646  0.0733  0.4393  2.1689

PERCOLATION/LEAKAGE THROUGH      0.0000  0.0014  0.0085  0.0044  0.0044  0.0062
  LAYER  4                       0.0061  0.0022  0.0041  0.0007  0.0042  0.0164

PERCOLATION/LEAKAGE THROUGH      0.0503  0.0464  0.0531  0.0484  0.0495  0.0474
  LAYER  6                       0.0494  0.0478  0.0459  0.0469  0.0463  0.0488

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                  MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
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AVERAGE DAILY HEAD ON           0.000   0.004   0.143   0.088   0.134   0.262
  TOP OF LAYER  2               0.060   0.037   0.082   0.006   0.041   0.477

STD. DEVIATION OF DAILY         0.000   0.012   0.556   0.335   0.641   0.934
  HEAD ON TOP OF LAYER  2       0.161   0.195   0.322   0.031   0.142   1.130

AVERAGE DAILY HEAD ON           0.000   0.001   0.009   0.006   0.006   0.009
  TOP OF LAYER  4               0.007   0.003   0.006   0.001   0.004   0.021

STD. DEVIATION OF DAILY         0.000   0.003   0.017   0.019   0.019   0.026
  HEAD ON TOP OF LAYER  4       0.015   0.010   0.019   0.003   0.011   0.035

AVERAGE DAILY HEAD ON           0.000   0.000   0.000   0.000   0.000   0.000
  TOP OF LAYER  6               0.000   0.000   0.000   0.000   0.000   0.000

STD. DEVIATION OF DAILY         0.000   0.000   0.000   0.000   0.000   0.000
  HEAD ON TOP OF LAYER  6       0.000   0.000   0.000   0.000   0.000   0.000

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                         ANNUAL TOTALS FOR YEAR   15
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                                        INCHES          CU. FEET      PERCENT
                                       --------        ----------     -------
  PRECIPITATION                          38.05         138121.500     100.00

  RUNOFF                                 12.881         46759.281      33.85

  EVAPOTRANSPIRATION                     17.983         65278.578      47.26

  PERC./LEAKAGE THROUGH LAYER  2          7.467278      27106.217      19.62

  AVG. HEAD ON TOP OF LAYER  2            0.1110

  DRAINAGE COLLECTED FROM LAYER  3        7.3102        26536.037      19.21

  PERC./LEAKAGE THROUGH LAYER  4          0.058600        212.718       0.15

  AVG. HEAD ON TOP OF LAYER  4            0.0060

  PERC./LEAKAGE THROUGH LAYER  6          0.580236       2106.255       1.52

  AVG. HEAD ON TOP OF LAYER  6            0.0004

  CHANGE IN WATER STORAGE                -0.705         -2558.623      -1.85

  SOIL WATER AT START OF YEAR           168.277        610845.875

  SOIL WATER AT END OF YEAR             168.259        610781.625

  SNOW WATER AT START OF YEAR             0.687          2494.371       1.81

  SNOW WATER AT END OF YEAR               0.000             0.000       0.00

  ANNUAL WATER BUDGET BALANCE             0.0000           -0.034       0.00

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                  MONTHLY TOTALS (IN INCHES) FOR YEAR   16
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                                JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
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PRECIPITATION                    1.53    2.20    1.86    1.94    1.43    2.02
                                 3.28    6.75    1.35    0.00    3.35    2.81

RUNOFF                           0.770   1.761   0.295   0.000   0.000   0.009
                                 0.065   2.482   0.000   0.000   0.105   0.850

EVAPOTRANSPIRATION               0.334   0.321   1.346   2.125   1.259   1.891
                                 2.646   2.522   1.148   0.170   0.916   0.775
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PERCOLATION/LEAKAGE THROUGH     0.2485  0.0598  1.0983  0.0000  0.0135  0.0888
  LAYER  2                      0.9550  1.7399  0.0380  0.0000  1.8332  1.0329

LATERAL DRAINAGE COLLECTED      0.3445  0.0591  1.0900  0.0000  0.0133  0.0880
  FROM LAYER  3                 0.9478  1.7276  0.0376  0.0000  1.8190  1.0232

PERCOLATION/LEAKAGE THROUGH     0.0025  0.0007  0.0083  0.0000  0.0002  0.0008
  LAYER  4                      0.0072  0.0123  0.0004  0.0000  0.0143  0.0078

PERCOLATION/LEAKAGE THROUGH     0.0450  0.0421  0.0457  0.0423  0.0439  0.0425
  LAYER  6                      0.0445  0.0442  0.0410  0.0419  0.0428  0.0422

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                  MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
-------------------------------------------------------------------------------

AVERAGE DAILY HEAD ON           0.038   0.003   0.226   0.000   0.001   0.007
  TOP OF LAYER  2               0.136   0.385   0.003   0.000   0.284   0.286

STD. DEVIATION OF DAILY         0.210   0.012   0.698   0.000   0.005   0.041
  HEAD ON TOP OF LAYER  2       0.428   1.026   0.016   0.000   0.674   0.932

AVERAGE DAILY HEAD ON           0.003   0.001   0.011   0.000   0.000   0.001
  TOP OF LAYER  4               0.009   0.017   0.000   0.000   0.018   0.010

STD. DEVIATION OF DAILY         0.015   0.002   0.027   0.000   0.001   0.004
  HEAD ON TOP OF LAYER  4       0.023   0.034   0.002   0.000   0.030   0.024

AVERAGE DAILY HEAD ON           0.000   0.000   0.000   0.000   0.000   0.000
  TOP OF LAYER  6               0.000   0.000   0.000   0.000   0.000   0.000

STD. DEVIATION OF DAILY         0.000   0.000   0.000   0.000   0.000   0.000
  HEAD ON TOP OF LAYER  6       0.000   0.000   0.000   0.000   0.000   0.000

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                         ANNUAL TOTALS FOR YEAR   16
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                                        INCHES          CU. FEET      PERCENT
                                       --------        ----------     -------
  PRECIPITATION                          28.52         103527.609     100.00

  RUNOFF                                  6.337         23001.725      22.22

  EVAPOTRANSPIRATION                     15.453         56095.070      54.18

  PERC./LEAKAGE THROUGH LAYER  2          7.107996      25802.023      24.92

  AVG. HEAD ON TOP OF LAYER  2            0.1140

  DRAINAGE COLLECTED FROM LAYER  3        7.1500        25954.479      25.07

  PERC./LEAKAGE THROUGH LAYER  4          0.054533        197.956       0.19

  AVG. HEAD ON TOP OF LAYER  4            0.0058

  PERC./LEAKAGE THROUGH LAYER  6          0.518090       1880.668       1.82

  AVG. HEAD ON TOP OF LAYER  6            0.0004

  CHANGE IN WATER STORAGE                -0.938         -3404.344      -3.29

  SOIL WATER AT START OF YEAR           168.259        610781.625

  SOIL WATER AT END OF YEAR             167.322        607377.250

  SNOW WATER AT START OF YEAR             0.000             0.000       0.00

  SNOW WATER AT END OF YEAR               0.000             0.000       0.00

  ANNUAL WATER BUDGET BALANCE             0.0000            0.010       0.00

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                  MONTHLY TOTALS (IN INCHES) FOR YEAR   17
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                                JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
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PRECIPITATION                    2.21    2.73    8.10    2.53    3.17    5.63
                                 3.76    5.72    5.14    1.23    2.42    3.95

RUNOFF                           0.000   2.040   4.359   0.081   0.034   0.261
                                 0.090   1.169   1.045   0.002   0.041   0.001

EVAPOTRANSPIRATION               0.747   0.482   1.744   2.349   3.029   4.276
                                 2.208   2.797   3.561   1.136   0.663   0.695

PERCOLATION/LEAKAGE THROUGH     0.3235  0.0000  2.6204  1.1326  0.4122  1.1260
  LAYER  2                      0.6363  1.9114  1.1949  0.0985  0.9064  1.8854

LATERAL DRAINAGE COLLECTED      0.3227  0.0000  2.5538  1.1717  0.4088  1.1173
  FROM LAYER  3                 0.5655  1.9325  1.2159  0.0976  0.8887  1.8797

PERCOLATION/LEAKAGE THROUGH     0.0028  0.0000  0.0188  0.0087  0.0034  0.0087
  LAYER  4                      0.0047  0.0147  0.0093  0.0009  0.0073  0.0161

PERCOLATION/LEAKAGE THROUGH     0.0409  0.0362  0.0432  0.0387  0.0390  0.0387
  LAYER  6                      0.0390  0.0396  0.0374  0.0364  0.0369  0.0409

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                  MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
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AVERAGE DAILY HEAD ON           0.026   0.000   0.719   0.268   0.051   0.210
  TOP OF LAYER  2               0.069   0.492   0.303   0.008   0.126   0.200

STD. DEVIATION OF DAILY         0.100   0.000   1.408   0.892   0.194   0.597
  HEAD ON TOP OF LAYER  2       0.233   1.140   0.931   0.046   0.377   0.424

AVERAGE DAILY HEAD ON           0.003   0.000   0.025   0.012   0.004   0.011
  TOP OF LAYER  4               0.005   0.019   0.012   0.001   0.009   0.018

STD. DEVIATION OF DAILY         0.010   0.000   0.041   0.028   0.013   0.023
  HEAD ON TOP OF LAYER  4       0.014   0.032   0.026   0.004   0.021   0.027

AVERAGE DAILY HEAD ON           0.000   0.000   0.000   0.000   0.000   0.000
  TOP OF LAYER  6               0.000   0.000   0.000   0.000   0.000   0.000

STD. DEVIATION OF DAILY         0.000   0.000   0.000   0.000   0.000   0.000
  HEAD ON TOP OF LAYER  6       0.000   0.000   0.000   0.000   0.000   0.000

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                         ANNUAL TOTALS FOR YEAR   17
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                                        INCHES          CU. FEET      PERCENT
                                       --------        ----------     -------
  PRECIPITATION                          46.59         169121.719     100.00

  RUNOFF                                  9.124         33119.465      19.58

  EVAPOTRANSPIRATION                     23.687         85982.266      50.84

  PERC./LEAKAGE THROUGH LAYER  2         12.247538      44458.562      26.29

  AVG. HEAD ON TOP OF LAYER  2            0.2060

  DRAINAGE COLLECTED FROM LAYER  3       12.1541        44119.562      26.09

  PERC./LEAKAGE THROUGH LAYER  4          0.095330        346.049       0.20

  AVG. HEAD ON TOP OF LAYER  4            0.0099

  PERC./LEAKAGE THROUGH LAYER  6          0.467027       1695.309       1.00

  AVG. HEAD ON TOP OF LAYER  6            0.0003
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  CHANGE IN WATER STORAGE                 1.158          4205.058       2.49

  SOIL WATER AT START OF YEAR           167.322        607377.250

  SOIL WATER AT END OF YEAR             167.096        606558.750

  SNOW WATER AT START OF YEAR             0.000             0.000       0.00

  SNOW WATER AT END OF YEAR               1.384          5023.602       2.97

  ANNUAL WATER BUDGET BALANCE             0.0000            0.055       0.00

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                  MONTHLY TOTALS (IN INCHES) FOR YEAR   18
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                                JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                                ------- ------- ------- ------- ------- -------

PRECIPITATION                    2.58    1.77    6.60    0.95    1.23    6.42
                                 2.04    2.31    3.50    2.38    1.03    1.87

RUNOFF                           2.959   0.000   5.400   0.000   0.022   1.078
                                 0.006   0.010   0.175   0.058   0.000   0.234

EVAPOTRANSPIRATION               0.436   0.465   0.902   1.439   0.953   3.910
                                 1.934   2.534   2.326   1.676   0.835   0.490

PERCOLATION/LEAKAGE THROUGH     0.1039  0.0000  1.6494  0.4833  0.2119  1.4434
  LAYER  2                      0.0706  0.0683  0.6275  1.0176  0.0000  0.0000

LATERAL DRAINAGE COLLECTED      0.1027  0.0000  1.6123  0.5032  0.2101  1.4317
  FROM LAYER  3                 0.0699  0.0676  0.6217  1.0105  0.0000  0.0000

PERCOLATION/LEAKAGE THROUGH     0.0012  0.0000  0.0134  0.0037  0.0018  0.0117
  LAYER  4                      0.0007  0.0007  0.0049  0.0081  0.0000  0.0000

PERCOLATION/LEAKAGE THROUGH     0.0354  0.0312  0.0388  0.0332  0.0342  0.0354
  LAYER  6                      0.0335  0.0336  0.0334  0.0349  0.0317  0.0329

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                  MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
-------------------------------------------------------------------------------

AVERAGE DAILY HEAD ON           0.004   0.000   0.244   0.121   0.025   0.290
  TOP OF LAYER  2               0.005   0.005   0.113   0.142   0.000   0.000

STD. DEVIATION OF DAILY         0.013   0.000   0.613   0.611   0.132   0.868
  HEAD ON TOP OF LAYER  2       0.029   0.028   0.466   0.487   0.000   0.000

AVERAGE DAILY HEAD ON           0.001   0.000   0.016   0.005   0.002   0.014
  TOP OF LAYER  4               0.001   0.001   0.006   0.010   0.000   0.000

STD. DEVIATION OF DAILY         0.003   0.000   0.026   0.019   0.008   0.025
  HEAD ON TOP OF LAYER  4       0.003   0.003   0.018   0.022   0.000   0.000

AVERAGE DAILY HEAD ON           0.000   0.000   0.000   0.000   0.000   0.000
  TOP OF LAYER  6               0.000   0.000   0.000   0.000   0.000   0.000

STD. DEVIATION OF DAILY         0.000   0.000   0.000   0.000   0.000   0.000
  HEAD ON TOP OF LAYER  6       0.000   0.000   0.000   0.000   0.000   0.000

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                         ANNUAL TOTALS FOR YEAR   18
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                                        INCHES          CU. FEET      PERCENT
                                       --------        ----------     -------
  PRECIPITATION                          32.68         118628.398     100.00
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  RUNOFF                                  9.942         36090.121     30.42

  EVAPOTRANSPIRATION                     17.900         64978.273     54.77

  PERC./LEAKAGE THROUGH LAYER  2          5.675943      20603.674     17.37

  AVG. HEAD ON TOP OF LAYER  2            0.0790

  DRAINAGE COLLECTED FROM LAYER  3        5.6298        20436.232     17.23

  PERC./LEAKAGE THROUGH LAYER  4          0.046126        167.438      0.14

  AVG. HEAD ON TOP OF LAYER  4            0.0046

  PERC./LEAKAGE THROUGH LAYER  6          0.408352       1482.316      1.25

  AVG. HEAD ON TOP OF LAYER  6            0.0003

  CHANGE IN WATER STORAGE                -1.201         -4358.469     -3.67

  SOIL WATER AT START OF YEAR           167.096        606558.750

  SOIL WATER AT END OF YEAR             166.829        605587.750

  SNOW WATER AT START OF YEAR             1.384          5023.602      4.23

  SNOW WATER AT END OF YEAR               0.451          1636.109      1.38

  ANNUAL WATER BUDGET BALANCE             0.0000           -0.070      0.00

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                  MONTHLY TOTALS (IN INCHES) FOR YEAR   19
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                                 JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                                 ------- ------- ------- ------- ------- -------

PRECIPITATION                     2.10    6.49    4.27    4.65    5.29    7.45
                                  5.49    6.27    1.36    1.34    1.93    4.51

RUNOFF                            1.861   2.110   6.217   0.108   0.004   0.505
                                  0.345   1.281   0.008   0.002   0.000   2.168

EVAPOTRANSPIRATION                0.392   0.405   1.328   3.464   4.221   5.192
                                  3.818   3.613   1.172   1.025   0.674   0.545

PERCOLATION/LEAKAGE THROUGH       0.0000  0.0782  1.4987  1.2635  0.3730  2.5687
  LAYER  2                        0.9584  1.7467  0.1807  0.3134  0.4704  1.0021

LATERAL DRAINAGE COLLECTED        0.0000  0.0772  1.4857  1.2537  0.3191  2.6003
  FROM LAYER  3                   0.9503  1.7335  0.1788  0.3110  0.4663  0.9937

PERCOLATION/LEAKAGE THROUGH       0.0000  0.0010  0.0130  0.0097  0.0026  0.0197
  LAYER  4                        0.0081  0.0133  0.0018  0.0023  0.0041  0.0084

PERCOLATION/LEAKAGE THROUGH       0.0330  0.0306  0.0366  0.0329  0.0321  0.0337
  LAYER  6                        0.0328  0.0325  0.0293  0.0300  0.0298  0.0316

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                   MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
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AVERAGE DAILY HEAD ON             0.000   0.003   0.237   0.148   0.042   0.552
  TOP OF LAYER  2                 0.125   0.366   0.011   0.053   0.044   0.120

STD. DEVIATION OF DAILY           0.000   0.009   0.651   0.384   0.174   1.112
  HEAD ON TOP OF LAYER  2         0.464   1.112   0.038   0.293   0.176   0.314

AVERAGE DAILY HEAD ON             0.000   0.001   0.014   0.012   0.003   0.026
  TOP OF LAYER  4                 0.009   0.017   0.002   0.003   0.005   0.010

STD. DEVIATION OF DAILY           0.000   0.002   0.023   0.025   0.012   0.034
  HEAD ON TOP OF LAYER  4         0.019   0.030   0.006   0.013   0.013   0.020
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AVERAGE DAILY HEAD ON             0.000   0.000   0.000   0.000   0.000   0.000
  TOP OF LAYER  6                 0.000   0.000   0.000   0.000   0.000   0.000

STD. DEVIATION OF DAILY           0.000   0.000   0.000   0.000   0.000   0.000
  HEAD ON TOP OF LAYER  6         0.000   0.000   0.000   0.000   0.000   0.000

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                       ANNUAL TOTALS FOR YEAR   19
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                                         INCHES          CU. FEET     PERCENT
                                        --------        ----------    -------
  PRECIPITATION                           51.15         185674.484    100.00

  RUNOFF                                  14.609         53028.969     28.56

  EVAPOTRANSPIRATION                      25.849         93830.203     50.53

  PERC./LEAKAGE THROUGH LAYER  2          10.453660      37946.785     20.44

  AVG. HEAD ON TOP OF LAYER  2             0.1418

  DRAINAGE COLLECTED FROM LAYER  3        10.3697        37641.863     20.27

  PERC./LEAKAGE THROUGH LAYER  4           0.084001        304.922      0.16

  AVG. HEAD ON TOP OF LAYER  4             0.0085

  PERC./LEAKAGE THROUGH LAYER  6           0.384893       1397.162      0.75

  AVG. HEAD ON TOP OF LAYER  6             0.0003

  CHANGE IN WATER STORAGE                 -0.062          -223.756     -0.12

  SOIL WATER AT START OF YEAR            166.829        605587.750

  SOIL WATER AT END OF YEAR              166.892        605818.312

  SNOW WATER AT START OF YEAR              0.451          1636.109      0.88

  SNOW WATER AT END OF YEAR                0.326          1181.822      0.64

  ANNUAL WATER BUDGET BALANCE              0.0000            0.050      0.00

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                  MONTHLY TOTALS (IN INCHES) FOR YEAR   20
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                                 JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
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PRECIPITATION                     3.64    4.16    2.08    2.55    6.94    4.71
                                  1.95    1.78    1.50    3.06    2.54    4.04

RUNOFF                            1.731   3.198   3.435   0.002   0.816   0.260
                                  0.021   0.197   0.042   0.181   0.077   0.062

EVAPOTRANSPIRATION                0.521   0.431   0.262   3.246   4.342   2.313
                                  2.552   1.103   0.841   1.597   1.087   0.916

PERCOLATION/LEAKAGE THROUGH       0.1328  0.2656  0.2241  0.5625  1.7261  1.1491
  LAYER  2                        0.4208  0.4799  0.2386  1.5820  1.2035  2.5692

LATERAL DRAINAGE COLLECTED        0.1312  0.2624  0.2217  0.5580  1.7126  1.0735
  FROM LAYER  3                   0.4841  0.4763  0.2365  1.5709  1.1942  2.4864

PERCOLATION/LEAKAGE THROUGH       0.0016  0.0033  0.0024  0.0046  0.0135  0.0085
  LAYER  4                        0.0038  0.0036  0.0021  0.0112  0.0093  0.0184

PERCOLATION/LEAKAGE THROUGH       0.0305  0.0294  0.0302  0.0293  0.0317  0.0290
  LAYER  6                        0.0287  0.0284  0.0276  0.0292  0.0285  0.0299
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                   MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
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AVERAGE DAILY HEAD ON             0.005   0.011   0.008   0.134   0.342   0.128
  TOP OF LAYER  2                 0.059   0.094   0.024   0.327   0.266   0.392

STD. DEVIATION OF DAILY           0.013   0.018   0.024   0.569   0.938   0.366
  HEAD ON TOP OF LAYER  2         0.306   0.473   0.122   0.831   0.743   0.731

AVERAGE DAILY HEAD ON             0.001   0.003   0.002   0.006   0.017   0.011
  TOP OF LAYER  4                 0.005   0.005   0.002   0.015   0.012   0.024

STD. DEVIATION OF DAILY           0.003   0.004   0.006   0.017   0.027   0.022
  HEAD ON TOP OF LAYER  4         0.016   0.017   0.009   0.035   0.025   0.037

AVERAGE DAILY HEAD ON             0.000   0.000   0.000   0.000   0.000   0.000
  TOP OF LAYER  6                 0.000   0.000   0.000   0.000   0.000   0.000

STD. DEVIATION OF DAILY           0.000   0.000   0.000   0.000   0.000   0.000
  HEAD ON TOP OF LAYER  6         0.000   0.000   0.000   0.000   0.000   0.000

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                       ANNUAL TOTALS FOR YEAR   20
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                                        INCHES          CU. FEET     PERCENT
                                       --------        ----------    -------
  PRECIPITATION                          38.95         141388.516    100.00

  RUNOFF                                 10.022         36379.859     25.73

  EVAPOTRANSPIRATION                     19.210         69733.391     49.32

  PERC./LEAKAGE THROUGH LAYER  2         10.554273      38312.008     27.10

  AVG. HEAD ON TOP OF LAYER  2            0.1491

  DRAINAGE COLLECTED FROM LAYER  3       10.4077        37780.102     26.72

  PERC./LEAKAGE THROUGH LAYER  4          0.082143        298.180      0.21

  AVG. HEAD ON TOP OF LAYER  4            0.0085

  PERC./LEAKAGE THROUGH LAYER  6          0.352632       1280.055      0.91

  AVG. HEAD ON TOP OF LAYER  6            0.0002

  CHANGE IN WATER STORAGE                -1.043         -3784.958     -2.68

  SOIL WATER AT START OF YEAR           166.892        605818.312

  SOIL WATER AT END OF YEAR             166.175        603215.125

  SNOW WATER AT START OF YEAR             0.326          1181.822      0.84

  SNOW WATER AT END OF YEAR               0.000             0.000      0.00

  ANNUAL WATER BUDGET BALANCE             0.0000            0.067      0.00

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                  MONTHLY TOTALS (IN INCHES) FOR YEAR   21
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                                 JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                                 ------- ------- ------- ------- ------- -------

PRECIPITATION                     4.17    1.28    5.89    2.06    4.04    2.36
                                  6.89    4.87    2.44    2.17    2.22    4.45
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RUNOFF                            0.050   1.292   2.166   0.145   0.086   0.010
                                  0.200   0.232   0.044   0.063   0.011   0.245

EVAPOTRANSPIRATION                0.735   0.476   2.055   1.829   3.147   2.351
                                  4.895   3.644   3.054   1.195   1.276   0.724

PERCOLATION/LEAKAGE THROUGH       2.4214  0.0000  2.5762  0.3969  0.6817  0.1247
  LAYER  2                        1.3191  0.4369  0.3758  0.4531  1.0848  3.0968

LATERAL DRAINAGE COLLECTED        2.4665  0.0000  2.5560  0.3941  0.6766  0.1235
  FROM LAYER  3                   1.2683  0.4727  0.3727  0.4495  1.0759  2.9989

PERCOLATION/LEAKAGE THROUGH       0.0194  0.0000  0.0202  0.0028  0.0051  0.0012
  LAYER  4                        0.0108  0.0041  0.0031  0.0036  0.0089  0.0229

PERCOLATION/LEAKAGE THROUGH       0.0301  0.0224  0.0310  0.0237  0.0255  0.0241
  LAYER  6                        0.0284  0.0258  0.0244  0.0255  0.0260  0.0293

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                   MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
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AVERAGE DAILY HEAD ON             0.385   0.000   0.458   0.082   0.100   0.010
  TOP OF LAYER  2                 0.165   0.041   0.050   0.073   0.123   0.525

STD. DEVIATION OF DAILY           0.743   0.000   0.857   0.439   0.377   0.057
  HEAD ON TOP OF LAYER  2         0.339   0.169   0.199   0.386   0.324   1.010

AVERAGE DAILY HEAD ON             0.024   0.000   0.025   0.004   0.007   0.001
  TOP OF LAYER  4                 0.012   0.005   0.004   0.004   0.011   0.029

STD. DEVIATION OF DAILY           0.033   0.000   0.033   0.016   0.018   0.005
  HEAD ON TOP OF LAYER  4         0.018   0.011   0.011   0.016   0.021   0.035

AVERAGE DAILY HEAD ON             0.000   0.000   0.000   0.000   0.000   0.000
  TOP OF LAYER  6                 0.000   0.000   0.000   0.000   0.000   0.000

STD. DEVIATION OF DAILY           0.000   0.000   0.000   0.000   0.000   0.000
  HEAD ON TOP OF LAYER  6         0.000   0.000   0.000   0.000   0.000   0.000

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                       ANNUAL TOTALS FOR YEAR   21
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                                         INCHES          CU. FEET     PERCENT
                                        --------        ----------    -------
  PRECIPITATION                           42.84         155509.203    100.00

  RUNOFF                                   4.545         16496.615     10.61

  EVAPOTRANSPIRATION                      25.379         92126.492     59.24

  PERC./LEAKAGE THROUGH LAYER  2          12.967497      47072.012     30.27

  AVG. HEAD ON TOP OF LAYER  2             0.1677

  DRAINAGE COLLECTED FROM LAYER  3        12.8547        46662.441     30.01

  PERC./LEAKAGE THROUGH LAYER  4           0.102219        371.056      0.24

  AVG. HEAD ON TOP OF LAYER  4             0.0104

  PERC./LEAKAGE THROUGH LAYER  6           0.316130       1147.552      0.74

  AVG. HEAD ON TOP OF LAYER  6             0.0002

  CHANGE IN WATER STORAGE                 -0.255          -923.840     -0.59

  SOIL WATER AT START OF YEAR            166.175        603215.125

  SOIL WATER AT END OF YEAR              165.920        602291.312

  SNOW WATER AT START OF YEAR              0.000             0.000      0.00

  SNOW WATER AT END OF YEAR                0.000             0.000      0.00

  ANNUAL WATER BUDGET BALANCE              0.0000           -0.057      0.00
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              MONTHLY TOTALS (IN INCHES) FOR YEAR   22
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                              JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
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PRECIPITATION                  3.56    4.00    3.28    2.62    1.53    6.51
                               7.40    5.08    4.78    1.90    4.51    0.77

RUNOFF                         1.803   4.091   1.642   0.160   0.017   0.698
                               0.496   0.338   1.329   0.081   0.091   0.000

EVAPOTRANSPIRATION             0.483   0.367   1.817   0.711   2.156   4.170
                               4.075   4.176   2.093   0.605   1.188   0.587

PERCOLATION/LEAKAGE THROUGH    0.0067  0.2417  1.0532  0.8557  0.2772  1.6432
  LAYER  2                     2.0128  0.9794  1.5906  0.6178  3.3794  0.0013

LATERAL DRAINAGE COLLECTED     0.0811  0.2372  1.0465  0.7544  0.3702  1.6310
  FROM LAYER  3                1.9983  0.9715  1.5791  0.5274  3.4401  0.0013

PERCOLATION/LEAKAGE THROUGH    0.0006  0.0026  0.0087  0.0053  0.0030  0.0122
  LAYER  4                     0.0145  0.0079  0.0115  0.0037  0.0259  0.0000

PERCOLATION/LEAKAGE THROUGH    0.0229  0.0227  0.0261  0.0230  0.0238  0.0249
  LAYER  6                     0.0251  0.0245  0.0229  0.0220  0.0266  0.0199

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               MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
------------------------------------------------------------------------------


AVERAGE DAILY HEAD ON          0.000   0.009   0.153   0.266   0.033   0.364
  TOP OF LAYER  2              0.417   0.176   0.513   0.112   0.515   0.000

STD. DEVIATION OF DAILY        0.001   0.029   0.564   0.987   0.153   0.894
  HEAD ON TOP OF LAYER  2      0.919   0.654   1.246   0.444   0.798   0.000

AVERAGE DAILY HEAD ON          0.001   0.003   0.010   0.008   0.004   0.016
  TOP OF LAYER  4              0.019   0.009   0.016   0.005   0.034   0.000

STD. DEVIATION OF DAILY        0.004   0.006   0.021   0.026   0.014   0.029
  HEAD ON TOP OF LAYER  4      0.034   0.021   0.032   0.020   0.038   0.000

AVERAGE DAILY HEAD ON          0.000   0.000   0.000   0.000   0.000   0.000
  TOP OF LAYER  6              0.000   0.000   0.000   0.000   0.000   0.000

STD. DEVIATION OF DAILY        0.000   0.000   0.000   0.000   0.000   0.000
  HEAD ON TOP OF LAYER  6      0.000   0.000   0.000   0.000   0.000   0.000

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                      ANNUAL TOTALS FOR YEAR   22
------------------------------------------------------------------------------
                                         INCHES          CU. FEET     PERCENT
                                        --------        ----------    -------
  PRECIPITATION                           45.94         166762.234    100.00

  RUNOFF                                  10.745         39005.625     23.39

  EVAPOTRANSPIRATION                      22.428         81413.781     48.82

  PERC./LEAKAGE THROUGH LAYER  2          12.659129      45952.641     27.56

  AVG. HEAD ON TOP OF LAYER  2             0.2132

  DRAINAGE COLLECTED FROM LAYER  3        12.6382        45876.555     27.51

  PERC./LEAKAGE THROUGH LAYER  4           0.095956        348.321      0.21




                      ANNUAL TOTALS FOR YEAR   23
------------------------------------------------------------------------------
                                         INCHES          CU. FEET     PERCENT
                                        --------        ----------    -------
  PRECIPITATION                           44.90         162986.984    100.00

  RUNOFF                                   8.019         29107.225     17.86

  EVAPOTRANSPIRATION                      23.082         83787.312     51.41

  PERC./LEAKAGE THROUGH LAYER  2          12.931643      46941.863     28.80

  AVG. HEAD ON TOP OF LAYER  2             0.2126

  DRAINAGE COLLECTED FROM LAYER  3        12.8319        46579.789     28.58

  PERC./LEAKAGE THROUGH LAYER  4           0.099337        360.593      0.22

  AVG. HEAD ON TOP OF LAYER  4             0.0105

  PERC./LEAKAGE THROUGH LAYER  6           0.273356        992.283      0.61

  AVG. HEAD ON TOP OF LAYER  6             0.0002

  CHANGE IN WATER STORAGE                  0.694          2520.385      1.55

  SOIL WATER AT START OF YEAR            165.321        600115.375

  SOIL WATER AT END OF YEAR              165.462        600627.625

  SNOW WATER AT START OF YEAR              0.444          1610.038      0.99

  SNOW WATER AT END OF YEAR                0.997          3618.181      2.22

  ANNUAL WATER BUDGET BALANCE              0.0000            0.000      0.00

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              MONTHLY TOTALS (IN INCHES) FOR YEAR   24
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                              JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                              ------- ------- ------- ------- ------- -------

PRECIPITATION                  3.17    1.76    2.56    8.38    3.44    4.05
                               3.29    3.98    2.25    0.52    2.65    3.63

RUNOFF                         0.000   2.079   3.038   2.624   0.766   0.110
                               0.013   0.353   0.095   0.000   0.194   1.554

EVAPOTRANSPIRATION             0.609   0.517   1.385   3.163   1.532   3.061
                               2.970   2.684   1.798   0.520   0.499   0.451

PERCOLATION/LEAKAGE THROUGH    0.3806  0.0362  0.8288  2.8647  0.7923  1.2412
  LAYER  2                     0.2341  0.7919  0.5810  0.0000  1.5075  0.8162

LATERAL DRAINAGE COLLECTED     0.3777  0.0307  0.8266  2.8438  0.7867  1.2314
  FROM LAYER  3                0.2319  0.7860  0.5765  0.0000  1.4970  0.8096

PERCOLATION/LEAKAGE THROUGH    0.0032  0.0004  0.0073  0.0209  0.0056  0.0098
  LAYER  4                     0.0022  0.0059  0.0044  0.0000  0.0105  0.0067

PERCOLATION/LEAKAGE THROUGH    0.0193  0.0178  0.0227  0.0230  0.0189  0.0202
  LAYER  6                     0.0191  0.0202  0.0191  0.0188  0.0204  0.0211

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               MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
------------------------------------------------------------------------------


AVERAGE DAILY HEAD ON          0.048   0.001   0.146   0.913   0.241   0.163
  TOP OF LAYER  2              0.017   0.147   0.120   0.000   0.407   0.148

STD. DEVIATION OF DAILY        0.232   0.007   0.561   1.735   0.920   0.335
  HEAD ON TOP OF LAYER  2      0.064   0.517   0.473   0.000   1.169   0.483
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  AVG. HEAD ON TOP OF LAYER  4             0.0104

  PERC./LEAKAGE THROUGH LAYER  6           0.284334       1032.134      0.62

  AVG. HEAD ON TOP OF LAYER  6             0.0002

  CHANGE IN WATER STORAGE                 -0.156          -565.879     -0.34

  SOIL WATER AT START OF YEAR            165.920        602291.312

  SOIL WATER AT END OF YEAR              165.321        600115.375

  SNOW WATER AT START OF YEAR              0.000             0.000      0.00

  SNOW WATER AT END OF YEAR                0.444          1610.038      0.97

  ANNUAL WATER BUDGET BALANCE              0.0000            0.020      0.00

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              MONTHLY TOTALS (IN INCHES) FOR YEAR   23
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                              JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                              ------- ------- ------- ------- ------- -------

PRECIPITATION                  3.93    3.97    2.55    2.20    1.25    7.10
                               6.55    1.75    4.40    0.98    3.30    6.92

RUNOFF                         1.465   4.827   0.010   0.012   0.000   0.539
                               0.365   0.005   0.354   0.000   0.160   0.281

EVAPOTRANSPIRATION             0.448   0.454   2.421   2.346   1.263   4.892
                               4.131   2.122   2.347   0.580   1.215   0.864

PERCOLATION/LEAKAGE THROUGH    0.0000  0.6089  0.5130  0.2086  0.1046  1.4849
  LAYER  2                     1.8784  0.0000  1.5492  0.0000  1.8962  4.6878

LATERAL DRAINAGE COLLECTED     0.0000  0.5314  0.5572  0.2296  0.1035  1.4728
  FROM LAYER  3                1.8450  0.0200  1.5376  0.0000  1.8814  4.6534

PERCOLATION/LEAKAGE THROUGH    0.0000  0.0053  0.0049  0.0021  0.0011  0.0116
  LAYER  4                     0.0138  0.0002  0.0116  0.0000  0.0149  0.0340

PERCOLATION/LEAKAGE THROUGH    0.0207  0.0224  0.0229  0.0216  0.0221  0.0242
  LAYER  6                     0.0238  0.0209  0.0231  0.0208  0.0241  0.0267

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               MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
------------------------------------------------------------------------------


AVERAGE DAILY HEAD ON          0.000   0.122   0.054   0.013   0.009   0.280
  TOP OF LAYER  2              0.375   0.000   0.324   0.000   0.401   0.973

STD. DEVIATION OF DAILY        0.000   0.571   0.179   0.052   0.045   0.828
  HEAD ON TOP OF LAYER  2      0.892   0.000   0.832   0.000   0.922   1.264

AVERAGE DAILY HEAD ON          0.000   0.006   0.005   0.002   0.001   0.015
  TOP OF LAYER  4              0.018   0.000   0.015   0.000   0.019   0.045

STD. DEVIATION OF DAILY        0.000   0.013   0.014   0.007   0.004   0.026
  HEAD ON TOP OF LAYER  4      0.031   0.001   0.030   0.000   0.030   0.044

AVERAGE DAILY HEAD ON          0.000   0.000   0.000   0.000   0.000   0.000
  TOP OF LAYER  6              0.000   0.000   0.000   0.000   0.000   0.000

STD. DEVIATION OF DAILY        0.000   0.000   0.000   0.000   0.000   0.000
  HEAD ON TOP OF LAYER  6      0.000   0.000   0.000   0.000   0.000   0.000

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AVERAGE DAILY HEAD ON          0.004   0.000   0.008   0.028   0.008   0.012
  TOP OF LAYER  4              0.002   0.008   0.006   0.000   0.015   0.008

STD. DEVIATION OF DAILY        0.013   0.001   0.017   0.041   0.024   0.022
  HEAD ON TOP OF LAYER  4      0.006   0.020   0.019   0.000   0.035   0.019

AVERAGE DAILY HEAD ON          0.000   0.000   0.000   0.000   0.000   0.000
  TOP OF LAYER  6              0.000   0.000   0.000   0.000   0.000   0.000

STD. DEVIATION OF DAILY        0.000   0.000   0.000   0.000   0.000   0.000
  HEAD ON TOP OF LAYER  6      0.000   0.000   0.000   0.000   0.000   0.000

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                      ANNUAL TOTALS FOR YEAR   24
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                                         INCHES          CU. FEET     PERCENT
                                        --------        ----------    -------
  PRECIPITATION                           39.68         144038.391    100.00

  RUNOFF                                  10.826         39297.164     27.28

  EVAPOTRANSPIRATION                      19.189         69656.523     48.36

  PERC./LEAKAGE THROUGH LAYER  2          10.074477      36570.352     25.39

  AVG. HEAD ON TOP OF LAYER  2             0.1960

  DRAINAGE COLLECTED FROM LAYER  3         9.9979        36292.234     25.20

  PERC./LEAKAGE THROUGH LAYER  4           0.077022        279.590      0.19

  AVG. HEAD ON TOP OF LAYER  4             0.0082

  PERC./LEAKAGE THROUGH LAYER  6           0.240663        873.605      0.61

  AVG. HEAD ON TOP OF LAYER  6             0.0002

  CHANGE IN WATER STORAGE                 -0.573         -2081.125     -1.44

  SOIL WATER AT START OF YEAR            165.462        600627.625

  SOIL WATER AT END OF YEAR              165.886        602164.687

  SNOW WATER AT START OF YEAR              0.997          3618.181      2.51

  SNOW WATER AT END OF YEAR                0.000             0.000      0.00

  ANNUAL WATER BUDGET BALANCE              0.0000           -0.013      0.00

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              MONTHLY TOTALS (IN INCHES) FOR YEAR   25
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                              JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                              ------- ------- ------- ------- ------- -------

PRECIPITATION                  3.12    2.68    4.94    1.80    2.70    4.61
                               2.75    3.87    2.27    2.60    2.41    4.00

RUNOFF                         2.675   2.100   1.763   0.000   0.000   0.245
                               0.063   0.219   0.026   0.073   0.004   0.387

EVAPOTRANSPIRATION             0.265   0.429   1.696   2.088   2.268   3.911
                               1.662   3.587   0.724   1.370   1.269   0.387

PERCOLATION/LEAKAGE THROUGH    0.1788  0.1511  2.4505  0.0000  0.0992  0.7897
  LAYER  2                     0.2019  0.8879  0.4753  1.2819  1.2257  2.8472

LATERAL DRAINAGE COLLECTED     0.1768  0.1493  2.4315  0.0000  0.0982  0.7834
  FROM LAYER  3                0.1504  0.9306  0.3798  1.2705  1.3084  2.8290
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PERCOLATION/LEAKAGE THROUGH      0.0020  0.0018  0.0190  0.0000  0.0009  0.0063
  LAYER  4                       0.0012  0.0076  0.0028  0.0092  0.0099  0.0204

PERCOLATION/LEAKAGE THROUGH      0.0204  0.0189  0.0245  0.0179  0.0196  0.0208
  LAYER  6                       0.0197  0.0216  0.0197  0.0211  0.0209  0.0219

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                   MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
-------------------------------------------------------------------------------

AVERAGE DAILY HEAD ON            0.007   0.006   0.414   0.000   0.005   0.152
  TOP OF LAYER  2                0.026   0.192   0.101   0.291   0.182   0.592

STD. DEVIATION OF DAILY          0.021   0.015   0.817   0.000   0.026   0.549
  HEAD ON TOP OF LAYER  2        0.143   0.687   0.503   0.861   0.462   1.268

AVERAGE DAILY HEAD ON            0.002   0.002   0.023   0.000   0.001   0.008
  TOP OF LAYER  4                0.001   0.009   0.004   0.012   0.013   0.027

STD. DEVIATION OF DAILY          0.004   0.003   0.035   0.000   0.004   0.019
  HEAD ON TOP OF LAYER  4        0.008   0.021   0.016   0.031   0.027   0.043

AVERAGE DAILY HEAD ON            0.000   0.000   0.000   0.000   0.000   0.000
  TOP OF LAYER  6                0.000   0.000   0.000   0.000   0.000   0.000

STD. DEVIATION OF DAILY          0.000   0.000   0.000   0.000   0.000   0.000
  HEAD ON TOP OF LAYER  6        0.000   0.000   0.000   0.000   0.000   0.000

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                          ANNUAL TOTALS FOR YEAR   25
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                                       INCHES          CU. FEET      PERCENT
                                      --------        ----------     -------
  PRECIPITATION                         37.75         137032.500     100.00

  RUNOFF                                 7.553         27417.379      20.01

  EVAPOTRANSPIRATION                    19.655         71347.148      52.07

  PERC./LEAKAGE THROUGH LAYER  2        10.589075      38438.344      28.05

  AVG. HEAD ON TOP OF LAYER  2           0.1640

  DRAINAGE COLLECTED FROM LAYER  3      10.5079        38143.758      27.84

  PERC./LEAKAGE THROUGH LAYER  4         0.081152        294.583       0.21

  AVG. HEAD ON TOP OF LAYER  4           0.0085

  PERC./LEAKAGE THROUGH LAYER  6         0.247010        896.647       0.65

  AVG. HEAD ON TOP OF LAYER  6           0.0002

  CHANGE IN WATER STORAGE               -0.213          -772.396      -0.56

  SOIL WATER AT START OF YEAR          165.886        602164.687

  SOIL WATER AT END OF YEAR            165.429        600508.250

  SNOW WATER AT START OF YEAR            0.000             0.000       0.00

  SNOW WATER AT END OF YEAR              0.244           884.024       0.65

  ANNUAL WATER BUDGET BALANCE            0.0000           -0.035       0.00

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                  MONTHLY TOTALS (IN INCHES) FOR YEAR   26
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                                 JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
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PRECIPITATION                     0.91    2.47    3.11    4.26    4.15    5.76
                                  5.71    5.39    7.04    2.49    0.72    2.06

RUNOFF                            0.442   0.430   0.650   0.417   0.163   0.524
                                  0.725   1.076   1.818   0.000   0.000   0.015

EVAPOTRANSPIRATION                0.509   0.624   2.108   2.171   3.193   4.002
                                  3.919   2.941   2.325   2.100   0.620   0.734

PERCOLATION/LEAKAGE THROUGH      0.0000  1.7714  1.1668  1.5137  0.6474  1.3057
  LAYER  2                       1.2982  1.3735  1.5090  1.7196  0.0000  0.9091

LATERAL DRAINAGE COLLECTED       0.0000  1.7147  1.2014  1.5023  0.6425  1.2965
  FROM LAYER  3                  1.2886  1.3634  1.4487  1.7546  0.0000  0.9010

PERCOLATION/LEAKAGE THROUGH      0.0000  0.0126  0.0095  0.0114  0.0048  0.0092
  LAYER  4                       0.0096  0.0101  0.0111  0.0142  0.0000  0.0081

PERCOLATION/LEAKAGE THROUGH      0.0181  0.0191  0.0206  0.0198  0.0185  0.0186
  LAYER  6                       0.0198  0.0196  0.0190  0.0207  0.0154  0.0196

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                   MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
-------------------------------------------------------------------------------

AVERAGE DAILY HEAD ON            0.000   0.372   0.292   0.304   0.103   0.277
  TOP OF LAYER  2                0.362   0.363   0.301   0.275   0.000   0.077

STD. DEVIATION OF DAILY          0.000   0.815   0.980   0.871   0.393   0.828
  HEAD ON TOP OF LAYER  2        1.215   1.163   0.821   0.834   0.000   0.165

AVERAGE DAILY HEAD ON            0.000   0.018   0.012   0.015   0.006   0.013
  TOP OF LAYER  4                0.012   0.013   0.014   0.017   0.000   0.009

STD. DEVIATION OF DAILY          0.000   0.034   0.026   0.029   0.020   0.031
  HEAD ON TOP OF LAYER  4        0.029   0.029   0.027   0.026   0.000   0.016

AVERAGE DAILY HEAD ON            0.000   0.000   0.000   0.000   0.000   0.000
  TOP OF LAYER  6                0.000   0.000   0.000   0.000   0.000   0.000

STD. DEVIATION OF DAILY          0.000   0.000   0.000   0.000   0.000   0.000
  HEAD ON TOP OF LAYER  6        0.000   0.000   0.000   0.000   0.000   0.000

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                          ANNUAL TOTALS FOR YEAR   26
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                                       INCHES          CU. FEET      PERCENT
                                      --------        ----------     -------
  PRECIPITATION                         44.07         159974.094     100.00

  RUNOFF                                 6.260         22724.664      14.21

  EVAPOTRANSPIRATION                    25.247         91646.937      57.29

  PERC./LEAKAGE THROUGH LAYER  2        13.214325      47968.000      29.98

  AVG. HEAD ON TOP OF LAYER  2           0.2271

  DRAINAGE COLLECTED FROM LAYER  3      13.1137        47602.648      29.76

  PERC./LEAKAGE THROUGH LAYER  4         0.100651        365.364       0.23

  AVG. HEAD ON TOP OF LAYER  4           0.0108

  PERC./LEAKAGE THROUGH LAYER  6         0.228982        831.205       0.52

  AVG. HEAD ON TOP OF LAYER  6           0.0002

  CHANGE IN WATER STORAGE               -0.780         -2831.349      -1.77

  SOIL WATER AT START OF YEAR          165.429        600508.250

  SOIL WATER AT END OF YEAR            164.893        598560.937
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  SNOW WATER AT START OF YEAR            0.244           884.024       0.55

  SNOW WATER AT END OF YEAR              0.000             0.000       0.00

  ANNUAL WATER BUDGET BALANCE            0.0000           -0.003       0.00

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                  MONTHLY TOTALS (IN INCHES) FOR YEAR   27
-------------------------------------------------------------------------------

                                 JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                                 ------- ------- ------- ------- ------- -------

PRECIPITATION                     1.90    2.08    3.23    2.93    1.28    3.46
                                  5.10    5.31    0.89    1.51    2.88    2.82

RUNOFF                            0.011   1.249   2.746   0.051   0.008   0.030
                                  0.207   0.167   0.000   0.000   0.490   0.147

EVAPOTRANSPIRATION                1.126   0.140   0.257   2.990   1.460   2.733
                                  4.055   3.330   1.272   1.219   1.081   1.144

PERCOLATION/LEAKAGE THROUGH      0.8995  0.0000  0.0813  0.7617  0.2005  0.6944
  LAYER  2                       0.7333  1.3365  0.0308  0.0000  1.0633  1.7702

LATERAL DRAINAGE COLLECTED       0.8925  0.0000  0.0789  0.7563  0.1991  0.6885
  FROM LAYER  3                  0.7278  1.2344  0.1224  0.0000  1.0042  1.8077

PERCOLATION/LEAKAGE THROUGH      0.0070  0.0000  0.0011  0.0063  0.0017  0.0058
  LAYER  4                       0.0055  0.0095  0.0010  0.0000  0.0078  0.0139

PERCOLATION/LEAKAGE THROUGH      0.0184  0.0149  0.0182  0.0192  0.0180  0.0193
  LAYER  6                       0.0190  0.0200  0.0172  0.0177  0.0193  0.0208

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                   MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
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AVERAGE DAILY HEAD ON            0.158   0.000   0.003   0.148   0.019   0.078
  TOP OF LAYER  2                0.166   0.237   0.002   0.000   0.285   0.306

STD. DEVIATION OF DAILY          0.530   0.000   0.007   0.565   0.101   0.228
  HEAD ON TOP OF LAYER  2        0.678   0.691   0.011   0.000   0.927   0.801

AVERAGE DAILY HEAD ON            0.009   0.000   0.001   0.008   0.002   0.007
  TOP OF LAYER  4                0.007   0.012   0.001   0.000   0.010   0.017

STD. DEVIATION OF DAILY          0.021   0.000   0.002   0.017   0.008   0.016
  HEAD ON TOP OF LAYER  4        0.021   0.027   0.006   0.000   0.024   0.031

AVERAGE DAILY HEAD ON            0.000   0.000   0.000   0.000   0.000   0.000
  TOP OF LAYER  6                0.000   0.000   0.000   0.000   0.000   0.000

STD. DEVIATION OF DAILY          0.000   0.000   0.000   0.000   0.000   0.000
  HEAD ON TOP OF LAYER  6        0.000   0.000   0.000   0.000   0.000   0.000

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                          ANNUAL TOTALS FOR YEAR   27
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                                       INCHES          CU. FEET      PERCENT
                                      --------        ----------     -------
  PRECIPITATION                         33.39         121205.727     100.00

  RUNOFF                                 5.106         18536.072      15.29

  EVAPOTRANSPIRATION                    20.808         75531.961      62.32

  PERC./LEAKAGE THROUGH LAYER  2         7.571430      27484.291      22.68
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  AVG. HEAD ON TOP OF LAYER  2           0.1168

  DRAINAGE COLLECTED FROM LAYER  3       7.5117        27267.371      22.50

  PERC./LEAKAGE THROUGH LAYER  4         0.059758        216.921       0.18

  AVG. HEAD ON TOP OF LAYER  4           0.0061

  PERC./LEAKAGE THROUGH LAYER  6         0.221756        804.974       0.66

  AVG. HEAD ON TOP OF LAYER  6           0.0002

  CHANGE IN WATER STORAGE               -0.258          -934.752      -0.77

  SOIL WATER AT START OF YEAR          164.893        598560.937

  SOIL WATER AT END OF YEAR            164.635        597626.187

  SNOW WATER AT START OF YEAR            0.000             0.000       0.00

  SNOW WATER AT END OF YEAR              0.000             0.000       0.00

  ANNUAL WATER BUDGET BALANCE            0.0000            0.097       0.00

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                  MONTHLY TOTALS (IN INCHES) FOR YEAR   28
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                                 JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
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PRECIPITATION                     0.90    2.99    3.33    1.37    3.09    7.76
                                  1.57    6.43    1.29    3.41    1.80    2.64

RUNOFF                            0.097   2.189   2.708   0.720   0.171   1.352
                                  0.000   1.427   0.000   0.665   0.000   0.540

EVAPOTRANSPIRATION                0.540   0.282   0.449   1.265   2.001   5.054
                                  1.337   2.885   1.999   1.176   1.087   0.531

PERCOLATION/LEAKAGE THROUGH      0.0066  0.0000  0.1510  0.5494  0.7264  1.6397
  LAYER  2                       0.0905  1.3656  0.1870  0.9215  0.7750  0.0230

LATERAL DRAINAGE COLLECTED       0.0065  0.0000  0.1494  0.5450  0.7131  1.6351
  FROM LAYER  3                  0.0896  1.3347  0.2064  0.9102  0.7664  0.0282

PERCOLATION/LEAKAGE THROUGH      0.0002  0.0000  0.0016  0.0044  0.0056  0.0123
  LAYER  4                       0.0010  0.0096  0.0019  0.0073  0.0070  0.0005

PERCOLATION/LEAKAGE THROUGH      0.0175  0.0166  0.0190  0.0188  0.0196  0.0198
  LAYER  6                       0.0182  0.0194  0.0177  0.0194  0.0196  0.0178

-------------------------------------------------------------------------------
                   MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
-------------------------------------------------------------------------------

AVERAGE DAILY HEAD ON            0.000   0.000   0.006   0.130   0.140   0.419
  TOP OF LAYER  2                0.006   0.361   0.018   0.227   0.081   0.001

STD. DEVIATION OF DAILY          0.000   0.000   0.022   0.560   0.530   0.995
  HEAD ON TOP OF LAYER  2        0.029   1.113   0.095   0.838   0.227   0.004

AVERAGE DAILY HEAD ON            0.000   0.000   0.001   0.005   0.007   0.016
  TOP OF LAYER  4                0.001   0.013   0.002   0.009   0.008   0.000

STD. DEVIATION OF DAILY          0.000   0.000   0.005   0.017   0.019   0.029
  HEAD ON TOP OF LAYER  4        0.003   0.030   0.008   0.022   0.014   0.001

AVERAGE DAILY HEAD ON            0.000   0.000   0.000   0.000   0.000   0.000
  TOP OF LAYER  6                0.000   0.000   0.000   0.000   0.000   0.000

STD. DEVIATION OF DAILY          0.000   0.000   0.000   0.000   0.000   0.000
  HEAD ON TOP OF LAYER  6        0.000   0.000   0.000   0.000   0.000   0.000
```

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                       ANNUAL TOTALS FOR YEAR   28
------------------------------------------------------------------------------
                                         INCHES          CU. FEET     PERCENT
                                        --------        ----------    -------
  PRECIPITATION                           36.58         132785.453    100.00

  RUNOFF                                   9.869         35825.469     26.98

  EVAPOTRANSPIRATION                      18.608         67546.562     50.87

  PERC./LEAKAGE THROUGH LAYER  2           6.435871      23362.213     17.59

  AVG. HEAD ON TOP OF LAYER  2             0.1157

  DRAINAGE COLLECTED FROM LAYER  3         6.3846        23176.170     17.45

  PERC./LEAKAGE THROUGH LAYER  4           0.051253        186.047      0.14

  AVG. HEAD ON TOP OF LAYER  4             0.0052

  PERC./LEAKAGE THROUGH LAYER  6           0.223366        810.817      0.61

  AVG. HEAD ON TOP OF LAYER  6             0.0002

  CHANGE IN WATER STORAGE                  1.495          5426.442      4.09

  SOIL WATER AT START OF YEAR            164.635        597626.187

  SOIL WATER AT END OF YEAR              165.081        599242.812

  SNOW WATER AT START OF YEAR              0.000             0.000      0.00

  SNOW WATER AT END OF YEAR                1.050          3809.847      2.87

  ANNUAL WATER BUDGET BALANCE              0.0000           -0.011      0.00

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                MONTHLY TOTALS (IN INCHES) FOR YEAR   29
------------------------------------------------------------------------------

                          JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                          ------- ------- ------- ------- ------- -------

PRECIPITATION               1.40    3.40    3.21    4.19    7.40    3.57
                            2.39    3.27    1.55    1.68    2.16    2.51

RUNOFF                      1.708   3.241   0.512   0.110   0.586   0.312
                            0.018   0.121   0.035   0.001   0.133   0.019

EVAPOTRANSPIRATION          0.316   0.165   1.866   2.796   3.940   2.603
                            2.145   2.769   1.158   0.876   0.863   0.550

PERCOLATION/LEAKAGE THROUGH 0.0000  0.2418  1.4292  1.4195  2.8670  1.1881
  LAYER  2                  0.2267  0.3794  0.2639  0.3555  0.7628  1.3165

LATERAL DRAINAGE COLLECTED  0.0000  0.2382  1.4163  1.4117  2.7554  1.2708
  FROM LAYER  3             0.2249  0.3761  0.2614  0.3527  0.7058  1.3566

PERCOLATION/LEAKAGE THROUGH 0.0000  0.0029  0.0111  0.0101  0.0197  0.0093
  LAYER  4                  0.0018  0.0033  0.0024  0.0029  0.0052  0.0117

PERCOLATION/LEAKAGE THROUGH 0.0177  0.0180  0.0202  0.0182  0.0198  0.0176
  LAYER  6                  0.0166  0.0175  0.0169  0.0175  0.0169  0.0198

------------------------------------------------------------------------------
                  MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
------------------------------------------------------------------------------
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AVERAGE DAILY HEAD ON          0.000   0.010   0.303   0.311   0.364   0.284
  TOP OF LAYER  2              0.021   0.031   0.024   0.060   0.173   0.109

STD. DEVIATION OF DAILY        0.000   0.019   0.809   0.876   1.261   0.851
  HEAD ON TOP OF LAYER  2      0.115   0.141   0.098   0.319   0.579   0.250

AVERAGE DAILY HEAD ON          0.000   0.003   0.014   0.014   0.027   0.013
  TOP OF LAYER  4              0.002   0.004   0.003   0.003   0.007   0.013

STD. DEVIATION OF DAILY        0.000   0.004   0.026   0.032   0.039   0.028
  HEAD ON TOP OF LAYER  4      0.009   0.010   0.008   0.013   0.023   0.021

AVERAGE DAILY HEAD ON          0.000   0.000   0.000   0.000   0.000   0.000
  TOP OF LAYER  6              0.000   0.000   0.000   0.000   0.000   0.000

STD. DEVIATION OF DAILY        0.000   0.000   0.000   0.000   0.000   0.000
  HEAD ON TOP OF LAYER  6      0.000   0.000   0.000   0.000   0.000   0.000

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                       ANNUAL TOTALS FOR YEAR   29
------------------------------------------------------------------------------
                                         INCHES          CU. FEET     PERCENT
                                        --------        ----------    -------
  PRECIPITATION                           36.73         133329.906    100.00

  RUNOFF                                   6.796         24670.555     18.50

  EVAPOTRANSPIRATION                      20.046         72768.727     54.58

  PERC./LEAKAGE THROUGH LAYER  2          10.450273      37934.488     28.45

  AVG. HEAD ON TOP OF LAYER  2             0.1659

  DRAINAGE COLLECTED FROM LAYER  3        10.3699        37642.699     28.23

  PERC./LEAKAGE THROUGH LAYER  4           0.080389        291.811      0.22

  AVG. HEAD ON TOP OF LAYER  4             0.0085

  PERC./LEAKAGE THROUGH LAYER  6           0.216685        786.566      0.59

  AVG. HEAD ON TOP OF LAYER  6             0.0001

  CHANGE IN WATER STORAGE                 -0.699         -2538.669     -1.90

  SOIL WATER AT START OF YEAR            165.081        599242.812

  SOIL WATER AT END OF YEAR              164.761        598082.500

  SNOW WATER AT START OF YEAR              1.050          3809.847      2.86

  SNOW WATER AT END OF YEAR                0.670          2431.475      1.82

  ANNUAL WATER BUDGET BALANCE              0.0000            0.039      0.00

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



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                MONTHLY TOTALS (IN INCHES) FOR YEAR   30
------------------------------------------------------------------------------

                          JAN/JUL FEB/AUG MAR/SEP APR/OCT MAY/NOV JUN/DEC
                          ------- ------- ------- ------- ------- -------

PRECIPITATION               1.77    3.46    4.86    3.67    2.56    2.83
                            3.85    1.99    1.06    0.17    2.46    3.47

RUNOFF                      1.646   2.634   1.550   0.025   0.004   0.021
                            1.499   0.017   0.000   0.000   0.233   0.093

EVAPOTRANSPIRATION          0.424   0.348   1.945   3.000   2.287   2.202
                            2.018   1.539   1.101   0.170   0.494   0.920
```

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PERCOLATION/LEAKAGE THROUGH 0.0083  0.1872  2.4457  1.1026  0.2804  0.2408
  LAYER  2                  0.7002  0.2332  0.1597  0.0000  1.0174  1.4612

LATERAL DRAINAGE COLLECTED  0.0082  0.1763  2.4353  1.0943  0.2776  0.2387
  FROM LAYER  3             0.6951  0.2314  0.1584  0.0000  1.0088  1.4509

PERCOLATION/LEAKAGE THROUGH 0.0002  0.0019  0.0193  0.0083  0.0028  0.0021
  LAYER  4                  0.0051  0.0018  0.0014  0.0000  0.0076  0.0113

PERCOLATION/LEAKAGE THROUGH 0.0164  0.0160  0.0212  0.0169  0.0167  0.0161
  LAYER  6                  0.0168  0.0164  0.0161  0.0163  0.0174  0.0189

------------------------------------------------------------------------------
                  MONTHLY SUMMARIES FOR DAILY HEADS (INCHES)
------------------------------------------------------------------------------


AVERAGE DAILY HEAD ON       0.000   0.008   0.371   0.112   0.028   0.025
  TOP OF LAYER  2           0.221   0.020   0.017   0.000   0.284   0.193

STD. DEVIATION OF DAILY     0.002   0.021   0.742   0.310   0.088   0.107
  HEAD ON TOP OF LAYER  2   0.851   0.109   0.094   0.000   0.960   0.559

AVERAGE DAILY HEAD ON       0.000   0.002   0.023   0.011   0.003   0.002
  TOP OF LAYER  4           0.007   0.002   0.002   0.000   0.010   0.014

STD. DEVIATION OF DAILY     0.000   0.005   0.028   0.027   0.006   0.007
  HEAD ON TOP OF LAYER  4   0.022   0.010   0.007   0.000   0.026   0.027

AVERAGE DAILY HEAD ON       0.000   0.000   0.000   0.000   0.000   0.000
  TOP OF LAYER  6           0.000   0.000   0.000   0.000   0.000   0.000

STD. DEVIATION OF DAILY     0.000   0.000   0.000   0.000   0.000   0.000
  HEAD ON TOP OF LAYER  6   0.000   0.000   0.000   0.000   0.000   0.000

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                       ANNUAL TOTALS FOR YEAR   30
------------------------------------------------------------------------------
                                         INCHES          CU. FEET     PERCENT
                                        --------        ----------    -------
  PRECIPITATION                           32.15         116704.492    100.00

  RUNOFF                                   7.723         28032.920     24.02

  EVAPOTRANSPIRATION                      16.448         59705.652     51.16

  PERC./LEAKAGE THROUGH LAYER  2           7.836672      28447.121     24.38

  AVG. HEAD ON TOP OF LAYER  2             0.1067

  DRAINAGE COLLECTED FROM LAYER  3         7.7750        28223.102     24.18

  PERC./LEAKAGE THROUGH LAYER  4           0.061713        224.017      0.19

  AVG. HEAD ON TOP OF LAYER  4             0.0063

  PERC./LEAKAGE THROUGH LAYER  6           0.205155        744.713      0.64

  AVG. HEAD ON TOP OF LAYER  6             0.0001

  CHANGE IN WATER STORAGE                 -0.001            -1.872      0.00

  SOIL WATER AT START OF YEAR            164.761        598082.500

  SOIL WATER AT END OF YEAR              164.303        596421.187

  SNOW WATER AT START OF YEAR              0.670          2431.475      2.08

  SNOW WATER AT END OF YEAR                1.127          4090.898      3.51

  ANNUAL WATER BUDGET BALANCE              0.0000           -0.022      0.00

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     AVERAGE MONTHLY VALUES IN INCHES FOR YEARS    1 THROUGH   30
------------------------------------------------------------------------------

                    JAN/JUL  FEB/AUG  MAR/SEP  APR/OCT  MAY/NOV  JUN/DEC
                    -------  -------  -------  -------  -------  -------
  PRECIPITATION
  -------------
    TOTALS             2.47     2.80     3.78     3.25     3.78     4.21
                       4.37     3.53     2.81     1.88     2.71     3.03

    STD. DEVIATIONS    1.25     1.12     1.64     1.79     2.15     2.07
                       1.90     1.81     1.54     1.18     1.23     1.26

  RUNOFF
  ------
    TOTALS             1.209    2.136    2.249    0.207    0.256    0.411
                       0.387    0.356    0.353    0.088    0.214    0.575

    STD. DEVIATIONS    1.193    1.059    2.035    0.487    0.444    0.636
                       0.526    0.571    0.491    0.181    0.465    0.712

  EVAPOTRANSPIRATION
  ------------------
    TOTALS             0.481    0.425    1.514    2.386    2.690    3.062
                       2.965    2.593    1.749    1.108    0.986    0.656

    STD. DEVIATIONS    0.218    0.166    0.559    0.804    1.034    1.158
                       0.983    0.919    0.716    0.542    0.279    0.191

  PERCOLATION/LEAKAGE THROUGH LAYER  2
  ------------------------------------
    TOTALS             0.1796   0.3022   1.2973   0.9171   0.7788   0.8612
                       0.8517   0.6541   0.6124   0.6993   1.1199   1.2597

    STD. DEVIATIONS    0.4632   0.4711   0.7178   0.7991   0.8099   0.5831
                       0.6434   0.6228   0.5940   0.6528   0.9305   1.1015

  LATERAL DRAINAGE COLLECTED FROM LAYER  3
  ----------------------------------------
    TOTALS             0.1859   0.2885   1.2950   0.9071   0.7688   0.8628
                       0.8301   0.6602   0.6022   0.6977   1.1095   1.2512

    STD. DEVIATIONS    0.4706   0.4483   0.7101   0.7872   0.7910   0.5822
                       0.6306   0.6205   0.5869   0.6548   0.9345   1.0835

  PERCOLATION/LEAKAGE THROUGH LAYER  4
  ------------------------------------
    TOTALS             0.0016   0.0027   0.0104   0.0069   0.0060   0.0067
                       0.0064   0.0051   0.0047   0.0054   0.0087   0.0098

    STD. DEVIATIONS    0.0037   0.0034   0.0053   0.0058   0.0058   0.0044
                       0.0046   0.0046   0.0042   0.0050   0.0069   0.0080

  PERCOLATION/LEAKAGE THROUGH LAYER  6
  ------------------------------------
    TOTALS             0.4758   0.4298   0.4667   0.4426   0.4526   0.4209
                       0.4236   0.4197   0.4023   0.4121   0.3961   0.4058

    STD. DEVIATIONS    0.7471   0.6733   0.7311   0.6994   0.7166   0.6820
                       0.6999   0.6946   0.6672   0.6842   0.6567   0.6734


------------------------------------------------------------------------------
            AVERAGES OF MONTHLY AVERAGED DAILY HEADS (INCHES)
------------------------------------------------------------------------------


  DAILY AVERAGE HEAD ON TOP OF LAYER  2
  -------------------------------------
    AVERAGES           0.0237   0.0451   0.2411   0.1974   0.1456   0.1716
                       0.1693   0.1301   0.1430   0.1304   0.2308   0.2220

    STD. DEVIATIONS    0.0746   0.0983   0.1682   0.2115   0.1886   0.1377
                       0.1694   0.1498   0.1849   0.1374   0.2487   0.2293

  DAILY AVERAGE HEAD ON TOP OF LAYER  4
  -------------------------------------
    AVERAGES           0.0018   0.0030   0.0125   0.0090   0.0074   0.0086
                       0.0080   0.0064   0.0060   0.0067   0.0111   0.0121

    STD. DEVIATIONS    0.0045   0.0047   0.0068   0.0078   0.0076   0.0058
```

```
                           0.0061   0.0060   0.0058   0.0063   0.0093   0.0104

  DAILY AVERAGE HEAD ON TOP OF LAYER  6
  -------------------------------------
    AVERAGES             44.5973  43.7970  42.1998  40.4220  39.4289  38.7072
                         38.0143  37.3121  36.6220  35.9333  35.2474  34.5636

    STD. DEVIATIONS      90.9321  89.5493  87.8190  86.5292  85.2565  83.9066
                         82.5537  81.1886  79.8569  78.5364  77.2291  75.9328

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     AVERAGE ANNUAL TOTALS & (STD. DEVIATIONS) FOR YEARS    1 THROUGH   30
-------------------------------------------------------------------------------
                                      INCHES            CU. FEET       PERCENT
                               -------------------   -------------   ---------
 PRECIPITATION                  38.62    (   5.672)     140194.2     100.00

 RUNOFF                          8.439   (  2.9493)      30634.43     21.851

 EVAPOTRANSPIRATION             20.615   (  2.6938)      74834.21     53.379

 PERCOLATION/LEAKAGE THROUGH     9.53324 (  2.17260)     34605.676    24.68409
   LAYER  2

 AVERAGE HEAD ON TOP             0.154 (    0.041)
   OF LAYER  2

 LATERAL DRAINAGE COLLECTED      9.45906 (  2.15882)     34336.387   24.49201
   FROM LAYER  3

 PERCOLATION/LEAKAGE THROUGH     0.07418 (  0.01619)       269.283     0.19208
   LAYER  4

 AVERAGE HEAD ON TOP             0.008 (    0.002)
   OF LAYER  4

 PERCOLATION/LEAKAGE THROUGH     5.14817 (  8.29458)     18687.861    13.32998
   LAYER  6

 AVERAGE HEAD ON TOP            38.904 (   83.152)
   OF LAYER  6

 CHANGE IN WATER STORAGE        -5.041   (  8.3038)     -18298.66    -13.052

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                PEAK DAILY VALUES FOR YEARS    1 THROUGH   30
   ------------------------------------------------------------------------
                                                (INCHES)      (CU. FT.)
                                               ----------   -------------
      PRECIPITATION                              4.55        16516.500

      RUNOFF                                     3.203       11627.1816

      PERCOLATION/LEAKAGE THROUGH LAYER  2       0.408183     1481.70361

      AVERAGE HEAD ON TOP OF LAYER  2            6.000

      DRAINAGE COLLECTED FROM LAYER  3           0.40129      1456.67688

      PERCOLATION/LEAKAGE THROUGH LAYER  4       0.002665        9.67365

      AVERAGE HEAD ON TOP OF LAYER  4            0.120

      MAXIMUM HEAD ON TOP OF LAYER  4            0.238

      LOCATION OF MAXIMUM HEAD IN LAYER  3
            (DISTANCE FROM DRAIN)                3.8 FEET

      PERCOLATION/LEAKAGE THROUGH LAYER  6       0.073746      267.69687

      AVERAGE HEAD ON TOP OF LAYER  6          323.945

      SNOW WATER                                 4.56        16547.7930
```

```
      MAXIMUM VEG. SOIL WATER (VOL/VOL)                      0.4790

      MINIMUM VEG. SOIL WATER (VOL/VOL)                      0.2510

       ***  Maximum heads are computed using McEnroe's equations.  ***

            Reference:  Maximum Saturated Depth over Landfill Liner
                        by Bruce M. McEnroe, University of Kansas
                        ASCE Journal of Environmental Engineering
                        Vol. 119, No. 2, March 1993, pp. 262-270.

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                  FINAL WATER STORAGE AT END OF YEAR   30
    ----------------------------------------------------------------------
                 LAYER        (INCHES)       (VOL/VOL)
                 -----        --------       ---------
                   1            2.0901         0.3484

                   2           12.8100         0.4270

                   3            0.0020         0.0100

                   4            0.0000         0.0000

                   5           35.0523         0.1082

                   6          107.4130         0.4610

               SNOW WATER       1.127

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APPENDIX B

MIGRATE Model Input and Output Files

```
#VAR CWLP Closure in Place (BASELINE)

MIGRATE VERSION 9:  Output Units = SI
            1                 Number of Layers
           15                 Number of Variable Groups
             0      yrs              0      yrs  Start Time
            50      yrs             50      yrs  End Time  - Time Group 1
            10                                   Number of Increments
             1                                   Number of Landfills
             1                                   Top Boundary Condition
             0        m              0        m  Offset - Landfill 1
           507        m            507        m  Surface Width
           481        m            481        m  Base Width
             1     mg/L              1     mg/L  Concentration
             0      yrs              0      yrs  Half-Life
             3                                   Bottom Boundary Condition
             0        m              0        m  Base Integration Width
             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
          2.23        m           2.23        m  Thickness
          0.43                                   Porosity
           187      m/a            187      m/a  Velocity
          2936     m2/a           2936     m2/a  Dispersion Coef.
             5                           #Sublayers - Layer 1
          5.91        m           5.91        m  Thickness
          0.46                                   Porosity
          1470    kg/m3           1.47    g/cm3  Density
         0.634     m2/a          0.634     m2/a  Vertical Diffusion Coef.
        0.0776     m2/a         0.0776     m2/a  Horz. Diffusion Coef.
         0.651      m/a          0.651      m/a  Vertical Velocity
             0      m/a              0      m/a  Horz. Velocity
             0    m3/kg              0     mL/g  Distribution Coef.
             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
             0                                   Type of Fractures
            51      yrs             51      yrs  End Time  - Time Group 2
             1                                   Number of Increments
             1                                   Number of Landfills
             1                                   Top Boundary Condition
             0        m              0        m  Offset - Landfill 1
           507        m            507        m  Surface Width
           481        m            481        m  Base Width
             1     mg/L              1     mg/L  Concentration
             0      yrs              0      yrs  Half-Life
             3                                   Bottom Boundary Condition
             0        m              0        m  Base Integration Width
             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
          2.23        m           2.23        m  Thickness
          0.43                                   Porosity
           175      m/a            175      m/a  Velocity
          2735     m2/a           2735     m2/a  Dispersion Coef.
             5                           #Sublayers - Layer 1
          5.91        m           5.91        m  Thickness
          0.46                                   Porosity
          1470    kg/m3           1.47    g/cm3  Density
         0.587     m2/a          0.587     m2/a  Vertical Diffusion Coef.
         0.072     m2/a          0.072     m2/a  Horz. Diffusion Coef.
         0.592      m/a          0.592      m/a  Vertical Velocity
             0      m/a              0      m/a  Horz. Velocity
             0    m3/kg              0     mL/g  Distribution Coef.
             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
             0                                   Type of Fractures
            52      yrs             52      yrs  End Time  - Time Group 3
             1                                   Number of Increments
             1                                   Number of Landfills
             1                                   Top Boundary Condition
             0        m              0        m  Offset - Landfill 1
           507        m            507        m  Surface Width
           481        m            481        m  Base Width
             1     mg/L              1     mg/L  Concentration
             0      yrs              0      yrs  Half-Life
             3                                   Bottom Boundary Condition
             0        m              0        m  Base Integration Width
```

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             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
          2.23        m           2.23        m  Thickness
          0.43                                   Porosity
           163      m/a            163      m/a  Velocity
          2553     m2/a           2553     m2/a  Dispersion Coef.
             5                           #Sublayers - Layer 1
          5.91        m           5.91        m  Thickness
          0.46                                   Porosity
          1470    kg/m3           1.47    g/cm3  Density
         0.527     m2/a          0.527     m2/a  Vertical Diffusion Coef.
        0.0669     m2/a         0.0669     m2/a  Horz. Diffusion Coef.
         0.538      m/a          0.538      m/a  Vertical Velocity
             0      m/a              0      m/a  Horz. Velocity
             0    m3/kg              0     mL/g  Distribution Coef.
             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
             0                                   Type of Fractures
            53      yrs             53      yrs  End Time  - Time Group 4
             1                                   Number of Increments
             1                                   Number of Landfills
             1                                   Top Boundary Condition
             0        m              0        m  Offset - Landfill 1
           507        m            507        m  Surface Width
           481        m            481        m  Base Width
             1     mg/L              1     mg/L  Concentration
             0      yrs              0      yrs  Half-Life
             3                                   Bottom Boundary Condition
             0        m              0        m  Base Integration Width
             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
          2.23        m           2.23        m  Thickness
          0.43                                   Porosity
           153      m/a            153      m/a  Velocity
          2391     m2/a           2391     m2/a  Dispersion Coef.
             5                           #Sublayers - Layer 1
          5.91        m           5.91        m  Thickness
          0.46                                   Porosity
          1470    kg/m3           1.47    g/cm3  Density
         0.481     m2/a          0.481     m2/a  Vertical Diffusion Coef.
        0.0623     m2/a         0.0623     m2/a  Horz. Diffusion Coef.
          0.49      m/a           0.49      m/a  Vertical Velocity
             0      m/a              0      m/a  Horz. Velocity
             0    m3/kg              0     mL/g  Distribution Coef.
             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
             0                                   Type of Fractures
            54      yrs             54      yrs  End Time  - Time Group 5
             1                                   Number of Increments
             1                                   Number of Landfills
             1                                   Top Boundary Condition
             0        m              0        m  Offset - Landfill 1
           507        m            507        m  Surface Width
           481        m            481        m  Base Width
             1     mg/L              1     mg/L  Concentration
             0      yrs              0      yrs  Half-Life
             3                                   Bottom Boundary Condition
             0        m              0        m  Base Integration Width
             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
          2.23        m           2.23        m  Thickness
          0.43                                   Porosity
           143      m/a            143      m/a  Velocity
          2235     m2/a           2235     m2/a  Dispersion Coef.
             5                           #Sublayers - Layer 1
          5.91        m           5.91        m  Thickness
          0.46                                   Porosity
          1470    kg/m3           1.47    g/cm3  Density
         0.437     m2/a          0.437     m2/a  Vertical Diffusion Coef.
         0.058     m2/a          0.058     m2/a  Horz. Diffusion Coef.
         0.444      m/a          0.444      m/a  Vertical Velocity
             0      m/a              0      m/a  Horz. Velocity
             0    m3/kg              0     mL/g  Distribution Coef.
             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
```

```
             0                                   Type of Fractures
            55      yrs             55      yrs  End Time  - Time Group 6
             1                                   Number of Increments
             1                                   Number of Landfills
             1                                   Top Boundary Condition
             0        m              0        m  Offset - Landfill 1
           507        m            507        m  Surface Width
           481        m            481        m  Base Width
             1     mg/L              1     mg/L  Concentration
             0      yrs              0      yrs  Half-Life
             3                                   Bottom Boundary Condition
             0        m              0        m  Base Integration Width
             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
          2.23        m           2.23        m  Thickness
          0.43                                   Porosity
           134      m/a            134      m/a  Velocity
          2098     m2/a           2098     m2/a  Dispersion Coef.
             5                           #Sublayers - Layer 1
          5.91        m           5.91        m  Thickness
          0.46                                   Porosity
          1470    kg/m3           1.47    g/cm3  Density
         0.399     m2/a          0.399     m2/a  Vertical Diffusion Coef.
        0.0541     m2/a         0.0541     m2/a  Horz. Diffusion Coef.
         0.403      m/a          0.403      m/a  Vertical Velocity
             0      m/a              0      m/a  Horz. Velocity
             0    m3/kg              0     mL/g  Distribution Coef.
             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
             0                                   Type of Fractures
            56      yrs             56      yrs  End Time  - Time Group 7
             1                                   Number of Increments
             1                                   Number of Landfills
             1                                   Top Boundary Condition
             0        m              0        m  Offset - Landfill 1
           507        m            507        m  Surface Width
           481        m            481        m  Base Width
             1     mg/L              1     mg/L  Concentration
             0      yrs              0      yrs  Half-Life
             3                                   Bottom Boundary Condition
             0        m              0        m  Base Integration Width
             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
          2.23        m           2.23        m  Thickness
          0.43                                   Porosity
           115      m/a            115      m/a  Velocity
          1807     m2/a           1807     m2/a  Dispersion Coef.
             5                           #Sublayers - Layer 1
          5.91        m           5.91        m  Thickness
          0.46                                   Porosity
          1470    kg/m3           1.47    g/cm3  Density
         0.317     m2/a          0.317     m2/a  Vertical Diffusion Coef.
        0.0459     m2/a         0.0459     m2/a  Horz. Diffusion Coef.
         0.317      m/a          0.317      m/a  Vertical Velocity
             0      m/a              0      m/a  Horz. Velocity
             0    m3/kg              0     mL/g  Distribution Coef.
             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
             0                                   Type of Fractures
            57      yrs             57      yrs  End Time  - Time Group 8
             1                                   Number of Increments
             1                                   Number of Landfills
             1                                   Top Boundary Condition
             0        m              0        m  Offset - Landfill 1
           507        m            507        m  Surface Width
           481        m            481        m  Base Width
             1     mg/L              1     mg/L  Concentration
             0      yrs              0      yrs  Half-Life
             3                                   Bottom Boundary Condition
             0        m              0        m  Base Integration Width
             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
          2.23        m           2.23        m  Thickness
          0.43                                   Porosity
            84      m/a             84      m/a  Velocity
```

```
          1321     m2/a           1321     m2/a  Dispersion Coef.
             5                           #Sublayers - Layer 1
          5.91        m           5.91        m  Thickness
          0.46                                   Porosity
          1470    kg/m3           1.47    g/cm3  Density
          0.18     m2/a           0.18     m2/a  Vertical Diffusion Coef.
        0.0323     m2/a         0.0323     m2/a  Horz. Diffusion Coef.
         0.173      m/a          0.173      m/a  Vertical Velocity
             0      m/a              0      m/a  Horz. Velocity
             0    m3/kg              0     mL/g  Distribution Coef.
             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
             0                                   Type of Fractures
            58      yrs             58      yrs  End Time  - Time Group 9
             1                                   Number of Increments
             1                                   Number of Landfills
             1                                   Top Boundary Condition
             0        m              0        m  Offset - Landfill 1
           507        m            507        m  Surface Width
           481        m            481        m  Base Width
             1     mg/L              1     mg/L  Concentration
             0      yrs              0      yrs  Half-Life
             3                                   Bottom Boundary Condition
             0        m              0        m  Base Integration Width
             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
          2.23        m           2.23        m  Thickness
          0.43                                   Porosity
            59      m/a             59      m/a  Velocity
           922     m2/a            922     m2/a  Dispersion Coef.
             5                           #Sublayers - Layer 1
          5.91        m           5.91        m  Thickness
          0.46                                   Porosity
          1470    kg/m3           1.47    g/cm3  Density
        0.0682     m2/a         0.0682     m2/a  Vertical Diffusion Coef.
         0.021     m2/a          0.021     m2/a  Horz. Diffusion Coef.
        0.0552      m/a         0.0552      m/a  Vertical Velocity
             0      m/a              0      m/a  Horz. Velocity
             0    m3/kg              0     mL/g  Distribution Coef.
             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
             0                                   Type of Fractures
            60      yrs             60      yrs  End Time  - Time Group 10
             2                                   Number of Increments
             1                                   Number of Landfills
             1                                   Top Boundary Condition
             0        m              0        m  Offset - Landfill 1
           507        m            507        m  Surface Width
           481        m            481        m  Base Width
             1     mg/L              1     mg/L  Concentration
             0      yrs              0      yrs  Half-Life
             3                                   Bottom Boundary Condition
             0        m              0        m  Base Integration Width
             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
          2.23        m           2.23        m  Thickness
          0.43                                   Porosity
            55      m/a             55      m/a  Velocity
           866     m2/a            866     m2/a  Dispersion Coef.
             5                           #Sublayers - Layer 1
          5.91        m           5.91        m  Thickness
          0.46                                   Porosity
          1470    kg/m3           1.47    g/cm3  Density
        0.0526     m2/a         0.0526     m2/a  Vertical Diffusion Coef.
        0.0195     m2/a         0.0195     m2/a  Horz. Diffusion Coef.
        0.0387      m/a         0.0387      m/a  Vertical Velocity
             0      m/a              0      m/a  Horz. Velocity
             0    m3/kg              0     mL/g  Distribution Coef.
             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
             0                                   Type of Fractures
            62      yrs             62      yrs  End Time  - Time Group 11
             2                                   Number of Increments
             1                                   Number of Landfills
             1                                   Top Boundary Condition
```

```
       0        m              0        m  Offset - Landfill 1
     507        m            507        m  Surface Width
     481        m            481        m  Base Width
       1     mg/L              1     mg/L  Concentration
       0      yrs              0      yrs  Half-Life
       3                                   Bottom Boundary Condition
       0        m              0        m  Base Integration Width
       0      yrs              0      yrs  Half-Life
       0      m/a              0      m/a  Sink Removal
    2.23        m           2.23        m  Thickness
    0.43                                   Porosity
      52      m/a             52      m/a  Velocity
     817     m2/a            817     m2/a  Dispersion Coef.
       5                           #Sublayers - Layer 1
    5.91        m           5.91        m  Thickness
    0.46                                   Porosity
    1470    kg/m3           1.47    g/cm3  Density
  0.0388     m2/a         0.0388     m2/a  Vertical Diffusion Coef.
  0.0181     m2/a         0.0181     m2/a  Horz. Diffusion Coef.
  0.0242      m/a         0.0242      m/a  Vertical Velocity
       0      m/a              0      m/a  Horz. Velocity
       0    m3/kg              0     mL/g  Distribution Coef.
       0      yrs              0      yrs  Half-Life
       0      m/a              0      m/a  Sink Removal
       0                                   Type of Fractures
      67      yrs             67      yrs  End Time  - Time Group 12
       5                                   Number of Increments
       1                                   Number of Landfills
       1                                   Top Boundary Condition
       0        m              0        m  Offset - Landfill 1
     507        m            507        m  Surface Width
     481        m            481        m  Base Width
       1     mg/L              1     mg/L  Concentration
       0      yrs              0      yrs  Half-Life
       3                                   Bottom Boundary Condition
       0        m              0        m  Base Integration Width
       0      yrs              0      yrs  Half-Life
       0      m/a              0      m/a  Sink Removal
    2.23        m           2.23        m  Thickness
    0.43                                   Porosity
      51      m/a             51      m/a  Velocity
     792     m2/a            792     m2/a  Dispersion Coef.
       5                           #Sublayers - Layer 1
    5.91        m           5.91        m  Thickness
    0.46                                   Porosity
    1470    kg/m3           1.47    g/cm3  Density
  0.0319     m2/a         0.0319     m2/a  Vertical Diffusion Coef.
  0.0174     m2/a         0.0174     m2/a  Horz. Diffusion Coef.
  0.0169      m/a         0.0169      m/a  Vertical Velocity
       0      m/a              0      m/a  Horz. Velocity
       0    m3/kg              0     mL/g  Distribution Coef.
       0      yrs              0      yrs  Half-Life
       0      m/a              0      m/a  Sink Removal
       0                                   Type of Fractures
      72      yrs             72      yrs  End Time  - Time Group 13
       5                                   Number of Increments
       1                                   Number of Landfills
       1                                   Top Boundary Condition
       0        m              0        m  Offset - Landfill 1
     507        m            507        m  Surface Width
     481        m            481        m  Base Width
       1     mg/L              1     mg/L  Concentration
       0      yrs              0      yrs  Half-Life
       3                                   Bottom Boundary Condition
       0        m              0        m  Base Integration Width
       0      yrs              0      yrs  Half-Life
       0      m/a              0      m/a  Sink Removal
    2.23        m           2.23        m  Thickness
    0.43                                   Porosity
      49      m/a             49      m/a  Velocity
     768     m2/a            768     m2/a  Dispersion Coef.
       5                           #Sublayers - Layer 1
    5.91        m           5.91        m  Thickness
    0.46                                   Porosity
    1470    kg/m3           1.47    g/cm3  Density
```

```
        0.0251     m2/a         0.0251     m2/a  Vertical Diffusion Coef.
        0.0167     m2/a         0.0167     m2/a  Horz. Diffusion Coef.
       0.00979      m/a        0.00979      m/a  Vertical Velocity
             0      m/a              0      m/a  Horz. Velocity
             0    m3/kg              0     mL/g  Distribution Coef.
             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
             0                                   Type of Fractures
            77      yrs             77      yrs  End Time  - Time Group 14
             5                                   Number of Increments
             1                                   Number of Landfills
             1                                   Top Boundary Condition
             0        m              0        m  Offset - Landfill 1
           507        m            507        m  Surface Width
           481        m            481        m  Base Width
             1     mg/L              1     mg/L  Concentration
             0      yrs              0      yrs  Half-Life
             3                                   Bottom Boundary Condition
             0        m              0        m  Base Integration Width
             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
          2.23        m           2.23        m  Thickness
          0.43                                   Porosity
            48      m/a             48      m/a  Velocity
           756     m2/a            756     m2/a  Dispersion Coef.
             5                           #Sublayers - Layer 1
          5.91        m           5.91        m  Thickness
          0.46                                   Porosity
          1470    kg/m3           1.47    g/cm3  Density
        0.0216     m2/a         0.0216     m2/a  Vertical Diffusion Coef.
        0.0164     m2/a         0.0164     m2/a  Horz. Diffusion Coef.
       0.00614      m/a        0.00614      m/a  Vertical Velocity
             0      m/a              0      m/a  Horz. Velocity
             0    m3/kg              0     mL/g  Distribution Coef.
             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
             0                                   Type of Fractures
            80      yrs             80      yrs  End Time  - Time Group 15
             3                                   Number of Increments
             1                                   Number of Landfills
             1                                   Top Boundary Condition
             0        m              0        m  Offset - Landfill 1
           507        m            507        m  Surface Width
           481        m            481        m  Base Width
             1     mg/L              1     mg/L  Concentration
             0      yrs              0      yrs  Half-Life
             3                                   Bottom Boundary Condition
             0        m              0        m  Base Integration Width
             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
          2.23        m           2.23        m  Thickness
          0.43                                   Porosity
            48      m/a             48      m/a  Velocity
           754     m2/a            754     m2/a  Dispersion Coef.
             5                           #Sublayers - Layer 1
          5.91        m           5.91        m  Thickness
          0.46                                   Porosity
          1470    kg/m3           1.47    g/cm3  Density
         0.021     m2/a          0.021     m2/a  Vertical Diffusion Coef.
        0.0163     m2/a         0.0163     m2/a  Horz. Diffusion Coef.
       0.00551      m/a        0.00551      m/a  Vertical Velocity
             0      m/a              0      m/a  Horz. Velocity
             0    m3/kg              0     mL/g  Distribution Coef.
             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
             0                                   Type of Fractures
   3                            No. of distances of interest
         240.5        m          240.5        m  Distance
         273.5        m          273.5        m  Distance
         306.5        m          306.5        m  Distance
        7     20             0             2  TAU, N, SIG, RNU : Talbot Integ
SELECT
         1e-04           200           20      Gauss Step Size, #Steps, #Samples
```

```
1
              *********************************************************
              *                                                       *
              *                                                       *
              *         M I G R A T E   S I M U L A T I O N           *
              *                                                       *
              *                RUN DATE -   11- 1-80                  *
              *                TIME     -   20:13:19                  *
              *                                                       *
              *                REVISION - 1995/15/02                  *
              *                                                       *
              *                       MIGRATE                         *
              *                                                       *
              *                     VERSION 9.0.0                     *
              *                                                       *
              *    COPYRIGHT  R.K. ROWE & J.R. BOOKER  1985-1995      *
              *                                                       *
              * LICENSED USER: Andrews Environmental Engineering Ltd. *
              *                                                       *
              *********************************************************


 ***************************************************************************
  #VAR CWLP Closure in Place (BASELINE)
 ***************************************************************************


________________________________________________________________________________


                              TIME-VARYING PROPERTIES GROUP    1

 START TIME           =         0.0000
 END TIME             =        50.0000
 NUMBER OF INCREMENTS =            10


 SURFACE BOUNDARY
 ~~~~~~~~~~~~~~~~

 SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0


 OFFSET OF CENTER OF LANDFILL    1 IS     0.0000E+00

 WIDTH OF BASE OF LANDFILL IS BETWEEN      -240.5000< X <  240.5000
 WIDTH OF SURFACE OF LANDFILL IS BETWEEN   -253.5000< X <  253.5000


 THE INITIAL SOURCE CONCENTRATION              =   0.1000E+01

 BASE BOUNDARY
 ~~~~~~~~~~~~~
 BASE BOUNDARY CONDITION DEFINED BY
 A PERMEABLE BASE STRATUM WITH THE FOLLOWING PROPERTIES:

 BASE INTEGRATION WIDTH IS BETWEEN        - 1521.0000< X < 1521.0000


 BASE THICKNESS         =   0.2230E+01
 BASE POROSITY          =     0.4300
 OUTFLOW VELOCITY       =   0.1870E+03
 BASE DISPERSION COEFF. =   0.2936E+04


                           PROPERTIES OF THE MATRIX
                           ========================


 LAYER  DISPERSION COEFF. POROSITY ADSORPTION  DENSITY  ADV. VELOCITY THICKNESS
         VERT.    HORZ.             COEFF.              HORZ.   VERT.
 ~~~~~  ~~~~~~~~~~~~~~~~~ ~~~~~~~~ ~~~~~~~~~~  ~~~~~~~  ~~~~~~~~~~~~~ ~~~~~~~~~
   1    .634E+00 .776E-01  0.460   0.000E+00 1470.000  0.0000   0.6510     1.18
   2    .634E+00 .776E-01  0.460   0.000E+00 1470.000  0.0000   0.6510     1.18
   3    .634E+00 .776E-01  0.460   0.000E+00 1470.000  0.0000   0.6510     1.18
   4    .634E+00 .776E-01  0.460   0.000E+00 1470.000  0.0000   0.6510     1.18
   5    .634E+00 .776E-01  0.460   0.000E+00 1470.000  0.0000   0.6510     1.18


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                              TIME-VARYING PROPERTIES GROUP    2

 START TIME           =        50.0000
 END TIME             =        51.0000
 NUMBER OF INCREMENTS =             1


 SURFACE BOUNDARY
 ~~~~~~~~~~~~~~~~

 SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0


 OFFSET OF CENTER OF LANDFILL    1 IS     0.0000E+00

 WIDTH OF BASE OF LANDFILL IS BETWEEN      -240.5000< X <  240.5000
 WIDTH OF SURFACE OF LANDFILL IS BETWEEN   -253.5000< X <  253.5000


 THE INITIAL SOURCE CONCENTRATION              =   0.1000E+01

 BASE BOUNDARY
 ~~~~~~~~~~~~~
 BASE BOUNDARY CONDITION DEFINED BY
 A PERMEABLE BASE STRATUM WITH THE FOLLOWING PROPERTIES:

 BASE INTEGRATION WIDTH IS BETWEEN        - 1521.0000< X < 1521.0000


 BASE THICKNESS         =   0.2230E+01
 BASE POROSITY          =     0.4300
 OUTFLOW VELOCITY       =   0.1750E+03
 BASE DISPERSION COEFF. =   0.2735E+04


                           PROPERTIES OF THE MATRIX
                           ========================


 LAYER  DISPERSION COEFF. POROSITY ADSORPTION  DENSITY  ADV. VELOCITY THICKNESS
         VERT.    HORZ.             COEFF.              HORZ.   VERT.
 ~~~~~  ~~~~~~~~~~~~~~~~~ ~~~~~~~~ ~~~~~~~~~~  ~~~~~~~  ~~~~~~~~~~~~~ ~~~~~~~~~
   1    .587E+00 .720E-01  0.460   0.000E+00 1470.000  0.0000   0.5920     1.18
   2    .587E+00 .720E-01  0.460   0.000E+00 1470.000  0.0000   0.5920     1.18
   3    .587E+00 .720E-01  0.460   0.000E+00 1470.000  0.0000   0.5920     1.18
   4    .587E+00 .720E-01  0.460   0.000E+00 1470.000  0.0000   0.5920     1.18
   5    .587E+00 .720E-01  0.460   0.000E+00 1470.000  0.0000   0.5920     1.18


________________________________________________________________________________


                              TIME-VARYING PROPERTIES GROUP    3

 START TIME           =        51.0000
 END TIME             =        52.0000
 NUMBER OF INCREMENTS =             1


 SURFACE BOUNDARY
 ~~~~~~~~~~~~~~~~

 SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0


 OFFSET OF CENTER OF LANDFILL    1 IS     0.0000E+00

 WIDTH OF BASE OF LANDFILL IS BETWEEN      -240.5000< X <  240.5000
 WIDTH OF SURFACE OF LANDFILL IS BETWEEN   -253.5000< X <  253.5000


 THE INITIAL SOURCE CONCENTRATION              =   0.1000E+01

 BASE BOUNDARY
 ~~~~~~~~~~~~~
 BASE BOUNDARY CONDITION DEFINED BY
 A PERMEABLE BASE STRATUM WITH THE FOLLOWING PROPERTIES:

 BASE INTEGRATION WIDTH IS BETWEEN        - 1521.0000< X < 1521.0000


 BASE THICKNESS         =   0.2230E+01
 BASE POROSITY          =     0.4300
 OUTFLOW VELOCITY       =   0.1630E+03
 BASE DISPERSION COEFF. =   0.2553E+04


                           PROPERTIES OF THE MATRIX
                           ========================


 LAYER  DISPERSION COEFF. POROSITY ADSORPTION  DENSITY  ADV. VELOCITY THICKNESS
         VERT.    HORZ.             COEFF.              HORZ.   VERT.
 ~~~~~  ~~~~~~~~~~~~~~~~~ ~~~~~~~~ ~~~~~~~~~~  ~~~~~~~  ~~~~~~~~~~~~~ ~~~~~~~~~
   1    .527E+00 .669E-01  0.460   0.000E+00 1470.000  0.0000   0.5380     1.18
   2    .527E+00 .669E-01  0.460   0.000E+00 1470.000  0.0000   0.5380     1.18
   3    .527E+00 .669E-01  0.460   0.000E+00 1470.000  0.0000   0.5380     1.18
   4    .527E+00 .669E-01  0.460   0.000E+00 1470.000  0.0000   0.5380     1.18
   5    .527E+00 .669E-01  0.460   0.000E+00 1470.000  0.0000   0.5380     1.18


________________________________________________________________________________


                              TIME-VARYING PROPERTIES GROUP    4

 START TIME           =        52.0000
 END TIME             =        53.0000
 NUMBER OF INCREMENTS =             1


 SURFACE BOUNDARY
 ~~~~~~~~~~~~~~~~

 SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0


 OFFSET OF CENTER OF LANDFILL    1 IS     0.0000E+00

 WIDTH OF BASE OF LANDFILL IS BETWEEN      -240.5000< X <  240.5000
 WIDTH OF SURFACE OF LANDFILL IS BETWEEN   -253.5000< X <  253.5000


 THE INITIAL SOURCE CONCENTRATION              =   0.1000E+01

 BASE BOUNDARY
 ~~~~~~~~~~~~~
 BASE BOUNDARY CONDITION DEFINED BY
 A PERMEABLE BASE STRATUM WITH THE FOLLOWING PROPERTIES:

 BASE INTEGRATION WIDTH IS BETWEEN        - 1521.0000< X < 1521.0000


 BASE THICKNESS         =   0.2230E+01
 BASE POROSITY          =     0.4300
 OUTFLOW VELOCITY       =   0.1530E+03
 BASE DISPERSION COEFF. =   0.2391E+04


                           PROPERTIES OF THE MATRIX
                           ========================


 LAYER  DISPERSION COEFF. POROSITY ADSORPTION  DENSITY  ADV. VELOCITY THICKNESS
         VERT.    HORZ.             COEFF.              HORZ.   VERT.
 ~~~~~  ~~~~~~~~~~~~~~~~~ ~~~~~~~~ ~~~~~~~~~~  ~~~~~~~  ~~~~~~~~~~~~~ ~~~~~~~~~
   1    .481E+00 .623E-01  0.460   0.000E+00 1470.000  0.0000   0.4900     1.18
   2    .481E+00 .623E-01  0.460   0.000E+00 1470.000  0.0000   0.4900     1.18
   3    .481E+00 .623E-01  0.460   0.000E+00 1470.000  0.0000   0.4900     1.18
   4    .481E+00 .623E-01  0.460   0.000E+00 1470.000  0.0000   0.4900     1.18
   5    .481E+00 .623E-01  0.460   0.000E+00 1470.000  0.0000   0.4900     1.18


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                              TIME-VARYING PROPERTIES GROUP    5

 START TIME           =        53.0000
 END TIME             =        54.0000
 NUMBER OF INCREMENTS =             1


 SURFACE BOUNDARY
 ~~~~~~~~~~~~~~~~

 SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0


 OFFSET OF CENTER OF LANDFILL    1 IS     0.0000E+00

 WIDTH OF BASE OF LANDFILL IS BETWEEN      -240.5000< X <  240.5000
 WIDTH OF SURFACE OF LANDFILL IS BETWEEN   -253.5000< X <  253.5000


 THE INITIAL SOURCE CONCENTRATION              =   0.1000E+01

 BASE BOUNDARY
 ~~~~~~~~~~~~~
 BASE BOUNDARY CONDITION DEFINED BY
 A PERMEABLE BASE STRATUM WITH THE FOLLOWING PROPERTIES:

 BASE INTEGRATION WIDTH IS BETWEEN        - 1521.0000< X < 1521.0000


 BASE THICKNESS         =   0.2230E+01
 BASE POROSITY          =     0.4300
 OUTFLOW VELOCITY       =   0.1430E+03
 BASE DISPERSION COEFF. =   0.2235E+04


                           PROPERTIES OF THE MATRIX
                           ========================


 LAYER  DISPERSION COEFF. POROSITY ADSORPTION  DENSITY  ADV. VELOCITY THICKNESS
         VERT.    HORZ.             COEFF.              HORZ.   VERT.
 ~~~~~  ~~~~~~~~~~~~~~~~~ ~~~~~~~~ ~~~~~~~~~~  ~~~~~~~  ~~~~~~~~~~~~~ ~~~~~~~~~
   1    .437E+00 .580E-01  0.460   0.000E+00 1470.000  0.0000   0.4440     1.18
   2    .437E+00 .580E-01  0.460   0.000E+00 1470.000  0.0000   0.4440     1.18
   3    .437E+00 .580E-01  0.460   0.000E+00 1470.000  0.0000   0.4440     1.18
   4    .437E+00 .580E-01  0.460   0.000E+00 1470.000  0.0000   0.4440     1.18
   5    .437E+00 .580E-01  0.460   0.000E+00 1470.000  0.0000   0.4440     1.18


________________________________________________________________________________


                              TIME-VARYING PROPERTIES GROUP    6
```

```
START TIME           =        54.0000
END TIME             =        55.0000
NUMBER OF INCREMENTS =            1


SURFACE BOUNDARY
~~~~~~~~~~~~~~~~

SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0


OFFSET OF CENTER OF LANDFILL    1 IS     0.0000E+00

WIDTH OF BASE OF LANDFILL IS BETWEEN      -240.5000< X <  240.5000
WIDTH OF SURFACE OF LANDFILL IS BETWEEN   -253.5000< X <  253.5000


THE INITIAL SOURCE CONCENTRATION              =   0.1000E+01

BASE BOUNDARY
~~~~~~~~~~~~~
BASE BOUNDARY CONDITION DEFINED BY
A PERMEABLE BASE STRATUM WITH THE FOLLOWING PROPERTIES:

BASE INTEGRATION WIDTH IS BETWEEN        - 1521.0000< X < 1521.0000


BASE THICKNESS         =   0.2230E+01
BASE POROSITY          =     0.4300
OUTFLOW VELOCITY       =   0.1340E+03
BASE DISPERSION COEFF. =   0.2098E+04


                           PROPERTIES OF THE MATRIX
                           ========================


LAYER  DISPERSION COEFF. POROSITY ADSORPTION  DENSITY  ADV. VELOCITY THICKNESS
        VERT.    HORZ.              COEFF.              HORZ.   VERT.
~~~~~  ~~~~~~~~~~~~~~~~~ ~~~~~~~~ ~~~~~~~~~~  ~~~~~~~  ~~~~~~~~~~~~~ ~~~~~~~~~
  1    .399E+00 .541E-01  0.460   0.000E+00 1470.000  0.0000   0.4030     1.18
  2    .399E+00 .541E-01  0.460   0.000E+00 1470.000  0.0000   0.4030     1.18
  3    .399E+00 .541E-01  0.460   0.000E+00 1470.000  0.0000   0.4030     1.18
  4    .399E+00 .541E-01  0.460   0.000E+00 1470.000  0.0000   0.4030     1.18
  5    .399E+00 .541E-01  0.460   0.000E+00 1470.000  0.0000   0.4030     1.18

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                             TIME-VARYING PROPERTIES GROUP    7

START TIME           =        55.0000
END TIME             =        56.0000
NUMBER OF INCREMENTS =            1


SURFACE BOUNDARY
~~~~~~~~~~~~~~~~

SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0


OFFSET OF CENTER OF LANDFILL    1 IS     0.0000E+00

WIDTH OF BASE OF LANDFILL IS BETWEEN      -240.5000< X <  240.5000
WIDTH OF SURFACE OF LANDFILL IS BETWEEN   -253.5000< X <  253.5000


THE INITIAL SOURCE CONCENTRATION              =   0.1000E+01

BASE BOUNDARY
~~~~~~~~~~~~~
BASE BOUNDARY CONDITION DEFINED BY
```

```
A PERMEABLE BASE STRATUM WITH THE FOLLOWING PROPERTIES:

BASE INTEGRATION WIDTH IS BETWEEN        - 1521.0000< X < 1521.0000


BASE THICKNESS         =   0.2230E+01
BASE POROSITY          =     0.4300
OUTFLOW VELOCITY       =   0.1150E+03
BASE DISPERSION COEFF. =   0.1807E+04


                           PROPERTIES OF THE MATRIX
                           ========================


LAYER  DISPERSION COEFF. POROSITY ADSORPTION  DENSITY  ADV. VELOCITY THICKNESS
        VERT.    HORZ.              COEFF.              HORZ.   VERT.
~~~~~  ~~~~~~~~~~~~~~~~~ ~~~~~~~~ ~~~~~~~~~~  ~~~~~~~  ~~~~~~~~~~~~~ ~~~~~~~~~
  1    .317E+00 .459E-01  0.460   0.000E+00 1470.000  0.0000   0.3170     1.18
  2    .317E+00 .459E-01  0.460   0.000E+00 1470.000  0.0000   0.3170     1.18
  3    .317E+00 .459E-01  0.460   0.000E+00 1470.000  0.0000   0.3170     1.18
  4    .317E+00 .459E-01  0.460   0.000E+00 1470.000  0.0000   0.3170     1.18
  5    .317E+00 .459E-01  0.460   0.000E+00 1470.000  0.0000   0.3170     1.18

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                             TIME-VARYING PROPERTIES GROUP    8

START TIME           =        56.0000
END TIME             =        57.0000
NUMBER OF INCREMENTS =            1


SURFACE BOUNDARY
~~~~~~~~~~~~~~~~

SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0


OFFSET OF CENTER OF LANDFILL    1 IS     0.0000E+00

WIDTH OF BASE OF LANDFILL IS BETWEEN      -240.5000< X <  240.5000
WIDTH OF SURFACE OF LANDFILL IS BETWEEN   -253.5000< X <  253.5000


THE INITIAL SOURCE CONCENTRATION              =   0.1000E+01

BASE BOUNDARY
~~~~~~~~~~~~~
BASE BOUNDARY CONDITION DEFINED BY
A PERMEABLE BASE STRATUM WITH THE FOLLOWING PROPERTIES:

BASE INTEGRATION WIDTH IS BETWEEN        - 1521.0000< X < 1521.0000


BASE THICKNESS         =   0.2230E+01
BASE POROSITY          =     0.4300
OUTFLOW VELOCITY       =   0.8400E+02
BASE DISPERSION COEFF. =   0.1321E+04


                           PROPERTIES OF THE MATRIX
                           ========================


LAYER  DISPERSION COEFF. POROSITY ADSORPTION  DENSITY  ADV. VELOCITY THICKNESS
        VERT.    HORZ.              COEFF.              HORZ.   VERT.
~~~~~  ~~~~~~~~~~~~~~~~~ ~~~~~~~~ ~~~~~~~~~~  ~~~~~~~  ~~~~~~~~~~~~~ ~~~~~~~~~
  1    .180E+00 .323E-01  0.460   0.000E+00 1470.000  0.0000   0.1730     1.18
  2    .180E+00 .323E-01  0.460   0.000E+00 1470.000  0.0000   0.1730     1.18
  3    .180E+00 .323E-01  0.460   0.000E+00 1470.000  0.0000   0.1730     1.18
```

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  4    .180E+00 .323E-01  0.460   0.000E+00 1470.000  0.0000   0.1730     1.18
  5    .180E+00 .323E-01  0.460   0.000E+00 1470.000  0.0000   0.1730     1.18

_______________________________________________________________________________


                             TIME-VARYING PROPERTIES GROUP    9

START TIME           =        57.0000
END TIME             =        58.0000
NUMBER OF INCREMENTS =            1


SURFACE BOUNDARY
~~~~~~~~~~~~~~~~

SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0


OFFSET OF CENTER OF LANDFILL    1 IS     0.0000E+00

WIDTH OF BASE OF LANDFILL IS BETWEEN      -240.5000< X <  240.5000
WIDTH OF SURFACE OF LANDFILL IS BETWEEN   -253.5000< X <  253.5000


THE INITIAL SOURCE CONCENTRATION              =   0.1000E+01

BASE BOUNDARY
~~~~~~~~~~~~~
BASE BOUNDARY CONDITION DEFINED BY
A PERMEABLE BASE STRATUM WITH THE FOLLOWING PROPERTIES:

BASE INTEGRATION WIDTH IS BETWEEN        - 1521.0000< X < 1521.0000


BASE THICKNESS         =   0.2230E+01
BASE POROSITY          =     0.4300
OUTFLOW VELOCITY       =   0.5900E+02
BASE DISPERSION COEFF. =   0.9220E+03


                           PROPERTIES OF THE MATRIX
                           ========================


LAYER  DISPERSION COEFF. POROSITY ADSORPTION  DENSITY  ADV. VELOCITY THICKNESS
        VERT.    HORZ.              COEFF.              HORZ.   VERT.
~~~~~  ~~~~~~~~~~~~~~~~~ ~~~~~~~~ ~~~~~~~~~~  ~~~~~~~  ~~~~~~~~~~~~~ ~~~~~~~~~
  1    .682E-01 .210E-01  0.460   0.000E+00 1470.000  0.0000   0.0552     1.18
  2    .682E-01 .210E-01  0.460   0.000E+00 1470.000  0.0000   0.0552     1.18
  3    .682E-01 .210E-01  0.460   0.000E+00 1470.000  0.0000   0.0552     1.18
  4    .682E-01 .210E-01  0.460   0.000E+00 1470.000  0.0000   0.0552     1.18
  5    .682E-01 .210E-01  0.460   0.000E+00 1470.000  0.0000   0.0552     1.18

_______________________________________________________________________________


                             TIME-VARYING PROPERTIES GROUP   10

START TIME           =        58.0000
END TIME             =        60.0000
NUMBER OF INCREMENTS =            2


SURFACE BOUNDARY
~~~~~~~~~~~~~~~~

SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0


OFFSET OF CENTER OF LANDFILL    1 IS     0.0000E+00
```

```
WIDTH OF BASE OF LANDFILL IS BETWEEN      -240.5000< X <  240.5000
WIDTH OF SURFACE OF LANDFILL IS BETWEEN   -253.5000< X <  253.5000


THE INITIAL SOURCE CONCENTRATION              =   0.1000E+01

BASE BOUNDARY
~~~~~~~~~~~~~
BASE BOUNDARY CONDITION DEFINED BY
A PERMEABLE BASE STRATUM WITH THE FOLLOWING PROPERTIES:

BASE INTEGRATION WIDTH IS BETWEEN        - 1521.0000< X < 1521.0000


BASE THICKNESS         =   0.2230E+01
BASE POROSITY          =     0.4300
OUTFLOW VELOCITY       =   0.5500E+02
BASE DISPERSION COEFF. =   0.8660E+03


                           PROPERTIES OF THE MATRIX
                           ========================


LAYER  DISPERSION COEFF. POROSITY ADSORPTION  DENSITY  ADV. VELOCITY THICKNESS
        VERT.    HORZ.              COEFF.              HORZ.   VERT.
~~~~~  ~~~~~~~~~~~~~~~~~ ~~~~~~~~ ~~~~~~~~~~  ~~~~~~~  ~~~~~~~~~~~~~ ~~~~~~~~~
  1    .526E-01 .195E-01  0.460   0.000E+00 1470.000  0.0000   0.0387     1.18
  2    .526E-01 .195E-01  0.460   0.000E+00 1470.000  0.0000   0.0387     1.18
  3    .526E-01 .195E-01  0.460   0.000E+00 1470.000  0.0000   0.0387     1.18
  4    .526E-01 .195E-01  0.460   0.000E+00 1470.000  0.0000   0.0387     1.18
  5    .526E-01 .195E-01  0.460   0.000E+00 1470.000  0.0000   0.0387     1.18

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                             TIME-VARYING PROPERTIES GROUP   11

START TIME           =        60.0000
END TIME             =        62.0000
NUMBER OF INCREMENTS =            2


SURFACE BOUNDARY
~~~~~~~~~~~~~~~~

SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0


OFFSET OF CENTER OF LANDFILL    1 IS     0.0000E+00

WIDTH OF BASE OF LANDFILL IS BETWEEN      -240.5000< X <  240.5000
WIDTH OF SURFACE OF LANDFILL IS BETWEEN   -253.5000< X <  253.5000


THE INITIAL SOURCE CONCENTRATION              =   0.1000E+01

BASE BOUNDARY
~~~~~~~~~~~~~
BASE BOUNDARY CONDITION DEFINED BY
A PERMEABLE BASE STRATUM WITH THE FOLLOWING PROPERTIES:

BASE INTEGRATION WIDTH IS BETWEEN        - 1521.0000< X < 1521.0000


BASE THICKNESS         =   0.2230E+01
BASE POROSITY          =     0.4300
OUTFLOW VELOCITY       =   0.5200E+02
BASE DISPERSION COEFF. =   0.8170E+03


                           PROPERTIES OF THE MATRIX
```

```
                           ========================


 LAYER  DISPERSION COEFF. POROSITY ADSORPTION  DENSITY  ADV. VELOCITY THICKNESS
         VERT.    HORZ.             COEFF.              HORZ.   VERT.
 ~~~~~  ~~~~~~~~~~~~~~~~~ ~~~~~~~~ ~~~~~~~~~~  ~~~~~~~  ~~~~~~~~~~~~~ ~~~~~~~~~
   1    .388E-01 .181E-01  0.460   0.000E+00 1470.000  0.0000   0.0242     1.18
   2    .388E-01 .181E-01  0.460   0.000E+00 1470.000  0.0000   0.0242     1.18
   3    .388E-01 .181E-01  0.460   0.000E+00 1470.000  0.0000   0.0242     1.18
   4    .388E-01 .181E-01  0.460   0.000E+00 1470.000  0.0000   0.0242     1.18
   5    .388E-01 .181E-01  0.460   0.000E+00 1470.000  0.0000   0.0242     1.18


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                             TIME-VARYING PROPERTIES GROUP   12

 START TIME           =        62.0000
 END TIME             =        67.0000
 NUMBER OF INCREMENTS =             5


 SURFACE BOUNDARY
 ~~~~~~~~~~~~~~~~

 SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0


 OFFSET OF CENTER OF LANDFILL    1 IS     0.0000E+00

 WIDTH OF BASE OF LANDFILL IS BETWEEN      -240.5000< X <  240.5000
 WIDTH OF SURFACE OF LANDFILL IS BETWEEN   -253.5000< X <  253.5000


 THE INITIAL SOURCE CONCENTRATION              =   0.1000E+01

 BASE BOUNDARY
 ~~~~~~~~~~~~~
 BASE BOUNDARY CONDITION DEFINED BY
 A PERMEABLE BASE STRATUM WITH THE FOLLOWING PROPERTIES:

 BASE INTEGRATION WIDTH IS BETWEEN        - 1521.0000< X < 1521.0000


 BASE THICKNESS         =   0.2230E+01
 BASE POROSITY          =     0.4300
 OUTFLOW VELOCITY       =   0.5100E+02
 BASE DISPERSION COEFF. =   0.7920E+03


                           PROPERTIES OF THE MATRIX
                           ========================


 LAYER  DISPERSION COEFF. POROSITY ADSORPTION  DENSITY  ADV. VELOCITY THICKNESS
         VERT.    HORZ.             COEFF.              HORZ.   VERT.
 ~~~~~  ~~~~~~~~~~~~~~~~~ ~~~~~~~~ ~~~~~~~~~~  ~~~~~~~  ~~~~~~~~~~~~~ ~~~~~~~~~
   1    .319E-01 .174E-01  0.460   0.000E+00 1470.000  0.0000   0.0169     1.18
   2    .319E-01 .174E-01  0.460   0.000E+00 1470.000  0.0000   0.0169     1.18
   3    .319E-01 .174E-01  0.460   0.000E+00 1470.000  0.0000   0.0169     1.18
   4    .319E-01 .174E-01  0.460   0.000E+00 1470.000  0.0000   0.0169     1.18
   5    .319E-01 .174E-01  0.460   0.000E+00 1470.000  0.0000   0.0169     1.18


________________________________________________________________________________


                             TIME-VARYING PROPERTIES GROUP   13

 START TIME           =        67.0000
 END TIME             =        72.0000
 NUMBER OF INCREMENTS =             5
```

```
 SURFACE BOUNDARY
 ~~~~~~~~~~~~~~~~

 SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0


 OFFSET OF CENTER OF LANDFILL    1 IS     0.0000E+00

 WIDTH OF BASE OF LANDFILL IS BETWEEN      -240.5000< X <  240.5000
 WIDTH OF SURFACE OF LANDFILL IS BETWEEN   -253.5000< X <  253.5000


 THE INITIAL SOURCE CONCENTRATION              =   0.1000E+01

 BASE BOUNDARY
 ~~~~~~~~~~~~~
 BASE BOUNDARY CONDITION DEFINED BY
 A PERMEABLE BASE STRATUM WITH THE FOLLOWING PROPERTIES:

 BASE INTEGRATION WIDTH IS BETWEEN        - 1521.0000< X < 1521.0000


 BASE THICKNESS         =   0.2230E+01
 BASE POROSITY          =     0.4300
 OUTFLOW VELOCITY       =   0.4900E+02
 BASE DISPERSION COEFF. =   0.7680E+03


                           PROPERTIES OF THE MATRIX
                           ========================


 LAYER  DISPERSION COEFF. POROSITY ADSORPTION  DENSITY  ADV. VELOCITY THICKNESS
         VERT.    HORZ.             COEFF.              HORZ.   VERT.
 ~~~~~  ~~~~~~~~~~~~~~~~~ ~~~~~~~~ ~~~~~~~~~~  ~~~~~~~  ~~~~~~~~~~~~~ ~~~~~~~~~
   1    .251E-01 .167E-01  0.460   0.000E+00 1470.000  0.0000   0.0098     1.18
   2    .251E-01 .167E-01  0.460   0.000E+00 1470.000  0.0000   0.0098     1.18
   3    .251E-01 .167E-01  0.460   0.000E+00 1470.000  0.0000   0.0098     1.18
   4    .251E-01 .167E-01  0.460   0.000E+00 1470.000  0.0000   0.0098     1.18
   5    .251E-01 .167E-01  0.460   0.000E+00 1470.000  0.0000   0.0098     1.18


________________________________________________________________________________


                             TIME-VARYING PROPERTIES GROUP   14

 START TIME           =        72.0000
 END TIME             =        77.0000
 NUMBER OF INCREMENTS =             5


 SURFACE BOUNDARY
 ~~~~~~~~~~~~~~~~

 SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0


 OFFSET OF CENTER OF LANDFILL    1 IS     0.0000E+00

 WIDTH OF BASE OF LANDFILL IS BETWEEN      -240.5000< X <  240.5000
 WIDTH OF SURFACE OF LANDFILL IS BETWEEN   -253.5000< X <  253.5000


 THE INITIAL SOURCE CONCENTRATION              =   0.1000E+01

 BASE BOUNDARY
 ~~~~~~~~~~~~~
 BASE BOUNDARY CONDITION DEFINED BY
 A PERMEABLE BASE STRATUM WITH THE FOLLOWING PROPERTIES:

 BASE INTEGRATION WIDTH IS BETWEEN        - 1521.0000< X < 1521.0000
```

```
 BASE THICKNESS         =   0.2230E+01
 BASE POROSITY          =     0.4300
 OUTFLOW VELOCITY       =   0.4800E+02
 BASE DISPERSION COEFF. =   0.7560E+03


                           PROPERTIES OF THE MATRIX
                           ========================


 LAYER  DISPERSION COEFF. POROSITY ADSORPTION  DENSITY  ADV. VELOCITY THICKNESS
         VERT.    HORZ.             COEFF.              HORZ.   VERT.
 ~~~~~  ~~~~~~~~~~~~~~~~~ ~~~~~~~~ ~~~~~~~~~~  ~~~~~~~  ~~~~~~~~~~~~~ ~~~~~~~~~
   1    .216E-01 .164E-01  0.460   0.000E+00 1470.000  0.0000   0.0061     1.18
   2    .216E-01 .164E-01  0.460   0.000E+00 1470.000  0.0000   0.0061     1.18
   3    .216E-01 .164E-01  0.460   0.000E+00 1470.000  0.0000   0.0061     1.18
   4    .216E-01 .164E-01  0.460   0.000E+00 1470.000  0.0000   0.0061     1.18
   5    .216E-01 .164E-01  0.460   0.000E+00 1470.000  0.0000   0.0061     1.18


________________________________________________________________________________


                             TIME-VARYING PROPERTIES GROUP   15

 START TIME           =        77.0000
 END TIME             =        80.0000
 NUMBER OF INCREMENTS =             3


 SURFACE BOUNDARY
 ~~~~~~~~~~~~~~~~

 SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0


 OFFSET OF CENTER OF LANDFILL    1 IS     0.0000E+00

 WIDTH OF BASE OF LANDFILL IS BETWEEN      -240.5000< X <  240.5000
 WIDTH OF SURFACE OF LANDFILL IS BETWEEN   -253.5000< X <  253.5000


 THE INITIAL SOURCE CONCENTRATION              =   0.1000E+01

 BASE BOUNDARY
 ~~~~~~~~~~~~~
 BASE BOUNDARY CONDITION DEFINED BY
 A PERMEABLE BASE STRATUM WITH THE FOLLOWING PROPERTIES:

 BASE INTEGRATION WIDTH IS BETWEEN        - 1521.0000< X < 1521.0000


 BASE THICKNESS         =   0.2230E+01
 BASE POROSITY          =     0.4300
 OUTFLOW VELOCITY       =   0.4800E+02
 BASE DISPERSION COEFF. =   0.7540E+03


                           PROPERTIES OF THE MATRIX
                           ========================


 LAYER  DISPERSION COEFF. POROSITY ADSORPTION  DENSITY  ADV. VELOCITY THICKNESS
         VERT.    HORZ.             COEFF.              HORZ.   VERT.
 ~~~~~  ~~~~~~~~~~~~~~~~~ ~~~~~~~~ ~~~~~~~~~~  ~~~~~~~  ~~~~~~~~~~~~~ ~~~~~~~~~
   1    .210E-01 .163E-01  0.460   0.000E+00 1470.000  0.0000   0.0055     1.18
   2    .210E-01 .163E-01  0.460   0.000E+00 1470.000  0.0000   0.0055     1.18
   3    .210E-01 .163E-01  0.460   0.000E+00 1470.000  0.0000   0.0055     1.18
   4    .210E-01 .163E-01  0.460   0.000E+00 1470.000  0.0000   0.0055     1.18
   5    .210E-01 .163E-01  0.460   0.000E+00 1470.000  0.0000   0.0055     1.18
```

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                           INTEGRATION PARAMETERS
                           ======================

 THE PARAMETERS USED TO INVERT THE LAPLACE TRANSFORM ARE
 TAU =0.700E+01 N =  20 SIG =0.000E+00 RNU =0.200E+01


 SELECTED GAUSS QUADRATURE SAMPLE POINTS ARE:

  GAUSSIAN INTEGRATION SUBINTERVAL SIZE = 0.100E-03
  NUMBER OF SUBINTERVALS                = 200
  NUMBER OF SAMPLE POINTS USED PER STEP =  20



                              RESULTS
                              =======


 ANALYSIS FOR TIME PERIOD   1

 CALCULATED CONCENTRATIONS AT SELECTED DEPTHS,
 LATERAL DISTANCES AND TIMES:


    TIME        LATERAL     DEPTH    CONCENTRATION
                DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

  0.5000E+01  0.2405E+03  0.0000E+00  0.5726E+00
                          0.1182E+01  0.5711E+00
                          0.2364E+01  0.5647E+00
                          0.3546E+01  0.5455E+00
                          0.4728E+01  0.5072E+00
                          0.5910E+01  0.5520E+00

  0.5000E+01  0.2735E+03  0.0000E+00  0.3530E+00
                          0.1182E+01  0.3520E+00
                          0.2364E+01  0.3481E+00
                          0.3546E+01  0.3367E+00
                          0.4728E+01  0.3234E+00
                          0.5910E+01  0.5562E+00

  0.5000E+01  0.3065E+03  0.0000E+00  0.1505E+00
                          0.1182E+01  0.1501E+00
                          0.2364E+01  0.1484E+00
                          0.3546E+01  0.1442E+00
                          0.4728E+01  0.1533E+00
                          0.5910E+01  0.5502E+00

   TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
   INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
   ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
  0.1625E+04    0.4367E+03    0.7989E+00   0.4349E+03

  ------------------------------------------------------------


    TIME        LATERAL     DEPTH    CONCENTRATION
                DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

  0.1000E+02  0.2405E+03  0.0000E+00  0.5726E+00
                          0.1182E+01  0.5724E+00
                          0.2364E+01  0.5722E+00
                          0.3546E+01  0.5727E+00
                          0.4728E+01  0.5833E+00
                          0.5910E+01  0.7436E+00

  0.1000E+02  0.2735E+03  0.0000E+00  0.3530E+00
                          0.1182E+01  0.3529E+00
                          0.2364E+01  0.3529E+00
                          0.3546E+01  0.3545E+00
```

```
                        0.4728E+01  0.3813E+00
                        0.5910E+01  0.7648E+00

0.1000E+02  0.3065E+03  0.0000E+00  0.1505E+00
                        0.1182E+01  0.1504E+00
                        0.2364E+01  0.1506E+00
                        0.3546E+01  0.1534E+00
                        0.4728E+01  0.1944E+00
                        0.5910E+01  0.7753E+00

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.3153E+04    0.1844E+04    0.3337E+03   0.1100E+04

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.1500E+02  0.2405E+03  0.0000E+00  0.5726E+00
                        0.1182E+01  0.5724E+00
                        0.2364E+01  0.5723E+00
                        0.3546E+01  0.5730E+00
                        0.4728E+01  0.5843E+00
                        0.5910E+01  0.7457E+00

0.1500E+02  0.2735E+03  0.0000E+00  0.3530E+00
                        0.1182E+01  0.3529E+00
                        0.2364E+01  0.3529E+00
                        0.3546E+01  0.3548E+00
                        0.4728E+01  0.3822E+00
                        0.5910E+01  0.7672E+00

0.1500E+02  0.3065E+03  0.0000E+00  0.1505E+00
                        0.1182E+01  0.1504E+00
                        0.2364E+01  0.1506E+00
                        0.3546E+01  0.1536E+00
                        0.4728E+01  0.1952E+00
                        0.5910E+01  0.7779E+00

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.4681E+04    0.3444E+04    0.1039E+04   0.1128E+04

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.2000E+02  0.2405E+03  0.0000E+00  0.5726E+00
                        0.1182E+01  0.5724E+00
                        0.2364E+01  0.5723E+00
                        0.3546E+01  0.5730E+00
                        0.4728E+01  0.5843E+00
                        0.5910E+01  0.7439E+00

0.2000E+02  0.2735E+03  0.0000E+00  0.3530E+00
                        0.1182E+01  0.3529E+00
                        0.2364E+01  0.3529E+00
                        0.3546E+01  0.3548E+00
                        0.4728E+01  0.3822E+00
                        0.5910E+01  0.7654E+00

0.2000E+02  0.3065E+03  0.0000E+00  0.1505E+00
                        0.1182E+01  0.1504E+00
                        0.2364E+01  0.1506E+00
                        0.3546E+01  0.1536E+00
```

```
                        0.4728E+01  0.1951E+00
                        0.5910E+01  0.7762E+00

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.6210E+04    0.5052E+04    0.1759E+04   0.1129E+04

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.2500E+02  0.2405E+03  0.0000E+00  0.5726E+00
                        0.1182E+01  0.5724E+00
                        0.2364E+01  0.5723E+00
                        0.3546E+01  0.5730E+00
                        0.4728E+01  0.5842E+00
                        0.5910E+01  0.7438E+00

0.2500E+02  0.2735E+03  0.0000E+00  0.3530E+00
                        0.1182E+01  0.3529E+00
                        0.2364E+01  0.3529E+00
                        0.3546E+01  0.3548E+00
                        0.4728E+01  0.3820E+00
                        0.5910E+01  0.7652E+00

0.2500E+02  0.3065E+03  0.0000E+00  0.1505E+00
                        0.1182E+01  0.1504E+00
                        0.2364E+01  0.1506E+00
                        0.3546E+01  0.1535E+00
                        0.4728E+01  0.1950E+00
                        0.5910E+01  0.7758E+00

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.7738E+04    0.6660E+04    0.2481E+04   0.1128E+04

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.3000E+02  0.2405E+03  0.0000E+00  0.5726E+00
                        0.1182E+01  0.5724E+00
                        0.2364E+01  0.5723E+00
                        0.3546E+01  0.5730E+00
                        0.4728E+01  0.5842E+00
                        0.5910E+01  0.7449E+00

0.3000E+02  0.2735E+03  0.0000E+00  0.3530E+00
                        0.1182E+01  0.3529E+00
                        0.2364E+01  0.3529E+00
                        0.3546E+01  0.3548E+00
                        0.4728E+01  0.3820E+00
                        0.5910E+01  0.7662E+00

0.3000E+02  0.3065E+03  0.0000E+00  0.1505E+00
                        0.1182E+01  0.1504E+00
                        0.2364E+01  0.1506E+00
                        0.3546E+01  0.1535E+00
                        0.4728E+01  0.1950E+00
                        0.5910E+01  0.7768E+00

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.9266E+04    0.8269E+04    0.3202E+04   0.1128E+04
```

```
------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.3500E+02  0.2405E+03  0.0000E+00  0.5726E+00
                        0.1182E+01  0.5724E+00
                        0.2364E+01  0.5723E+00
                        0.3546E+01  0.5730E+00
                        0.4728E+01  0.5843E+00
                        0.5910E+01  0.7463E+00

0.3500E+02  0.2735E+03  0.0000E+00  0.3530E+00
                        0.1182E+01  0.3529E+00
                        0.2364E+01  0.3529E+00
                        0.3546E+01  0.3548E+00
                        0.4728E+01  0.3821E+00
                        0.5910E+01  0.7676E+00

0.3500E+02  0.3065E+03  0.0000E+00  0.1505E+00
                        0.1182E+01  0.1504E+00
                        0.2364E+01  0.1506E+00
                        0.3546E+01  0.1535E+00
                        0.4728E+01  0.1951E+00
                        0.5910E+01  0.7781E+00

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1079E+05    0.9878E+04    0.3923E+04   0.1128E+04

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.4000E+02  0.2405E+03  0.0000E+00  0.5726E+00
                        0.1182E+01  0.5724E+00
                        0.2364E+01  0.5723E+00
                        0.3546E+01  0.5730E+00
                        0.4728E+01  0.5844E+00
                        0.5910E+01  0.7475E+00

0.4000E+02  0.2735E+03  0.0000E+00  0.3530E+00
                        0.1182E+01  0.3529E+00
                        0.2364E+01  0.3529E+00
                        0.3546E+01  0.3548E+00
                        0.4728E+01  0.3822E+00
                        0.5910E+01  0.7688E+00

0.4000E+02  0.3065E+03  0.0000E+00  0.1505E+00
                        0.1182E+01  0.1504E+00
                        0.2364E+01  0.1506E+00
                        0.3546E+01  0.1535E+00
                        0.4728E+01  0.1951E+00
                        0.5910E+01  0.7794E+00

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1232E+05    0.1149E+05    0.4644E+04   0.1130E+04

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
```

```
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.4500E+02  0.2405E+03  0.0000E+00  0.5726E+00
                        0.1182E+01  0.5724E+00
                        0.2364E+01  0.5723E+00
                        0.3546E+01  0.5730E+00
                        0.4728E+01  0.5844E+00
                        0.5910E+01  0.7484E+00

0.4500E+02  0.2735E+03  0.0000E+00  0.3530E+00
                        0.1182E+01  0.3529E+00
                        0.2364E+01  0.3529E+00
                        0.3546E+01  0.3548E+00
                        0.4728E+01  0.3823E+00
                        0.5910E+01  0.7698E+00

0.4500E+02  0.3065E+03  0.0000E+00  0.1505E+00
                        0.1182E+01  0.1504E+00
                        0.2364E+01  0.1506E+00
                        0.3546E+01  0.1535E+00
                        0.4728E+01  0.1952E+00
                        0.5910E+01  0.7804E+00

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1385E+05    0.1309E+05    0.5364E+04   0.1131E+04

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.5000E+02  0.2405E+03  0.0000E+00  0.5726E+00
                        0.1182E+01  0.5724E+00
                        0.2364E+01  0.5723E+00
                        0.3546E+01  0.5730E+00
                        0.4728E+01  0.5845E+00
                        0.5910E+01  0.7491E+00

0.5000E+02  0.2735E+03  0.0000E+00  0.3530E+00
                        0.1182E+01  0.3529E+00
                        0.2364E+01  0.3529E+00
                        0.3546E+01  0.3548E+00
                        0.4728E+01  0.3824E+00
                        0.5910E+01  0.7705E+00

0.5000E+02  0.3065E+03  0.0000E+00  0.1505E+00
                        0.1182E+01  0.1504E+00
                        0.2364E+01  0.1506E+00
                        0.3546E+01  0.1536E+00
                        0.4728E+01  0.1953E+00
                        0.5910E+01  0.7812E+00

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1538E+05    0.1470E+05    0.6085E+04   0.1133E+04

------------------------------------------------------------


ANALYSIS FOR TIME PERIOD   2

CALCULATED CONCENTRATIONS AT SELECTED DEPTHS,
LATERAL DISTANCES AND TIMES:


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~
```

```
 0.5100E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5724E+00
                         0.2364E+01  0.5723E+00
                         0.3546E+01  0.5748E+00
                         0.4728E+01  0.5978E+00
                         0.5910E+01  0.6823E+00

 0.5100E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3529E+00
                         0.2364E+01  0.3530E+00
                         0.3546E+01  0.3577E+00
                         0.4728E+01  0.4030E+00
                         0.5910E+01  0.7155E+00

 0.5100E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1504E+00
                         0.2364E+01  0.1508E+00
                         0.3546E+01  0.1574E+00
                         0.4728E+01  0.2218E+00
                         0.5910E+01  0.7396E+00

  TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1573E+05   -0.2499E+01    0.1399E+03   0.1172E+04

 ------------------------------------------------------------


ANALYSIS FOR TIME PERIOD   3

CALCULATED CONCENTRATIONS AT SELECTED DEPTHS,
LATERAL DISTANCES AND TIMES:


   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.5200E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5728E+00
                         0.2364E+01  0.5730E+00
                         0.3546E+01  0.5764E+00
                         0.4728E+01  0.6002E+00
                         0.5910E+01  0.6336E+00

 0.5200E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3531E+00
                         0.2364E+01  0.3536E+00
                         0.3546E+01  0.3598E+00
                         0.4728E+01  0.4085E+00
                         0.5910E+01  0.6617E+00

 0.5200E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1506E+00
                         0.2364E+01  0.1513E+00
                         0.3546E+01  0.1599E+00
                         0.4728E+01  0.2300E+00
                         0.5910E+01  0.6810E+00

  TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1606E+05   -0.2940E+02    0.1389E+03   0.1199E+04

 ------------------------------------------------------------


ANALYSIS FOR TIME PERIOD   4

CALCULATED CONCENTRATIONS AT SELECTED DEPTHS,
LATERAL DISTANCES AND TIMES:
```

```
   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.5300E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5725E+00
                         0.2364E+01  0.5729E+00
                         0.3546E+01  0.5768E+00
                         0.4728E+01  0.5998E+00
                         0.5910E+01  0.6002E+00

 0.5300E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3530E+00
                         0.2364E+01  0.3537E+00
                         0.3546E+01  0.3607E+00
                         0.4728E+01  0.4102E+00
                         0.5910E+01  0.6261E+00

 0.5300E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1505E+00
                         0.2364E+01  0.1515E+00
                         0.3546E+01  0.1612E+00
                         0.4728E+01  0.2335E+00
                         0.5910E+01  0.6439E+00

  TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1637E+05   -0.5313E+02    0.1408E+03   0.1204E+04

 ------------------------------------------------------------


ANALYSIS FOR TIME PERIOD   5

CALCULATED CONCENTRATIONS AT SELECTED DEPTHS,
LATERAL DISTANCES AND TIMES:


   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.5400E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5724E+00
                         0.2364E+01  0.5727E+00
                         0.3546E+01  0.5767E+00
                         0.4728E+01  0.5998E+00
                         0.5910E+01  0.5688E+00

 0.5400E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3529E+00
                         0.2364E+01  0.3537E+00
                         0.3546E+01  0.3612E+00
                         0.4728E+01  0.4124E+00
                         0.5910E+01  0.5936E+00

 0.5400E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1505E+00
                         0.2364E+01  0.1516E+00
                         0.3546E+01  0.1621E+00
                         0.4728E+01  0.2376E+00
                         0.5910E+01  0.6116E+00

  TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1666E+05   -0.7140E+02    0.1446E+03   0.1186E+04

 ------------------------------------------------------------
```

```
ANALYSIS FOR TIME PERIOD   6

CALCULATED CONCENTRATIONS AT SELECTED DEPTHS,
LATERAL DISTANCES AND TIMES:


   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.5500E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5727E+00
                         0.2364E+01  0.5730E+00
                         0.3546E+01  0.5771E+00
                         0.4728E+01  0.6004E+00
                         0.5910E+01  0.5374E+00

 0.5500E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3531E+00
                         0.2364E+01  0.3539E+00
                         0.3546E+01  0.3620E+00
                         0.4728E+01  0.4155E+00
                         0.5910E+01  0.5620E+00

 0.5500E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1506E+00
                         0.2364E+01  0.1519E+00
                         0.3546E+01  0.1632E+00
                         0.4728E+01  0.2428E+00
                         0.5910E+01  0.5809E+00

  TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1692E+05   -0.8396E+02    0.1443E+03   0.1153E+04

 ------------------------------------------------------------


ANALYSIS FOR TIME PERIOD   7

CALCULATED CONCENTRATIONS AT SELECTED DEPTHS,
LATERAL DISTANCES AND TIMES:


   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.5600E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5727E+00
                         0.2364E+01  0.5733E+00
                         0.3546E+01  0.5777E+00
                         0.4728E+01  0.6049E+00
                         0.5910E+01  0.4936E+00

 0.5600E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3531E+00
                         0.2364E+01  0.3542E+00
                         0.3546E+01  0.3632E+00
                         0.4728E+01  0.4252E+00
                         0.5910E+01  0.5210E+00

 0.5600E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1507E+00
                         0.2364E+01  0.1522E+00
                         0.3546E+01  0.1651E+00
                         0.4728E+01  0.2570E+00
                         0.5910E+01  0.5444E+00

  TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
```

```
 0.1714E+05   -0.1150E+03    0.1249E+03   0.1116E+04

 ------------------------------------------------------------


ANALYSIS FOR TIME PERIOD   8

CALCULATED CONCENTRATIONS AT SELECTED DEPTHS,
LATERAL DISTANCES AND TIMES:


   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.5700E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5728E+00
                         0.2364E+01  0.5736E+00
                         0.3546E+01  0.5791E+00
                         0.4728E+01  0.6205E+00
                         0.5910E+01  0.4187E+00

 0.5700E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3532E+00
                         0.2364E+01  0.3547E+00
                         0.3546E+01  0.3661E+00
                         0.4728E+01  0.4541E+00
                         0.5910E+01  0.4542E+00

 0.5700E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1508E+00
                         0.2364E+01  0.1528E+00
                         0.3546E+01  0.1691E+00
                         0.4728E+01  0.2973E+00
                         0.5910E+01  0.4875E+00

  TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1729E+05   -0.1469E+03    0.9019E+02   0.1064E+04

 ------------------------------------------------------------


ANALYSIS FOR TIME PERIOD   9

CALCULATED CONCENTRATIONS AT SELECTED DEPTHS,
LATERAL DISTANCES AND TIMES:


   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.5800E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5728E+00
                         0.2364E+01  0.5739E+00
                         0.3546E+01  0.5823E+00
                         0.4728E+01  0.6530E+00
                         0.5910E+01  0.3143E+00

 0.5800E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3533E+00
                         0.2364E+01  0.3553E+00
                         0.3546E+01  0.3722E+00
                         0.4728E+01  0.5104E+00
                         0.5910E+01  0.3525E+00

 0.5800E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1509E+00
                         0.2364E+01  0.1537E+00
                         0.3546E+01  0.1778E+00
                         0.4728E+01  0.3730E+00
```

```
                         0.5910E+01  0.3906E+00

  TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1737E+05   -0.1158E+03    0.6210E+02   0.9841E+03

 ------------------------------------------------------------


ANALYSIS FOR TIME PERIOD  10

CALCULATED CONCENTRATIONS AT SELECTED DEPTHS,
LATERAL DISTANCES AND TIMES:

   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.5900E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5729E+00
                         0.2364E+01  0.5744E+00
                         0.3546E+01  0.5886E+00
                         0.4728E+01  0.6561E+00
                         0.5910E+01  0.2112E+00

 0.5900E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3534E+00
                         0.2364E+01  0.3564E+00
                         0.3546E+01  0.3830E+00
                         0.4728E+01  0.5353E+00
                         0.5910E+01  0.2462E+00

 0.5900E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1510E+00
                         0.2364E+01  0.1552E+00
                         0.3546E+01  0.1923E+00
                         0.4728E+01  0.4201E+00
                         0.5910E+01  0.2827E+00

  TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1744E+05   -0.9758E+02    0.5658E+02   0.9016E+03

 ------------------------------------------------------------


   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.6000E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5729E+00
                         0.2364E+01  0.5745E+00
                         0.3546E+01  0.5891E+00
                         0.4728E+01  0.6433E+00
                         0.5910E+01  0.1398E+00

 0.6000E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3534E+00
                         0.2364E+01  0.3565E+00
                         0.3546E+01  0.3839E+00
                         0.4728E+01  0.5195E+00
                         0.5910E+01  0.1662E+00

 0.6000E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1510E+00
                         0.2364E+01  0.1554E+00
                         0.3546E+01  0.1936E+00
                         0.4728E+01  0.4019E+00
                         0.5910E+01  0.1950E+00
```

```
  TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1747E+05   -0.1186E+03    0.1116E+03   0.8219E+03

 ------------------------------------------------------------


ANALYSIS FOR TIME PERIOD  11

CALCULATED CONCENTRATIONS AT SELECTED DEPTHS,
LATERAL DISTANCES AND TIMES:

   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.6100E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5730E+00
                         0.2364E+01  0.5754E+00
                         0.3546E+01  0.5940E+00
                         0.4728E+01  0.6065E+00
                         0.5910E+01  0.8158E-01

 0.6100E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3536E+00
                         0.2364E+01  0.3582E+00
                         0.3546E+01  0.3942E+00
                         0.4728E+01  0.4984E+00
                         0.5910E+01  0.9924E-01

 0.6100E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1513E+00
                         0.2364E+01  0.1578E+00
                         0.3546E+01  0.2086E+00
                         0.4728E+01  0.3962E+00
                         0.5910E+01  0.1196E+00

  TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1752E+05   -0.7241E+02    0.5042E+02   0.7399E+03

 ------------------------------------------------------------


   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.6200E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5730E+00
                         0.2364E+01  0.5756E+00
                         0.3546E+01  0.5943E+00
                         0.4728E+01  0.5931E+00
                         0.5910E+01  0.5763E-01

 0.6200E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3536E+00
                         0.2364E+01  0.3586E+00
                         0.3546E+01  0.3953E+00
                         0.4728E+01  0.4836E+00
                         0.5910E+01  0.6705E-01

 0.6200E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1514E+00
                         0.2364E+01  0.1583E+00
                         0.3546E+01  0.2107E+00
                         0.4728E+01  0.3805E+00
                         0.5910E+01  0.7859E-01
```

```
  TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1755E+05   -0.9001E+02    0.9912E+02   0.6633E+03

 ------------------------------------------------------------


ANALYSIS FOR TIME PERIOD  12

CALCULATED CONCENTRATIONS AT SELECTED DEPTHS,
LATERAL DISTANCES AND TIMES:

   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.6300E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5731E+00
                         0.2364E+01  0.5768E+00
                         0.3546E+01  0.5945E+00
                         0.4728E+01  0.5630E+00
                         0.5910E+01  0.4487E-01

 0.6300E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3539E+00
                         0.2364E+01  0.3608E+00
                         0.3546E+01  0.4013E+00
                         0.4728E+01  0.4617E+00
                         0.5910E+01  0.4975E-01

 0.6300E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1518E+00
                         0.2364E+01  0.1615E+00
                         0.3546E+01  0.2219E+00
                         0.4728E+01  0.3669E+00
                         0.5910E+01  0.5551E-01

  TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1760E+05   -0.5360E+02    0.4628E+02   0.5825E+03

 ------------------------------------------------------------


   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.6400E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5732E+00
                         0.2364E+01  0.5770E+00
                         0.3546E+01  0.5938E+00
                         0.4728E+01  0.5515E+00
                         0.5910E+01  0.4174E-01

 0.6400E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3540E+00
                         0.2364E+01  0.3614E+00
                         0.3546E+01  0.4017E+00
                         0.4728E+01  0.4490E+00
                         0.5910E+01  0.4503E-01

 0.6400E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1519E+00
                         0.2364E+01  0.1622E+00
                         0.3546E+01  0.2233E+00
                         0.4728E+01  0.3532E+00
                         0.5910E+01  0.4848E-01

  TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
```

```
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1762E+05   -0.6644E+02    0.9113E+02   0.5072E+03

 ------------------------------------------------------------


   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.6500E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5732E+00
                         0.2364E+01  0.5772E+00
                         0.3546E+01  0.5929E+00
                         0.4728E+01  0.5436E+00
                         0.5910E+01  0.4257E-01

 0.6500E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3540E+00
                         0.2364E+01  0.3617E+00
                         0.3546E+01  0.4013E+00
                         0.4728E+01  0.4389E+00
                         0.5910E+01  0.4499E-01

 0.6500E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1519E+00
                         0.2364E+01  0.1627E+00
                         0.3546E+01  0.2234E+00
                         0.4728E+01  0.3412E+00
                         0.5910E+01  0.4739E-01

  TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1764E+05   -0.7065E+02    0.1343E+03   0.4365E+03

 ------------------------------------------------------------


   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.6600E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5732E+00
                         0.2364E+01  0.5773E+00
                         0.3546E+01  0.5920E+00
                         0.4728E+01  0.5378E+00
                         0.5910E+01  0.4619E-01

 0.6600E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3541E+00
                         0.2364E+01  0.3619E+00
                         0.3546E+01  0.4006E+00
                         0.4728E+01  0.4306E+00
                         0.5910E+01  0.4792E-01

 0.6600E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1520E+00
                         0.2364E+01  0.1630E+00
                         0.3546E+01  0.2229E+00
                         0.4728E+01  0.3306E+00
                         0.5910E+01  0.4949E-01

  TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1765E+05   -0.6888E+02    0.1752E+03   0.3710E+03

 ------------------------------------------------------------
```

```
   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.6700E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5732E+00
                         0.2364E+01  0.5773E+00
                         0.3546E+01  0.5909E+00
                         0.4728E+01  0.5330E+00
                         0.5910E+01  0.5128E-01

 0.6700E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3541E+00
                         0.2364E+01  0.3620E+00
                         0.3546E+01  0.3996E+00
                         0.4728E+01  0.4232E+00
                         0.5910E+01  0.5271E-01

 0.6700E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1520E+00
                         0.2364E+01  0.1632E+00
                         0.3546E+01  0.2220E+00
                         0.4728E+01  0.3209E+00
                         0.5910E+01  0.5379E-01

  TOTAL MASS    TOTAL MASS     VELOCITY    MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1767E+05   -0.6246E+02    0.2132E+03   0.3119E+03

 ------------------------------------------------------------


ANALYSIS FOR TIME PERIOD  13

CALCULATED CONCENTRATIONS AT SELECTED DEPTHS,
LATERAL DISTANCES AND TIMES:

   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.6800E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5734E+00
                         0.2364E+01  0.5780E+00
                         0.3546E+01  0.5869E+00
                         0.4728E+01  0.5360E+00
                         0.5910E+01  0.5146E-01

 0.6800E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3545E+00
                         0.2364E+01  0.3641E+00
                         0.3546E+01  0.4002E+00
                         0.4728E+01  0.4385E+00
                         0.5910E+01  0.5414E-01

 0.6800E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1527E+00
                         0.2364E+01  0.1665E+00
                         0.3546E+01  0.2269E+00
                         0.4728E+01  0.3463E+00
                         0.5910E+01  0.5639E-01

  TOTAL MASS    TOTAL MASS     VELOCITY    MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1771E+05   -0.2189E+02    0.3302E+02   0.2527E+03

 ------------------------------------------------------------
```

```
   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.6900E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5735E+00
                         0.2364E+01  0.5782E+00
                         0.3546E+01  0.5852E+00
                         0.4728E+01  0.5312E+00
                         0.5910E+01  0.4938E-01

 0.6900E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3547E+00
                         0.2364E+01  0.3647E+00
                         0.3546E+01  0.3996E+00
                         0.4728E+01  0.4344E+00
                         0.5910E+01  0.5272E-01

 0.6900E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1529E+00
                         0.2364E+01  0.1674E+00
                         0.3546E+01  0.2273E+00
                         0.4728E+01  0.3429E+00
                         0.5910E+01  0.5577E-01

  TOTAL MASS    TOTAL MASS     VELOCITY    MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1773E+05   -0.2629E+02    0.6178E+02   0.2049E+03

 ------------------------------------------------------------


   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.7000E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5735E+00
                         0.2364E+01  0.5783E+00
                         0.3546E+01  0.5839E+00
                         0.4728E+01  0.5265E+00
                         0.5910E+01  0.4626E-01

 0.7000E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3548E+00
                         0.2364E+01  0.3650E+00
                         0.3546E+01  0.3989E+00
                         0.4728E+01  0.4291E+00
                         0.5910E+01  0.4986E-01

 0.7000E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1530E+00
                         0.2364E+01  0.1680E+00
                         0.3546E+01  0.2272E+00
                         0.4728E+01  0.3371E+00
                         0.5910E+01  0.5324E-01

  TOTAL MASS    TOTAL MASS     VELOCITY    MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1774E+05   -0.2744E+02    0.8581E+02   0.1680E+03

 ------------------------------------------------------------


   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.7100E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5736E+00
                         0.2364E+01  0.5783E+00
```

```
                         0.3546E+01  0.5829E+00
                         0.4728E+01  0.5220E+00
                         0.5910E+01  0.4336E-01

 0.7100E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3548E+00
                         0.2364E+01  0.3652E+00
                         0.3546E+01  0.3981E+00
                         0.4728E+01  0.4235E+00
                         0.5910E+01  0.4673E-01

 0.7100E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1531E+00
                         0.2364E+01  0.1684E+00
                         0.3546E+01  0.2268E+00
                         0.4728E+01  0.3306E+00
                         0.5910E+01  0.5001E-01

  TOTAL MASS    TOTAL MASS     VELOCITY    MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1775E+05   -0.2672E+02    0.1051E+03   0.1411E+03

 ------------------------------------------------------------


   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.7200E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5736E+00
                         0.2364E+01  0.5783E+00
                         0.3546E+01  0.5819E+00
                         0.4728E+01  0.5179E+00
                         0.5910E+01  0.4222E-01

 0.7200E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3549E+00
                         0.2364E+01  0.3654E+00
                         0.3546E+01  0.3974E+00
                         0.4728E+01  0.4181E+00
                         0.5910E+01  0.4494E-01

 0.7200E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1532E+00
                         0.2364E+01  0.1687E+00
                         0.3546E+01  0.2263E+00
                         0.4728E+01  0.3240E+00
                         0.5910E+01  0.4761E-01

  TOTAL MASS    TOTAL MASS     VELOCITY    MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1776E+05   -0.2455E+02    0.1203E+03   0.1229E+03

 ------------------------------------------------------------


ANALYSIS FOR TIME PERIOD  14

CALCULATED CONCENTRATIONS AT SELECTED DEPTHS,
LATERAL DISTANCES AND TIMES:

   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.7300E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5738E+00
                         0.2364E+01  0.5784E+00
                         0.3546E+01  0.5788E+00
```

```
                         0.4728E+01  0.5120E+00
                         0.5910E+01  0.3930E-01

 0.7300E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3554E+00
                         0.2364E+01  0.3669E+00
                         0.3546E+01  0.3990E+00
                         0.4728E+01  0.4251E+00
                         0.5910E+01  0.4207E-01

 0.7300E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1540E+00
                         0.2364E+01  0.1716E+00
                         0.3546E+01  0.2321E+00
                         0.4728E+01  0.3424E+00
                         0.5910E+01  0.4481E-01

  TOTAL MASS    TOTAL MASS     VELOCITY    MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1780E+05   -0.8524E+01    0.1144E+02   0.1069E+03

 ------------------------------------------------------------


   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.7400E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5739E+00
                         0.2364E+01  0.5783E+00
                         0.3546E+01  0.5774E+00
                         0.4728E+01  0.5067E+00
                         0.5910E+01  0.3692E-01

 0.7400E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3556E+00
                         0.2364E+01  0.3674E+00
                         0.3546E+01  0.3989E+00
                         0.4728E+01  0.4211E+00
                         0.5910E+01  0.3961E-01

 0.7400E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1543E+00
                         0.2364E+01  0.1725E+00
                         0.3546E+01  0.2332E+00
                         0.4728E+01  0.3396E+00
                         0.5910E+01  0.4227E-01

  TOTAL MASS    TOTAL MASS     VELOCITY    MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1782E+05   -0.1103E+02    0.2029E+02   0.9717E+02

 ------------------------------------------------------------


   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.7500E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5740E+00
                         0.2364E+01  0.5783E+00
                         0.3546E+01  0.5764E+00
                         0.4728E+01  0.5019E+00
                         0.5910E+01  0.3484E-01

 0.7500E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3558E+00
                         0.2364E+01  0.3677E+00
                         0.3546E+01  0.3986E+00
```

```
                        0.4728E+01  0.4162E+00
                        0.5910E+01  0.3746E-01

0.7500E+02  0.3065E+03  0.0000E+00  0.1505E+00
                        0.1182E+01  0.1545E+00
                        0.2364E+01  0.1731E+00
                        0.3546E+01  0.2336E+00
                        0.4728E+01  0.3348E+00
                        0.5910E+01  0.4002E-01

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1783E+05   -0.1257E+02    0.2751E+02   0.9103E+02

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.7600E+02  0.2405E+03  0.0000E+00  0.5726E+00
                        0.1182E+01  0.5740E+00
                        0.2364E+01  0.5782E+00
                        0.3546E+01  0.5754E+00
                        0.4728E+01  0.4975E+00
                        0.5910E+01  0.3313E-01

0.7600E+02  0.2735E+03  0.0000E+00  0.3530E+00
                        0.1182E+01  0.3559E+00
                        0.2364E+01  0.3678E+00
                        0.3546E+01  0.3982E+00
                        0.4728E+01  0.4112E+00
                        0.5910E+01  0.3558E-01

0.7600E+02  0.3065E+03  0.0000E+00  0.1505E+00
                        0.1182E+01  0.1546E+00
                        0.2364E+01  0.1735E+00
                        0.3546E+01  0.2337E+00
                        0.4728E+01  0.3294E+00
                        0.5910E+01  0.3799E-01

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1784E+05   -0.1339E+02    0.3378E+02   0.8675E+02

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.7700E+02  0.2405E+03  0.0000E+00  0.5726E+00
                        0.1182E+01  0.5740E+00
                        0.2364E+01  0.5781E+00
                        0.3546E+01  0.5746E+00
                        0.4728E+01  0.4934E+00
                        0.5910E+01  0.3208E-01

0.7700E+02  0.2735E+03  0.0000E+00  0.3530E+00
                        0.1182E+01  0.3559E+00
                        0.2364E+01  0.3680E+00
                        0.3546E+01  0.3978E+00
                        0.4728E+01  0.4063E+00
                        0.5910E+01  0.3429E-01

0.7700E+02  0.3065E+03  0.0000E+00  0.1505E+00
                        0.1182E+01  0.1547E+00
                        0.2364E+01  0.1739E+00
                        0.3546E+01  0.2337E+00
```

```
                        0.4728E+01  0.3238E+00
                        0.5910E+01  0.3645E-01

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1785E+05   -0.1343E+02    0.3961E+02   0.8324E+02

------------------------------------------------------------



ANALYSIS FOR TIME PERIOD  15

CALCULATED CONCENTRATIONS AT SELECTED DEPTHS,
LATERAL DISTANCES AND TIMES:


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.7800E+02  0.2405E+03  0.0000E+00  0.5726E+00
                        0.1182E+01  0.5742E+00
                        0.2364E+01  0.5778E+00
                        0.3546E+01  0.5711E+00
                        0.4728E+01  0.4920E+00
                        0.5910E+01  0.2954E-01

0.7800E+02  0.2735E+03  0.0000E+00  0.3530E+00
                        0.1182E+01  0.3565E+00
                        0.2364E+01  0.3693E+00
                        0.3546E+01  0.3994E+00
                        0.4728E+01  0.4165E+00
                        0.5910E+01  0.3205E-01

0.7800E+02  0.3065E+03  0.0000E+00  0.1505E+00
                        0.1182E+01  0.1557E+00
                        0.2364E+01  0.1767E+00
                        0.3546E+01  0.2398E+00
                        0.4728E+01  0.3440E+00
                        0.5910E+01  0.3447E-01

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1789E+05   -0.6043E+01    0.5675E+01   0.7839E+02

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.7900E+02  0.2405E+03  0.0000E+00  0.5726E+00
                        0.1182E+01  0.5743E+00
                        0.2364E+01  0.5776E+00
                        0.3546E+01  0.5696E+00
                        0.4728E+01  0.4871E+00
                        0.5910E+01  0.2659E-01

0.7900E+02  0.2735E+03  0.0000E+00  0.3530E+00
                        0.1182E+01  0.3567E+00
                        0.2364E+01  0.3697E+00
                        0.3546E+01  0.3993E+00
                        0.4728E+01  0.4125E+00
                        0.5910E+01  0.2933E-01

0.7900E+02  0.3065E+03  0.0000E+00  0.1505E+00
                        0.1182E+01  0.1560E+00
                        0.2364E+01  0.1776E+00
                        0.3546E+01  0.2409E+00
                        0.4728E+01  0.3410E+00
```

```
                        0.5910E+01  0.3198E-01

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1790E+05   -0.8092E+01    0.1136E+02   0.7394E+02

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.8000E+02  0.2405E+03  0.0000E+00  0.5726E+00
                        0.1182E+01  0.5743E+00
                        0.2364E+01  0.5774E+00
                        0.3546E+01  0.5685E+00
                        0.4728E+01  0.4825E+00
                        0.5910E+01  0.2324E-01

0.8000E+02  0.2735E+03  0.0000E+00  0.3530E+00
                        0.1182E+01  0.3568E+00
                        0.2364E+01  0.3699E+00
                        0.3546E+01  0.3989E+00
                        0.4728E+01  0.4076E+00
                        0.5910E+01  0.2611E-01

0.8000E+02  0.3065E+03  0.0000E+00  0.1505E+00
                        0.1182E+01  0.1562E+00
                        0.2364E+01  0.1781E+00
                        0.3546E+01  0.2413E+00
                        0.4728E+01  0.3360E+00
                        0.5910E+01  0.2890E-01

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1792E+05   -0.9348E+01    0.1706E+02   0.6954E+02

------------------------------------------------------------




                               N O T I C E
                               -----------

           ALTHOUGH THIS  PROGRAM HAS BEEN  TESTED AND  EXPERIENCE
          WOULD  INDICATE THAT IT IS  ACCURATE  WITHIN  THE  LIMITS
          GIVEN BY  THE  ASSUMPTIONS OF THE  THEORY  USED , WE MAKE
          NO  WARRANTY AS TO  WORKABILITY  OF THIS SOFTWARE OR  ANY
          OTHER LICENSED MATERIAL.  NO  WARRANTIES EITHER EXPRESSED
          OR IMPLIED (INCLUDING WARRANTIES OF FITNESS)  SHALL APPLY
            NO  RESPONSIBILITY  IS ASSUMED FOR ANY ERRORS, MISTAKES
          OR MISREPRESENTATIONS THAT MAY OCCUR FROM THE USE OF THIS
          COMPUTER PROGRAM.  THE USER  ACCEPTS  FULL RESPONSIBILITY
          FOR  ASSESSING  THE  VALIDITY  AND APPLICABILITY  OF THE
          RESULTS OBTAINED WITH THIS PROGRAM FOR ANY SPECIFIC CASE.




              ************************************************
              *                                              *
              *                                              *
              *                                              *
              *      M I G R A T E   S I M U L A T I O N     *
```

```
              *                                              *
              *            ANALYSIS      COMPLETED           *
              *                                              *
              *          TIME     -       21: 9:14           *
              *          EXECUTION TIME    0:55:55           *
              *                                              *
              *                                              *
              ************************************************
```

```
#VAR CWLP Closure by Remova1 (BASELINE)

MIGRATE VERSION 9:  Output Units = SI
           1                  Number of Layers
           2                  Number of Variable Groups
             0      yrs              0      yrs  Start Time
            54      yrs             54      yrs  End Time  - Time Group 1
             9                                   Number of Increments
             1                                   Number of Landfills
             1                                   Top Boundary Condition
             0        m              0        m  Offset - Landfill 1
           507        m            507        m  Surface Width
           481        m            481        m  Base Width
             1     mg/L              1     mg/L  Concentration
             0      yrs              0      yrs  Half-Life
             3                                   Bottom Boundary Condition
             0        m              0        m  Base Integration Width
             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
          2.23        m           2.23        m  Thickness
          0.43                                   Porosity
           187      m/a            187      m/a  Velocity
          2936     m2/a           2936     m2/a  Dispersion Coef.
             5                           #Sublayers - Layer 1
          5.91        m           5.91        m  Thickness
          0.46                                   Porosity
          1470    kg/m3           1.47    g/cm3  Density
         0.634     m2/a          0.634     m2/a  Vertical Diffusion Coef.
        0.0776     m2/a         0.0776     m2/a  Horz. Diffusion Coef.
         0.651      m/a          0.651      m/a  Vertical Velocity
             0      m/a              0      m/a  Horz. Velocity
             0    m3/kg              0     mL/g  Distribution Coef.
             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
             0                                   Type of Fractures
            84      yrs             84      yrs  End Time  - Time Group 2
            30                                   Number of Increments
             1                                   Number of Landfills
             1                                   Top Boundary Condition
             0        m              0        m  Offset - Landfill 1
           507        m            507        m  Surface Width
           481        m            481        m  Base Width
             0     mg/L              0     mg/L  Concentration
             0      yrs              0      yrs  Half-Life
             3                                   Bottom Boundary Condition
             0        m              0        m  Base Integration Width
             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
          2.23        m           2.23        m  Thickness
          0.43                                   Porosity
           187      m/a            187      m/a  Velocity
          2936     m2/a           2936     m2/a  Dispersion Coef.
             5                           #Sublayers - Layer 1
          5.91        m           5.91        m  Thickness
          0.46                                   Porosity
          1470    kg/m3           1.47    g/cm3  Density
         0.634     m2/a          0.634     m2/a  Vertical Diffusion Coef.
        0.0776     m2/a         0.0776     m2/a  Horz. Diffusion Coef.
         0.651      m/a          0.651      m/a  Vertical Velocity
             0      m/a              0      m/a  Horz. Velocity
             0    m3/kg              0     mL/g  Distribution Coef.
             0      yrs              0      yrs  Half-Life
             0      m/a              0      m/a  Sink Removal
             0                                   Type of Fractures
   3                            No. of distances of interest
         240.5        m          240.5        m  Distance
         273.5        m          273.5        m  Distance
         306.5        m          306.5        m  Distance
        7    20             0             2  TAU, N, SIG, RNU : Talbot Integ
SELECT
         1e-04            200             20       Gauss Step Size, #Steps, #Samples
```

```
                 *********************************************************
                 *                                                       *
                 *                                                       *
                 *          M I G R A T E   S I M U L A T I O N          *
                 *                                                       *
                 *                 RUN DATE -   10- 1-80                 *
                 *                 TIME     -   22:50:35                 *
                 *                                                       *
                 *                 REVISION - 1995/15/02                 *
                 *                                                       *
                 *                        MIGRATE                        *
                 *                                                       *
                 *                      VERSION 9.0.0                    *
                 *                                                       *
                 *    COPYRIGHT  R.K. ROWE & J.R. BOOKER  1985-1995      *
                 *                                                       *
                 * LICENSED USER: Andrews Environmental Engineering Ltd. *
                 *                                                       *
                 *********************************************************


 **************************************************************************
  #VAR CWLP Closure by Removal (BASELINE)
 **************************************************************************


______________________________________________________________________________


                              TIME-VARYING PROPERTIES GROUP    1

 START TIME           =         0.0000
 END TIME             =        54.0000
 NUMBER OF INCREMENTS =             9


 SURFACE BOUNDARY
 ~~~~~~~~~~~~~~~~

 SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0


 OFFSET OF CENTER OF LANDFILL    1 IS     0.0000E+00

 WIDTH OF BASE OF LANDFILL IS BETWEEN      -240.5000< X <  240.5000
 WIDTH OF SURFACE OF LANDFILL IS BETWEEN   -253.5000< X <  253.5000


 THE INITIAL SOURCE CONCENTRATION              =   0.1000E+01

 BASE BOUNDARY
 ~~~~~~~~~~~~~
 BASE BOUNDARY CONDITION DEFINED BY
 A PERMEABLE BASE STRATUM WITH THE FOLLOWING PROPERTIES:

 BASE INTEGRATION WIDTH IS BETWEEN        - 1521.0000< X < 1521.0000


 BASE THICKNESS         =   0.2230E+01
 BASE POROSITY          =     0.4300
 OUTFLOW VELOCITY       =   0.1870E+03
 BASE DISPERSION COEFF. =   0.2936E+04


                            PROPERTIES OF THE MATRIX
                            ========================


 LAYER  DISPERSION COEFF. POROSITY ADSORPTION  DENSITY  ADV. VELOCITY THICKNESS
         VERT.    HORZ.             COEFF.              HORZ.   VERT.
```

```
 ~~~~~   ~~~~~~~~~~~~~~~~~ ~~~~~~~~ ~~~~~~~~~~  ~~~~~~~  ~~~~~~~~~~~~~ ~~~~~~~~~
   1    .634E+00 .776E-01  0.460   0.000E+00 1470.000  0.0000   0.6510     1.18
   2    .634E+00 .776E-01  0.460   0.000E+00 1470.000  0.0000   0.6510     1.18
   3    .634E+00 .776E-01  0.460   0.000E+00 1470.000  0.0000   0.6510     1.18
   4    .634E+00 .776E-01  0.460   0.000E+00 1470.000  0.0000   0.6510     1.18
   5    .634E+00 .776E-01  0.460   0.000E+00 1470.000  0.0000   0.6510     1.18


______________________________________________________________________________


                              TIME-VARYING PROPERTIES GROUP    2

 START TIME           =        54.0000
 END TIME             =        84.0000
 NUMBER OF INCREMENTS =            30


 SURFACE BOUNDARY
 ~~~~~~~~~~~~~~~~

 SURFACE BOUNDARY CONDITION DEFINED BY A CONSTANT CONCENTRATION C0


 OFFSET OF CENTER OF LANDFILL    1 IS     0.0000E+00

 WIDTH OF BASE OF LANDFILL IS BETWEEN      -240.5000< X <  240.5000
 WIDTH OF SURFACE OF LANDFILL IS BETWEEN   -253.5000< X <  253.5000


 THE INITIAL SOURCE CONCENTRATION              =   0.0000E+00

 BASE BOUNDARY
 ~~~~~~~~~~~~~
 BASE BOUNDARY CONDITION DEFINED BY
 A PERMEABLE BASE STRATUM WITH THE FOLLOWING PROPERTIES:

 BASE INTEGRATION WIDTH IS BETWEEN        - 1521.0000< X < 1521.0000


 BASE THICKNESS         =   0.2230E+01
 BASE POROSITY          =     0.4300
 OUTFLOW VELOCITY       =   0.1870E+03
 BASE DISPERSION COEFF. =   0.2936E+04


                            PROPERTIES OF THE MATRIX
                            ========================


 LAYER  DISPERSION COEFF. POROSITY ADSORPTION  DENSITY  ADV. VELOCITY THICKNESS
         VERT.    HORZ.             COEFF.              HORZ.   VERT.
 ~~~~~   ~~~~~~~~~~~~~~~~~ ~~~~~~~~ ~~~~~~~~~~  ~~~~~~~  ~~~~~~~~~~~~~ ~~~~~~~~~
   1    .634E+00 .776E-01  0.460   0.000E+00 1470.000  0.0000   0.6510     1.18
   2    .634E+00 .776E-01  0.460   0.000E+00 1470.000  0.0000   0.6510     1.18
   3    .634E+00 .776E-01  0.460   0.000E+00 1470.000  0.0000   0.6510     1.18
   4    .634E+00 .776E-01  0.460   0.000E+00 1470.000  0.0000   0.6510     1.18
   5    .634E+00 .776E-01  0.460   0.000E+00 1470.000  0.0000   0.6510     1.18


                             INTEGRATION PARAMETERS
                             ======================

 THE PARAMETERS USED TO INVERT THE LAPLACE TRANSFORM ARE
 TAU =0.700E+01 N =  20 SIG =0.000E+00 RNU =0.200E+01


 SELECTED GAUSS QUADRATURE SAMPLE POINTS ARE:

  GAUSSIAN INTEGRATION SUBINTERVAL SIZE = 0.100E-03
  NUMBER OF SUBINTERVALS                = 200
  NUMBER OF SAMPLE POINTS USED PER STEP =  20
```

```
                               RESULTS
                               =======


 ANALYSIS FOR TIME PERIOD   1

 CALCULATED CONCENTRATIONS AT SELECTED DEPTHS,
 LATERAL DISTANCES AND TIMES:


    TIME        LATERAL     DEPTH    CONCENTRATION
                DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

  0.6000E+01  0.2405E+03  0.0000E+00  0.5726E+00
                          0.1182E+01  0.5719E+00
                          0.2364E+01  0.5694E+00
                          0.3546E+01  0.5617E+00
                          0.4728E+01  0.5498E+00
                          0.5910E+01  0.6589E+00

  0.6000E+01  0.2735E+03  0.0000E+00  0.3530E+00
                          0.1182E+01  0.3526E+00
                          0.2364E+01  0.3510E+00
                          0.3546E+01  0.3471E+00
                          0.4728E+01  0.3547E+00
                          0.5910E+01  0.6717E+00

  0.6000E+01  0.3065E+03  0.0000E+00  0.1505E+00
                          0.1182E+01  0.1503E+00
                          0.2364E+01  0.1497E+00
                          0.3546E+01  0.1492E+00
                          0.4728E+01  0.1742E+00
                          0.5910E+01  0.6738E+00

   TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
   INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
   ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
  0.1931E+04    0.6818E+03    0.7682E+01   0.6647E+03

  ------------------------------------------------------------


    TIME        LATERAL     DEPTH    CONCENTRATION
                DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

  0.1200E+02  0.2405E+03  0.0000E+00  0.5726E+00
                          0.1182E+01  0.5724E+00
                          0.2364E+01  0.5723E+00
                          0.3546E+01  0.5729E+00
                          0.4728E+01  0.5842E+00
                          0.5910E+01  0.7455E+00

  0.1200E+02  0.2735E+03  0.0000E+00  0.3530E+00
                          0.1182E+01  0.3529E+00
                          0.2364E+01  0.3529E+00
                          0.3546E+01  0.3547E+00
                          0.4728E+01  0.3821E+00
                          0.5910E+01  0.7669E+00

  0.1200E+02  0.3065E+03  0.0000E+00  0.1505E+00
                          0.1182E+01  0.1504E+00
                          0.2364E+01  0.1506E+00
                          0.3546E+01  0.1535E+00
                          0.4728E+01  0.1950E+00
                          0.5910E+01  0.7777E+00

   TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
   INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
   ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
  0.3764E+04    0.2480E+04    0.6086E+03   0.1123E+04
```

```
  ------------------------------------------------------------


    TIME        LATERAL     DEPTH    CONCENTRATION
                DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

  0.1800E+02  0.2405E+03  0.0000E+00  0.5726E+00
                          0.1182E+01  0.5724E+00
                          0.2364E+01  0.5723E+00
                          0.3546E+01  0.5730E+00
                          0.4728E+01  0.5844E+00
                          0.5910E+01  0.7444E+00

  0.1800E+02  0.2735E+03  0.0000E+00  0.3530E+00
                          0.1182E+01  0.3529E+00
                          0.2364E+01  0.3529E+00
                          0.3546E+01  0.3548E+00
                          0.4728E+01  0.3822E+00
                          0.5910E+01  0.7660E+00

  0.1800E+02  0.3065E+03  0.0000E+00  0.1505E+00
                          0.1182E+01  0.1504E+00
                          0.2364E+01  0.1506E+00
                          0.3546E+01  0.1536E+00
                          0.4728E+01  0.1952E+00
                          0.5910E+01  0.7769E+00

   TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
   INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
   ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
  0.5598E+04    0.4409E+04    0.1471E+04   0.1129E+04

  ------------------------------------------------------------


    TIME        LATERAL     DEPTH    CONCENTRATION
                DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

  0.2400E+02  0.2405E+03  0.0000E+00  0.5726E+00
                          0.1182E+01  0.5724E+00
                          0.2364E+01  0.5723E+00
                          0.3546E+01  0.5730E+00
                          0.4728E+01  0.5842E+00
                          0.5910E+01  0.7437E+00

  0.2400E+02  0.2735E+03  0.0000E+00  0.3530E+00
                          0.1182E+01  0.3529E+00
                          0.2364E+01  0.3529E+00
                          0.3546E+01  0.3548E+00
                          0.4728E+01  0.3821E+00
                          0.5910E+01  0.7651E+00

  0.2400E+02  0.3065E+03  0.0000E+00  0.1505E+00
                          0.1182E+01  0.1504E+00
                          0.2364E+01  0.1506E+00
                          0.3546E+01  0.1535E+00
                          0.4728E+01  0.1950E+00
                          0.5910E+01  0.7757E+00

   TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
   INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
   ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
  0.7432E+04    0.6339E+04    0.2336E+04   0.1129E+04

  ------------------------------------------------------------


    TIME        LATERAL     DEPTH    CONCENTRATION
                DISTANCE
```

```
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.3000E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5724E+00
                         0.2364E+01  0.5723E+00
                         0.3546E+01  0.5730E+00
                         0.4728E+01  0.5842E+00
                         0.5910E+01  0.7449E+00

 0.3000E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3529E+00
                         0.2364E+01  0.3529E+00
                         0.3546E+01  0.3548E+00
                         0.4728E+01  0.3820E+00
                         0.5910E+01  0.7662E+00

 0.3000E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1504E+00
                         0.2364E+01  0.1506E+00
                         0.3546E+01  0.1535E+00
                         0.4728E+01  0.1950E+00
                         0.5910E+01  0.7768E+00

  TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.9266E+04    0.8269E+04    0.3202E+04   0.1128E+04

 ------------------------------------------------------------


   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.3600E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5724E+00
                         0.2364E+01  0.5723E+00
                         0.3546E+01  0.5730E+00
                         0.4728E+01  0.5843E+00
                         0.5910E+01  0.7466E+00

 0.3600E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3529E+00
                         0.2364E+01  0.3529E+00
                         0.3546E+01  0.3548E+00
                         0.4728E+01  0.3821E+00
                         0.5910E+01  0.7679E+00

 0.3600E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1504E+00
                         0.2364E+01  0.1506E+00
                         0.3546E+01  0.1535E+00
                         0.4728E+01  0.1951E+00
                         0.5910E+01  0.7784E+00

  TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1110E+05    0.1020E+05    0.4068E+04   0.1128E+04

 ------------------------------------------------------------


   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.4200E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5724E+00
                         0.2364E+01  0.5723E+00
                         0.3546E+01  0.5730E+00
                         0.4728E+01  0.5844E+00
```

```
                         0.5910E+01  0.7479E+00

 0.4200E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3529E+00
                         0.2364E+01  0.3529E+00
                         0.3546E+01  0.3548E+00
                         0.4728E+01  0.3822E+00
                         0.5910E+01  0.7693E+00

 0.4200E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1504E+00
                         0.2364E+01  0.1506E+00
                         0.3546E+01  0.1535E+00
                         0.4728E+01  0.1952E+00
                         0.5910E+01  0.7798E+00

  TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1293E+05    0.1213E+05    0.4932E+04   0.1130E+04

 ------------------------------------------------------------


   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.4800E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5724E+00
                         0.2364E+01  0.5723E+00
                         0.3546E+01  0.5730E+00
                         0.4728E+01  0.5845E+00
                         0.5910E+01  0.7489E+00

 0.4800E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3529E+00
                         0.2364E+01  0.3529E+00
                         0.3546E+01  0.3548E+00
                         0.4728E+01  0.3823E+00
                         0.5910E+01  0.7703E+00

 0.4800E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1504E+00
                         0.2364E+01  0.1506E+00
                         0.3546E+01  0.1536E+00
                         0.4728E+01  0.1953E+00
                         0.5910E+01  0.7809E+00

  TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1477E+05    0.1406E+05    0.5797E+04   0.1132E+04

 ------------------------------------------------------------


   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.5400E+02  0.2405E+03  0.0000E+00  0.5726E+00
                         0.1182E+01  0.5724E+00
                         0.2364E+01  0.5723E+00
                         0.3546E+01  0.5730E+00
                         0.4728E+01  0.5845E+00
                         0.5910E+01  0.7495E+00

 0.5400E+02  0.2735E+03  0.0000E+00  0.3530E+00
                         0.1182E+01  0.3529E+00
                         0.2364E+01  0.3529E+00
                         0.3546E+01  0.3548E+00
                         0.4728E+01  0.3824E+00
```

```
                         0.5910E+01  0.7709E+00

 0.5400E+02  0.3065E+03  0.0000E+00  0.1505E+00
                         0.1182E+01  0.1504E+00
                         0.2364E+01  0.1506E+00
                         0.3546E+01  0.1536E+00
                         0.4728E+01  0.1954E+00
                         0.5910E+01  0.7816E+00

  TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1660E+05    0.1599E+05    0.6661E+04   0.1134E+04

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ANALYSIS FOR TIME PERIOD   2

CALCULATED CONCENTRATIONS AT SELECTED DEPTHS,
LATERAL DISTANCES AND TIMES:

   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.5500E+02  0.2405E+03  0.0000E+00  0.0000E+00
                         0.1182E+01  0.1548E+00
                         0.2364E+01  0.4138E+00
                         0.3546E+01  0.5497E+00
                         0.4728E+01  0.5942E+00
                         0.5910E+01  0.6898E+00

 0.5500E+02  0.2735E+03  0.0000E+00  0.0000E+00
                         0.1182E+01  0.9544E-01
                         0.2364E+01  0.2553E+00
                         0.3546E+01  0.3420E+00
                         0.4728E+01  0.3984E+00
                         0.5910E+01  0.7212E+00

 0.5500E+02  0.3065E+03  0.0000E+00  0.0000E+00
                         0.1182E+01  0.4071E-01
                         0.2364E+01  0.1092E+00
                         0.3546E+01  0.1503E+00
                         0.4728E+01  0.2165E+00
                         0.5910E+01  0.7437E+00

  TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1659E+05    0.2639E+02    0.1502E+03   0.1182E+04

 ------------------------------------------------------------


   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.5600E+02  0.2405E+03  0.0000E+00  0.0000E+00
                         0.1182E+01  0.3898E-01
                         0.2364E+01  0.1583E+00
                         0.3546E+01  0.3379E+00
                         0.4728E+01  0.4950E+00
                         0.5910E+01  0.7150E+00

 0.5600E+02  0.2735E+03  0.0000E+00  0.0000E+00
                         0.1182E+01  0.2405E-01
                         0.2364E+01  0.9778E-01
                         0.3546E+01  0.2105E+00
                         0.4728E+01  0.3284E+00
                         0.5910E+01  0.7349E+00
```

```
 0.5600E+02  0.3065E+03  0.0000E+00  0.0000E+00
                         0.1182E+01  0.1027E-01
                         0.2364E+01  0.4197E-01
                         0.3546E+01  0.9290E-01
                         0.4728E+01  0.1741E+00
                         0.5910E+01  0.7439E+00

  TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1658E+05    0.3483E+03    0.3054E+03   0.1159E+04

 ------------------------------------------------------------


   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.5700E+02  0.2405E+03  0.0000E+00  0.0000E+00
                         0.1182E+01  0.1169E-01
                         0.2364E+01  0.5652E-01
                         0.3546E+01  0.1562E+00
                         0.4728E+01  0.3087E+00
                         0.5910E+01  0.6090E+00

 0.5700E+02  0.2735E+03  0.0000E+00  0.0000E+00
                         0.1182E+01  0.7219E-02
                         0.2364E+01  0.3499E-01
                         0.3546E+01  0.9801E-01
                         0.4728E+01  0.2116E+00
                         0.5910E+01  0.6388E+00

 0.5700E+02  0.3065E+03  0.0000E+00  0.0000E+00
                         0.1182E+01  0.3095E-02
                         0.2364E+01  0.1514E-01
                         0.3546E+01  0.4431E-01
                         0.4728E+01  0.1214E+00
                         0.5910E+01  0.6613E+00

  TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
  INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
  ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
 0.1658E+05    0.6122E+03    0.4657E+03   0.1066E+04

 ------------------------------------------------------------


   TIME        LATERAL     DEPTH    CONCENTRATION
               DISTANCE
  ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

 0.5800E+02  0.2405E+03  0.0000E+00  0.0000E+00
                         0.1182E+01  0.3854E-02
                         0.2364E+01  0.2053E-01
                         0.3546E+01  0.6629E-01
                         0.4728E+01  0.1620E+00
                         0.5910E+01  0.3828E+00

 0.5800E+02  0.2735E+03  0.0000E+00  0.0000E+00
                         0.1182E+01  0.2385E-02
                         0.2364E+01  0.1278E-01
                         0.3546E+01  0.4235E-01
                         0.4728E+01  0.1171E+00
                         0.5910E+01  0.4107E+00

 0.5800E+02  0.3065E+03  0.0000E+00  0.0000E+00
                         0.1182E+01  0.1031E-02
                         0.2364E+01  0.5627E-02
                         0.3546E+01  0.2024E-01
                         0.4728E+01  0.7545E-01
                         0.5910E+01  0.4358E+00
```

```
 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1658E+05    0.7875E+03    0.6228E+03   0.8908E+03

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.5900E+02  0.2405E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.1349E-02
                        0.2364E+01  0.7655E-02
                        0.3546E+01  0.2749E-01
                        0.4728E+01  0.7714E-01
                        0.5910E+01  0.1931E+00

0.5900E+02  0.2735E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.8395E-03
                        0.2364E+01  0.4820E-02
                        0.3546E+01  0.1808E-01
                        0.4728E+01  0.5883E-01
                        0.5910E+01  0.2105E+00

0.5900E+02  0.3065E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.3694E-03
                        0.2364E+01  0.2204E-02
                        0.3546E+01  0.9396E-02
                        0.4728E+01  0.4189E-01
                        0.5910E+01  0.2274E+00

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1658E+05    0.8968E+03    0.7652E+03   0.6825E+03

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.6000E+02  0.2405E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.4928E-03
                        0.2364E+01  0.2927E-02
                        0.3546E+01  0.1131E-01
                        0.4728E+01  0.3444E-01
                        0.5910E+01  0.8500E-01

0.6000E+02  0.2735E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.3100E-03
                        0.2364E+01  0.1879E-02
                        0.3546E+01  0.7717E-02
                        0.4728E+01  0.2743E-01
                        0.5910E+01  0.9378E-01

0.6000E+02  0.3065E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.1414E-03
                        0.2364E+01  0.9124E-03
                        0.3546E+01  0.4396E-02
                        0.4728E+01  0.2099E-01
                        0.5910E+01  0.1026E+00

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1658E+05    0.9727E+03    0.9004E+03   0.4569E+03

------------------------------------------------------------
```

```
  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.6100E+02  0.2405E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.1858E-03
                        0.2364E+01  0.1141E-02
                        0.3546E+01  0.4632E-02
                        0.4728E+01  0.1465E-01
                        0.5910E+01  0.3369E-01

0.6100E+02  0.2735E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.1191E-03
                        0.2364E+01  0.7522E-03
                        0.3546E+01  0.3278E-02
                        0.4728E+01  0.1206E-01
                        0.5910E+01  0.3763E-01

0.6100E+02  0.3065E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.5745E-04
                        0.2364E+01  0.3936E-03
                        0.3546E+01  0.2030E-02
                        0.4728E+01  0.9695E-02
                        0.5910E+01  0.4165E-01

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1658E+05    0.1028E+04    0.1013E+04   0.2616E+03

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.6200E+02  0.2405E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.7175E-04
                        0.2364E+01  0.4505E-03
                        0.3546E+01  0.1882E-02
                        0.4728E+01  0.5969E-02
                        0.5910E+01  0.1162E-01

0.6200E+02  0.2735E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.4712E-04
                        0.2364E+01  0.3062E-03
                        0.3546E+01  0.1377E-02
                        0.4728E+01  0.5023E-02
                        0.5910E+01  0.1325E-01

0.6200E+02  0.3065E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.2440E-04
                        0.2364E+01  0.1731E-03
                        0.3546E+01  0.9135E-03
                        0.4728E+01  0.4173E-02
                        0.5910E+01  0.1494E-01

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1658E+05    0.1065E+04    0.1088E+04   0.1308E+03

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~
```

```
0.6300E+02  0.2405E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.2814E-04
                        0.2364E+01  0.1790E-03
                        0.3546E+01  0.7546E-03
                        0.4728E+01  0.2306E-02
                        0.5910E+01  0.2942E-02

0.6300E+02  0.2735E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.1902E-04
                        0.2364E+01  0.1255E-03
                        0.3546E+01  0.5678E-03
                        0.4728E+01  0.1962E-02
                        0.5910E+01  0.3542E-02

0.6300E+02  0.3065E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.1061E-04
                        0.2364E+01  0.7619E-04
                        0.3546E+01  0.3968E-03
                        0.4728E+01  0.1658E-02
                        0.5910E+01  0.4175E-02

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1658E+05    0.1085E+04    0.1129E+04   0.5920E+02

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.6400E+02  0.2405E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.1113E-04
                        0.2364E+01  0.7106E-04
                        0.3546E+01  0.2961E-03
                        0.4728E+01  0.8222E-03
                        0.5910E+01  0.1567E-03

0.6400E+02  0.2735E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.7748E-05
                        0.2364E+01  0.5122E-04
                        0.3546E+01  0.2271E-03
                        0.4728E+01  0.6947E-03
                        0.5910E+01  0.3085E-03

0.6400E+02  0.3065E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.4636E-05
                        0.2364E+01  0.3300E-04
                        0.3546E+01  0.1643E-03
                        0.4728E+01  0.5832E-03
                        0.5910E+01  0.4745E-03

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1658E+05    0.1096E+04    0.1149E+04   0.2528E+02

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.6500E+02  0.2405E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.4403E-05
                        0.2364E+01  0.2794E-04
                        0.3546E+01  0.1124E-03
                        0.4728E+01  0.2662E-03
                        0.5910E+01 -0.9562E-04
```

```
0.6500E+02  0.2735E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.3150E-05
                        0.2364E+01  0.2059E-04
                        0.3546E+01  0.8678E-04
                        0.4728E+01  0.2148E-03
                        0.5910E+01 -0.1324E-03

0.6500E+02  0.3065E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.2000E-05
                        0.2364E+01  0.1387E-04
                        0.3546E+01  0.6360E-04
                        0.4728E+01  0.1700E-03
                        0.5910E+01 -0.1656E-03

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1658E+05    0.1101E+04    0.1158E+04   0.1111E+02

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.6600E+02  0.2405E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.1729E-05
                        0.2364E+01  0.1080E-04
                        0.3546E+01  0.4142E-04
                        0.4728E+01  0.9867E-04
                        0.5910E+01  0.6451E-03

0.6600E+02  0.2735E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.1265E-05
                        0.2364E+01  0.8074E-05
                        0.3546E+01  0.3173E-04
                        0.4728E+01  0.7371E-04
                        0.5910E+01  0.5433E-03

0.6600E+02  0.3065E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.8398E-06
                        0.2364E+01  0.5586E-05
                        0.3546E+01  0.2298E-04
                        0.4728E+01  0.5148E-04
                        0.5910E+01  0.4384E-03

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1658E+05    0.1103E+04    0.1161E+04   0.6056E+01

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.6700E+02  0.2405E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.6713E-06
                        0.2364E+01  0.4145E-05
                        0.3546E+01  0.1659E-04
                        0.4728E+01  0.8614E-04
                        0.5910E+01  0.1608E-02

0.6700E+02  0.2735E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.4988E-06
                        0.2364E+01  0.3122E-05
                        0.3546E+01  0.1268E-04
                        0.4728E+01  0.7098E-04
                        0.5910E+01  0.1505E-02
```

```
0.6700E+02  0.3065E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.3411E-06
                        0.2364E+01  0.2190E-05
                        0.3546E+01  0.9143E-05
                        0.4728E+01  0.5685E-04
                        0.5910E+01  0.1395E-02

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1658E+05    0.1103E+04    0.1162E+04   0.4653E+01

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.6800E+02  0.2405E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.2628E-06
                        0.2364E+01  0.1719E-05
                        0.3546E+01  0.1007E-04
                        0.4728E+01  0.1238E-03
                        0.5910E+01  0.2374E-02

0.6800E+02  0.2735E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.1979E-06
                        0.2364E+01  0.1322E-05
                        0.3546E+01  0.8299E-05
                        0.4728E+01  0.1135E-03
                        0.5910E+01  0.2306E-02

0.6800E+02  0.3065E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.1386E-06
                        0.2364E+01  0.9612E-06
                        0.3546E+01  0.6681E-05
                        0.4728E+01  0.1035E-03
                        0.5910E+01  0.2228E-02

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1658E+05    0.1104E+04    0.1162E+04   0.4327E+01

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.6900E+02  0.2405E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.1146E-06
                        0.2364E+01  0.9626E-06
                        0.3546E+01  0.1003E-04
                        0.4728E+01  0.1623E-03
                        0.5910E+01  0.2726E-02

0.6900E+02  0.2735E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.8948E-07
                        0.2364E+01  0.7990E-06
                        0.3546E+01  0.9126E-05
                        0.4728E+01  0.1559E-03
                        0.5910E+01  0.2708E-02

0.6900E+02  0.3065E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.6654E-07
                        0.2364E+01  0.6494E-06
                        0.3546E+01  0.8275E-05
                        0.4728E+01  0.1492E-03
                        0.5910E+01  0.2679E-02
```

```
 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1658E+05    0.1104E+04    0.1162E+04   0.3964E+01

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.7000E+02  0.2405E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.6784E-07
                        0.2364E+01  0.8086E-06
                        0.3546E+01  0.1131E-04
                        0.4728E+01  0.1790E-03
                        0.5910E+01  0.2590E-02

0.7000E+02  0.2735E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.5770E-07
                        0.2364E+01  0.7365E-06
                        0.3546E+01  0.1083E-04
                        0.4728E+01  0.1764E-03
                        0.5910E+01  0.2625E-02

0.7000E+02  0.3065E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.4839E-07
                        0.2364E+01  0.6697E-06
                        0.3546E+01  0.1037E-04
                        0.4728E+01  0.1733E-03
                        0.5910E+01  0.2650E-02

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1658E+05    0.1104E+04    0.1163E+04   0.3187E+01

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.7100E+02  0.2405E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.7065E-07
                        0.2364E+01  0.7572E-06
                        0.3546E+01  0.6037E-05
                        0.4728E+01  0.7165E-04
                        0.5910E+01  0.1987E-02

0.7100E+02  0.2735E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.6805E-07
                        0.2364E+01  0.7696E-06
                        0.3546E+01  0.6231E-05
                        0.4728E+01  0.6574E-04
                        0.5910E+01  0.1810E-02

0.7100E+02  0.3065E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.6551E-07
                        0.2364E+01  0.7839E-06
                        0.3546E+01  0.6504E-05
                        0.4728E+01  0.6101E-04
                        0.5910E+01  0.1629E-02

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1658E+05    0.1104E+04    0.1163E+04   0.1685E+01

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```

```
  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.7200E+02  0.2405E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.6135E-07
                        0.2364E+01  0.5960E-06
                        0.3546E+01  0.4151E-05
                        0.4728E+01  0.5359E-04
                        0.5910E+01  0.1570E-02

0.7200E+02  0.2735E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.6206E-07
                        0.2364E+01  0.6257E-06
                        0.3546E+01  0.4320E-05
                        0.4728E+01  0.4803E-04
                        0.5910E+01  0.1448E-02

0.7200E+02  0.3065E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.6272E-07
                        0.2364E+01  0.6577E-06
                        0.3546E+01  0.4561E-05
                        0.4728E+01  0.4321E-04
                        0.5910E+01  0.1318E-02

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1658E+05    0.1105E+04    0.1164E+04  -0.2067E-01

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.7300E+02  0.2405E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.4758E-07
                        0.2364E+01  0.3603E-06
                        0.3546E+01  0.1326E-05
                        0.4728E+01  0.2165E-04
                        0.5910E+01  0.9685E-03

0.7300E+02  0.2735E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.4993E-07
                        0.2364E+01  0.3946E-06
                        0.3546E+01  0.1425E-05
                        0.4728E+01  0.1652E-04
                        0.5910E+01  0.8919E-03

0.7300E+02  0.3065E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.5228E-07
                        0.2364E+01  0.4319E-06
                        0.3546E+01  0.1588E-05
                        0.4728E+01  0.1177E-04
                        0.5910E+01  0.8040E-03

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1658E+05    0.1105E+04    0.1165E+04  -0.1660E+01

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.7400E+02  0.2405E+03  0.0000E+00  0.0000E+00
```

```
                        0.1182E+01  0.2763E-07
                        0.2364E+01  0.6676E-07
                        0.3546E+01 -0.1921E-05
                        0.4728E+01 -0.1422E-04
                        0.5910E+01  0.3615E-03

0.7400E+02  0.2735E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.3064E-07
                        0.2364E+01  0.9746E-07
                        0.3546E+01 -0.1925E-05
                        0.4728E+01 -0.1913E-04
                        0.5910E+01  0.3171E-03

0.7400E+02  0.3065E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.3374E-07
                        0.2364E+01  0.1317E-06
                        0.3546E+01 -0.1876E-05
                        0.4728E+01 -0.2395E-04
                        0.5910E+01  0.2602E-03

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1658E+05    0.1105E+04    0.1166E+04  -0.2944E+01

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.7500E+02  0.2405E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.3648E-08
                        0.2364E+01 -0.2393E-06
                        0.3546E+01 -0.4903E-05
                        0.4728E+01 -0.4358E-04
                        0.5910E+01 -0.9109E-04

0.7500E+02  0.2735E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.6590E-08
                        0.2364E+01 -0.2183E-06
                        0.3546E+01 -0.5038E-05
                        0.4728E+01 -0.4861E-04
                        0.5910E+01 -0.1161E-03

0.7500E+02  0.3065E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.9698E-08
                        0.2364E+01 -0.1936E-06
                        0.3546E+01 -0.5134E-05
                        0.4728E+01 -0.5376E-04
                        0.5910E+01 -0.1539E-03

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1658E+05    0.1105E+04    0.1166E+04  -0.3665E+01

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.7600E+02  0.2405E+03  0.0000E+00  0.0000E+00
                        0.1182E+01 -0.2060E-07
                        0.2364E+01 -0.5038E-06
                        0.3546E+01 -0.6936E-05
                        0.4728E+01 -0.5755E-04
                        0.5910E+01 -0.2793E-03

0.7600E+02  0.2735E+03  0.0000E+00  0.0000E+00
```

```
                        0.1182E+01 -0.1829E-07
                        0.2364E+01 -0.4969E-06
                        0.3546E+01 -0.7221E-05
                        0.4728E+01 -0.6295E-04
                        0.5910E+01 -0.2943E-03

0.7600E+02  0.3065E+03  0.0000E+00  0.0000E+00
                        0.1182E+01 -0.1576E-07
                        0.2364E+01 -0.4863E-06
                        0.3546E+01 -0.7480E-05
                        0.4728E+01 -0.6866E-04
                        0.5910E+01 -0.3217E-03

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1658E+05    0.1106E+04    0.1166E+04  -0.3734E+01

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.7700E+02  0.2405E+03  0.0000E+00  0.0000E+00
                        0.1182E+01 -0.4105E-07
                        0.2364E+01 -0.6774E-06
                        0.3546E+01 -0.7500E-05
                        0.4728E+01 -0.5077E-04
                        0.5910E+01 -0.1618E-03

0.7700E+02  0.2735E+03  0.0000E+00  0.0000E+00
                        0.1182E+01 -0.3980E-07
                        0.2364E+01 -0.6870E-06
                        0.3546E+01 -0.7934E-05
                        0.4728E+01 -0.5658E-04
                        0.5910E+01 -0.1709E-03

0.7700E+02  0.3065E+03  0.0000E+00  0.0000E+00
                        0.1182E+01 -0.3829E-07
                        0.2364E+01 -0.6934E-06
                        0.3546E+01 -0.8359E-05
                        0.4728E+01 -0.6285E-04
                        0.5910E+01 -0.1918E-03
 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1658E+05    0.1105E+04    0.1166E+04  -0.3182E+01

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.7800E+02  0.2405E+03  0.0000E+00  0.0000E+00
                        0.1182E+01 -0.5428E-07
                        0.2364E+01 -0.7258E-06
                        0.3546E+01 -0.6342E-05
                        0.4728E+01 -0.2245E-04
                        0.5910E+01  0.2296E-03

0.7800E+02  0.2735E+03  0.0000E+00  0.0000E+00
                        0.1182E+01 -0.5433E-07
                        0.2364E+01 -0.7522E-06
                        0.3546E+01 -0.6906E-05
                        0.4728E+01 -0.2841E-04
                        0.5910E+01  0.2283E-03

0.7800E+02  0.3065E+03  0.0000E+00  0.0000E+00
```

```
                        0.1182E+01 -0.5413E-07
                        0.2364E+01 -0.7763E-06
                        0.3546E+01 -0.7474E-05
                        0.4728E+01 -0.3497E-04
                        0.5910E+01  0.2157E-03

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1658E+05    0.1105E+04    0.1166E+04  -0.2147E+01

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.7900E+02  0.2405E+03  0.0000E+00  0.0000E+00
                        0.1182E+01 -0.5814E-07
                        0.2364E+01 -0.6363E-06
                        0.3546E+01 -0.3535E-05
                        0.4728E+01  0.2354E-04
                        0.5910E+01  0.8020E-03

0.7900E+02  0.2735E+03  0.0000E+00  0.0000E+00
                        0.1182E+01 -0.5955E-07
                        0.2364E+01 -0.6777E-06
                        0.3546E+01 -0.4184E-05
                        0.4728E+01  0.1798E-04
                        0.5910E+01  0.8147E-03

0.7900E+02  0.3065E+03  0.0000E+00  0.0000E+00
                        0.1182E+01 -0.6074E-07
                        0.2364E+01 -0.7178E-06
                        0.3546E+01 -0.4851E-05
                        0.4728E+01  0.1173E-04
                        0.5910E+01  0.8167E-03
 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1658E+05    0.1105E+04    0.1165E+04  -0.8464E+00

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.8000E+02  0.2405E+03  0.0000E+00  0.0000E+00
                        0.1182E+01 -0.5208E-07
                        0.2364E+01 -0.4199E-06
                        0.3546E+01  0.5424E-06
                        0.4728E+01  0.7961E-04
                        0.5910E+01  0.1423E-02

0.8000E+02  0.2735E+03  0.0000E+00  0.0000E+00
                        0.1182E+01 -0.5473E-07
                        0.2364E+01 -0.4724E-06
                        0.3546E+01 -0.1274E-06
                        0.4728E+01  0.7522E-04
                        0.5910E+01  0.1459E-02

0.8000E+02  0.3065E+03  0.0000E+00  0.0000E+00
                        0.1182E+01 -0.5722E-07
                        0.2364E+01 -0.5247E-06
                        0.3546E+01 -0.8301E-06
                        0.4728E+01  0.7005E-04
                        0.5910E+01  0.1484E-02

 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
```

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 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1658E+05    0.1105E+04    0.1164E+04   0.4749E+00

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.8100E+02  0.2405E+03  0.0000E+00  0.0000E+00
                        0.1182E+01 -0.3718E-07
                        0.2364E+01 -0.1084E-06
                        0.3546E+01  0.5281E-05
                        0.4728E+01  0.1360E-03
                        0.5910E+01  0.1951E-02

0.8100E+02  0.2735E+03  0.0000E+00  0.0000E+00
                        0.1182E+01 -0.4080E-07
                        0.2364E+01 -0.1667E-06
                        0.3546E+01  0.4665E-05
                        0.4728E+01  0.1337E-03
                        0.5910E+01  0.2018E-02

0.8100E+02  0.3065E+03  0.0000E+00  0.0000E+00
                        0.1182E+01 -0.4432E-07
                        0.2364E+01 -0.2258E-06
                        0.3546E+01  0.4003E-05
                        0.4728E+01  0.1304E-03
                        0.5910E+01  0.2076E-02
 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1658E+05    0.1104E+04    0.1164E+04   0.1584E+01

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  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.8200E+02  0.2405E+03  0.0000E+00  0.0000E+00
                        0.1182E+01 -0.1589E-07
                        0.2364E+01  0.2514E-06
                        0.3546E+01  0.9959E-05
                        0.4728E+01  0.1829E-03
                        0.5910E+01  0.2262E-02

0.8200E+02  0.2735E+03  0.0000E+00  0.0000E+00
                        0.1182E+01 -0.2009E-07
                        0.2364E+01  0.1936E-06
                        0.3546E+01  0.9471E-05
                        0.4728E+01  0.1833E-03
                        0.5910E+01  0.2367E-02

0.8200E+02  0.3065E+03  0.0000E+00  0.0000E+00
                        0.1182E+01 -0.2427E-07
                        0.2364E+01  0.1338E-06
                        0.3546E+01  0.8928E-05
                        0.4728E+01  0.1828E-03
                        0.5910E+01  0.2464E-02
 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1658E+05    0.1104E+04    0.1163E+04   0.2303E+01

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  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.8300E+02  0.2405E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.8495E-08
                        0.2364E+01  0.6071E-06
                        0.3546E+01  0.1388E-04
                        0.4728E+01  0.2123E-03
                        0.5910E+01  0.2276E-02

0.8300E+02  0.2735E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.4149E-08
                        0.2364E+01  0.5557E-06
                        0.3546E+01  0.1358E-04
                        0.4728E+01  0.2159E-03
                        0.5910E+01  0.2422E-02

0.8300E+02  0.3065E+03  0.0000E+00  0.0000E+00
                        0.1182E+01 -0.2573E-09
                        0.2364E+01  0.5014E-06
                        0.3546E+01  0.1322E-04
                        0.4728E+01  0.2186E-03
                        0.5910E+01  0.2561E-02
 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1658E+05    0.1104E+04    0.1163E+04   0.2535E+01

------------------------------------------------------------


  TIME        LATERAL     DEPTH    CONCENTRATION
              DISTANCE
 ~~~~~~~~~   ~~~~~~~~~   ~~~~~~~~~ ~~~~~~~~~~~~~

0.8400E+02  0.2405E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.3242E-07
                        0.2364E+01  0.9095E-06
                        0.3546E+01  0.1650E-04
                        0.4728E+01  0.2192E-03
                        0.5910E+01  0.1971E-02

0.8400E+02  0.2735E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.2835E-07
                        0.2364E+01  0.8696E-06
                        0.3546E+01  0.1643E-04
                        0.4728E+01  0.2262E-03
                        0.5910E+01  0.2154E-02

0.8400E+02  0.3065E+03  0.0000E+00  0.0000E+00
                        0.1182E+01  0.2415E-07
                        0.2364E+01  0.8260E-06
                        0.3546E+01  0.1630E-04
                        0.4728E+01  0.2324E-03
                        0.5910E+01  0.2332E-02
 TOTAL MASS    TOTAL MASS     VELOCITY   MASS IN BASE
 INTO SOIL     INTO BASE     TRANSPORT   -WY/2 TO +WY/2
 ~~~~~~~~~~    ~~~~~~~~~~    ~~~~~~~~~   ~~~~~~~~~~~~~~
0.1658E+05    0.1104E+04    0.1163E+04   0.2280E+01

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NOTICE

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  ALTHOUGH THIS  PROGRAM HAS BEEN  TESTED AND  EXPERIENCE
WOULD  INDICATE THAT IT IS  ACCURATE  WITHIN  THE  LIMITS
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    *           EXECUTION TIME    0:32:40           *
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ATTACHMENT 12

HYDROGEOLOGY REPORT, GROUNDWATER MONITORING PROGRAM STATISTICAL PROCEDURES

City Water, Light & Power

Coal Combustion Residuals Surface Impoundments

Springfield, Sangamon County, Illinois

Hydrogeologic Report, Groundwater Monitoring Program and Statistical Procedures

October 2021

Prepared for:
City Water, Light & Power
3100 Stevenson Drive
Springfield, Illinois 62703

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ILLINOIS | MISSOURI | INDIANA

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1. INTRODUCTION

City Water, Light and Power (CWLP) owns and operates two (2) existing coal combustion residual (CCR) surface impoundments subject to the Illinois EPA's rules (35 Ill. Adm. Code 845) for CCR surface impoundments.

The two (2) CCR surface impoundments are regulated by Illinois EPA CCR rule 35 Ill. Adm. Code 845 Standards for the Disposal of Coal Combustion Residuals in Surface Impoundments. As indicated above, the hydrogeologic site characterization, groundwater monitoring and statistical procedures requirements of Illinois EPA CCR rules 35 Ill. Adm. Code 845.Subpart F apply to both impoundments. This Hydrogeologic Report and Groundwater Monitoring Program were prepared to meet the hydrogeologic site characterization, groundwater monitoring and statistical procedures requirements of the Illinois EPA CCR surface impoundment rules 35 Ill. Adm. Code 845.Subpart F.

1.1 Site Description

The CWLP CCR surface impoundments are located north and east of the former Lakeside Power Generating Station and Dallman Power Generating Station in the Eastern ½ of Section 12, Township 15 North, Range 5 West, in Springfield, Illinois (see Figure 1). These CCR surface impoundments are identified as the Lakeside Ash Pond and the Dallman Ash Pond (see Figure 2).

The former Lakeside Power Generating Station and Dallman Power Generating Station are situated on the northwestern bank of Lake Springfield in Springfield, Illinois. The Lakeside Ash Pond is immediately south of Spaulding Dam at the northern end of Lake Springfield. The Dallman Ash Pond is immediately northwest of the Lakeside Ash Pond.

1.2 Site History

The Sugar Creek historically meandered across the site, generally from the west to east with an overall flow direction to the north (see Figure 3). During the construction of the ash ponds, the creek was abandoned and relocated to the west of the site. The old creek bed was filled with different types of soil, ranging from cohesive soils characterized as silty clays, to granular fill characterized as poorly graded silty to clayey sands.

The Lakeside Ash Pond is primarily a diked embankment with some incising along the east perimeter. The Lakeside Ash Pond consists of four separate ponds (i.e., three lime softening ponds and a settling pond) totaling approximately 35 acres. CCR ash was first placed in the Lakeside Ash Pond area in the middle 1930's. The Lakeside Ash Pond is its present configuration was placed into service prior to 1958 and ceased receiving ash in 2009.

The Lakeside Ash Pond was originally used as a settling pond for fly ash and bottom ash sluiced with raw lake water. Presently, lime-softening ponds located on the southern portion of the Lakeside Ash Pond receive water softening lime residuals from the CWLP Drinking Water Purification Plant, Flue Gas Desulfurization Waste Water Treatment Plant (FGD WWTP) clarifier blowdown sludge, and wash-down water from miscellaneous floor drains. The FGD WWTP sludge contains CCR. The other flows are non-CCR.

The most recent change made to the Lakeside Ash Pond was a vertical expansion completed in 1988. The vertical expansion consists of berms built on top of and inside of the existing embankments in such a way that the toe of the outer slope of the expansion berms matches up with the top of the inner slope of the existing embankments. The vertical expansion berms are approximately ten feet in height.

The Dallman Ash Pond is a partially incised and diked embankment placed into service in approximately 1976. The Dallman Ash Pond is one contiguous 34.5 acre pond. The Dallman Ash Pond is used as a settling pond for fly ash and bottom ash, which are sluiced with raw lake water from Dallman Power Station Units 31, 32 and 33. In addition, industrial wastewater treatment plant clarifier blowdown, landfill leachate and evaporation pond water is pumped into the Dallman Ash Pond. The evaporation water is non-CCR storm water from the FGD Landfill area that collects in the eastern portion of the undeveloped area. The generating facility (GF) WWTP sludge, landfill leachate and evaporation water are non-CCR. All materials being sent to the Dallman Ash Pond are liquid or wet processed solids. No expansion of the Dallman Ash Pond has occurred since its construction.

Settled water from both the Lakeside Ash Pond and Dallman Ash Pond flow into opposite sides of a Clarification Pond for final polishing before being discharged to Sugar Creek at a permitted NPDES outfall.

2. SITE GEOLOGY

The geologic conditions have been investigated through both literature and site-specific geologic investigations including multiple subsurface investigations, including those prior to the impoundment development, along the perimeter of the impoundments and including the hydrogeologic investigation at the permitted Subtitle D CCR landfill located north of the Lakeside Ash Pond and east of the Dallman Ash Pond. These investigations were as follows:

- Professional Service Industries (PSI), June 1989. This investigation consisted of five soil borings within the east section of the south cell (Cell 1).
- Andrews Environmental Engineering, Inc., February 1990. This investigation was performed for Cell 2 and consisted of 13 soil borings. The drilling and testing were completed by PSI.
- Andrews Environmental Engineering, Inc. , March 1990. This investigation was performed to install six wells at the Facility. The drilling and testing were completed by PSI.
- Patrick Engineering, Inc. (PEI), July 1992. This investigation was performed to further characterize the hydrogeology of the landfill setting. Approximately 44 soil borings and piezometers were installed by PEI.
- Stabilize, Inc. (SI), December 2008. This investigation installed three new monitoring wells as part of an assessment program for the landfill. The drilling, soil testing, and well construction were performed by Reynolds Well Drilling.
- City Water, Light and Power (CWLP), April 2010. This investigation was performed to install four piezometers on the west side of the CCR surface impoundments along Sugar Creek. The drilling and testing were completed by PSI.

- Stabilize, Inc. (SI), May 2011. This investigation installed four new monitoring wells to further the characterization of the CCR surface impoundments. The drilling, soil testing, and well construction were performed by PSI.

- Andrews Engineering, Inc., January 2012. This investigation was performed to replace CCR surface impoundment wells and install an additional background well. The drilling and well installation were completed by TerraDrill.

- Andrews Engineering, Inc., July 2017. This project included drilling peripheral to the Dallman Ash Pond.

- Andrews Engineering, Inc., September and October 2018. This project included borings peripheral to the Dallman Ash Pond.

- Andrews Engineering, Inc., May and July 2019. This project included advancement of borings drilling peripheral to the Dallman Ash Pond.

- Andrews Engineering, Inc., February 2021. This project included the installation of 4 assessment wells located west of Sugar Creek.

The geologic characterization was prepared in context of the April 15, 2021 Illinois EPA CCR rule 35 Ill. Adm. Code 845.Subpart F requirements. Emphasis is placed on characterizing the uppermost aquifer and the underlying confining aquitard. The uppermost aquifer is the required unit for groundwater quality monitoring under the Illinois EPA CCR rules.

The occurrence of the deposits discussed below are variable due to the meandering nature of Sugar Creek prior to the development of Lake Springfield and Spaulding Dam. The meandering creek has resulted in sequential erosion and deposition (scour and fill) throughout much of the creek drainage system, both laterally and vertically.

The geologic boring logs and well construction reports upon which the site-specific hydrogeologic conditions are based are provided in Appendix A. Geologic cross-sections are provided in Appendix B. The site specific geologic conditions are in general agreement with the geologic literature for the region. Given that the CCR ash impoundments are located within the former Sugar Creek drainage basin, many of the quaternary deposits present in the uplands are absent. The surficial deposits within the limits of the CCR surface impoundments appear to be comprised of alluvium overlying glacio-fluvial deposits (i.e., till and outwash sands and gravels). The quaternary deposits rest directly on top of Pennsylvanian aged bedrock primarily comprised of shale.

2.1 Surficial Deposits

The shallow stratigraphy and lithology at the CCR surface impoundments include approximately 20 to 50 feet of Pleistocene sediments, dependent upon location. In descending order these materials are identified as fill material, upper cohesive deposit, shallow sand, lower cohesive deposit, basal sand and creek fill.

The overall tendency is for the finer-grained materials (clays, silty clays and silts) to overlie the coarser-grained materials (sands and gravels). This coarsening downward is present throughout much of the site. At the majority of the borehole locations, the coarser materials rest directly on top of the weathered bedrock surface. It is this coarser material, the basal sand, which is characterized as the uppermost aquifer.

Fill Material

Fill material encountered at the facility is either used as structural fill adjacent to the CCR surface impoundments or as berm construction material. Where encountered as structural fill, it as much as 25 feet thick and is described as a brown to dark brown and grey to dark grey silty clay, clayey silt, silt or sand, typically with trace to some organic material (i.e., rootlets and fragments of wood).

Within the abandoned creek area, the underlying upper cohesive deposit and shallow sand are absent and the fill material may rest directly on top of creek fill.

Upper Cohesive Deposit

The upper cohesive deposit is an alluvial deposit described as brown to gray silty clay with trace fine sand, and is stiff with a medium plasticity and containing trace organics towards the bottom. Where encountered, the upper cohesive deposit ranges from 2.5 to 16 feet thick and overlies the shallow sand. Within the abandoned creek area, the upper cohesive deposit and underlying shallow sand are absent.

The upper cohesive deposit has a relatively low hydraulic conductivity in the vertical direction as determined by laboratory triaxial hydraulic conductivity tests from borings taken from the landfill investigation. The hydraulic conductivity values determined from the laboratory tests ranged from 1.6×10^{-5} cm/sec to 5.2×10^{-7} cm/sec. However, the upper cohesive deposit is an alluvial deposit and it is expected that the horizontal coefficient of hydraulic conductivity will be greater than the vertical coefficient. Based on test results for the lower cohesive deposit, it is anticipated that the horizontal hydraulic conductivity for the upper cohesive deposit is in the range of 10^{-6} to 10^{-5} cm/sec.

Shallow Sand

The shallow sand underlies the upper cohesive deposit and overlies the lower cohesive deposit. Where encountered, the unit is described as a brown to gray silty to clayey fine sand. It contains small lenses of silty clay and clayey silt. This unit is not contiguous over the entire site. Its thickness ranges from 1 to 3 feet over most of the investigated area and where encountered likely represents the pre-construction ground surface.

Laboratory tests performed on representative samples collected from the shallow sand unit during this and previous investigations indicate the shallow sand contains 0% gravel, 50% to 52% sand, and 48% to 50% silt/clay. Two landfill piezometers were screened in the shallow sand unit to obtain potentiometric surface information and conduct field hydraulic conductivity tests. The hydraulic conductivity of this unit based on the slug test results ranges from 3.6×10^{-3} to 2.9×10^{-2} cm/sec.

Lower Cohesive Deposit

The lower cohesive deposit consists of brown, gray, and brownish gray silty clays, clayey silts, and clays, having very soft to stiff consistency. The lower cohesive deposit ranges in thickness from 0 to 22 feet with an average thickness of about 15 feet. The deposit was not encountered in isolated areas along the abandoned creek, possibly due to excessive erosion of creek bottom in these areas.

The lower cohesive deposit is generally overlain by the shallow sand and underlain by the basal sand. However, within the abandoned creek area, the lower cohesive deposit was encountered directly below the creek fill. In some areas the basal sand is not present and the lower cohesive deposit directly overlies the bedrock.

The soils in the lower cohesive deposit can be similar in color and texture to the soils in the upper cohesive deposit. The distinction between the two deposits was based on the presence or changes in soil consistency (as measured with a calibrated hand held penetrometer) and a marked difference in moisture content. The lower cohesive deposit is not exposed at the ground surface in the investigated area.

The lower cohesive deposit consists of 0% gravel, 8% to 48% sand, and 52% to 95% silt/clay; and has a relatively low hydraulic conductivity. The vertical hydraulic conductivity ranges from 1.3 x 10^{-8} to 1.8 x 10^{-6} cm/sec (triaxial permeameter). The horizontal hydraulic conductivity ranges from 4.6 x 10^{-5} to 7.6 x 10^{-5} cm/sec (field slug tests).

Basal Sand

In most locations, the basal sand is the lower-most surficial deposit. The basal sand is a gray colored, poorly graded, silty to clayey fine sand to well graded sand with minor amounts of fine gravel. This unit was encountered in a medium dense to dense condition. The top elevation of the basal sand varies from 491 to 513 feet mean sea level (MSL) and the thickness ranges from about 0 to 12.3 feet. The unit was not encountered consistently, likely due to excessive erosion of the creek bottom.

The basal sand generally overlies the bedrock surface and underlies the lower cohesive deposit. There are some pockets of very hard, fine grained silty clay to clay overlying bedrock in a few areas. The basal sand is present above these pockets of clayey deposits, thought to be weathered bedrock.

The basal sand generally consists of 0% to 34% gravel, 50% to 91% sand, and 6% to 44% silt/clay; and exhibits a mean field hydraulic conductivity of 1.73 x 10^{-2} cm/sec. The basal sand was saturated in all locations where it was encountered.

Creek Fill Material

The·borings made along the abandoned creek locations indicate that the creek fill materials consist of variable soils ranging from silty clays to silty sands. Cohesive soils characterized as silty clays to organic silty clay were typically encountered. In some areas, the cohesive fill materials extended down to the top of bedrock. The granular fill materials are typically poorly graded silty to clayey sands and contain organics or wood fragments. In some areas, the granular fill materials also extended down to the top of bedrock.

The cohesive fill material contains 0% gravel, 2% to 48% sand, and 52% to 98% silt/clay. The vertical hydraulic conductivity ranges from 7.6 x 10^{-8} cm/sec to.2.1x10^{-5} cm/sec. The granular fill materials contain 0 to 2% gravel, 55% to 65% sand and 33% to 45% silt/clay. Based on one laboratory hydraulic conductivity test performed on a Shelby tube sample obtained from berm fill, the hydraulic conductivity of the granular fill material is 3.3 x 10^{-8} cm/sec.

The creek fill materials identified during the previous landfill investigations have a significant effect on the site hydrogeologic conditions. The upper and lower cohesive deposits are considered to act as aquitards (where present) which restrict vertical flow into the water bearing units. For all practical purposes, the bedrock is considered to be an aquiclude.

Fill materials encountered in the landfill borings range from silty clays and organic silty clays to silty sands and clayey sands. These water level measurements indicate that groundwater movement within the creek fill materials is complicated because of the highly variable hydraulic characteristics of the fill materials and their random placement.

Four landfill piezometers are screened into the fill materials. Of these, one piezometer was installed into cohesive fill material and the other piezometers were installed in granular fill materials. Hydraulic conductivity of the granular fill materials is based on one field test resulting in a value of 6.1×10^{-2} cm/sec. The hydraulic conductivity of the cohesive fill material ranged from 7.1×10^{-5} cm/sec to 1.1×10^{-4} cm/sec. These values represent the hydraulic conductivity in the horizontal direction.

Laboratory hydraulic conductivity test performed on landfill cohesive fill materials ranged from $2.1\text{x}10^{-3}$ cm/sec to 3.3×10^{-8} cm/sec. The higher hydraulic conductivity values are believed to be typical of soils which contain organic matter (e.g. wood fragments). The hydraulic conductivity values based on laboratory tests are generally considered to be representative of the coefficient of hydraulic conductivity in the vertical direction because of the sample configuration during testing. However, because of the randomness of the fill, it is more likely that the hydraulic conductivity is within the range of 10^{-5} to 10^{-4} cm/sec.

2.2 Uppermost Bedrock

The bedrock at the project site consists of Pennsylvanian shales which are gray in color. The bedrock surface elevation varies from approximately 492 feet MSL near the center of the existing landfill, to approximately 554 feet MSL located on a bedrock outcrop near the landfill area (southeast corner of Cell 1). In general, the bedrock surface slopes from the east and west towards the center of the landfill area.

Rock Quality Designation (RQD) measurements were performed on all core samples taken from the landfill area. RQDs measured from core samples collected during this investigation ranges from 80% to 100%. The RQD values indicate that the bedrock is not highly fractured. Two in situ hydraulic conductivity tests were performed to determine the hydraulic conductivity of the upper portions of the bedrock. Test results indicate hydraulic conductivity values of 1.8×10^{-7} cm/sec and 1.3×10^{-6} cm/sec. This shows that the bedrock encountered at the project site is relatively impermeable. There is good correlation between the lithology of the rocks tested and the hydraulic conductivity values obtained. The upper bedrock beneath the impoundments is expected to exhibit the same characteristics as encountered at the landfill.

3. SITE HYDROGEOLOGY

The uppermost aquifer and underlying confining unit control groundwater movement and the potential for CCR impacted groundwater migration. This narrative provides a description of the regional and site-specific hydrogeologic conditions.

3.1 Uppermost Aquifer

The uppermost aquifer is characterized as the basal sand overlying the shale bedrock. In some locations the creek fill materials, ranging from silty clays and organic silty clays to silty sands and clayey sands, were found to be in direct hydraulic communication with the basal sand that directly overlies the bedrock surface. Due to the highly variable hydraulic characteristics and random placement of the creek fill materials, further characterization is difficult.

As indicated above, the hydraulic conductivity of the basal sand ranges from 5.6 x 10^{-4} to 3.6 x 10^{-2} cm/sec. The groundwater in the basal sand appears to be under confined, semi-confined, or unconfined conditions dependent upon location. The upper limit of the uppermost aquifer is dependent upon the seasonally fluctuating groundwater table. The potentiometric surface of the basal sand varies from 565 feet MSL at upgradient locations, south of the Lakeside Ash Pond, to 525 feet MSL at downgradient locations near Sugar Creek, north of the Dallman Ash Pond. As a result, the saturated thickness is variably dependent upon the location and the seasonal variation in the groundwater table.

Groundwater movement within the uppermost aquifer is controlled by recharge along topographic highs and discharge along the original stream valley. The pre-surface impoundment flow direction in the uppermost aquifer was dominantly horizontal from the adjacent banks toward the natural convergence along Sugar Creek, which formerly drained the site. This was overall from south to north with local deviations. This dominant flow pattern persists under present day conditions but with localized variation introduced by the hydrologic discontinuity created upon construction of the CCR surface impoundments.

The CCR surface impoundment wells were used to derive potentiometric surface maps for the most recent four consecutive events. This was completed to capture climatic, including seasonal and temporal fluctuations in groundwater flow. As shown, overall groundwater movement is from south to north (see Appendix C). The east perimeter of the Lakeside Ash Pond is largely upgradient, and the west side is largely sidegradient where groundwater movement is parallel to the perimeter. Excavated areas within the FGDS Landfill area act as a groundwater sink along the east side of the Dallman Ash Pond. Groundwater generally moves northward from the Dallman Ash Pond, but also moves easterly towards the FGDS Landfill and westerly towards Sugar Creek.

3.2 Lower Confining Unit

The uppermost bedrock at the project site is primarily Pennsylvanian age shale with isolated thin coal layers. The Pennsylvanian shale functions as a lower confining unit due to its low permeability and effective porosity. The lower confining unit represents a natural hydrogeologic barrier (i.e., aquitard) to the vertical movement of groundwater.

In situ hydraulic conductivity test (slug tests) indicate that the hydraulic conductivity for the upper portions of the bedrock range from 1.8 x 10^{-7} to 1.3 x 10^{-6} cm/sec. There appears to be good correlation between the rock lithology and the measured values of hydraulic conductivity. The bedrock over most of the site will act as an aquiclude and prevent the downward movement of groundwater.

3.3 Surface Water

The nearest surface water bodies are Lake Springfield, located upgradient to the CCR surface impoundments and Sugar Creek located adjacent to the western and northern perimeter of the CCR surface impoundments (see Figure 2).

- Lake Springfield

- Sugar Creek

3.3.1 Surface Water Intakes

There are two surface water intakes located near the CCR surface impoundments facility (see Appendix D). These intakes are identified as:

- Intake No. 52140 - Lake Springfield 1 Intake 2

- Intake No. 52141 - South Fork Horse Creek Intake

Both of these intakes are located along Lake Springfield and supply water to the Springfield public water supply (IL1671200). These intakes are upgradient of the CCR surface impoundments and completely disassociated with the impoundments.

3.4 Community Water Supply Wells

A potable water well survey was completed in the vicinity of the Dallman and Lakeside Ash Ponds. The survey was conducted using the Illinois EPA's web-based Geographic Information System (GIS) database1 in the Source Water Assessment Program (SWAP) for potable water wells downgradient of the CCR impoundments.

The Illinois EPA’s SWAP GIS database system identifies community water supply wells and other potable wells (private, semi-private and non-community water supply wells) include data from the following sources:

- Illinois EPA, Division of Public Water Supplies;
- Illinois State Geological Survey (ISGS);
- Illinois State Water Survey; and
- Illinois Department of Public Health.

Based on groundwater elevation data from numerous monitoring wells and piezometers located between and adjacent to the CWLP CCR impoundments, groundwater movement in the vicinity of the CCR impoundments is generally from the south-southwest to the north-northeast, approximately paralleling the Sugar Creek basin. The search extended to the first water well encountered hydraulically downgradient of the impoundments, located near Illinois Route 29 at a distance of approximately 3,400 feet. The results of the IEPA SWAP query is provided in Appendix D.

There is no reason to believe that potable wells exist within 2,500-feet of the CCR impoundments that were not identified as part of this potable water well survey.

3.5 Designated Nature Preserves

The nearest designated nature preserve (DNP), as approved by the Illinois EPA Groundwater Section of the Bureau of Water pursuant to 35 Ill. Adm. Code 620.230 are the Thomas W and Elizabeth Moews Dore Seep, located approximately 100 miles north-northeast and Stemler Cave located approximately 100 miles south-southwest of the subject facility. Moews Dore Seep is

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[1] (http://illinois-epa.maps.arcgis.com/apps/webappviewer/index.html?id=4d37a05f5ba441f1b30dab54ccb81fc8)

situated in Putnam county (Section 34, T32N R2W 3PM), Hennepin Township, along the Illinois River bluffs about 1 mile west of State Route 26 and is a 26-acre seep and seep-related wetland community. It is within the Hennepin and Hopper Lakes Project area and it is the largest identified seep area in the Illinois River Section of the Upper Mississippi River and Illinois River Bottomlands. Stemler Cave in St. Clair county (Sections 12, 13 and 14, T1S R10W 3PM), Sugar Loaf Township, on the karst highlands approximately 2 miles east of Columbia, Illinois.

3.6 Underground Mines

Pursuant to 35 Ill. Adm. Code 845.620(b)(14) the initial permit application must include a map displaying any known underground mines beneath a CCR surface impoundment. Using the ISGS ILMINES GIS coverage (https://prairie-research.maps.arcgis.com/apps/webappviewer) a map displaying the extent of underground mines within the limits of the CCR surface impoundments has been prepared. Included as Appendix E, the map shows the presence of an underground coal mine beneath the location of the Dallman Ash Pond. There are no underground mines located beneath the Lakeside Ash Pond.

It is noted from historical mine location maps that the Dallman Ash Pond was partially undermined using the room and pillar panel method, during the period from 1901 to 1938 by various coal companies operating in the region. Brewerton Coal Company operated the mine during the final year. The main shaft was located in what is now a commercial/residential area at the north end of Fox Bridge Road, off of Adlai Stevenson Drive (Section 11, T15N R5W 3PM, 650 FSL, 440 FWL). The Springfield (No.5) Coal was mined from a 5 to 6 foot thick seam at a depth of 235 feet. (Bargh et al, 1993).

There is no evidence (i.e., subsidence, altered groundwater flow patterns, bedrock fracturing) that the presence of these underground mines have structurally compromise the Dallman Ash Pond or the Lakeside Ash Pond.

4. GROUNDWATER MONITORING

Groundwater monitoring at the CWLP CCR surface impoundments has been prepared to address the groundwater monitoring system, the groundwater sampling and analysis, groundwater monitoring program, the assessment of corrective measures, corrective action plan and implementation of the corrective action plan.

4.1 Groundwater Monitoring System

In accordance with 35 Ill. Adm. Code 845.630 the groundwater monitoring system consists of a sufficient number of wells, installed at appropriate locations and depths, to yield groundwater samples from the uppermost aquifer that: (1) accurately represent the quality of background groundwater that has not been affected by leakage from a CCR surface impoundment, and (2) accurately represent the quality of groundwater passing the impoundment boundary of the CCR surface impoundment to monitor potential contaminant pathways in the uppermost aquifer.

Pursuant to 35 Ill. Adm. Code 845.630(b) the number, spacing, and depths of the groundwater monitoring wells have been determined based upon site-specific technical information to meet the rule's performance standard, including the subsurface conditions observed at the site. This includes a characterization of the uppermost aquifer and the confining bedrock layer immediately below the uppermost aquifer.

The monitoring well locations take into consideration the natural (pre-surface impoundment) and current convergence of groundwater flow paths. The wells are located as close as feasible to the downgradient CCR surface impoundments based on topography, surface impoundment construction, and operations. The existing monitor well network (number of wells, locations, and screen interval) was installed pursuant to recommendations of the Illinois EPA Bureau of Water.

The groundwater monitoring system consists of eleven monitor wells screening the silt, sand, and gravel at the bedrock interface. The direction of groundwater movement, as described above, is to the west-northwest; therefore, the northern and western boundaries of the impoundments will be downgradient, and the southern and eastern boundaries will be upgradient.

Pursuant to 35 Ill. Adm. Code 845.630(c) the groundwater monitoring system includes a sufficient number of monitoring wells to meet the performance standards specified in 35 Ill. Adm. Code 845.630(a) based upon the site-specific information specified in 35 Ill. Adm. Code 845.630(b). The well locations are depicted in Figure 4. Table 1 provides a summary of well construction and the approximate screened intervals. Appendix A contains the well construction reports.

Two (2) groundwater monitoring wells are representative of background (ambient) groundwater quality conditions of the uppermost aquifer. These wells are identified as AP-4 and AP-5. Background concentrations are chemical concentrations or parameter values that represent naturally-occurring groundwater that has not been impacted by the surface impoundment or other facility activities.

Monitoring well AP-4 is located in an upgradient position, southwest of the CCR surface impoundments and along the eastern bank of Sugar Creek, immediately north of Lake Springfield dam. The well is screened at the surface of the Pennsylvanian shale and basal sand. This well is not upgradient of the subject CCR surface impoundments in a hydrologic sense but it is located on available CWLP property where it provides representative background groundwater quality, as allowed under 35 Ill. Adm. Code 845.630(a).

Monitoring well AP-5 is located in an upgradient position, southeast of the CCR surface impoundments and in a topographically slightly higher position. The well screen elevation is screened at the top of Pennsylvanian shale and basal sand at this location. This well monitors the upgradient groundwater quality of the uppermost aquifer at this location.

Nine (9) groundwater wells allow monitoring of the downgradient groundwater quality conditions in the uppermost aquifer. These wells are identified as AP-1R, AP-2A, AP-3, AP-6, AP-7, AP-8, AP-10, AP-14 and RW-3. The locations and depths of these wells accurately represent the quality of groundwater passing the impoundment boundaries of the CCR units and reasonably make possible the detection of geochemical changes in the uppermost aquifer. These groundwater monitoring wells are all screened across the interface of the overburden (basal sand) and weathered bedrock. Monitoring wells AP-1, AP-2, AP-3, AP-6, AP-7, AP-8, AP-10, AP-14 and AW-3 are located along the toe of the CCR surface impoundments and adjacent to Sugar Creek.

Pursuant to 35 Ill. Adm. Code 845.630(e) the monitoring wells are constructed in a manner that maintains the integrity of the monitoring well and borehole. All wells were installed pursuant to the Illinois Department of Public Health Water Well Construction Code (77 IAC 920) for monitoring well construction standards (see Appendix F). Any replacement and/or new groundwater monitoring wells will be constructed to meet 77 IAC 920. All monitoring well installations were documented in the respective reports. Boring logs and well construction reports are provided in

Appendix A. All drilling and groundwater monitoring well construction was completed under the direct supervision of an Illinois Licensed Professional Geologist.

4.2 Groundwater Sampling and Analysis Program

The groundwater monitoring program includes consistent sampling and analysis procedures to provide accurate representation of groundwater quality (35 Ill. Adm. Code 845.640(a)). The activities include sample collection, preservation and shipment, analytical procedures, chain of custody, and quality assurance and quality control.

Groundwater is sampled for the constituents listed in 35 Ill. Adm. Code 600(a)(1), total calcium and turbidity (see Table 2). For groundwater monitoring, these constituents include:

- Antimony
- Arsenic
- Barium
- Beryllium
- Boron
- Cadmium
- Chloride
- Chromium
- Cobalt
- Fluoride
- Lead
- Lithium
- Mercury
- Molybdenum
- pH
- Selenium
- Sulfate
- Thallium
- Total Dissolved Solids
- Radium 226 and 228 combined
- Calcium
- Turbidity

In accordance with 35 Ill. Adm. Code 845.640(i) all constituents are analyzed as total recoverable, where samples are not field filtered. All groundwater samples collected pursuant to 35 Ill. Adm. Code 845.Subpart F shall be analyzed by a certified laboratory using Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846 (35 Ill. Adm. Code 845.640(j)).

Pursuant to 35 Ill. Adm. Code 845.640(c), groundwater levels will be measured in each groundwater monitoring well immediately prior to purging, and each time groundwater is sampled. Other wells may be retained as water level measurement points. Levels will be measured to the nearest 0.01 feet (1/100 hundredth) and used to determine rate and direction of groundwater movement each time groundwater is sampled. In addition, a water table map/potentiometric surface map for the uppermost aquifer will be generated using the measured water levels obtained from each sampling event. The contours on these maps will allow for a quantitative assessment of flow rate and direction. Measurements of well depths will also be obtained during each sampling event to verify that the wells are physically intact and not filling with sediment, except where such measurements are not possible due to the presence of dedicated sampling equipment in the well.

Pursuant to 35 Ill. Adm. Code 845.640(d) the background groundwater quality has been established for each of the constituents listed in 35 Ill. Adm. Code 845.600 by using the upgradient and background wells described under 35 Ill. Adm. Code 845.630(a)(1), as applicable for groundwater monitoring requirements (35 Ill. Adm. Code 845.650). The upgradient and background wells include AP-4 and AP-5.

Background concentrations for AP-4 and AP-5 were developed from samples collected for eight consecutive quarters, allowing the statistical method employed to account for seasonal/temporal variability. The chemical constituents include only those parameters listed at 35 Ill. Adm. Code 845.600(a)(1).

The background concentrations are statistically analyzed to establish site-specific upper confidence limits for each chemical or parameter. The statistical methodology utilized for derivation of the background concentrations is provided in Appendix G. Background concentrations and groundwater analytical results are summarized in Appendix H.

Results from the background wells (AP-4 and AP-5) will be continually evaluated. If the groundwater quality significantly changes, it will become necessary to revise the background concentrations. In such an event, the statistical method contained in Appendix G will be utilized for such revision. Details for any revision will be placed in the facility record.

The number of samples collected under groundwater monitoring, if necessary (for both downgradient and background wells), will be consistent with the statistical procedures selected under 35 Ill. Adm. Code 845.640(f) and the performance standard under 35 Ill. Adm. Code 845.640(g). The sampling procedures for background wells AP-4 and AP-5 and downgradient groundwater monitoring wells AP-1, AP-2, AP-3, AP-6, AP-7, AP-8, AP-10, AP-14 and AW-3 are consistent with that specified under 35 Ill. Adm. Code 845.650.

Pursuant to 35 Ill. Adm. Code 845.640(f), the selected statistical method to be used during in evaluating groundwater monitoring data for each constituent is the Prediction Interval Procedure under 35 Ill. Adm. Code 845.640(f)(1)(C). For this procedure, an interval for each constituent is established from the distribution of the background data and then the level of each constituent in each compliance well (i.e., well/constituent) is compared to the upper prediction limit to assess if a statistically significant increase (SSI) over background has occurred.

The selected method to evaluate concentrations obtained as part of the groundwater monitoring program is appropriate to determine the occurrence of statistically significant changes in the groundwater quality data and complies with the performance standards under 35 Ill. Adm. Code 845.640(g), including:

(1) 35 Ill. Adm. Code 845.640(g)(1) addressing the distribution of constituents where normal distributions will use parametric methods and non-normal distributions will use non-parametric methods.

(2) 35 Ill. Adm. Code 845.640(g)(4) addressing the effectiveness of this approach by considering the number of samples in the background database, the data distribution, and the range of concentrations values for each constituent of concern.

(3) 35 Ill. Adm. Code 845.640(g)(5) establishing the practical quantitation limit as the lowest concentration level that can be reliably achieved during routine laboratory operating conditions.

(4) 35 Ill. Adm. Code 845.640(g)(6) allowing for the correction of seasonal and spatial variability as well as temporal correlation in the data.

4.3 Groundwater Monitoring Program

In accordance with 35 Ill. Adm. Code 845.650, the Groundwater Monitoring Program (GMP) includes, at a minimum, groundwater monitoring for all constituents listed in 35 Ill. Adm. Code 845.600(a)(1), calcium and turbidity.

Eight (8) independent samples were collected from each background and downgradient well and analyzed for the constituents listed in 35 Ill. Adm. Code 845.600(a)(1) and calcium. Samples are continuing to be collected to develop a background for turbidity. The initial eight (8) independent sampling events were completed on a semi-annual basis over the second quarter 2015 through first quarter 2017. This schedule allowed the capture of seasonal variability in quality and groundwater flow conditions. Details for derivation of the background concentrations are provided in Appendix G. Background concentrations and groundwater analytical results are summarized in Appendix H.

Monitoring frequency for the CCR constituents under 35 Ill. Adm. Code 845.650(b)(1)(A) will proceed on a quarterly interval during the active life of the CCR unit and the post closure period, except as allowed by 35 Ill. Adm. Code 845.650(b)(4).

The number of samples collected and analyzed are consistent with the sampling and statistical procedures required by 35 Ill. Adm. Code 845.640(e) and account for any unique characteristics of the site (35 Ill. Adm. Code 845.650(c)). Sampling for will occur on a quarterly basis, except as allowed by 35 Ill. Adm. Code 845.650(b)(4).

Pursuant to 35 Ill. Adm. Code 845.650(d), if it is determined pursuant to 35 Ill. Adm. Code 845.640(h) that there is a statistically significant increase (SSI) over the groundwater protection standard for one or more of the constituents listed in 35 Ill. Adm. Code 845.600, the Illinois EPA shall be notified which constituent exceeded the groundwater protection standard and place the notification in the facility's operating record as required by 35 Ill. Adm. Code 845.800(d)(16). Also, the owner must either 1) within 60 days of the SSI, complete an alternative source demonstration (35 Ill. Adm. Code 845.650(e)); or 2) within 90 days of the SSI initiate an assessment of corrective measures as required by 35 Ill. Adm. Code 845.660 following the completion of the nature and extent characterization (35 Ill. Adm. Code 845.650(d)(1)) and notification requirements (35 Ill. Adm. Code 845.650(d)(2)).

Pursuant to 35 Ill. Adm. Code 845.650(e) an Alternate Source Demonstration (ASD) may be used to demonstrate that a source other than the CCR unit(s) caused the SSI, or that the SSI was the result of error in sampling, analysis, statistical evaluation, or natural variation in groundwater quality. The ASD must be submitted to the Illinois EPA within 60 days of detecting the SSI and within 24 hours of submittal be placed on the CWLP's CCR website. If the Illinois EPA concurs with the ASD, groundwater monitoring shall resume as required by 35 Ill. Adm. Code 845.650. The ASD must be included in the annual groundwater monitoring and corrective action report required by 35 Ill. Adm. Code 845.610(e). If the Illinois EPA does not concur with the ASD, the assessment of corrective measures must be initiated under 35 Ill. Adm. Code 845.660. If the Illinois EPA does not concur with the ASD, the facility may petition the Illinois Environmental Pollution Control Board (the Board) for review of the Illinois EPA's non-concurrence under 35 Ill. Adm. Code 105.

Pursuant to 35 Ill. Adm. Code 845.650(d), if it has been determined that the SSI is due to a release from the CCR surface impoundment(s) the facility must initiate an assessment of corrective measure (ACM) (35 Ill. Adm. Code 845.660) within 90 days after the detected exceedance of the GWPS. The remedy ultimately selected by the ACM must be based on a characterization of the nature and extent of the release sufficient to clean up all releases from the CCR surface impoundment pursuant to 35 Ill. Adm. Code 845.660.

The characterization must be submitted to the Illinois EPA and be placed in the facility's operating record as required by 35 Ill. Adm. Code 845.800(d)(16). Characterization of the release includes the following minimum measures:

A) Install additional monitoring wells necessary to define the contaminant plume(s);

B) Collect data on the nature and estimated quantity of material released including specific information on the constituents listed in 35 Ill. Adm. Code 845.600 and the levels at which they are present in the material released;

C) Install at least one additional monitoring well at the facility boundary in the direction of contaminant migration and sample this well in accordance with 35 Ill. Adm. Code 845.650(a) and (b); and

D) Sample all wells in accordance with 35 Ill. Adm. Code 845.650(a) and (b) to characterize the nature and extent of the release.

As part of the ACM, the facility shall notify all persons who own the land or reside on the land that directly overlies any part of the plume of contamination if contaminants have migrated off-site as indicated by sampling of wells in accordance with 35 Ill. Adm. Code 845(d)(1). Notifications made pursuant to 35 Ill. Adm. Code 845.650(d)(2) shall be submitted to the Illinois EPA and placed into the facility's operating record as required by 845.800(d)(16).

4.4 Assessment of Corrective Measures

Within 90 days of determining that an SSI has occurred for any constituent listed in 35 Ill. Adm. Code 845.600, or immediately upon detection of a release, the facility must initiate an ACM to prevent further releases, to remediate releases, and to restore the affected area. The ACM must be completed within 90 days unless a time extension of not more than 60 days is needed to complete the ACM, as demonstrated by the facility. The facility will include any such demonstration in the annual groundwater monitoring and corrective action report required under 35 Ill. Adm. Code 845.610(e). The CCR unit will continue to monitor groundwater in accordance with the groundwater monitoring program (35 Ill. Adm. Code 845.650) during the ACM.

The ACM will evaluate the effectiveness of potential corrective measures in meeting the requirements and objectives of the remedy as described under 35 Ill. Adm. Code 845.670, including performance, reliability, ease of implementation, impacts, exposure, time required, permitting, etc. (35 Ill. Adm. Code 845.660(c)).

The completed assessment of corrective measures will be placed in the operating record; discussed at a public meeting at least 30 days prior to the selection of a remedy under 35 Ill. Adm. Code 845.240; and recordkeeping, notification, and internet requirements will be met.

Pursuant to 35 Ill. Adm. Code 845.660(e) when the facility is completing closure and corrective action simultaneously, the facility may combine the ACM required by 35 Ill. Adm. Code 845.660 and the closure alternatives analysis required by 35 Ill. Adm. Code 845.710 into one assessment of alternatives.

4.5 Corrective Action Plan

Within one year after completing the ACM as specified in 35 Ill. Adm. Code 845.660, and after completion of the public meeting in 35 Ill. Adm. Code 845.660(d), the facility shall submit in a construction permit application, a corrective action plan (CAP) that identifies the selected remedy. The CAP shall be:

- based on the results of the ACM conducted under 35 Ill. Adm. Code 845.660;
- identify a selected remedy that meets the standards listed in 35 Ill. Adm. Code 845.670(d);
- contain the corrective action alternatives analysis specified in 35 Ill. Adm. Code 845.670(e); and
- contain a proposed schedule for implementation, including an analysis of the factors in 35 Ill. Adm. Code 845.670(f).

Pursuant to 35 Ill. Adm. Code 845.670(d), the selected remedy must be protective of human health and environment, attain the GWPS, control the source(s) of release so as to reduce or eliminate, to the extent feasible, further releases on constituents listed in 35 Ill. Adm. Code 845.600, remove from the environment as much of the contaminated material as feasible, and comply with standards for management of wastes under 35 Ill. Adm. Code 845.680(d).

Pursuant to 35 Ill. Adm. Code 845.670(e) the corrective action alternatives analysis shall consider the long and short term effectiveness and protectiveness of each potential remedy along with the degree of certainty that the remedy will prove successful based on the factors under 35 Ill. Adm. Code 845.670(e)(1)(A) through (H), the effectiveness of the remedy in controlling the source to reduce further releases based on consideration of each of the factors (35 Ill. Adm. Code 845.670(e)(2), the ease or difficulty of implementing each potential remedy (35 Ill. Adm. Code 845.670(e)(3), and the degree to which the community concerns are addressed by each potential remedy (35 Ill. Adm. Code 845.670(e)(4)).

Pursuant to 35 Ill. Adm. Code 845.670(f), the schedule for implementing and completing remedial activities must require the completion of remedial activities within a reasonable time, taking into consideration the factors in 35 Ill. Adm. Code 845.670(f)(1) through (6).

4.6 Implementation of the Corrective Action Plan

Pursuant to 35 Ill. Adm. Code 845.680(a), within 90 days of selecting the remedy, the facility will initiate remedial activities. Based on the schedule provided under 35 Ill. Adm. Code 845.670(f) for implementation of corrective action, the facility must establish and implement a corrective action groundwater monitoring program that meets the requirements of the monitoring program under 35 Ill. Adm. Code 845.650, implement the corrective action remedy selected under 35 Ill. Adm. Code 845.670, and address any interim measures that might be needed to reduce the contaminants leaching from the CCR unit. If at any time the facility determines that compliance with the requirements of 35 Ill. Adm. Code 845.670(d) is not being achieved through the remedy selected, other methods or techniques that could feasibly achieve compliance should be evaluated and implemented 35 Ill. Adm. Code 845.680(b).

Pursuant to 35 Ill. Adm. Code 845.680(c), the remedy will be considered complete when compliance with the GWPS has been achieved at all points within the plume of contamination that lies beyond the waste boundary, the concentrations of constituents listed in 35 Ill. Adm. Code

845.600 have not exceeded the GWPS for a period of three consecutive years, and all action required to complete the remedy have been satisfied. The effectiveness of the remedial actions will be evaluated based on the confidence intervals constructed for applicable well/constituent pairs as compared to a specified clean-up standard which is the GWPS. When the entire interval is determined to be below the GWPS for three consecutive years, that well/constituent pair will be declared to be in compliance, and inorganic well/constituent pairs will be moved back into routine groundwater monitoring and appropriate limit-based statistics will resume.

All CCR units that are managed under a remedy required under 35 Ill Adm. Code 845.670 will be managed in a manner that complies with applicable requirements (35 Ill. Adm. Code 845.680(d)).

Pursuant to 35 Ill. Adm. Code 845.680(e), upon completion of the corrective action plan the facility will prepare a corrective action completion report and a certification from a qualified professional engineer that the corrective action plan has been completed in accordance with 35 Ill. Adm. Code 845.680(c). The corrective action completion report shall include the information under 35 Ill. Adm. Code 845.680(e)(1)(A) through (F) and shall be placed into the facility's operating record as required by 35 Ill. Adm. Code 845.800(d)(18).

5. REFERENCES CITED

U.S. Environmental Protection Agency (EPA). March 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance. Office of Resource Conservation and Recovery Program Implementation and Information Division, U.S. Environmental Protection Agency, Washington, DC. 888 p.

TABLES

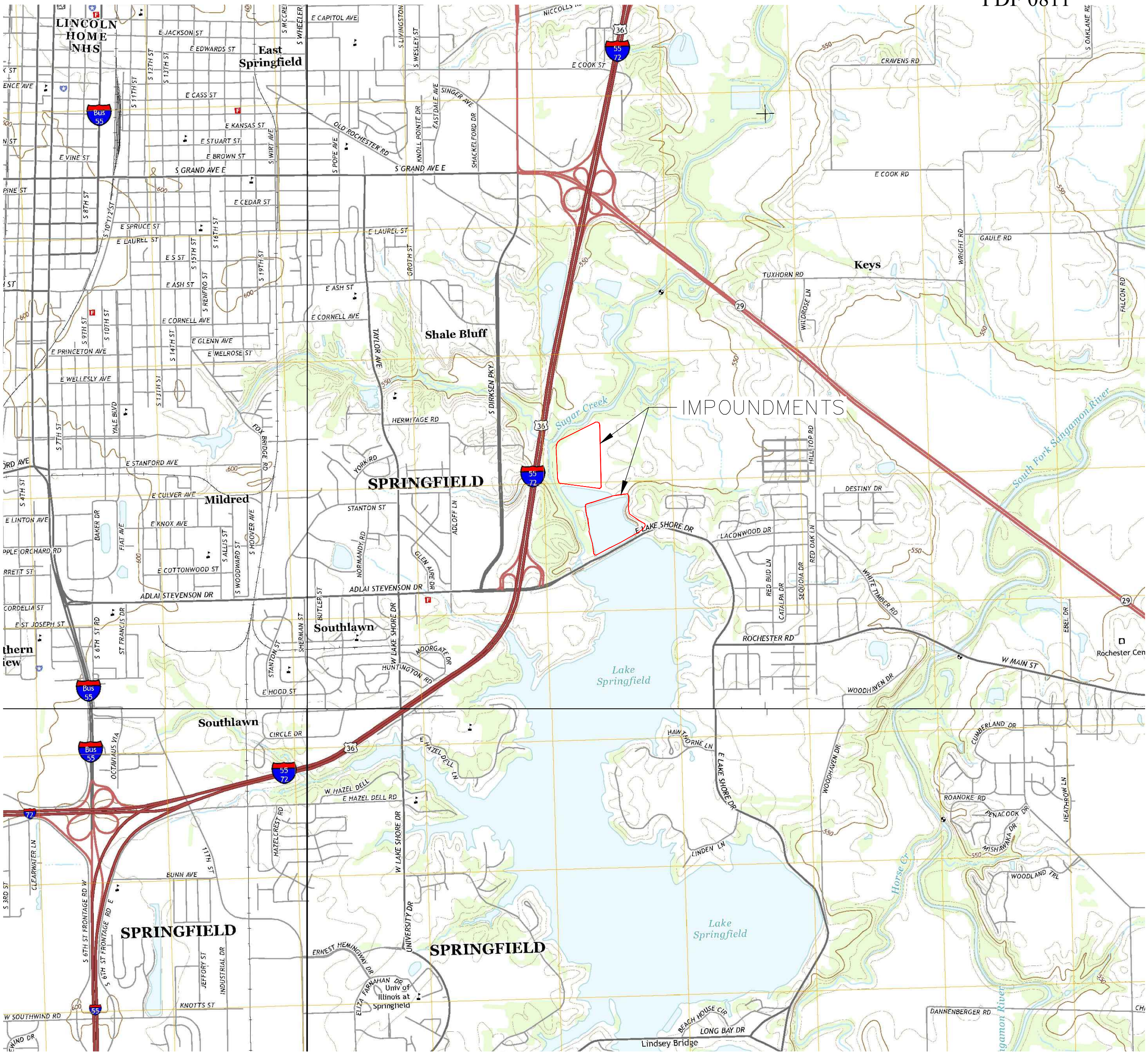
TABLE 1
PROPOSED MONITORING NETWORK
Power Plant Ash Impoundment
CWLP

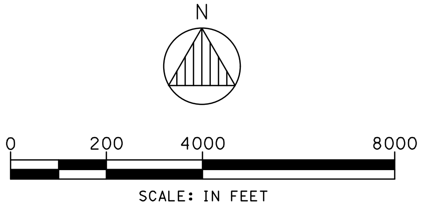
Well ID	Monitoring Position	Material Screened	Ground Surface Elevation (ft MSL)	Top of Casing Elevation (ft MSL)	Approximate Screen Interval (ft MSL)		
AP-1R	Downgradient	Bedrock/unconsolidated interface	533.1	535.6	511.5	-	502.1
AP-2A	Downgradient	Bedrock/unconsolidated interface	533.6	536.1	525.2	-	515.1
AP-3	Downgradient	Bedrock/unconsolidated interface	533.7	535.6	523.7	-	513.7
AP-4	Upgradient	Bedrock/unconsolidated interface	553.9	554.6	503.9	-	493.9
AP-5	Upgradient	Bedrock/unconsolidated interface	581.6	583.9	563.8	-	553.9
AP-6	Downgradient	Bedrock/unconsolidated interface	534.8	537.8	508.4	-	498.6
AP-7	Downgradient	Bedrock/unconsolidated interface	536.1	539	506.8	-	497.1
AP-8	Downgradient	Bedrock/unconsolidated interface	537.2	540.3	508.6	-	498
AP-10	Downgradient	Bedrock/unconsolidated interface	534.4	537.5	509.7	-	499.9
AP-14	Downgradient	Bedrock/unconsolidated interface	536.8	539.6	519.5	-	509.8
RW-3	Downgradient	Bedrock/unconsolidated interface	536.8	539.3	505.5	-	495.9

TABLE 2
PROPOSED ROUTINE MONITORING PARAMETERS
Power Plant Ash Impoundment
CWLP

Parameter	Units	Parameter Type
Bottom of well elevation	ft MSL	Field
Depth to water	feet	Field
Depth to water from measuring point	feet	Field
Elevation of groundwater surface	ft MSL	Field
pH, Field	units	Field
Spec. Conductance, Field	µmhos/cm @25C	Field
Temperature	°F	Field
Turbidity	NTU	Field
Antimony	mg/L	Inorganic
Arsenic, Total	mg/L	Inorganic
Barium, Total	mg/L	Inorganic
Beryllium, Total	mg/L	Inorganic
Boron, Total	mg/L	Inorganic
Cadmium, Total	mg/L	Inorganic
Calcium, Total	mg/L	Inorganic
Chloride, Total	mg/L	Inorganic
Chromium, Total	mg/L	Inorganic
Cobalt, Total	mg/L	Inorganic
Fluoride, Total	mg/L	Inorganic
Lead, Total	mg/L	Inorganic
Lithium	mg/L	Inorganic
Mercury, Total	mg/L	Inorganic
Molybdenum, Total	mg/L	Inorganic
Radium-226	pci/L	Inorganic
Radium-228	pci/L	Inorganic
Selenium	mg/L	Inorganic
Sulfate, Total	mg/L	Inorganic
Thallium	mg/L	Inorganic
Total Dissolved Solids	mg/L	Inorganic

FIGURES





NOTE:

BACKGROUND IMAGE COURTESY OF
UNITED STATES GEOLOGICAL SURVEY.

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APPROVED BY: BJH *DESIGNED BY:* BJH *DRAWN BY:* MPN

SITE LOCATION

PLANS PREPARED FOR

CITY, WATER, LIGHT & POWER

SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: JULY 2021

PROJECT ID: 200387/0026

SHEET NUMBER:

FIGURE
1

LEGEND

🟥 CCR SURFACE IMPOUNDMENT

NOTE

IMAGE SOURCE: GOOGLE EARTH PRO, IMAGE DATE JUNE 7, 2016.

N

0 150 300 600

SCALE: IN FEET

NO.	DATE	REVISION DESCRIPTION	BY

ANDREWS ENGINEERING
3300 GINGER CREEK DRIVE
SPRINGFIELD, ILLINOIS 62711-7233
PH (217) 787-2334 WWW.ANDREWS-ENG.COM
PONTIAC, IL • LOMBARD, IL • INDIANAPOLIS, IN • WARRENTON, MO

APPROVED BY: DG DESIGNED BY: DG DRAWN BY: MPN

SITE DETAILS

PLANS PREPARED FOR
CITY, WATER, LIGHT AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

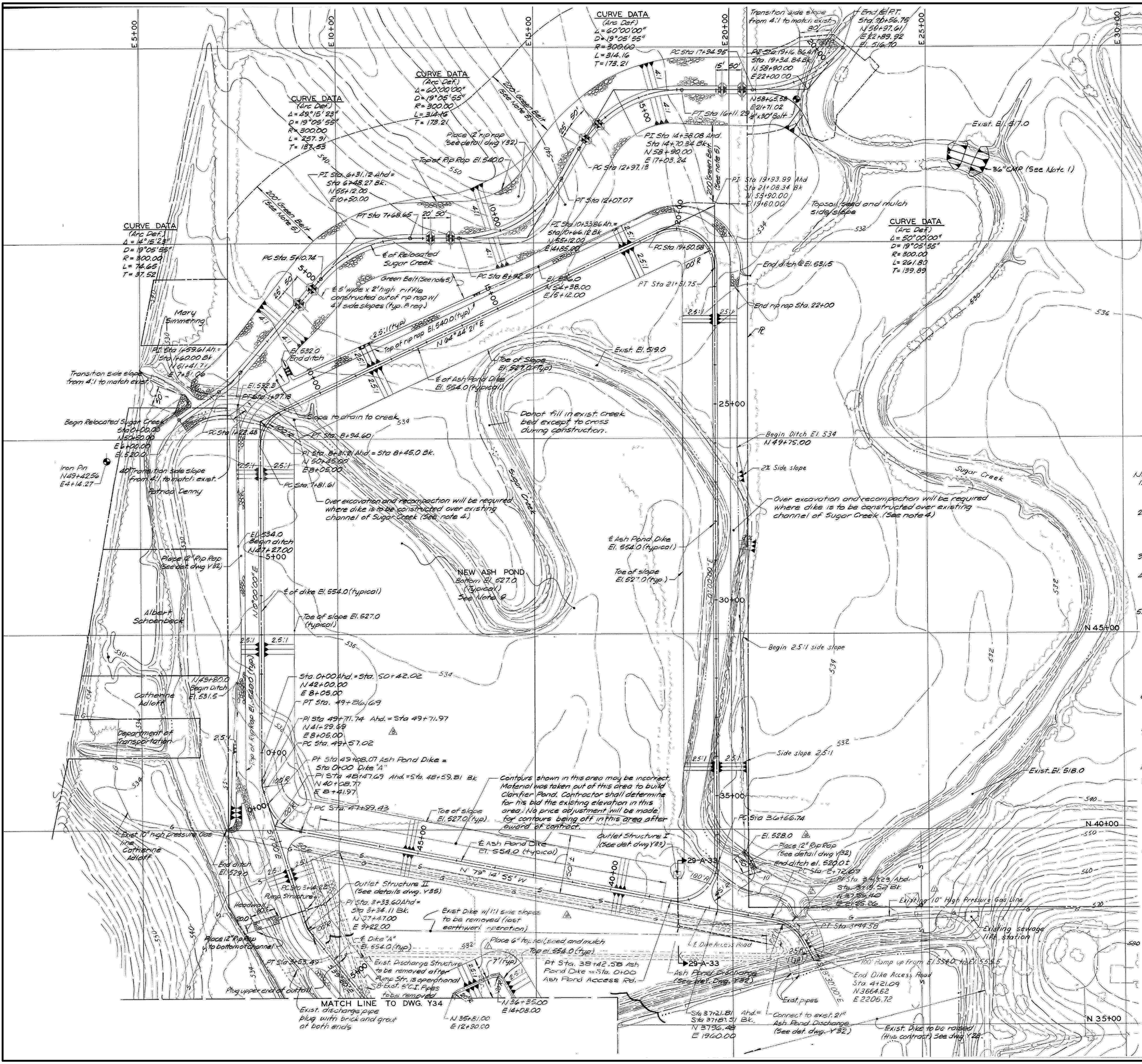
DATE: JULY 2021

PROJECT ID: 200387/0026

SHEET NUMBER:

FIG. 2

Tab: Layout1 Last Saved: July 28, 2021, by Mike Nguyen Plotted: Wednesday, July 28, 2021 9:34:45 AM
J:\S\Springfield CWLP\CWLP\dwg\2021\Site Details.dwg

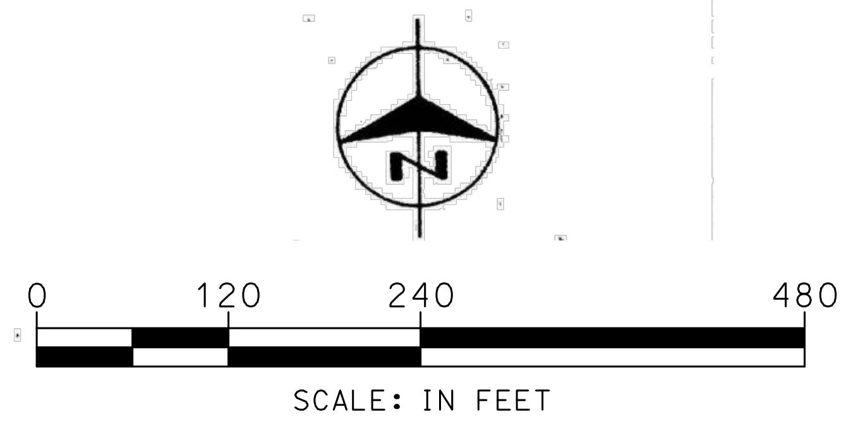


Notes:

1. Two 36" Corregated Metal Pipe, 16 gauge, Bituminous coated, 2½" x ⅔" corrugations, with 2 end sections required.
2. Excavate for Relocated Sugar Creek from Sta. 2+00 to Sta 19+00 leaving excavation isolated from Sugar Creek waters untill excavation and Rip Rap is completed between the above mentioned stations.
3. Area is suseptable to flooding
4. Over excavate at least 4.0 feet under dike below exist. channel banks and bottom. (See cross sections) Fill with cohesive material and compact to at least 90%
5. Form a greenbelt on both sides of Relocated Sugar Creek. Areas within Greenbelt which are cleared or disturbed during construction shall be topsoiled & seeded. Plant trees on 25' ctr. On ground above el. 540.0 10 trees shall be Hard Maple the rest shall be Sycamore. On ground that is below El. 540.0 10 trees shall be Pin Oak the rest shall be Sycamore. Do not plant trees on ash pond dike
6. Clearing Limits as shown outside of Purchacers property lines. Within Purchacers proprerty clear as necessary for const. Keep clearing limits as close to work as possible
7. Waste area is north of Green Belt. Grade waste area to drain and to present a neat appearance. Seed and mulch Waste Area.

△1

9. Borrow material for the Ash Pond Dikes shall come from center of pond and Relocated Sugar Creek. If in the opinion of the engineer material taken from the pond area is too wet to dry in a reasonable length of time the contractor will be permitted to borrow from the area directly north of Relocated Sugar Creek as long as the borrow area is topsoiled, seeded, and mulched, and graded to drain as directed by engineer.



SCALE: IN FEET

NO.	DATE	BY	REVISION
△1	12-7-76	TKP	(M,7) Added 6" topsoil to dike. (L,13) Removed Bench Mark and note 8.
	12-10-76	LNB	ISSUED
△2	4-27-77	MGH	Changed Dike Access Rd. and exist. dike alignments. Removed 300' pipe. Moved exist. pipe
	4-27-77	LNB	ISSUED
△3	5-26-77	DEJ	Revised dike alignment along So. side of Ash Pond.
	5-31-77	LNB	ISSUED
△4	2-1-79	DLM	CONFORMING TO CONSTRUCTION RECORDS

NO.	DATE	REVISION DESCRIPTION	BY

CONTRACT NO. 3333
ASH POND
V.Y. DALLMAN POWER STATION - UNIT 33
SPRINGFIELD, ILLINOIS
GRADING PLAN

Burns & McDonnell
Engineers - Architects - Consultants
KANSAS CITY, MISSOURI

DATE	AUG. 13, 1976	DRAWING NO. Y29	REV. 4
DESIGNED	LNB		
DETAILED	TRP	PROJECT	73-008-1
CHECKED		SHEET OF SHEETS	

ANDREWS ENGINEERING
3300 GINGER CREEK DRIVE
SPRINGFIELD, ILLINOIS 62711-7233
PH (217) 787-2334 WWW.ANDREWS-ENG.COM
PONTIAC, IL • LOMBARD, IL • INDIANAPOLIS, IN • WARRENTON, MO

APPROVED BY: BJH
DESIGNED BY: MTH
DRAWN BY: MPN

1976 SITE SURVEY

PLANS PREPARED FOR
CITY, WATER, LIGHT, AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: AUGUST 2021
PROJECT ID: 200325/0003
SHEET NUMBER:
FIG. 3

Tab: Layout1 Last Saved: August 23, 2021, by Mike Nguyen Plotted: Monday, August 23, 2021 10:07:43 AM
S:\SA\Springfield CWLP\CWLP Ash Pond\DWG\2021\1974 Site Survey.dwg

NOTE

IMAGE SOURCE: GOOGLE EARTH PRO, IMAGE DATE JUNE 7, 2016.

NO.	DATE	REVISION DESCRIPTION	BY

ANDREWS
ENGINEERING
3300 GINGER CREEK DRIVE
SPRINGFIELD, ILLINOIS 62711-7233
PH (217) 787-2334 WWW.ANDREWS-ENG.COM
PONTIAC, IL • LOMBARD, IL • INDIANAPOLIS, IN • WARRENTON, MO

APPROVED BY: DG
DESIGNED BY: DG
DRAWN BY: MPN

GROUNDWATER MONITORING NETWORK

PLANS PREPARED FOR
CITY, WATER, LIGHT AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: JULY 2021
PROJECT ID: 200387/0026
SHEET NUMBER:

FIG. 4

Tab: Layout1 Last Saved: July 28, 2021, by Mike Nguyen Plotted: Wednesday, July 28, 2021 11:12:08 AM
J:\S\Springfield CWLP\CWLP\dwg\2021\Groundwater Monitoring Network.dwg

APPENDIX A

BORING LOGS AND WELL CONSTRUCTION REPORTS

RAPPS
ENGINEERING and APPLIED SCIENCE

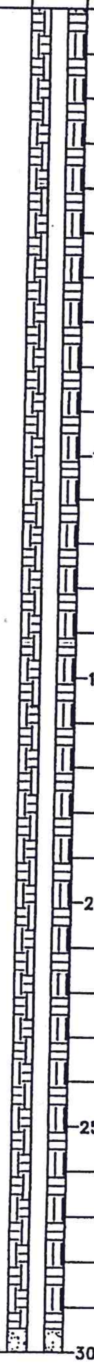
BORING LOG

821 SOUTH DURKIN – SPRINGFIELD IL 62704 – (217)787-2118

Site Name: FGDS Development Landfill
Boring No: AW-3
Drilling Firm: Reynolds Drilling Corp.
Drilling Method: HSA
Surface Elev: 537.75
Logged By: KJM
Checked By: KJM
Date Started: 12/30/08
Completed: 12/31/08

DEPTH	Material Description Classification System_____	Sampling			Tests			Comments	DEPTH
		Tube No.	Type	% Rec.	OVM (ppm)	Qu t/sf PEN	Moist		
0	Dark brown clayey silt; Moist; Firm; Organic debris & plant roots		5' CONTINUOUS SAMPLER						0
	Gray to brown mottled silty clay; Moist; Firm; Trace sand; Laminated; Fe oxidation stains	1		100					
5		2		100					5
10		3		95				Wet seam @ 11.5'	10
15	Gray sandy clay; Moist; Firm; Finely laminated	4		95				Water on rods	15
20	Dark gray sandy silt; Moist; Soft to firm; Some clay	5		80					20
25		6		30				No recovery 26.5'–30'	25
30									30

Well



Water Level_____after_____hrs.

Sheet 1 of 2

RAPPS

ENGINEERING and APPLIED SCIENCE

BORING LOG

821 SOUTH DURKIN – SPRINGFIELD IL 62704 – (217)787-2118

Site Name: FGDS Development Landfill
Boring No: AW-3
Drilling Firm: Reynolds Drilling Corp.
Drilling Method: HSA
Surface Elev: 537.75
Logged By: KJM
Checked By: KJM
Date Started: 12/30/08
Completed: 12/31/08

DEPTH	Material Description Classification System_____	Sampling			Tests			Comments	Well	DEPTH
		Tube No.	Type	% Rec.	OVM (ppm)	Qu t/sf PEN	Moist			
30	Dark gray silt; Trace sand	7	5' CONTINUOUS SAMPLER	100						30
35	Sandy									35
	Gray fine to medium silty sand; Wet; Gravelly @ base	8		100						
40	Gray shale							Broken shale in bit No recovery past 40'		40
	End of Boring @ 41.83'	9		0				Refusal		
45										45
50										50
55										55
60										60

Water Level_____after_____hrs.

Sheet 2 of 2

Illinois Environmental Protection Agency **Well Completion Report**

Site Number: 1678250020 County: Sangamon

Well #: AW-3

Site Name: FGDS Development Landfill

State Plane Coordinate: X ____ Y ____ (or) Latitude: __ ° __ ' __ " Longitude: __ ° __ ' __ "

Borehole #: AW-3

Surveyed by: David Mihelsic

IL Registration #: 3762

Drilling Contractor: Reynolds Drilling Corp.

Driller: Andrew Rachford

Consulting Firm: Rapps Engineering & Applied Science

Geologist: Ken Miller

Drilling Method: HSA

Drilling Fluid (Type): NA

Logged By: Ken Miller

Date Started: 12/30/08 Date Finished: 12/31/08

Report Form Completed By: Ken Miller

Date: 5/18/09

ANNULAR SPACE DETAILS

Type of Surface Seal: Cement

Type of Annular Sealant: Bentonite Chips

Installation Method: Poured

Setting Time: >24 hrs

Type of Bentonite Seal - - Granular, [✓ Pellet], Slurry (Choose One)

Installation Method: Poured

Setting Time: 16 hrs

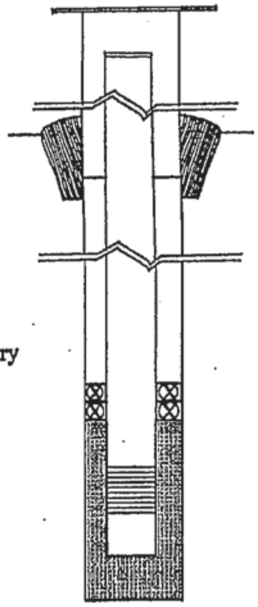
Type of Sand Pack: Quartz Sand

Grain Size: 50 (Sieve Size)

Installation Method: Poured

Type of Backfill Material: ________ (If applicable)

Installation Method: ________



Elevations (MSL)*	Depths (BGS)	(.01ft.)
		Top of Protective Casing
540.33	-2.58	Top of Riser Pipe
537.75	0	Ground Surface
534.75	3.00	Top of Annular Sealant
		Static Water Level (After Completion)
511.32	26.43	Top of Seal
508.32	29.43	Top of Sand Pack
506.32	31.43	Top of Screen
496.32	41.43	Bottom of Screen
495.92	41.83	Bottom of Well
495.92	41.83	Bottom of Borehole

* Referenced to a National Geodetic Datum

WELL CONSTRUCTION MATERIAL

(Choose one type of material for each area)

Protective Casing	SS304, SS316, PTFE, PVC, or [✓ Other]
Riser Pipe Above W.T.	SS304, SS316, PTFE, [✓ PVC] or Other
Riser Pipe Below W.T.	SS304, SS316, PTFE, [✓ PVC] or Other
Screen	SS304, SS316, PTFE, [✓ PVC] or Other

CASING MEASURMENTS

Diameter of Borehole (inches)	8.25
ID of Riser Pipe (inches)	2
Protective Casing Length (feet)	5
Riser Pipe Length (feet)	34.01
Bottom of Screen to End Cap (feet)	0.4
Screen Length (1^{st} slot to last slot) (feet)	10
Total Length of Casing (feet)	44.41
Screen Slot Size **	0.010

**Hand-Slotted Well Screens are Unacceptable

Well Completion Form (revised 02/06/02)

Professional Service Industries, Inc.
480 North Street
Springfield, Illinois 62704
Telephone: 217/544-6663
Fax: 217/544-6143

LOG OF BORING AP-1

Sheet 1 of 1

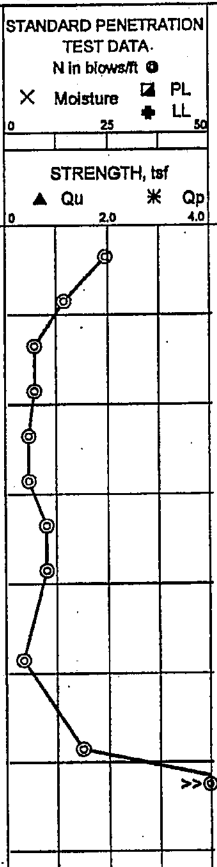
PSI Job No.: 0020522
Project: Piezometer Installation
Location: CWLP Ash Pond
East Lake Shore Drive
Springfield, Illinois

Drilling Method: Hollow Stem Auger
Sampling Method: Split Spoon
Hammer Type: CME Automatic; ETR = 86%
Boring Location: See attached boring location plan.

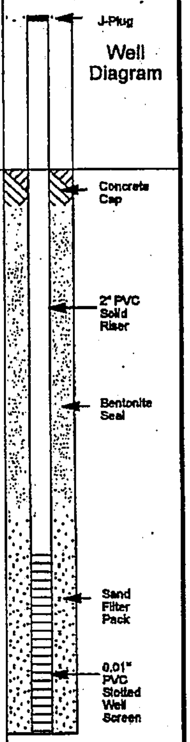
WATER LEVELS	
▽ While Drilling	9 feet
▼ Upon Completion	N/A
▽ Delay	N/A

Station: N/A
Offset: N/A

Elevation (feet)	Depth, (feet)	Graphic Log	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %
			☒	1	18	Dark brown silty CLAY, very stiff, slightly moist	CL	7-8-9 N_{60}=24	
			☒	2	18	Dark brown clayey SILT, stiff, slightly moist	ML	5-5-5 N_{60}=14	
			☒	3	18	Gray clayey SILT, trace brown, firm, moist	ML	2-2-3 N_{60}=7	
			☒	4	18 ▽			2-2-3 N_{60}=7	
			☒	5	18			1-2-2 N_{60}=6	
			☒	6	18	Gray silty CLAY, few brown sand, firm, saturated	CL	1-2-2 N_{60}=6	
			☒	7	18	Gray sandy CLAY, stiff, saturated	CLS	4-3-4 N_{60}=10	
			☒	8	18	Blue-gray clayey SILT, soft to very stiff, moist to saturated		3-3-4 N_{60}=10	
			☒	9	18		ML	1-2-1 N_{60}=4	
			☒	10	18	Gray SAND with SILT, medium dense/very stiff, saturated	SW-SM	6-7-6 N_{60}=19	
			☒	11	6	Gray SHALE, hard, slightly moist Boring terminated ay -31.5'	CL	50/6"	



Additional Remarks



Completion Depth: 35.0 ft
Date Boring Started: 4/21/10
Date Boring Completed: 4/21/10
Logged By: Rob Preuss
Drilling Contractor: PSI, Inc.

Sample Types:
- Auger Cutting
- Split-Spoon
- Rock Core
- Shelby Tube
- Hand Auger
- Texas Cone

Latitude:
Longitude:
Drill Rig: ATV D50
Remarks: N_{60} denotes the normalization to 60% efficiency as described in ASTM D4633. Moistures determined by visual methods.

The stratification lines represent approximate boundaries. The transition may be gradual.

Professional Service Industries, Inc.
480 North Street
Springfield, Illinois 62704
Telephone: 217/544-6663
Fax: 217/544-6143

LOG OF BORING AP-2

Sheet 1 of 1

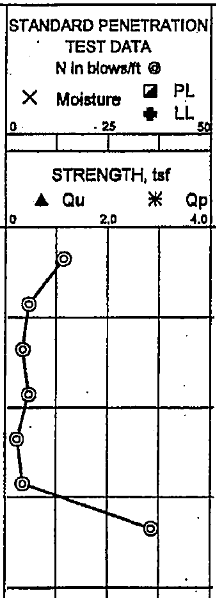
PSI Job No.: 0020522
Project: Piezometer Installation
Location: CWLP Ash Pond
East Lake Shore Drive
Springfield, Illinois

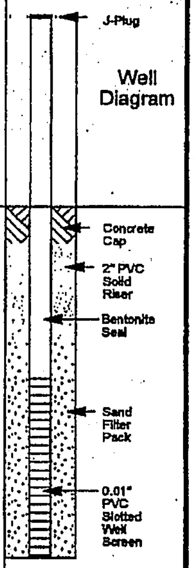
Drilling Method: Hollow Stem Auger
Sampling Method: Split Spoon
Hammer Type: CME Automatic; ETR = 86%
Boring Location: See attached boring location plan.

WATER LEVELS	
▽ While Drilling	9 feet
▼ Upon Completion	N/A
▽ Delay	N/A

Station: N/A
Offset: N/A

Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)
1	10	Dark brown silty CLAY, some sand, stiff, slightly moist (FILL)	CL	4-4-6 N_{60}=14
2	8	Dark brown silty CLAY, soft to firm, moist	CL	2-2-2 N_{60}=6
3	6	Gray silty CLAY, soft to firm, moist	CL	1-1-2 N_{60}=4
4	18	Gray clayey SILT, soft to firm, saturated		2-2-2 N_{60}=6
5	18		ML	2-1-1 N_{60}=3
6	18			2-1-2 N_{60}=4
7	18	Light gray SAND, dense, saturated	SP	4-9-16 N_{60}=36
8	14	Gray SHALE, hard, slightly moist Boring terminate at -20'	CL	19-24-50/2"





Completion Depth: 20.0 ft
Date Boring Started: 4/21/10
Date Boring Completed: 4/21/10
Logged By: Rob Preuss
Drilling Contractor: PSI, Inc.

Sample Types:
- Auger Cutting
- Split-Spoon
- Rock Core
- Shelby Tube
- Hand Auger
- Texas Cone

Latitude:
Longitude:
Drill Rig: ATV D50
Remarks: N_{60} denotes the normalization to 60% efficiency as described in ASTM D4633. Moistures determined by visual methods

The stratification lines represent approximate boundaries. The transition may be gradual.

Professional Service Industries, Inc.
480 North Street
Springfield, Illinois 62704
Telephone: 217/544-6663
Fax: 217/544-6143

LOG OF BORING AP-3

Sheet 1 of 1

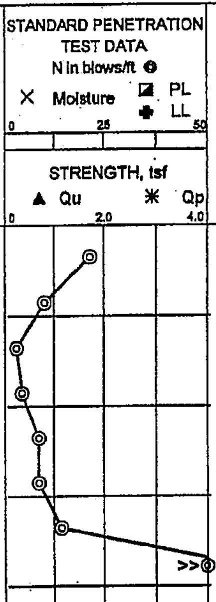
PSI Job No.: 0020522
Project: Piezometer Installation
Location: CWLP Ash Pond
East Lake Shore Drive
Springfield, Illinois

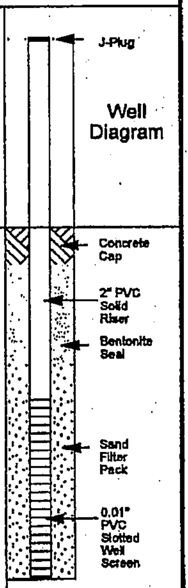
Drilling Method: Hollow Stem Auger
Sampling Method: Split Spoon
Hammer Type: CME Automatic; ETR = 86%
Boring Location: See attached boring location plan.

WATER LEVELS	
▽ While Drilling	None feet
▼ Upon Completion	N/A
▽ Delay	N/A

Station: N/A
Offset: N/A

Elevation (feet)	Depth, (feet)	Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)	Moisture, %	Additional Remarks
	0	☒	1	18	Dark brown silty CLAY, very stiff, slightly moist	CL	6-7-8 N_{60}=21		
	5	☒	2	18	Gray/brown clayey SILT, soft to stiff, moist to saturated		3-3-4 N_{60}=10		
		☒	3	18		ML	1-1-1 N_{60}=3		
	10	☒	4	18	Gray clayey SILT, soft to very stiff, saturated		2-1-2 N_{60}=4		
		☒	5	18			2-2-4 N_{60}=9		
	15	☒	6	16		ML	2-2-4 N_{60}=9		
		☒	7	18			4-4-6 N_{60}=14		
		☒	8	10	Gray SHALE, hard, slightly moist	CL	32-50/3"		
	20				Boring terminated at -19.5				





Completion Depth: 20.0 ft
Date Boring Started: 4/21/10
Date Boring Completed: 4/21/10
Logged By: Rob Preuss
Drilling Contractor: PSI, Inc.

Sample Types:

▮ Auger Cutting	■ Shelby Tube
☒ Split-Spoon	● Hand Auger
▯ Rock Core	↓ Texas Cone

Latitude:
Longitude:
Drill Rig: ATV D50
Remarks: N_{60} denotes the normalization to 60% efficiency as described in ASTM D4633. Moistures determined by visual methods

The stratification lines represent approximate boundaries. The transition may be gradual.

Professional Service Industries, Inc.
480 North Street
Springfield, Illinois 62704
Telephone: 217/544-6663
Fax: 217/544-6143

LOG OF BORING AP-4

Sheet 1 of 1

PSI Job No.: 0020522
Project: Piezometer Installation
Location: CWLP Ash Pond
East Lake Shore Drive
Springfield, Illinois

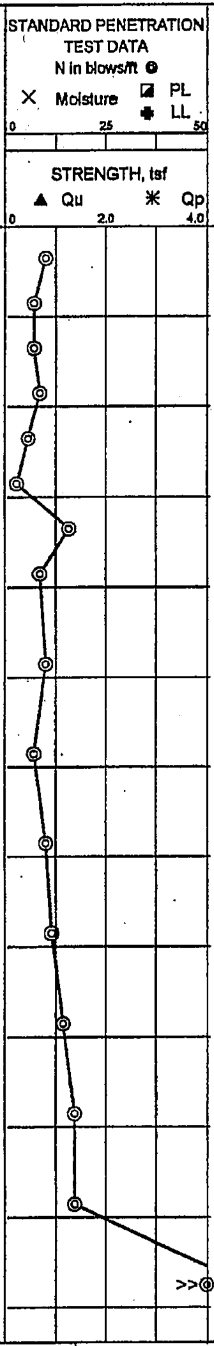
Drilling Method: Hollow Stem Auger
Sampling Method: Split Spoon
Hammer Type: CME Automatic; ETR = 86%
Boring Location: See attached boring location plan.

WATER LEVELS

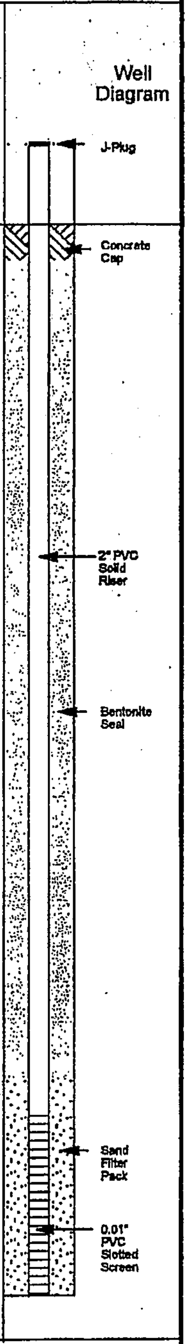
▽ While Drilling	11	feet
▼ Upon Completion	N/A	
▼ Delay	N/A	

Station: N/A
Offset: N/A

Sample Type	Sample No.	Recovery (inches)	MATERIAL DESCRIPTION	USCS Classification	SPT Blows per 6-inch (SS)
☒	1	17	Brown silty CLAY, some brown sand, firm to stiff, slightly moist (FILL)	CL	4-4-3 N_{60}=10
☒	2	18	Brown silty CLAY, trace roots, firm to stiff, moist (FILL)	CL	4-3-2 N_{60}=7
☒	3	10	Brown SILT, trace gray, firm to stiff, moist (FILL)	ML	6-3-2 N_{60}=7
☒	4	12	5" Brown SAND transitioning to Black FLY ASH at 9.4', stiff to very stiff, slightly moist (FILL)	SAND/FLY ASH	2-2-4 N_{60}=9
☒	5	18			2-2-2 N_{60}=6
☒	6	16			2-1-1 N_{60}=3
☒	7	16	Black FLY ASH, some fine sub-round gravel, stiff to very stiff, moist to saturated (FILL)	FLY ASH	6-6-5 N_{60}=16
☒	8	18			3-3-3 N_{60}=9
			Gray/green (organic?) CLAY, stiff, trace fine sand, moist to saturated	CL	
☒	9	1			3-3-4 N_{60}=10
☒	10	18	Brown/gray silty CLAY, fiorm to stiff, saturated	CL	2-2-3 N_{60}=7
☒	11	18	Gray SILT, stiff to very stiff, saturated	ML	3-3-4 N_{60}=10
☒	12	18			4-4-4 N_{60}=11
☒	13	18			4-4-6 N_{60}=14
☒	14	18			4-5-7 N_{60}=17
			Gray fine to coarse SAND, medium dense, saturated	SW	
☒	15	18			5-5-7 N_{60}=17
☒	16	1	Gray SHALE, hard, moist	CL	50/1"
			Boring terminated at -60'		



Additional Remarks



Completion Depth: 60.0 ft
Date Boring Started: 4/20/10
Date Boring Completed: 4/20/10
Logged By: Rob Preuss
Drilling Contractor: PSI, Inc.

Sample Types:
Auger Cutting
☒ Split-Spoon
Rock Core
Shelby Tube
Hand Auger
Texas Cone

Latitude:
Longitude:
Drill Rig: ATV D50
Remarks: N_{60} denotes the normalization to 60% efficiency as described in ASTM D4633. Moistures determined by visual methods

The stratification lines represent approximate boundaries. The transition may be gradual.

Andrews Engineering, Inc.
3300 Ginger Creek Drive, Springfield, IL 62711 (217) 787-2334

Field Boring Log

Site Information:
Name: City Water, Light, & Power
Location: Springfield, IL
County: Sangamon
Site No.:
AEEI No.: 2011-127

Location:
Coord. System: Site Grid
Northing: 5132.40
Easting: 831.70

Weather:
Cloudy; 38° F; West 10-15 MPH

Boring Information:
Boring No.: AP-1R
Well No.: AP-1R
Surf. Elev.: 533.10

Depth Information:
Total: 32.50
Auger: 32.50
Core:

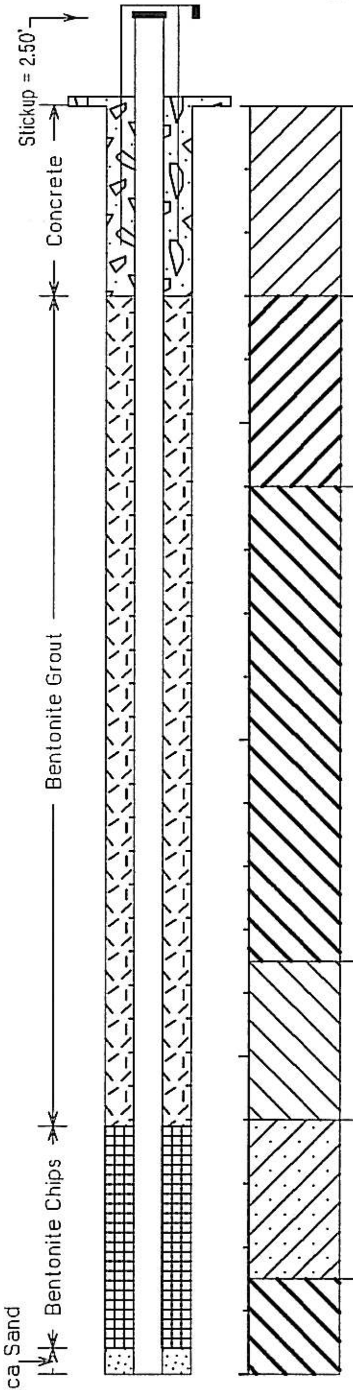
Dates:
Start: 1/30/2012
Finish: 1/30/2012

Drilling Contractor:
Name: Terra Drill, Inc.
City: Dupo, IL
Equipment: CME 550 with 4¼" I.D. HSA and 5' CB

Personnel:
Geologist: M. Hewitt
Driller: J. Brown
Helper (s): J. Horn

Sample Type: ▮ - Continuous Barrel ☒ - Split Spoon ▨ - Shelby Tube ▮ - Core ☐ - Blind Drill

Depth (ft.)	Run No.	Type	No.	Recov.	Blow Count	q_p [q_s] (in tsf)	% Moisture
0–4	1			NA			
4–9 (5)	2			NA			
9–14 (10)	3			NA			
14–19 (15)	4			NA			
19–20	5	▮					



Description/*Comments*	USC	Elev. (MSL)
Dark brown silty CLAY; very stiff; slightly moist	CL	
Dark brown clayey SILT; stiff; slightly moist	ML	530
Gray clayey SILT; trace brown; firm; moist	ML	525 520
Gray silty CLAY; few brown sand; firm; saturated	CL	
Gray sandy CLAY; stiff; saturated	SC	515
Blue-gray clayey SILT; soft to very stiff; moist to saturated	ML	

NOTES: AP-1R blind-drilled to 19.0 ft bgs
Geology from 0-19.0 ft bgs based on AP-1 log

Andrews Engineering, Inc.
3300 Ginger Creek Drive, Springfield, IL 62711 (217) 787-2334

Field Boring Log

Site Information:
Name: City Water, Light, & Power
Location: Springfield, IL
County: Sangamon
Site No.:
AEEI No.: 2011-127

Location:
Coord. System: Site Grid
Northing: 5132.40
Easting: 831.70

Weather:
Cloudy; 38° F; West 10-15 MPH

Boring Information:
Boring No.: AP-1R
Well No.: AP-1R
Surf. Elev.: 533.10

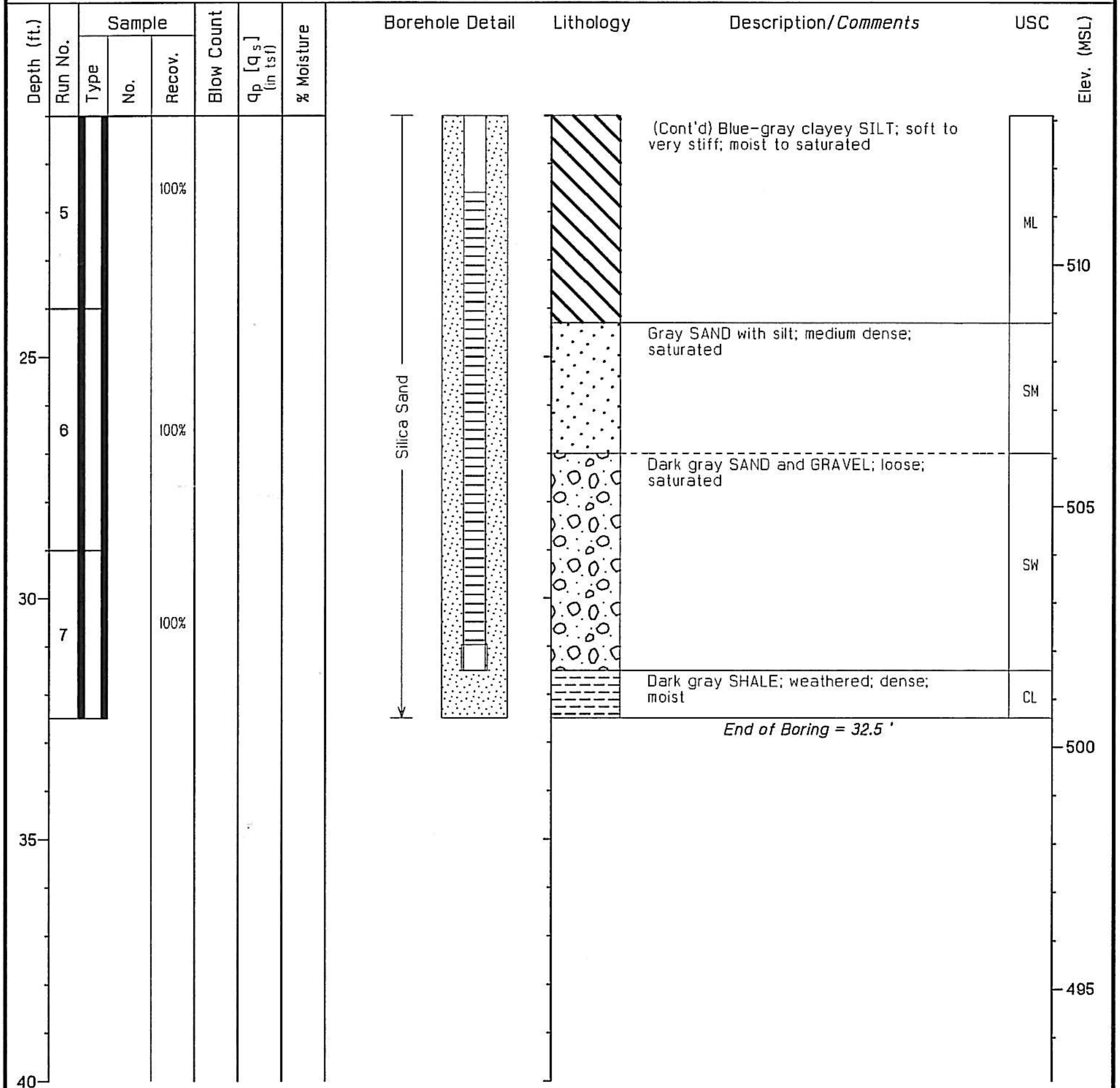
Depth Information:
Total: 32.50
Auger: 32.50
Core:

Dates:
Start: 1/30/2012
Finish: 1/30/2012

Drilling Contractor:
Name: Terra Drill, Inc.
City: Dupo, IL
Equipment: CME 550 with 4¼" I.D. HSA and 5' CB

Personnel:
Geologist: M. Hewitt
Driller: J. Brown
Helper (s): J. Horn

Sample Type: ▯ - Continuous Barrel ☒ - Split Spoon ▨ - Shelby Tube ▮ - Core ☐ - Blind Drill



(Cont'd) Blue-gray clayey SILT; soft to very stiff; moist to saturated

Gray SAND with silt; medium dense; saturated

Dark gray SAND and GRAVEL; loose; saturated

Dark gray SHALE; weathered; dense; moist

End of Boring = 32.5 '

NOTES: AP-1R blind-drilled to 19.0 ft bgs
Geology from 0-19.0 ft bgs based on AP-1 log

Illinois Environmental Protection Agency

Well Completion Report

Site #:

County: Sangamon

Well #: AP-1R

Site Name: City Water, Light, & Power

Borehole #: AP-1R

Coordinates: X 831.70 Y 5132.40 (or) Latitude: ° ' " Longitude: ° ' "

Surveyed by:

IL Registration #:

Drilling Contractor: Terra Drill, Inc.

Consulting Firm: Andrews Engineering, Inc.

Driller: J. Brown

Geologist: M. Hewitt

Drilling Method: 4¼" HSA w/ 5' Continuous Barrel

Logged by: M. Hewitt

Drilling Fluids (type):

Report Form Completed by: J. Rhoades

Date Well Started: 1/30/2012

Date Well Finished: 1/30/2012

Date Form Completed: 2/27/2012

ANNULAR SPACE DETAILS

Type of surface seal: Concrete

Type of annular sealant: Bentonite Grout

Installation method: Tremie

Setting time: 2 Hours

Type of bentonite seal: Bentonite Chips

Installation method: Free drop

Setting time: 2 Hours

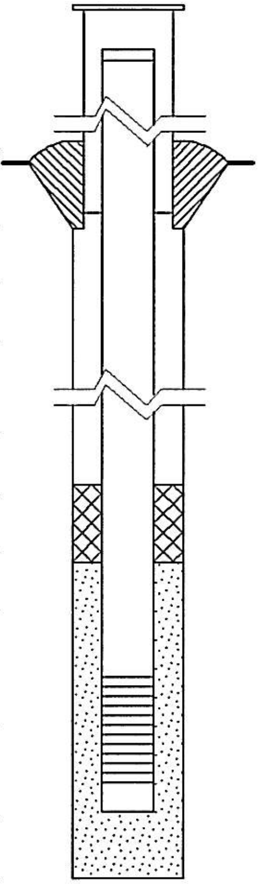
Type of sand pack: Unimin Sand

Grain size: 10/20 (sieve size)

Installation method: Free drop

Type of backfill material: (if applicable)

Installation method:



ELEVATION (MSL)®	DEPTH (BGS)◆	(0.01 ft)
535.60	-2.50	Top of Protective Casing
.00	533.10	Top of Riser Pipe
533.10	.00	Ground Surface
530.10	3.00	Top of Annular Sealant
n/a	n/a	Static Water Level Measured on (after completion)
517.00	16.10	Top of Seal
513.51	19.59	Top of Sandpack
-21.59	554.69	Top of Screen
-30.97	564.07	Bottom of Screen
-31.50	564.60	Bottom of Well
500.60	32.50	Bottom of Borehole

® Referenced to a National Geodetic Vertical Datum
◆ positive (+) values below GS, negitive (-) values above GS

CASING MEASUREMENTS

Diameter of Borehole (in)	8.0
ID of Riser Pipe (in)	2.0
Protective Casing Length (ft)	5.0
Riser Pipe Length (ft)	21.59
Bottom of Screen to End Cap (ft)	.53
Screen Length [1st slot to last slot] (ft)	9.38
Total Length of Casing (ft)	31.50
Screen Slot Size*	0.01"

*Hand-slotted well screens are unacceptable.

WELL CONSTRUCTION MATERIALS

Protective Casing	SS304, SS316, PTFE, PVC or *Other:Steel*
Riser Pipe Above W.T.	SS304, SS316, PTFE, *PVC*, or Other:
Riser Pipe Below W.T.	SS304, SS316, PTFE, *PVC*, or Other:
Screen	SS304, SS316, PTFE, *PVC*, or Other:

(AE950315)

Andrews Engineering, Inc.
3300 Ginger Creek Drive, Springfield, IL 62711 (217) 787-2334

PDF 0826

Field Boring Log

Site Information:
Name: City Water, Light, & Power
Location: Springfield, IL
County: Sangamon
Site No.:
AEEI No.: 2011-127

Location:
Coord. System: Site Grid
Northing: 4184.70
Easting: 725.50

Weather:
Cloudy; 38° F; West 10-15 MPH

Boring Information:
Boring No.: AP-2R
Well No.: AP-2R
Surf. Elev.: 533.10

Depth Information:
Total: 18.50
Auger: 18.50
Core:

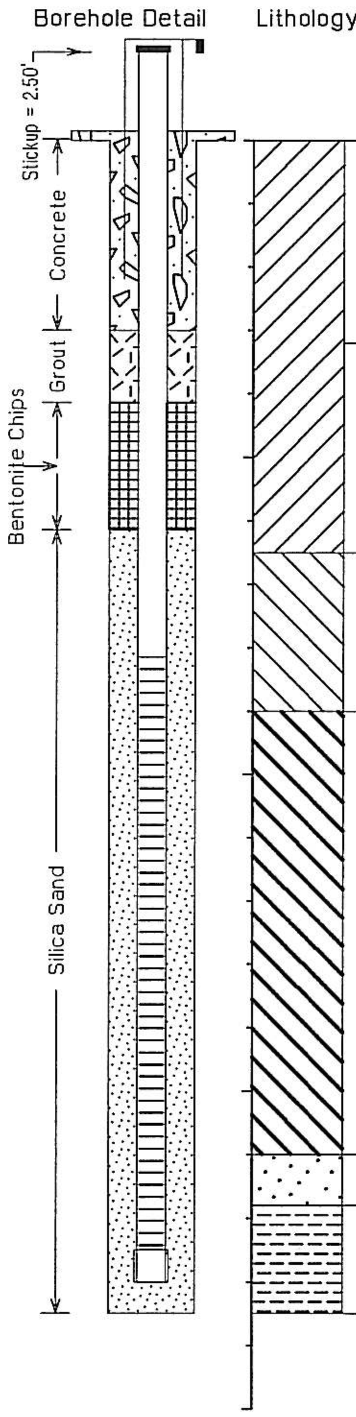
Dates:
Start: 1/31/2012
Finish: 1/31/2012

Drilling Contractor:
Name: Terra Drill, Inc.
City: Dupo, IL
Equipment: CME 550 with 4¼" I.D. HSA and 5' CB

Personnel:
Geologist: M. Hewitt
Driller: J. Brown
Helper (s): J. Horn

Sample Type: ▮ - Continuous Barrel ☒ - Split Spoon ▨ - Shelby Tube ▮ - Core ☐ - Blind Drill

Depth (ft.)	Run No.	Sample Type	Sample No.	Sample Recov.	Blow Count	q_p [q_s] (in tsf)	% Moisture
0–5	1			NA			
5–10	2			NA			
10–15	3	▮		70%			
15–18.5	4	▮		100%			



Description/*Comments*	USC
Dark brown silty CLAY; some sand; stiff; slightly moist	CL
Dark brown silty CLAY; soft to firm; moist	
Gray silty CLAY; soft to firm; moist	CL
Gray clayey SILT; very soft; moist to wet	ML
Light gray SAND; dense; saturated	SP
Gray SHALE; hard; slightly moist	CL

End of Boring = 18.5 '

Depth (ft.): 5, 10, 15, 20
Elev. (MSL): 530, 525, 520, 515

NOTES: AP-2R blind-drilled to 10.0 ft bgs
Geology from 0-10.0 ft bgs based on AP-1 log

Illinois Environmental Protection Agency

Well Completion Report

Site #: County: Sangamon Well #: AP-2R

Site Name: City Water, Light, & Power Borehole #: AP-2R

Coordinates: X 725.50 Y 4184.70 (or) Latitude: ° ' " Longitude: ° ' "

Surveyed by: IL Registration #:

Drilling Contractor: Terra Drill, Inc. Consulting Firm: Andrews Engineering, Inc.

Driller: J. Brown Geologist: M. Hewitt

Drilling Method: 4¼" HSA w/ 5' Continuous Barrel Logged by: M. Hewitt

Drilling Fluids (type): Report Form Completed by: J. Rhoades

Date Well Started: 1/31/2012 Date Well Finished: 1/31/2012 Date Form Completed: 2/27/2012

ANNULAR SPACE DETAILS

Type of surface seal: Concrete

Type of annular sealant: Bentonite Grout

Installation method: Tremie

Setting time: 2 Hours

Type of bentonite seal: Bentonite Chips

Installation method: Free drop

Setting time: 2 Hours

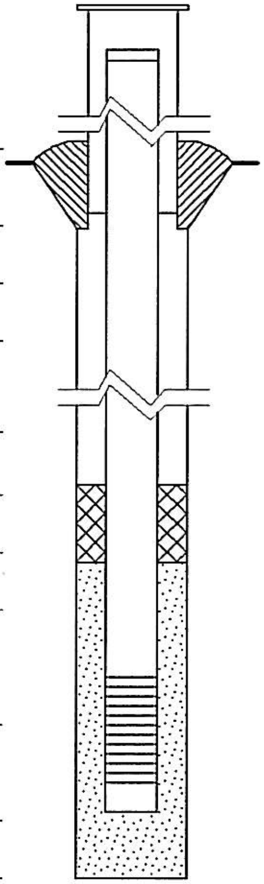
Type of sand pack: Unimin Sand

Grain size: 10/20 (sieve size)

Installation method: Free drop

Type of backfill material: (if applicable)

Installation method:



ELEVATION (MSL)⊕	DEPTH (BGS)◆	(0.01 ft)
535.60	-2.50	Top of Protective Casing
.00	533.10	Top of Riser Pipe
533.10	.00	Ground Surface
530.10	3.00	Top of Annular Sealant
n/a	n/a	Static Water Level Measured on (after completion)
528.96	4.14	Top of Seal
526.96	6.14	Top of Sandpack
-8.14	541.24	Top of Screen
-17.47	550.57	Bottom of Screen
-18.00	551.10	Bottom of Well
514.60	18.50	Bottom of Borehole

⊕ Referenced to a National Geodetic Vertical Datum
◆ positive (+) values below GS, negitive (-) values above GS

CASING MEASUREMENTS

Diameter of Borehole (in)	8.0
ID of Riser Pipe (in)	2.0
Protective Casing Length (ft)	5.0
Riser Pipe Length (ft)	8.14
Bottom of Screen to End Cap (ft)	.53
Screen Length [1st slot to last slot] (ft)	9.33
Total Length of Casing (ft)	18.00
Screen Slot Size*	0.01"

*Hand-slotted well screens are unacceptable.

WELL CONSTRUCTION MATERIALS

Protective Casing	SS304, SS316, PTFE, PVC or *Other:Steel*
Riser Pipe Above W.T.	SS304, SS316, PTFE, *PVC*, or Other:
Riser Pipe Below W.T.	SS304, SS316, PTFE, *PVC*, or Other:
Screen	SS304, SS316, PTFE, *PVC*, or Other:

(AE950315)

Andrews Engineering, Inc.
3300 Ginger Creek Drive
Springfield, IL 62711

FIELD BORING LOG

Site Information:
Name: Springfield City Water, Light, and Power
Location: Springfield, IL
County: Sangamon
Site No.:
AEI No.: 160192

Location:
Coord. System: Site Grid
Northing: 4185.2
Easting: 735.9

Weather: Sunny, 40F

Boring Information:
Boring No: AP-2A
Well No: AP-2A
Surf Elev.: 533.6

Depth Information:
Total: 19.0
Auger: 19.0
Core:

Dates:
Start: 2/16/16
Finish: 2/16/16

Drilling Contractor:
Contractor Name: Bulldog Drilling
City: Dupo, IL
Equipment: AMS Powerprobe w/ 4.25" HSA and 5' MC

Personnel:
Geologist: C. Myrvold
Driller: J. Edwards
Helper(s): Z. Strickland

- Continuous Barrel (CB) - Split Spoon (SS) - Shelby Tube - Core - Blind Drill

Depth (ft)	Run No.	Sample Type	Sample Recov.	Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
							Ground Surface	533.6
0							Blind drilled to 9.0 feet. For detailed geology refer to the original log for AP-2R	
								530.0
5	1							
								525.0
							Gray CLAYEY SILT; moist to wet; moderately loose	
10								
	2		3.2/4					
								520.0
15	3		4.0/4					
							Light gray SAND; fine to medium grained; saturated; some gravel	
	4		2.0/2				Gray SHALE; weathered; hard; slightly moist	
								515.0
							End of Boring = 19 Feet	
20								

Notes:

Illinois Environmental Protection Agency

Well Completion Report

Site #:

County: Sangamon

Well #: AP-2A

Site Name: Springfield City Water, Light, and Power

Borehole #:

Coordinates: X 735.9 Y 4185.2 (or) Latitude: ° ' " Longitude: ° ' "

Surveyed by: Springfield City Water, Light, and Power

IL Registration #:

Drilling Contractor: Bulldog Drilling, Inc.

Consulting Firm: Andrews Engineering, Inc.

Driller: J. Edwards

Geologist: C. Myrvold

Drilling Method: AMS Powerprobe w/ 4.25" HSA and 5' MC

Logged by: C. Myrvold

Drilling Fluids (type): na

Report Form Completed by: C. Myrvold

Date Well Started: 2/16/2016

Date Well Finished: 2/16/2016

Date Form Completed: 3/06/2016

ANNULAR SPACE DETAILS

Type of surface seal: Concrete

Type of annular sealant: N/A

Installation method:

Setting time:

Type of bentonite seal: Bentonite chips

Installation method: Free drop

Setting time: 24+ hours

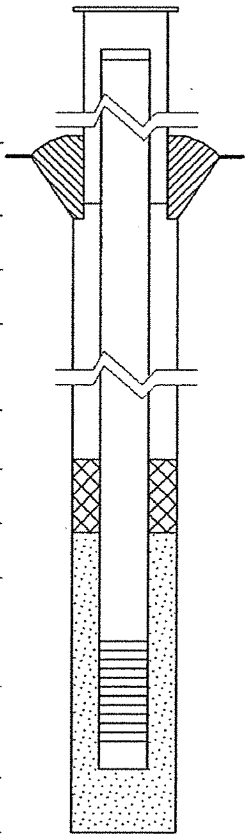
Type of sand pack: Silica sand

Grain size: 20/40 (sieve size)

Installation method: Free drop

Type of backfill material: N/A (if applicable)

Installation method:



ELEVATION (MSL)[®]	DEPTH (BGS)[*]	(0.01 ft)
536.50	-2.90	Top of Protective Casing
536.10	-2.50	Top of Riser Pipe
533.60	0.00	Ground Surface
	N/A	Top of Annular Sealant
		Static Water Level Measured on (after completion)
530.60	3.00	Top of Seal
527.19	6.41	Top of Sandpack
525.19	8.41	Top of Screen
515.54	18.06	Bottom of Screen
515.10	18.50	Bottom of Well
514.60	19.00	Bottom of Borehole

[®] Referenced to a National Geodetic Vertical Datum

[*] positive (+) values below GS, negitive (-) values above GS

Notes:

CASING MEASUREMENTS

Diameter of Borehole (in)	8.25
ID of Riser Pipe (in)	2
Protective Casing Length (ft)	5.0
Riser Pipe Length (ft)	10.91
Bottom of Screen to End Cap (ft)	0.44
Screen Length (1st slot to last slot) (ft)	9.65
Total Length of Casing (ft)	21.00
Screen Slot Size[‡]	#10 (0.01)

[‡] Hand-slotted well screens are unacceptable.

WELL CONSTRUCTION MATERIALS

Protective Casing	Anodized Aluminum
Riser Pipe Above W.T.	PVC
Riser Pipe Below W.T.	PVC
Screen	PVC

Andrews Engineering, Inc.
3300 Ginger Creek Drive, Springfield, IL 62711 (217) 787-2334

Field Boring Log

Site Information:
Name: City Water, Light, & Power
Location: Springfield, IL
County: Sangamon
Site No.:
AEEI No.: 2011-127

Location:
Coord. System: Site Grid
Northing: 3164.10
Easting: 3203.10

Weather:
Cloudy; 38° F; West 10-15 MPH

Boring Information:
Boring No.: AP-5
Well No.: AP-5
Surf. Elev.:

Depth Information:
Total: 49.0
Auger: 49.0
Core:

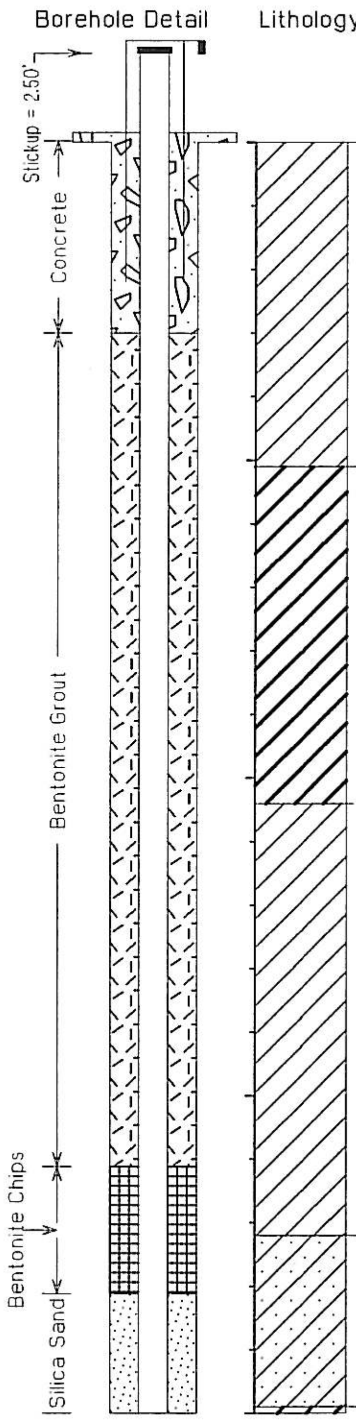
Dates:
Start: 2/1/2012
Finish: 2/1/2012

Drilling Contractor:
Name: Terra Drill, Inc.
City: Dupo, IL
Equipment: CME 550 with 4¼" I.D. HSA
5' CB and 2' SS

Personnel:
Geologist: M. Hewitt
Driller: J. Brown
Helper (s): J. Horn

Sample Type: ▮ - Continuous Barrel ☒ - Split Spoon ▨ - Shelby Tube ▮ - Core ☐ - Blind Drill

Depth (ft.)	Run No.	Sample Type	Sample No.	Sample Recov.	Blow Count	q_p [q_s] (in tsf)	% Moisture
0–4	1	Continuous Barrel		100%			
4–9	2	Continuous Barrel		76%			
9–14	3	Continuous Barrel		100%			
14–19	4	Continuous Barrel		100%			
19–20	5	Split Spoon		100%			



Depth (ft.)	Description/*Comments*	USC	Elev. (MSL)
0	Dark yellowish brown silty CLAY; very firm; moist; some dark brown mottling; trace organics	CL	0
5	Olive brown clayey SILT; moderately soft; moist; some dark yellowish brown mottling grades dark yellowish brown; clay content increasing	ML	-5
10	Olive brown silty CLAY; very firm; moist; trace coarse sand; few iron concretions; some dark yellowish brown mottling some gravel	CL	-10
15			-15
	Dark yellowish brown sandy CLAY; some gravel; very soft; moist to wet	SC	
20	Dark yellowish brown clayey SILT with sand and gravel; firm; moist	ML-SM	-20

NOTES:

Field Boring Log

PDF0831

Site Information:
Name: City Water, Light, & Power
Location: Springfield, IL
County: Sangamon
Site No.:
AEEI No.: 2011-127

Location:
Coord. System: Site Grid
Northing: 3164.10
Easting: 3203.10

Weather:
Cloudy; 38° F; West 10-15 MPH

Boring Information:
Boring No.: AP-5
Well No.: AP-5
Surf. Elev.:

Depth Information:
Total: 49.0
Auger: 49.0
Core: -

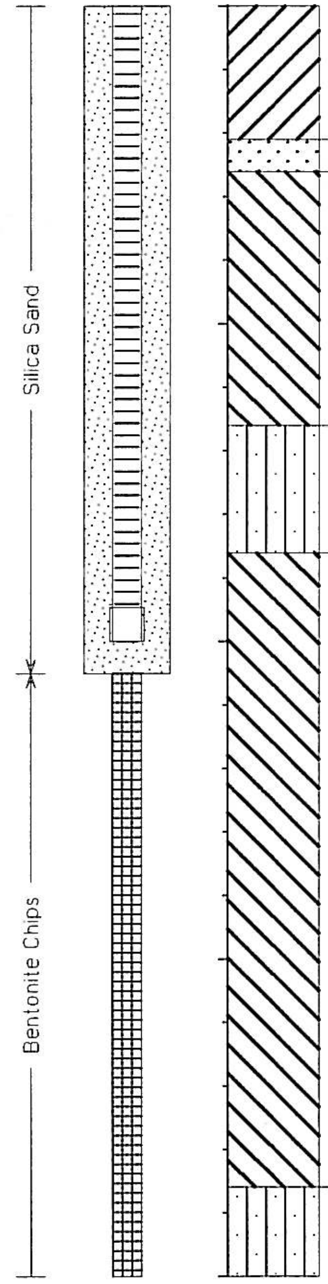
Dates:
Start: 2/1/2012
Finish: 2/1/2012

Drilling Contractor:
Name: Terra Drill, Inc.
City: Dupo, IL
Equipment: CME 550 with 4¼" I.D. HSA
5' CB and 2' SS

Personnel:
Geologist: M. Hewitt
Driller: J. Brown
Helper (s): J. Horn

Sample Type: ▯ - Continuous Barrel ☒ - Split Spoon ▨ - Shelby Tube ▯ - Core ☐ - Blind Drill

Depth (ft.)	Run No.	Type	No.	Recov.	Blow Count	q_p $[q_s]$ (in tsf)	% Moisture
20–21	5	Split Spoon					
21–23	6	Split Spoon		100%			
23–28	7	Continuous Barrel		100%			
28–31	8	Continuous Barrel		100%			
31–33	9	Split Spoon		90%			
33–38	10	Continuous Barrel		100%			
38–40	11	Continuous Barrel					



Description/*Comments*	USC	Elev. (MSL)
(Cont'd) Dark yellowish brown clayey SILT with sand and gravel; firm; moist	ML-SM	-20
Dark yellowish brown SAND; coarse-grained; loose; wet	SP	
Yellowish gray clayey SILT with sand; trace gravel; very hard; moist	ML	-25
Gray silty SAND with clay; some gravel; soft; wet	SM	
Gray clayey SILT; some gravel; very hard; moist some shale and coal fragments	ML	-30 -35
Light gray silty SAND; some gravel; trace chert; rounded; moderately firm; moist	SM	-40

Depth (ft.): 25, 30, 35, 40

NOTES:

Andrews Engineering, Inc.
3300 Ginger Creek Drive, Springfield, IL 62711 (217) 787-2334

Field Boring Log

PDF0832

Site Information:
Name: City Water, Light, & Power
Location: Springfield, IL
County: Sangamon
Site No.:
AEEI No.: 2011-127

Location:
Coord. System: Site Grid
Northing: 3164.10
Easting: 3203.10

Weather:
Cloudy; 38° F; West 10-15 MPH

Boring Information:
Boring No.: AP-5
Well No.: AP-5
Surf. Elev.:

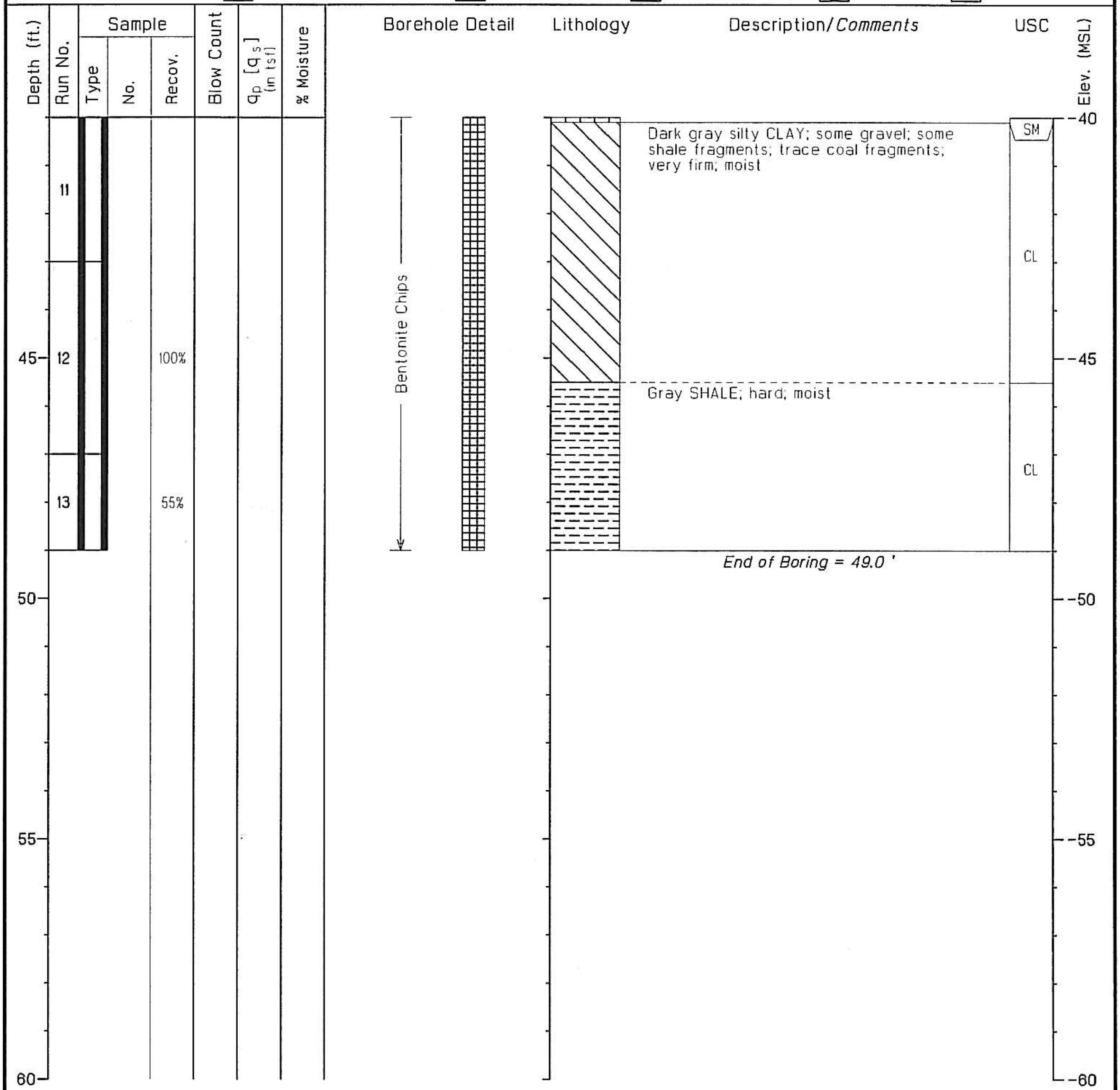
Depth Information:
Total: 49.0
Auger: 49.0
Core:

Dates:
Start: 2/1/2012
Finish: 2/1/2012

Drilling Contractor:
Name: Terra Drill, Inc.
City: Dupo, IL
Equipment: CME 550 with 4¼" I.D. HSA
5' CB and 2' SS

Personnel:
Geologist: M. Hewitt
Driller: J. Brown
Helper (s): J. Horn

Sample Type: ▮ - Continuous Barrel ☒ - Split Spoon ▨ - Shelby Tube ▮ - Core ☐ - Blind Drill



Depth (ft.)	Run No.	Sample Type	Sample No.	Sample Recov.	Blow Count	q_p [q_s] (in tsf)	% Moisture
40–43	11						
43–47	12			100%			
47–49	13			55%			

Description/*Comments*	USC
	SM
Dark gray silty CLAY; some gravel; some shale fragments; trace coal fragments; very firm; moist	CL
Gray SHALE; hard; moist	CL

End of Boring = 49.0 '

NOTES:

Illinois Environmental Protection Agency

Well Completion Report

Site #: ______ County: Sangamon Well #: AP-5

Site Name: City Water, Light, & Power Borehole #: AP-5

Coordinates: X 3203.10 Y 3164.10 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed by: ______ IL Registration #: ______

Drilling Contractor: Terra Drill, Inc. Consulting Firm: Andrews Engineering, Inc.

Driller: J. Brown Geologist: M. Hewitt

Drilling Method: 4¼" HSA w/ 5' CB & 2' SS Logged by: M. Hewitt

Drilling Fluids (type): ______ Report Form Completed by: J. Rhoades

Date Well Started: 2/1/2012 Date Well Finished: 2/1/2012 Date Form Completed: 2/27/2012

ANNULAR SPACE DETAILS

Type of surface seal: Concrete

Type of annular sealant: Bentonite Grout

Installation method: Tremie

Setting time: 2 Hours

Type of bentonite seal: Bentonite Chips

Installation method: Free drop

Setting time: 2 Hours

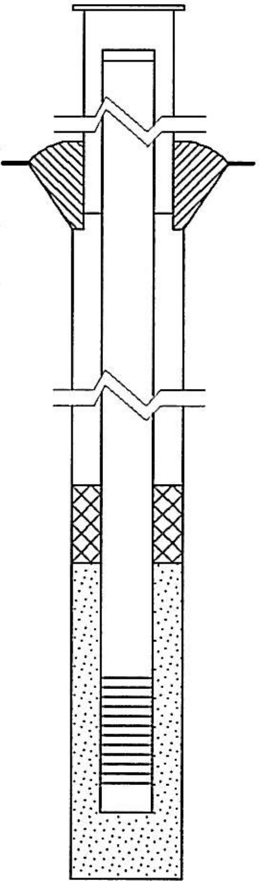
Type of sand pack: Unimin Sand

Grain size: 10/20 (sieve size)

Installation method: Free drop

Type of backfill material: Bentonite Chips (if applicable)

Installation method: Free drop



ELEVATION (MSL)®	DEPTH (BGS)*	(0.01 ft)
584.30	-2.70	Top of Protective Casing
583.90	-2.30	Top of Riser Pipe
581.60	.00	Ground Surface
578.60	3.00	Top of Annular Sealant
n/a	n/a	Static Water Level Measured on (after completion)
565.48	16.12	Top of Seal
563.48	18.12	Top of Sandpack
563.78	17.82	Top of Screen
554.44	27.16	Bottom of Screen
553.90	27.70	Bottom of Well
551.10	30.50	Bottom of Borehole

® Referenced to a National Geodetic Vertical Datum
* positive (+) values below GS, negitive (-) values above GS

NOTES:

- Borehole AP-5 sampled to 49.0 feet below ground surface (BGS) and backfilled with bentonite chips to 30.5 feet BGS

CASING MEASUREMENTS

Diameter of Borehole (in)	8.0
ID of Riser Pipe (in)	2.0
Protective Casing Length (ft)	5.0
Riser Pipe Length (ft)	20.12
Bottom of Screen to End Cap (ft)	.54
Screen Length [1st slot to last slot] (ft)	9.34
Total Length of Casing (ft)	30.00
Screen Slot Size*	0.01"

*Hand-slotted well screens are unacceptable.

WELL CONSTRUCTION MATERIALS

Protective Casing	SS304, SS316, PTFE, PVC or *Other:Steel*
Riser Pipe Above W.T.	SS304, SS316, PTFE, *PVC*, or Other:
Riser Pipe Below W.T.	SS304, SS316, PTFE, *PVC*, or Other:
Screen	SS304, SS316, PTFE, *PVC*, or Other:

(AE950315)

Andrews Engineering, Inc.
3300 Ginger Creek Drive
Springfield, IL 62711

FIELD BORING LOG

Site Information:
Name: Springfield City Water, Light, and Power
Location: Springfield, IL
County: Sangamon
Site No.:
AEI No.: 160192

Location:
Coord. System: Site Grid
Northing: 4185.2
Easting: 735.9

Weather: Sunny, 40F

Boring Information:
Boring No: AP-2A
Well No: AP-2A
Surf Elev.: 533.6

Depth Information:
Total: 19.0
Auger: 19.0
Core:

Dates:
Start: 2/16/16
Finish: 2/16/16

Drilling Contractor:
Contractor Name: Bulldog Drilling
City: Dupo, IL
Equipment: AMS Powerprobe w/ 4.25" HSA and 5' MC

Personnel:
Geologist: C. Myrvold
Driller: J. Edwards
Helper(s): Z. Strickland

- Continuous Barrel (CB)
- Split Spoon (SS)
- Shelby Tube
- Core
- Blind Drill

Depth (ft)	Run No.	Sample Type	Sample Recov.	Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
							Ground Surface	533.6
0 5	1						Blind drilled to 9.0 feet. For detailed geology refer to the original log for AP-2R	530.0 525.0
10	2		3.2/4				Gray CLAYEY SILT; moist to wet; moderately loose	
15	3		4.0/4					520.0
	4		2.0/2				Light gray SAND; fine to medium grained; saturated; some gravel Gray SHALE; weathered; hard; slightly moist	515.0
20							End of Boring = 19 Feet	

Notes:

Illinois Environmental Protection Agency Well Completion Report

Site #: County: Sangamon Well #: AP-2A

Site Name: Springfield City Water, Light, and Power Borehole #:

Coordinates: X 735.9 Y 4185.2 (or) Latitude: ° ' " Longitude: ° ' "

Surveyed by: Springfield City Water, Light, and Power IL Registration #:

Drilling Contractor: Bulldog Drilling, Inc. Consulting Firm: Andrews Engineering, Inc.

Driller: J. Edwards Geologist: C. Myrvold

Drilling Method: AMS Powerprobe w/ 4.25" HSA and 5' MC Logged by: C. Myrvold

Drilling Fluids (type): na Report Form Completed by: C. Myrvold

Date Well Started: 2/16/2016 Date Well Finished: 2/16/2016 Date Form Completed: 3/06/2016

ANNULAR SPACE DETAILS

Type of surface seal: Concrete

Type of annular sealant: N/A

Installation method:

Setting time:

Type of bentonite seal: Bentonite chips

Installation method: Free drop

Setting time: 24+ hours

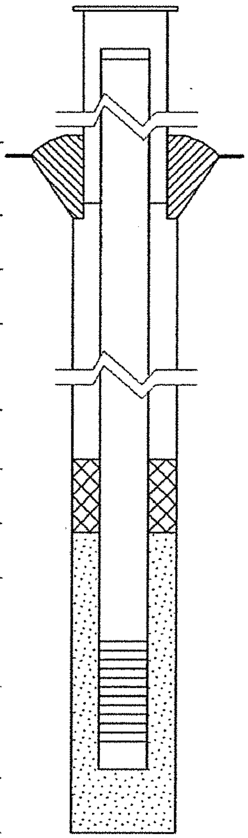
Type of sand pack: Silica sand

Grain size: 20/40 (sieve size)

Installation method: Free drop

Type of backfill material: N/A (if applicable)

Installation method:



ELEVATION (MSL)®	DEPTH (BGS)*	(0.01 ft)
536.50	-2.90	Top of Protective Casing
536.10	-2.50	Top of Riser Pipe
533.60	0.00	Ground Surface
	N/A	Top of Annular Sealant
		Static Water Level Measured on (after completion)
530.60	3.00	Top of Seal
527.19	6.41	Top of Sandpack
525.19	8.41	Top of Screen
515.54	18.06	Bottom of Screen
515.10	18.50	Bottom of Well
514.60	19.00	Bottom of Borehole

® Referenced to a National Geodetic Vertical Datum
* positive (+) values below GS, negitive (-) values above GS

Notes:

CASING MEASUREMENTS

Diameter of Borehole (in)	8.25
ID of Riser Pipe (in)	2
Protective Casing Length (ft)	5.0
Riser Pipe Length (ft)	10.91
Bottom of Screen to End Cap (ft)	0.44
Screen Length [1st slot to last slot] (ft)	9.65
Total Length of Casing (ft)	21.00
Screen Slot Size¥	#10 (0.01)

¥Hand-slotted well screens are unacceptable.

WELL CONSTRUCTION MATERIALS

Protective Casing	Anodized Aluminum
Riser Pipe Above W.T.	PVC
Riser Pipe Below W.T.	PVC
Screen	PVC

Andrews Engineering, Inc.
3300 Ginger Creek Drive
Springfield, IL 62711

FIELD BORING LOG

Site Information:
Name: CWLP Ash Pond
Location: Springfield, Illinois
County: Sangamon
Site No.:
AEI No.:

Location:
Coord. System:
Northing: 0
Easting: 0

Weather: sunny, 73 deg

Boring Information:
Boring No: TW3E
Well No: TW3E
Surf Elev.: 0

Depth Information:
Total: 40.5'
Auger: 40.5'
Core: -

Dates:
Start: 06/27/2017
Finish: 06/27/2017

Drilling Contractor:
Contractor Name: Bulldog Drilling
City: Dupo
Equipment: 4.25" HSA, CME 55, 5' Continuous Macrocore

Personnel:
Geologist: D. Ghosh
Driller: J. Gates
Helper(s): C. Clines

- Continuous Barrel (CB) - Split Spoon (SS) - Shelby Tube - Core - Blind Drill

Depth (ft)	Run No.	Sample Type	Sample Recov.	Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
							Ground Surface	0.0
0	1		4.5/5				**CLAYEY SILT** dark brown, iron oxidation staining, moist, firm to hard, moderate cementation, with root structure	
5	2		5.0/5				**SILT** brown to gray, iron oxidation, moist, 2" wet seam at 12', firm, moderate cementation, blocky, some clay	-5.0
10	3		5.0/5				**SILT** gray, firm to hard, trace fine grained sand sandy 14.5-15'	-10.0
15	4		4.5/5				**SILTY CLAY** dark gray, moist to wet, soft to firm, strong cementation, laminated, some wood fragments	-15.0
20								-20.0

Notes:

Andrews Engineering, Inc.
3300 Ginger Creek Drive
Springfield, IL 62711

FIELD BORING LOG

Boring Information: TW3E Boring No: TW3E Well No: TW3E

▌▌ - Continuous Barrel (CB) ▌▯ - Split Spoon (SS) ◣ - Shelby Tube ▯▌▯ - Core ‖‖ - Blind Drill

Depth (ft)	Run No.	Sample: Type	Sample: Recov.	Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
	5		5.0/5				cont: dark gray, moist to wet, soft to firm, strong cementation, laminated, some wood fragments	
							SILTY CLAY dark gray, till, moist to wet, soft to firm, moderate cementation, trace fine grained sand and gravel	-25
26								
	6		3.0/5					
								-30
31								
	7		4.5/5					
							SANDY SILT fine grained sand	
								-35
36								
							SILTY SAND gray, fine to medeium grained, wet	
	8		4.0/5.5					
							medium to coarse grained, trace fine grained, angular	
							SHALE	
								-40
							End of Boring = 40.5 Feet	
41								

Notes:

Illinois Environmental Protection Agency

Well Completion Report

Site Number:

County: Sangamon

Site Name: City Water, Light & Power (CWLP) Ash Ponds

Well #: TW3E

State Plane Coordinate: X _____ Y _____ (or) Latitude: ____ o ____ ' ____ " Longitude: ____ o ____ ' ____ "

Borehole #: TW3E

Surveyed by:

IL Registration #:

Drilling Contractor: Bulldog Drilling, Inc.

Driller: J. Gates

Consulting Firm: Andrews Engineering, Inc.

Geologist: D. Ghosh

Drilling Method: CME 55 w/ 4.25" HSA

Drilling Fluid (Type): none

Logged By: D. Ghosh

Date Started: 6/27/17

Date Finished: 6/27/17

Report Form Completed By: M. Hewitt

Date: 9/18/17

ANNULAR SPACE DETAILS

Type of Surface Seal: Bentonite Grout

Type of Annular Sealant: Bentonite Grout

Installation Method: Tremi

Setting Time: 24 hours

Type of Bentonite Seal - - Granular, [✓ Pellet], Slurry
(Choose One)

Installation Method: Free drop

Setting Time: N/A

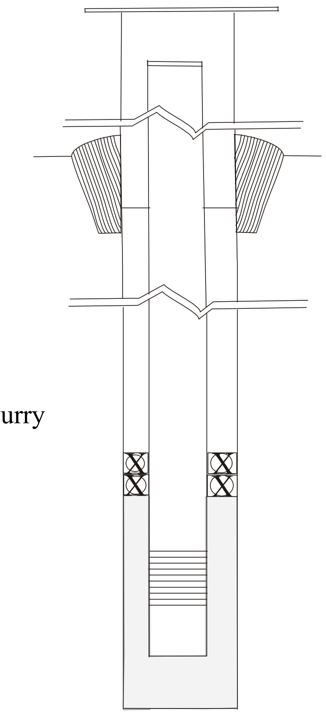
Type of Sand Pack: Silica Sand

Grain Size: 10/20 (Sieve Size)

Installation Method: Free Drop

Type of Backfill Material: None
(if applicable)

Installation Method: N/A



Elevations (MSL)*	Depths (BGS)	(.01ft.)
		Top of Protective Casing
	-2.17	Top of Riser Pipe
	0	Ground Surface
	0	Top of Annular Sealant
	9.14	Static Water Level (After Completion)
	28.0	Top of Seal
	28.2	Top of Sand Pack
	30.22	Top of Screen
	39.82	Bottom of Screen
	40.5	Bottom of Well
	40.5	Bottom of Borehole

* Referenced to a National Geodetic Datum

WELL CONSTRUCTION MATERIAL
(Choose one type of material for each area)

Protective Casing	SS304, SS316, PTFE, PVC, or Other
Riser Pipe Above W.T.	SS304, SS316, PTFE, [✓ PVC], or Other
Riser Pipe Below W.T.	SS304, SS316, PTFE, [✓ PVC], or Other
Screen	SS304, SS316, PTFE, [✓ PVC], or Other

CASING MEASURMENTS

Diameter of Borehole (inches)	8.25
ID of Riser Pipe (inches)	2.049
Protective Casing Length (feet)	
Riser Pipe Length (feet)	32.39
Bottom of Screen to End Cap (feet)	0.68
Screen Length (1st slot to last slot) (feet)	9.6
Total Length of Casing (feet)	42.67
Screen Slot Size **	0.01

**Hand-Slotted Well Screens are Unacceptable

Andrews Engineering, Inc.
3300 Ginger Creek Drive
Springfield, IL 62711

FIELD BORING LOG

Site Information:
Name: CWLP Ash Pond
Location: Springfield, Illinois
County: Sangamon
Site No.:
AEI No.:

Location:
Coord. System: Site Coordinates
Northing: 5613.3
Easting: 1737.4

Weather: rain, 55 deg; sunny, 73 deg

Boring Information:
Boring No: TW3N
Well No: RW-3
Surf Elev.: 536.8

Depth Information:
Total: 41.6'
Auger: 41.6'
Core: -

Dates:
Start: 06/26/2017
Finish: 06/27/2017

Drilling Contractor:
Contractor Name: Bulldog Drilling
City: Dupo
Equipment: 4.25" HSA, CME 55, 5' Continuous Macrocore

Personnel:
Geologist: D. Ghosh
Driller: J. Gates
Helper(s): C. Clines

- Continuous Barrel (CB) - Split Spoon (SS) - Shelby Tube - Core - Blind Drill

Depth (ft)	Run No.	Sample		Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
		Type	Recov.					
							Ground Surface	536.8
0	1		3.5/5				**SILTY CLAY** dark brown, pervasive iron oxidation staining, dry (moist below 3'), firm to hard, moderate cementation, with root structure	535.0
							SILTY CLAY light tan, moist, moderate cementation, blocky	
5	2		5.0/5				**SILT** brown to gray, mottling, iron oxidation staining, moist, firm, moderate cementation	530.0
10	3		4.5/5				**SAND** sand lens, with silt, wet, trace clay	525.0
							SANDY SILT brown to gray, laminated, some wood fragments, trace coarse sand, coal and roots	
15	4		5.0/5				**SILTY CLAY** gray, wet to moist, very soft, strong cementation, laminated, some wood fragments, trace fine sand	520.0
20							**SILTY CLAY** dark gray, wet, very soft, strong cementation, homogeneous	

Notes:

Andrews Engineering, Inc.
3300 Ginger Creek Drive
Springfield, IL 62711

PDF 0840

FIELD BORING LOG

Boring Information: RW-3 Boring No: TW3N Well No: RW-3

- Continuous Barrel (CB) - Split Spoon (SS) - Shelby Tube - Core - Blind Drill

Depth (ft)	Run No.	Sample Type	Sample Recov.	Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
	5		3.0/5				cont: dark gray, wet, very soft, strong cementation, homogeneous	515
26	6		4.0/5				**SILTY CLAY** dark gray, till, moist, firm to hard, trace coarse and fine gravel, trace coal	510
31	7		4.5/5					505
36	8		5.0/5				**SANDY SILT** **SILTY SAND** gray, fine to medium graineed, wet, trace angular gravel	500
41	9						**SHALE** weathered	
							End of Boring = 41.6 Feet	495

Notes:

Illinois Environmental Protection Agency **Well Completion Report**

Site Number: ____________ County: Sangamon

Site Name: City Water, Light & Power (CWLP) Ash Ponds

Well #: TW3N

State Plane Coordinate: X _____ Y _____ (or) Latitude: ____ o ____ ' ____ " Longitude: ____ o ____ ' ____ "

Borehole #: TW3N

Surveyed by: ____________

IL Registration #: ____________

Drilling Contractor: Bulldog Drilling, Inc.

Driller: J. Gates

Consulting Firm: Andrews Engineering, Inc.

Geologist: D. Ghosh

Drilling Method: CME 55 w/ 4.25" HSA

Drilling Fluid (Type): none

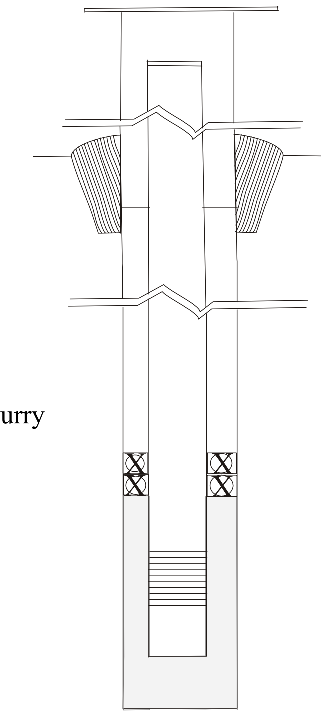
Logged By: D. Ghosh

Date Started: 6/26/17 Date Finished: 6/27/17

Report Form Completed By: M. Hewitt

Date: 9/18/17

ANNULAR SPACE DETAILS



Type of Surface Seal: Bentonite Grout

Type of Annular Sealant: Bentonite Grout

Installation Method: Tremi

Setting Time: 24 hours

Type of Bentonite Seal - - Granular, [✓ Pellet], Slurry
(Choose One)

Installation Method: Free drop

Setting Time: N/A

Type of Sand Pack: Silica Sand

Grain Size: 10/20 (Sieve Size)

Installation Method: Free Drop

Type of Backfill Material: None
(if applicable)

Installation Method: N/A

Elevations (MSL)*	Depths (BGS)	(.01ft.)
		Top of Protective Casing
	-2.5	Top of Riser Pipe
	0	Ground Surface
	0	Top of Annular Sealant
	8.71	Static Water Level (After Completion)
	27	Top of Seal
	29.6	Top of Sand Pack
	31.34	Top of Screen
	40.92	Bottom of Screen
	41.6	Bottom of Well
	41.6	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASURMENTS

Diameter of Borehole (inches)	8.25
ID of Riser Pipe (inches)	2.049
Protective Casing Length (feet)	
Riser Pipe Length (feet)	33.84
Bottom of Screen to End Cap (feet)	0.68
Screen Length (1st slot to last slot) (feet)	9.58
Total Length of Casing (feet)	44.1
Screen Slot Size **	0.01

**Hand-Slotted Well Screens are Unacceptable

WELL CONSTRUCTION MATERIAL

(Choose one type of material for each area)

Protective Casing	SS304, SS316, PTFE, PVC, or Other
Riser Pipe Above W.T.	SS304, SS316, PTFE, [✓ PVC], or Other
Riser Pipe Below W.T.	SS304, SS316, PTFE, [✓ PVC], or Other
Screen	SS304, SS316, PTFE, [✓ PVC], or Other

Andrews Engineering, Inc.
3300 Ginger Creek Drive
Springfield, IL 62711

FIELD BORING LOG

Site Information:
Name: CWLP Ash Pond
Location: Springfield, Illinois
County: Sangamon
Site No.:
AEI No.:

Location:
Coord. System:
Northing: 0
Easting: 0

Weather: rain, 55 deg

Boring Information:
Boring No: TW3W
Well No: TW3W
Surf Elev.: 0

Depth Information:
Total: 23.8'
Auger: 23.8'
Core: -

Dates:
Start: 06/26/2017
Finish: 06/26/2017

Drilling Contractor:
Contractor Name: Bulldog Drilling
City: Dupo
Equipment: 4.25" HSA, CME 55, 5' Continuous Macrocore

Personnel:
Geologist: D. Ghosh
Driller: J. Gates
Helper(s): C. Clines

▮ - Continuous Barrel (CB) ▮ - Split Spoon (SS) ◣ - Shelby Tube ▮ - Core ‖ - Blind Drill

Depth (ft)	Run No.	Sample Type	Sample Recov.	Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
							Ground Surface	0.0
0	1		4.5/5				**SILTY CLAY** dark brown, dry, firm to hard, moderate cementation, root structure in upper 2 feet high clay content, moist, soft to firm, blocky iron oxidation spots	
5	2		4.5/5				**SILT** brown to gray, iron oxidation pervasive, moist, soft to firm, moderate cementation, some clay very soft	-5.0
							SILTY SAND brown, fine to medium grained sand, wet, poor cementation, moderately sorted, trace clay	
10	3		4.0/5					-10.0
							CLAYEY SAND brown to dark gray, with gravel, coarse grained towards bottom, wet, strong cementation, poorly sorted	
15	4		4.5/5				**SILTY CLAY** dark gray, with coal fragments, moist, very soft, strong cementation, homogeneous appearance, coal content high at 19-19.5'	-15.0
20	5		2.8/3.8				**SILTY CLAY** blue gray, till, wet, soft, moderate cementation, homogeneous appearance, trace coarse sand and gravel light tan, silty from 22-22.5'	-20.0
							SANDY SHALE	
							End of Boring = 23.8 Feet	

Notes: Borehole refusal at 23.8'.

Illinois Environmental Protection Agency **Well Completion Report**

Site Number: ______ County: Sangamon

Site Name: City Water, Light & Power (CWLP) Ash Ponds

Well #: TW3W

State Plane Coordinate: X _____ Y _____ (or) Latitude: ___ o ___ ' ___ " Longitude: ___ o ___ ' ___ "

Borehole #: TW3W

Surveyed by: ______

IL Registration #: ______

Drilling Contractor: Bulldog Drilling, Inc.

Driller: J. Gates

Consulting Firm: Andrews Engineering, Inc.

Geologist: D. Ghosh

Drilling Method: CME 55 w/ 4.25" HSA

Drilling Fluid (Type): none

Logged By: D. Ghosh

Date Started: 6/26/17 Date Finished: 6/26/17

Report Form Completed By: M. Hewitt

Date: 9/18/17

ANNULAR SPACE DETAILS

Type of Surface Seal: Bentonite Grout

Type of Annular Sealant: Bentonite Grout

Installation Method: Tremi

Setting Time: 24 hours

Type of Bentonite Seal - - Granular, [✓ Pellet], Slurry
(Choose One)

Installation Method: Free drop

Setting Time: N/A

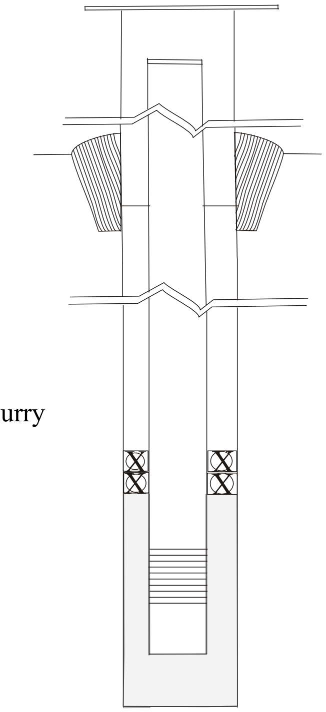
Type of Sand Pack: Silica Sand

Grain Size: 10/20 (Sieve Size)

Installation Method: Free Drop

Type of Backfill Material: None
(if applicable)

Installation Method: N/A



Elevations (MSL)*	Depths (BGS)	(.01ft.)
		Top of Protective Casing
	-2.58	Top of Riser Pipe
	0	Ground Surface
	0	Top of Annular Sealant
	9.32	Static Water Level (After Completion)
	9.6	Top of Seal
	11.85	Top of Sand Pack
	13.54	Top of Screen
	23.12	Bottom of Screen
	23.8	Bottom of Well
	23.8	Bottom of Borehole

* Referenced to a National Geodetic Datum

CASING MEASURMENTS

Diameter of Borehole (inches)	8.25
ID of Riser Pipe (inches)	2.049
Protective Casing Length (feet)	
Riser Pipe Length (feet)	16.12
Bottom of Screen to End Cap (feet)	0.68
Screen Length (1st slot to last slot) (feet)	9.58
Total Length of Casing (feet)	26.38
Screen Slot Size **	0.01

**Hand-Slotted Well Screens are Unacceptable

WELL CONSTRUCTION MATERIAL
(Choose one type of material for each area)

Protective Casing	SS304, SS316, PTFE, PVC, or Other
Riser Pipe Above W.T.	SS304, SS316, PTFE, [✓ PVC], or Other
Riser Pipe Below W.T.	SS304, SS316, PTFE, [✓ PVC], or Other
Screen	SS304, SS316, PTFE, [✓ PVC], or Other

Andrews Engineering, Inc.
3300 Ginger Creek Drive
Springfield, IL 62711

FIELD BORING LOG

Site Information:
Name: CWLP
Location: Springfield, IL
County: Sangamon
Site No.:
AEEI No.: 180247

Location:
Coord. System:
Northing: 0
Easting: 0

Weather: 65, overcast

Boring Information:
Boring No: GP1
Well No: GP1
Surf Elev.: 0

Depth Information:
Total: 40.0'
Auger: 40.0'
Core: N/A

Dates:
Start: 6/14/2019
Finish: 6/14/2019

Drilling Contractor:
Contractor Name: Bulldog Drilling
City: Dupo, IL
Equipment: CME 55cc 4.25" HSA w/ 5' MC and 2' SS

Personnel:
Geologist: B. Kenning
Driller: C. Clines
Helper(s): D. Smith

▌▌ - Continuous Barrel (CB) ▌ - Split Spoon (SS) ◣ - Shelby Tube ▌ - Core ‖ - Blind Drill

Depth (ft)	Sample Run No.	Sample Type	Sample Recov.	Blow Count	Lithology	Description/Comments	Elev. (MSL)
						Ground Surface	0.0
0						Brown clayey TOPSOIL.	
						Light brown to gray silty CLAY, moist, stiff.	
	1		4.2				
5							-5.0
	2		2.2				
10							-10.0
	3		4.6				
15							-15.0
						Gray clayey SILT, moist to wet, moderately stiff.	
	4		4.3				
20							-20.0
	5		4.2				
						Brown/gray silty CLAY, moist, moderately stiff, contains coal fragments.	
						Gray clayey SILT, moist to wet, moderately stiff.	
25							-25.0

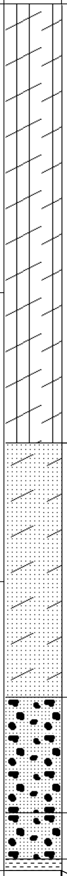
Notes:

Andrews Engineering, Inc.
3300 Ginger Creek Drive
Springfield, IL 62711

FIELD BORING LOG

Boring Information: GP1 Boring No: GP1 Well No: GP1

▌▌ - Continuous Barrel (CB) █ - Split Spoon (SS) ◣ - Shelby Tube ▯█ - Core ▯▯ - Blind Drill



Depth (ft)	Sample Run No.	Sample Type	Sample Recov.	Blow Count	Lithology	Description/Comments	Elev. (MSL)
	6	▌▌	3.7				
30							-30
	7	▌▌	3.7			Gray SAND, fine-grained, wet, loose.	
35							-35
	8	▌▌	4.1			Gray SAND, fine to medium-grained, wet, loose, trace gravel.	
						Gray SAND, medium to coarse-grained, wet, loose, trace gravel.	
40						Gray SHALE, weathered, moist, soft.	-40
						End of Boring = 40 Feet	
45							-45
50							-50

Notes:

Illinois Environmental Protection Agency

Well Completion Report

Site #:

County: Sangamon

Well #: GP1

Site Name: Springfield CWLP Ash Pond

Borehole #: GP1

Coordinates: X Y (or) Latitude: ° ' " Longitude: ° ' "

Surveyed by: Andrews Engineering, Inc.

IL Registration #:

Drilling Contractor: Bulldog drilling

Consulting Firm: Andrews Engineering, Inc.

Driller: C. Clines

Geologist: B. Kenning

Drilling Method: CME 55cc 4.25 in HSA w/ 5'MC and 2' SS

Logged by: B. Kenning

Drilling Fluids (type): N/A

Report Form Completed by: B. Kenning

Date Well Started: 6/14/19

Date Well Finished: 6/14/19

Date Form Completed: 7/19/2019

ANNULAR SPACE DETAILS

Type of surface seal:

Type of annular sealant: Bentonite Grout

Installation method: Tremie

Setting time: > 24 hours

Type of bentonite seal: Bentonite Chips

Installation method: Free Drop

Setting time: > 24 hours

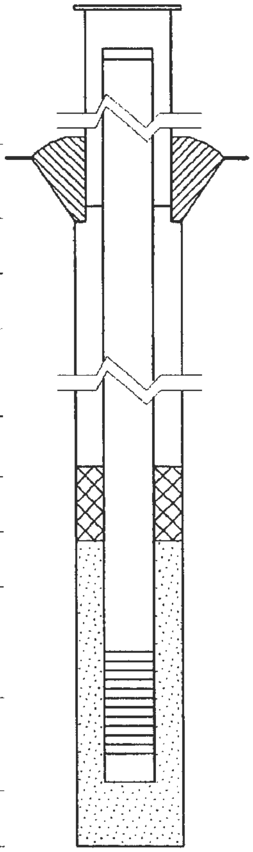
Type of sand pack: Silica Sand Pre-Pack

Grain size: 10/20 (sieve size)

Installation method: Free Drop

Type of backfill material: N/A (if applicable)

Installation method:



ELEVATION (MSL)*	DEPTH (BGS)*	(0.01 ft)
		Top of Protective Casing
	- 2.82'	Top of Riser Pipe
	0.00'	Ground Surface
	3.00'	Top of Annular Sealant
		Static Water Level Measured on (after completion)
	25.34'	Top of Seal
	27.34'	Top of Sandpack
	29.34'	Top of Screen
	39.04'	Bottom of Screen
	39.50'	Bottom of Well
	40.00'	Bottom of Borehole

* Referenced to a National Geodetic Vertical Datum

* positive (+) values below GS, negitive (-) values above GS

CASING MEASUREMENTS

Diameter of Borehole (in)	8.25
ID of Riser Pipe (in)	#2
Protective Casing Length (ft)	N/A
Riser Pipe Length (ft)	31.91
Bottom of Screen to End Cap (ft)	0.46
Screen Length (1st slot to last slot) (ft)	9.70
Total Length of Casing (ft)	N/A
Screen Slot Size*	#10 (0.01)

*Hand-slotted well screens are unacceptable.

WELL CONSTRUCTION MATERIALS

Protective Casing	N/A
Riser Pipe Above W.T.	PVC
Riser Pipe Below W.T.	PVC
Screen	PVC

Andrews Engineering, Inc.
3300 Ginger Creek Drive
Springfield, IL 62711

FIELD BORING LOG

Site Information:
Name: CWLP
Location: Springfield, IL
County: Sangamon
Site No.:
AEEI No.: 180247

Location:
Coord. System:
Northing: 0
Easting: 0

Weather: 60, partly cloudy, light breeze

Boring Information:
Boring No: GP2
Well No: GP2
Surf Elev.: 0

Depth Information:
Total: 40.0'
Auger: 40.0'
Core: N/A

Dates:
Start: 6/14/2019
Finish: 6/14/2019

Drilling Contractor:
Contractor Name: Bulldog Drilling
City: Dupo, IL
Equipment: CME 55cc 4.25" HSA w/ 5' MC and 2' SS

Personnel:
Geologist: B. Kenning
Driller: C. Clines
Helper(s): D. Smith

▮▮ - Continuous Barrel (CB) ▮ - Split Spoon (SS) ◣ - Shelby Tube ▮ - Core ▯▯ - Blind Drill

Depth (ft)	Sample Run No.	Type	Recov.	Blow Count	Lithology	Description/Comments	Elev. (MSL)
						Ground Surface	0.0
0		▮▮				Brown clayey TOPSOIL.	
						Brown silty CLAY, moist, stiff.	
	1	▮▮	3.0				
5							-5.0
	2	▮▮	3.5				
10							-10.0
						Brown/gray clayey SILT, moist, stiff.	
	3	▮▮	3.0				
15							-15.0
	4	▮▮	3.8				
20							-20.0
	5	▮▮	2.7				
25							-25.0

Notes: No signs of freewater

FIELD BORING LOG

Boring Information: GP2 Boring No: GP2 Well No: GP2

- Continuous Barrel (CB) - Split Spoon (SS) - Shelby Tube - Core - Blind Drill

Depth (ft)	Sample			Blow Count	Lithology	Description/Comments	Elev. (MSL)
	Run No.	Type	Recov.				
	6		4.1			Gray clayey SAND, fine-grained, moist, moderately stiff.	
30							-30
	7		4.1				
						Gray clayey SILT, moist, stiff, coal fragments at 30.4'.	
35							-35
						Gray SHALE, weathered, slightly moist, soft.	
	8		3.4				
40						End of Boring = 40 Feet	-40
45							-45
50							-50

Notes: No signs of freewater

Illinois Environmental Protection Agency

Well Completion Report

Site #: ______ County: Sangamon Well #: GP2

Site Name: Springfield CWLP Ash Pond Borehole #: GP2

Coordinates: X ______ Y ______ (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed by: Andrews Engineering, Inc. IL Registration #: ______

Drilling Contractor: Bulldog drilling Consulting Firm: Andrews Engineering, Inc.

Driller: C. Clines Geologist: B. Kenning

Drilling Method: CME 55cc 4.25 in HSA w/ 5'MC Logged by: B. Kenning

Drilling Fluids (type): N/A Report Form Completed by: B. Kenning

Date Well Started: 6/14/19 Date Well Finished: 6/14/19 Date Form Completed: 7/19/2019

ANNULAR SPACE DETAILS

Type of surface seal: ______

Type of annular sealant: Bentonite Grout

Installation method: Tremie

Setting time: > 24 hours

Type of bentonite seal: Bentonite Chips

Installation method: Free Drop

Setting time: > 24 hours

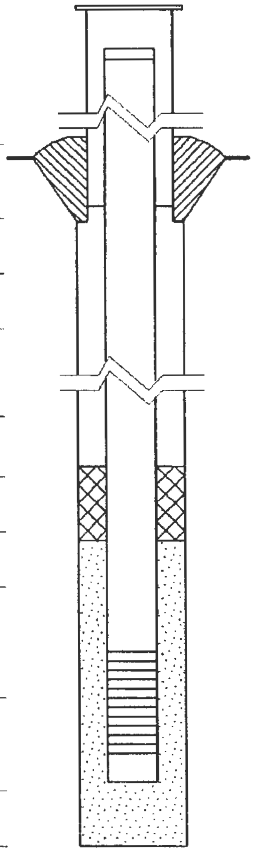
Type of sand pack: Silica Sand Pre-Pack

Grain size: 10/20 (sieve size)

Installation method: Free Drop

Type of backfill material: N/A (if applicable)

Installation method: ______



ELEVATION (MSL)*	DEPTH (BGS)*	(0.01 ft)
		Top of Protective Casing
	- 2.88'	Top of Riser Pipe
	0.00'	Ground Surface
	3.00'	Top of Annular Sealant
		Static Water Level Measured on (after completion)
	25.34'	Top of Seal
	27.34'	Top of Sandpack
	29.34'	Top of Screen
	39.04'	Bottom of Screen
	39.50'	Bottom of Well
	40.00'	Bottom of Borehole

* Referenced to a National Geodetic Vertical Datum
* positive (+) values below GS, negitive (-) values above GS

CASING MEASUREMENTS

Diameter of Borehole (in)	8.25
ID of Riser Pipe (in)	#2
Protective Casing Length (ft)	N/A
Riser Pipe Length (ft)	31.78
Bottom of Screen to End Cap (ft)	0.46
Screen Length (1st slot to last slot) (ft)	9.70
Total Length of Casing (ft)	N/A
Screen Slot Size*	#10 (0.01)

*Hand-slotted well screens are unacceptable.

WELL CONSTRUCTION MATERIALS

Protective Casing	N/A
Riser Pipe Above W.T.	PVC
Riser Pipe Below W.T.	PVC
Screen	PVC

Andrews Engineering, Inc.
3300 Ginger Creek Drive
Springfield, IL 62711

FIELD BORING LOG

Site Information:
Name: CWLP
Location: Springfield
County: Sangamon
Site No.:
AEEI No.: 180247

Location:
Coord. System:
Northing: 0
Easting: 0

Weather: 65, partly cloudy

Boring Information:
Boring No: GP3
Well No: GP3
Surf Elev.: 0

Depth Information:
Total: 25'
Auger: 25'
Core: N/A

Dates:
Start: 6/13/2019
Finish: 6/13/2019

Drilling Contractor:
Contractor Name: Bulldog Drilling
City: Dupo, IL
Equipment: CME 55cc 4.25 in HSA w/ 5' MC and 2' SS

Personnel:
Geologist: B. Kenning
Driller: C. Clines
Helper(s): D. Smith

▌▐ - Continuous Barrel (CB) █ - Split Spoon (SS) ◣ - Shelby Tube █ - Core ‖ - Blind Drill

Depth (ft)	Sample Run No.	Type	Recov.	Blow Count	Lithology	Description/Comments	Elev. (MSL)
						Ground Surface	0.0
0	1	▌▐	4.7			Brown silty to clayey TOPSOIL, moist, stiff.	
						Brown silty CLAY to clayey SILT, moist, stiff.	
5	2	█	1.6	2 4 4 6			-5.0
	3	█	1.6	4 9 12 12		Light brown clayey SILT, slightly moist, stiff.	
10	4	█	1.8	6 11 11 12			-10.0
	5	▌▐	3.0			Brown clayey SAND, fine-grained, slightly moist, moderately stiff.	
15	6	▌▐	4.0			Brown silty CLAY, moist, stiff, contains coal fragments.	-15.0
						Brown clayey SAND, fine-grained, moist, moderately loose.	
20							-20.0

Notes: Macrocore refusal at 23'; Split spoon refusal at 24'; blind drilled to EOB depth of 25'

Andrews Engineering, Inc.
3300 Ginger Creek Drive
Springfield, IL 62711

FIELD BORING LOG

Boring Information: GP3 Boring No: GP3 Well No: GP3

▌▌ - Continuous Barrel (CB) ■ - Split Spoon (SS) ◣ - Shelby Tube ▐ - Core ‖ - Blind Drill

Depth (ft)	Sample			Blow Count	Lithology	Description/Comments	Elev. (MSL)
	Run No.	Type	Recov.				
	7	▌▌	2.2		▨	Gray SHALE, weathered, slightly moist, soft.	
	8	■	0.7	41 50 3"	▨		
	9	‖	0.0				
25						End of Boring = 25 Feet	-25
30							-30
35							-35
40							-40

Notes: Macrocore refusal at 23'; Split spoon refusal at 24'; blind drilled to EOB depth of 25'

Illinois Environmental Protection Agency

Well Completion Report

Site #: ____________ County: Sangamon Well #: GP3

Site Name: Springfield CWLP Ash Pond Borehole #: GP3

Coordinates: X ________ Y ________ (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed by: Andrews Engineering, Inc. IL Registration #: ________

Drilling Contractor: Bulldog drilling Consulting Firm: Andrews Engineering, Inc.

Driller: C. Clines Geologist: B. Kenning

Drilling Method: CME 55cc 4.25 in HSA w/ 5'MC Logged by: B. Kenning

Drilling Fluids (type): N/A Report Form Completed by: B. Kenning

Date Well Started: 6/13/19 Date Well Finished: 6/13/19 Date Form Completed: 7/19/2019

ANNULAR SPACE DETAILS

Type of surface seal: ____________

Type of annular sealant: Bentonite Chips

Installation method: Free Drop

Setting time: > 24 hours

Type of bentonite seal: Bentonite Chips

Installation method: Free Drop

Setting time: > 24 hours

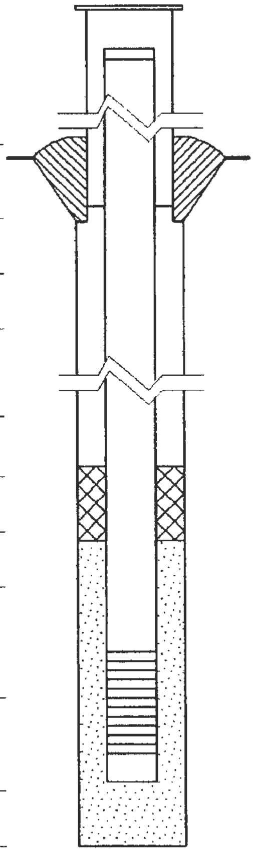
Type of sand pack: Silica Sand Pre-Pack

Grain size: 10/20 (sieve size)

Installation method: Free Drop

Type of backfill material: N/A (if applicable)

Installation method: ____________



ELEVATION (MSL)*	DEPTH (BGS)*	(0.01 ft)
		Top of Protective Casing
	- 1.14'	Top of Riser Pipe
	0.00'	Ground Surface
	3.00'	Top of Annular Sealant
		Static Water Level Measured on (after completion)
	3.00'	Top of Seal
	17.07'	Top of Sandpack
	19.07'	Top of Screen
	23.75'	Bottom of Screen
	24.30'	Bottom of Well
	24.80'	Bottom of Borehole

* Referenced to a National Geodetic Vertical Datum
* positive (+) values below GS, negitive (-) values above GS

CASING MEASUREMENTS

Diameter of Borehole (in)	8.25
ID of Riser Pipe (in)	#2
Protective Casing Length (ft)	N/A
Riser Pipe Length (ft)	20.33
Bottom of Screen to End Cap (ft)	0.55
Screen Length (1st slot to last slot) (ft)	4.68
Total Length of Casing (ft)	N/A
Screen Slot Size*	#10 (0.01)

*Hand-slotted well screens are unacceptable.

WELL CONSTRUCTION MATERIALS

Protective Casing	N/A
Riser Pipe Above W.T.	PVC
Riser Pipe Below W.T.	PVC
Screen	PVC

Andrews Engineering, Inc.
3300 Ginger Creek Drive
Springfield, IL 62711

FIELD BORING LOG

Site Information:
Name: Springfield City Water Light and Power
Location: Springfield, IL
County: Sangamon
Site No.:
AEI No.: 180247

Location:
Coord. System:
Northing: 0
Easting: 0

Weather: 80's F, Sunny

Boring Information:
Boring No: GP4
Well No: GP4
Surf Elev.: 0

Depth Information:
Total: 38.0
Auger: 38.0
Core: N/A

Dates:
Start: 5/17/19
Finish: 5/17/19

Drilling Contractor:
Contractor Name: Bulldog Drilling, Inc.
City: Dupo, IL
Equipment: AMS PowerProbe 9500 w/ 5' MC

Personnel:
Geologist: C. Myrvold
Driller: J. Edwards
Helper(s): S. Guy

▮▮ - Continuous Barrel (CB) ▮ - Split Spoon (SS) ◣ - Shelby Tube ▮ - Core ▯▯ - Blind Drill

Depth (ft)	Run No.	Sample		Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
		Type	Recov.					
							Ground Surface	0.0
0							Gray clayey SILT, moist, loose.	
							Brown/gray silty CLAY, moist, stiff.	
	1	▮▮	4.3/5					
5								-5.0
	2	▮▮	3.7/4					
							Gray clayey SILT, moist, moderately loose.	
							Brown silty SAND, fine to medium-grained, moist, moderately tight.	
10								-10.0
	3	▮▮	4.0/4				Gray to dark gray silty CLAY, moist, stiff; trace to some sand.	
15	4	▮▮	1.3/4					-15.0
	5	▮▮	4.0/4					
20								-20.0

Notes:

FIELD BORING LOG

Boring Information: GP4 Boring No: GP4 Well No: GP4

▌▌ - Continuous Barrel (CB) █ - Split Spoon (SS) ◣ - Shelby Tube ▯▌ - Core ▯▯ - Blind Drill

Depth (ft)	Run No.	Sample Type	Sample Recov.	Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
		▌▌					(cont.) Gray to dark gray silty CLAY, moist, stiff; trace to some sand.	
	6	▌▌	3.1/4					
25		▌▌						-25.0
	7	▌▌	4.0/4					
30		▌▌						-30.0
	8	▌▌	3.4/4					
35	9	▌▌	4.0/4					-35.0
		▯▯						
							End of Boring = 38 Feet	
40								-40.0

Notes:

Illinois Environmental Protection Agency — Well Completion Report

Site #:
County: Sangamon
Well #: GP4

Site Name: Springfield CWLP Ash Pond
Borehole #: GP4

Coordinates: X ______ Y ______ (or) Latitude: ____° ____' ____" Longitude: ____° ____' ____"

Surveyed by: Andrews Engineering, Inc.
IL Registration #:

Drilling Contractor: Bulldog drilling
Consulting Firm: Andrews Engineering, Inc.

Driller: J. Edwards
Geologist: C. Myrvold

Drilling Method: CME 55cc 4.25 in HSA w/ 5'MC
Logged by: C.Myrvold

Drilling Fluids (type): N/A
Report Form Completed by: B. Kenning

Date Well Started: 5/17/19
Date Well Finished: 5/17/19
Date Form Completed: 7/19/2019

ANNULAR SPACE DETAILS

Type of surface seal:

Type of annular sealant: Bentonite Grout

Installation method: Tremie

Setting time: > 24 hours

Type of bentonite seal: Bentonite Chips

Installation method: Free Drop

Setting time: > 24 hours

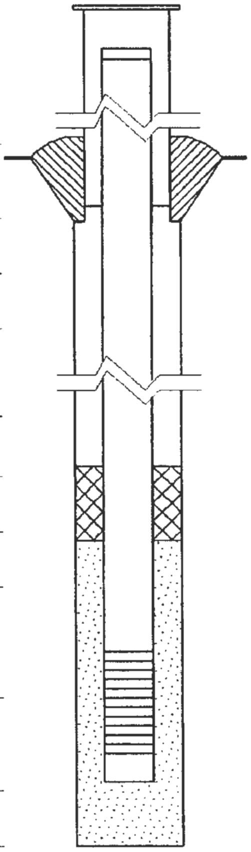
Type of sand pack: Silica Sand Pre-Pack

Grain size: 10/20 (sieve size)

Installation method: Free Drop

Type of backfill material: N/A (if applicable)

Installation method:



ELEVATION (MSL)*	DEPTH (BGS)*	(0.01 ft)
		Top of Protective Casing
	- 3.00'	Top of Riser Pipe
	0.00'	Ground Surface
	3.00'	Top of Annular Sealant
		Static Water Level Measured on (after completion)
	23.43'	Top of Seal
	25.43'	Top of Sandpack
	27.43'	Top of Screen
	37.20'	Bottom of Screen
	37.50'	Bottom of Well
	38.00'	Bottom of Borehole

* Referenced to a National Geodetic Vertical Datum
* positive (+) values below GS, negitive (-) values above GS

CASING MEASUREMENTS

Diameter of Borehole (in)	8.25
ID of Riser Pipe (in)	#2
Protective Casing Length (ft)	N/A
Riser Pipe Length (ft)	30.18
Bottom of Screen to End Cap (ft)	0.30
Screen Length [1st slot to last slot] (ft)	9.77
Total Length of Casing (ft)	N/A
Screen Slot Size*	#10 (0.01)

*Hand-slotted well screens are unacceptable.

WELL CONSTRUCTION MATERIALS

Protective Casing	N/A
Riser Pipe Above W.T.	PVC
Riser Pipe Below W.T.	PVC
Screen	PVC

Andrews Engineering, Inc.
3300 Ginger Creek Drive
Springfield, IL 62711

FIELD BORING LOG

Site Information:
Name: CWLP
Location: Springfield, IL
County: Sangamon
Site No.:
AEEI No.: 180247

Location:
Coord. System:
Northing: 0
Easting: 0

Weather:

Boring Information:
Boring No: GP5
Well No: GP5
Surf Elev.: 0

Depth Information:
Total: 15.5'
Auger: 15.5'
Core: N/A

Dates:
Start: 6/11/2019
Finish: 6/11/2019

Drilling Contractor:
Contractor Name: Bulldog Drilling
City: Dupo, IL
Equipment: CME 55cc w/ 4.25" HSA and 5' MC

Personnel:
Geologist: C. Myrvold
Driller: C. Clines
Helper(s): D. Smith

▮▮ - Continuous Barrel (CB) ▮ - Split Spoon (SS) ◣ - Shelby Tube ▮ - Core ▯▯ - Blind Drill

Depth (ft)	Sample			Blow Count	Lithology	Description/Comments	Elev. (MSL)
	Run No.	Type	Recov.				
						Ground Surface	0.0
0	1	▮▮	0.5		▨	Brown silty CLAY, moist, stiff.	
5	2	▮▮	4.5		▨	Brown to gray silty CLAY, moderately stiff, shows of iron oxidation.	-5.0
		▮▮			■	Black COAL, slightly moist, soft.	
10	3	▮▮	2		■		-10.0
	4	▮▮	3		░	Gray SHALE, weathered, dry, soft.	
15	5	▮▮	0.5		░		-15.0
						End of Boring = 15.5 Feet	
20							-20.0

Notes: Refusal at 15.5'; No well installation

Andrews Engineering, Inc.
3300 Ginger Creek Drive
Springfield, IL 62711

FIELD BORING LOG

Site Information:
Name: Springfield City Water Light and Power
Location: Springfield, IL
County: Sangamon
Site No.:
AEI No.: 180247

Location:
Coord. System:
Northing: 0
Easting: 0

Weather: 80's F, Sunny

Boring Information:
Boring No: GP6
Well No: GP6
Surf Elev.: 0

Depth Information:
Total: 37.0
Auger: 37.0
Core: N/A

Dates:
Start: 5/17/19
Finish: 5/17/19

Drilling Contractor:
Contractor Name: Bulldog Drilling, Inc.
City: Dupo, IL
Equipment: AMS PowerProbe 9500 w/ 5' MC

Personnel:
Geologist: C. Myrvold
Driller: J. Edwards
Helper(s): S. Guy

▮▮ - Continuous Barrel (CB) ■ - Split Spoon (SS) ◪ - Shelby Tube ▮ - Core ▯▯ - Blind Drill

Depth (ft)	Run No.	Sample		Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
		Type	Recov.					
							Ground Surface	0.0
0							Dark brown clayey silt TOPSOIL, moist, moderately loose.	
							Brown/gray silty CLAY to clayey SILT, moist, stiff.	
	1	▮▮	4.1/5					
5								-5.0
	2	▮▮	4.0/4					
10								-10.0
	3	▮▮	4.0/4				Brown silty SAND, fine-grained, saturated, loose.	
							Dark gray clayey SAND, fine-grained, wet to saturated, moderately loose, some silt.	
							Dark gray clayey SILT, moist, moderately stiff to stiff, some sand.	
15	4	▮▮	1.3/4					-15.0
	5	▮▮	3.0/4					
20								-20.0

Notes: refusal at 37'

Andrews Engineering, Inc.
3300 Ginger Creek Drive
Springfield, IL 62711

FIELD BORING LOG

Boring Information: GP6 Boring No: GP6 Well No: GP6

▌▌ - Continuous Barrel (CB) █ - Split Spoon (SS) ◣ - Shelby Tube ▐ - Core ▯▯ - Blind Drill

Depth (ft)	Run No.	Sample Type	Sample Recov.	Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
		▌▌				▨	(cont.) Dark gray clayey SILT, moist, moderately stiff to stiff, some sand.	
	6	▌▌	4.0/4			▨	Dark gray silty CLAY, moist, moderately stiff, some sand.	
25		▌▌				▨		-25.0
	7	▌▌	4.0/4			▨		
30		▌▌				▨		-30.0
	8	▌▌	2.7/4			▨		
35	9	▌▌	4.0/4			▨		-35.0
		▌▌				▨	Dark brownish gray clayey SAND, fine-grained, moist to wet, moderately loose.	
							End of Boring = 37 Feet	
40								-40.0

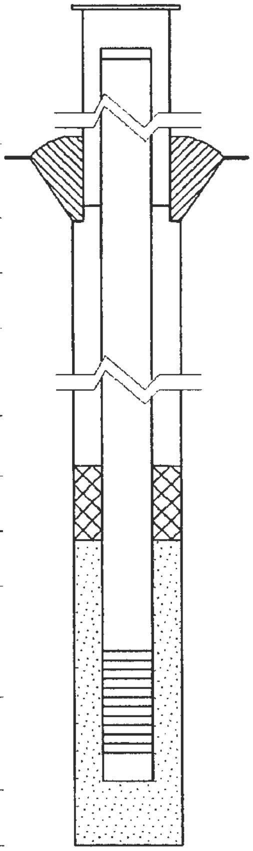
Notes: refusal at 37'

Illinois Environmental Protection Agency **Well Completion Report**

Site #:
County: Sangamon
Well #: GP6
Site Name: Springfield CWLP Ash Pond
Borehole #: GP6
Coordinates: X Y (or) Latitude: ° ' " Longitude: ° ' "
Surveyed by: Andrews Engineering, Inc.
IL Registration #:
Drilling Contractor: Bulldog drilling
Consulting Firm: Andrews Engineering, Inc.
Driller: J. Edwards
Geologist: C. Myrvold
Drilling Method: CME 55cc 4.25 in HSA w/ 5'MC
Logged by: C.Myrvold
Drilling Fluids (type): N/A
Report Form Completed by: B. Kenning
Date Well Started: 5/17/19
Date Well Finished: 5/17/19
Date Form Completed: 7/19/2019

ANNULAR SPACE DETAILS

Type of surface seal:
Type of annular sealant: Bentonite Grout
Installation method: Tremie
Setting time: > 24 hours
Type of bentonite seal: Bentonite Chips
Installation method: Free Drop
Setting time: > 24 hours
Type of sand pack: Silica Sand Pre-Pack
Grain size: 10/20 (sieve size)
Installation method: Free Drop
Type of backfill material: N/A (if applicable)
Installation method:



ELEVATION (MSL)*	DEPTH (BGS)*	(0.01 ft)
		Top of Protective Casing
	- 3.00'	Top of Riser Pipe
	0.00'	Ground Surface
	3.00'	Top of Annular Sealant
		Static Water Level Measured on (after completion)
	22.43'	Top of Seal
	24.43'	Top of Sandpack
	26.43'	Top of Screen
	36.20'	Bottom of Screen
	36.50'	Bottom of Well
	37.00'	Bottom of Borehole

* Referenced to a National Geodetic Vertical Datum
* positive (+) values below GS, negitive (-) values above GS

CASING MEASUREMENTS

Diameter of Borehole (in)	8.25
ID of Riser Pipe (in)	#2
Protective Casing Length (ft)	N/A
Riser Pipe Length (ft)	29.18
Bottom of Screen to End Cap (ft)	0.30
Screen Length (1st slot to last slot) (ft)	9.77
Total Length of Casing (ft)	N/A
Screen Slot Size*	#10 (0.01)

*Hand-slotted well screens are unacceptable.

WELL CONSTRUCTION MATERIALS

Protective Casing	N/A
Riser Pipe Above W.T.	PVC
Riser Pipe Below W.T.	PVC
Screen	PVC

Andrews Engineering, Inc.
3300 Ginger Creek Drive
Springfield, IL 62711

FIELD BORING LOG

Site Information:
Name: Springfield City Water Light and Power
Location: Springfield, IL
County: Sangamon
Site No.:
AEI No.: 180247

Location:
Coord. System:
Northing: 0
Easting: 0

Weather: 80's F, Sunny

Boring Information:
Boring No: GP7
Well No: GP7
Surf Elev.: 0

Depth Information:
Total: 36.5
Auger: 36.5
Core: N/A

Dates:
Start: 5/16/19
Finish: 5/16/19

Drilling Contractor:
Contractor Name: Bulldog Drilling, Inc.
City: Dupo, IL
Equipment: AMS PowerProbe 9500 w/ 5' MC

Personnel:
Geologist: C. Myrvold
Driller: J. Edwards
Helper(s): S. Guy

▌▌ - Continuous Barrel (CB) ▌ - Split Spoon (SS) ◣ - Shelby Tube ▌ - Core ▯▯ - Blind Drill

Depth (ft)	Run No.	Sample Type	Sample Recov.	Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
							Ground Surface	0.0
0		▌▌					Dark brown clayey silt TOPSOIL, moist, moderately loose.	
		▌▌					Brown/gray silty CLAY to clayey SILT, moist, stiff, trace sand.	
	1	▌▌	4.1/5					
5		▌▌						-5.0
	2	▌▌	4.0/4					
10		▌▌						-10.0
	3	▌▌	4.0/4					
		▌▌					Gray silty CLAY, moist, stiff.	
15	4	▌▌	2.7/4					-15.0
		▌▌					17.0 - 18.0: Soft, saturated.	
		▌▌					18.0 - 25.0: moderately loose to moderately stiff.	
	5	▌▌	4.0/4					
20		▌▌						-20.0

Notes: Refusal at 36.50'

Andrews Engineering, Inc.
3300 Ginger Creek Drive
Springfield, IL 62711

FIELD BORING LOG

Boring Information: GP7 Boring No: GP7 Well No: GP7

▮▮ - Continuous Barrel (CB) █ - Split Spoon (SS) ◣ - Shelby Tube ▯▮ - Core ▯▯ - Blind Drill

Depth (ft)	Run No.	Sample Type	Sample Recov.	Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
		▮▮					(cont.) Gray silty CLAY, moist, stiff.	
	6	▮▮	4.0/4				23.0 - 25.0: gray to brown/gray.	
25	7	▮▮	3.1/4				Dark gray silty CLAY, moist, moderately stiff; some sand.	-25.0
		▮▮					Dark gray silty SAND, fine-grained, wet, loose, some clay.	
30	8	▮▮	3.7/4					-30.0
35	9	▮▮	3.5/ 3.5					-35.0
		▮▮					Gray to dark gray SHALE, weathered, soft, dry.	
							End of Boring = 36.5 Feet	
40								-40.0

Notes: Refusal at 36.50'

Illinois Environmental Protection Agency

Well Completion Report

Site #:
County: Sangamon
Well #: GP7

Site Name: Springfield CWLP Ash Pond
Borehole #: GP7

Coordinates: X ______ Y ______ (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed by: Andrews Engineering, Inc.
IL Registration #:

Drilling Contractor: Bulldog drilling
Consulting Firm: Andrews Engineering, Inc.

Driller: J. Edwards
Geologist: C. Myrvold

Drilling Method: CME 55cc 4.25 in HSA w/ 5'MC
Logged by: C.Myrvold

Drilling Fluids (type): N/A
Report Form Completed by: B. Kenning

Date Well Started: 5/16/2019
Date Well Finished: 5/16/2019
Date Form Completed: 7/19/2019

ANNULAR SPACE DETAILS

Type of surface seal:

Type of annular sealant: Bentonite Grout

Installation method: Tremie

Setting time: > 24 hours

Type of bentonite seal: Bentonite Chips

Installation method: Free Drop

Setting time: > 24 hours

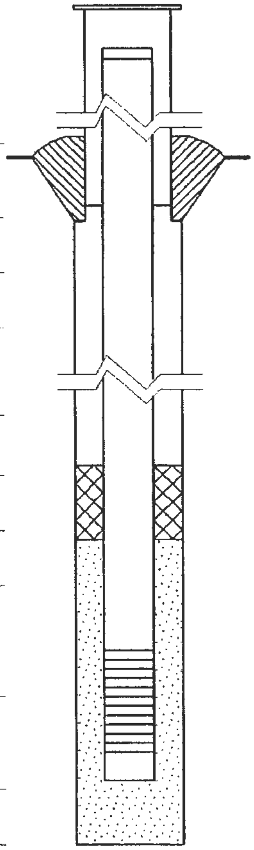
Type of sand pack: Silica Sand Pre-Pack

Grain size: 10/20 (sieve size)

Installation method: Free Drop

Type of backfill material: N/A (if applicable)

Installation method:



ELEVATION (MSL)*	DEPTH (BGS)*	(0.01 ft)
		Top of Protective Casing
	- 3.08'	Top of Riser Pipe
	0.00'	Ground Surface
	3.00'	Top of Annular Sealant
		Static Water Level Measured on (after completion)
	21.93'	Top of Seal
	23.93'	Top of Sandpack
	25.93'	Top of Screen
	35.70'	Bottom of Screen
	36.00'	Bottom of Well
	36.50'	Bottom of Borehole

* Referenced to a National Geodetic Vertical Datum

* positive (+) values below GS, negitive (-) values above GS

CASING MEASUREMENTS

Diameter of Borehole (in)	8.25
ID of Riser Pipe (in)	#2
Protective Casing Length (ft)	N/A
Riser Pipe Length (ft)	28.76
Bottom of Screen to End Cap (ft)	0.30
Screen Length (1st slot to last slot) (ft)	9.77
Total Length of Casing (ft)	N/A
Screen Slot Size*	#10 (0.01)

*Hand-slotted well screens are unacceptable.

WELL CONSTRUCTION MATERIALS

Protective Casing	N/A
Riser Pipe Above W.T.	PVC
Riser Pipe Below W.T.	PVC
Screen	PVC

Andrews Engineering, Inc.
3300 Ginger Creek Drive
Springfield, IL 62711

FIELD BORING LOG

Site Information:
Name: Springfield City Water Light and Power
Location: Springfield, IL
County: Sangamon
Site No.:
AEI No.: 180247

Location:
Coord. System:
Northing: 0
Easting: 0

Weather: 80's F, Sunny

Boring Information:
Boring No: GP8
Well No: GP8
Surf Elev.: 0

Depth Information:
Total: 42.0
Auger: 42.0
Core: N/A

Dates:
Start: 5/15/19
Finish: 5/16/19

Drilling Contractor:
Contractor Name: Bulldog Drilling, Inc.
City: Dupo, IL
Equipment: AMS PowerProbe 9500 w/ 5' MC

Personnel:
Geologist: C. Myrvold
Driller: J. Edwards
Helper(s): S. Guy

▮▮ - Continuous Barrel (CB) ▮ - Split Spoon (SS) ◣ - Shelby Tube ▮ - Core ▯▯ - Blind Drill

Depth (ft)	Run No.	Sample Type	Sample Recov.	Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
							Ground Surface	0.0
0		▮▮					Dark brown clayey SILT, moist to wet, loose.	
		▮▮					Brown silty CLAY, moist, stiff, trace sand, black mottling.	
	1	▮▮	2.7/4					
5		▮▮						-5.0
	2	▮▮	3.3/4					
10	3	▮▮	4.0/4					-10.0
	4	▮▮	4.0/4				Gray silty CLAY, moist, moderately stiff.	
15		▮▮						-15.0
	5	▮▮	4.0/4					
20		▮▮						-20.0

Notes: Refusal at 42.00'

FIELD BORING LOG

Boring Information: GP8 Boring No: GP8 Well No: GP8

▮▮ - Continuous Barrel (CB) ▮ - Split Spoon (SS) ◣ - Shelby Tube ▯▮ - Core ▯▯ - Blind Drill

Depth (ft)	Run No.	Sample Type	Sample Recov.	Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
		▮▮					(cont.) Gray silty CLAY, moist, moderately stiff.	
	6	▮▮	2.2/4					
25		▮▮						-25.0
	7	▮▮	4.0/4					
30	8	▮▮	4.0/4					-30.0
	9	▮▮	4.0/4					
35		▮▮					Dark gray clayey SAND, fine-grained, moist, moderately stiff.	-35.0
	10	▮▮	4.0/4					
40		▮▮						-40.0

Notes: Refusal at 42.00'

Andrews Engineering, Inc.
3300 Ginger Creek Drive
Springfield, IL 62711

FIELD BORING LOG

Boring Information: GP8 Boring No: GP8 Well No: GP8

▌▌ - Continuous Barrel (CB) ▌ - Split Spoon (SS) ◣ - Shelby Tube ☐▌ - Core ☐☐ - Blind Drill

Depth (ft)	Run No.	Sample		Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
		Type	Recov.					
	11	▌▌	2.0/2			▨		
						▨	Gray to dark gray weathered SHALE, soft, slightly moist.	
							End of Boring = 42 Feet	
45								-45.0
50								-50.0
55								-55.0
60								-60.0

Notes: Refusal at 42.00'

Illinois Environmental Protection Agency **Well Completion Report**

Site #: County: Sangamon Well #: GP8

Site Name: Springfield CWLP Ash Pond Borehole #: GP8

Coordinates: X Y (or) Latitude: ° ' " Longitude: ° ' "

Surveyed by: Andrews Engineering, Inc. IL Registration #:

Drilling Contractor: Bulldog drilling Consulting Firm: Andrews Engineering, Inc.

Driller: J. Edwards Geologist: C. Myrvold

Drilling Method: CME 55cc 4.25 in HSA w/ 5'MC Logged by: C.Myrvold

Drilling Fluids (type): N/A Report Form Completed by: B. Kenning

Date Well Started: 5/15/19 Date Well Finished: 5/16/19 Date Form Completed: 7/19/2019

ANNULAR SPACE DETAILS

Type of surface seal:

Type of annular sealant: Bentonite Grout

Installation method: Tremie

Setting time: > 24 hours

Type of bentonite seal: Bentonite Chips

Installation method: Free Drop

Setting time: > 24 hours

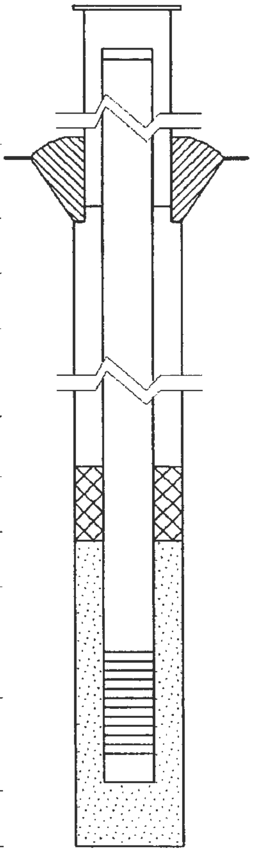
Type of sand pack: Silica Sand Pre-Pack

Grain size: 10/20 (sieve size)

Installation method: Free Drop

Type of backfill material: N/A (if applicable)

Installation method:



ELEVATION (MSL)*	DEPTH (BGS)•	(0.01 ft)
		Top of Protective Casing
	- 3.00'	Top of Riser Pipe
	0.00'	Ground Surface
	3.00'	Top of Annular Sealant
		Static Water Level Measured on (after completion)
	27.43'	Top of Seal
	29.43'	Top of Sandpack
	31.43'	Top of Screen
	41.20'	Bottom of Screen
	41.50'	Bottom of Well
	42.00'	Bottom of Borehole

* Referenced to a National Geodetic Vertical Datum
• positive (+) values below GS, negitive (-) values above GS

CASING MEASUREMENTS

Diameter of Borehole (in)	8.50
ID of Riser Pipe (in)	#2
Protective Casing Length (ft)	N/A
Riser Pipe Length (ft)	34.18
Bottom of Screen to End Cap (ft)	0.30
Screen Length (1st slot to last slot) (ft)	9.77
Total Length of Casing (ft)	N/A
Screen Slot Size†	#10 (0.01)

† Hand-slotted well screens are unacceptable.

WELL CONSTRUCTION MATERIALS

Protective Casing	N/A
Riser Pipe Above W.T.	PVC
Riser Pipe Below W.T.	PVC
Screen	PVC

ANDREWS ENGINEERING
3300 Ginger Creek Drive - 217.787.2334
Springfield, IL 62711

FIELD BORING LOG

Site Information:
Name: CWLP
Location: Springfield, IL.
County: Sangamon
Site No.:
AEI No.: 200387

Location:
Coord. System:
Northing: 3401.7
Easting: 1265.0

Weather: 52F Sunny

Boring Information:
Boring No: W-9
Well No: AP-8
Surf Elev.: 7.00

Depth Information:
Total: 39.6
Auger: 4.25" HSA
Core: 5ft. Continuous Sampler

Dates:
Start: 2/25/2021
Finish: 2/25/2021

Drilling Contractor:
Contractor Name: Total Drilling Services/Skinner ltd.
City: Hindsboro, IL.
Equipment: CME 850

Personnel:
Geologist: C.M. Latham
Driller: Todd Skinner
Helper(s): A. Bruce

- Continuous Barrel (CB) | - Split Spoon (SS) | - Shelby Tube | - Core | - Blind Drill

Depth (ft)	Run No.	Sample Type	Sample Recov.	Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
							Ground Surface	0.0
0							**SILTY TOPSOIL** Dark brown, organic roots, moist, low-moderate firm.	
	1		4/5				**SILTY CLAY** Dark brown, firm, moist.	
							Mottling with light brown and grey silty clay. Oxidation. 3'-5'.	
5							**CLAYEY SILT** Grey, oxidation mottling, moist, soft.	-5.0
	2		5/5				Increased oxidation at 8'	
							SAND SEAM Fine-grained, well sorted, subrounded, saturated, soft.	
10							**CLAYEY SILT** Grey, oxidation, moist, soft.	-10.0
							SILTY CLAY Light grey, moist, soft	
	3		5/5					
15								-15.0
	4		5/5					
20								-20.0

Notes:

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3300 Ginger Creek Drive - 217.787.2334
Springfield, IL 62711

FIELD BORING LOG

Boring Information: W-9 Boring No: W-9 Well No: AP-8

▮▮ - Continuous Barrel (CB) ▮☐ - Split Spoon (SS) ◣ - Shelby Tube ☐▮ - Core ▯▯ - Blind Drill

Depth (ft)	Run No.	Sample Type	Sample Recov.	Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
	5	▮▮	5/5				**CLAYEY SILT** Brown, moist, soft-firm. Organic roots at 20' Mottling with grey clay at 23.5'	
							SILTY CLAY Grey, moist, soft.	
25							**SILTY CLAY** Dark grey, firm, moist. Mottled dark grey clay with blue clay at 26.5'	-25.0
	6	▮▮	5/5				**CLAY** Dark grey, firm, moist. Mottled dark grey clay with blue clay at 26.5'	
30	7	▮▮	5/5				**SILTY CLAY** Blue, with trace organic coal fragments, moist, soft, moderate plasticity.	-30.0
							CLAYEY SILT WITH SAND Moist, poorly sorted, trace coal.	
35	8	▮▮	3.5/5					-35.0
							SAND Loose sands, saturated, poorly sorted.	
	9	▮☐		60 40			**SHALE** Blue, moist, weathered, with lamination.	
40							End of Boring = 39.6 Feet	-40.0

Notes:

Illinois Environmental Protection Agency

Well Completion Report

PDF 0869

Site #: County: Sangamon Well #: AP-8

Site Name: Springfield CWLP Ash Pond Borehole #: W-9

Coordinates: X 1265.0 Y 3401.7 (or) Latitude: ° ' " Longitude: ° ' "

Surveyed by: Andrews Engineering, Inc. IL Registration #:

Drilling Contractor: Total Drilling Services/Skinner LTD. Consulting Firm: Andrews Engineering, Inc.

Driller: Todd Skinner Geologist: C. M. Latham

Drilling Method: CME 850 4.25 in HSA w/ 5'MC and 2' SS Logged by: C.M.Latham

Drilling Fluids (type): N/A Report Form Completed by: C.M. Latham

Date Well Started: 2/25/2021 Date Well Finished: 2/25/2021 Date Form Completed: 3/2/2021

ANNULAR SPACE DETAILS

Type of surface seal: Concrete

Type of annular sealant: Bentonite Chips

Installation method: Free Drop

Setting time: > 24

Type of bentonite seal: Bentonite Chips

Installation method: Free Drop

Setting time: > 24 hours

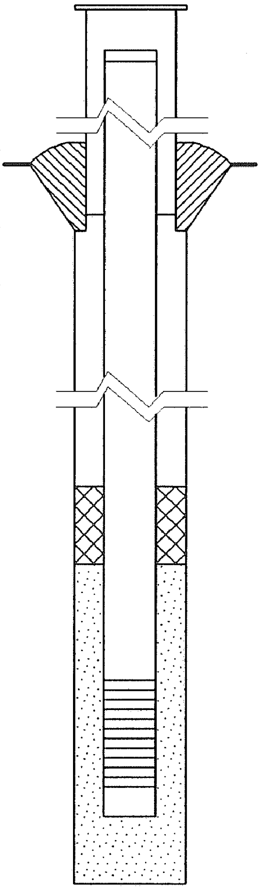
Type of sand pack: Silica Sand Pre-Pack

Grain size: 20/40 (sieve size)

Installation method: Free Drop

Type of backfill material: N/A (if applicable)

Installation method:



ELEVATION (MSL)[®]	DEPTH (BGS)[*]	(0.01 ft)
540.30	-3.10	Top of Protective Casing
540.30	-3.10	Top of Riser Pipe
537.20	0.00	Ground Surface
534.20	3.00	Top of Annular Sealant
530.20	7.00	Static Water Level Measured on (after completion)
	3.00	Top of Seal
510.60	26.60	Top of Sandpack
508.60	28.60	Top of Screen
498.02	39.18	Bottom of Screen
497.60	39.60	Bottom of Well
497.60	39.60	Bottom of Borehole

[®] Referenced to a National Geodetic Vertical Datum
[*] positive (+) values below GS, negitive (-) values above GS

CASING MEASUREMENTS

Diameter of Borehole (in)	8.25
ID of Riser Pipe (in)	
Protective Casing Length (ft)	N/A
Riser Pipe Length (ft)	29.48'
Bottom of Screen to End Cap (ft)	0.42
Screen Length [1st slot to last slot] (ft)	9.70
Total Length of Casing (ft)	N/A
Screen Slot Size[¥]	#10 (0.01)

[¥] Hand-slotted well screens are unacceptable.

WELL CONSTRUCTION MATERIALS

Protective Casing	N/A
Riser Pipe Above W.T.	PVC
Riser Pipe Below W.T.	PVC
Screen	PVC

PDF 0870

FIELD BORING LOG

Site Information:
Name: CWLP
Location: Springfield, IL.
County: Sangamon
Site No.:
AEI No.: 200387

Location:
Coord. System:
Northing: 5216.8
Easting: 703.0

Weather: 43F Sunny

Boring Information:
Boring No: W-8
Well No: AP-9
Surf Elev.: 9.30

Depth Information:
Total: 32.5ft.
Auger: 4.25". HSA
Core: 5ft. Continuous Sampler

Dates:
Start: 2/26/2021
Finish: 2/26/2021

Drilling Contractor:
Contractor Name: Total Drilling Services/Skinner ltd.
City: Hindsboro, IL.
Equipment: CME 850

Personnel:
Geologist: C.M. Latham
Driller: Todd Skinner
Helper(s): A. Bruce

- Continuous Barrel (CB) - Split Spoon (SS) - Shelby Tube - Core - Blind Drill

Depth (ft)	Run No.	Sample Type	Sample Recov.	Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
							Ground Surface	0.0
0	1		5/5				**CLAYEY SILT** Dark brown, organic roots and leaves, moist, soft.	
							CLAYEY SILT Dark brown, moist, firm, slight mottling with dark grey clay.	
5	2		4.5				**SILTY CLAY** Medium brown, silty clay, soft, high plasticity, moist.	-5.0
10	3		4.5/5				Oxidation at 11' Moderate mottling with dark grey clay at 12 ft.	-10.0
15	4		5/5				**SILTY CLAY** Dark grey, moist, soft, high plasticity.	-15.0
							CLAY Light grey clay, moist, soft, mottled with brown clay and oxidation.	
20								-20.0

Notes:

ANDREWS ENGINEERING
3300 Ginger Creek Drive - 217.787.2334
Springfield, IL 62711

FIELD BORING LOG

Boring Information: W-8 Boring No: W-8 Well No: AP-9

- Continuous Barrel (CB) - Split Spoon (SS) - Shelby Tube - Core - Blind Drill

Depth (ft)	Run No.	Sample		Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
		Type	Recov.					
	5		5/5				**SILTY CLAY** Brown, moist, firm, mottled with oxidation. Mottled with blue clay and oxidation.	
							CLAY Blue clay, moist, firm, high plasticity. Increasing silt content.	
25								-25.0
	6		4.5/5				**CLAYEY SILT WITH SAND** Poorly sorted, moist. Gradation to heavier sand content; poorly sorted, moist.	
							SAND AND GRAVEL Sand and gravel with organic coal fragments; moist, poorly sorted.	
							SHALE Grey, laminated, weathered, shale. Firm, Moist.	
30								-30.0
	7			30 88 4				
							End of Boring = 32.5 Feet	
35								-35.0
40								-40.0

Notes:

Illinois Environmental Protection Agency

Well Completion Report

Site #: ______ County: Sangamon Well #: AP-9

Site Name: Springfield CWLP Ash Pond Borehole #: W-8

Coordinates: X 703.0 Y 5216.8 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed by: Andrews Engineering, Inc. IL Registration #: ______

Drilling Contractor: Total Drilling Services/Skinner LTD. Consulting Firm: Andrews Engineering, Inc.

Driller: Todd Skinner Geologist: C. M. Latham

Drilling Method: CME 850 4.25 in HSA w/ 5'MC and 2' SS Logged by: C.M. Latham

Drilling Fluids (type): N/A Report Form Completed by: C.M. Latham

Date Well Started: 2/26/2021 Date Well Finished: 2/26/2021 Date Form Completed: 3/2/2021

ANNULAR SPACE DETAILS

Type of surface seal: Concrete

Type of annular sealant: Bentonite Chips

Installation method: Free Drop

Setting time: > 24

Type of bentonite seal: Bentonite Chips

Installation method: Free Drop

Setting time: > 24 hours

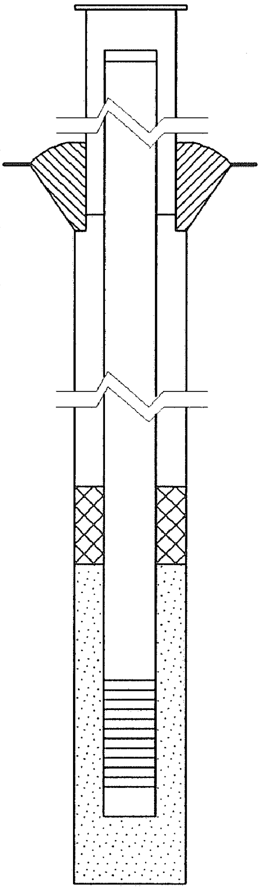
Type of sand pack: Silica Sand Pre-Pack

Grain size: 20/40 (sieve size)

Installation method: Free Drop

Type of backfill material: N/A (if applicable)

Installation method: ______



ELEVATION (MSL)®	DEPTH (BGS)*	(0.01 ft)
537.20	-2.90	Top of Protective Casing
537.20	-2.90	Top of Riser Pipe
534.30	0.00	Ground Surface
531.30	3.00	Top of Annular Sealant
525.00	9.30	Static Water Level Measured on (after completion)
	3.00	Top of Seal
514.00	20.30	Top of Sandpack
512.00	22.30	Top of Screen
502.24	32.06	Bottom of Screen
501.80	32.50	Bottom of Well
501.80	32.50	Bottom of Borehole

® Referenced to a National Geodetic Vertical Datum
* positive (+) values below GS, negitive (-) values above GS

CASING MEASUREMENTS

Diameter of Borehole (in)	8.25
ID of Riser Pipe (in)	
Protective Casing Length (ft)	N/A
Riser Pipe Length (ft)	24.91
Bottom of Screen to End Cap (ft)	0.44
Screen Length [1st slot to last slot] (ft)	9.76
Total Length of Casing (ft)	N/A
Screen Slot Size¥	#10 (0.01)

¥Hand-slotted well screens are unacceptable.

WELL CONSTRUCTION MATERIALS

Protective Casing	N/A
Riser Pipe Above W.T.	PVC
Riser Pipe Below W.T.	PVC
Screen	PVC

ANDREWS ENGINEERING

3300 Ginger Creek Drive - 217.787.2334
Springfield, IL 62711

FIELD BORING LOG

Site Information:
Name: CWLP
Location: Springfield
County: Sangamon
Site No.:
AEI No.: 200387

Location:
Coord. System:
Northing: 4684.0
Easting: 695.6

Weather: 40F Partly cloudy

Boring Information:
Boring No: W-5
Well No: AP-10
Surf Elev.: 6.02

Depth Information:
Total: 34.97
Auger: 4.25" HSA
Core: 5ft. Continous Sampler

Dates:
Start: 2/24/2021
Finish: 2/24/2021

Drilling Contractor:
Contractor Name: Total Drilling Services/Skinner ltd.
City: Hindsboro, Il.
Equipment: CME 850

Personnel:
Geologist: C.M. Latham
Driller: Todd Skinner
Helper(s): A. Bruce

- Continuous Barrel (CB) - Split Spoon (SS) - Shelby Tube - Core - Blind Drill

Depth (ft)	Run No.	Sample Type	Sample Recov.	Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
							Ground Surface	0.0
0	1		2.5/5				**SILTY TOPSOIL** Dark brown, moist, very firm, hard silt in shoe.	
							SILT Medium brown, moist, very firm, hard silt in shoe.	
5	2		4/4				**CLAYEY SILT** Brown, moist, soft, homogenous.	-5.0
							SILTY CLAY Brown, high plasticity, moist, very soft, homogenous. Trace sand seen in top of barrel.	
10	3		5				Wet from 10'-15' Free water at 12'5"	-10.0
15	4		5				**SILTY CLAY** Grey, soft, moist. Fine sands, trace gravels at 17'	-15.0
							CLAYEY SILT WITH SAND Blueish grey with trace gravel, soft, moderate sorting.	
20								-20.0

Notes:

ANDREWS ENGINEERING
3300 Ginger Creek Drive - 217.787.2334
Springfield, IL 62711

FIELD BORING LOG

Boring Information: W-5 Boring No: W-5 Well No: AP-10

▌▌ - Continuous Barrel (CB) ◧ - Split Spoon (SS) ◣ - Shelby Tube ▌ - Core ▯▯ - Blind Drill

Depth (ft)	Run No.	Sample Type	Sample Recov.	Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
	5		5/5				**SANDY GRAVEL** Poorly sorted, sub rounded, saturated, unconsolidated sands. Poorly sorted angular gravel. **SILTY CLAY** Blue, high plasticity, firm, moist, tight clay. Very thin sand seam, fine grained, saturated at 23' Very thin sand seam, fine grained, saturated at 29.5'	
25	6		5/5					-25.0
30	7		4/5	33			**DIAMICTON** Blue, subrounded, poorly sorted sandy clay, with angular coal up to 0.3ft. Angular gravels; poorly sorted. Trace silts, saturated. Gradation into larger gravel and sand clasts towards bottom with trace silts and no clay. **SHALE** Grey, moist, with lamination.	-30.0
35	8			60			End of Boring = 34.97 Feet	-35.0
40								-40.0

Notes:

PDF 0875

Illinois Environmental Protection Agency

Well Completion Report

Site #: 　County: Sangamon　Well #: AP-10

Site Name: Springfield CWLP Ash Pond　Borehole #: W-5

Coordinates: X 695.6　Y 4684.0　(or) Latitude: ° ' " Longitude: ° ' "

Surveyed by: Andrews Engineering, Inc.　IL Registration #:

Drilling Contractor: Total Drilling Services/Skinner LTD.　Consulting Firm: Andrews Engineering, Inc.

Driller: Todd Skinner　Geologist: C. M. Latham

Drilling Method: CME 850 4.25 in HSA w/ 5'MC and 2' SS　Logged by: C.M. Latham

Drilling Fluids (type): N/A　Report Form Completed by: C.M. Latham

Date Well Started: 2/24/2021　Date Well Finished: 2/24/2021　Date Form Completed: 3/2/2021

ANNULAR SPACE DETAILS

Type of surface seal: Concrete

Type of annular sealant: Bentonite Chips

Installation method: Free Drop

Setting time: > 24

Type of bentonite seal: Bentonite Chips

Installation method: Free Drop

Setting time: > 24 hours

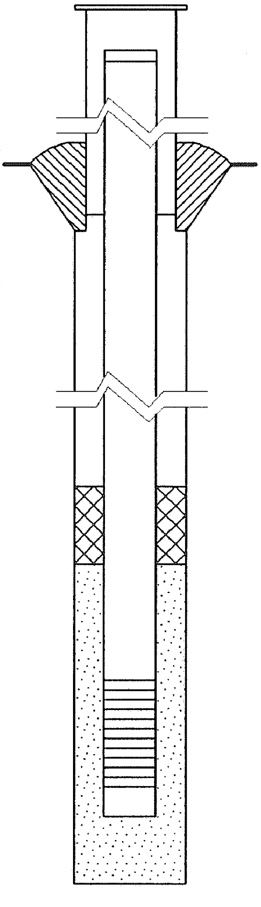
Type of sand pack: Silica Sand Pre-Pack

Grain size: 20/40 (sieve size)

Installation method: Free Drop

Type of backfill material: N/A (if applicable)

Installation method:



ELEVATION (MSL)®	DEPTH (BGS)*	(0.01 ft)
537.50	-3.10	Top of Protective Casing
537.50	-3.10	Top of Riser Pipe
534.40	0.00	Ground Surface
531.40	3.00	Top of Annular Sealant
528.38	6.02	Static Water Level Measured on (after completion)
	3.00	Top of Seal
511.80	22.60	Top of Sandpack
509.70	24.70	Top of Screen
499.89	34.51	Bottom of Screen
499.43	34.97	Bottom of Well
499.43	34.97	Bottom of Borehole

® Referenced to a National Geodetic Vertical Datum

* positive (+) values below GS, negitive (-) values above GS

CASING MEASUREMENTS

Diameter of Borehole (in)	8.25
ID of Riser Pipe (in)	
Protective Casing Length (ft)	N/A
Riser Pipe Length (ft)	29.48'
Bottom of Screen to End Cap (ft)	0.46
Screen Length [1st slot to last slot] (ft)	9.71
Total Length of Casing (ft)	N/A
Screen Slot Size¥	#10 (0.01)

¥Hand-slotted well screens are unacceptable.

WELL CONSTRUCTION MATERIALS

Protective Casing	N/A
Riser Pipe Above W.T.	PVC
Riser Pipe Below W.T.	PVC
Screen	PVC

ANDREWS ENGINEERING
3300 Ginger Creek Drive - 217.787.2334
Springfield, IL 62711

FIELD BORING LOG

Site Information:
Name: CWLP Ash Pond
Location: Springfield, IL
County: Sangamon
Site No.:
AEI No.: 200387-0025

Location:
Coord. System:
Northing: 4150.6
Easting: 524.5

Weather: Clear 40s

Boring Information:
Boring No: W-4
Well No: AP-11
Surf Elev.: NA

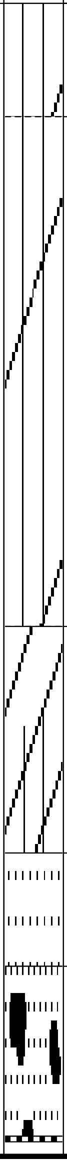
Depth Information:
Total: 20.1
Auger: 4.25" HSA
Core: 5ft continous sampler

Dates:
Start: 2/23/2021
Finish: 2/23/2021

Drilling Contractor:
Contractor Name: Total Drilling Services/Skinner LTD
City: Hindsboro
Equipment: CME 850

Personnel:
Geologist: Scott Kangas
Driller: Todd Skinner
Helper(s): Adam Bruce

▮ - Continuous Barrel (CB) ■ - Split Spoon (SS) ◥ - Shelby Tube ■ - Core ▯ - Blind Drill

Depth (ft)	Run No.	Sample Type	Sample Recov.	Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
							Ground Surface	0.0
0							**CLAYEY SILT TOPSILT** Black to dark brown, moist, soft to moderately stiff.	
	1		3.5/5				**CLAYEY SILT** Dark brown, moist, stiff to hard, homogenous.	
5	2		3.75/5				Very hard, trace fine sand, and oxidation with depth	-5.0
10	3		5/5				**SILTY CLAY** Olive gray, moist, soft, heavily oxidated, trace fine sand that increases with depth	-10.0
15	4		2.5/5				**CLAYEY SAND** Dark Gray to reddish brown with depth, wet, soft, fine well sorted sand	-15.0
							GRAVEL AND SAND Gray, poorly sorted up to 1" angular pieces, wet	
20								-20.0

Notes:

ANDREWS ENGINEERING
3300 Ginger Creek Drive - 217.787.2334
Springfield, IL 62711

FIELD BORING LOG

Boring Information: W-4 Boring No: W-4 Well No: AP-11

▌▌ - Continuous Barrel (CB) █☐ - Split Spoon (SS) ◣ - Shelby Tube ☐█ - Core ▯▯ - Blind Drill

Depth (ft)	Run No.	Sample		Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
		Type	Recov.					
							SHALE Weathered, gray	
							End of Boring = 20.1 Feet	
25								-25.0
30								-30.0
35								-35.0
40								-40.0

Notes:

PDF 0878

Illinois Environmental Protection Agency

Well Completion Report

Site #: County: Sangamon Well #: AP-11

Site Name: Springfield CWLP Ash Pond Borehole #: W-4

Coordinates: X 524.5 Y 4150.6 (or) Latitude: ° ' " Longitude: ° ' "

Surveyed by: Andrews Engineering, Inc. IL Registration #:

Drilling Contractor: Total Drilling Services/Skinner LTD Consulting Firm: Andrews Engineering, Inc.

Driller: Todd Skinner Geologist: S Kangas

Drilling Method: CME 850 4.25 in HSA w/ 5'MC and 2' SS Logged by: S Kangas

Drilling Fluids (type): N/A Report Form Completed by: S Kangas

Date Well Started: 2/23/2021 Date Well Finished: 2/23/2021 Date Form Completed: 3/2/2021

ANNULAR SPACE DETAILS

Type of surface seal: Concrete

Type of annular sealant: Bentonite Chips

Installation method: Free Drop

Setting time: >24

Type of bentonite seal: Bentonite Chips

Installation method: Free Drop

Setting time: > 24 hours

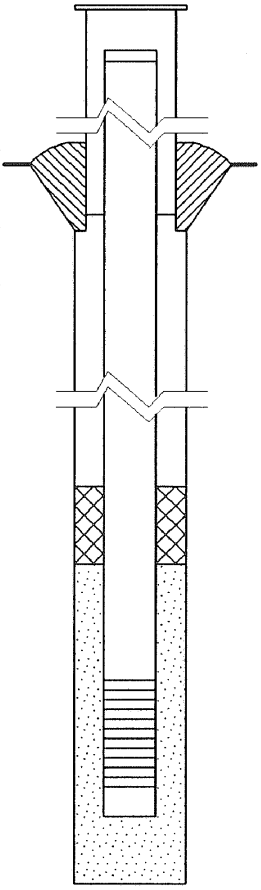
Type of sand pack: Silica Sand Pre-Pack

Grain size: 20/40 (sieve size)

Installation method: Free Drop

Type of backfill material: N/A (if applicable)

Installation method:



ELEVATION (MSL)®	DEPTH (BGS)*	(0.01 ft)
538.10	-2.80	Top of Protective Casing
538.10	-2.80	Top of Riser Pipe
535.30	0.00	Ground Surface
531.80	3.50	Top of Annular Sealant
		Static Water Level Measured on (after completion)
531.80	3.50	Top of Seal
527.60	7.70	Top of Sandpack
525.28	10.02	Top of Screen
515.58	19.72	Bottom of Screen
515.15	20.15	Bottom of Well
515.15	20.15	Bottom of Borehole

® Referenced to a National Geodetic Vertical Datum

* positive (+) values below GS, negitive (-) values above GS

CASING MEASUREMENTS

Diameter of Borehole (in)	8.25
ID of Riser Pipe (in)	#2
Protective Casing Length (ft)	N/A
Riser Pipe Length (ft)	14.96
Bottom of Screen to End Cap (ft)	0.43
Screen Length (1st slot to last slot) (ft)	9.70
Total Length of Casing (ft)	N/A
Screen Slot Size¥	#10 (0.01)

¥Hand-slotted well screens are unacceptable.

WELL CONSTRUCTION MATERIALS

Protective Casing	N/A
Riser Pipe Above W.T.	PVC
Riser Pipe Below W.T.	PVC
Screen	PVC

ANDREWS ENGINEERING

3300 Ginger Creek Drive - 217.787.2334
Springfield, IL 62711

FIELD BORING LOG

Site Information:
Name: CWLP Ash Pond
Location: Springfield, IL
County: Sangamon
Site No.:
AEI No.: 200387-0025

Location:
Coord. System:
Northing: 3797.7
Easting: 667.6

Weather: Clear 40s

Boring Information:
Boring No: W-3
Well No: AP-12
Surf Elev.: NA

Depth Information:
Total: 27.3
Auger: 4.25" HSA
Core: 5ft continous sampler

Dates:
Start: 2/23/2021
Finish: 2/23/2021

Drilling Contractor:
Contractor Name: Total Drilling Services/Skinner LTD
City: Hindsboro, IL
Equipment: CME 850

Personnel:
Geologist: Scott Kangas
Driller: Todd Skinner
Helper(s): Adam Bruce

▮▮ - Continuous Barrel (CB) ▮ - Split Spoon (SS) ◣ - Shelby Tube ▮ - Core ▯▯ - Blind Drill

Depth (ft)	Run No.	Sample Type	Sample Recov.	Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
							Ground Surface	0.0
0	1	▮▮	4/5				**CLAYEY SILT TOPSOIL** Dark brown, moist, soft to slightly stiff, root structures	
							CLAYEY SILT Brown, moist, stiff to hard, heavily oxidated, homogenous	
5	2	▮▮	4/5				**SILT** Light gray, moist, firm to hard, heavily oxidated, mottling, homogenous.	-5.0
10	3	▮▮	5/5				**CLAYEY SILT** Brown, moist, stiff to hard, moderate oxidation Lighter in color, trace fine sand, and increase clay content with depth	-10.0
15	4	▮▮	4/5					-15.0
							SANDY CLAY Gray, wet, soft, fine sand, well sorted and homgenous	
20								-20.0

Notes:

FIELD BORING LOG

Boring Information: W-3 Boring No: W-3 Well No: AP-12

▮▮ - Continuous Barrel (CB) ▮▯ - Split Spoon (SS) ◣ - Shelby Tube ▯▮ - Core ▯▯ - Blind Drill

Depth (ft)	Run No.	Sample		Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
		Type	Recov.					
	5	▮▮	2.5/ 2.5					
	6	▮▮	2/2.5				**CLAYEY SAND** Dark gray, wet, stiff, well sorted fine sand	
							GRAVEL AND SAND Gray, poorly sorted, angular to subangular, 1.5" or less in size	
25	7	▮▮	2.3/ 2.3				**SHALE** Gray, weathered	-25.0
							End of Boring = 27.3 Feet	
30								-30.0
35								-35.0
40								-40.0

Notes:

Illinois Environmental Protection Agency

Well Completion Report

PDF 0881

Site #: County: Sangamon Well #: AP-12

Site Name: Springfield CWLP Ash Pond Borehole #: W-3

Coordinates: X 667.6 Y 3797.7 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed by: Andrews Engineering, Inc. IL Registration #:

Drilling Contractor: Total Drilling Services/Skinner LTD. Consulting Firm: Andrews Engineering, Inc.

Driller: Todd Skinner Geologist: C. M. Latham

Drilling Method: CME 850 4.25 in HSA w/ 5'MC and 2' SS Logged by: Scott Krangus

Drilling Fluids (type): N/A Report Form Completed by: C.M. Latham

Date Well Started: 2/23/2021 Date Well Finished: 2/24/2021 Date Form Completed: 3/2/2021

ANNULAR SPACE DETAILS

Type of surface seal: Concrete

Type of annular sealant: Bentonite Chips

Installation method: Free Drop

Setting time: > 24

Type of bentonite seal: Bentonite Chips

Installation method: Free Drop

Setting time: > 24 hours

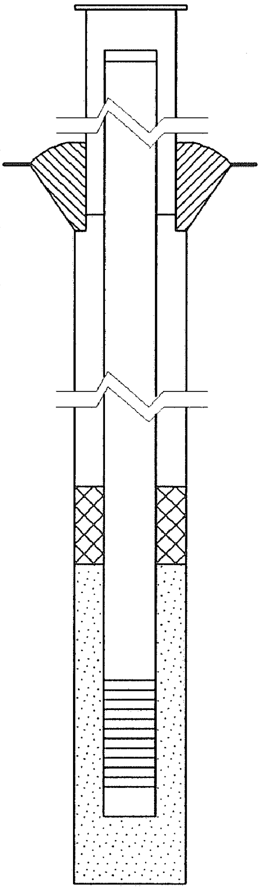
Type of sand pack: Silica Sand Pre-Pack

Grain size: 20/40 (sieve size)

Installation method: Free Drop

Type of backfill material: N/A (if applicable)

Installation method:



ELEVATION (MSL)®	DEPTH (BGS)*	(0.01 ft)
540.70	-2.90	Top of Protective Casing
540.60	-2.80	Top of Riser Pipe
537.80	0.00	Ground Surface
534.80	3.00	Top of Annular Sealant
		Static Water Level Measured on (after completion)
	3.00	Top of Seal
522.80	15.00	Top of Sandpack
520.80	17.00	Top of Screen
510.88	26.92	Bottom of Screen
510.30	27.50	Bottom of Well
510.50	27.30	Bottom of Borehole

® Referenced to a National Geodetic Vertical Datum
* positive (+) values below GS, negitive (-) values above GS

CASING MEASUREMENTS

Diameter of Borehole (in)	8.25
ID of Riser Pipe (in)	
Protective Casing Length (ft)	N/A
Riser Pipe Length (ft)	24.94
Bottom of Screen to End Cap (ft)	0.38
Screen Length [1st slot to last slot] (ft)	9.70
Total Length of Casing (ft)	N/A
Screen Slot Size*	#10 (0.01)

*Hand-slotted well screens are unacceptable.

WELL CONSTRUCTION MATERIALS

Protective Casing	N/A
Riser Pipe Above W.T.	PVC
Riser Pipe Below W.T.	PVC
Screen	PVC

ANDREWS ENGINEERING

3300 Ginger Creek Drive - 217.787.2334
Springfield, IL 62711

FIELD BORING LOG

Site Information:
Name: CWLP
Location: Springfield, IL.
County: Sangamon
Site No.:
AEI No.: 200387

Location:
Coord. System:
Northing: 3451.2
Easting: 852.1

Weather: 50F Sunny

Boring Information:
Boring No: W-2
Well No: AP-13
Surf Elev.: 6.25

Depth Information:
Total: 27.6
Auger: 4.25" HSA
Core: 5ft. Continuous Sampler

Dates:
Start: 2/23/2021
Finish: 2/24/2021

Drilling Contractor:
Contractor Name: Total Drilling Services/Skinner ltd.
City: Hindsboro, IL.
Equipment: CME 850

Personnel:
Geologist: C.M. Latham
Driller: Todd Skinner
Helper(s): A. Bruce

▮ - Continuous Barrel (CB) ■ - Split Spoon (SS) ◣ - Shelby Tube ▮ - Core ▯ - Blind Drill

Depth (ft)	Run No.	Sample Type	Sample Recov.	Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
							Ground Surface	0.0
0		▮					**SILTY TOPSOIL** Dark Brown-black, moist, soft.	
	1	▮	3.5				**CLAYEY SILT** Light brown, firm, moist.	
		▮					**SILT** Grey, moist, firm, homogenous.	
5		▮					**SILT** Reddish brown, moist, firm, homogenous.	-5.0
	2	▮	4/5					
10		▮					**CLAYEY SILT** Reddish brown, mottled with grey clay, moist, soft-firm, homogenous.	-10.0
	3	▮	5/5					
15		▮						-15.0
	4	▮	5/5					
20								-20.0

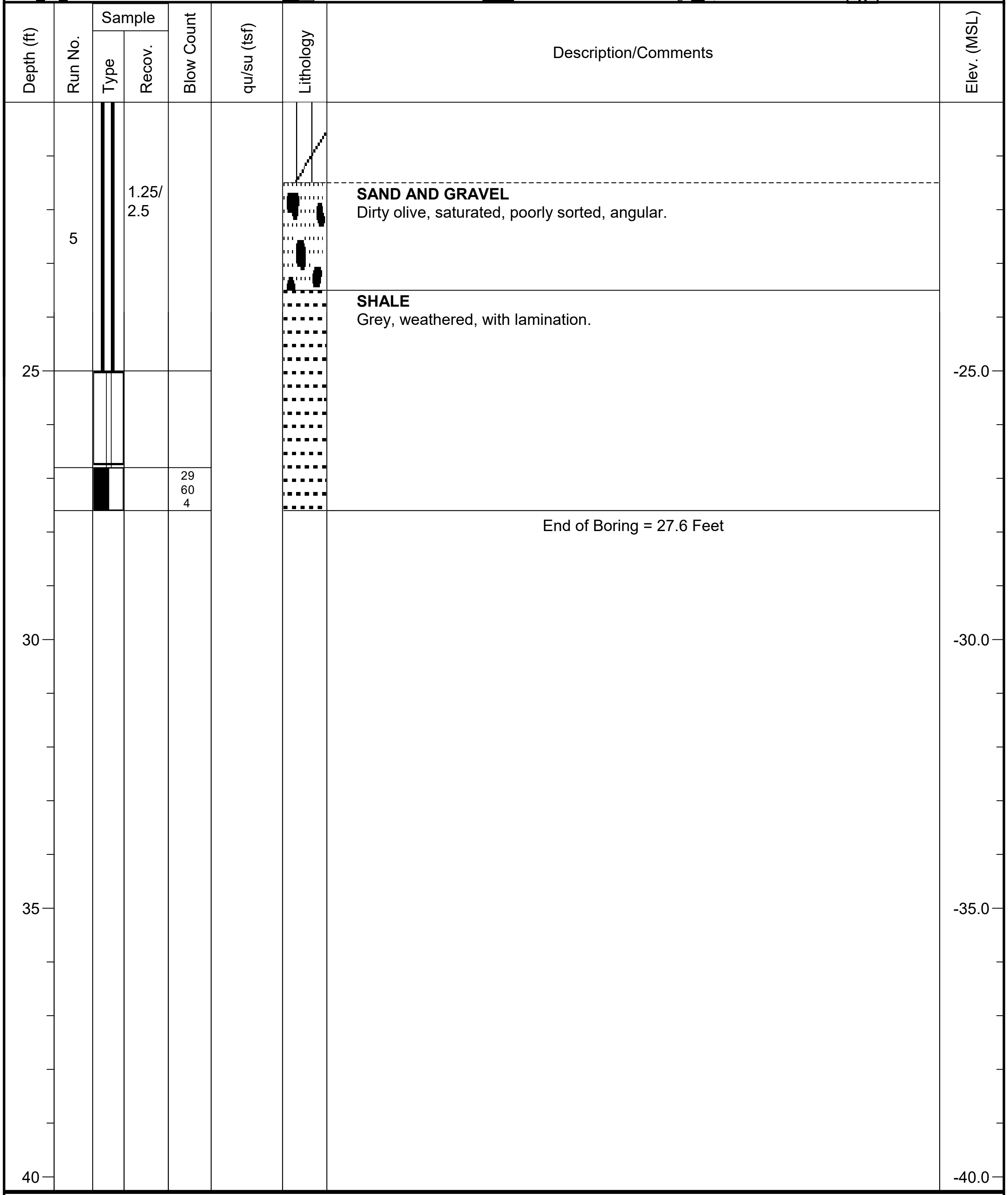
Notes:

ANDREWS ENGINEERING
3300 Ginger Creek Drive - 217.787.2334
Springfield, IL 62711

FIELD BORING LOG

Boring Information: W-2 Boring No: W-2 Well No: AP-13

▌▌ - Continuous Barrel (CB) ▌☐ - Split Spoon (SS) ◣ - Shelby Tube ☐▌ - Core ☐☐ - Blind Drill



SAND AND GRAVEL
Dirty olive, saturated, poorly sorted, angular.

SHALE
Grey, weathered, with lamination.

End of Boring = 27.6 Feet

Notes:

Illinois Environmental Protection Agency **Well Completion Report**

Site #: ______ County: Sangamon Well #: AP-13

Site Name: Springfield CWLP Ash Pond Borehole #: W-2

Coordinates: X 852.1 Y 3451.2 (or) Latitude: ___° ___' ___" Longitude: ___° ___' ___"

Surveyed by: Andrews Engineering, Inc. IL Registration #: ______

Drilling Contractor: Total Drilling Services/Skinner LTD. Consulting Firm: Andrews Engineering, Inc.

Driller: Todd Skinner Geologist: C. M. Latham

Drilling Method: CME 850 4.25 in HSA w/ 5'MC and 2' SS Logged by: C.M. Latham

Drilling Fluids (type): N/A Report Form Completed by: C.M. Latham

Date Well Started: 2/24/2021 Date Well Finished: 2/24/2021 Date Form Completed: 3/2/2021

ANNULAR SPACE DETAILS

Type of surface seal: Concrete

Type of annular sealant: Bentonite Chips

Installation method: Free Drop

Setting time: > 24

Type of bentonite seal: Bentonite Chips

Installation method: Free Drop

Setting time: > 24 hours

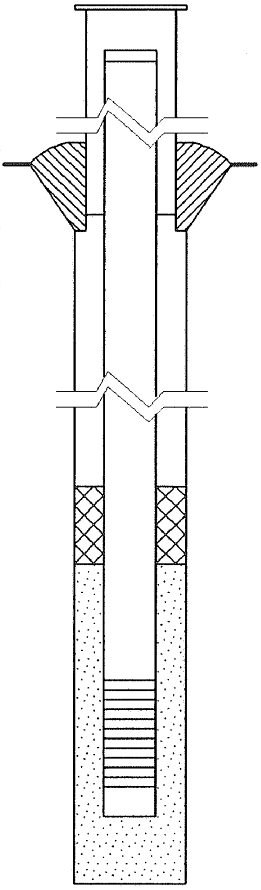
Type of sand pack: Silica Sand Pre-Pack

Grain size: 20/40 (sieve size)

Installation method: Free Drop

Type of backfill material: N/A (if applicable)

Installation method: ______



ELEVATION (MSL)®	DEPTH (BGS)*	(0.01 ft)
542.00	-3.40	Top of Protective Casing
542.00	-3.40	Top of Riser Pipe
538.60	0.00	Ground Surface
355.60	3.00	Top of Annular Sealant
532.35	6.25	Static Water Level Measured on (after completion)
____	3.00	Top of Seal
524.08	14.52	Top of Sandpack
522.08	16.52	Top of Screen
511.47	27.13	Bottom of Screen
511.00	27.60	Bottom of Well
511.00	27.60	Bottom of Borehole

® Referenced to a National Geodetic Vertical Datum
* positive (+) values below GS, negitive (-) values above GS

CASING MEASUREMENTS

Diameter of Borehole (in)	8.25
ID of Riser Pipe (in)	
Protective Casing Length (ft)	N/A
Riser Pipe Length (ft)	19.94'
Bottom of Screen to End Cap (ft)	0.47'
Screen Length [1st slot to last slot] (ft)	9.70
Total Length of Casing (ft)	N/A
Screen Slot Size¥	#10 (0.01)

¥Hand-slotted well screens are unacceptable.

WELL CONSTRUCTION MATERIALS

Protective Casing	N/A
Riser Pipe Above W.T.	PVC
Riser Pipe Below W.T.	PVC
Screen	PVC

ANDREWS ENGINEERING
3300 Ginger Creek Drive - 217.787.2334
Springfield, IL 62711

FIELD BORING LOG

Site Information:
Name: CWLP
Location: Springfield, IL
County: Sangamon
Site No.:
AEI No.: 200387

Location:
Coord. System:
Northing: 3171.5
Easting: 1275.2

Weather: 44F Partly Sunny

Boring Information:
Boring No: W-1
Well No: AP-14
Surf Elev.: 2.00

Depth Information:
Total: 27.5
Auger: 4.25" HSA
Core: 5ft Continuous Sampler

Dates:
Start: 2/25/2021
Finish: 2/26/2021

Drilling Contractor:
Contractor Name: Total Drilling Services/Skinner ltd.
City: Hindsboro, IL
Equipment: CME 850 4.25" HSA w/ 5' cont. sampler and 2'SS

Personnel:
Geologist: C.M. Latham
Driller: Todd Skinner
Helper(s): A. Bruce

- Continuous Barrel (CB) - Split Spoon (SS) - Shelby Tube - Core - Blind Drill

Depth (ft)	Run No.	Sample Type	Sample Recov.	Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
							Ground Surface	0.0
0	1		3.5/5				**SILTY TOPSOIL** Dark brown, moist, soft, organic leaves	
							SILTY CLAY Some gravel	
5	2		5/5				**CLAYEY SILT** Dark brown, moist, soft, organic leaves and roots, oxidation	-5.0
							SILTY CLAY Medium brown, mottled with grey clay and oxidation, high plasticity, moist, firm.	
10	3		4/5				Groundwater encountered at 14'	-10.0
15	4		5/5				**SILTY CLAY** Grey, moist, firm, high plasticity, oxidation 21-21.5' coal fragments with undifferentiated organic materials	-15.0
20								-20.0

Notes:

ANDREWS ENGINEERING
3300 Ginger Creek Drive - 217.787.2334
Springfield, IL 62711

FIELD BORING LOG

Boring Information: W-1 Boring No: W-1 Well No: AP-14

- Continuous Barrel (CB) - Split Spoon (SS) - Shelby Tube - Core - Blind Drill

Depth (ft)	Run No.	Sample Type	Sample Recov.	Blow Count	qu/su (tsf)	Lithology	Description/Comments	Elev. (MSL)
	5		3/5				**SILTY CLAY** Some gravel	
							SAND Coarse grained, poorly sorted, unconsolidated, saturated.	
25	6		3/5	30 60 4			**SHALE** Grey, weatherd with lamination	-25.0
							End of Boring = 27.5 Feet	
30								-30.0
35								-35.0
40								-40.0

Notes:

Illinois Environmental Protection Agency Well Completion Report

Site #: County: Sangamon Well #: AP-14

Site Name: Springfield CWLP Ash Pond Borehole #: W-1

Coordinates: X 1275.2 Y 3171.5 (or) Latitude: ° ' " Longitude: ° ' "

Surveyed by: Andrews Engineering, Inc. IL Registration #:

Drilling Contractor: Total Drilling Services/Skinner LTD. Consulting Firm: Andrews Engineering, Inc.

Driller: Todd Skinner Geologist: C. M. Latham

Drilling Method: CME 850 4.25 in HSA w/ 5'MC and 2' SS Logged by: C.M. Latham

Drilling Fluids (type): N/A Report Form Completed by: C.M. Latham

Date Well Started: 2/25/2021 Date Well Finished: 2/26/2021 Date Form Completed: 3/2/2021

ANNULAR SPACE DETAILS

Type of surface seal: Concrete

Type of annular sealant: Bentonite Chips

Installation method: Free Drop

Setting time: > 24

Type of bentonite seal: Bentonite Chips

Installation method: Free Drop

Setting time: > 24 hours

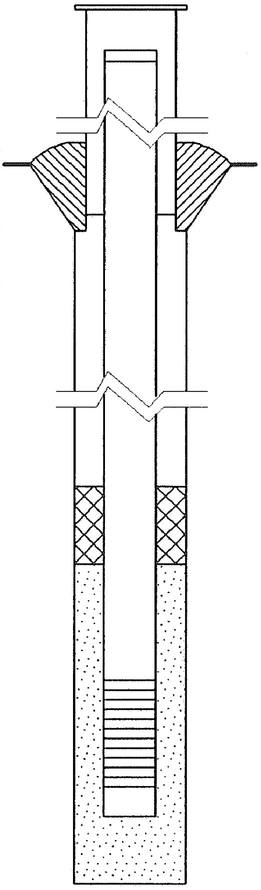
Type of sand pack: Silica Sand Pre-Pack

Grain size: 20/40 (sieve size)

Installation method: Free Drop

Type of backfill material: N/A (if applicable)

Installation method:



ELEVATION (MSL)®	DEPTH (BGS)*	(0.01 ft)
539.60	-2.80	Top of Protective Casing
539.60	-2.80	Top of Riser Pipe
536.80	0.00	Ground Surface
533.80	3.00	Top of Annular Sealant
534.80	2.00	Static Water Level Measured on (after completion)
	3.00	Top of Seal
521.45	15.35	Top of Sandpack
519.45	17.35	Top of Screen
509.75	27.05	Bottom of Screen
509.30	27.50	Bottom of Well
509.30	27.50	Bottom of Borehole

® Referenced to a National Geodetic Vertical Datum
* positive (+) values below GS, negitive (-) values above GS

CASING MEASUREMENTS

Diameter of Borehole (in)	8.25
ID of Riser Pipe (in)	
Protective Casing Length (ft)	N/A
Riser Pipe Length (ft)	19.94
Bottom of Screen to End Cap (ft)	0.45
Screen Length [1st slot to last slot] (ft)	9.70
Total Length of Casing (ft)	N/A
Screen Slot Size¥	#10 (0.01)

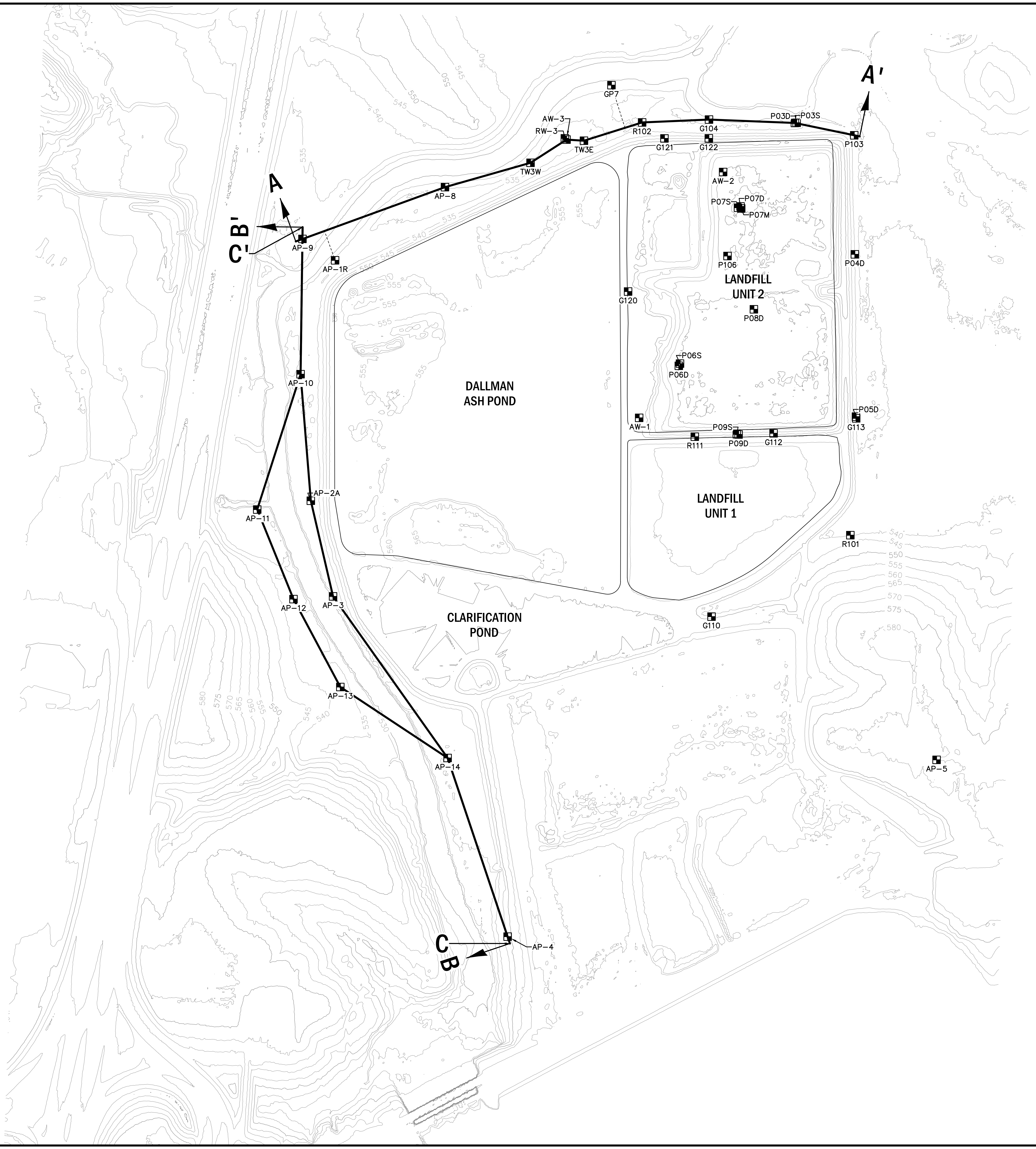
¥Hand-slotted well screens are unacceptable.

WELL CONSTRUCTION MATERIALS

Protective Casing	N/A
Riser Pipe Above W.T.	PVC
Riser Pipe Below W.T.	PVC
Screen	PVC

APPENDIX B

GEOLOGIC CROSS-SECTIONS



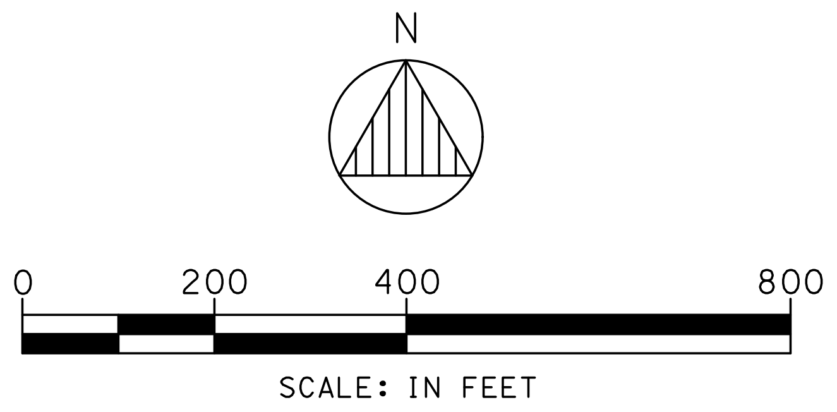
LEGEND

CROSS-SECTION LINE

▪ EXISTING MONITORING WELL LOCATION

NOTES

1. LIDAR DATA DERIVED FROM USGS WEBSITE (FLIGHT DATE: OCTOBER 15, 2018).
2. CONTOUR INTERVAL SHOWN IS 5 FEET.



SCALE: IN FEET

NO.	DATE	REVISION DESCRIPTION	BY

ANDREWS ENGINEERING
3300 GINGER CREEK DRIVE
SPRINGFIELD, ILLINOIS 62711-7233
PH (217) 787-2334 WWW.ANDREWS-ENG.COM
PONTIAC, IL • LOMBARD, IL • INDIANAPOLIS, IN • WARRENTON, MO

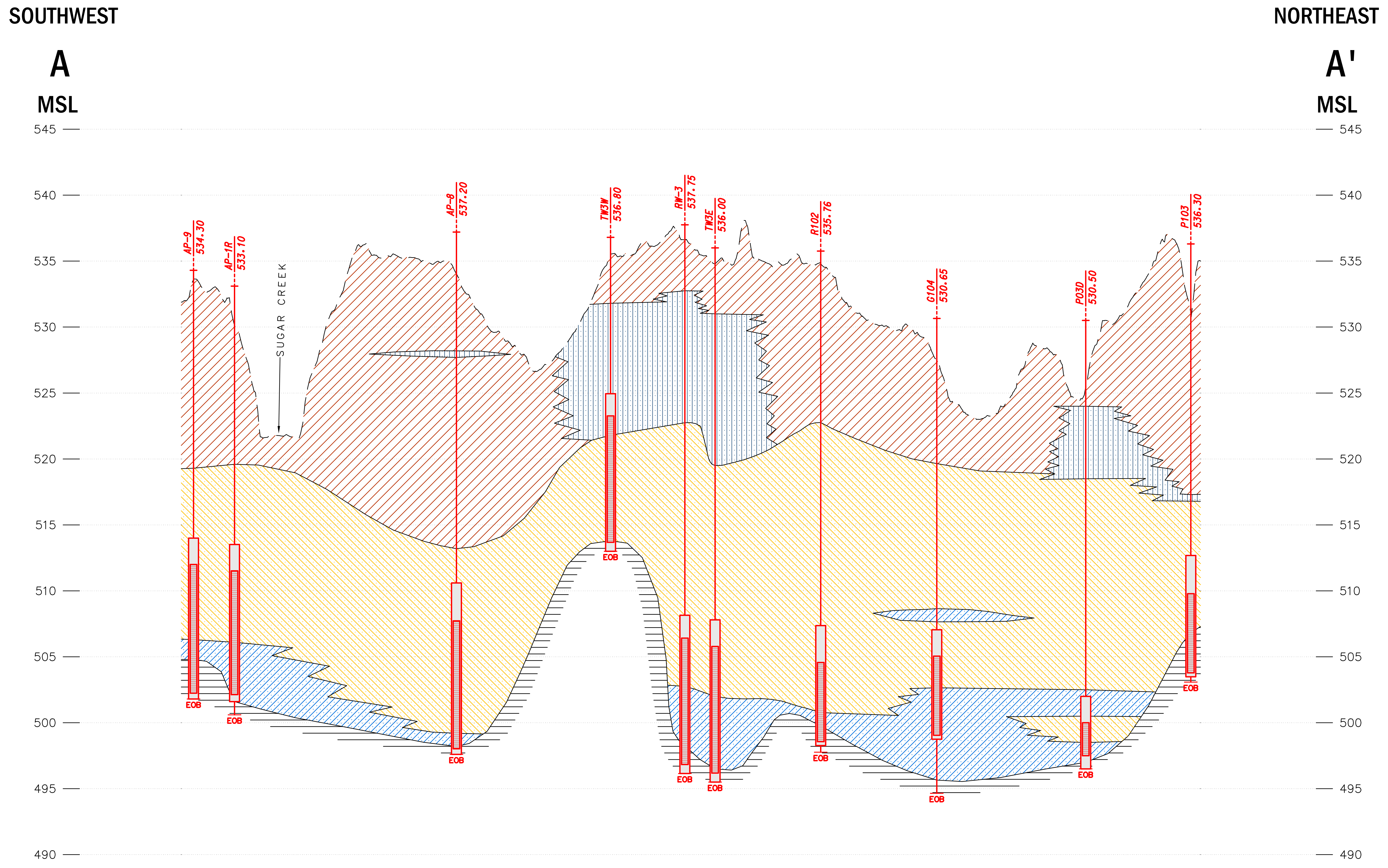
APPROVED BY: BJH
DESIGNED BY: SWK
DRAWN BY: MPN

GEOLOGIC CROSS-SECTION LOCATIONS MAP

PREPARED FOR
CITY WATER, LIGHT, AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: APRIL 2021
PROJECT ID: 200387/0003
SHEET NUMBER:
1

Tab: 1 Last Saved: October 22, 2021, by Ben Karpus Plotted: Friday, October 22, 2021 3:50:19 PM
J:\S\Springfield CWLP\CWLP Ash Pond\DWG\2021\Geologic Cross-Sections\PROFILES.dwg



NOTES

1. DEPTH AND THICKNESS OF SUBSURFACE STRATA WERE GENERALIZED FROM AND INTERPOLATED BETWEEN BORINGS. INFORMATION ON ACTUAL SUBSURFACE CONDITIONS EXISTS ONLY AT THE LOCATION OF THE BORING. SEE BORING LOGS FOR DETAILED DESCRIPTION.
2. LIDAR DATA DERIVED FROM USGS WEBSITE (FLIGHT DATE: OCTOBER 15, 2018).

LEGEND

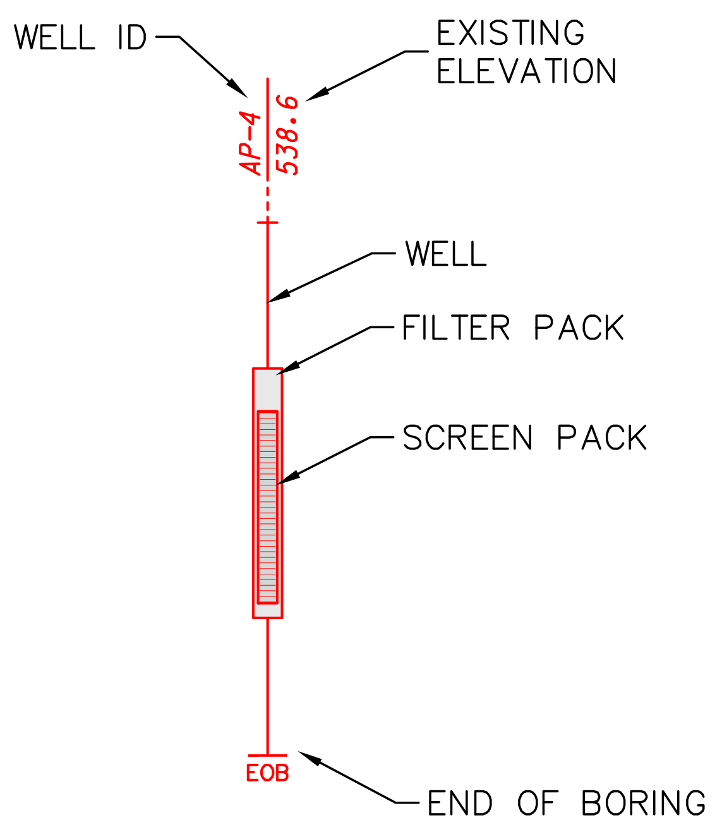
▨ UPPER COHESIVE DEPOSIT

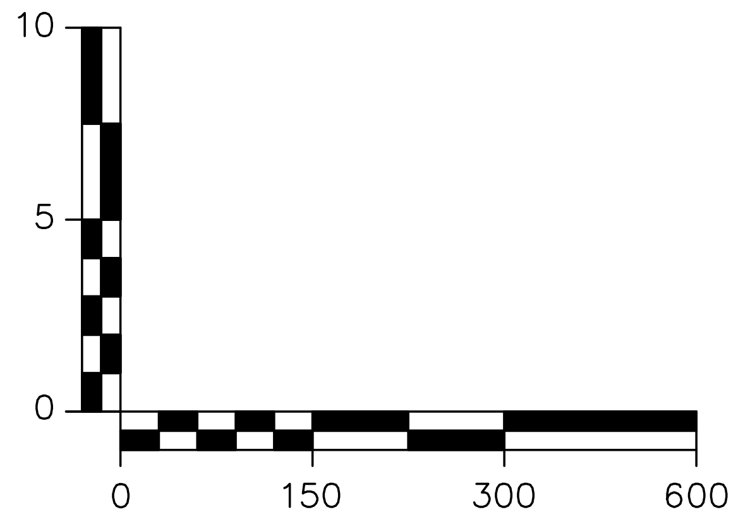
▨ SHALLOW SAND

▨ LOWER COHESIVE DEPOSIT

▨ BASAL SAND

☰ SHALE





SCALE: IN FEET

NO.	DATE	REVISION DESCRIPTION	BY

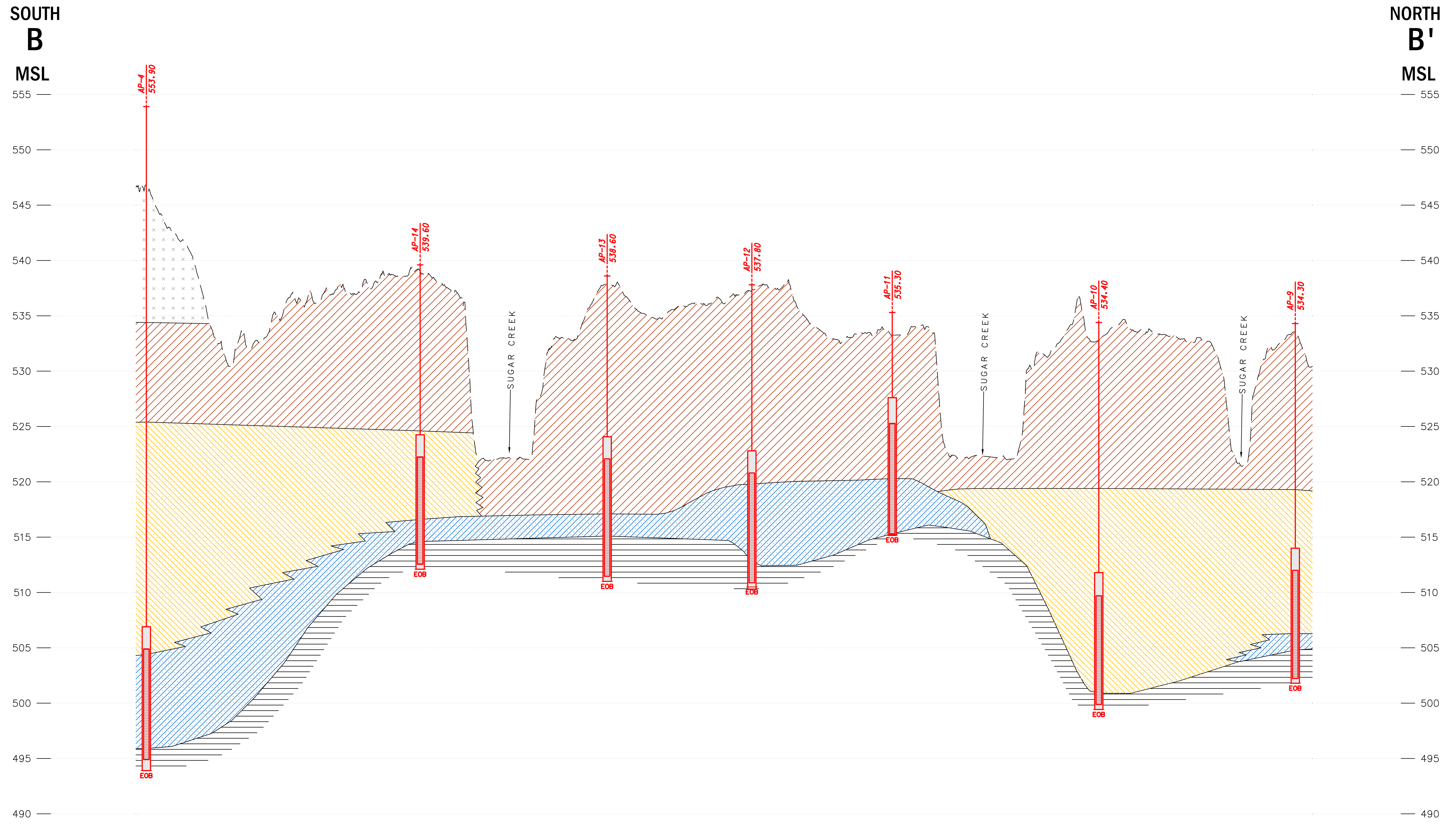
ANDREWS ENGINEERING
3300 GINGER CREEK DRIVE
SPRINGFIELD, ILLINOIS 62711-7233
PH (217) 787-2334 WWW.ANDREWS-ENG.COM
PONTIAC, IL • LOMBARD, IL • INDIANAPOLIS, IN • WARRENTON, MO

APPROVED BY: BJH
DESIGNED BY: SWK
DRAWN BY: MPN

GEOLOGIC CROSS-SECTION A-A'

PREPARED FOR
CITY WATER, LIGHT, AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: APRIL 2021
PROJECT ID: 200387/0003
SHEET NUMBER: A-A'

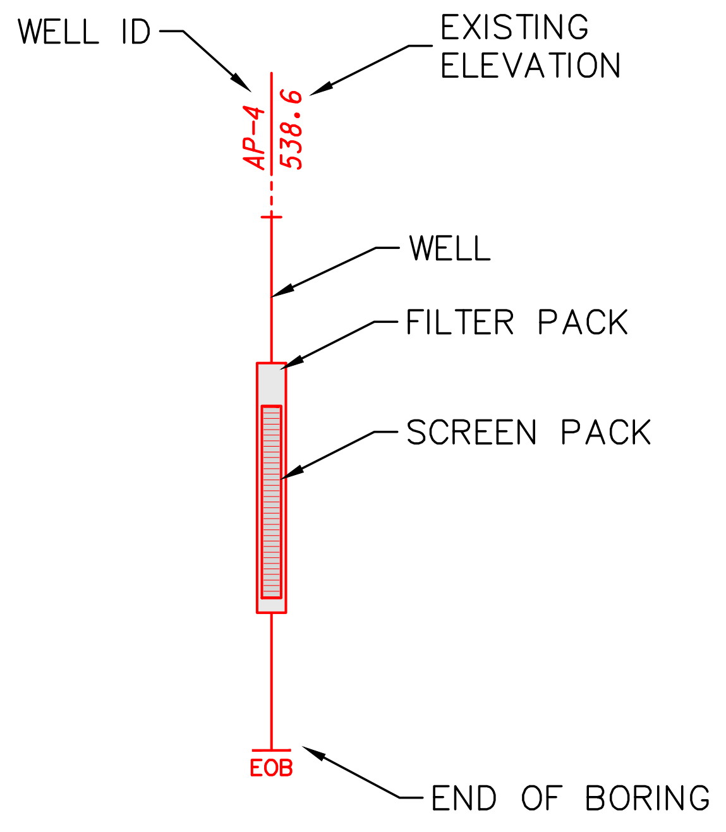


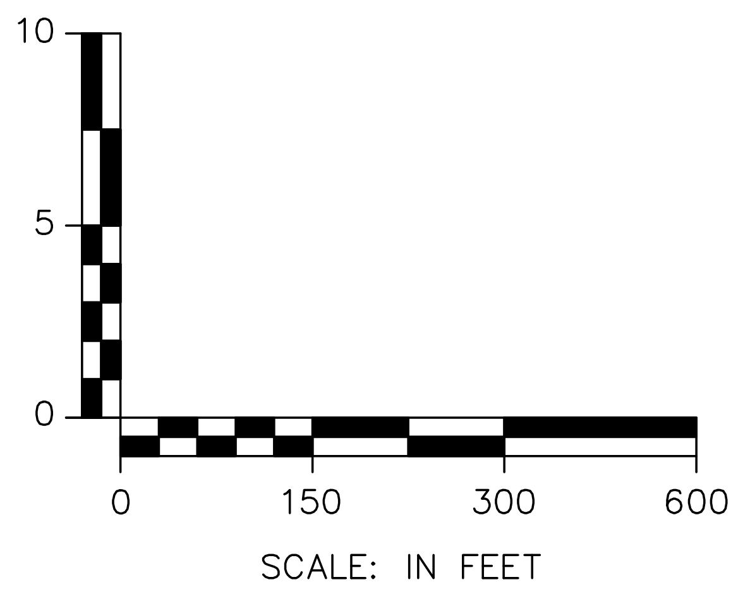
NOTES

1. DEPTH AND THICKNESS OF SUBSURFACE STRATA WERE GENERALIZED FROM AND INTERPOLATED BETWEEN BORINGS. INFORMATION ON ACTUAL SUBSURFACE CONDITIONS EXISTS ONLY AT THE LOCATION OF THE BORING. SEE BORING LOGS FOR DETAILED DESCRIPTION.
2. LIDAR DATA DERIVED FROM USGS WEBSITE (FLIGHT DATE: OCTOBER 15, 2018).

LEGEND

- ▨ FILL
- ▨ UPPER COHESIVE DEPOSIT
- ▨ SHALLOW SAND
- ▨ LOWER COHESIVE DEPOSIT
- ▨ BASAL SAND
- ▤ SHALE





NO.	DATE	REVISION DESCRIPTION	BY

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SPRINGFIELD, ILLINOIS 62711-7233
PH (217) 787-2334 WWW.ANDREWS-ENG.COM
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APPROVED BY: BJH
DESIGNED BY: SWK
DRAWN BY: MPN

GEOLOGIC CROSS-SECTION B-B'

PREPARED FOR
CITY WATER, LIGHT, AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: APRIL 2021
PROJECT ID: 200387/0003
SHEET NUMBER: B-B'

Tab: BB Last Saved: October 22, 2021, by Ben Karpus Plotted: Friday, October 22, 2021 3:51:01 PM
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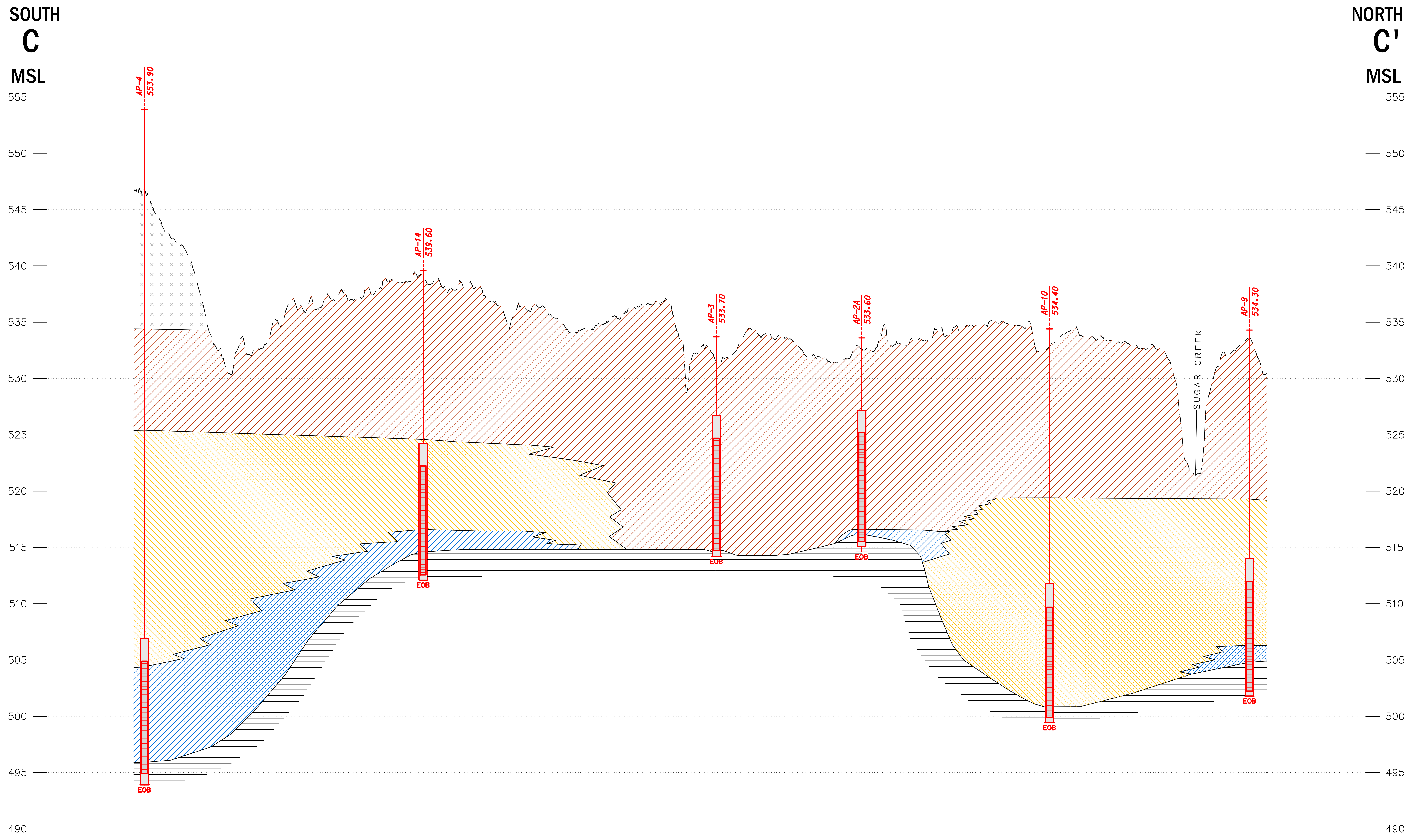
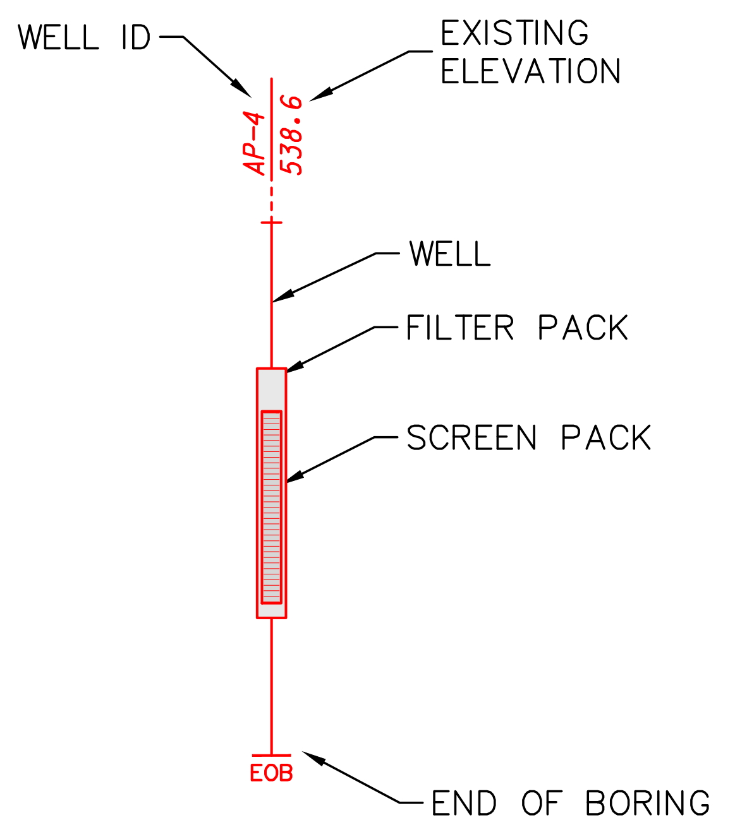


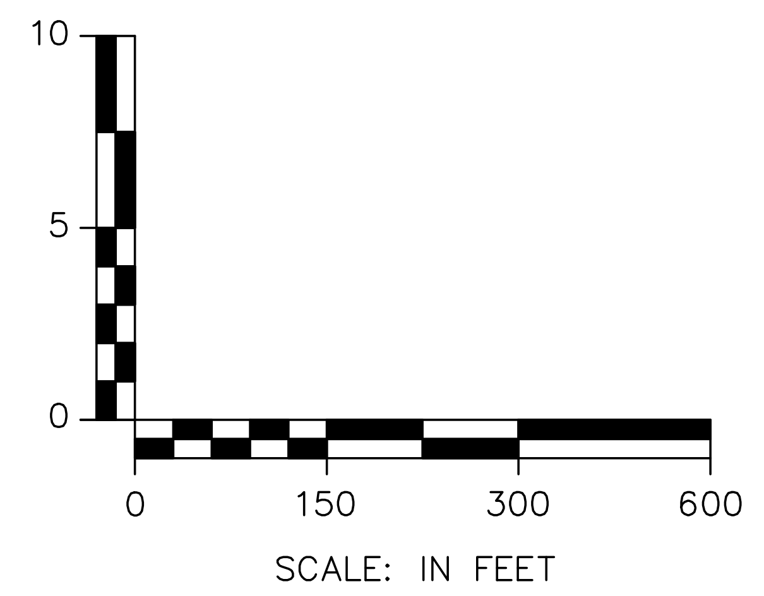
NOTES

1. DEPTH AND THICKNESS OF SUBSURFACE STRATA WERE GENERALIZED FROM AND INTERPOLATED BETWEEN BORINGS. INFORMATION ON ACTUAL SUBSURFACE CONDITIONS EXISTS ONLY AT THE LOCATION OF THE BORING. SEE BORING LOGS FOR DETAILED DESCRIPTION.
2. LIDAR DATA DERIVED FROM USGS WEBSITE (FLIGHT DATE: OCTOBER 15, 2018).

LEGEND

▨	FILL
▨	UPPER COHESIVE DEPOSIT
▨	SHALLOW SAND
▨	LOWER COHESIVE DEPOSIT
▨	BASAL SAND
▤	SHALE





NO.	DATE	REVISION DESCRIPTION	BY

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APPROVED BY: BJH DESIGNED BY: SWK DRAWN BY: BCK

GEOLOGIC CROSS-SECTION C-C'

PREPARED FOR
CITY WATER, LIGHT, AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: OCTOBER 2021
PROJECT ID: 200387/0003
SHEET NUMBER:
C-C'

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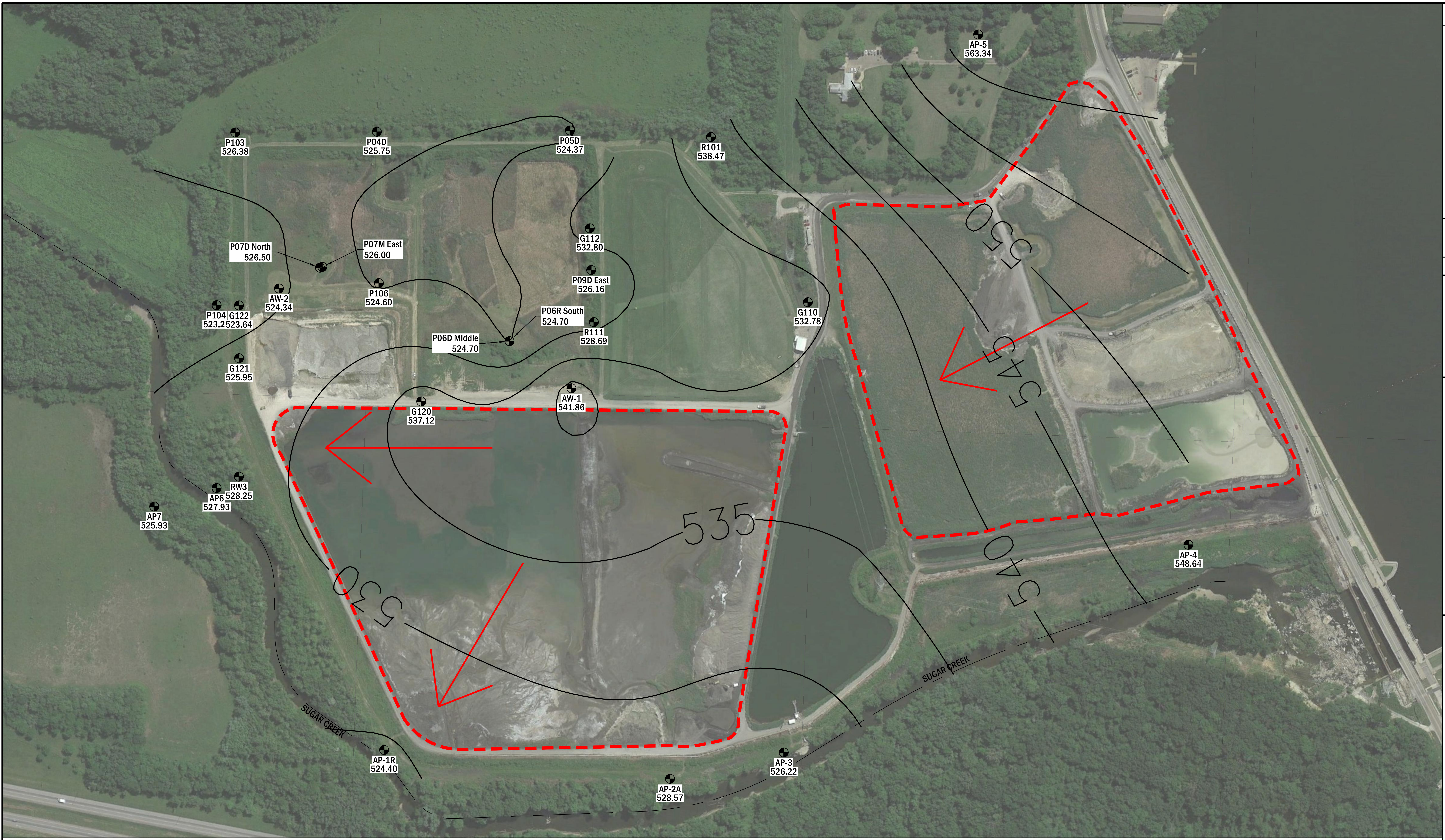
APPENDIX C

POTENTIOMETRIC SURFACE MAPS



LEGEND

●	MONITORING WELL LOCATION
🟥	CCR SURFACE IMPOUNDMENT
←	GROUNDWATER FLOW DIRECTION

NOTES

1. SAMPLING DATE: 1/22/2021
2. CONTOUR INTERVAL = 5 FEET
3. IMAGE SOURCE: GOOGLE EARTH PRO, IMAGE DATE MAY 15, 2012
4. ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM (1988).

N

0 150 300 600

SCALE: IN FEET

NO. | DATE | REVISION DESCRIPTION | BY

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APPROVED BY: BJH | DESIGNED BY: MTH | DRAWN BY: BCK

POTENTIOMETRIC SURFACE MAP
1ST QUARTER 2021

PLANS PREPARED FOR
CITY, WATER, LIGHT, AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE:
OCTOBER 2021

PROJECT ID:
150077/0021

SHEET NUMBER:
1Q21

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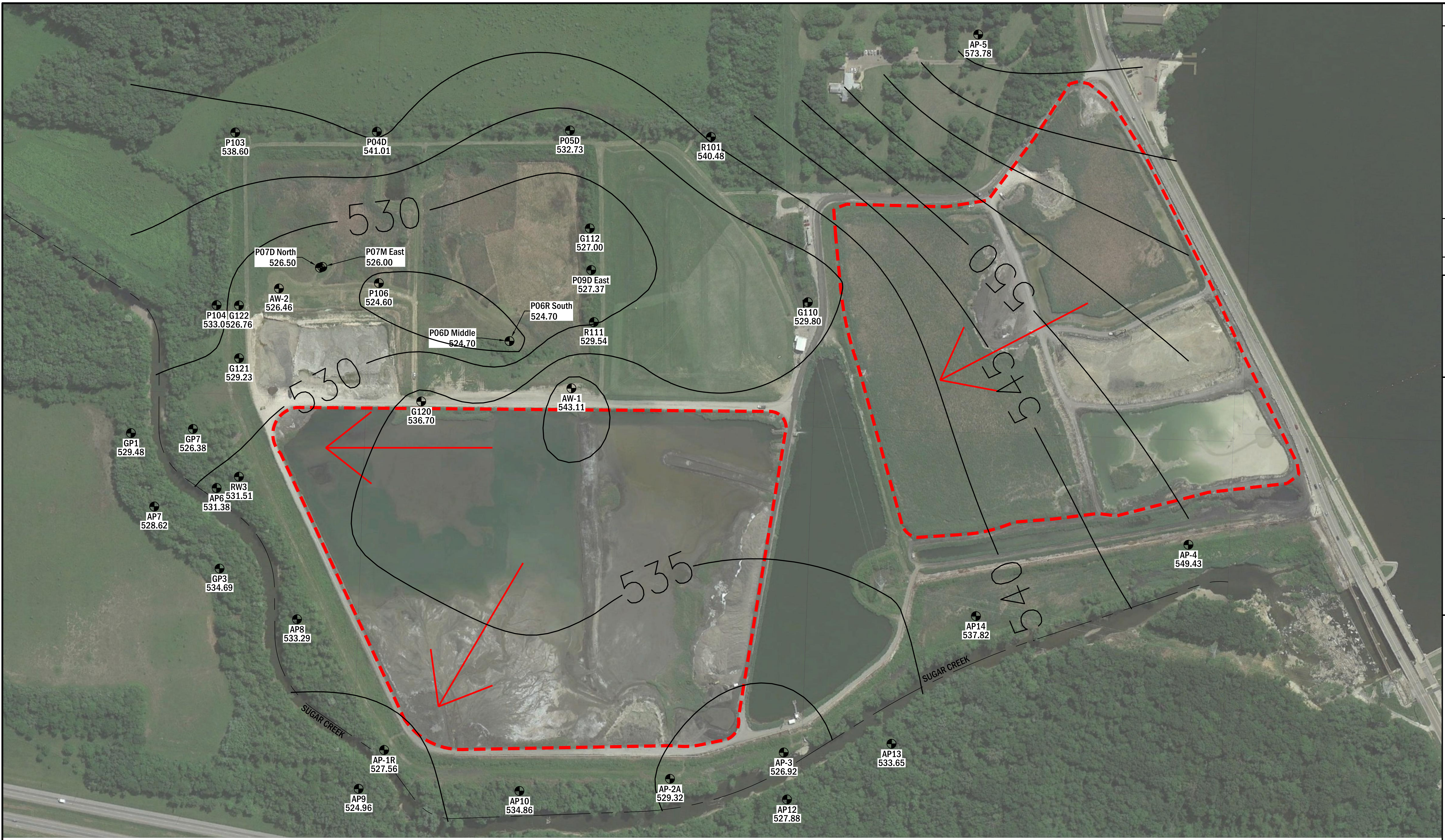

LEGEND

●	MONITORING WELL LOCATION
🟥	CCR SURFACE IMPOUNDMENT
←	GROUNDWATER FLOW DIRECTION

NOTES

1. SAMPLING DATE: 5/27/2021
2. CONTOUR INTERVAL = 5 FEET
3. IMAGE SOURCE: GOOGLE EARTH PRO, IMAGE DATE MAY 15, 2012
4. ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM (1988).

N

0 150 300 600

SCALE: IN FEET

NO.	DATE	REVISION DESCRIPTION	BY

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APPROVED BY: BJH | DESIGNED BY: MTH | DRAWN BY: BCK

POTENTIOMETRIC SURFACE MAP
2ND QUARTER 2021

PLANS PREPARED FOR
CITY, WATER, LIGHT, AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: OCTOBER 2021

PROJECT ID: 150077/0021

SHEET NUMBER:

2Q21

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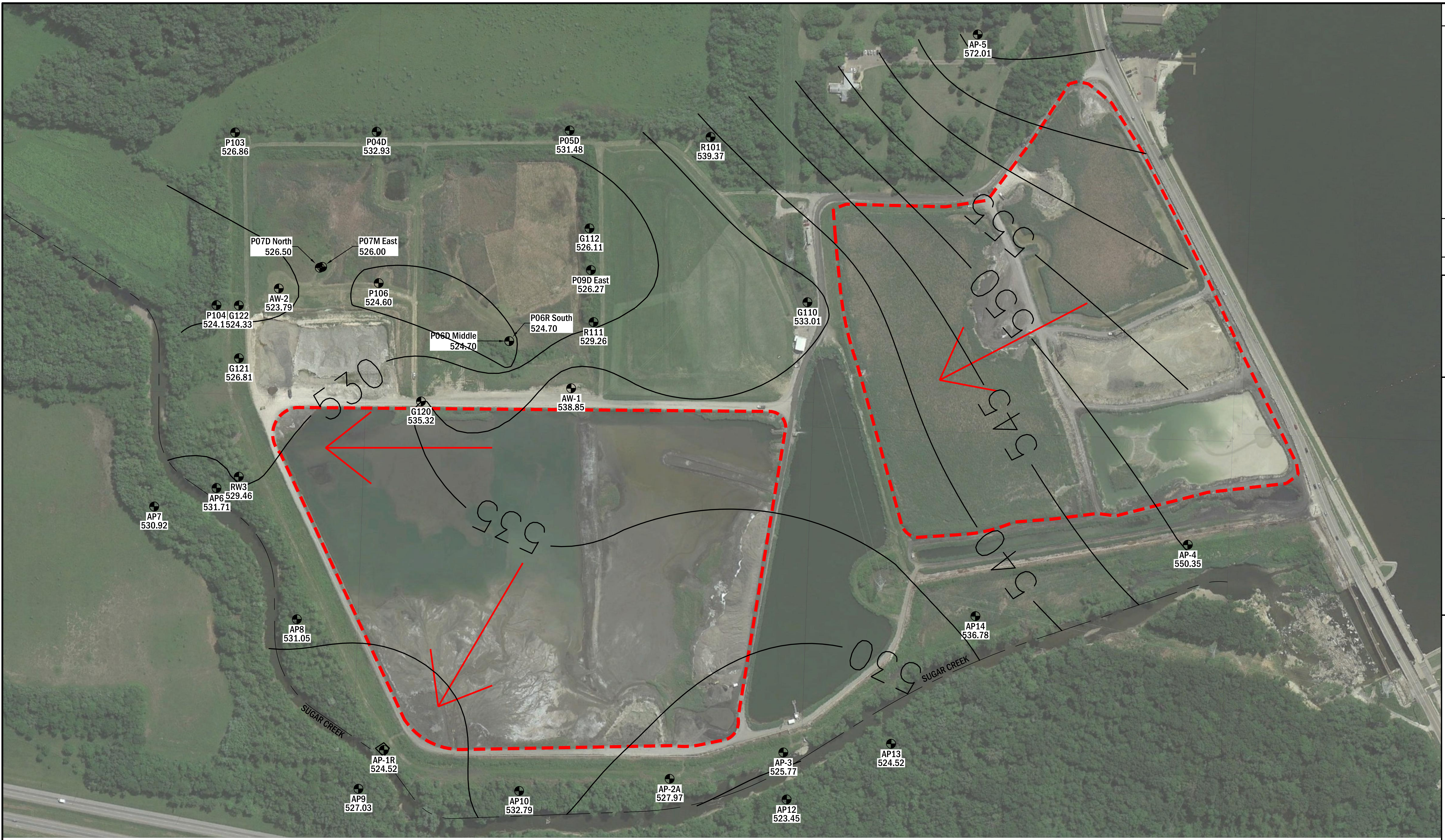

LEGEND

⊕	MONITORING WELL LOCATION
▬ ▬ ▬	CCR SURFACE IMPOUNDMENT
←	GROUNDWATER FLOW DIRECTION

NOTES

1. SAMPLING DATE: 8/25/2021
2. CONTOUR INTERVAL = 5 FEET
3. IMAGE SOURCE: GOOGLE EARTH PRO, IMAGE DATE MAY 15, 2012
4. ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM (1988).

N

0 150 300 600

SCALE: IN FEET

NO.	DATE	REVISION DESCRIPTION	BY

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APPROVED BY: BJH
DESIGNED BY: MTH
DRAWN BY: BCK

POTENTIOMETRIC SURFACE MAP
3RD QUARTER 2021

PLANS PREPARED FOR
CITY, WATER, LIGHT, AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE:
OCTOBER 2021

PROJECT ID:
150077/0021

SHEET NUMBER:
3Q21

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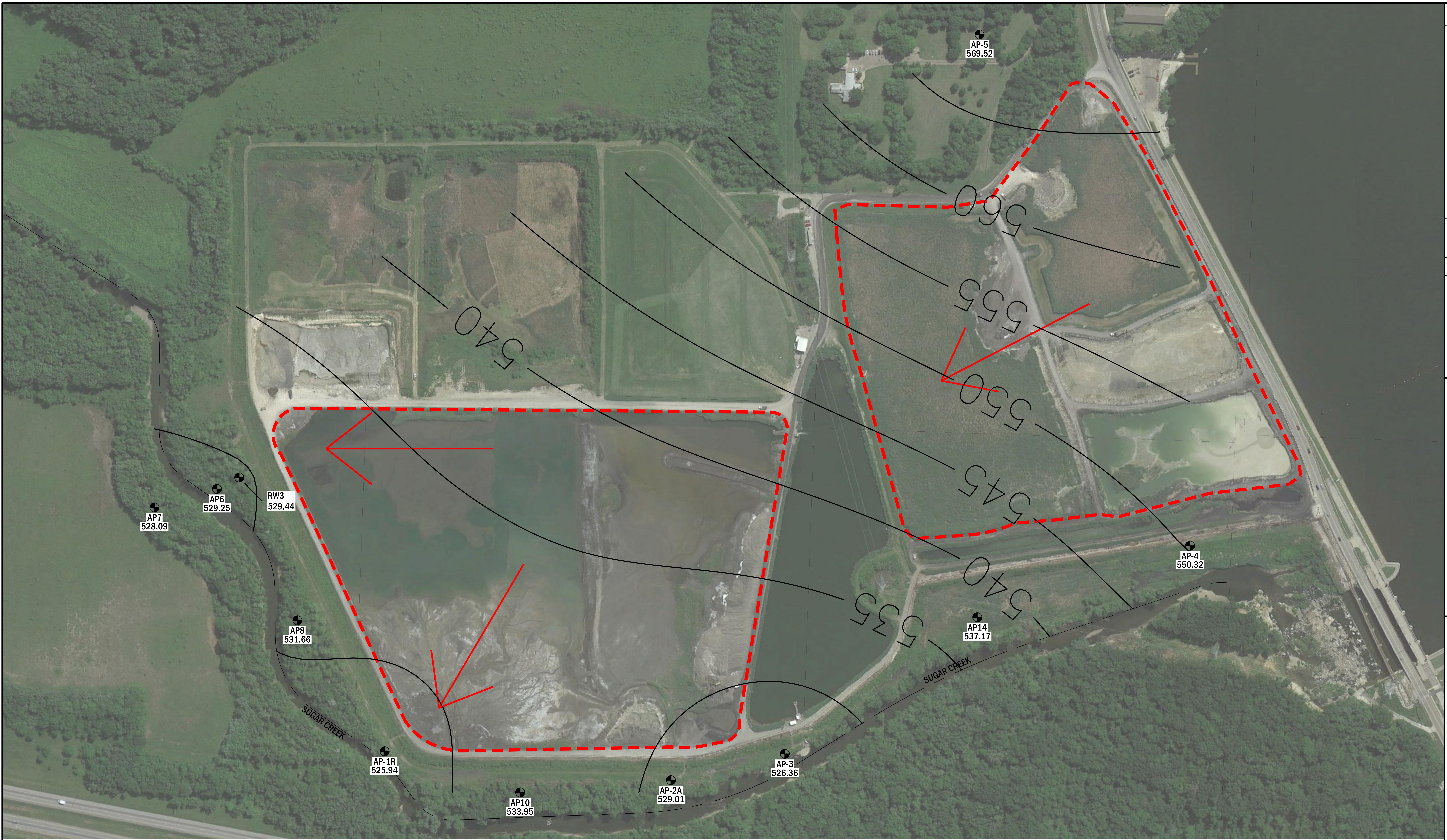
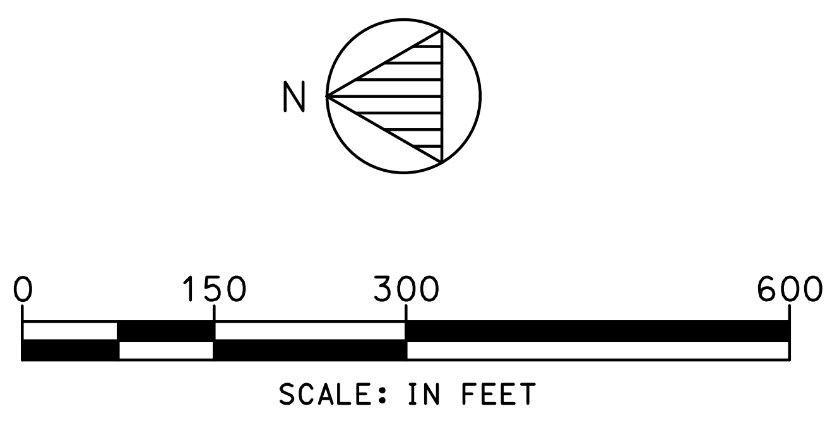


LEGEND

●	MONITORING WELL LOCATION
▬ ▬ ▬	CCR SURFACE IMPOUNDMENT
←	GROUNDWATER FLOW DIRECTION

NOTES

1. SAMPLING DATE: 10/21/2021
2. CONTOUR INTERVAL = 5 FEET
3. IMAGE SOURCE: GOOGLE EARTH PRO, IMAGE DATE MAY 15, 2012
4. ELEVATIONS ARE BASED ON NORTH AMERICAN VERTICAL DATUM (1988).



NO.	DATE	REVISION DESCRIPTION	BY

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APPROVED BY: BJH
DESIGNED BY: MTH
DRAWN BY: BCK

POTENTIOMETRIC SURFACE MAP
4TH QUARTER 2021

PLANS PREPARED FOR
CITY, WATER, LIGHT, AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE:
OCTOBER 2021

PROJECT ID:
150077/0021

SHEET NUMBER:
4Q21

Tab: 4Q21 Last Saved: October 25, 2021, by Ben Karpus Plotted: Monday, October 25, 2021 3:32:53 PM
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APPENDIX D

POTABLE WELL SURVEY

CITY WATER, LIGHT AND POWER

POTABLE WATER WELL SURVEY - CCR SURFACE IMPOUNDMENTS

A potable water well survey was completed in the vicinity of the Dallman and Lakeside Ash Ponds. Based on groundwater elevation data from numerous monitoring wells and piezometers located between and adjacent to the CWLP CCR impoundments, groundwater movement in the vicinity of the CCR impoundments is generally from the south-southwest to the north-northeast, approximately paralleling the Sugar Creek basin. The search extended to the first water well encountered hydraulically downgradient of the impoundments, located near Illinois Route 29 at a distance of approximately 3,400 feet.

The survey was conducted using the Illinois EPA's web-based Geographic Information System (GIS) database[1] in the Source Water Assessment Program (SWAP) for potable water wells downgradient of the CCR impoundments.

The Illinois EPA's SWAP GIS database system identifies community water supply wells and other potable wells (private, semi-private and non-community water supply wells) include data from the following sources:

- Illinois EPA, Division of Public Water Supplies;
- Illinois State Geological Survey (ISGS);
- Illinois State Water Survey; and
- Illinois Department of Public Health.

Based upon this potable water well search, no private, semi-private and non-community water supply wells are located within 2,500 feet downgradient of the CCR impoundments. This search distance is based upon the maximum allowable setback zone for a potable water well as identified in Section 14.3(f) of the Illinois Environmental Protection Act. Included are screen-captures of the Illinois EPA's SWAP GIS database system well query for the subject CCR impoundments and ISGS well records for the wells identified. The screen captures depict the two closest well locations. These wells are discussed below.

Within the Sugar Creek basin, the nearest downgradient potable water well is located approximately 3,400 feet north-northeast of the CWLP CCR impoundments. The owner of this well at the time of installation, as identified on the ISGS well record, was William Bartels (API 121672620900). Installed September 25, 2001, this well is 55 feet deep and screened within material described as "shale fracture/clay." The Sangamon County Tax Parcel Viewer & Property Tax Web Site (http://gismaps.co.sangamon.il.us/tpv/) identifies this well as being located on improved commercial property.

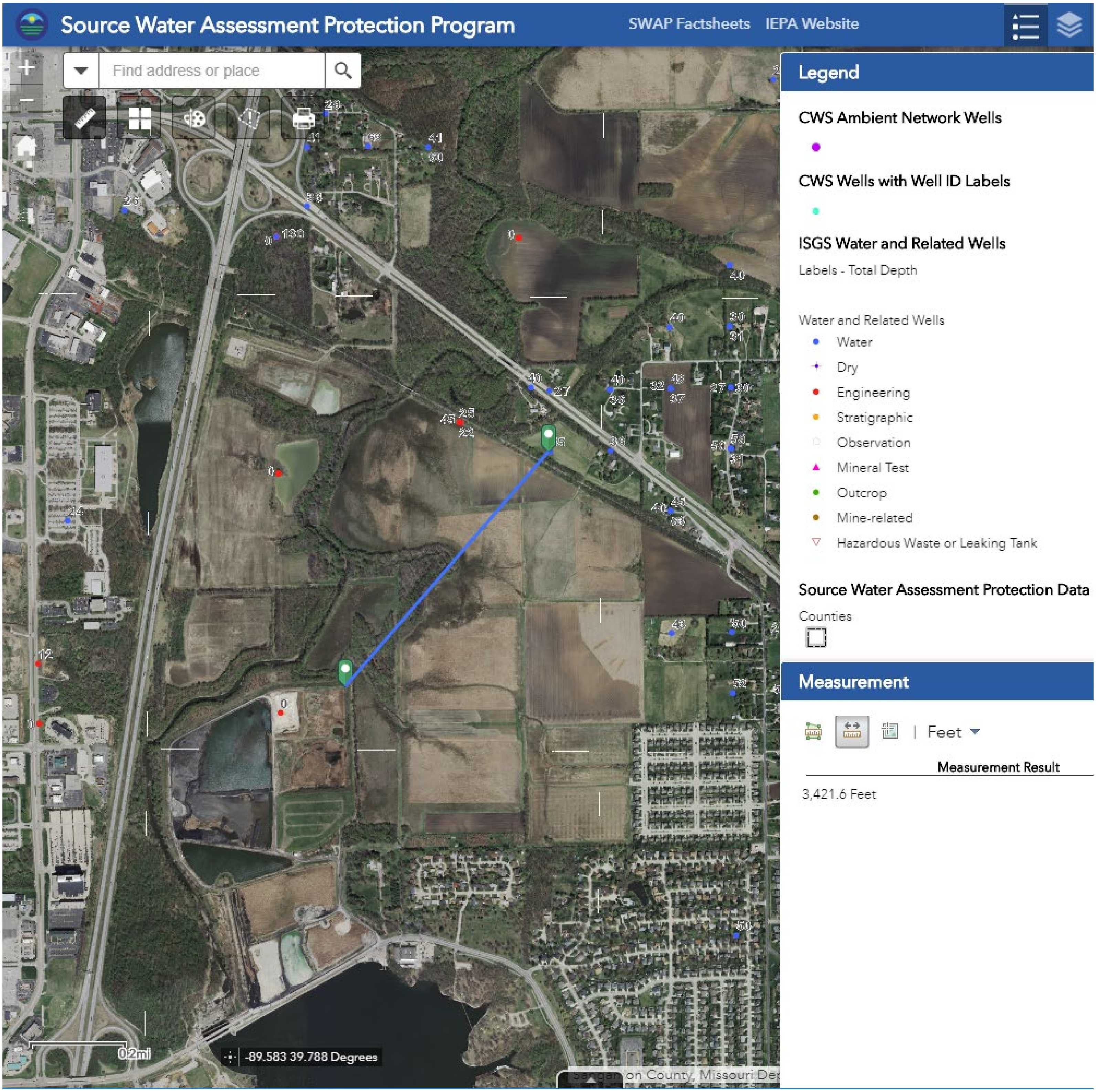
The other potable water well is located a little more than 2,500 feet north-northwest of the CCR impoundments (API 121670148100). The well was installed December 1, 1965, is 24 feet deep, and screened within material described as "hardpan." A review of the Sangamon County Tax Parcel Viewer & Property Tax Web Site identified the current property owner as the State of Illinois Department of Transportation. While this well is located north of the CCR impoundments, it appears to be just west and outside of the Sugar Creek basin, and as such most likely not hydraulically downgradient of the CCR impoundments.

There is no reason to believe that potable wells exist within 2,500 feet hydraulically downgradient of the CCR impoundments that were not identified as part of this potable water well survey.

---

[1] (http://illinois-epa.maps.arcgis.com/apps/webappviewer/index.html?id=4d37a05f5ba441f1b30dab54ccb81fc8)

Illinois EPA SWAP GIS Database Query
CWLP – Springfield, Illinois
William Bartels - API 121672620900



Legend

CWS Ambient Network Wells

●

CWS Wells with Well ID Labels

●

ISGS Water and Related Wells

Labels - Total Depth

Water and Related Wells
- ● Water
- ✦ Dry
- ● Engineering
- ● Stratigraphic
- ○ Observation
- ▲ Mineral Test
- ● Outcrop
- ● Mine-related
- ▽ Hazardous Waste or Leaking Tank

Source Water Assessment Protection Data

Counties

☐

Measurement

Feet

Measurement Result
3,421.6 Feet

Page 1

ILLINOIS STATE GEOLOGICAL SURVEY

Private Water Well	**Top**	**Bottom**
black topsoil	0	5
gray silt	5	11
brown clay (H2o @ 18'-22')	11	22
brown till	22	25
soft gray shale	25	32
hard gray shale fracture @ 43'	32	55
Total Depth		**55**

Casing: 6" PVC SDR 21 from -1' to 18'
36" CONCRETE from 18' to 55'

Grout: HOLE PLUG from 16 to 17.

Grout: BUCKSHOT from 17 to 55.

Water from shale fracture/clay at 18' to 43'.

Owner Address: 3596 East State Rt. 29 Springfield, IL

Address of well: Rt. 29
Springfield, IL

Location source: Location from permit

Permit Date: August 13, 2001 **Permit #:**

COMPANY Wiesenhofer, Andrew

FARM Bartels, William

DATE DRILLED September 25, 2001 **NO.**

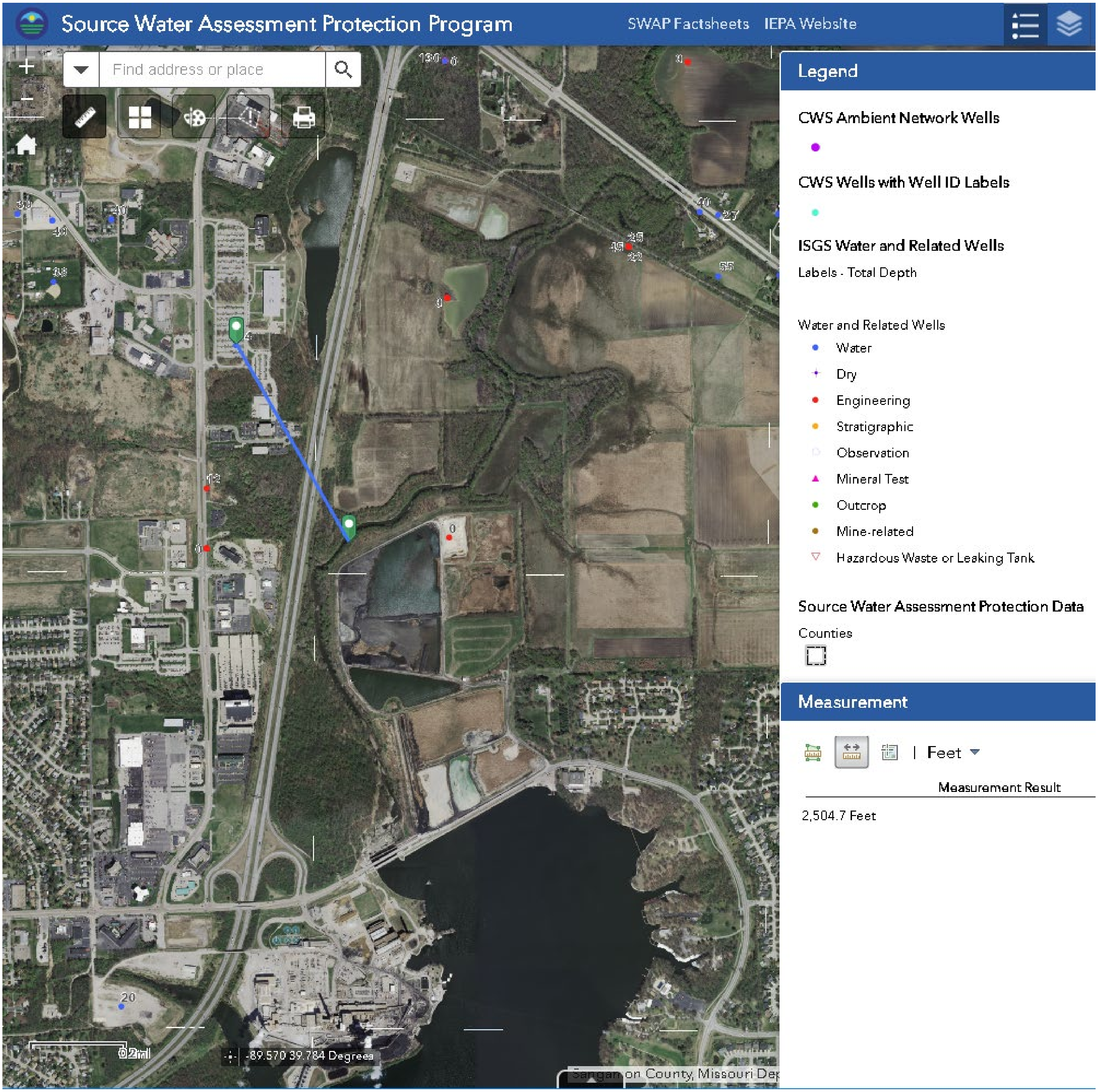
ELEVATION 0 **COUNTY NO.** 26209

LOCATION SW NE SW

LATITUDE 39.777352 **LONGITUDE** -89.587243

COUNTY **Sangamon** **API** **121672620900** **6 - 15N - 4W**

Illinois EPA SWAP GIS Database Query
CWLP – Springfield, Illinois
IDOT - API 121670148100



Legend

CWS Ambient Network Wells

●

CWS Wells with Well ID Labels

●

ISGS Water and Related Wells

Labels - Total Depth

Water and Related Wells
- ● Water
- ✦ Dry
- ● Engineering
- ● Stratigraphic
- ○ Observation
- ▲ Mineral Test
- ● Outcrop
- ● Mine-related
- ▽ Hazardous Waste or Leaking Tank

Source Water Assessment Protection Data

Counties

☐

Measurement

| Feet ▾

Measurement Result
2,504.7 Feet

Page 1

ILLINOIS STATE GEOLOGICAL SURVEY

Water Well	**Top**	**Bottom**
s.s. #52306	0	0
top soil	0	3
yellow clay	3	18
brown clay	18	19
hardpan	19	24
Total Depth		**24**

Casing: 36" CONCRETE from 0' to 20'

Water from hardpan at 19' to 24'.
Static level 10' below casing top which is 0' above GL
Pumping level 0' when pumping at 20 gpm for 0 hours

Driller's Log filed

Sample set # 52306 (1' - 24')

Owner Address: ,
Location source: Location from the driller

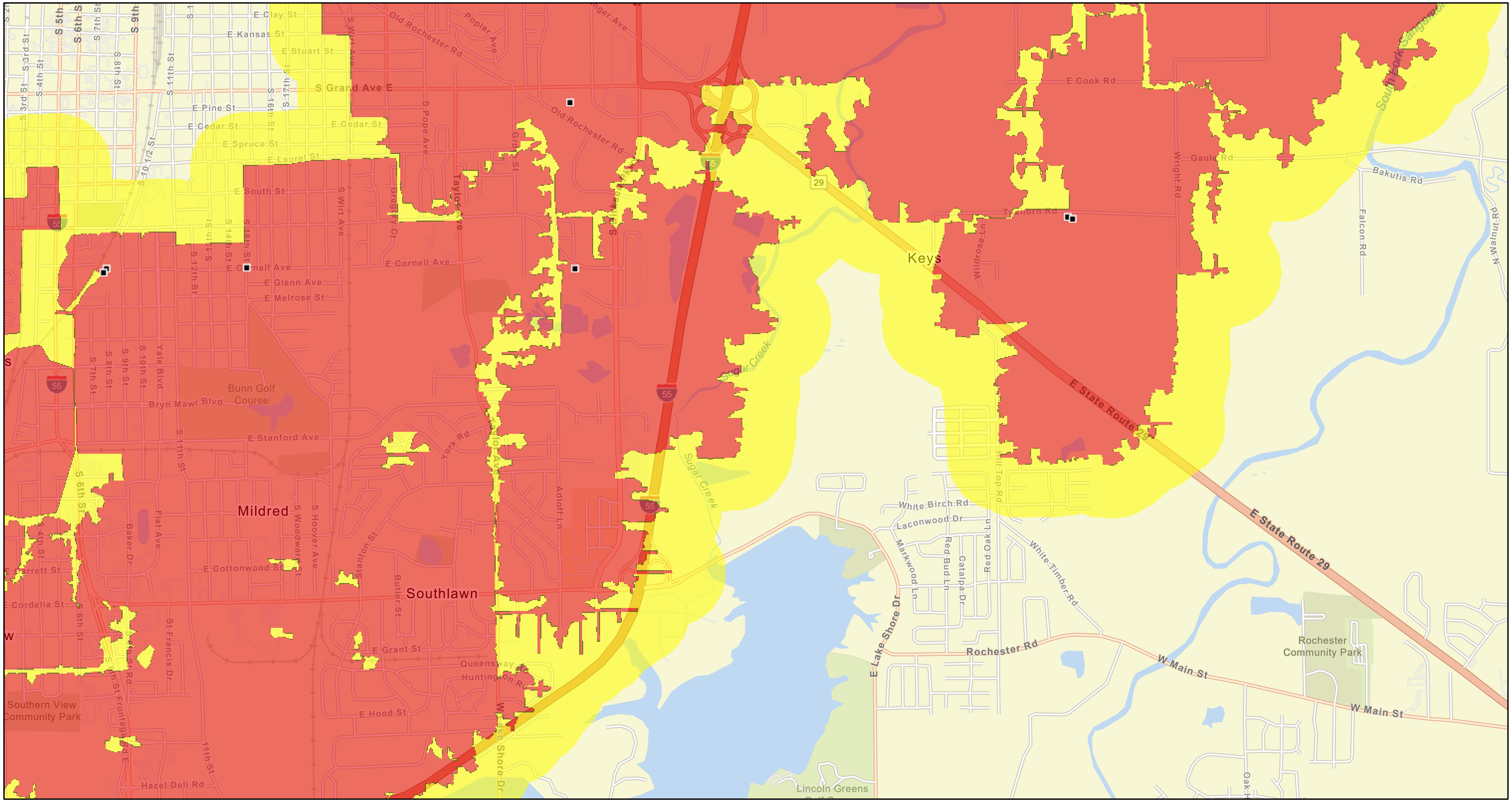
Permit Date: **Permit #:**

COMPANY owner
FARM Fiskas, Raymond L.
DATE DRILLED January 1, 1965 **NO.** 1
ELEVATION 0 **COUNTY NO.** 01481
LOCATION 430'N line, 320'E line of NW SE SW
LATITUDE 39.775264 **LONGITUDE** -89.606181
COUNTY **Sangamon** **API 121670148100** **1 - 15N - 5W**

APPENDIX E

UNDERGROUND MINES QUERY

Illinois State Geological Survey -- ILMINES



10/11/2021, 2:48:19 PM

- 🟨 Underground Mine Buffer Region
- ☐ Non Coal Mines

Underground Coal Mines

- 🟥 Underground
- 🟥 Indefinite Underground Mine Boundary
- 🟧 Surface
- ▲ Non Coal Mine Shaft

1:31,640

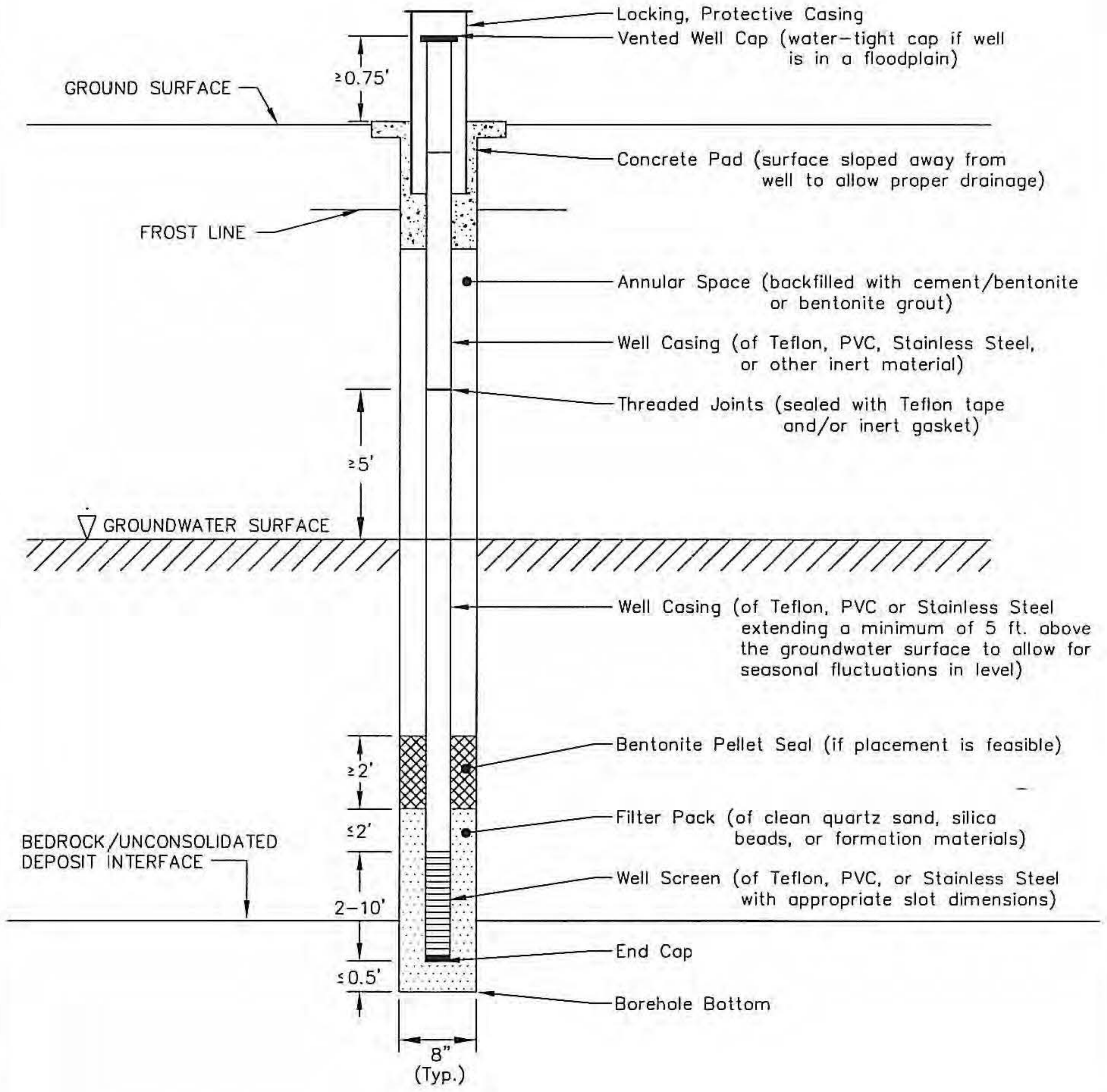
0 1,500 3,000 6,000 ft

0 490 980 1,960 m

Missouri Dept. of Conservation, Missouri DNR, Esri, HERE, Garmin, SafeGraph, INCREMENT P, METI/NASA, USGS, EPA, NPS, US Census Bureau, USDA, PRI - ISGS

APPENDIX F

WELL CONSTRUCTION DETAIL



NOTE: Detail after 77 IAC 920.170 and I.E.P.A. Administrative Procedure #11

ANDREWS ENGINEERING, INC.
3300 Ginger Creek Drive, Springfield, IL 62711-7233
Tel (217) 787-2334 Fax (217) 787-9495
Pontiac, IL • Naperville, IL • Indianapolis, IN • Warrenton, MO

APPROVED BY: MTH DESIGNED BY: MTH DRAWN BY: MPN

GROUNDWATER MONITORING WELL DETAIL

PLANS PREPARED FOR
CWLP
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: NOVEMBER 2011
PROJECT ID: 2011-127
FILE: GMW DETAIL.DWG
SHEET NUMBER: 1

APPENDIX G

STATISTICAL METHOD FOR DETERMINATION OF BACKGROUNDS

Statistical Analyses Method

1.0 References

1. 35 Illinois Administrative Code 811.320
2. "Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Interim Final Guidance." Office of Solid Waste, USEPA, April 1989.
3. "Statistical Analysis of Ground-Water Monitoring Data at RCRA Facilities, Addendum to Interim Final Guidance." Office of Solid Waste, USEPA, July 1992.

2.0 Statistical Method

The statistical method for determination of an interwell background concentration includes the calculation of the 95% upper confidence limit (95% CL) for each parameter utilizing at least four consecutive quarters of data. Calculation of an intrawell background concentration requires calculation of the 99% upper confidence limit (99% CL). Prior to the calculation of the upper confidence limit, the data set is evaluated for normality, outliers and the percentage of non-detect values. Each of the steps for determining the upper confidence limit is outlined below in Sections 2.1 through 2.4.

2.1 Normality Testing

The distribution of the data is tested for normality using the Shapiro-Wilk normality test. If the data is not found to follow a normal distribution, a nonparametric statistical method shall be utilized. Generally, the highest detected concentration is utilized as the upper confidence limit if the data set is found to be nonparametric. If the data is found to follow a normal distribution, the procedures outlined below are used to determine the upper confidence limit.

2.2 Handling of Outliers

Prior to statistical analyses, the data set is evaluated for outliers. Outliers are defined as data points that vary significantly from the mean value of the data set. Outliers may represent sampling error, contamination from surface run-off, analytical laboratory error, or anomalous site conditions. Outliers, if not removed from the data set, can erroneously increase the background concentration which makes the background concentration less likely to detect an exceedences related to a release from a waste unit. Once a statistical outlier has been identified, the concentrations shall be evaluated to determine the cause. If the outlier is determined to be a result of sampling, laboratory or some other error, the outlier will be removed from the data set. If no specific reason can be documented the point will be considered representative of site conditions and will be included in the statistical analysis. Statistical analysis will then be conducted as described below.

2.3 Handling of Non-Detects (NDs)

Non-detect values (NDs) are handled according to the percentage of Non-Detects (%ND) present in the data set. The data treatment is completed according to the following criteria:

a) For under 0% NDs, no adjustment is made to the values in the data set.
b) For under 15% NDs, the value of one-half (½) the reported Detection Limit (DL) is substituted for the ND value, and the mean and standard deviation are calculated using detected values with the substituted ND values.
c) For 15-50% NDs, Cohen's Adjustment is used to adjust the mean and standard deviation. The adjusted mean and standard deviation are then used to calculate the Confidence Limit.
d) For over 50% but not 100% NDs, the highest recorded concentration is substituted for the prediction limit.
e) For 100% NDs, the Practical Quantitation Limit (PQL) will be substituted for the ND value. The mean and standard deviation will be calculated using the substituted ND values.

2.4 Calculation of the Confidence Limit

After any outliers are removed and the data has been treated for non-detect values, the statistical procedure for calculation of the Confidence Limit will be conducted according to the following steps:

a) <u>Calculate arithmetic mean</u>

The arithmetic mean is calculated using the pooled data for each parameter. The arithmetic mean (X_b) is calculated using the following equation:

$$X_b = \frac{X_1 + X_2 + \ldots + X_n}{n}$$

where: X_b = Average background value

X_n = Individual background value for *n* sample

n = Number of background values

b) Calculate standard deviation

The standard deviation is calculated using the pooled data for each parameter. The standard deviation is calculated using the following equation:

$$S_b = \sqrt{\frac{(X_1 - X_b) + (X_2 - X_b) + \ldots + (X_n - X_b)}{n - 1}}$$

where: S_b = Population standard deviation
X_n = Individual background value for *n* sample
X_b = Mean (1)
n = Number of background samples

c) Calculate the 95% Upper Confidence Limit

The 95% Upper Confidence Limit is calculated for each parameter using the mean (1), the standard deviation (2), the number of background samples, and the Student's t value given for $\sigma = 0.05$ (95% Confidence). The Student's t value varies upon the number of background samples. The 95% Upper Confidence Limit is calculated using the following equation:

$$CL = X_b \pm S_b \bullet t \bullet \sqrt{1 + \frac{1}{n}}$$

where: CL = Upper Confidence Limit (Upper and Lower for pH)
X_b = Mean (1)
S_b = Standard Deviation (2)
t = Student's t value at 0.05 significance (95% Confidence)
n = Number of background samples

APPENDIX H

EXISTING GROUNDWATER QUALITY

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	4/25/2012	8/23/2012	11/28/2012	2/21/2013	5/22/2013	8/28/2013	11/20/2013	2/26/2014	5/20/2014	8/26/2014	11/21/2014
AP-1	Boron, total	mg/l	2	0.787	2	10.4	15.2	4.3	3.9	7.76	14.7	18.9	< 2	17.2	18	17.9
AP-2	Boron, total	mg/l	2	0.787	2	5.51	6.88	6.24	10	5.01	5.46	4.78	4.1	4.36	4.84	4.87
AP-3	Boron, total	mg/l	2	0.787	2	18.4	20.9	8.03	29.1	18.7	21.3	20.6	19.3	19.3	19.2	19.5
AP-4	Boron, total	mg/l	2	0.787	2	0.123	0.787	< 2	< 0.687	0.75	0.665	< 2	< 2	0.0899	0.106	0.103
AP-5	Boron, total	mg/l	2	0.787	2	< 0.625	0.782	< 3.2	< 0.687	0.22	0.0954	< 2	< 2	< 0.0625	0.0936	0.0546
AP-6	Boron, total	mg/l	2	0.787	2											
AP-7	Boron, total	mg/l	2	0.787	2											
AW-3/RW-3	Boron, total	mg/l	2	0.787	2	0.162	0.689	< 2	0.706	0.22	0.187	< 2	< 2	0.166	0.144	0.156
AP-8	Boron, total	mg/l	2	0.787	2											
AP-9	Boron, total	mg/l	2	0.787	2											
AP-10	Boron, total	mg/l	2	0.787	2											
AP-11	Boron, total	mg/l	2	0.787	2											
AP-12	Boron, total	mg/l	2	0.787	2											
AP-13	Boron, total	mg/l	2	0.787	2											
AP-14	Boron, total	mg/l	2	0.787	2											
AP-1	Calcium, total	mg/l	na	176.63	176.63											
AP-2	Calcium, total	mg/l	na	176.63	176.63											
AP-3	Calcium, total	mg/l	na	176.63	176.63											
AP-4	Calcium, total	mg/l	na	176.63	176.63											
AP-5	Calcium, total	mg/l	na	176.63	176.63											
AP-6	Calcium, total	mg/l	na	176.63	176.63											
AP-7	Calcium, total	mg/l	na	176.63	176.63											
AW-3/RW-3	Calcium, total	mg/l	na	176.63	176.63											
AP-8	Calcium, total	mg/l	na	176.63	176.63											
AP-9	Calcium, total	mg/l	na	176.63	176.63											
AP-10	Calcium, total	mg/l	na	176.63	176.63											
AP-11	Calcium, total	mg/l	na	176.63	176.63											
AP-12	Calcium, total	mg/l	na	176.63	176.63											
AP-13	Calcium, total	mg/l	na	176.63	176.63											
AP-14	Calcium, total	mg/l	na	176.63	176.63											
AP-1	Chloride, total	mg/l	200	24.2	200	38.2	39.3	40.3	43.6	44.8	45.9	44.7	43.1	45.3	46.5	47.7
AP-2	Chloride, total	mg/l	200	24.2	200	13	19.9	22.8	25.2	19.8	18.9	34.8	22	24.7	24.1	23.4
AP-3	Chloride, total	mg/l	200	24.2	200	46.2	47.7	54.6	55.6	47.5	43.4	46.8	47.7	41.6	43.3	39.1
AP-4	Chloride, total	mg/l	200	24.2	200	9.85	11	10.5	10.8	11	10.7	10.9	10.6	11.2	11.3	11
AP-5	Chloride, total	mg/l	200	24.2	200	7.23	3.32	3.76	3.71	2.61	1.95	2.07	2.83	3.29	4.2	4.03
AP-6	Chloride, total	mg/l	200	24.2	200											
AP-7	Chloride, total	mg/l	200	24.2	200											
AW-3/RW-3	Chloride, total	mg/l	200	24.2	200	23	23.7	23.5	26.2	28.9	27.8	27	23.3	25.1	23.3	24.2
AP-8	Chloride, total	mg/l	200	24.2	200											
AP-9	Chloride, total	mg/l	200	24.2	200											
AP-10	Chloride, total	mg/l	200	24.2	200											
AP-11	Chloride, total	mg/l	200	24.2	200											
AP-12	Chloride, total	mg/l	200	24.2	200											
AP-13	Chloride, total	mg/l	200	24.2	200											
AP-14	Chloride, total	mg/l	200	24.2	200											
AP-1	Fluoride, total	mg/l	4	0.62	4	< 0.5	< 0.5	< 0.5	0.17	0.26	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
AP-2	Fluoride, total	mg/l	4	0.62	4	< 0.5	< 0.5	< 0.5	< 0.5	0.43	0.523	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
AP-3	Fluoride, total	mg/l	4	0.62	4	< 0.5	< 0.5	< 0.5	< 0.5	0.32	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
AP-4	Fluoride, total	mg/l	4	0.62	4	< 0.5	< 0.5	< 0.5	< 0.5	0.2	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
AP-5	Fluoride, total	mg/l	4	0.62	4	< 0.5	< 0.5	< 0.5	< 0.5	0.43	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
AP-6	Fluoride, total	mg/l	4	0.62	4											
AP-7	Fluoride, total	mg/l	4	0.62	4											
AW-3/RW-3	Fluoride, total	mg/l	4	0.62	4	0.43	< 0.5	< 0.5	< 0.5	0.42	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
AP-8	Fluoride, total	mg/l	4	0.62	4											
AP-10	Fluoride, total	mg/l	4	0.62	4											
AP-14	Fluoride, total	mg/l	4	0.62	4											
AP-1	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	7.10		7.23	7.41	6.95	7.13	6.92	7.03	7.03	6.92	7.15
AP-2	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	7.65	7	7.58	7.8	6.83	9.94	6.76	6.93	6.99	6.87	7.03
AP-3	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	7.31	6.88	7.35	7.4	7.07	6.98	6.88	6.25	7.09	7.03	6.63
AP-4	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	7.07	7.63	7.09	7.04	7.23	7.04	7.1	7.31	7.31	7.1	7.14
AP-5	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	7.19		7.29	7.23	7.46	7.15	7.32	7.48	7.53	7.31	7.31
AP-6	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0											

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	4/25/2012	8/23/2012	11/28/2012	2/21/2013	5/22/2013	8/28/2013	11/20/2013	2/26/2014	5/20/2014	8/26/2014	11/21/2014
AP-7	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0											
AW-3/RW-3	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	7.15		7.05	7.68	7.63	7.3	7.31	7.48	7.71	7.18	7.35
AP-8	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0											
AP-9	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0											
AP-10	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0											
AP-11	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0											
AP-12	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0											
AP-13	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0											
AP-14	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0											
AP-1	Sulfate, total	mg/l	400	84.5	400	463	469	488	506	603	597	581	436	615	594	619
AP-2	Sulfate, total	mg/l	400	84.5	400	201	250	293	283	240	280	< 5	252	289	364	463
AP-3	Sulfate, total	mg/l	400	84.5	400	274	315	318	292	347	353	338	298	343	356	362
AP-4	Sulfate, total	mg/l	400	84.5	400	< 5	< 5	< 5	< 5	0.3	< 5	< 5	< 5	< 5	< 5	< 5
AP-5	Sulfate, total	mg/l	400	84.5	400	43.5	76.8	84.5	83.4	55.3	66.8	59.5	63.1	62.5	56.2	68.7
AP-6	Sulfate, total	mg/l	400	84.5	400											
AP-7	Sulfate, total	mg/l	400	84.5	400											
AW-3/RW-3	Sulfate, total	mg/l	400	84.5	400	10.9	5.99	< 5	< 5	40.8	25.8	15	13.7	8.25	11	8.7
AP-8	Sulfate, total	mg/l	400	84.5	400											
AP-9	Sulfate, total	mg/l	400	84.5	400											
AP-10	Sulfate, total	mg/l	400	84.5	400											
AP-11	Sulfate, total	mg/l	400	84.5	400											
AP-12	Sulfate, total	mg/l	400	84.5	400											
AP-13	Sulfate, total	mg/l	400	84.5	400											
AP-14	Sulfate, total	mg/l	400	84.5	400											
AP-1	Total Dissolved Solids	mg/l	1200	597.94	1200	1020	788	1160	1120	1390	1380	1250	1100	1360	1300	1490
AP-2	Total Dissolved Solids	mg/l	1200	597.94	1200	866	836	1100	932	950	1000	748	870	946	1000	1080
AP-3	Total Dissolved Solids	mg/l	1200	597.94	1200	926	1000	928	624	1040	992	870	812	872	880	974
AP-4	Total Dissolved Solids	mg/l	1200	597.94	1200	560	448	574	460	578	548	316	442	510	554	492
AP-5	Total Dissolved Solids	mg/l	1200	597.94	1200	404	316	404	370	410	428	384	358	544	390	446
AP-6	Total Dissolved Solids	mg/l	1200	597.94	1200											
AP-7	Total Dissolved Solids	mg/l	1200	597.94	1200											
AW-3/RW-3	Total Dissolved Solids	mg/l	1200	597.94	1200	470	422	570	724	436	652	408	406	450	454	468
AP-8	Total Dissolved Solids	mg/l	1200	597.94	1200											
AP-9	Total Dissolved Solids	mg/l	1200	597.94	1200											
AP-10	Total Dissolved Solids	mg/l	1200	597.94	1200											
AP-11	Total Dissolved Solids	mg/l	1200	597.94	1200											
AP-12	Total Dissolved Solids	mg/l	1200	597.94	1200											
AP-13	Total Dissolved Solids	mg/l	1200	597.94	1200											
AP-14	Total Dissolved Solids	mg/l	1200	597.94	1200											
AP-1	Antimony, total	mg/l	0.006	0.016	0.016	< 0.006	0.0073	< 0.006	< 0.006	0.0118	< 0.006	< 0.006	< 0.006	< 0.0625	< 0.0312	< 0.0312
AP-2	Antimony, total	mg/l	0.006	0.016	0.016	< 0.006	< 0.006	< 0.006	< 0.006	0.026	0.006	< 0.006	< 0.006	< 0.0625	< 0.0312	< 0.0312
AP-3	Antimony, total	mg/l	0.006	0.016	0.016	< 0.006	< 0.006	< 0.006	0.00805	0.0161	< 0.006	< 0.006	< 0.006	< 0.0625	< 0.0312	< 0.0312
AP-4	Antimony, total	mg/l	0.006	0.016	0.016	< 0.006	< 0.006	< 0.006	< 0.006	0.0152	< 0.006	< 0.006	< 0.006	< 0.0625	< 0.0312	< 0.0312
AP-5	Antimony, total	mg/l	0.006	0.016	0.016	< 0.006	0.0063	< 0.0096	< 0.006	0.0160	< 0.006	< 0.006	< 0.006	< 0.0625	< 0.0312	< 0.0312
AP-6	Antimony, total	mg/l	0.006	0.016	0.016											
AP-7	Antimony, total	mg/l	0.006	0.016	0.016											
AW-3/RW-3	Antimony, total	mg/l	0.006	0.016	0.016	< 0.0075	0.0067	< 0.006	< 0.006	0.0128	< 0.006	< 0.006	< 0.006	< 0.0625	< 0.0312	< 0.0312
AP-8	Antimony, total	mg/l	0.006	0.016	0.016											
AP-9	Antimony, total	mg/l	0.006	0.016	0.016											
AP-10	Antimony, total	mg/l	0.006	0.016	0.016											
AP-11	Antimony, total	mg/l	0.006	0.016	0.016											
AP-12	Antimony, total	mg/l	0.006	0.016	0.016											
AP-13	Antimony, total	mg/l	0.006	0.016	0.016											
AP-14	Antimony, total	mg/l	0.006	0.016	0.016											

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	4/25/2012	8/23/2012	11/28/2012	2/21/2013	5/22/2013	8/28/2013	11/20/2013	2/26/2014	5/20/2014	8/26/2014	11/21/2014
AP-1	Arsenic, total	mg/l	0.01	0.0724	0.0724	< 0.05	0.0141	0.00572	< 0.05	0.00976	< 0.015	< 0.05	0.158	< 0.0625	< 0.0312	< 0.0312
AP-2	Arsenic, total	mg/l	0.01	0.0724	0.0724	< 0.05	0.0331	0.0156	0.0738	0.034	0.0224	< 0.05	< 0.05	< 0.0625	< 0.0312	< 0.0312
AP-3	Arsenic, total	mg/l	0.01	0.0724	0.0724	< 0.05	0.0254	0.0136	0.0784	0.016	< 0.015	< 0.05	< 0.05	< 0.0625	< 0.0312	< 0.0312
AP-4	Arsenic, total	mg/l	0.01	0.0724	0.0724	< 0.05	0.0294	0.00608	< 0.05	0.025	0.0193	< 0.05	< 0.05	< 0.0625	< 0.0312	< 0.0312
AP-5	Arsenic, total	mg/l	0.01	0.0724	0.0724	0.076	0.102	0.0243	< 0.05	0.0094	< 0.015	< 0.05	< 0.05	< 0.0625	0.0662	< 0.0312
AP-6	Arsenic, total	mg/l	0.01	0.0724	0.0724											
AP-7	Arsenic, total	mg/l	0.01	0.0724	0.0724											
AW-3/RW-3	Arsenic, total	mg/l	0.01	0.0724	0.0724	0.149	0.131	0.121	0.104	< 0.015	< 0.015	0.134	0.139	0.138	0.134	0.118
AP-8	Arsenic, total	mg/l	0.01	0.0724	0.0724											
AP-9	Arsenic, total	mg/l	0.01	0.0724	0.0724											
AP-10	Arsenic, total	mg/l	0.01	0.0724	0.0724											
AP-11	Arsenic, total	mg/l	0.01	0.0724	0.0724											
AP-12	Arsenic, total	mg/l	0.01	0.0724	0.0724											
AP-13	Arsenic, total	mg/l	0.01	0.0724	0.0724											
AP-14	Arsenic, total	mg/l	0.01	0.0724	0.0724											
AP-1	Barium, total	mg/l	2	5.24	5.24	< 2	0.255	< 2	< 2	0.306	0.639	< 2	< 2	0.993	0.694	0.952
AP-2	Barium, total	mg/l	2	5.24	5.24	< 2	0.731	< 2	< 2	0.200	0.282	< 2	< 2	0.355	0.242	0.276
AP-3	Barium, total	mg/l	2	5.24	5.24	< 2	0.160	< 2	< 2	0.095	0.125	< 2	< 2	0.144	0.0979	0.0939
AP-4	Barium, total	mg/l	2	5.24	5.24	< 2	0.366	< 2	< 2	0.370	0.385	< 2	< 2	0.352	0.346	0.351
AP-5	Barium, total	mg/l	2	5.24	5.24	< 2	2.760	< 3.2	< 2	0.130	0.228	< 2	< 2	0.278	0.663	0.193
AP-6	Barium, total	mg/l	2	5.24	5.24											
AP-7	Barium, total	mg/l	2	5.24	5.24											
AW-3/RW-3	Barium, total	mg/l	2	5.24	5.24	0.376	0.202	< 2	< 2	0.059	0.0843	< 2	< 2	0.274	0.183	0.18
AP-8	Barium, total	mg/l	2	5.24	5.24											
AP-9	Barium, total	mg/l	2	5.24	5.24											
AP-10	Barium, total	mg/l	2	5.24	5.24											
AP-11	Barium, total	mg/l	2	5.24	5.24											
AP-12	Barium, total	mg/l	2	5.24	5.24											
AP-13	Barium, total	mg/l	2	5.24	5.24											
AP-14	Barium, total	mg/l	2	5.24	5.24											
AP-1	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.004	< 0.004	< 0.004	< 0.004	< 0.00375	< 0.004	< 0.004	< 0.004	< 0.0625	< 0.00312	< 0.00312
AP-2	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.0625	< 0.00312	< 0.00312
AP-3	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.0625	< 0.00312	< 0.00312
AP-4	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.0625	< 0.00312	< 0.00312
AP-5	Beryllium, total	mg/l	0.004	0.0164	0.0164	0.0128	0.0092	0.0164	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.0625	0.00735	< 0.00312
AP-6	Beryllium, total	mg/l	0.004	0.0164	0.0164											
AP-7	Beryllium, total	mg/l	0.004	0.0164	0.0164											
AW-3/RW-3	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.0075	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.004	< 0.0625	< 0.00312	< 0.00312
AP-8	Beryllium, total	mg/l	0.004	0.0164	0.0164											
AP-9	Beryllium, total	mg/l	0.004	0.0164	0.0164											
AP-10	Beryllium, total	mg/l	0.004	0.0164	0.0164											
AP-11	Beryllium, total	mg/l	0.004	0.0164	0.0164											
AP-12	Beryllium, total	mg/l	0.004	0.0164	0.0164											
AP-13	Beryllium, total	mg/l	0.004	0.0164	0.0164											
AP-14	Beryllium, total	mg/l	0.004	0.0164	0.0164											
AP-1	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.005	< 0.0025	< 0.005	< 0.005	< 0.00125	< 0.0025	< 0.005	< 0.005	< 0.0625	< 0.00312	< 0.00312
AP-2	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.0025	< 0.005	< 0.005	< 0.0625	< 0.00312	< 0.00312
AP-3	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.0025	< 0.005	< 0.005	< 0.0625	< 0.00312	< 0.00312
AP-4	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005	< 0.0025	< 0.005	< 0.005	< 0.0625	< 0.00312	< 0.00312
AP-5	Cadmium, total	mg/l	0.005	0.0128	0.0128	0.0128	0.00575	< 0.008	< 0.005	< 0.005	< 0.0025	< 0.005	< 0.005	< 0.0625	0.00525	< 0.00312
AP-6	Cadmium, total	mg/l	0.005	0.0128	0.0128											
AP-7	Cadmium, total	mg/l	0.005	0.0128	0.0128											
AW-3/RW-3	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.005	< 0.0025	< 0.00005	< 0.005	< 0.005	< 0.0025	< 0.005	< 0.005	< 0.0625	< 0.00312	< 0.00312
AP-8	Cadmium, total	mg/l	0.005	0.0128	0.0128											
AP-9	Cadmium, total	mg/l	0.005	0.0128	0.0128											
AP-10	Cadmium, total	mg/l	0.005	0.0128	0.0128											
AP-11	Cadmium, total	mg/l	0.005	0.0128	0.0128											
AP-12	Cadmium, total	mg/l	0.005	0.0128	0.0128											
AP-13	Cadmium, total	mg/l	0.005	0.0128	0.0128											
AP-14	Cadmium, total	mg/l	0.005	0.0128	0.0128											

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	4/25/2012	8/23/2012	11/28/2012	2/21/2013	5/22/2013	8/28/2013	11/20/2013	2/26/2014	5/20/2014	8/26/2014	11/21/2014
AP-1	Chromium, total	mg/l	0.1	0.811	0.811	< 0.1	< 0.0175	< 0.1	< 0.1	0.0024	< 0.01	< 0.1	< 0.1	< 0.0625	< 0.0312	< 0.0312
AP-2	Chromium, total	mg/l	0.1	0.811	0.811	< 0.1	0.111	< 0.1	< 0.1	0.0091	0.018	< 0.1	< 0.1	< 0.0625	< 0.0312	< 0.0312
AP-3	Chromium, total	mg/l	0.1	0.811	0.811	< 0.1	< 0.0175	< 0.1	< 0.1	< 0.1	< 0.01	< 0.1	< 0.1	< 0.0625	< 0.0312	< 0.0312
AP-4	Chromium, total	mg/l	0.1	0.811	0.811	< 0.1	< 0.0175	< 0.1	< 0.1	0.0039	< 0.01	< 0.1	< 0.1	< 0.0625	< 0.0312	< 0.0312
AP-5	Chromium, total	mg/l	0.1	0.811	0.811	0.328	0.449	0.42	< 0.1	0.016	0.0431	0.113	< 0.1	< 0.0625	0.174	< 0.0312
AP-6	Chromium, total	mg/l	0.1	0.811	0.811											
AP-7	Chromium, total	mg/l	0.1	0.811	0.811											
AW-3/RW-3	Chromium, total	mg/l	0.1	0.811	0.811	0.0443	< 0.0175	< 0.1	< 0.1	< 0.1	< 0.01	< 0.1	< 0.1	< 0.0625	< 0.0312	< 0.0312
AP-8	Chromium, total	mg/l	0.1	0.811	0.811											
AP-9	Chromium, total	mg/l	0.1	0.811	0.811											
AP-10	Chromium, total	mg/l	0.1	0.811	0.811											
AP-11	Chromium, total	mg/l	0.1	0.811	0.811											
AP-12	Chromium, total	mg/l	0.1	0.811	0.811											
AP-13	Chromium, total	mg/l	0.1	0.811	0.811											
AP-14	Chromium, total	mg/l	0.1	0.811	0.811											
AP-1	Cobalt, total	mg/l	0.006	0.297	0.297	< 1	< 0.0175	< 1	< 1	< 0.0075	< 0.015	< 1	< 1	< 0.0313	< 0.0156	< 0.0156
AP-2	Cobalt, total	mg/l	0.006	0.297	0.297	< 1	0.0528	< 1	< 1	0.0093	< 0.015	< 1	< 1	< 0.0313	< 0.0156	< 0.0156
AP-3	Cobalt, total	mg/l	0.006	0.297	0.297	< 1	< 0.0175	< 1	< 1	< 1	< 0.015	< 1	< 1	< 0.0313	< 0.0156	< 0.0156
AP-4	Cobalt, total	mg/l	0.006	0.297	0.297	< 1	< 0.0175	< 1	< 1	< 1	< 0.015	< 1	< 1	< 0.0313	< 0.0156	< 0.0156
AP-5	Cobalt, total	mg/l	0.006	0.297	0.297	< 1	0.297	< 1.6	< 1	0.0086	0.0223	< 1	< 1	< 0.0313	0.11	< 0.0156
AP-6	Cobalt, total	mg/l	0.006	0.297	0.297											
AP-7	Cobalt, total	mg/l	0.006	0.297	0.297											
AW-3/RW-3	Cobalt, total	mg/l	0.006	0.297	0.297	0.0278	< 0.0175	< 1	< 1	< 1	< 0.015	< 1	< 1	< 0.0313	< 0.0156	< 0.0156
AP-8	Cobalt, total	mg/l	0.006	0.297	0.297											
AP-9	Cobalt, total	mg/l	0.006	0.297	0.297											
AP-10	Cobalt, total	mg/l	0.006	0.297	0.297											
AP-11	Cobalt, total	mg/l	0.006	0.297	0.297											
AP-12	Cobalt, total	mg/l	0.006	0.297	0.297											
AP-13	Cobalt, total	mg/l	0.006	0.297	0.297											
AP-14	Cobalt, total	mg/l	0.006	0.297	0.297											
AP-1	Lead, total	mg/l	0.0075	0.638	0.638	< 0.0075	< 0.005	< 0.0075	< 0.0075	0.0019	< 0.005	< 0.0075	0.0291	< 0.0625	< 0.0312	< 0.0312
AP-2	Lead, total	mg/l	0.0075	0.638	0.638	0.047	0.0599	0.0433	< 0.0075	0.0048	0.0104	0.015	< 0.0075	< 0.0625	< 0.0312	< 0.0312
AP-3	Lead, total	mg/l	0.0075	0.638	0.638	< 0.0075	0.0118	< 0.0075	< 0.0075	< 0.0075	< 0.005	< 0.0075	< 0.0075	< 0.0625	< 0.0312	< 0.0312
AP-4	Lead, total	mg/l	0.0075	0.638	0.638	< 0.0075	< 0.005	< 0.0075	< 0.0075	0.0036	< 0.005	< 0.0075	< 0.0075	< 0.0625	< 0.0312	< 0.0312
AP-5	Lead, total	mg/l	0.0075	0.638	0.638	0.236	0.312	0.277	0.0244	0.0104	0.0312	0.638	0.032	< 0.0625	0.093	< 0.0312
AP-6	Lead, total	mg/l	0.0075	0.638	0.638											
AP-7	Lead, total	mg/l	0.0075	0.638	0.638											
AW-3/RW-3	Lead, total	mg/l	0.0075	0.638	0.638	0.0371	< 0.005	< 0.0075	< 0.0075	< 0.0075	< 0.005	< 0.0075	< 0.0075	< 0.0625	< 0.0312	< 0.0312
AP-8	Lead, total	mg/l	0.0075	0.638	0.638											
AP-9	Lead, total	mg/l	0.0075	0.638	0.638											
AP-10	Lead, total	mg/l	0.0075	0.638	0.638											
AP-11	Lead, total	mg/l	0.0075	0.638	0.638											
AP-12	Lead, total	mg/l	0.0075	0.638	0.638											
AP-13	Lead, total	mg/l	0.0075	0.638	0.638											
AP-14	Lead, total	mg/l	0.0075	0.638	0.638											
AP-1	Lithium	mg/l	0.04	0.05	0.05											
AP-2	Lithium	mg/l	0.04	0.05	0.05											
AP-3	Lithium	mg/l	0.04	0.05	0.05											
AP-4	Lithium	mg/l	0.04	0.05	0.05											
AP-5	Lithium	mg/l	0.04	0.05	0.05											
AP-6	Lithium	mg/l	0.04	0.05	0.05											
AP-7	Lithium	mg/l	0.04	0.05	0.05											
AW-3/RW-3	Lithium	mg/l	0.04	0.05	0.05											
AP-8	Lithium	mg/l	0.04	0.05	0.05											
AP-9	Lithium	mg/l	0.04	0.05	0.05											
AP-10	Lithium	mg/l	0.04	0.05	0.05											
AP-11	Lithium	mg/l	0.04	0.05	0.05											
AP-12	Lithium	mg/l	0.04	0.05	0.05											
AP-13	Lithium	mg/l	0.04	0.05	0.05											
AP-14	Lithium	mg/l	0.04	0.05	0.05											

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	4/25/2012	8/23/2012	11/28/2012	2/21/2013	5/22/2013	8/28/2013	11/20/2013	2/26/2014	5/20/2014	8/26/2014	11/21/2014
AP-1	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-2	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0006
AP-3	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-4	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-5	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005	0.0007	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-6	Mercury, total	mg/l	0.002	0.0008	0.002											
AP-7	Mercury, total	mg/l	0.002	0.0008	0.002											
AW-3/RW-3	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-8	Mercury, total	mg/l	0.002	0.0008	0.002											
AP-9	Mercury, total	mg/l	0.002	0.0008	0.002											
AP-10	Mercury, total	mg/l	0.002	0.0008	0.002											
AP-11	Mercury, total	mg/l	0.002	0.0008	0.002											
AP-12	Mercury, total	mg/l	0.002	0.0008	0.002											
AP-13	Mercury, total	mg/l	0.002	0.0008	0.002											
AP-14	Mercury, total	mg/l	0.002	0.0008	0.002											
AP-1	Molybdenum	mg/l	0.1	0.025	0.1											
AP-2	Molybdenum	mg/l	0.1	0.025	0.1											
AP-3	Molybdenum	mg/l	0.1	0.025	0.1											
AP-4	Molybdenum	mg/l	0.1	0.025	0.1											
AP-5	Molybdenum	mg/l	0.1	0.025	0.1											
AP-6	Molybdenum	mg/l	0.1	0.025	0.1											
AP-7	Molybdenum	mg/l	0.1	0.025	0.1											
AW-3/RW-3	Molybdenum	mg/l	0.1	0.025	0.1											
AP-8	Molybdenum	mg/l	0.1	0.025	0.1											
AP-9	Molybdenum	mg/l	0.1	0.025	0.1											
AP-10	Molybdenum	mg/l	0.1	0.025	0.1											
AP-11	Molybdenum	mg/l	0.1	0.025	0.1											
AP-12	Molybdenum	mg/l	0.1	0.025	0.1											
AP-13	Molybdenum	mg/l	0.1	0.025	0.1											
AP-14	Molybdenum	mg/l	0.1	0.025	0.1											
AP-1	Radium-226 + Radium-228	pCi/l	5	7.1	7.1		1.9	2.5	2.9	3.3	1.58	2.29	1.3	-21.9	4	1.66
AP-2	Radium-226 + Radium-228	pCi/l	5	7.1	7.1		2.9	1.66	2.09	4.2	1.29	2.29	1.13	1.49	-0.28	1.98
AP-3	Radium-226 + Radium-228	pCi/l	5	7.1	7.1		2.03	2.05	1.51	1.73	0.98	1.66	1.49	-1.23	1.15	0.72
AP-4	Radium-226 + Radium-228	pCi/l	5	7.1	7.1		1.68	2.71	1.4	1.53	1.97	0.98	1.47	1.73	2.22	2.2
AP-5	Radium-226 + Radium-228	pCi/l	5	7.1	7.1		12.2	2.02	3.2	1.78	1.81	3.5	1.76	0.92	0	2.14
AP-6	Radium-226 + Radium-228	pCi/l	5	7.1	7.1											
AP-7	Radium-226 + Radium-228	pCi/l	5	7.1	7.1											
AW-3/RW-3	Radium-226 + Radium-228	pCi/l	5	7.1	7.1		1.49	1.78	2.1	0.84	1.03	2.8	1.58	1.66	1.4	1.75
AP-8	Radium-226 + Radium-228	pCi/l	5	7.1	7.1											
AP-9	Radium-226 + Radium-228	pCi/l	5	7.1	7.1											
AP-10	Radium-226 + Radium-228	pCi/l	5	7.1	7.1											
AP-11	Radium-226 + Radium-228	pCi/l	5	7.1	7.1											
AP-12	Radium-226 + Radium-228	pCi/l	5	7.1	7.1											
AP-13	Radium-226 + Radium-228	pCi/l	5	7.1	7.1											
AP-14	Radium-226 + Radium-228	pCi/l	5	7.1	7.1											
AP-1	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.05	< 0.0025	< 0.05	< 0.05	0.0204	0.00274	< 0.05	< 0.05	< 0.0625	< 0.0312	< 0.0312
AP-2	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.05	< 0.0025	< 0.05	< 0.05	0.045	< 0.0025	< 0.05	< 0.05	< 0.0625	< 0.0312	< 0.0312
AP-3	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.05	< 0.0025	< 0.05	< 0.05	0.013	< 0.0025	< 0.05	< 0.05	< 0.0625	< 0.0312	< 0.0312
AP-4	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.05	0.00497	< 0.05	< 0.05	0.0079	< 0.0025	< 0.05	< 0.05	< 0.0625	< 0.0312	< 0.0312
AP-5	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.05	0.00585	< 0.08	< 0.05	0.0046	0.00523	< 0.05	< 0.05	< 0.0625	< 0.0312	< 0.0312
AP-6	Selenium, total	mg/l	0.05	0.0079	0.05											
AP-7	Selenium, total	mg/l	0.05	0.0079	0.05											
AW-3/RW-3	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.0025	< 0.0025	< 0.05	< 0.05	0.0025	< 0.0025	< 0.05	< 0.05	< 0.0625	< 0.0312	< 0.0312
AP-8	Selenium, total	mg/l	0.05	0.0079	0.05											
AP-9	Selenium, total	mg/l	0.05	0.0079	0.05											
AP-10	Selenium, total	mg/l	0.05	0.0079	0.05											
AP-11	Selenium, total	mg/l	0.05	0.0079	0.05											
AP-12	Selenium, total	mg/l	0.05	0.0079	0.05											
AP-13	Selenium, total	mg/l	0.05	0.0079	0.05											
AP-14	Selenium, total	mg/l	0.05	0.0079	0.05											

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	4/25/2012	8/23/2012	11/28/2012	2/21/2013	5/22/2013	8/28/2013	11/20/2013	2/26/2014	5/20/2014	8/26/2014	11/21/2014
AP-1	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.002	< 0.002	< 0.002	< 0.002	0.00095	< 0.002	< 0.002	< 0.002	< 0.0625	< 0.0312	< 0.0312
AP-2	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.002	< 0.002	< 0.002	< 0.002	0.0018	< 0.002	< 0.002	< 0.002	< 0.0625	< 0.0312	< 0.0312
AP-3	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.0625	< 0.0312	< 0.0312
AP-4	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.0625	< 0.0312	< 0.0312
AP-5	Thallium, total	mg/l	0.002	0.00556	0.0056	0.00258	0.00302	< 0.0032	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.0625	< 0.0312	< 0.0312
AP-6	Thallium, total	mg/l	0.002	0.00556	0.0056											
AP-7	Thallium, total	mg/l	0.002	0.00556	0.0056											
AW-3/RW-3	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.0025	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002	< 0.0625	< 0.0312	< 0.0312
AP-8	Thallium, total	mg/l	0.002	0.00556	0.0056											
AP-9	Thallium, total	mg/l	0.002	0.00556	0.0056											
AP-10	Thallium, total	mg/l	0.002	0.00556	0.0056											
AP-11	Thallium, total	mg/l	0.002	0.00556	0.0056											
AP-12	Thallium, total	mg/l	0.002	0.00556	0.0056											
AP-13	Thallium, total	mg/l	0.002	0.00556	0.0056											
AP-14	Thallium, total	mg/l	0.002	0.00556	0.0056											
AP-1	Turbidity	NTU	NA	NA	NA											
AP-2	Turbidity	NTU	NA	NA	NA											
AP-3	Turbidity	NTU	NA	NA	NA											
AP-4	Turbidity	NTU	NA	NA	NA											
AP-5	Turbidity	NTU	NA	NA	NA											
AP-6	Turbidity	NTU	NA	NA	NA											
AP-7	Turbidity	NTU	NA	NA	NA											
AW-3/RW-3	Turbidity	NTU	NA	NA	NA											
AP-8	Turbidity	NTU	NA	NA	NA											
AP-9	Turbidity	NTU	NA	NA	NA											
AP-10	Turbidity	NTU	NA	NA	NA											
AP-11	Turbidity	NTU	NA	NA	NA											
AP-12	Turbidity	NTU	NA	NA	NA											
AP-13	Turbidity	NTU	NA	NA	NA											
AP-14	Turbidity	NTU	NA	NA	NA											

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	2/24/2015	5/28/2015	8/20/2015	11/13/2015	2/26/2016	5/13/2016	8/4/2016	11/18/2016	2/16/2017	5/31/2017	8/2/2017	11/9/2017
AP-1	Boron, total	mg/l	2	0.787	2	17.9	15.7	17.5	18.8	16.1	17.2	17.9	17.3	22.5	13.9	19.4	20.3
AP-2	Boron, total	mg/l	2	0.787	2	4.12	4.51	5.01		4.62	4.43	4.4	4.28	3.92	3.63	3.58	3.16
AP-3	Boron, total	mg/l	2	0.787	2	17.8	16.4	17.6	20.1	16.9	16.2	16.5	18.6		17.7	18.9	19.2
AP-4	Boron, total	mg/l	2	0.787	2	0.105	0.123	0.0779	0.119	0.0783	0.123	0.131	0.136	0.117	0.12	0.105	0.129
AP-5	Boron, total	mg/l	2	0.787	2	0.0383	0.0379	0.0298	0.053	0.0699	0.0537	0.0779	0.0733	0.0483	0.0443	0.0407	0.073
AP-6	Boron, total	mg/l	2	0.787	2												
AP-7	Boron, total	mg/l	2	0.787	2												
AW-3/RW-3	Boron, total	mg/l	2	0.787	2	0.16	0.157	0.155	0.17	0.179	0.155	0.135	0.2	0.162	0.163	0.173	0.206
AP-8	Boron, total	mg/l	2	0.787	2												
AP-9	Boron, total	mg/l	2	0.787	2												
AP-10	Boron, total	mg/l	2	0.787	2												
AP-11	Boron, total	mg/l	2	0.787	2												
AP-12	Boron, total	mg/l	2	0.787	2												
AP-13	Boron, total	mg/l	2	0.787	2												
AP-14	Boron, total	mg/l	2	0.787	2												
AP-1	Calcium, total	mg/l	na	176.63	176.63		260	241	242	234	209	228	196	266	173	15	259
AP-2	Calcium, total	mg/l	na	176.63	176.63		350	358		312	203	191	185	180	174	238	203
AP-3	Calcium, total	mg/l	na	176.63	176.63		169	168	184	190	154	161	154	198	138	198	176
AP-4	Calcium, total	mg/l	na	176.63	176.63		121	117	125	125	118	118	117	136	117	150	141
AP-5	Calcium, total	mg/l	na	176.63	176.63		103	92.2	124	98.1	77.3	158	201	155	83.5	105	118
AP-6	Calcium, total	mg/l	na	176.63	176.63												
AP-7	Calcium, total	mg/l	na	176.63	176.63												
AW-3/RW-3	Calcium, total	mg/l	na	176.63	176.63		74.6	85.4	90.7	68.6	105	74.3	72.8	96.1	69.9	5.08	77.7
AP-8	Calcium, total	mg/l	na	176.63	176.63												
AP-9	Calcium, total	mg/l	na	176.63	176.63												
AP-10	Calcium, total	mg/l	na	176.63	176.63												
AP-11	Calcium, total	mg/l	na	176.63	176.63												
AP-12	Calcium, total	mg/l	na	176.63	176.63												
AP-13	Calcium, total	mg/l	na	176.63	176.63												
AP-14	Calcium, total	mg/l	na	176.63	176.63												
AP-1	Chloride, total	mg/l	200	24.2	200	46.9	50.7	44.8	68.9	45.8	46.2	48.3	47.3	47.9	44.6	50.2	54.1
AP-2	Chloride, total	mg/l	200	24.2	200	19.6	25.6	28.1		40.7	39.7	40.2	41.1	41.5	42.1	46.6	48.6
AP-3	Chloride, total	mg/l	200	24.2	200	38.7	40.6	34.8	52.1	40.3	37.9	38.8	38.9	39.6	39.9	38.3	40.9
AP-4	Chloride, total	mg/l	200	24.2	200	10.8	15.1	10.2	16.7	11.3	12.3	11.3	9.8	10.6	12	11.9	12.1
AP-5	Chloride, total	mg/l	200	24.2	200	4.02	4.79	< 3	3.27	< 3	< 3	< 3	< 3	< 3	< 3	< 3	< 30
AP-6	Chloride, total	mg/l	200	24.2	200												
AP-7	Chloride, total	mg/l	200	24.2	200												
AW-3/RW-3	Chloride, total	mg/l	200	24.2	200	25.3	24.1	20.9	33	23.7	24.7	22.7	23	22.9	26.8	27.1	26.2
AP-8	Chloride, total	mg/l	200	24.2	200												
AP-9	Chloride, total	mg/l	200	24.2	200												
AP-10	Chloride, total	mg/l	200	24.2	200												
AP-11	Chloride, total	mg/l	200	24.2	200												
AP-12	Chloride, total	mg/l	200	24.2	200												
AP-13	Chloride, total	mg/l	200	24.2	200												
AP-14	Chloride, total	mg/l	200	24.2	200												
AP-1	Fluoride, total	mg/l	4	0.62	4	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
AP-2	Fluoride, total	mg/l	4	0.62	4	< 0.5	< 0.5	< 0.5		< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
AP-3	Fluoride, total	mg/l	4	0.62	4	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
AP-4	Fluoride, total	mg/l	4	0.62	4	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
AP-5	Fluoride, total	mg/l	4	0.62	4	< 0.5	< 0.5	< 0.5	0.88	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5
AP-6	Fluoride, total	mg/l	4	0.62	4												
AP-7	Fluoride, total	mg/l	4	0.62	4												
AW-3/RW-3	Fluoride, total	mg/l	4	0.62	4	< 0.5	< 0.5	< 0.5	0.6	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	0.5	1.1
AP-8	Fluoride, total	mg/l	4	0.62	4												
AP-10	Fluoride, total	mg/l	4	0.62	4												
AP-14	Fluoride, total	mg/l	4	0.62	4												
AP-1	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	6.73	7.07	6.92	7.13	7.22	6.76	6.57	6.85	6.96	6.72	6.59	6.89
AP-2	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	7.1	6.86	6.82		6.87	6.69	6.77	6.75	6.8	6.6	6.83	6.78
AP-3	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	6.98	7	6.88	7.07	7.01	6.78	6.91	6.8	6.92	6.55	6.78	6.95
AP-4	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	6.82	7.45	7.01	7.14	7.39	7.18	7.13	7.01	7.02	7.08	7.29	7.12
AP-5	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	7.32	7.16	6.52	7.51	7.66	7.56	6.83	7.62	7.42	7.36	7.77	7.19
AP-6	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0												

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	2/24/2015	5/28/2015	8/20/2015	11/13/2015	2/26/2016	5/13/2016	8/4/2016	11/18/2016	2/16/2017	5/31/2017	8/2/2017	11/9/2017
AP-7	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0												
AW-3/RW-3	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	7.04	7.19	6.93	7.52	7.29	7.49	7.18	7.48	7.34	7.21	7.26	6.92
AP-8	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0												
AP-9	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0												
AP-10	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0												
AP-11	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0												
AP-12	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0												
AP-13	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0												
AP-14	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0												
AP-1	Sulfate, total	mg/l	400	84.5	400	504	486	550	388	594	597	612	589	645	532	672	664
AP-2	Sulfate, total	mg/l	400	84.5	400	497	686	711		531	418	335	327	279	346	390	348
AP-3	Sulfate, total	mg/l	400	84.5	400	290	332	315	337	310	359	369	339	328	328	368	319
AP-4	Sulfate, total	mg/l	400	84.5	400	< 5	< 5	< 5	6.47	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
AP-5	Sulfate, total	mg/l	400	84.5	400	52.6	48.2	47.4	58.8	54.3	46.8	50.8	52.5	55.5	54.8	48.4	55.3
AP-6	Sulfate, total	mg/l	400	84.5	400												
AP-7	Sulfate, total	mg/l	400	84.5	400												
AW-3/RW-3	Sulfate, total	mg/l	400	84.5	400	5.62	< 5	5.05	< 5	27.5	24.2	17.3	8.74	< 5	7.75	< 5	< 5
AP-8	Sulfate, total	mg/l	400	84.5	400												
AP-9	Sulfate, total	mg/l	400	84.5	400												
AP-10	Sulfate, total	mg/l	400	84.5	400												
AP-11	Sulfate, total	mg/l	400	84.5	400												
AP-12	Sulfate, total	mg/l	400	84.5	400												
AP-13	Sulfate, total	mg/l	400	84.5	400												
AP-14	Sulfate, total	mg/l	400	84.5	400												
AP-1	Total Dissolved Solids	mg/l	1200	597.94	1200	1230	1260	1200	1280	1010	1430	1390	1320	1430	1180	1450	1420
AP-2	Total Dissolved Solids	mg/l	1200	597.94	1200	1250	1460	1520		1200	1160	1020	1070	906	1020	1060	966
AP-3	Total Dissolved Solids	mg/l	1200	597.94	1200	866	900	860	850	712	914	958	940	810	848	920	848
AP-4	Total Dissolved Solids	mg/l	1200	597.94	1200	486	502	476	470	492	514	554	558	482	538	526	544
AP-5	Total Dissolved Solids	mg/l	1200	597.94	1200	384	388	368	290	358	292	474	344	406	426	392	470
AP-6	Total Dissolved Solids	mg/l	1200	597.94	1200												
AP-7	Total Dissolved Solids	mg/l	1200	597.94	1200												
AW-3/RW-3	Total Dissolved Solids	mg/l	1200	597.94	1200	398	420	408	434	370	370	488	474	412	442	462	424
AP-8	Total Dissolved Solids	mg/l	1200	597.94	1200												
AP-9	Total Dissolved Solids	mg/l	1200	597.94	1200												
AP-10	Total Dissolved Solids	mg/l	1200	597.94	1200												
AP-11	Total Dissolved Solids	mg/l	1200	597.94	1200												
AP-12	Total Dissolved Solids	mg/l	1200	597.94	1200												
AP-13	Total Dissolved Solids	mg/l	1200	597.94	1200												
AP-14	Total Dissolved Solids	mg/l	1200	597.94	1200												
AP-1	Antimony, total	mg/l	0.006	0.016	0.016	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-2	Antimony, total	mg/l	0.006	0.016	0.016	< 0.0312	< 0.025	< 0.025		< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-3	Antimony, total	mg/l	0.006	0.016	0.016	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-4	Antimony, total	mg/l	0.006	0.016	0.016	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-5	Antimony, total	mg/l	0.006	0.016	0.016	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-6	Antimony, total	mg/l	0.006	0.016	0.016												
AP-7	Antimony, total	mg/l	0.006	0.016	0.016												
AW-3/RW-3	Antimony, total	mg/l	0.006	0.016	0.016	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-8	Antimony, total	mg/l	0.006	0.016	0.016												
AP-9	Antimony, total	mg/l	0.006	0.016	0.016												
AP-10	Antimony, total	mg/l	0.006	0.016	0.016												
AP-11	Antimony, total	mg/l	0.006	0.016	0.016												
AP-12	Antimony, total	mg/l	0.006	0.016	0.016												
AP-13	Antimony, total	mg/l	0.006	0.016	0.016												
AP-14	Antimony, total	mg/l	0.006	0.016	0.016												

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	2/24/2015	5/28/2015	8/20/2015	11/13/2015	2/26/2016	5/13/2016	8/4/2016	11/18/2016	2/16/2017	5/31/2017	8/2/2017	11/9/2017
AP-1	Arsenic, total	mg/l	0.01	0.0724	0.0724	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-2	Arsenic, total	mg/l	0.01	0.0724	0.0724	< 0.0312	< 0.025	< 0.025		< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-3	Arsenic, total	mg/l	0.01	0.0724	0.0724	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-4	Arsenic, total	mg/l	0.01	0.0724	0.0724	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	0.0266
AP-5	Arsenic, total	mg/l	0.01	0.0724	0.0724	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-6	Arsenic, total	mg/l	0.01	0.0724	0.0724												
AP-7	Arsenic, total	mg/l	0.01	0.0724	0.0724												
AW-3/RW-3	Arsenic, total	mg/l	0.01	0.0724	0.0724	0.105	0.118	0.121	0.151	0.0982	0.0939	0.231	0.224	0.21	0.0856	0.157	0.172
AP-8	Arsenic, total	mg/l	0.01	0.0724	0.0724												
AP-9	Arsenic, total	mg/l	0.01	0.0724	0.0724												
AP-10	Arsenic, total	mg/l	0.01	0.0724	0.0724												
AP-11	Arsenic, total	mg/l	0.01	0.0724	0.0724												
AP-12	Arsenic, total	mg/l	0.01	0.0724	0.0724												
AP-13	Arsenic, total	mg/l	0.01	0.0724	0.0724												
AP-14	Arsenic, total	mg/l	0.01	0.0724	0.0724												
AP-1	Barium, total	mg/l	2	5.24	5.24	0.0683	0.360	0.646	0.303	0.592	0.578	0.682	0.433	0.953	0.253	0.727	0.662
AP-2	Barium, total	mg/l	2	5.24	5.24	0.241	0.254	0.268		0.147	0.0995	0.0795	0.0691	0.0998	0.0892	0.0735	0.0765
AP-3	Barium, total	mg/l	2	5.24	5.24	0.106	0.136	0.0938	0.114	0.131	0.102	0.106	0.1	0.124	0.0849	0.0947	0.0997
AP-4	Barium, total	mg/l	2	5.24	5.24	0.329	0.301	0.348	0.355	0.322	0.373	0.381	0.357	0.413	0.405	0.391	0.41
AP-5	Barium, total	mg/l	2	5.24	5.24	0.0846	0.109	0.0955	0.158	0.0618	0.0628	0.251	0.201	0.137	0.0807	0.043	0.308
AP-6	Barium, total	mg/l	2	5.24	5.24												
AP-7	Barium, total	mg/l	2	5.24	5.24												
AW-3/RW-3	Barium, total	mg/l	2	5.24	5.24	0.166	0.185	0.181	0.213	0.177	0.164	0.208	0.197	0.271	0.202	0.221	0.23
AP-8	Barium, total	mg/l	2	5.24	5.24												
AP-9	Barium, total	mg/l	2	5.24	5.24												
AP-10	Barium, total	mg/l	2	5.24	5.24												
AP-11	Barium, total	mg/l	2	5.24	5.24												
AP-12	Barium, total	mg/l	2	5.24	5.24												
AP-13	Barium, total	mg/l	2	5.24	5.24												
AP-14	Barium, total	mg/l	2	5.24	5.24												
AP-1	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.00312	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
AP-2	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.00312	< 0.0025	< 0.0025		< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
AP-3	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.00312	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
AP-4	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.00312	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
AP-5	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.00312	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
AP-6	Beryllium, total	mg/l	0.004	0.0164	0.0164												
AP-7	Beryllium, total	mg/l	0.004	0.0164	0.0164												
AW-3/RW-3	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.00312	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
AP-8	Beryllium, total	mg/l	0.004	0.0164	0.0164												
AP-9	Beryllium, total	mg/l	0.004	0.0164	0.0164												
AP-10	Beryllium, total	mg/l	0.004	0.0164	0.0164												
AP-11	Beryllium, total	mg/l	0.004	0.0164	0.0164												
AP-12	Beryllium, total	mg/l	0.004	0.0164	0.0164												
AP-13	Beryllium, total	mg/l	0.004	0.0164	0.0164												
AP-14	Beryllium, total	mg/l	0.004	0.0164	0.0164												
AP-1	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.00312	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
AP-2	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.00312	< 0.0025	< 0.0025		< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
AP-3	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.00312	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
AP-4	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.00312	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
AP-5	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.00312	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
AP-6	Cadmium, total	mg/l	0.005	0.0128	0.0128												
AP-7	Cadmium, total	mg/l	0.005	0.0128	0.0128												
AW-3/RW-3	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.00312	< 0.0025	< 0.0025	< 0.005	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.0025
AP-8	Cadmium, total	mg/l	0.005	0.0128	0.0128												
AP-9	Cadmium, total	mg/l	0.005	0.0128	0.0128												
AP-10	Cadmium, total	mg/l	0.005	0.0128	0.0128												
AP-11	Cadmium, total	mg/l	0.005	0.0128	0.0128												
AP-12	Cadmium, total	mg/l	0.005	0.0128	0.0128												
AP-13	Cadmium, total	mg/l	0.005	0.0128	0.0128												
AP-14	Cadmium, total	mg/l	0.005	0.0128	0.0128												

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	2/24/2015	5/28/2015	8/20/2015	11/13/2015	2/26/2016	5/13/2016	8/4/2016	11/18/2016	2/16/2017	5/31/2017	8/2/2017	11/9/2017
AP-1	Chromium, total	mg/l	0.1	0.811	0.811	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-2	Chromium, total	mg/l	0.1	0.811	0.811	< 0.0312	< 0.025	< 0.025		< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-3	Chromium, total	mg/l	0.1	0.811	0.811	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-4	Chromium, total	mg/l	0.1	0.811	0.811	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-5	Chromium, total	mg/l	0.1	0.811	0.811	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	0.0605	0.0432	< 0.025	< 0.025	< 0.025	0.0653
AP-6	Chromium, total	mg/l	0.1	0.811	0.811												
AP-7	Chromium, total	mg/l	0.1	0.811	0.811												
AW-3/RW-3	Chromium, total	mg/l	0.1	0.811	0.811	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-8	Chromium, total	mg/l	0.1	0.811	0.811												
AP-9	Chromium, total	mg/l	0.1	0.811	0.811												
AP-10	Chromium, total	mg/l	0.1	0.811	0.811												
AP-11	Chromium, total	mg/l	0.1	0.811	0.811												
AP-12	Chromium, total	mg/l	0.1	0.811	0.811												
AP-13	Chromium, total	mg/l	0.1	0.811	0.811												
AP-14	Chromium, total	mg/l	0.1	0.811	0.811												
AP-1	Cobalt, total	mg/l	0.006	0.297	0.297	< 0.0156	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-2	Cobalt, total	mg/l	0.006	0.297	0.297	< 0.0156	< 0.025	< 0.025		< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-3	Cobalt, total	mg/l	0.006	0.297	0.297	< 0.0156	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-4	Cobalt, total	mg/l	0.006	0.297	0.297	< 0.0156	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-5	Cobalt, total	mg/l	0.006	0.297	0.297	< 0.0156	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	0.029	< 0.025	< 0.025	< 0.025	< 0.025	0.0277
AP-6	Cobalt, total	mg/l	0.006	0.297	0.297												
AP-7	Cobalt, total	mg/l	0.006	0.297	0.297												
AW-3/RW-3	Cobalt, total	mg/l	0.006	0.297	0.297	< 0.0156	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-8	Cobalt, total	mg/l	0.006	0.297	0.297												
AP-9	Cobalt, total	mg/l	0.006	0.297	0.297												
AP-10	Cobalt, total	mg/l	0.006	0.297	0.297												
AP-11	Cobalt, total	mg/l	0.006	0.297	0.297												
AP-12	Cobalt, total	mg/l	0.006	0.297	0.297												
AP-13	Cobalt, total	mg/l	0.006	0.297	0.297												
AP-14	Cobalt, total	mg/l	0.006	0.297	0.297												
AP-1	Lead, total	mg/l	0.0075	0.638	0.638	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-2	Lead, total	mg/l	0.0075	0.638	0.638	< 0.0312	< 0.025	< 0.025		< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-3	Lead, total	mg/l	0.0075	0.638	0.638	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-4	Lead, total	mg/l	0.0075	0.638	0.638	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-5	Lead, total	mg/l	0.0075	0.638	0.638	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	0.0286	0.0254	< 0.025	< 0.025	< 0.025	0.0287
AP-6	Lead, total	mg/l	0.0075	0.638	0.638												
AP-7	Lead, total	mg/l	0.0075	0.638	0.638												
AW-3/RW-3	Lead, total	mg/l	0.0075	0.638	0.638	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-8	Lead, total	mg/l	0.0075	0.638	0.638												
AP-9	Lead, total	mg/l	0.0075	0.638	0.638												
AP-10	Lead, total	mg/l	0.0075	0.638	0.638												
AP-11	Lead, total	mg/l	0.0075	0.638	0.638												
AP-12	Lead, total	mg/l	0.0075	0.638	0.638												
AP-13	Lead, total	mg/l	0.0075	0.638	0.638												
AP-14	Lead, total	mg/l	0.0075	0.638	0.638												
AP-1	Lithium	mg/l	0.04	0.05	0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
AP-2	Lithium	mg/l	0.04	0.05	0.05		< 0.05	< 0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
AP-3	Lithium	mg/l	0.04	0.05	0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
AP-4	Lithium	mg/l	0.04	0.05	0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
AP-5	Lithium	mg/l	0.04	0.05	0.05		< 0.05	< 0.05	< 0.25	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
AP-6	Lithium	mg/l	0.04	0.05	0.05												
AP-7	Lithium	mg/l	0.04	0.05	0.05												
AW-3/RW-3	Lithium	mg/l	0.04	0.05	0.05		< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
AP-8	Lithium	mg/l	0.04	0.05	0.05												
AP-9	Lithium	mg/l	0.04	0.05	0.05												
AP-10	Lithium	mg/l	0.04	0.05	0.05												
AP-11	Lithium	mg/l	0.04	0.05	0.05												
AP-12	Lithium	mg/l	0.04	0.05	0.05												
AP-13	Lithium	mg/l	0.04	0.05	0.05												
AP-14	Lithium	mg/l	0.04	0.05	0.05												

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	2/24/2015	5/28/2015	8/20/2015	11/13/2015	2/26/2016	5/13/2016	8/4/2016	11/18/2016	2/16/2017	5/31/2017	8/2/2017	11/9/2017
AP-1	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-2	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005	< 0.0005	< 0.0005		< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-3	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-4	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-5	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-6	Mercury, total	mg/l	0.002	0.0008	0.002												
AP-7	Mercury, total	mg/l	0.002	0.0008	0.002												
AW-3/RW-3	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-8	Mercury, total	mg/l	0.002	0.0008	0.002												
AP-9	Mercury, total	mg/l	0.002	0.0008	0.002												
AP-10	Mercury, total	mg/l	0.002	0.0008	0.002												
AP-11	Mercury, total	mg/l	0.002	0.0008	0.002												
AP-12	Mercury, total	mg/l	0.002	0.0008	0.002												
AP-13	Mercury, total	mg/l	0.002	0.0008	0.002												
AP-14	Mercury, total	mg/l	0.002	0.0008	0.002												
AP-1	Molybdenum	mg/l	0.1	0.025	0.1		< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-2	Molybdenum	mg/l	0.1	0.025	0.1		< 0.025	< 0.025		< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-3	Molybdenum	mg/l	0.1	0.025	0.1		< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-4	Molybdenum	mg/l	0.1	0.025	0.1		< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-5	Molybdenum	mg/l	0.1	0.025	0.1		< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-6	Molybdenum	mg/l	0.1	0.025	0.1												
AP-7	Molybdenum	mg/l	0.1	0.025	0.1												
AW-3/RW-3	Molybdenum	mg/l	0.1	0.025	0.1		< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-8	Molybdenum	mg/l	0.1	0.025	0.1												
AP-9	Molybdenum	mg/l	0.1	0.025	0.1												
AP-10	Molybdenum	mg/l	0.1	0.025	0.1												
AP-11	Molybdenum	mg/l	0.1	0.025	0.1												
AP-12	Molybdenum	mg/l	0.1	0.025	0.1												
AP-13	Molybdenum	mg/l	0.1	0.025	0.1												
AP-14	Molybdenum	mg/l	0.1	0.025	0.1												
AP-1	Radium-226 + Radium-228	pCi/l	5	7.1	7.1	3.4	1.62	2.3	3.8	4.8	0.26	1.94	1.79	1.53	1.34	1.18	1.99
AP-2	Radium-226 + Radium-228	pCi/l	5	7.1	7.1	2.4	1.57	2		2.9	-2.01	1.46	1.19	1.25	1.38	1.01	2.17
AP-3	Radium-226 + Radium-228	pCi/l	5	7.1	7.1	2.4	1.17	2	2	2.6	-0.06	1.37	1.34	2.06	1.07	1.21	1.4
AP-4	Radium-226 + Radium-228	pCi/l	5	7.1	7.1	2	1.07	2	2	3.2	1.15	1.6	2.31	2.52	1.36	2.03	1.99
AP-5	Radium-226 + Radium-228	pCi/l	5	7.1	7.1	2	2	2	2.5	2	0.36	1.3	2.54	1.19	1.75	2.9	3.2
AP-6	Radium-226 + Radium-228	pCi/l	5	7.1	7.1												
AP-7	Radium-226 + Radium-228	pCi/l	5	7.1	7.1												
AW-3/RW-3	Radium-226 + Radium-228	pCi/l	5	7.1	7.1	2	1.11	2	2	2.6	1.57	2.33	1.53	1.16	0.8	2.51	1.48
AP-8	Radium-226 + Radium-228	pCi/l	5	7.1	7.1												
AP-9	Radium-226 + Radium-228	pCi/l	5	7.1	7.1												
AP-10	Radium-226 + Radium-228	pCi/l	5	7.1	7.1												
AP-11	Radium-226 + Radium-228	pCi/l	5	7.1	7.1												
AP-12	Radium-226 + Radium-228	pCi/l	5	7.1	7.1												
AP-13	Radium-226 + Radium-228	pCi/l	5	7.1	7.1												
AP-14	Radium-226 + Radium-228	pCi/l	5	7.1	7.1												
AP-1	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-2	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.0312	< 0.025	< 0.025		< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-3	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-4	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-5	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-6	Selenium, total	mg/l	0.05	0.0079	0.05												
AP-7	Selenium, total	mg/l	0.05	0.0079	0.05												
AW-3/RW-3	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-8	Selenium, total	mg/l	0.05	0.0079	0.05												
AP-9	Selenium, total	mg/l	0.05	0.0079	0.05												
AP-10	Selenium, total	mg/l	0.05	0.0079	0.05												
AP-11	Selenium, total	mg/l	0.05	0.0079	0.05												
AP-12	Selenium, total	mg/l	0.05	0.0079	0.05												
AP-13	Selenium, total	mg/l	0.05	0.0079	0.05												
AP-14	Selenium, total	mg/l	0.05	0.0079	0.05												

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	2/24/2015	5/28/2015	8/20/2015	11/13/2015	2/26/2016	5/13/2016	8/4/2016	11/18/2016	2/16/2017	5/31/2017	8/2/2017	11/9/2017
AP-1	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-2	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.0312	< 0.025	< 0.025		< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-3	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-4	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-5	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-6	Thallium, total	mg/l	0.002	0.00556	0.0056												
AP-7	Thallium, total	mg/l	0.002	0.00556	0.0056												
AW-3/RW-3	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.0312	< 0.025	< 0.025	< 0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025
AP-8	Thallium, total	mg/l	0.002	0.00556	0.0056												
AP-9	Thallium, total	mg/l	0.002	0.00556	0.0056												
AP-10	Thallium, total	mg/l	0.002	0.00556	0.0056												
AP-11	Thallium, total	mg/l	0.002	0.00556	0.0056												
AP-12	Thallium, total	mg/l	0.002	0.00556	0.0056												
AP-13	Thallium, total	mg/l	0.002	0.00556	0.0056												
AP-14	Thallium, total	mg/l	0.002	0.00556	0.0056												
AP-1	Turbidity	NTU	NA	NA	NA												
AP-2	Turbidity	NTU	NA	NA	NA												
AP-3	Turbidity	NTU	NA	NA	NA												
AP-4	Turbidity	NTU	NA	NA	NA												
AP-5	Turbidity	NTU	NA	NA	NA												
AP-6	Turbidity	NTU	NA	NA	NA												
AP-7	Turbidity	NTU	NA	NA	NA												
AW-3/RW-3	Turbidity	NTU	NA	NA	NA												
AP-8	Turbidity	NTU	NA	NA	NA												
AP-9	Turbidity	NTU	NA	NA	NA												
AP-10	Turbidity	NTU	NA	NA	NA												
AP-11	Turbidity	NTU	NA	NA	NA												
AP-12	Turbidity	NTU	NA	NA	NA												
AP-13	Turbidity	NTU	NA	NA	NA												
AP-14	Turbidity	NTU	NA	NA	NA												

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	5/4/2018	6/21/2018	7/9/2018	2/13/2019	8/1/2019	2/28/2020	8/5/2020	1/21/20221	5/27/2021	8/24/2021
AP-1	Boron, total	mg/l	2	0.787	2	15.8		19.1	5.03	21	18	21.5	21.7	22.10	22.00
AP-2	Boron, total	mg/l	2	0.787	2	2.94		3.63	4.21	5.62	5.23	4.95	3.67	4.42	4.73
AP-3	Boron, total	mg/l	2	0.787	2	18.5		18.8	20.7	18.7	18.5	17.5	16.8	17.10	17.3
AP-4	Boron, total	mg/l	2	0.787	2	0.117		0.128	0.11	0.0677	0.0986	0.0939	0.0996	0.0928	0.0949
AP-5	Boron, total	mg/l	2	0.787	2	0.0616		0.0585	0.0275	0.116	0.033	0.044	0.0256	< 0.02	< 0.02
AP-6	Boron, total	mg/l	2	0.787	2						0.319	0.246	0.254		0.275
AP-7	Boron, total	mg/l	2	0.787	2						0.385	0.452	0.409	0.3870	0.387
AW-3/RW-3	Boron, total	mg/l	2	0.787	2	0.188	0.214	0.203	0.191	1.6	0.293	0.185	0.169	0.1740	0.180
AP-8	Boron, total	mg/l	2	0.787	2									0.0942	0.0887
AP-9	Boron, total	mg/l	2	0.787	2										0.0836
AP-10	Boron, total	mg/l	2	0.787	2									3.65	3.43
AP-11	Boron, total	mg/l	2	0.787	2										0.262
AP-12	Boron, total	mg/l	2	0.787	2										0.0267
AP-13	Boron, total	mg/l	2	0.787	2										0.0527
AP-14	Boron, total	mg/l	2	0.787	2									23.20	23.2
AP-1	Calcium, total	mg/l	na	176.63	176.63	190		223	98.1	243	215	242	233	242	233
AP-2	Calcium, total	mg/l	na	176.63	176.63	216		262	322	335	291	287	202	289	294
AP-3	Calcium, total	mg/l	na	176.63	176.63	145		158	180	166	158	157	139	148	148
AP-4	Calcium, total	mg/l	na	176.63	176.63	121		123	146	97.2	127	125	117	128	126
AP-5	Calcium, total	mg/l	na	176.63	176.63	99.7		101	95.1	132	78.5	357	75.4	89.1	77.8
AP-6	Calcium, total	mg/l	na	176.63	176.63						85.7	68.9	62.7		68.1
AP-7	Calcium, total	mg/l	na	176.63	176.63						66.7	63.6	55.7	63.9	65
AW-3/RW-3	Calcium, total	mg/l	na	176.63	176.63	69.7	85.2	78.9	84.1	175	247	73.8	68.2	73.74	69.7
AP-8	Calcium, total	mg/l	na	176.63	176.63									102	97.4
AP-9	Calcium, total	mg/l	na	176.63	176.63										77.6
AP-10	Calcium, total	mg/l	na	176.63	176.63									152	136
AP-11	Calcium, total	mg/l	na	176.63	176.63										0
AP-12	Calcium, total	mg/l	na	176.63	176.63										213
AP-13	Calcium, total	mg/l	na	176.63	176.63										105
AP-14	Calcium, total	mg/l	na	176.63	176.63									254	219
AP-1	Chloride, total	mg/l	200	24.2	200	45.4		51.7	40.9	52.1	49	60	58	51	55
AP-2	Chloride, total	mg/l	200	24.2	200	41.6		47	39.2	37.2	35	36	39	34	19
AP-3	Chloride, total	mg/l	200	24.2	200	38.4		36.7	36	36.3	36	35	37	33	36
AP-4	Chloride, total	mg/l	200	24.2	200	12		12.2	12.8	1.9	13	14	13	13	14
AP-5	Chloride, total	mg/l	200	24.2	200	< 5		< 5	4.45	< 12.5	< 5	7	< 4	3	5
AP-6	Chloride, total	mg/l	200	24.2	200						40	27	35		34
AP-7	Chloride, total	mg/l	200	24.2	200						50	78	67	67	66
AW-3/RW-3	Chloride, total	mg/l	200	24.2	200	28.8	28.8	29.8	28.1	25.5	36	28	26	26	28
AP-8	Chloride, total	mg/l	200	24.2	200									24	26
AP-9	Chloride, total	mg/l	200	24.2	200										29
AP-10	Chloride, total	mg/l	200	24.2	200									27	32
AP-11	Chloride, total	mg/l	200	24.2	200										99
AP-12	Chloride, total	mg/l	200	24.2	200										133
AP-13	Chloride, total	mg/l	200	24.2	200										78
AP-14	Chloride, total	mg/l	200	24.2	200									45	50
AP-1	Fluoride, total	mg/l	4	0.62	4	< 0.5		< 0.5	< 0.25	0.26	0.18	0.2	0.2	0.22	
AP-2	Fluoride, total	mg/l	4	0.62	4	< 0.5		< 0.5	< 0.25	0.28	0.21	0.22	0.22	0.25	
AP-3	Fluoride, total	mg/l	4	0.62	4	< 0.5		< 0.5	< 0.25	0.28	0.19	0.23	0.21	0.23	
AP-4	Fluoride, total	mg/l	4	0.62	4	< 0.5		< 0.5	< 0.25	0.43	0.12	0.14	0.12	0.16	
AP-5	Fluoride, total	mg/l	4	0.62	4	< 0.5		< 0.5	0.3	< 0.25	0.37	0.34	0.34	0.35	
AP-6	Fluoride, total	mg/l	4	0.62	4						0.51	0.39	0.45		
AP-7	Fluoride, total	mg/l	4	0.62	4						0.55	0.62	0.58	0.59	
AW-3/RW-3	Fluoride, total	mg/l	4	0.62	4	< 0.5	0.54	0.54	0.54	< 0.25	0.32	0.45	0.42	0.49	
AP-8	Fluoride, total	mg/l	4	0.62	4									0.33	
AP-10	Fluoride, total	mg/l	4	0.62	4									0.36	
AP-14	Fluoride, total	mg/l	4	0.62	4									0.31	
AP-1	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	6.65		6.71	7.07	6.68	6.74	6.8	6.69	6.46	6.73
AP-2	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	6.62		6.52	6.59	6.57	6.54	6.66	6.58	6.43	6.40
AP-3	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	6.77		6.61	6.76	6.77	6.67	6.78	6.73	6.69	6.52
AP-4	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	7.17		7	7.01	7.07	7.01	6.67	6.97	6.74	6.92
AP-5	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	7.23		7.05	7.42	7.32	7.46	7.36	7.27	7.05	7.08
AP-6	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0						7.11	7.45	7.21		7.10

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	5/4/2018	6/21/2018	7/9/2018	2/13/2019	8/1/2019	2/28/2020	8/5/2020	1/21/20221	5/27/2021	8/24/2021
AP-7	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0						7.24	7.3	7.2	7.03	7.11
AW-3/RW-3	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0	7.41	7.31	6.82	7.52	7.34	7.23	7.29	7.13	7.00	6.73
AP-8	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0									6.90	6.92
AP-9	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0										6.89
AP-10	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0									6.53	6.73
AP-11	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0										6.60
AP-12	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0										6.47
AP-13	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0										6.68
AP-14	pH (field)	units	6.5-9.0	6.76-7.63	6.5-9.0									7.21	6.98
AP-1	Sulfate, total	mg/l	400	84.5	400	573		674	179	673	616	683	976	721	734
AP-2	Sulfate, total	mg/l	400	84.5	400	467		656	725	816	686	709	367	660	707
AP-3	Sulfate, total	mg/l	400	84.5	400	355		401	402	354	345	342	388	347	371
AP-4	Sulfate, total	mg/l	400	84.5	400	< 5		< 5	< 1.5	44.7	< 10	< 10	< 10	10	< 10
AP-5	Sulfate, total	mg/l	400	84.5	400	66.8		61.7	60.8	< 1.5	37	49	46	53	65
AP-6	Sulfate, total	mg/l	400	84.5	400						< 10	18	< 10		< 10
AP-7	Sulfate, total	mg/l	400	84.5	400						< 10	< 10	< 10	10	< 10
AW-3/RW-3	Sulfate, total	mg/l	400	84.5	400	23.7	15	7.81	8.45	215	27	20	15	14	14
AP-8	Sulfate, total	mg/l	400	84.5	400									10	< 10
AP-9	Sulfate, total	mg/l	400	84.5	400										35
AP-10	Sulfate, total	mg/l	400	84.5	400									99	93
AP-11	Sulfate, total	mg/l	400	84.5	400										83
AP-12	Sulfate, total	mg/l	400	84.5	400										471
AP-13	Sulfate, total	mg/l	400	84.5	400										150
AP-14	Sulfate, total	mg/l	400	84.5	400									642	680
AP-1	Total Dissolved Solids	mg/l	1200	597.94	1200	1300		1520	550	1510	1220	1320	1500	1450	1420
AP-2	Total Dissolved Solids	mg/l	1200	597.94	1200	1170		1650	1720	1860	1430	1400	1090	1390	1460
AP-3	Total Dissolved Solids	mg/l	1200	597.94	1200	894		778	1090	913	830	794	846	784	824
AP-4	Total Dissolved Solids	mg/l	1200	597.94	1200	482		500	536	416	498	480	492	486	494
AP-5	Total Dissolved Solids	mg/l	1200	597.94	1200	404		482	420	518	314	580	362	358	422
AP-6	Total Dissolved Solids	mg/l	1200	597.94	1200						630	165	388		396
AP-7	Total Dissolved Solids	mg/l	1200	597.94	1200						432	444	478	454	462
AW-3/RW-3	Total Dissolved Solids	mg/l	1200	597.94	1200	400	438	482	412	871	880	335	364	390	404
AP-8	Total Dissolved Solids	mg/l	1200	597.94	1200									512	508
AP-9	Total Dissolved Solids	mg/l	1200	597.94	1200										434
AP-10	Total Dissolved Solids	mg/l	1200	597.94	1200									724	716
AP-11	Total Dissolved Solids	mg/l	1200	597.94	1200										636
AP-12	Total Dissolved Solids	mg/l	1200	597.94	1200										1150
AP-13	Total Dissolved Solids	mg/l	1200	597.94	1200										534
AP-14	Total Dissolved Solids	mg/l	1200	597.94	1200									1250	1270
AP-1	Antimony, total	mg/l	0.006	0.016	0.016	< 0.025		< 0.025	< 0.016	< 0.016	< 0.001	< 0.001	< 0.001	< 0.001	< 0.0010
AP-2	Antimony, total	mg/l	0.006	0.016	0.016	< 0.025		< 0.025	< 0.016	< 0.016	< 0.001	< 0.001	< 0.001	< 0.001	< 0.0010
AP-3	Antimony, total	mg/l	0.006	0.016	0.016	< 0.025		< 0.025	< 0.016	< 0.016	< 0.001	< 0.001	< 0.001	< 0.001	< 0.0010
AP-4	Antimony, total	mg/l	0.006	0.016	0.016	< 0.025		< 0.025	< 0.016	< 0.016	< 0.001	< 0.001	< 0.001	< 0.001	< 0.0010
AP-5	Antimony, total	mg/l	0.006	0.016	0.016	< 0.025		< 0.025	< 0.016	< 0.016	< 0.001	0.0011	< 0.001	< 0.001	< 0.0005
AP-6	Antimony, total	mg/l	0.006	0.016	0.016						< 0.001	< 0.001	< 0.001	< 0.001	< 0.0010
AP-7	Antimony, total	mg/l	0.006	0.016	0.016						< 0.001	< 0.001	< 0.001	< 0.001	< 0.0010
AW-3/RW-3	Antimony, total	mg/l	0.006	0.016	0.016	< 0.025	< 0.025	< 0.025	< 0.016	< 0.016	< 0.004	< 0.001	< 0.001	< 0.001	< 0.0010
AP-8	Antimony, total	mg/l	0.006	0.016	0.016									< 0.001	< 0.0010
AP-9	Antimony, total	mg/l	0.006	0.016	0.016										< 0.0010
AP-10	Antimony, total	mg/l	0.006	0.016	0.016									< 0.001	< 0.0010
AP-11	Antimony, total	mg/l	0.006	0.016	0.016										< 0.0010
AP-12	Antimony, total	mg/l	0.006	0.016	0.016										< 0.0100
AP-13	Antimony, total	mg/l	0.006	0.016	0.016										< 0.0100
AP-14	Antimony, total	mg/l	0.006	0.016	0.016									< 0.001	< 0.0010

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	5/4/2018	6/21/2018	7/9/2018	2/13/2019	8/1/2019	2/28/2020	8/5/2020	1/21/20221	5/27/2021	8/24/2021
AP-1	Arsenic, total	mg/l	0.01	0.0724	0.0724	< 0.025		< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.0250
AP-2	Arsenic, total	mg/l	0.01	0.0724	0.0724	< 0.025		< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.0250
AP-3	Arsenic, total	mg/l	0.01	0.0724	0.0724	< 0.025		< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.0250
AP-4	Arsenic, total	mg/l	0.01	0.0724	0.0724	< 0.025		< 0.025	< 0.025	< 0.025	0.0264	< 0.025	0.0359	< 0.025	< 0.0250
AP-5	Arsenic, total	mg/l	0.01	0.0724	0.0724	< 0.025		< 0.025	< 0.025	< 0.025	< 0.025	0.0937	< 0.025	< 0.025	< 0.0250
AP-6	Arsenic, total	mg/l	0.01	0.0724	0.0724						0.059	< 0.025	< 0.025	<	< 0.0250
AP-7	Arsenic, total	mg/l	0.01	0.0724	0.0724						< 0.025	0.0429	0.0415	< 0.025	< 0.0250
AW-3/RW-3	Arsenic, total	mg/l	0.01	0.0724	0.0724	0.0826	0.0935	0.136	0.124	< 0.025	0.497	0.253	0.116	0.119	0.1050
AP-8	Arsenic, total	mg/l	0.01	0.0724	0.0724									< 0.025	0.0359
AP-9	Arsenic, total	mg/l	0.01	0.0724	0.0724										< 0.0250
AP-10	Arsenic, total	mg/l	0.01	0.0724	0.0724									< 0.025	< 0.0250
AP-11	Arsenic, total	mg/l	0.01	0.0724	0.0724										< 0.0250
AP-12	Arsenic, total	mg/l	0.01	0.0724	0.0724										< 0.0250
AP-13	Arsenic, total	mg/l	0.01	0.0724	0.0724										< 0.0250
AP-14	Arsenic, total	mg/l	0.01	0.0724	0.0724									< 0.025	< 0.0250
AP-1	Barium, total	mg/l	2	5.24	5.24	0.0611		0.662	0.188	0.579	0.375	0.464	0.368	0.352	0.2040
AP-2	Barium, total	mg/l	2	5.24	5.24	0.264		0.109	0.155	0.203	0.0922	0.0994	0.0661	0.0927	0.0944
AP-3	Barium, total	mg/l	2	5.24	5.24	0.0999		0.122	0.123	0.129	0.099	0.0953	0.0858	0.0849	0.0948
AP-4	Barium, total	mg/l	2	5.24	5.24	0.356		0.359	0.416	0.0842	0.41	0.422	0.474	0.454	0.4560
AP-5	Barium, total	mg/l	2	5.24	5.24	0.0956		0.106	0.06	0.428	0.042	1.18	0.0429	0.0552	0.0473
AP-6	Barium, total	mg/l	2	5.24	5.24						0.512	0.179	0.126		0.1320
AP-7	Barium, total	mg/l	2	5.24	5.24						0.17	0.167	0.153	0.133	0.1380
AW-3/RW-3	Barium, total	mg/l	2	5.24	5.24	0.182	0.268	0.226	0.221	0.3	1.61	0.189	0.155	0.15	0.1530
AP-8	Barium, total	mg/l	2	5.24	5.24									0.363	0.3660
AP-9	Barium, total	mg/l	2	5.24	5.24										0.2960
AP-10	Barium, total	mg/l	2	5.24	5.24									0.594	0.5650
AP-11	Barium, total	mg/l	2	5.24	5.24										0.1580
AP-12	Barium, total	mg/l	2	5.24	5.24										0.2490
AP-13	Barium, total	mg/l	2	5.24	5.24										0.2620
AP-14	Barium, total	mg/l	2	5.24	5.24									0.165	0.0632
AP-1	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.0025		< 0.0025	< 0.0025	< 0.016	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-2	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.0025		< 0.0025	< 0.0025	< 0.016	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-3	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.0025		< 0.0025	< 0.0025	< 0.016	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-4	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.0025		< 0.0025	< 0.0025	< 0.016	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-5	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.0025		< 0.0025	< 0.0025	< 0.016	< 0.0005	0.0084	< 0.0005	< 0.0005	< 0.0005
AP-6	Beryllium, total	mg/l	0.004	0.0164	0.0164						0.0056	0.0007	< 0.0005		< 0.0005
AP-7	Beryllium, total	mg/l	0.004	0.0164	0.0164						< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AW-3/RW-3	Beryllium, total	mg/l	0.004	0.0164	0.0164	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.016	0.0278	< 0.0005	< 0.0005	< 0.0005	< 0.0005
AP-8	Beryllium, total	mg/l	0.004	0.0164	0.0164									< 0.0005	< 0.0005
AP-9	Beryllium, total	mg/l	0.004	0.0164	0.0164										< 0.0005
AP-10	Beryllium, total	mg/l	0.004	0.0164	0.0164									< 0.0005	< 0.0005
AP-11	Beryllium, total	mg/l	0.004	0.0164	0.0164										< 0.0005
AP-12	Beryllium, total	mg/l	0.004	0.0164	0.0164										0.0023
AP-13	Beryllium, total	mg/l	0.004	0.0164	0.0164										0.0020
AP-14	Beryllium, total	mg/l	0.004	0.0164	0.0164									0.0011	< 0.0005
AP-1	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.0025		< 0.0025	< 0.0025	< 0.012	< 0.002	< 0.002	< 0.002	< 0.002	< 0.0020
AP-2	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.0025		< 0.0025	< 0.0025	< 0.012	< 0.002	< 0.002	< 0.002	< 0.002	< 0.0020
AP-3	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.0025		< 0.0025	< 0.0025	< 0.012	< 0.002	< 0.002	< 0.002	< 0.002	< 0.0020
AP-4	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.0025		< 0.0025	< 0.0025	< 0.012	< 0.002	< 0.002	< 0.002	< 0.002	< 0.0020
AP-5	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.0025		< 0.0025	< 0.0025	< 0.012	< 0.002	0.005	< 0.002	< 0.002	< 0.0020
AP-6	Cadmium, total	mg/l	0.005	0.0128	0.0128						< 0.002	< 0.002	< 0.002		< 0.0020
AP-7	Cadmium, total	mg/l	0.005	0.0128	0.0128						< 0.002	< 0.002	< 0.002	< 0.002	< 0.0020
AW-3/RW-3	Cadmium, total	mg/l	0.005	0.0128	0.0128	< 0.0025	< 0.0025	< 0.0025	< 0.0025	< 0.012	0.0059	< 0.002	< 0.002	< 0.002	< 0.0020
AP-8	Cadmium, total	mg/l	0.005	0.0128	0.0128									< 0.002	< 0.0020
AP-9	Cadmium, total	mg/l	0.005	0.0128	0.0128										< 0.0020
AP-10	Cadmium, total	mg/l	0.005	0.0128	0.0128									< 0.002	< 0.0020
AP-11	Cadmium, total	mg/l	0.005	0.0128	0.0128										< 0.0020
AP-12	Cadmium, total	mg/l	0.005	0.0128	0.0128										< 0.0020
AP-13	Cadmium, total	mg/l	0.005	0.0128	0.0128										< 0.0020
AP-14	Cadmium, total	mg/l	0.005	0.0128	0.0128									< 0.002	< 0.0020

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	5/4/2018	6/21/2018	7/9/2018	2/13/2019	8/1/2019	2/28/2020	8/5/2020	1/21/20221	5/27/2021	8/24/2021
AP-1	Chromium, total	mg/l	0.1	0.811	0.811	< 0.025		< 0.025	< 0.025	< 0.025	< 0.005	< 0.005	< 0.005	< 0.0050	< 0.0050
AP-2	Chromium, total	mg/l	0.1	0.811	0.811	< 0.025		< 0.025	< 0.025	< 0.025	< 0.005	< 0.005	< 0.005	< 0.0050	< 0.0050
AP-3	Chromium, total	mg/l	0.1	0.811	0.811	< 0.025		< 0.025	< 0.025	< 0.025	< 0.005	< 0.005	< 0.005	< 0.0050	< 0.0050
AP-4	Chromium, total	mg/l	0.1	0.811	0.811	< 0.025		< 0.025	< 0.025	< 0.025	< 0.005	< 0.005	< 0.005	0.0062	0.0068
AP-5	Chromium, total	mg/l	0.1	0.811	0.811	< 0.025		< 0.025	< 0.025	< 0.025	< 0.005	0.198	< 0.005	< 0.0050	< 0.0050
AP-6	Chromium, total	mg/l	0.1	0.811	0.811						0.147	0.0151	< 0.005		< 0.0050
AP-7	Chromium, total	mg/l	0.1	0.811	0.811						< 0.005	< 0.005	< 0.005	< 0.0050	< 0.0050
AW-3/RW-3	Chromium, total	mg/l	0.1	0.811	0.811	< 0.025	0.0413	< 0.025	< 0.025	< 0.025	0.807	0.0052	< 0.005	< 0.0050	< 0.0050
AP-8	Chromium, total	mg/l	0.1	0.811	0.811									< 0.0050	< 0.0050
AP-9	Chromium, total	mg/l	0.1	0.811	0.811										< 0.0050
AP-10	Chromium, total	mg/l	0.1	0.811	0.811									0.0067	< 0.0050
AP-11	Chromium, total	mg/l	0.1	0.811	0.811										0.0068
AP-12	Chromium, total	mg/l	0.1	0.811	0.811										0.0608
AP-13	Chromium, total	mg/l	0.1	0.811	0.811										< 0.0020
AP-14	Chromium, total	mg/l	0.1	0.811	0.811									0.0290	< 0.0050
AP-1	Cobalt, total	mg/l	0.006	0.297	0.297	< 0.025		< 0.025	< 0.025	< 0.025	< 0.005	< 0.005	< 0.005	< 0.0050	< 0.0050
AP-2	Cobalt, total	mg/l	0.006	0.297	0.297	< 0.025		< 0.025	< 0.025	< 0.025	0.0134	0.0139	0.0097	0.0135	0.0131
AP-3	Cobalt, total	mg/l	0.006	0.297	0.297	< 0.025		< 0.025	< 0.025	< 0.025	0.0058	< 0.005	< 0.005	< 0.0050	< 0.0050
AP-4	Cobalt, total	mg/l	0.006	0.297	0.297	< 0.025		< 0.025	< 0.025	< 0.025	< 0.005	< 0.005	< 0.005	0.0052	< 0.0050
AP-5	Cobalt, total	mg/l	0.006	0.297	0.297	< 0.025		< 0.025	< 0.025	< 0.025	< 0.005	0.134	< 0.005	< 0.0050	< 0.0050
AP-6	Cobalt, total	mg/l	0.006	0.297	0.297						0.089	0.0106	< 0.005		< 0.0050
AP-7	Cobalt, total	mg/l	0.006	0.297	0.297						< 0.005	< 0.005	< 0.005	< 0.0050	< 0.0050
AW-3/RW-3	Cobalt, total	mg/l	0.006	0.297	0.297	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	0.453	< 0.005	< 0.005	< 0.0050	< 0.0050
AP-8	Cobalt, total	mg/l	0.006	0.297	0.297									< 0.0050	< 0.0050
AP-9	Cobalt, total	mg/l	0.006	0.297	0.297										< 0.0050
AP-10	Cobalt, total	mg/l	0.006	0.297	0.297									< 0.0050	< 0.0050
AP-11	Cobalt, total	mg/l	0.006	0.297	0.297										< 0.0050
AP-12	Cobalt, total	mg/l	0.006	0.297	0.297										0.0356
AP-13	Cobalt, total	mg/l	0.006	0.297	0.297										0.0400
AP-14	Cobalt, total	mg/l	0.006	0.297	0.297									0.0143	< 0.0050
AP-1	Lead, total	mg/l	0.0075	0.638	0.638	< 0.025		< 0.025	< 0.025	< 0.025	< 0.015	< 0.015	< 0.015	< 0.0150	< 0.0150
AP-2	Lead, total	mg/l	0.0075	0.638	0.638	< 0.025		< 0.025	< 0.025	< 0.025	< 0.015	< 0.015	< 0.015	< 0.0150	< 0.0150
AP-3	Lead, total	mg/l	0.0075	0.638	0.638	< 0.025		< 0.025	< 0.025	< 0.025	< 0.015	< 0.015	< 0.015	< 0.0150	< 0.0150
AP-4	Lead, total	mg/l	0.0075	0.638	0.638	< 0.025		< 0.025	< 0.025	< 0.025	< 0.015	< 0.015	< 0.015	< 0.0150	< 0.0150
AP-5	Lead, total	mg/l	0.0075	0.638	0.638	< 0.025		< 0.025	< 0.025	< 0.025	< 0.015	0.132	< 0.015	< 0.0150	< 0.0150
AP-6	Lead, total	mg/l	0.0075	0.638	0.638						0.0769	< 0.015	< 0.015		< 0.0150
AP-7	Lead, total	mg/l	0.0075	0.638	0.638						< 0.015	< 0.015	< 0.015	< 0.0150	< 0.0150
AW-3/RW-3	Lead, total	mg/l	0.0075	0.638	0.638	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	0.442	< 0.015	< 0.015	< 0.0150	< 0.0150
AP-8	Lead, total	mg/l	0.0075	0.638	0.638									< 0.0150	< 0.0150
AP-9	Lead, total	mg/l	0.0075	0.638	0.638										< 0.0150
AP-10	Lead, total	mg/l	0.0075	0.638	0.638									< 0.0150	< 0.0150
AP-11	Lead, total	mg/l	0.0075	0.638	0.638										< 0.0150
AP-12	Lead, total	mg/l	0.0075	0.638	0.638										< 0.0342
AP-13	Lead, total	mg/l	0.0075	0.638	0.638										< 0.0277
AP-14	Lead, total	mg/l	0.0075	0.638	0.638									< 0.0169	< 0.0150
AP-1	Lithium	mg/l	0.04	0.05	0.05	0.00912		0.0142	< 0.05	< 0.05	0.0104	0.0098	0.0101	0.0092	0.0100
AP-2	Lithium	mg/l	0.04	0.05	0.05	0.00725		0.00762	< 0.05	< 0.05	0.0065	0.0071	0.0063	0.0057	0.0068
AP-3	Lithium	mg/l	0.04	0.05	0.05	0.006		0.00675	< 0.05	< 0.05	0.006	0.0051	0.0052	< 0.0050	< 0.0050
AP-4	Lithium	mg/l	0.04	0.05	0.05	0.00712		0.00775	< 0.05	< 0.05	0.0071	0.0071	0.0087	0.0108	0.0113
AP-5	Lithium	mg/l	0.04	0.05	0.05	0.0125		0.0131	< 0.05	< 0.05	< 0.005	0.143	< 0.005	0.006	0.0068
AP-6	Lithium	mg/l	0.04	0.05	0.05						0.153	0.0195	0.0081		0.0080
AP-7	Lithium	mg/l	0.04	0.05	0.05						0.0115	0.0137	0.0112	0.0098	0.0101
AW-3/RW-3	Lithium	mg/l	0.04	0.05	0.05	0.0119	0.0359	0.0315	< 0.05	< 0.05	0.771	0.0098	0.0071	0.0068	0.0066
AP-8	Lithium	mg/l	0.04	0.05	0.05									0.0077	0.0072
AP-9	Lithium	mg/l	0.04	0.05	0.05										0.0054
AP-10	Lithium	mg/l	0.04	0.05	0.05									0.0145	0.0091
AP-11	Lithium	mg/l	0.04	0.05	0.05										0.0104
AP-12	Lithium	mg/l	0.04	0.05	0.05										0.0546
AP-13	Lithium	mg/l	0.04	0.05	0.05										0.0610
AP-14	Lithium	mg/l	0.04	0.05	0.05									0.0253	0.0100

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	5/4/2018	6/21/2018	7/9/2018	2/13/2019	8/1/2019	2/28/2020	8/5/2020	1/21/20221	5/27/2021	8/24/2021
AP-1	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005		< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0002	< 0.00020	< 0.00020
AP-2	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005		< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0002	< 0.00020	< 0.00020
AP-3	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005		< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0002	< 0.00020	< 0.00020
AP-4	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005		< 0.0005	< 0.0005	< 0.0005	< 0.0002	< 0.0002	< 0.0002	< 0.00020	< 0.00020
AP-5	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005		< 0.0005	< 0.0005	< 0.0005	< 0.0002	0.0003	< 0.0002	< 0.00020	< 0.00020
AP-6	Mercury, total	mg/l	0.002	0.0008	0.002						< 0.0002	< 0.0002	< 0.0002		< 0.00020
AP-7	Mercury, total	mg/l	0.002	0.0008	0.002						< 0.0002	< 0.0002	< 0.0002	< 0.00020	< 0.00020
AW-3/RW-3	Mercury, total	mg/l	0.002	0.0008	0.002	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005	0.0005	< 0.0002	< 0.0002	< 0.00020	< 0.00020
AP-8	Mercury, total	mg/l	0.002	0.0008	0.002									< 0.00020	< 0.00020
AP-9	Mercury, total	mg/l	0.002	0.0008	0.002										< 0.00020
AP-10	Mercury, total	mg/l	0.002	0.0008	0.002									< 0.00020	< 0.00020
AP-11	Mercury, total	mg/l	0.002	0.0008	0.002										< 0.00020
AP-12	Mercury, total	mg/l	0.002	0.0008	0.002										< 0.00020
AP-13	Mercury, total	mg/l	0.002	0.0008	0.002										< 0.00020
AP-14	Mercury, total	mg/l	0.002	0.0008	0.002									< 0.00020	< 0.00020
AP-1	Molybdenum	mg/l	0.1	0.025	0.1	< 0.025		< 0.025	< 0.025	< 0.025	< 0.01	< 0.01	< 0.01	< 0.0100	< 0.0100
AP-2	Molybdenum	mg/l	0.1	0.025	0.1	< 0.025		< 0.025	< 0.025	< 0.025	< 0.01	< 0.01	< 0.01	< 0.0100	< 0.0100
AP-3	Molybdenum	mg/l	0.1	0.025	0.1	< 0.025		< 0.025	< 0.025	< 0.025	< 0.01	< 0.01	< 0.01	< 0.0100	< 0.0100
AP-4	Molybdenum	mg/l	0.1	0.025	0.1	< 0.025		< 0.025	< 0.025	< 0.025	< 0.01	< 0.01	< 0.01	< 0.0100	< 0.0100
AP-5	Molybdenum	mg/l	0.1	0.025	0.1	< 0.025		< 0.025	< 0.025	< 0.025	< 0.01	< 0.01	< 0.01	< 0.0100	< 0.0100
AP-6	Molybdenum	mg/l	0.1	0.025	0.1						< 0.01	< 0.01	< 0.01		< 0.0100
AP-7	Molybdenum	mg/l	0.1	0.025	0.1						0.0119	0.0106	< 0.01	< 0.0100	< 0.0100
AW-3/RW-3	Molybdenum	mg/l	0.1	0.025	0.1	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	0.022	0.0116	0.0109	0.0105	< 0.0100
AP-8	Molybdenum	mg/l	0.1	0.025	0.1									< 0.0100	< 0.0100
AP-9	Molybdenum	mg/l	0.1	0.025	0.1										< 0.0100
AP-10	Molybdenum	mg/l	0.1	0.025	0.1									< 0.0100	< 0.0100
AP-11	Molybdenum	mg/l	0.1	0.025	0.1										< 0.0100
AP-12	Molybdenum	mg/l	0.1	0.025	0.1										< 0.0100
AP-13	Molybdenum	mg/l	0.1	0.025	0.1										< 0.0100
AP-14	Molybdenum	mg/l	0.1	0.025	0.1									< 0.0100	< 0.0100
AP-1	Radium-226 + Radium-228	pCi/l	5	7.1	7.1	4.1		1.96	0.93	1.85	1.37	2.86	0.377	1.088	0.8400
AP-2	Radium-226 + Radium-228	pCi/l	5	7.1	7.1	2.15		1.35	2.61	1.134	0.657	1.73	1.66	1.33	1.0080
AP-3	Radium-226 + Radium-228	pCi/l	5	7.1	7.1	1.83		1.15	2.48	1.51	0.73	0.185	0.926	0.457	0.2528
AP-4	Radium-226 + Radium-228	pCi/l	5	7.1	7.1	1.5		2.36	2.57	0.59	1.47	1.96	1.96	2.38	0.4489
AP-5	Radium-226 + Radium-228	pCi/l	5	7.1	7.1	1.61		1.63	0.83	1.25	0.455	5.87	0.869	0.0571	1.5200
AP-6	Radium-226 + Radium-228	pCi/l	5	7.1	7.1						9.45	3.03	0.309	0.677	0.3600
AP-7	Radium-226 + Radium-228	pCi/l	5	7.1	7.1						1.12	1.07	1.09	0.914	0.6570
AW-3/RW-3	Radium-226 + Radium-228	pCi/l	5	7.1	7.1	2.49	2.02	3.16	1.1	0.794	18	3.81	1.37	0.573	0.7380
AP-8	Radium-226 + Radium-228	pCi/l	5	7.1	7.1									1.573	2.7900
AP-9	Radium-226 + Radium-228	pCi/l	5	7.1	7.1										
AP-10	Radium-226 + Radium-228	pCi/l	5	7.1	7.1									1.61	2.3900
AP-11	Radium-226 + Radium-228	pCi/l	5	7.1	7.1										
AP-12	Radium-226 + Radium-228	pCi/l	5	7.1	7.1										
AP-13	Radium-226 + Radium-228	pCi/l	5	7.1	7.1										
AP-14	Radium-226 + Radium-228	pCi/l	5	7.1	7.1									1.127	0.8070
AP-1	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.025		< 0.025	< 0.025	< 0.025	< 0.001	< 0.001	< 0.001	< 0.0010	< 0.0010
AP-2	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.025		< 0.025	< 0.025	< 0.025	< 0.001	< 0.001	< 0.001	< 0.0010	< 0.0010
AP-3	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.025		< 0.025	< 0.025	< 0.025	< 0.001	< 0.001	< 0.001	< 0.0010	< 0.0010
AP-4	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.025		< 0.025	< 0.025	< 0.025	< 0.001	< 0.001	< 0.001	< 0.0010	< 0.0010
AP-5	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.025		< 0.025	< 0.025	< 0.025	< 0.001	< 0.001	< 0.001	< 0.0010	< 0.0005
AP-6	Selenium, total	mg/l	0.05	0.0079	0.05						< 0.001	< 0.001	< 0.001		< 0.0010
AP-7	Selenium, total	mg/l	0.05	0.0079	0.05						< 0.001	< 0.001	< 0.001	< 0.0010	< 0.0010
AW-3/RW-3	Selenium, total	mg/l	0.05	0.0079	0.05	< 0.025	< 0.025	< 0.025	< 0.025	< 0.025	< 0.001	< 0.001	< 0.001	< 0.0010	< 0.0010
AP-8	Selenium, total	mg/l	0.05	0.0079	0.05									< 0.0010	< 0.0010
AP-9	Selenium, total	mg/l	0.05	0.0079	0.05										< 0.0010
AP-10	Selenium, total	mg/l	0.05	0.0079	0.05									< 0.0010	< 0.0010
AP-11	Selenium, total	mg/l	0.05	0.0079	0.05										< 0.0010
AP-12	Selenium, total	mg/l	0.05	0.0079	0.05										< 0.0010
AP-13	Selenium, total	mg/l	0.05	0.0079	0.05										< 0.0010
AP-14	Selenium, total	mg/l	0.05	0.0079	0.05									< 0.0010	< 0.0010

TABLE 2
CITY WATER, LIGHT AND POWER
EXISTING GROUNDWATER QUALITY

Well	Parameter	Units	35 IAC 845.600	Background AP-4 & AP-5	GWPS	5/4/2018	6/21/2018	7/9/2018	2/13/2019	8/1/2019	2/28/2020	8/5/2020	1/21/20221	5/27/2021	8/24/2021
AP-1	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.025		< 0.025	< 0.005	< 0.005	< 0.002	< 0.002	< 0.002	< 0.0020	0.0031
AP-2	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.025		< 0.025	< 0.005	< 0.005	< 0.002	< 0.002	< 0.002	< 0.0020	< 0.0020
AP-3	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.025		< 0.025	< 0.005	< 0.005	< 0.002	< 0.002	< 0.002	< 0.0020	< 0.0020
AP-4	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.025		< 0.025	< 0.005	< 0.005	< 0.002	< 0.002	< 0.002	< 0.0020	< 0.0020
AP-5	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.025		< 0.025	< 0.005	< 0.005	< 0.002	< 0.002	< 0.002	< 0.0020	0.0019
AP-6	Thallium, total	mg/l	0.002	0.00556	0.0056						< 0.002	< 0.002	< 0.002		< 0.0020
AP-7	Thallium, total	mg/l	0.002	0.00556	0.0056						< 0.002	< 0.002	< 0.002	< 0.0020	0.0026
AW-3/RW-3	Thallium, total	mg/l	0.002	0.00556	0.0056	< 0.025	< 0.025	< 0.025	< 0.005	< 0.005	< 0.008	< 0.002	< 0.002	< 0.0020	< 0.0020
AP-8	Thallium, total	mg/l	0.002	0.00556	0.0056									0.0020	< 0.0020
AP-9	Thallium, total	mg/l	0.002	0.00556	0.0056										< 0.0020
AP-10	Thallium, total	mg/l	0.002	0.00556	0.0056									0.0027	< 0.0020
AP-11	Thallium, total	mg/l	0.002	0.00556	0.0056										< 0.0020
AP-12	Thallium, total	mg/l	0.002	0.00556	0.0056										< 0.0200
AP-13	Thallium, total	mg/l	0.002	0.00556	0.0056										< 0.0200
AP-14	Thallium, total	mg/l	0.002	0.00556	0.0056									0.0020	< 0.0020
AP-1	Turbidity	NTU	NA	NA	NA										15.73
AP-2	Turbidity	NTU	NA	NA	NA										9.95
AP-3	Turbidity	NTU	NA	NA	NA										6.58
AP-4	Turbidity	NTU	NA	NA	NA										93.21
AP-5	Turbidity	NTU	NA	NA	NA										4.98
AP-6	Turbidity	NTU	NA	NA	NA										9.11
AP-7	Turbidity	NTU	NA	NA	NA										6.79
AW-3/RW-3	Turbidity	NTU	NA	NA	NA										15.43
AP-8	Turbidity	NTU	NA	NA	NA										7.77
AP-9	Turbidity	NTU	NA	NA	NA										18.61
AP-10	Turbidity	NTU	NA	NA	NA										15.73
AP-11	Turbidity	NTU	NA	NA	NA										45.77
AP-12	Turbidity	NTU	NA	NA	NA										1580.98
AP-13	Turbidity	NTU	NA	NA	NA										1267.13
AP-14	Turbidity	NTU	NA	NA	NA										57.82

Notes:

1. Yellow shading indicates an exceedence of the GWPS.

2. Constituents with method detection limits above the GWPS that were non-detect are not interpreted as an exceedance.

3. Section 845.600 requires Radium-226 and Radium-228 concentrations to be combined, with a GWPS of 5 pCi/L. However, these parameters require two separate analysis and have been reported separately by the analytical laboratory individually. The sum of the values has been provided and compared to the GWPS. Background values have been calculated for the individual parameters. A value of 7.1 pCi/L was calculated for Radium 226. Therefore, 7.1 pCi/L is listed as the GWPS for Radium 226 and 228 combined.

4. Well AW-3 was replaced by well RW-3 prior to the May 2018 monitoring event.

5. "<" indicates no detection at the concentration listed.

6. A blank space indicates testing was not conducted on the parameter. The well may not have been installed at that time.

ATTACHMENT 13

FINAL CLOSURE PLAN

City Water, Light & Power

CCR Impoundments – Lakeside and Dallman Ash Ponds

Springfield, Sangamon County, Illinois

Final Closure Plan for Coal Combustion Residuals Surface Impoundments

February 2022

Submitted to:
Illinois Environmental Protection Agency
Bureau of Water
1021 North Grand Avenue East
Springfield, Illinois

Prepared for:
City Water, Light & Power
3100 Stevenson Drive
Springfield, Illinois 62703

ANDREWS
ENGINEERING

3300 Ginger Creek Drive, Springfield, IL 62711 | 217.787.2334

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TABLE OF CONTENTS

FIGURES

1. INTRODUCTION

City Water, Light and Power (CWLP) owns and operates two ash ponds which are defined as coal combustion residuals (CCR) surface impoundments. The impoundments include both the Lakeside and Dallman Ash Ponds and are being closed as a multi-unit system pursuant to Section 845.750. The plans and specifications for the installation of the final cover system along with the Construction Quality Assurance Plan are provided in Attachment 8 to the Closure Construction Application. This Final Closure Plan has been prepared pursuant to Section 845.720(b).

2. FACILITY DESCRIPTION

The impoundments are located north and east of the former Lakeside Power Generating Station and Dallman Power Generating Station in the Eastern ½ of Section 12, Township 15 North, Range 5 West, in Springfield, Illinois (see Figure 1). The former Lakeside Power Generating Station and Dallman Power Generating Station are situated on the northwestern bank of Lake Springfield in Springfield, Illinois. The Lakeside Ash Pond is immediately north of Spaulding Dam at the northern end of Lake Springfield (see Figure 2). The Dallman Ash Pond is immediately northwest of the Lakeside Ash Pond. Placed into service prior to 1958, the Lakeside Ash Pond is primarily a diked embankment with an in situ soil liner. The Lakeside Ash Pond consists of four separate ponds (i.e., three lime softening ponds and a settling pond) totaling approximately 35.0 acres. The Lakeside Ash Pond ceased receiving ash in 2009. The Dallman Ash Pond was placed into service in approximately 1976 and is also a diked embankment with an in situ soil liner. The Dallman Ash Pond is approximately 34.5 acres in area.

3. FINAL CLOSURE PLAN

The closure for Lakeside Ash Pond and the Dallman Ash Pond will be accomplished by leaving CCR in place pursuant to Section 845.750. The closure of both ponds will contain the following elements:

- Drainage/dewatering of ash ponds
- Stabilization of CCR
- Structural fill, if necessary
- Final cover system

Details of these items are discussed in the following sections. This plan may be revised at any time as allowed under 35 IAC Part 845.720 (b)(3). Amendments to this plan will be required if and when any significant changes occur to the operation of the CCR units that would substantially affect this plan, or unanticipated events necessitate a revision of this plan. This plan must be amended at least 60 days prior to a planned change in operation of the facility or CCR unit, or no later than 60 days after an unanticipated event requires the need to revise this closure plan.

Design and construction details (Plans and Specifications/Construction Quality Assurance Plan) are provided in Attachment 8 of the Closure Construction Application. The information contained below has been compiled pursuant to Section 845.720(b)(3).

3.1 Drainage/Dewatering

Free liquids will be removed from the ash ponds by utilizing existing pumping structures that will remove the liquids to an existing clarification pond, located to the south of the Dallman Ash Pond.

Water will eventually be discharged by permitted NPDES Outfall 004. The dewatering will be monitored for effectiveness and other methods employed to complete the process if determined to be necessary. Vegetation existing inside the pond limits will be removed during this process.

3.2 CCR Material Stabilization

After fee liquids and vegetation are removed from the ash ponds, CCR materials within the inactive Ash Ponds will be stabilized by grading and compacting to minimize the probability of future impoundment of water or sediment due to settlement. Grading and compacting the CCR materials will also enhance slope stability to minimize the potential movement of the final cover system.

3.3 Final Grading Design

Grading design plans have been developed, but will likely be amended during the final engineering design to accommodate the final quantity of material stored in the ash ponds. Final top slopes will include a minimum slope of three to five percent to promote surface drainage. Structural fill may be added above the CCR material to provide sufficient slope for the final cover system. A final grading design will be implemented that accommodates the anticipated amount of settling and/or subsidence of the CCR materials, as well as any structural fill placed in the CCR units.

It must be noted that additional CCR and non-CCR material may be needed to attain proper final elevations during grading prior to placement of the 40 mil LDPE cover. This could occur after the impoundments have ceased accepting CCR during regular operation of the power station. Acceptance of CCR and non-CCR material under these conditions does not imply the impoundments are active.

3.4 Stormwater Management

Post-closure infiltration of liquids into the waste will be minimized by directing stormwater through a system of drainage ditches. Drainage ditches will be built between the inner slope of the outer berms of the impoundments and the outer slope of the final cover. Stormwater will exit the ditches through culverts and letdowns built into the outer berms and discharge into the Sugar Creek. However, any stormwater which occurs in active construction areas where CCR may be in contact with the stormwater will be directed to the impoundment areas.

3.5 Final Cover Placement

The final grades of CCR material and structural fill, if used, will be covered by a 40 mil geosynthetic membrane layer, which will be topped with a geocomposite drainage layer. In terms of hydraulic flux, the geosynthetic layer will be equivalent or superior to a three-foot layer of soil with a hydraulic conductivity of 1 x 10-7 cm/sec and withstand the normal stresses imposed by the waste stabilization process. Roots, cobbles, debris, organic, and other deleterious material that may cause damage to the geosynthetic membrane will be removed from the CCR and/or soil material prior to placement of the geosynthetic membrane layer.

A soil protective layer containing a minimum of 36 inches of soil capable of sustaining plant growth will overlie the low permeable layer. The soil used for the protective layer should not be compacted and should be the best onsite readily available soil for supporting vegetation. Shallow-rooted grasses and legumes should be used to establish a vegetative growth for erosion control. The mixture of grasses and legumes selected must be amenable to the soil quality and thickness, slopes, moisture, and climatological conditions that exist without the need for continued maintenance.

Lime, fertilizer, and any other appropriate soil amendments, may be incorporated into the erosion layer at application rates determined from composite soil tests of the area to be seeded. Mulch consisting of straw, yard waste compost, jute, and/or wood excelsior may be used as necessary to hold the seed in place and conserve moisture. A professional knowledgeable in vegetation establishment will be consulted for determining the specific seed mixtures to be sown, suitable soil amendments, and application rates based upon specific seasonal conditions at the time of placement.

The finished surface of the final cover shall be surveyed on a spacing that shall not exceed 100 feet in any ordinate direction. Numerical testing tolerances shall be governed by standard significant digit and rounding as warranted. Acceptable standards for isolated nonconformances shall be the significant digit less 1/10 corrected for decimal place. However, at no time shall the allowable survey tolerances of the low permeability layer and final protective layers be such that the final protective layer be less than three-feet thick. This survey and acceptance criteria shall apply to protective layers of the final cover system, with allowance for the minimum three-foot difference between their surfaces. Installation and testing of all final cover components will be performed in accordance with the Construction Quality Assurance Plan.

4. CCR INVENTORY ESTIMATES

The maximum inventory of CCR ever on site for the active life of the Lakeside Ash Pond is estimated to be equivalent to the current inventory of CCR in that unit. According to CWLP personnel, the Lakeside Ash Pond currently has an approximate impounded CCR volume of 1,080,000 cubic yards with a maximum capacity of approximately 1,330,000 cubic yards. Therefore, premature closure or closure near the end of regulatory life of the facility will be essentially the same. There is no need to provide a separate premature closure plan.

The storage capacity for the Dallman Ash Pond is approximately 1,500,000 cubic yards. The Dallman Ash Pond currently has an approximate impounded CCR volume of 978,000 cubic yards, approximately 28,000 cubic yards of which is piled up above the normal water elevation that is being dried out for beneficial reuse. The maximum inventory of CCR ever on site for the active life would not exceed the 1,500,000 cubic yard storage capacity.

5. FINAL COVER AREA

It is assumed that the entire area of the ash ponds represents the largest area that will require a final cover system, as described in Section 2.3 of this report. Under these assumptions, the Lakeside Ash Pond will require a final cover system of approximately 35 acres, and the Dallman Ash Pond will require a final cover system of approximately 34.5 acres.

6. CLOSURE SCHEDULE

Closure of each Ash Pond will occur when the CCR unit ceases to receive CCR and Non-CCR wastes. Currently the impoundments will cease accepting CCR and non-CCR wastes in late 2023. Closure has been initiated under 845.730 once CWLP has stopped placing waste in the CCR surface impoundments and has submitted a construction permit application to the Agency. In the event the closer date is revised, the schedule for closure activities will vary accordingly.

The closure process will commence no later than 30 days after the date on which the CCR unit receives the known final receipt of CCR or non-CCR wastes, or removes the final volume of CCR from the CCR unit for the purpose of beneficial use. If the final receipt of CCR or non-CCR wastes is not known, then the closure process must still commence if the CCR unit has not received CCR or non-CCR wastes, or has not had CCR material removed from it for a duration of two years, unless it can be demonstrated that the idle unit will resume to receive or remove CCR materials in the foreseeable future.

The general sequence and timing of closure activities identified below will be applied to the closure of each Ash Pond as follows upon receipt of a construction permit from the Agency:

Season 1 – Initiation of the closure process
- Final engineering design
- Dewatering of CCR materials
- Remove existing vegetation
- Initial grading and compaction of CCR materials

Season 2 – Beginning one year after initiation of closure process
- Complete grading of CCR materials
- Add and grade structural fill, if necessary
- Construction of final cover system

Season 3 – Beginning two years after initiation of closure process
- Complete construction of final cover system, if necessary

7. NOTICES AND REPORTS

7.1 Closure Notices

In accordance with 35 IAC Parts 845.730(d), and 845.760(f), the following closure documentation will be completed and placed in the CWLP's CCR operating record and on the CWLP website:

- Notification of Intent to Close (Due on the date of the initiation of closure)
- Notification of Completion of Closure (30 days after completion of closure activities)
    - Will include a certified Construction Acceptance Report

7.2 Construction Acceptance Report

Both the Operator and a Professional Engineer (Engineer) must certify that closure is in accordance with the closure plan. Therefore, the Engineer should be designated at the outset of the closure process so that all aspects of the closure can be overseen. The Engineer will need to spend sufficient time on site to ensure adequate cover quality and thickness as well as proper completion of the other tasks. Furthermore, the Engineer will conduct testing to meet the requirements of the final cover design. The Engineer's services will include the preparation of plan sheets showing the final conditions at the closed site.

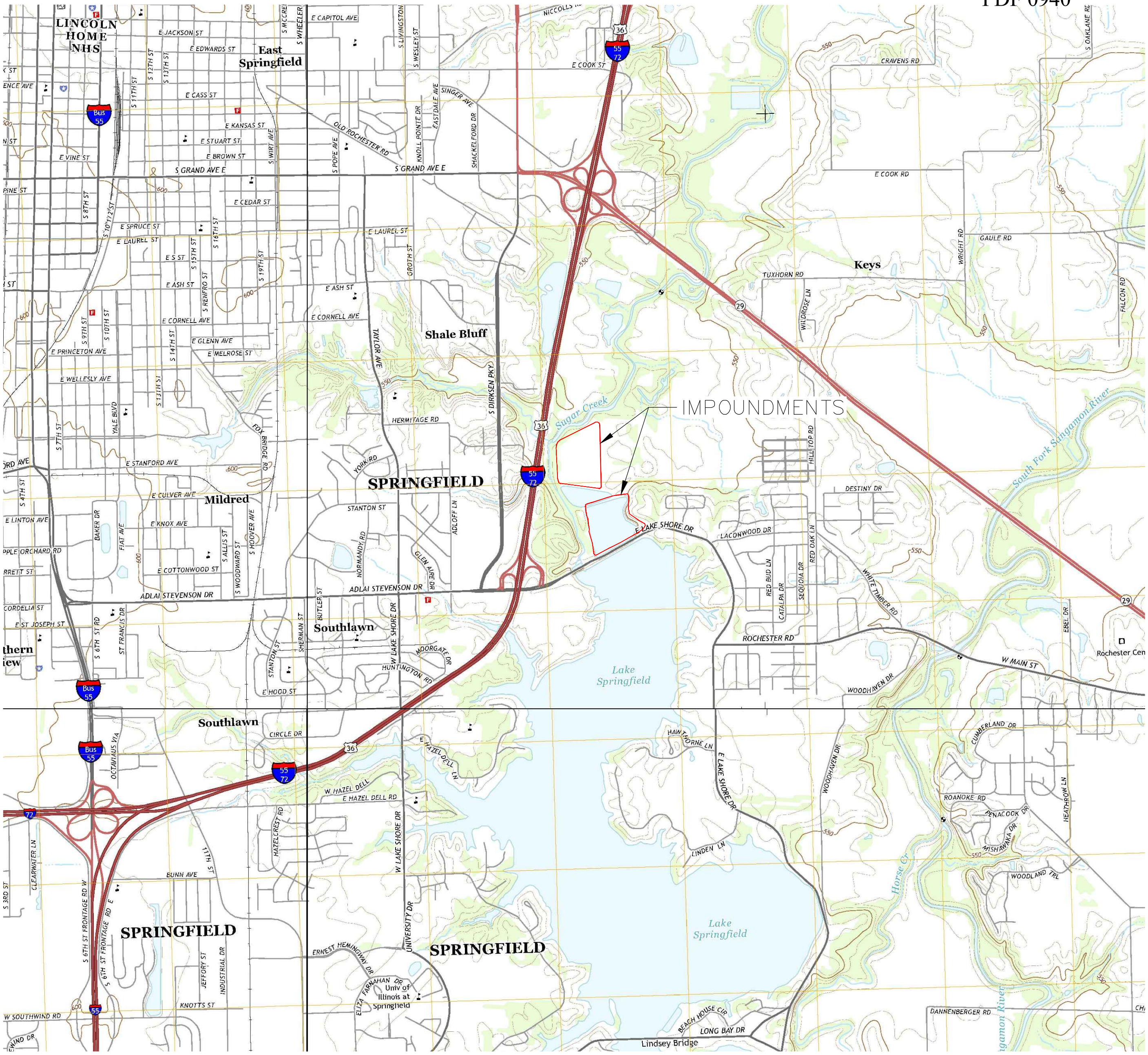
7.3 Deed Notations

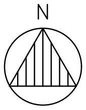
Following the closure of all units, the owner or operator will record a notation on the deed to the property, or some other instrument that is normally examined during title search. Within 30 days of the deed notation, a notification that the notation has been recorded and a copy will be placed in the operating record, and posted on the CWLP's website. The notation on the deed will in perpetuity notify any potential purchaser of the property that the land has been used as a CCR unit and its use is restricted under 35 IAC Part 845.760(h).

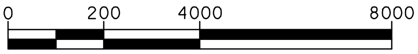
8. STATEMENT

This Final Closure Plan for Coal Combustion Residuals Surface Impoundments was completed for CWLP by Andrews Engineering, Inc. in accordance with the requirements under 35 IAC Part 845.750

FIGURES







SCALE: IN FEET

NOTE:

BACKGROUND IMAGE COURTESY OF
UNITED STATES GEOLOGICAL SURVEY.

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APPROVED BY: BJH	*DESIGNED BY:* BJH	*DRAWN BY:* MPN

SITE LOCATION

PLANS PREPARED FOR

CITY, WATER, LIGHT & POWER

SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: JULY 2021

PROJECT ID: 200387/0026

SHEET NUMBER:

FIGURE 1

PDF 0941

LEGEND

▬ ▬ ▬ CCR SURFACE IMPOUNDMENT

NOTE

IMAGE SOURCE: GOOGLE EARTH PRO, IMAGE DATE JUNE 7, 2016.

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SCALE: IN FEET

NO.	DATE	REVISION DESCRIPTION	BY

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APPROVED BY: DG
DESIGNED BY: DG
DRAWN BY: MPN

SITE DETAILS

PLANS PREPARED FOR
CITY, WATER, LIGHT AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

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FIG. 2

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ATTACHMENT 14

POST-CLOSURE CARE PLAN

City Water, Light & Power

CCR Impoundments – Lakeside and Dallman Ash Ponds

Springfield, Sangamon County, Illinois

Post-Closure Care Plan for Coal Combustion Residuals Surface Impoundments

February 2022

Submitted to:
Illinois Environmental Protection Agency
Bureau of Water
1021 North Grand Avenue East
Springfield, Illinois

Prepared for:
City Water, Light & Power
3100 Stevenson Drive
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FIGURES

1. INTRODUCTION

City Water, Light and Power (CWLP) owns and operates two ash ponds which are defined as coal combustion residuals (CCR) surface impoundments. The impoundments include both the Lakeside and Dallman Ash Ponds and are being closed as a multi-unit system pursuant to Section 845.750. The plans and specifications for the installation of the final cover system along with the Construction Quality Assurance Plan are provided in Attachment 8 to the Closure Construction Application. This Post-Closure Care Plan has been prepared pursuant to Section 845.780(d) and is provided as Attachment 13 to the Closure Construction Application.

2. FACILITY DESCRIPTION

The impoundments are located north and east of the former Lakeside Power Generating Station and Dallman Power Generating Station in the Eastern ½ of Section 12, Township 15 North, Range 5 West, in Springfield, Illinois (see Figure 1). The former Lakeside Power Generating Station and Dallman Power Generating Station are situated on the northwestern bank of Lake Springfield in Springfield, Illinois. The Lakeside Ash Pond is immediately north of Spaulding Dam at the northern end of Lake Springfield (see Figure 2). The Dallman Ash Pond is immediately northwest of the Lakeside Ash Pond. Placed into service prior to 1958, the Lakeside Ash Pond is primarily a diked embankment with an in situ soil liner. The Lakeside Ash Pond consists of four separate ponds (i.e., three lime softening ponds and a settling pond) totaling approximately 35.0 acres. The Lakeside Ash Pond ceased receiving ash in 2009. The Dallman Ash Pond was placed into service in approximately 1976 and is also a diked embankment with an in situ soil liner. The Dallman Ash Pond is approximately 34.5 acres in area.

3. POST-CLOSURE CARE PLAN

The Post-Closure Care Plan identifies the requirements for inspection and care of the impoundments and related components subsequent to installation and Agency approval of the final cover system. The Post-Closure Care Plan addresses the maintenance of the integrity and effectiveness of the final cover system which include making repairs to the system to correct effects of settlement, erosion, or other events, and preventing run-on and run-off from eroding the or damaging the final cover. In addition, the Plan addresses maintenance of the groundwater monitoring system and continued groundwater monitoring during post-closure care.

The requirements pursuant to Section 845.780 will be applicable for the entire post-closure care period (minimum of 30 years). At the end of the post-closure care period, the owner or operator must continue to conduct post-closure care until the groundwater monitoring data shows the concentrations are:

- Below the groundwater protection standards,
- Not increasing for those constituents over background, using the statistical procedures and performance standards in Section 845.640(f) and (g), provided that:
  - Concentrations have been reduced to the maximum extent feasible, and
  - Concentrations are protective of human health and the environment.

3.1 Inspection and Maintenance

The purpose of the inspections and maintenance is to ensure proper functioning of all items that remain after closure. The inspection of the final cover system and related structures must be consistent with the requirements listed in Section 845.540 throughout the entire post-closure care period.

Pursuant to Section 845.540(a), the CCR surface impoundments and appurtenances shall be inspected by a qualified person at intervals not exceeding seven days and after each 25-year, 24-hour storm. Each inspection conducted pursuant to this Section shall be documented in an inspection report that describes the condition of the CCR surface impoundment, any repairs made to the CCR surface impoundment and date of the repair. These inspection reports shall become part of the facility's operating record.

The 7-day and 25-year, 24-hour storm inspections shall note any appearances of actual or potential structural weaknesses or create safety issues for the CCR surface impoundments. Such issues may include; erosion that creates rills, gullies or crevices six inches or deeper within the final protective layer or berms, other signs of deterioration including failed or eroded vegetation in excess of 100 square feet, or cracks in dikes or other containment devices; and any visible releases. In addition, at intervals not exceeding 7-days, inspect the discharge of all outlets of hydraulic structures that pass underneath the base of the CCR surface impoundment or through the dike of the CCR surface impoundment, for abnormal discoloration, flow or discharge of debris or sediment; and at intervals not exceeding 30-days, monitor all CCR surface impoundment instrumentation.

The annual inspection and reporting requirements are outlined under Section 845.540(b). Pursuant to Section 845.540(b), the annual inspection shall be completed by a qualified professional engineer to ensure that the design, construction, and maintenance of the CCR surface impoundment is consistent with recognized and generally accepted engineering standards. The inspection shall include: a review of available information regarding the status and condition of the CCR surface impoundment, including files available in the operating record (e.g., CCR surface impoundment design and construction information required by Sections 845.220(a)(1) and 845.230(d)(2)(A), previous structural stability assessments required under Section 845.450, the results of inspections by a qualified person, and results of previous annual inspections); a visual inspection of the CCR surface impoundment to identify signs of distress or malfunction of the CCR surface impoundment and appurtenant structures; a visual inspection of any hydraulic structures underlying the base of the CCR surface impoundment or passing through the dike of the CCR surface impoundment for structural integrity and continued safe and reliable operation; the annual hazard potential classification certification, if applicable (see Section 845.440); the annual structural stability assessment certification, if applicable (see Section 845.450); the annual safety factor assessment certification, if applicable (see Section 845.460); and the inflow design flood control system plan certification (see Section 845.510(c)).

Inspection reports prepared by the qualified professional engineer to document the annual inspections must address: any changes in geometry of the impounding structure since the previous annual inspection; the location and type of existing instrumentation and the maximum recorded readings of each instrument since the previous annual inspection; any appearances of an actual or potential structural weakness of the CCR surface impoundment, in addition to any existing conditions that impact the safety of the CCR surface impoundment and appurtenant structures; and any other changes that may have affected the stability or operation of the impounding structure since the previous annual inspection.

Pursuant to Section 845.540(b)(5), if a deficiency or release is identified during an inspection, the owner or operator must submit to the Illinois EPA documentation detailing proposed corrective measures and obtain any necessary permits from the Illinois EPA.

Inspections specific to the final cover system include: assess the condition and the need for repair of final cover, vegetation, fencing, monitoring devices, and drainage structures, if present and if applicable. These inspections will be completed while conducting the 7-day inspection defined above, or as otherwise warranted.

In general, the following guidelines will be followed when assessing the need for remedial actions:

a) All rills, gullies, and crevices six inches or deeper in the final cover will be filled. Areas identified by the operator or during Illinois EPA inspections as particularly susceptible to erosion will be recontoured.
b) All reworked surfaces, and areas with failed or eroded vegetation in excess of 100 square feet cumulatively, shall be revegetated in accordance with the approved closure plan.
c) Brush, trees, or similar vegetation with tap roots growing in areas not so designated will be controlled.
d) Holes and depressions created by settling will be filled and recontoured so as to prevent standing water.
e) Eroded and scoured drainage channels will be repaired and lining material will be replaced if necessary.

Erosion and differential settlement may cause the need for cover repairs. The majority of settlement should be realized prior to the placement of the final cover system. Any areas where ponding occurs or erosion cuts appear will be promptly repaired in order to maintain the integrity of the final cover system as described in the closure plan. Earthen material for cover repairs will be made available from predetermined borrow areas proximate to the impoundments. Any area repaired herein will require re-establishment of vegetation. In addition, the final cover area will be mowed as necessary for the entire post-closure care period.

3.2 Groundwater Monitoring

Groundwater monitoring will be conducted pursuant to the existing Groundwater Monitoring Program and Statistical Procedures contained in Attachment 12 of the Closure Construction Permit Application and as defined in 35 IAC Part 845 Subpart F. Sampling and reporting will be conducted on a quarterly basis for a minimum period of 30 years after closure. After the initial five-year period, the sampling frequency may be reduced to a semiannual basis upon Illinois EPA approval pursuant to Section 845.650(b)(4). However, groundwater elevation monitoring will continue on a monthly basis. Groundwater monitoring records will be maintained at the operator's office or other designated location.

If during any sampling event it is discovered that a well has been damaged such that sample collection is prevented or impaired, it shall be repaired or replaced as soon as practical. All repairs will be recorded and placed in the facility record.

3.2.1 Recordkeeping

During post-closure care, records of field investigations, closure test results, inspection(s), and groundwater monitoring results will be maintained in the facility record.

3.2.2 Financial Assurance

CWLP is a unit of local government. Pursuant to Section 845.900(e), the Financial Assurance requirements of 35 IAC Part 845 Subpart I do not apply.

4. CONTACT INFORMATION

Pursuant to Section 845.780(d)(1)(B), listed below is the contact information for the facility during post-closure care.

Name: P.J. Becker

Address: 801 E. Monroe, 4th Floor
Springfield, IL 62701

Phone No. (217) 757-8610 Ext. 1110

Email Address: pj.becker@cwlp.com

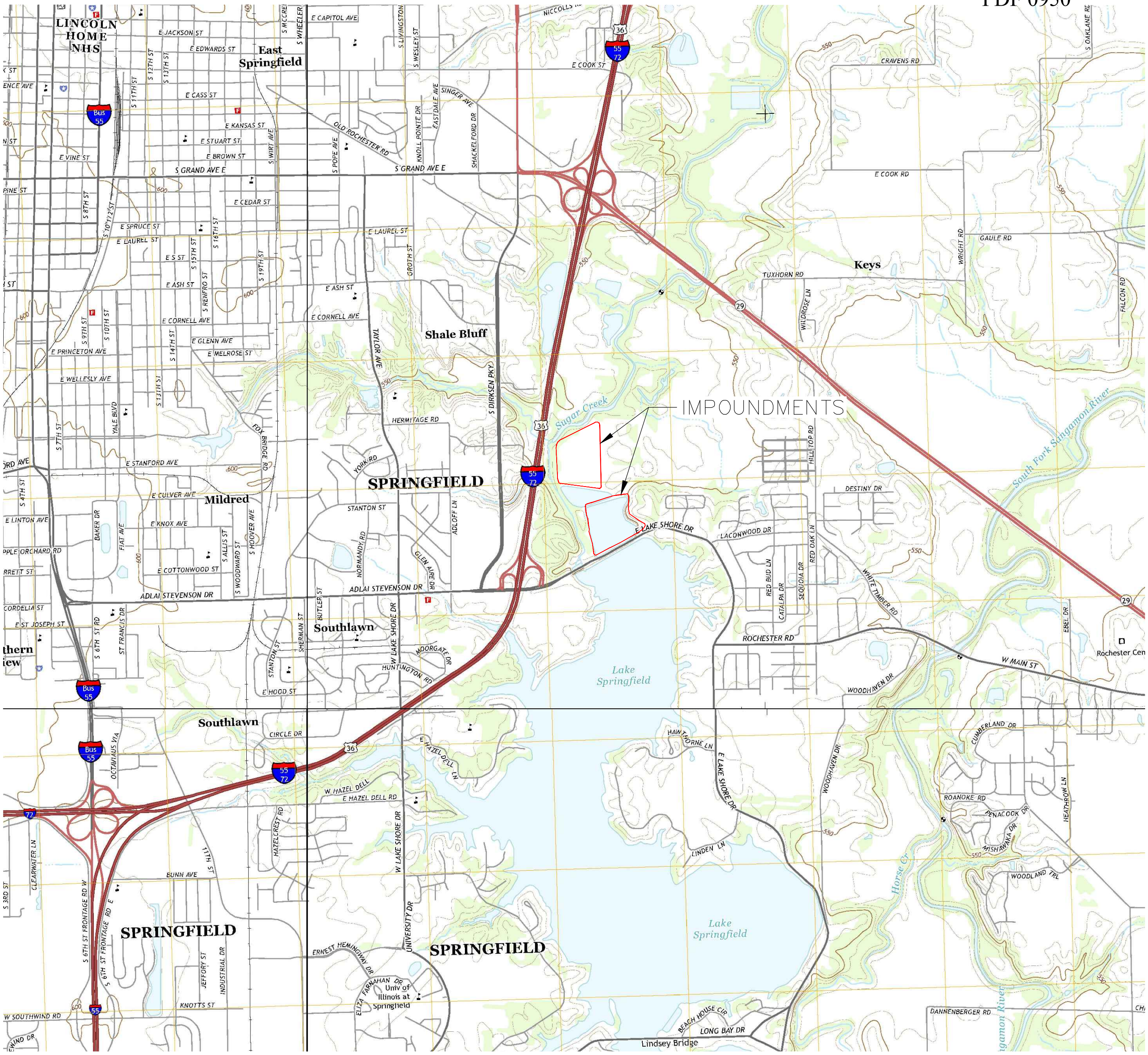
5. PLANNED PROPERTY USE

Subsequent to completion of the final cover system, there is no planned use of the impoundments. Therefore, the integrity of the final cover, liners, or any other component of the containment system, or the function of the monitoring systems will be maintained. If future use of the impoundments is considered, a demonstration must be made to the Illinois EPA prior to such use that no disturbance will occur resulting in an increase of potential threat to human health and the environment. Any demonstration must be certified by a qualified professional engineer.

6. STATEMENT

This Post-Closure Care Plan for Coal Combustion Residuals Surface Impoundments was completed for CWLP by Andrews Engineering, Inc. in accordance with the requirements under 35 IAC Part 845.780

FIGURES



NOTE:

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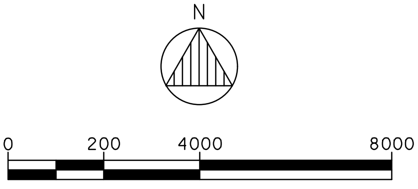

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APPROVED BY: BJH | DESIGNED BY: BJH | DRAWN BY: MPN

SITE LOCATION

PLANS PREPARED FOR

CITY, WATER, LIGHT & POWER

SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: JULY 2021

PROJECT ID: 200387/0026

SHEET NUMBER:

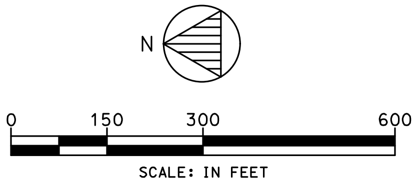
FIGURE 1

LEGEND

▬ ▬ ▬ CCR SURFACE IMPOUNDMENT

NOTE

IMAGE SOURCE: GOOGLE EARTH PRO, IMAGE DATE JUNE 7, 2016.



NO.	DATE	REVISION DESCRIPTION	BY

APPROVED BY: DG
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SITE DETAILS

PLANS PREPARED FOR
CITY, WATER, LIGHT AND POWER
SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

DATE: JULY 2021
PROJECT ID: 200387/0026
SHEET NUMBER:
FIG. 2

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