City Water, Light & Power
Springfield, Illinois

Groundwater Monitoring Program – CCR Landfill

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1. INTRODUCTION

The CWLP Flue Gas Desulfurization System (FGDS) Development landfill is located north of the former Lakeside Power Generating Station and Dallman Power Generating Station and east of the CCR surface impoundments in the Eastern ½ of Section 12, Township 15 North, Range 5 West, in Springfield, Illinois (see Figure 1). The landfill consists of 2 units. Unit 1 was permitted by the Illinois Environmental Protection Agency (Illinois EPA) to landfill materials generated from power plant and water treatment activities in 1980. Unit 1 consists of 10.5 acres and was filled to capacity and closed in accordance with 35 Illinois Administrative Code (Ill. Adm. Code) 807 regulations in February of 1993 and is not subject of this program. The Unit 1 final cover system consists of a three-foot-thick recompacted low hydraulic conductivity clay liner underlying a three-foot-thick protective cover/vegetative layer. A construction quality assurance report was submitted to the Illinois EPA upon completion of the final cover system for Unit 1.

Unit 2 consists of 22.3 acres located immediately north of Unit 1 and adjacent (east) to the Dallman Ash Pond. However, only a portion of Cell 3 (3.5 acres) of Unit 2 is currently developed and active. No other area of Unit 2 has been developed or utilized for any storage or disposal of Coal Combustion Residual (CCR) material. Unit 2 was designed and permitted pursuant to Ill. Adm. Code 814, Subpart C (Standards for Existing Units Accepting Chemical or Putrescible Wastes That May Remain Open for More Than Seven Years). The developed portion of Cell 3 is operated and monitored pursuant to these same standards. The referenced standards were based on the RCRA Subtitle D standards (40 CFR Part 258 – Criteria for Municipal Solid Waste Landfills).

A groundwater monitoring program for the Unit 2 landfill was established in 1995 pursuant to 35 Ill. Adm. Code 811 requirements and has undergone several updates through the permitting process with Illinois EPA since that time. Under the Illinois program, analytical results from groundwater sampling and statistical comparison of the results to background concentrations are reported to the Illinois EPA on a quarterly basis. By December 31 of each year, an annual report characterizing the groundwater quality with summaries and analyses of trends is also included. Pursuant to the Illinois regulations, concentration exceedances of applicable groundwater quality standards (AGQSs) can trigger resampling events, alternate source demonstrations, establishment of an assessment monitoring program, installation of additional monitoring wells or increased frequency of monitoring existing wells, corrective action or any combination thereof. Such activities are conducted pursuant to the application process and must be approved by the Illinois EPA prior to commencing with such efforts.

To date, Illinois EPA has approved 18 modifications to CWLP's initial permit. Several of these modifications are the result of addressing variable groundwater quality, initiating assessment

monitoring, revising AGQSs and providing an alternate source demonstration for groundwater quality in certain landfill wells.

CWLP will continue to adhere to Illinois EPA requirements for groundwater sampling and analyses concurrently with the groundwater monitoring program proposed herein. However, revisions to the Groundwater Monitoring Program have been incorporated pursuant to specification contained in the Consent Agreement and Final Order dated January 14, 2025.

2. REGULATIONS

As stated above, the developed portion of Cell 3 of Unit 2 was designed, constructed, and is operated and monitored pursuant to the RCRA Subtitle D compliant standards contained in 35 Ill. Adm. Code Part 814, Subpart C. Unit 2 complies with all standards, Federal and State, imposed for municipal solid waste and non-hazardous special waste landfills. Cell 3 of Unit 2 is permitted by the Illinois EPA to dispose of CCR and non-CCR materials generated by the CWLP coal combustion electric generating units and lime sludge from the water treatment process for potable water. The landfill is not permitted to accept municipal solid waste. As such, the United States Environmental Protection Agency (EPA) has stated Cell 3 of Unit 2 does not meet the definition of a municipal solid waste landfill and therefore must comply with 40 CFR Part 257.

CWLP intends to comply with the rules promulgated by EPA pertaining to Disposal of CCR from Electric Utilities published in 40 CFR Part 257 on April 17, 2015 in 80 FR 21202; and with the Technical Amendments published on July 2, 2015 in 80 FR 21468 and Technical Amendments published on July 30, 2018 in 83 FR 36435. This Groundwater Monitoring Program has been prepared pursuant to the Consent Agreement and Final Order (CAFO), 40 CFR § 22.13(b), filed January 14, 2025.

Pursuant to 40 CFR § 257.90(b)(1), by October 17, 2017, the owner or operator of a CCR unit must install a groundwater monitoring system that meets the requirements of 40 CFR § 257.91. The groundwater monitoring system must meet the CCR Rule's performance standard, which requires the system to consist of a sufficient number of wells, installed at appropriate locations and depths, to yield groundwater samples from the uppermost aquifer that accurately represent the quality of:

(1) background groundwater that has not been affected by leakage from a CCR unit; and
(2) groundwater passing the waste boundary of the CCR unit and monitoring all potential contaminant pathways.

The groundwater monitoring program under 40 CFR Part 257 consists of one upgradient well (R101) and four downgradient wells (AW-2, P07D, G121 and G122).

The landfill is situated in a dammed alluvial valley, downgradient of the existing Lakeside Ash Pond and the Dallman Ash Pond CCR surface impoundments. The uppermost aquifer beneath the subject landfill and CCR surface impoundments is the basal sand and hydraulically connected unconsolidated/bedrock surface interface.

The background groundwater monitoring wells for the landfill have been based upon the upgradient location of these well with respect to the landfill (e.g., floodplains, where nearby surface water can influence groundwater).

Information regarding the groundwater monitoring system design and construction has been certified by a qualified professional engineer as required by 40 CFR § 257.91(e)(1); the certification is included in the facility operating record pursuant to 40 CFR § 257.91(e)(1).

This Groundwater Monitoring Program (GMP) was prepared to meet the groundwater monitoring and corrective action requirements of the Federal CCR Rule §257.90-98. This GMP describes the methods and procedures to be used for conducting groundwater monitoring at CWLP CCR units. This GMP is subject to periodic revision as circumstances and/or new regulations dictate. Revisions to the GMP must be approved by a qualified professional engineer before placed in effect. The most up-to-date version of the GMP shall be kept in the Operating Records for use by CWLP and subcontractor personnel.

3. SITE DEVELOPMENT

The CWLP FGDS Development landfill was issued Permit No. 1995-243-LFM on November 9, 1995. A portion of Cell 3 of Unit 2 has been developed and operated pursuant to the initial permit and subsequent permit modifications. All changes to the facility subsequent to the issuance of the aforementioned permit were approved by the Illinois EPA via significant modification permits. CWLP has no current plans to develop additional areas within Unit 2.

4. SUBSURFACE CONDITIONS AT THE CCR LANDFILL

The subsurface conditions of the area in and surrounding the permitted Subtitle D landfill have been characterized through multiple subsurface investigations, including the hydrogeologic investigation of the Lakeside Ash Pond and 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 was 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 was 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., June 2019. This investigation advanced 7 direct push borings peripheral to the Dallman Ash Pond and included the installation 2 new monitoring wells as part of an assessment program for the CCR ash impoundments.
- Andrews Engineering, Inc., October 2023. This investigation consisted of 34 borings next to the impoundments and 4 next to landfill Unit 1, to investigate the CCR ash surface impoundment berm construction materials and the installation of 29 vibrating wire piezometers to characterize pore water pressure in the soils.
- Andrews Engineering, Inc., February 2024. This investigation consisted of 14 borings using a cone penetrometer adjacent to the Dallman and Lakeside Ash ponds.
- Andrews Engineering, Inc., April/May 2024. This investigation consisted of installation of six monitoring wells on the periphery of Lakeside and Dallman Ash Ponds, the installation of four monitoring wells within the Lakeside Ash Pond area, four monitoring wells within the Dallman Ash Pond Area, and the advancement of a 100-foot boring northwest of the Dallman Ash Pond.

The summary discussion below of the subsurface conditions is presented in context of the 2015 Federal CCR Rule 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 under the Federal CCR rule.

The occurrence of the deposits discussed below is 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.

4.1 SURFICIAL DEPOSITS

The shallow stratigraphy and lithology at the landfill include approximately 20 to 50 feet of Pleistocene sediments, dependent upon location. In ascending order these materials are identified as basal sand, lower cohesive deposit, shallow sand, upper cohesive deposit and fill material.

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, or the bedrock surface interface an immediately overlying material. The basal sand is largely present on the bedrock surface; however, finer-grained deposits may directly overlie the bedrock.

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.

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, 5% 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).

Shallow Sand

The shallow sand overlies the lower cohesive deposit and underlies the upper cohesive deposit where present. The unit consists of a brown to gray silty to clayey fine sand. It contains small lenses of silty clay and clayey silt. This deposit is limited in occurrence. Its thickness ranges from one to three feet over most of the investigated area.

Laboratory tests performed on representative samples collected from the shallow sand unit during 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 groundwater 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 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 x 10^{-5} cm/sec to 5.2 x 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.

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 7.6×10^{-8} cm/sec to 2.1×10^{-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 3.3×10^{-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 till 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 shale bedrock is considered to be an aquitard.

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. In some areas, there appears to be direct hydraulic communication between fill materials, shallow sand, and basal sand.

Four landfill piezometers were 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 3.3×10^{-8} cm/sec to 2.1×10^{-3} 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.

4.2 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.

The April-May 2024 investigation included the advancement of a 100-foot boring (B100) northwest of the Dallman Ash Pond. The 100-foot boring was a requirement of the Illinois EPA. The objective of the boring was to collect information for the calculations of resistance to mine collapse. No mine voids were encountered in this boring. Boring B100 was advanced to a total depth of 106 feet below surface. Bedrock was encountered at 32.3 feet below surface (500.7 ft MSL).

Packer testing was completed at seven intervals in boring B100 (i.e., 93 to 103.5 feet bgs, 82.5 to 93 feet bgs, 72 to 82.5 feet bgs, 61.5 to 72 feet bgs, and 51 to 61.5 feet bgs with the final two intervals overlapping 40.5 to 51 and 38.5 to 49 feet bgs). Test results indicate hydraulic conductivity below 482 feet msl is less than 1×10^{-9} cm/sec. The results confirm that bedrock below the weathered zone is relatively impermeable; however, the shallow weathered bedrock may have higher hydraulic conductivities and in direct hydraulic communication with the overlying basal sand such that the interface of the unconsolidated deposits and bedrock comprise 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.

4.3 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 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 5.6×10^{-4} to 3.6×10^{-2} cm/sec. The groundwater in the basal sand appears to be mostly under confined or semi-confined conditions. The upper limit of the uppermost aquifer is dependent upon the seasonally fluctuating potentiometric surface. The potentiometric surface of the basal sand varies from approximately 560 feet MSL at upgradient locations, south of the Lakeside Ash Pond, to approximately 523 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.

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 1.8×10^{-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 over most of the site will act as an aquitard and prevent the downward movement of groundwater.

4.4 GROUNDWATER MOVEMENT

The primary saturated interval beneath the CCR landfill and the adjacent CCR surface impoundments is the basal sand / bedrock interface. Groundwater movement within the basal sand / bedrock interface 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 dam and the CCR surface impoundments.

Existing wells at the site, including wells from the CCR surface impoundments, were used to derive potentiometric surface maps. The potentiometric surface maps were created using groundwater elevation data from landfill groundwater monitoring wells R101, AW-2, P07D, G121 and G122 and piezometers AW-1, RW-3, G110, R111, G112, G113 and G120. As shown, overall groundwater movement is from south to north with the excavated areas within Unit 2 as a groundwater sink (see Appendix A). The east perimeter of the Lakeside Ash Pond is largely upgradient where groundwater movement is somewhat perpendicular to the perimeter resulting in a northeasterly flow direction beneath the landfill. The low vertical permeability of the lower cohesive deposit (triaxial permeameter vertical hydraulic conductivity = 1.3 x 10^{-8} to 1.8 x 10^{-6} cm/sec) minimizes vertical flow (i.e., little hydraulic connection) between the overlying CCR ash ponds and the underlying uppermost aquifer. Based on historical surface water elevations, the Dallman Ash Pond is also upgradient to Cell 3. Sluicing operations have ceased and water elevations with the Dallman Ash Pond have decreased. As part of proposed closure activities (pending review), the water levels within both the Dallman and Lakeside Ash Ponds will decrease. Potentiometric surfaces will be monitored on a routine basis and the placement of the wells evaluated. Any revisions to the monitor well network will be done through the permitting process (Illinois EPA) and 40 CFR §257.91.

5. GROUNDWATER MONITORING AND CORRECTIVE ACTION – 40 CFR §257.90 THROUGH §257.98

The following sections specifically address the rules pertaining to Groundwater Monitoring and Corrective Action under sections Applicability (§257.90), Groundwater Monitoring Systems (§257.91), Groundwater Sampling and Analysis Requirements (§257.93), Detection Monitoring Program (§257.94), Assessment Monitoring Program (§257.95), Assessment of Corrective Measures (§257.96), Selection of Remedy (§257.97), and Implementation of the Corrective Action Program (§257.98).

5.1 APPLICABILITY – §257.90

Owners of an existing CCR landfill are required to install groundwater monitoring systems, develop a sampling and analysis program to include statistical procedures to be used for evaluating monitoring data, and initiate detection monitoring and evaluation of data for “statistically significant increases (SSI)” over background levels for selected constituents. If detected constituents are measured at a "statistically significant level (SSL)” over the established background level, the facility must conduct assessment monitoring, and if necessary, initiate corrective action responses to control the release.

The facility must make available an annual groundwater monitoring and corrective action report, the first of which was due no later than January 31, 2018. The report must document the status the groundwater monitoring and corrective action program, summarize actions completed, describe problems encountered, and identify activities for the upcoming year. The content of the report is prescribed in §257.90(e). The report must be placed in the facility's operating record and comply with the recordkeeping requirements in §257.105(h), notification requirements in §257.106(h), and internet requirements in §257.107(h).

5.2 GROUNDWATER MONITORING SYSTEM – §257.91

The rule for Groundwater Monitoring Systems (GMS) is a performance standard (§257.91(a)), where the system must consist 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 unit, and (2) accurately represent the quality of groundwater passing the waste boundary of the CCR unit to monitor potential contaminant pathways in the uppermost aquifer.

Under §257.91(b-c) 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 as summarized in Section 4 of this document. This includes a characterization of the uppermost aquifer.

The monitoring well locations consider the natural (pre-surface impoundment) and current convergence of groundwater flow paths. The wells are located as close as feasible to the downgradient edge of the landfill based on topography, berm construction, and operations.

The existing network of monitoring wells and piezometers (number of wells, locations, and screen interval) was installed pursuant to recommendations of the Illinois EPA Bureau of Land. The existing network consists of eleven monitoring wells and twelve piezometers screening the silt, sand, and gravel at the bedrock interface. The direction of groundwater movement at Cell 3, as described above, is to the east-northeast; therefore, the northern and eastern boundaries of the developed portion of Cell 3 will be downgradient, and the southern and western boundaries will be upgradient.

The proposed §257.91 monitoring network will be comprised of one upgradient well (R101) and four downgradient wells (AW-2, P07D, G121 and G122). The well locations are depicted in Figure 2. Table 1 provides a summary of well construction and the approximate screened intervals. Appendix B contains the boring logs and well completion reports for the CCR landfill wells and piezometers AW-1, RW-3, G110, R111, G112, G113 and G120.

Pursuant to §257.91(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 Ill. Adm. Code 920) for monitoring well construction standards. All monitoring well installations were documented in the respective reports. Well construction details are provided in Appendix B. All drilling and groundwater monitoring well construction was completed under the direct supervision of an Illinois Licensed Professional Geologist.

Background Quality – §257.91(1)

CWLP began monitoring the Unit 2 Landfill in accordance with 40 CFR 257 in October 2023 and is currently in the process of collecting eight consecutive independent samples from each monitoring well pursuant to 40 CFR 257.94(b) in order to develop applicable GWPS. Groundwater monitoring well P07D was first sampled in August 2024. The first statistical analysis of groundwater monitoring results with comparison to applicable GWPS will occur in 2025.

While CWLP is in the process of developing background values for Unit 2 under 40 CFR §257 pursuant to Paragraph 278 of the CAFO, CWLP shall continue to use interwell background concentrations to evaluate groundwater quality in accordance with Illinois EPA permit conditions until recalculated background values can be provided for all Appendix III and IV constituents under the federal program.

CWLP has completed five of the eight sampling events for the collection of data necessary for calculation of background concentrations for all Appendix III and Appendix IV parameters. The results of these samples to date are provided in a separate document (see Appendix C). Upon completion of the collection of the eight events, CWLP will calculate background concentrations for all Appendix III and Appendix IV and place the revised background concentrations, calculations and certification in the facility record.

Background well R101, is located south and east of Unit 2 and is screened from approximately 511.98 to 517.98 feet MSL. The screened zone consists of silty clay overlying the surface of the Pennsylvanian shale (511.78 ft. MSL). This well will provide representative background groundwater quality, as allowed under §257.91(a)(1)(ii).

The background concentrations will be statistically analyzed to establish site-specific upper confidence limits for each chemical or parameter. The statistical methodology to be utilized for derivation of the background concentrations is provided in Appendix D.

Results from the background wells 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 D will be utilized for such revision. Details for any revision will be placed in the facility record.

Downgradient Quality - §257.91(2)

Groundwater wells AW-2, P07D, G121 and G122 allow monitoring of the downgradient groundwater quality conditions in the uppermost aquifer. The locations and depths of these wells accurately represent the quality of groundwater passing beneath the impoundment boundaries of the landfill and reasonably make possible the detection of geochemical changes in the uppermost aquifer. These groundwater monitoring wells are all screened at the top of the weathered bedrock surface. Wells P07D and AW-2 are located immediately east of the landfill. Monitoring wells G121 and G122 are located along the northern berm of the landfill and adjacent to Sugar Creek. Further details are listed below:

- Monitoring well AW-2 is screened from approximately 494.86 to 504.86 feet MSL. The screened zone consists of sand overlying the surface of the Pennsylvanian shale (494.46 ft. MSL).
- Piezometer P07D is screened from approximately 496.2 to 498.7 feet MSL. The screened zone consists of sand immediately above the unconsolidated/Pennsylvanian shale interface (494 ft. MSL).
- Monitoring well G121 is screened from approximately 497.96 to 501.93 feet MSL. The screened zone consists of clayey sand, clayey silt and sand overlying the surface of the Pennsylvanian shale (498.7 ft MSL).
- Monitoring well G122 is screened from approximately 497.76 to 507.46 feet MSL. The screened zone consists of clayey silt, clayey sand and sand immediately above the unconsolidated/Pennsylvanian shale interface (494.3 ft MSL).

5.3 GROUNDWATER SAMPLING AND ANALYSIS REQUIREMENTS – §257.93

The Groundwater Monitoring Program (GMP) includes consistent sampling and analysis procedures to provide accurate representation of groundwater quality (§257.93(a)). The activities include sample collection, preservation and shipment, analytical procedures, chain of custody, and quality assurance and quality control as outlined in the Groundwater Sampling and Analyses Procedures (Appendix E).

Groundwater is sampled for the constituents listed in Appendices III and IV of Part 257 (§257.93(b)). For detection monitoring, these constituents include boron, calcium, chloride, fluoride, pH, sulfate, and total dissolved solids from Appendix III Part 257; and for assessment monitoring (if necessary) these constituents include antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, fluoride, lead, lithium, mercury, molybdenum, selenium, thallium, and radium 226 & 228 combined from Appendix IV Part 257. All constituents are analyzed as total recoverable, where samples are not field filtered.

5.4 DETECTION MONITORING PROGRAM – §257.94

Pursuant to §257.94(a), the Detection Monitoring Program includes, at a minimum, groundwater monitoring for all constituents listed in Appendix III to Part 257, including boron, calcium, chloride, fluoride, pH, sulfate, and total dissolved solids (TDS). The long-term monitoring frequency for the Appendix III constituents under §257.94(b) will be semiannual during the active life of the CCR unit and the post closure period.

Pursuant to §257.94(b), CWLP is in the process of collecting eight (8) independent samples from each background and downgradient well, analyzing for the constituents listed in Appendix III to Part 257 including boron, calcium, chloride, fluoride, pH, sulfate, and total dissolved solids (TDS); and for the constituents listed in Appendix IV to Part 257 including antomony, arsenic, barium, beryllium, cadmium, chromium, fluoride, lead, lithium, mercury, molybdenum, selenium, thallium and radium 226 & 228 combined.

The number of samples being collected and analyzed are consistent with the sampling and statistical procedures referenced in §257.93(e) and will account for any unique characteristics of the site (§257.94(c)). Once the background sampling is complete, detection monitoring will occur on a semi-annual basis.

Alternative monitoring frequency for repeated sampling and analyses for constituents listed in Appendix III of Part 257 during the active life and the post-closure period based on the availability of groundwater may be implemented pursuant to §257.94(d). No alternative monitoring frequency is sought at this time.

Detection monitoring occurs on a semi-annual basis for the Appendix III constituents. The results are compared to the established background concentrations. If a SSI is observed due to an exceedance of a background concentration, confirmation sampling may be conducted. If the concentration from the confirmation sampling does not exceed the applicable background concentration, no confirmed exceedance is deemed to have occurred and detection monitoring will resume. If the concentration from the confirmation sampling exceeds the applicable background concentration, then the SSI is confirmed. The confirmed SSI will be noted in the facility record.

Pursuant to §257.94(e), if the facility determines pursuant to §257.93(h) that there is a statistically significant increase (SSI) over background levels for one or more of the constituents listed in Appendix III to Part 257 at any monitoring well, within 90 days of this determination the facility will establish an assessment monitoring program meeting the requirements of §257.95 and prepare a notification for the facility's operating record stating that an assessment monitoring program has been established. Such a determination for SSI will occur under the Detection Monitoring Program after completion of the initial 8 independent sampling events and the initial statistical evaluation. As applicable, the facility may also 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 demonstration must be in writing and completed within 90 days of detecting the SSI. If the demonstration is successful, then detection monitoring may continue.

5.5 ASSESSMENT MONITORING PROGRAM – §257.95

Except as stated above, assessment monitoring is required pursuant to §257.95(a) whenever a SSI has been detected during detection monitoring for one or more of the constituents in Appendix III of Part 257. Under §257.95(b), within 90 days of triggering an assessment monitoring program, and annually thereafter, the facility must sample and analyze the groundwater for all constituents listed in Appendix IV to Part 257 until detection monitoring resumes. An alternative monitoring frequency may be considered if documented under the requirements of §257.95(c).

After obtaining the results from the initial and subsequent sampling events required under §257.95(b), the facility must within 90 days of obtaining the results, and on at least a semiannual basis thereafter, resample all wells that were installed pursuant to §257.91 and conduct analyses for all constituents in Appendix III and for those constituents in Appendix IV to Part 257 that are detected. The results of the Appendix IV constituents are compared to the established GWPSs. If there is an exceedance of a GWPS, confirmation sampling may be conducted for that specific Appendix IV constituent. If the concentration from the confirmation sampling does not exceed the GWPS, no confirmed exceedance is deemed to have occurred for that Appendix IV constituent. The results of a confirmed exceedance of a GWPS must be placed in the operating record. These activities and results will be summarized in the annual groundwater monitoring and corrective action report required under §257.90(e).

Pursuant to §257.95(e), if the concentration of all constituents listed in Appendix III and Appendix IV of Part 257 are shown to be at or below background values, using the statistical procedures in §257.93(g), for two consecutive sampling events, the facility may return to the detection monitoring and place notification in the operating record. If the concentrations of any constituent in Appendix III and Appendix IV to Part 257 are above background values, but all concentrations are below the GWPS, assessment monitoring must continue (§257.95(f)).

If one or more constituents in Appendix IV to Part 257 are detected at statistically significant levels (SSL) above the GWPS, the facility must place notification in the operating record and proceed to characterize the nature and extent of the release and any relevant site conditions that may affect the remedy ultimately selected (§257.95(g)). The characterization must meet the requirements of §257.95(g)(1) and the public notification the requirements of §257.95(g)(2). Under §257.95(g)(3), within 90 days of finding that any of the constituents listed in Appendix IV to Part 257 have been detected at a SSL exceeding the GWPS, the facility must either initiate an assessment of corrective measures under §257.96, or demonstrate an error in any such determination.

A GWPS must be established for each constituent in Appendix IV to Part 257 detected in the groundwater. The GWPS shall be: (1) for constituents for which a maximum contaminant level (MCL) has been established, the MCL for that constituent, or (2) for constituents for which an MCL has not been established, the background concentration for the constituent established from wells in accordance with §257.91, or (3) for constituents for which the background level is higher than the MCL identified under §257.95(h)(1), the background concentration shall be the GWPS.

5.6 ASSESSMENT OF CORRECTIVE MEASURES – §257.96

Within 90 days of determining that any constituent listed in Appendix IV of Part 257 has been detected at a SSL exceeding the GWPS, or immediately upon detection of a release, the facility must initiate an assessment of corrective measures to prevent further releases, to remediate releases, and to restore the affected area to original conditions (§257.96(a)). The assessment must be completed within 90 days unless a time extension of not more than 60 days is needed to complete the assessment, as demonstrated by the facility. The facility will include any such demonstration in the annual groundwater monitoring and corrective action report required under §257.90(e). The CCR unit will continue to monitor groundwater in accordance with the Assessment Monitoring Program during the assessment of corrective measures.

The assessment of corrective measures will evaluate the effectiveness of potential corrective measures in meeting the requirements and objectives of the remedy as described under §257.97, including performance, reliability, ease of implementation, impacts, exposure, time required, permitting, etc. (§257.96(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 §257.97; and recordkeeping, notification, and internet requirements will be met.

5.7 SELECTION OF REMEDY – §257.97

Based on the results of the assessment of corrective measures, a remedy will be selected as soon as feasible that meets the standards listed in §257.97(b), including being 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 in Appendix IV of Part 257, remove from the environment as much of the contaminated material as feasible, and comply with standards for management of wastes under §257.98(d). In selecting the remedy, the facility will consider the requirements of §257.97(c) and establish a schedule for implementing and completing remedial activities under §257.97(d).

5.8 IMPLEMENTATION OF THE CORRECTIVE ACTION PROGRAM – §257.98

Pursuant to §257.98(a), within 90 days of selecting the remedy, the facility will initiate remedial activities. Based on the schedule provided under §257.97(d) for implementation of remedial activities, the facility must establish and implement a corrective action groundwater monitoring program that meets the requirements of an assessment monitoring program under §257.95, implement the corrective action remedy selected under §257.97, 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 §257.97(b) is not being achieved through the remedy selected, other methods or techniques that could feasibly achieve compliance should be evaluated and implemented (§257.98(b)).

Pursuant to §257.98(c), the remedy will be considered complete when compliance with the GWPS has been achieved at all points within the plume of contamination that lie beyond the groundwater monitoring well system and concentrations of constituents listed in Appendix IV of Part 257 have not exceeded the GWPS for a period of three consecutive years. When the entire interval is determined to be below the standard under §257.98(c) 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 detection monitoring and appropriate limit-based statistics will resume.

All CCR units that are managed pursuant to a remedy required under §257.97 will be managed in a manner that complies with applicable RCRA requirements (§257.98(d)). Pursuant to §257.98(e), upon completion of the remedy the facility will prepare a notification stating that the remedy has been completed and obtain a certification from a qualified professional engineer.

6. RECORDKEEPING, NOTIFICATION, AND POSTING OF INFORMATION – FEDERAL RULE §257.105 THROUGH §257.107

6.1 RECORDKEEPING REQUIREMENTS – §257.105

CWLP, as owner of an existing CCR unit, will maintain files in its operating record as required under §257.105(h) – groundwater monitoring and corrective action – for a period of no less than five years. This includes:

1. annual groundwater monitoring report,
2. documentation pertaining to monitoring wells,
3. groundwater monitoring certification,
4. selection of statistical method certification,
5. notification within 30 days of establishing an assessment monitoring program,
6. analytical results of Appendices III and IV to Part 257,
7. notification within 30 days of returning to a detection monitoring program,
8. notification within 30 days of detecting of constituents in Appendix IV of Part 257 at statistically significant levels above the groundwater protection standard,

9. notification within 30 days of initiating the assessment of corrective measures,
10. the completed assessment of corrective measures,
11. documentation recording the public meeting for the corrective measures assessment,
12. the semiannual report describing the progress in selecting and designing the remedy and the selection of remedy report, and
13. notification within 30 days of completing the remedy.

6.2 NOTIFICATION REQUIREMENTS – §257.106

Notifications required under §257.106(h) – groundwater monitoring and corrective action – will be sent to the relevant regulatory authority, including:

1. the annual groundwater report,
2. availability of the groundwater monitoring system certification,
3. selection of a statistical method certification,
4. that an assessment monitoring program has been established,
5. that the CCR unit is returning to a detection monitoring program,
6. that constituent(s) in Appendix IV to Part 257 have been detected at statistically significant levels above the groundwater protection standard and notifications to landowners,
7. that an assessment of corrective measures has been initiated,
8. availability of assessment of corrective measures,
9. the availability of the semiannual report describing the progress in selecting and designing the remedy and the selection of remedy report, and
10. completion of the remedy.

6.3 PUBLICLY ACCESSIBLE INTERNET SITE REQUIREMENTS – §257.107

CWLP maintains a publicly accessible Internet site (CCR website) containing the information specified in §257.107(h) – groundwater monitoring and corrective action.

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

7. 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.

U.S. Environmental Protection Agency (EPA), 2015. Published in Federal Register Volume 80, No. 74 published on April 17, 2015, *Final Rule 40 §CFR Part 257 Hazardous and Solid Waste Management System; Disposal of Coal Combustion Residuals from Electric*

Utilities; and *Technical Amendments* (correcting the effective date) published in Federal Register Volume 80, No. 127 on July 2, 2015.

8. ENGINEERING CERTIFICATION

The owner or operator of a coal combustion residual (CCR) unit must obtain a certification from a qualified professional engineer that the groundwater monitoring system at the CCR unit has been designed and constructed to meet the requirements of 40 C.F.R. § 257.91.

The engineering certification for the groundwater monitoring system follows.

Professional Engineer Certification – Groundwater Monitoring Program

40 CFR § 257.91(f) Groundwater Monitoring System Certification

In accordance with Title 40 of the Code of Federal Regulations (40 CFR), Part 257, Subpart D, Section 257.91(f) the owner or operator of a coal combustion residuals (CCR) unit must obtain certification from a qualified professional engineer stating that the groundwater monitoring system at the CCR unit has been designed and constructed to meet the requirements of 40 C.F.R. § 257.91. If the groundwater monitoring system includes the minimum number of monitoring wells specified in 40 C.F.R. §257.91(c)(1), the certification must document the basis supporting use of the minimum number of monitoring wells. Further, in accordance with 40 C.F.R. §257.91(e)(1), when completing the groundwater monitoring system certification, the qualified professional engineer must be given access to documentation regarding the design, installation, development, and decommissioning of any monitoring wells, piezometers, and other measurement, sampling, and analytical devices.

The groundwater monitoring system designed and constructed for the City Water, Light, and Power (CWLP) landfill includes more than the minimum number of wells specified in 40 C.F.R. §257.91(c)(1). The undersigned has been given access to documentation regarding the design, installation, development, and decommissioning of monitoring wells, piezometers and other measurement, sampling, and analytical devices concerning the CWLP landfill.

I, Karl W. Finke, a qualified professional engineer in good standing in the State of Illinois, certify that the groundwater monitoring system at the CWLP landfill has been designed and constructed to meet the requirements of 40 C.F.R. §257.91.

Signature: Karl W. Finke

Illinois P.E. No: 062.068571

Date: 02/21/25

TABLES

TABLE 1:
WELL CONSTRUCTION SUMMARY

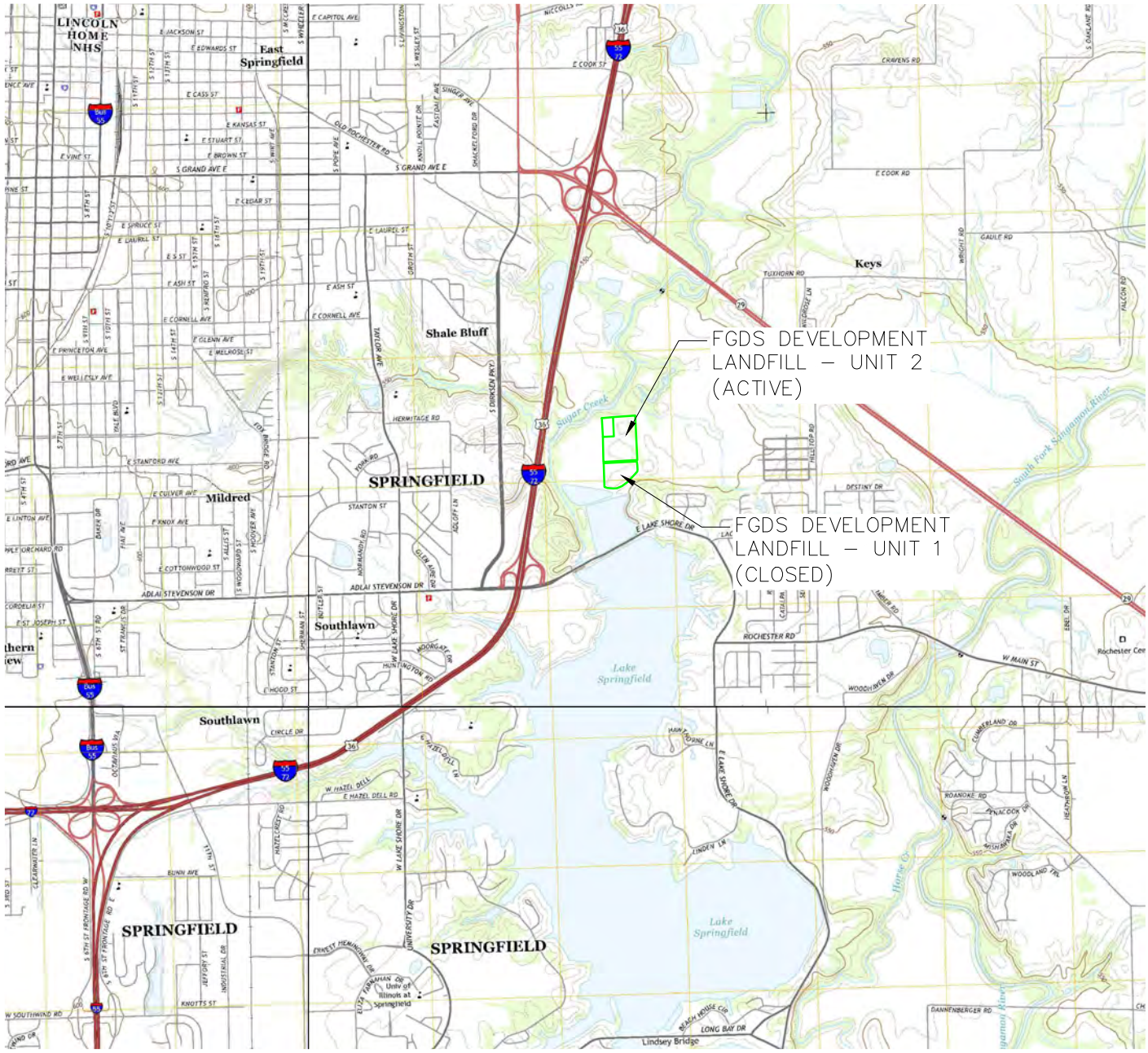
Table 1: Well Construction Summary

Well ID	Monitoring Position	Material Screened	Top of Casing (feet MSL)	Ground Surface (feet MSL)	Top of Screen (feet MSL)	Bottom of Screen (feet MSL)
R101	Upgradient/Background	Unconsolidated/Bedrock Interface	546.8	544.00	517.98	511.98
AW-2	Downgradient	Unconsolidated/Bedrock Interface	529.6	526.70	504.86	494.86
P07D	Downgradient	Unconsolidated/Bedrock Interface	528.5	526.50	498.7	496.2
G121	Downgradient	Unconsolidated/Bedrock Interface	555.6	553.70	501.93	497.96
G122	Downgradient	Unconsolidated/Bedrock Interface	554.4	552.60	507.46	497.76

FIGURES

FIGURE 1:
SITE LOCATION

J:\S\Springfield CWLP\CWLP Ash Pond\DWG\2024\Site Map FIG 1.dwg Tab: Layout1



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

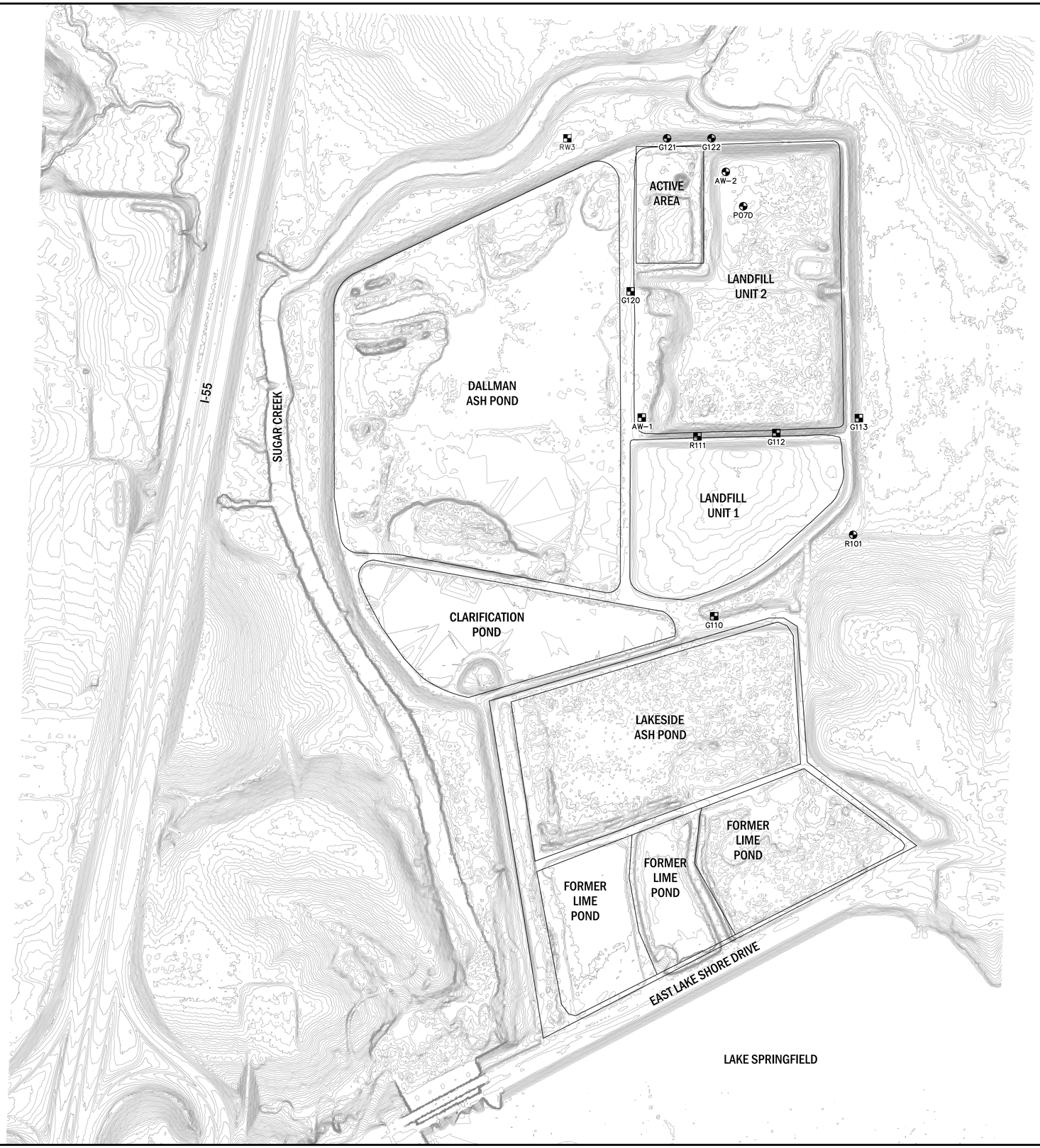
APPROVED BY: BJH	DESIGNED BY: BJH	DRAWN BY: BCK

SITE LOCATION

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

DATE: JANUARY 2024
PROJECT ID: 220408/0032
SHEET NUMBER:
FIGURE 1

FIGURE 2:
SITE FEATURES



LEGEND

- 40 CFR 257 GROUNDWATER MONITORING WELL
- PIEZOMETER (FOR GROUNDWATER ELEVATIONS ONLY)

NOTES

1. LIDAR DATA DERIVED FROM USGS WEBSITE (FLIGHT DATE: OCTOBER 15, 2018).

N

0 200 400 800

SCALE: IN FEET

NO.	DATE	REVISION DESCRIPTION	BY

ANDREWS ENGINEERING
3300 GINGER CREEK DRIVE
SPRINGFIELD, ILLINOIS 62711-7233
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PONTIAC, IL • LOMBARD, IL • INDIANAPOLIS, IN • WARRENTON, MO

DESIGNED BY: MTH | DRAWN BY: BCK | APPROVED BY: BJH

SITE DETAILS MAP

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

DATE: JANUARY 2025

PROJECT ID: 230339/0026

SHEET NUMBER:

FIG 2

Tab: SITE DETAILS MAP Last Saved: January 24, 2025, by Mike Nguyen Plotted: Friday, January 24, 2025 9:33:50 AM
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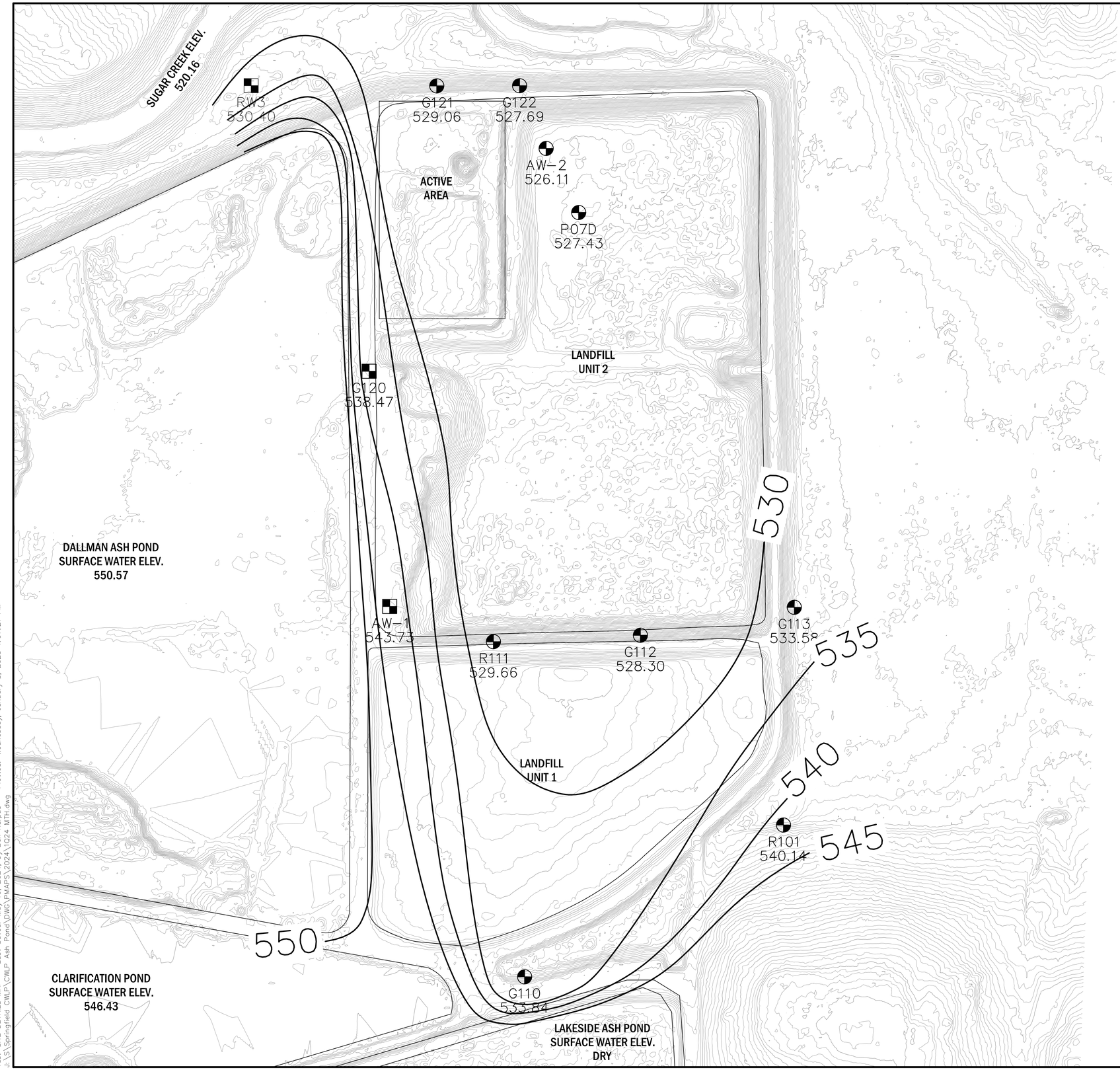
APPENDIX A:
POTENTIOMETRIC SURFACE MAPS



LEGEND

- 550 — EXISTING GROUND CONTOURS
- 540 — GROUNDWATER CONTOURS
- CCR SURFACE IMPOUNDMENT WELL
- FGDS LANDFILL WELL

NOTES

1. LIDAR DATA DERIVED FROM USGS WEBSITE (FLIGHT DATE: OCTOBER 15, 2018).
2. CONTOUR INTERVAL SHOWN IS 5 FEET.
3. SAMPLING DATE: 2/21/2024 – 2/26/2024.
4. NM = NOT MEASURED
5. SUGAR CREEK SURFACE WATER ELEVATION BASED ON USGS GAGE 05576250 FOR SUGAR CREEK NEAR SPRINGFIELD, IL.
6. DALLMAN AND LAKESIDE ASH PONDS SURFACE WATER ELEVATIONS COLLECTED ON APRIL 12, 2023.

N

0 100 200 400

SCALE: IN FEET

NO.	DATE	REVISION DESCRIPTION	BY

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DESIGNED BY: MTH | DRAWN BY: BCK | APPROVED BY: BJH

1ST QUARTER 2024 GROUNDWATER SURFACE MAP

PREPARED FOR

CITY WATER, LIGHT, AND POWER

SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

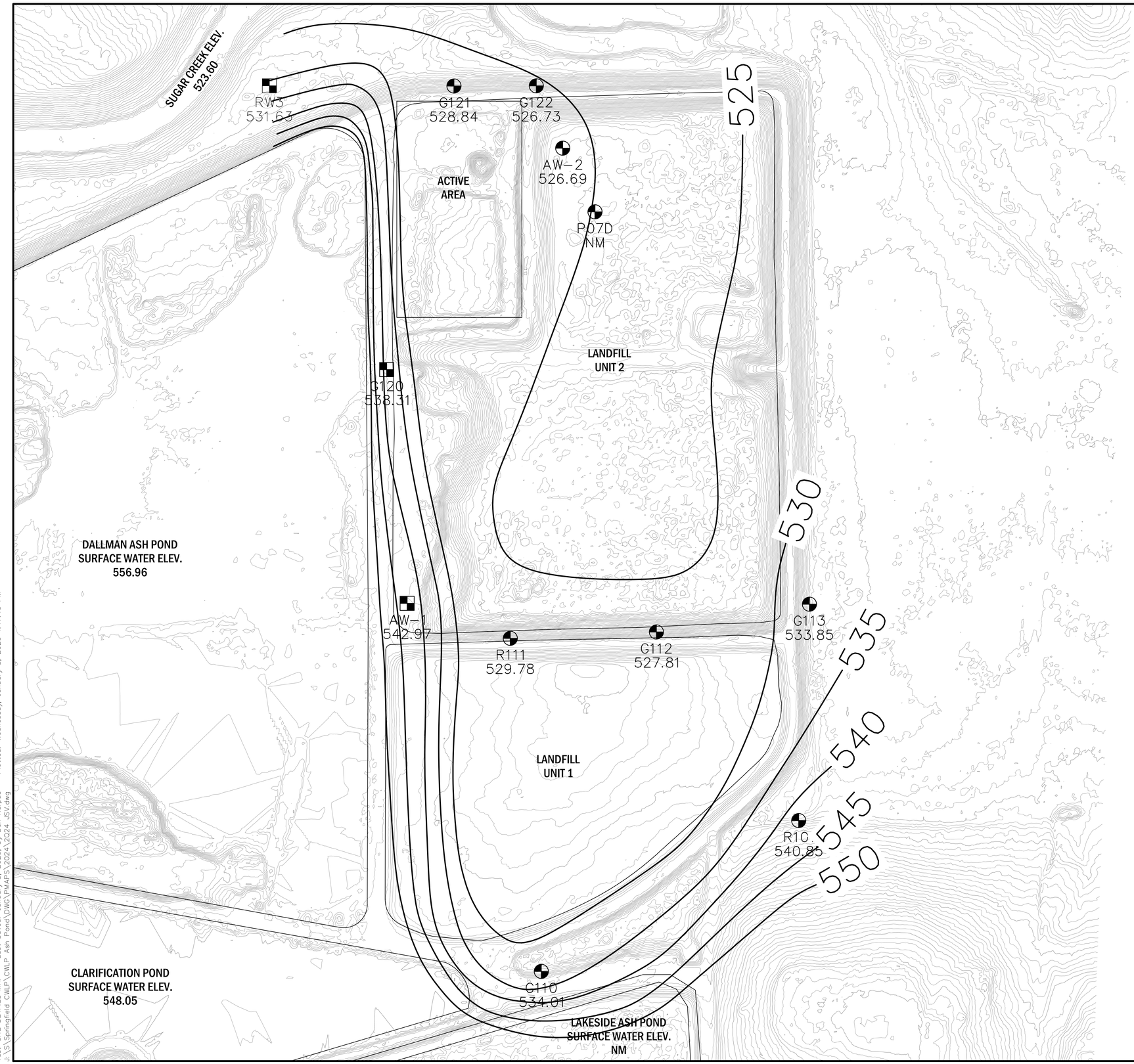
DATE: MAY 2024

PROJECT ID: 240338/0014

SHEET NUMBER:

1Q24

Tab: SITE DETAILS MAP Last Saved: May 16, 2024, by Ben Karpus Plotted: Wednesday, January 8, 2025 1:07:21 PM
J:\S\Springfield CWLP\CWLP Ash Pond\DWG\PMAPS\2024\1024 MTH.dwg



LEGEND

- 550 — EXISTING GROUND CONTOURS
- —540— GROUNDWATER CONTOURS
- CCR SURFACE IMPOUNDMENT WELL
- FGDS LANDFILL WELL

NOTES

1. LIDAR DATA DERIVED FROM USGS WEBSITE (FLIGHT DATE: OCTOBER 15, 2018).
2. CONTOUR INTERVAL SHOWN IS 5 FEET.
3. SAMPLING DATE: 5/9/2024 – 5/13/2024.
4. NM = NOT MEASURED
5. SUGAR CREEK SURFACE WATER ELEVATION BASED ON USGS GAGE 05576250 FOR SUGAR CREEK NEAR SPRINGFIELD, IL.
6. DALLMAN ASH PONDS AND CLARIFIER SURFACE WATER ELEVATIONS COLLECTED IN MAY 2024.

N

0 100 200 400

SCALE: IN FEET

NO.	DATE	REVISION DESCRIPTION	BY

ANDREWS ENGINEERING
3300 GINGER CREEK DRIVE
SPRINGFIELD, ILLINOIS 62711-7233
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DESIGNED BY: JSV | DRAWN BY: BCK | APPROVED BY: BJH

2ND QUARTER 2024 GROUNDWATER SURFACE MAP

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

DATE: JANUARY 2025

PROJECT ID: 240338/0014

SHEET NUMBER:

2Q24

Tab: SITE DETAILS MAP Last Saved: January 8, 2025, by Ben Karpus Plotted: Wednesday, January 8, 2025 1:17:15 PM
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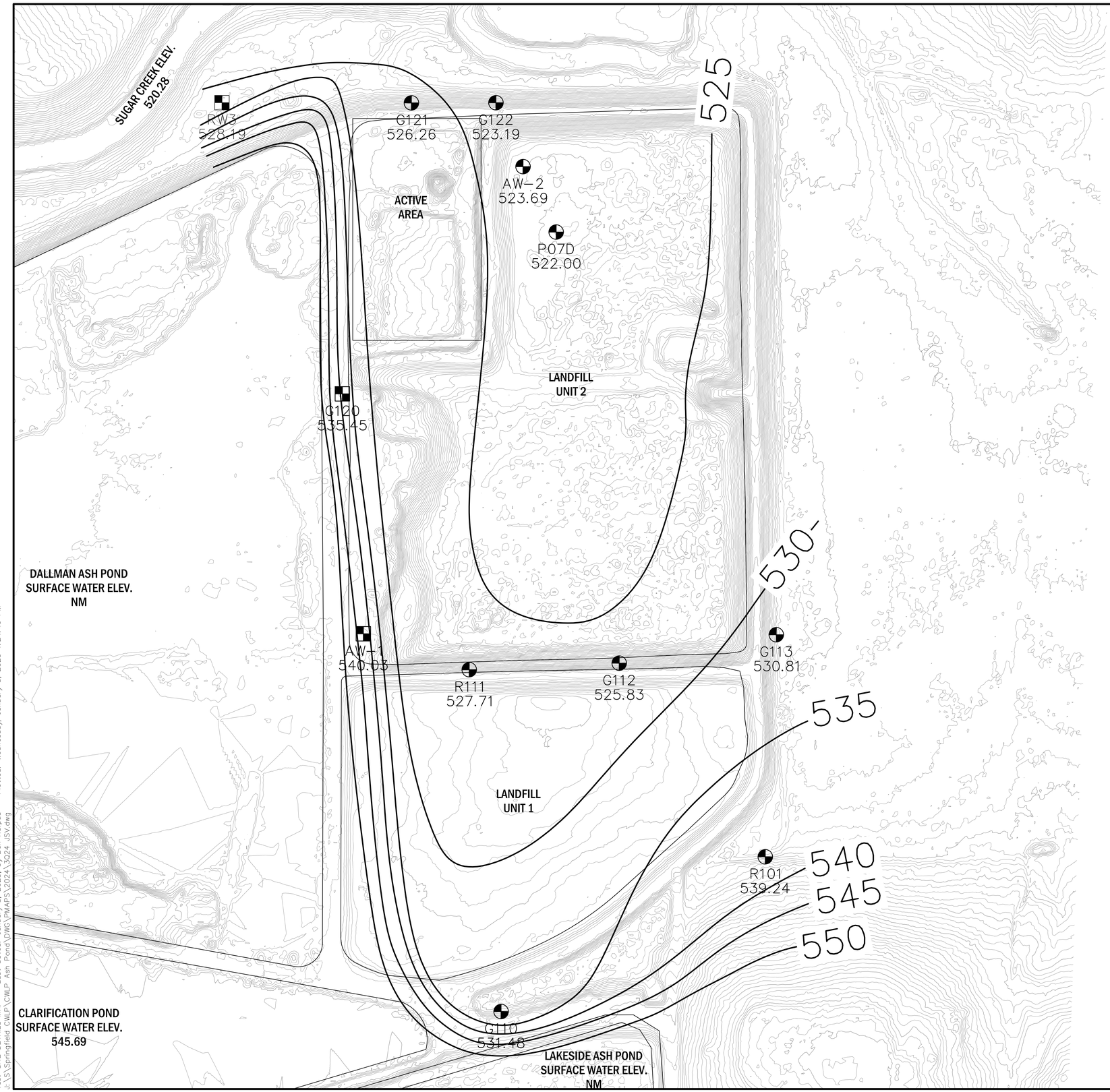

LEGEND

- 550 — EXISTING GROUND CONTOURS
- —540— GROUNDWATER CONTOURS
- CCR SURFACE IMPOUNDMENT WELL
- FGDS LANDFILL WELL

NOTES

1. LIDAR DATA DERIVED FROM USGS WEBSITE (FLIGHT DATE: OCTOBER 15, 2018).
2. CONTOUR INTERVAL SHOWN IS 5 FEET.
3. SAMPLING DATE: 8/12/2024 – 8/13/2024.
4. NM = NOT MEASURED
5. SUGAR CREEK SURFACE WATER ELEVATION BASED ON USGS GAGE 05576250 FOR SUGAR CREEK NEAR SPRINGFIELD, IL.
6. THE CLARIFICATION POND SURFACE WATER ELEVATION WAS COLLECTED IN AUGUST 2024.

N

0 100 200 400

SCALE: IN FEET

NO.	DATE	REVISION DESCRIPTION	BY

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DESIGNED BY: JSV | DRAWN BY: BCK | APPROVED BY: BJH

3RD QUARTER 2024 GROUNDWATER SURFACE MAP

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

DATE: JANUARY 2025

PROJECT ID: 240338/0014

SHEET NUMBER:

3Q24

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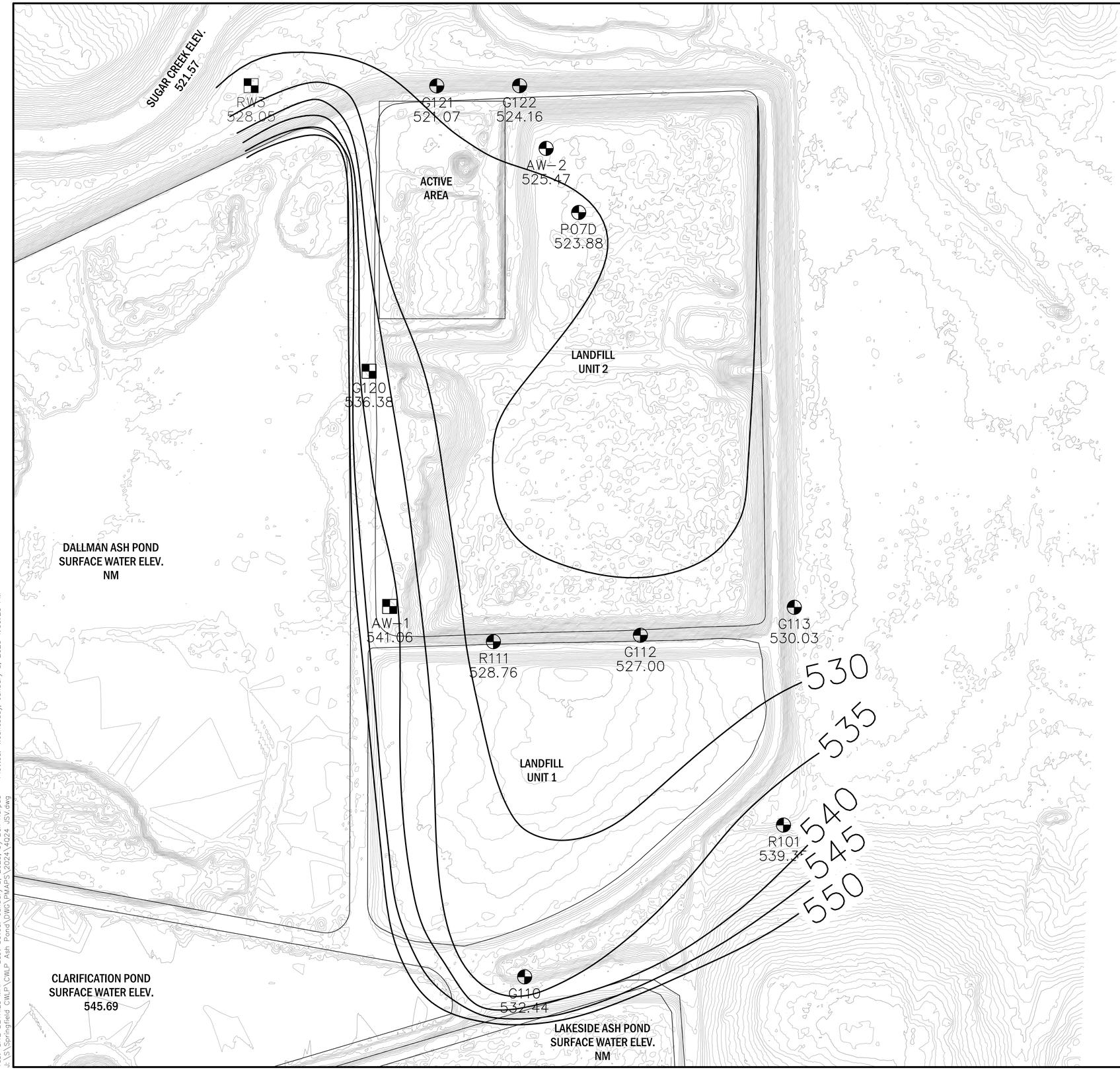

LEGEND

- 550 — EXISTING GROUND CONTOURS
- —540— GROUNDWATER CONTOURS
- CCR SURFACE IMPOUNDMENT WELL
- FGDS LANDFILL WELL

NOTES

1. LIDAR DATA DERIVED FROM USGS WEBSITE (FLIGHT DATE: OCTOBER 15, 2018).
2. CONTOUR INTERVAL SHOWN IS 5 FEET.
3. SAMPLING DATE: 11/11/2024 – 11/13/2024.
4. NM = NOT MEASURED
5. SUGAR CREEK SURFACE WATER ELEVATION BASED ON USGS GAGE 05576250 FOR SUGAR CREEK NEAR SPRINGFIELD, IL.
6. THE CLARIFICATION ASH POND SURFACE WATER ELEVATIONS COLLECTED IN NOVEMBER 2024.

N

0 100 200 400

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
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DESIGNED BY: JSV | DRAWN BY: BCK | APPROVED BY: BJH

4TH QUARTER 2024 GROUNDWATER SURFACE MAP

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

DATE: JANUARY 2025

PROJECT ID: 240338/0014

SHEET NUMBER:

4Q24

Tab: SITE DETAILS MAP Last Saved: January 8, 2025, by Ben Karpus Plotted: Wednesday, January 8, 2025 1:39:25 PM
J:\S\Springfield CWLP\CWLP Ash Pond\DWG\PMAPS\2024 4Q24 JSV.dwg

APPENDIX B:
BORING LOGS AND WELL CONSTRUCTION DETAILS

RAPPS

ENGINEERING and APPLIED SCIENCE

821 SOUTH DURKIN – SPRINGFIELD IL 62704 – (217)787-2118

BORING LOG

Site Name: FGDS Development Landfill — Boring No: AW-1

Drilling Firm: Reynolds Drilling Corp. — Drilling Method: HSA — Surface Elev: 552.85

Logged By: KJM — Checked By: KJM — Date Started: 12/29/08 — Completed: 12/30/08

DEPTH	Material Description Classification System	Sampling Tube No.	Type	% Rec.	Tests OVM (ppm)	Qu t/sf PEN	Moist	Comments	Well	DEPTH
0	Fill (not sampled)		5' CONTINUOUS SAMPLER					Blind drilled to 15'		0
15	Gray to brown silty clay fill; Moist; Soft to firm; Sand, pebbles & coal fragments	1		100						15
20	Plant debris	2		100						20
25	Dk. brown to gray clayey silt; Moist; Firm to hard; Laminated	3		100				Base of fill @ 23.6'		25
30										30

Water Level_____ after_____ hrs.

RAPPS

ENGINEERING and APPLIED SCIENCE

BORING LOG

821 SOUTH DURKIN – SPRINGFIELD IL 62704 – (217)787-2118

Site Name: FGDS Development Landfill — Boring No: AW-1

Drilling Firm: Reynolds Drilling Corp. — Drilling Method: HSA — Surface Elev: 552.85

Logged By: KJM — Checked By: KJM — Date Started: 12/29/08 — Completed: 12/30/08

DEPTH	Material Description Classification System	Sampling: Tube No.	Sampling: Type	Sampling: % Rec.	Tests: OVM (ppm)	Tests: Qu t/sf PEN	Tests: Moist	Comments	Well	DEPTH
30	Trace fine sand; Mottled	4	5' CONTINUOUS SAMPLER	100				Wet seam @ 32.2' Wet seam @ 33.3'		30
35	Softer	5		100						35
	Gray fine to coarse sand; Moist to wet; Clayey and silty zones; Trace gravel	6		90						
40										40
45		7		80						45
50	Pebbles									50
	Dark gray shale; Weathered/broken	8		25				Increased resistance		
55	End of boring @ 54.34'							Refusal		55
60										60

Water Level_____ after_____ hrs.

Illinois Environmental Protection Agency — **Well Completion Report**

Site Number: 1678250020 County: Sangamon

Site Name: FGDS Development Landfill Well #: AW-1

State Plane Coordinate: X ____ Y ____ (or) Latitude: ___ ___ ___ Longitude: ___ ___ ___ Borehole #: AW-1

N 4512.2 E 2030.49

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: 12/29/08 Date Finished: 12/30/08

Report Form Completed By: Ken Miller Date: 5/18/09

ANNULAR SPACE DETAILS

Type of Surface Seal: Cement

Type of Annular Sealant: Bentonite Grout

Installation Method: Tremie

Setting Time: >24 hrs

Type of Bentonite Seal - - Granular, (Pellet), Slurry (Choose One)

Installation Method: Poured

Setting Time: 20 hrs

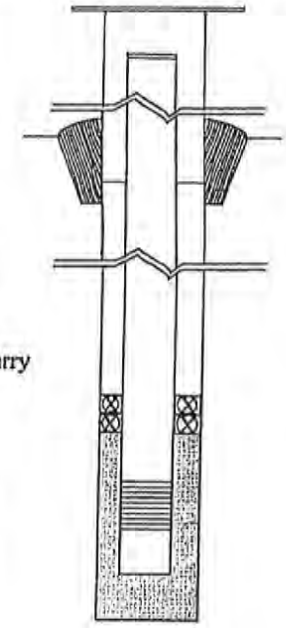
Type of Sand Pack: Quartz Sand

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
555.60	-2.75	Top of Riser Pipe
552.85	0	Ground Surface
549.85	3.00	Top of Annular Sealant
____	____	Static Water Level (After Completion)
513.90	38.95	Top of Seal
510.90	41.95	Top of Sand Pack
508.90	43.95	Top of Screen
498.90	53.95	Bottom of Screen
498.51	54.34	Bottom of Well
498.51	54.34	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)	46.70
Bottom of Screen to End Cap (feet)	0.4
Screen Length (1st slot to last slot) (feet)	10
Total Length of Casing (feet)	57.09
Screen Slot Size **	0.010

**Hand-Slotted Well Screens are Unacceptable

RAPPS

ENGINEERING and APPLIED SCIENCE

821 SOUTH DURKIN – SPRINGFIELD IL 62704 – (217)787-2118

BORING LOG

Site Name: FGDS Development Landfill — Boring No: AW-2

Drilling Firm: Reynolds Drilling Corp. — Drilling Method: HSA — Surface Elev: 526.68

Logged By: KJM — Checked By: KJM — Date Started: 1/2/09 — Completed: 1/2/09

DEPTH	Material Description Classification System	Sampling: Tube No.	Type	% Rec.	Tests: OVM (ppm)	Qu t/sf PEN	Moist	Comments	Well	DEPTH
0	Dark brown silty clay; Moist; Firm	1	5' CONTINUOUS SAMPLER	100						0
5	Sandy	2		100				Water on bit		5
10	Lt. brown to gray mottled clayey silt; Moist; Firm; Trace sand; Fe oxidation stains	3		100						10
	Dark gray silt; Moist; Firm									
15	Softer; Trace sand	4		100						15
20	Sandy	5		100				Wet seam @ 19' Wet seam @ 20.7'		20
25		6		100						25
30	Gray fine to medium sand									30

Water Level_____ after_____ hrs.

RAPPS

ENGINEERING and APPLIED SCIENCE

821 SOUTH DURKIN – SPRINGFIELD IL 62704 – (217)787-2118

BORING LOG

Site Name: FGDS Development Landfill — Boring No: AW-2

Drilling Firm: Reynolds Drilling Corp. — Drilling Method: HSA — Surface Elev: 526.68

Logged By: KJM — Checked By: KJM — Date Started: 1/2/09 — Completed: 1/2/09

DEPTH	Material Description Classification System	Sampling: Tube No.	Sampling: Type	Sampling: % Rec.	Tests: OVM (ppm)	Tests: Qu t/sf PEN	Tests: Moist	Comments	Well	DEPTH
30	Gravelly @ base									30
	End of Boring @ 32.22'	7	5' CONTINUOUS SAMPLER	100				Refusal Broken shale in bit		
35										35
40										40
45										45
50										50
55										55
60										60

Water Level____ after____ hrs.

Illinois Environmental Protection Agency — **Well Completion Report**

Site Number: 1678250020 County: Sangamon

Site Name: FGDS Development Landfill Well #: AW-2

State Plane Coordinate: X ____ Y ____ (or) Latitude: ___ ___ ___ Longitude: ___ ___ ___ Borehole #: AW-2

N 5480.91 E 2361.46

Surveyed by: David Mihelsic IL Registration #: 3762

Drilling Contractor: Reynolds Drilling Corp. Driller: Kerry Doetzel

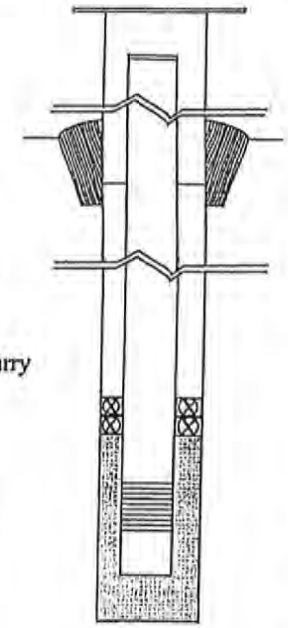
Consulting Firm: Rapps Engineering & Applied Science Geologist: Ken Miller

Drilling Method: HSA Drilling Fluid (Type): NA

Logged By: Ken Miller Date Started: 1/2/09 Date Finished: 1/2/09

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: >24 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
529.98	-3.30	Top of Riser Pipe
526.68	0	Ground Surface
523.68	3.00	Top of Annular Sealant
____	____	Static Water Level (After Completion)
509.86	16.82	Top of Seal
506.86	19.82	Top of Sand Pack
504.86	21.82	Top of Screen
494.86	31.82	Bottom of Screen
494.46	32.22	Bottom of Well
494.46	32.22	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)	25.12
Bottom of Screen to End Cap (feet)	0.4
Screen Length (1st slot to last slot) (feet)	10
Total Length of Casing (feet)	35.52
Screen Slot Size **	0.010

**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: -

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

Dates:
Start: 06/26/2017
Finish: 06/27/2017

- 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	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

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)
							cont: dark gray, wet, very soft, strong cementation, homogeneous	515
	5		3.0/5					
26								510
	6		4.0/5				**SILTY CLAY** dark gray, till, moist, firm to hard, trace coarse and fine gravel, trace coal	
31								505
	7		4.5/5					
							SANDY SILT	
36							**SILTY SAND** gray, fine to medium graineed, wet, trace angular gravel	500
	8		5.0/5					
							SHALE weathered	
41	9							
							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 / RW-3

State Plane Coordinate: X _____ Y _____ (or) Latitude: ____ ____ ____ Longitude: ____ ____ ____ Borehole #: TW3N

Surveyed by: _____ IL Registration #: _____

Drilling Contractor: Bulldog Drilling, Inc. Driller: J. Gates

Consulting Firm: Andrews Engineering, Inc. Geologist: D. Ghosh

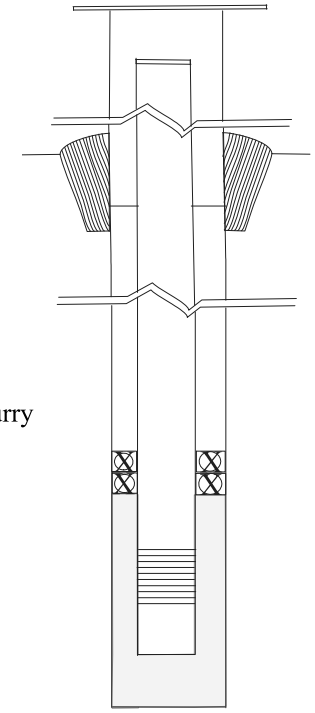
Drilling Method: CME 55 w/ 4.25" HSA Drilling Fluid (Type): none

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

	Elevations (MSL)*	Depths (BGS)	(.01ft.)
	_____	_____	Top of Protective Casing
	539.5	-2.5	Top of Riser Pipe
Type of Surface Seal: Bentonite Grout	536.8	0	Ground Surface
Type of Annular Sealant: Bentonite Grout	533.8	3	Top of Annular Sealant
Installation Method: Tremi	528.09	8.71	Static Water Level (After Completion)
Setting Time: 24 hours			
Type of Bentonite Seal - - Granular, Pellet, Slurry (Choose One)	509.8	27	Top of Seal
Installation Method: Free drop	507.2	29.6	Top of Sand Pack
Setting Time: N/A	505.66	31.14	Top of Screen
Type of Sand Pack: Silica Sand	496.08	40.72	Bottom of Screen
Grain Size: 10/20 (Sieve Size)	495.4	41.4	Bottom of Well
Installation Method: Free Drop	495.2	41.6	Bottom of Borehole
Type of Backfill Material: None (if applicable)			
Installation Method: N/A			



* 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)	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

PATRICK ENGINEERING INC.

BORING NUMBER P-7D SHEET 1 OF 2
CLIENT City of Springfield CWLP
PROJECT & NO. FGDS Landfill - Hydrogeo Invest. - 496B
LOCATION N 5,342.8 E 2,432.5

LOGGED BY KRR
GROUND ELEVATION 526.5

ELEVATION	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	Water Content PL □ - - - ○ - - - △ LL (10 20 30 40 50) / Unconfined Compressive Strength (TSF) ✳ (1 2 3 4 5)	NOTES & TEST RESULTS
526.5	0.0		Brown silty clay, trace fine sand, stiff to very stiff, medium plasticity, wet CL	AU-1 0.0-2.0		19.2	
			Mottled from 2.0'.	SS-2 2.0-4.0 24"R	3 3 4 5	✳ 17.6	SS-3: LL=33 PL=19 PI=14
				SS-3 4.0-6.0 24"R	2 3 4 4	✳ 21.7	
				SS-4 6.0-8.0 24"R	5 5 5 6	✳ 25.3	SS-4: CEC = 16.5 meq/100g
				3T-5 8.0-10.0 24"R		✳ 22.6	3T-5: Dry dens=101pcf k=2.0 E-07 cm/s
				SS-6AB 10.0-12.0 24"R	2 1 2 2	✳ 24.8	SS-6B: Gravel = 0% Sand = 52% Silt or Clay = 48%
515.0	11.5						
514.5	12.0		Brown clayey fine sand, little silt, loose, poorly graded, moist SC			✳ 23.1	
				SS-7 12.0-14.0 24"R	2 2 3 3	28.9	
			Gray silty clay, trace fine sand, soft to stiff, low to medium plasticity, wet CL	SS-8 14.0-16.0 24"R	WOH 1 1 1	✳ 26.9	SS-8: LL = 29 PL = 22 PI = 7
				SS-9 16.0-18.0 24"R	2 2 2 2	✳ 25.1	
				SS-10 18.0-20.0 24"R	WOH 1 1 1	✳ 23.6	
506.5	20.0						

DRILLING CONTRACTOR **Patrick Drilling**
DRILLING METHOD **4-1/4" I.D. HSA.**
DRILLING EQUIPMENT **CME-55/ATV**
DRILLING STARTED **7/30/92** ENDED **7/30/92**

REMARKS
WOH - Weight of Hammer.

WATER LEVEL (ft.)
▽ **20.0'** during drilling.
▽
▼

PATRICK ENGINEERING INC.

BORING NUMBER **P-7D** SHEET **2** OF **2**
CLIENT **City of Springfield CWLP**
PROJECT & NO. **FGDS Landfill - Hydrogeo Invest. - 496B**
LOCATION **N 5,342.8 E 2,432.5**

LOGGED BY **KRR**
GROUND ELEVATION **526.5**

ELEVATION	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	Water Content PL □ - - - ○ - - - △ LL (10 20 30 40 50) / Unconfined Compressive Strength (TSF) ✳ (1 2 3 4 5)	NOTES & TEST RESULTS
506.5	20.0		Gray silty clay, trace fine sand, soft, low to medium plasticity, wet CL	SS-11 20.0-22.0 24"R	WOH 1 1 1	✳ 22.6	Water level at 20.0' during drilling.
				3T-12 22.0-24.0 20"R		✳	
502.5	24.0		Gray clayey silt, some fine sand, loose, poorly graded, saturated CL-ML	SS-13 24.0-26.0 24"R	1 2 1 3	24.3	SS-13: Gravel = 0% Sand = 34% Silt or Clay = 66%
500.5	26.0		Gray fine sand, some silt, very loose, poorly graded, saturated SM	SS-14 26.0-28.0 18"R	1 1 1 1	19.1	
				SS-15 28.0-30.0 20"R	1 1 1 3	10.9	
497.5	29.0		Gray coarse to fine sand, some coarse to fine gravel, little silt, loose, well graded, saturated SW-SM/SM	SS-16 30.0-32.0 20"R	2 2 4 11	✳ 24.2	SS-16: Gravel = 27% Sand = 59% Silt or clay = 14%
495.5	31.0		Gray silty clay to clay, trace fine sand, very stiff to hard, medium to high plasticity, moist CL/CH	SS-17 32.0-34.0 15"R	28 115 200+ /3"	✳ 13.3	
494.0	32.5						
493.3	33.2		Gray shale				
			End of Boring at 33.2'.				Piezometer was installed immediately after completion of drilling. Refer to as-built diagram P-7D for more details.

DRILLING CONTRACTOR **Patrick Drilling**
DRILLING METHOD **4-1/4" I.D. HSA.**
DRILLING EQUIPMENT **CME-55/ATV**
DRILLING STARTED **7/30/92** ENDED **7/30/92**

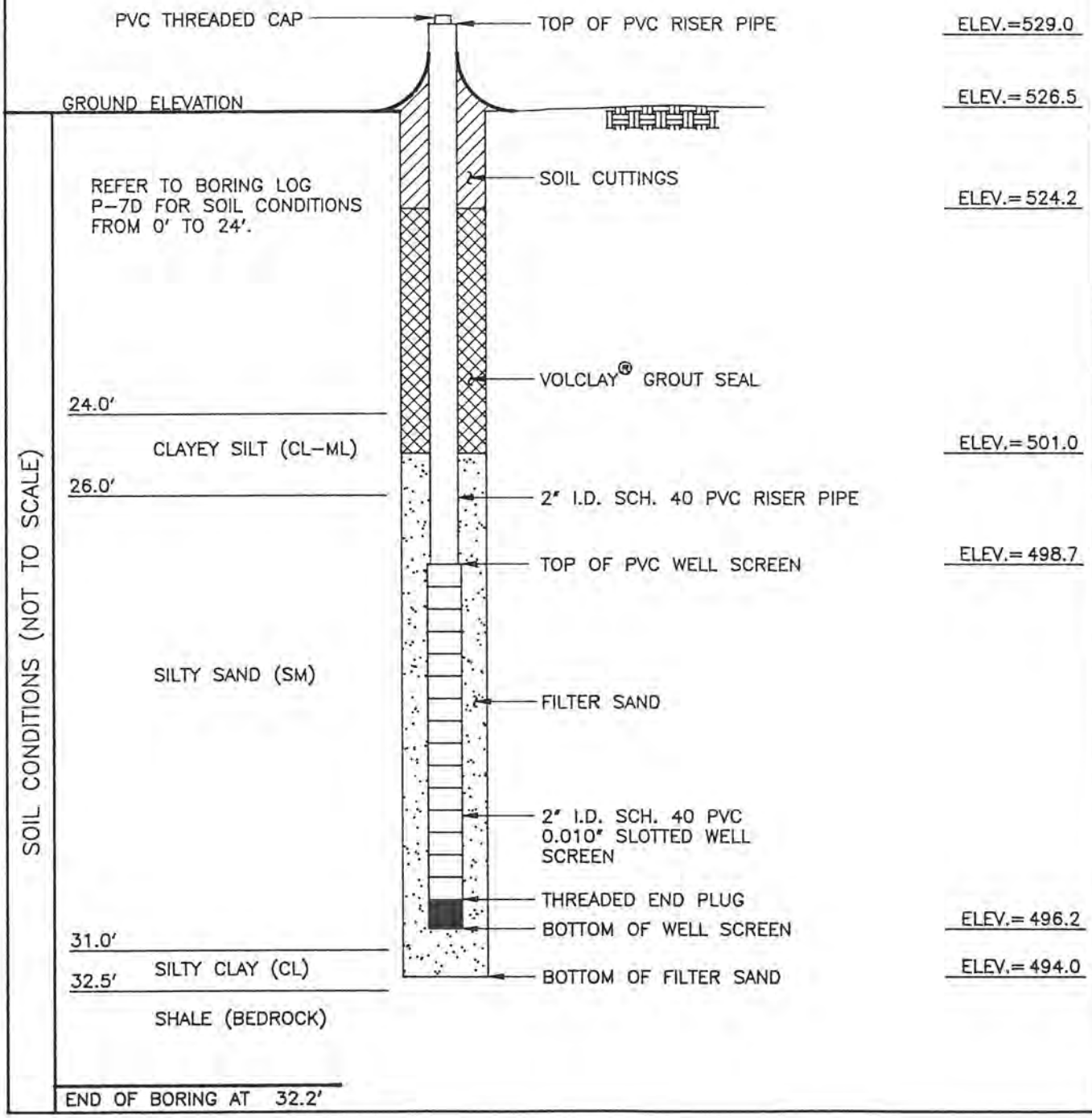
REMARKS
WOH - Weight of Hammer.

WATER LEVEL (ft.)
▽ **20.0'** during drilling.
▽
▽

PATRICK ENGINEERING INC.	PIEZOMETER INSTALLATION REPORT	PIEZ. NO. P-7D PROJ. NO. 496B

PROJECT FGDS LANDFILL
LOCATION SPRINGFIELD, ILLINOIS
CLIENT CWL&P
ENGINEER KRISHNA REDDY
DRILLER KEVIN SHAMWAY

BORING NO. P-7D
LOCATION N 5345.8
E 2429.5
INSTALLATION DATE 7/30/92
WEATHER RAIN, WARM, 80'S



Professional Service Industries, Inc.

RECORD OF SUBSURFACE EXPLORATION

Boring R-101

Project Name: Monitoring Well Installations Date of Boring: January 15, 1990

Site: CWLP Ash Disposal Facility Project No.: 020-05001

DESCRIPTION	DEPTH	SAMPLE	N	Q_u	Q_p	M_c	REMARKS
SURFACE							
*Note 1							
Silty clay to clayey silt, light brown, light grey	5	1-SS	35%				
		2-SS	100%				
	10						
13.0'-13.2': Brown sand, fine to medium		3-SS	75%				While Drilling ▽
Silty clay, grey, mottled brown	15						
		4-SS	100%				
Silt to clayey silt, grey, brown, some sand, fine to medium	20						
		5-SS	100%				
	25						
		6-SS	100%				
	30						
Shale, grey, brown (weathered)		7-SS	100%				
End of Boring							
*Note 1: 0"-6" Brown silty clay with organics							

Illinois Environmental Protection Agency — Well Completion Report

Site #: 1678250020 County: Sangamon Well #: R-101

Site Name: CWLP - Ash Disposal Facility Grid Coordinate: Northing 623.22 Easting 1426.13

Drilling Contractor: Professional Service Industries, Inc. Date Drilled Start: January 15, 1990

Driller: B. Williamson Geologist: -- Date Completed: January 15, 199

Drilling Method: Hollow Stem Auger - 3¼" I.D. Drilling Fluids (type): None

Annular Space Details

Type of Surface Seal: Concrete

Type of Annular Sealant: Cement/Bentonite Grout

Amount of cement: # of bags 3 lbs. per bag 94

Amount of bentonite: # of bags 0.1 lbs. per bag 50

Type of Bentonite Seal (Granular, Pellet): Pellet

Amount of bentonite: # of Bags 0.8 lbs. per bag 50

Type of Sand Pack: Silica Sand (Marco-Sandblasting)

Source of Sand: Henry Nelch & Son Co., Springfield, IL

Amount of Sand: # of bags 1.8 lbs. per bag 100

Well Construction Materials

	Stainless Steel Specify Type	Teflon Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint			--	
Riser pipe above w.t.			2"	
Riser pipe below w.t.			2"	
Screen			2"	
Coupling joint screen to riser			--	
Protective casing				6"X5' Steel

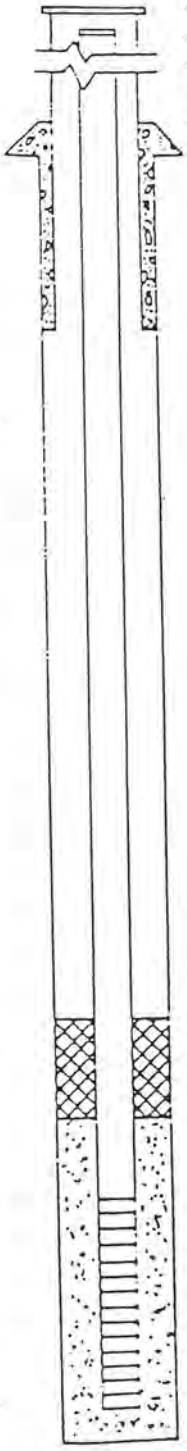
Measurements

to .01 ft. (where applicable)

Riser pipe length	31.6'
Protective casing length	5'
Screen length	6'
Bottom of screen to end cap	0.3'
Top of screen to first joint	0.3'
Total length of casing	37.6'
Screen slot size	0.010
# of openings in screen	--
Diameter of borehole (in)	6
ID of riser pipe (in)	2

Elevations — .01 ft.

546	83	MSL Top of Protective Casing
546	68	MSL Top of Riser Pipe
	+2.9	ft. Casing Stickup
543	78	MSL Ground Surface
	-3.1	ft. Top of annular sealant
	-21.3	ft. Top of Seal
	2.8	ft. Total Seal Interval
	-24.1	ft. Top of Sand
	-25.8	ft. Top of Screen
	6.0	ft. Total Screen Interval
	-31.8	ft. Bottom of Screen
	-34.0	ft. Bottom of Borehole



Completed by: Surveyed by: Ill. registration #

Andrews Environmental Engineering, Inc.

3535 Mayflower Boulevard, Springfield, IL 62707 (217) 787-2334

Field Boring Log

Site Information:
Name: City Water, Light, and Power
Location: Springfield, IL
County: Sangamon
Site No.: 1678250020
AEEI No.: 93-118

Location:
Coord. System: Site Coordinates
Northing: 3728.6
Easting: 2315.7

Boring Information:
Boring No.: G110
Well No.: G110
Surf. Elev.: 554.5
Depth Information:
Total: 59.5
Auger: 59.5
Rotary: N/A
Dates:
Start: 7/12/93
Finish: 7/12/93

Drilling Contractor:
Name: AE Exploration Corp.
City: Springfield, IL
Equipment: CME 55

Personel:
Geologist: B. Hunsberger
Driller: M. Moore
Helper (s): R. Smith

Sample Type: ▮ - Continuous Barrel ⊠ - Split Spoon ◪ - Shelby Tube ▮▮ - Core ▭ - Blind Drill

Depth (ft.)	Run No.	Sample Type	Sample No.	Sample Recov.	Blow Count	q_u /[q_s] (in tsf)	% Moisture	Borehole Detail	Lithology	Description/*Comments*	USC	Elev. (MSL)
										Gravel backfill-*access road.*		554.5
	1		1A	3.2'		3.5		Concrete Plug		Dark gray silty CLAY, little sand and gravel, with rootlets.		
5						2.75						549.5
	2		2A			2.8						
			2B			2.5				Dark gray-black clayey SILT, some fine sand, rootlets.		
			2C	5.0'		0.8				Dark gray-black silty CLAY, soft, with rootlets, some fine sand.		
	3											
10				1.4'								544.5
	4		4A			0.7		Cement/Bentonite Grout				
						0.5						
				2.8'		0.65						
			5A			3.25				Dark gray, very moist silty CLAY-clayey SILT, numerous plant and wood fragments *(appears to be original grade).*		
15												539.5
	5					2.75						
						2.25						
			5B			2.0						
				4.8'		2.8						
						1.8						
	6					2.2						
20						1.8						534.5

NOTE: ▽ = groundwater encountered while drilling.

Andrews Environmental Engineering, Inc.

3535 Mayflower Boulevard, Springfield, IL 62707 (217) 787-2334

Field Boring Log

Site Information:
Name: City Water, Light, and Power
Location: Springfield, IL
County: Sangamon
Site No.: 1678250020
AEEI No.: 93-118

Location:
Coord. System: Site Coordinates
Northing: 3728.6
Easting: 2315.7

Boring Information:
Boring No.: G110
Well No.: G110
Surf. Elev.: 554.5
Depth Information:
Total: 59.5
Auger: 59.5
Rotary: N/A
Dates:
Start: 7/12/93
Finish: 7/12/93

Drilling Contractor:
Name: AE Exploration Corp.
City: Springfield, IL
Equipment: CME 55

Personel:
Geologist: B. Hunsberger
Driller: M. Moore
Helper (s): R. Smith

Sample Type: ▯ – Continuous Barrel ⊠ – Split Spoon ⊘ – Shelby Tube ▮ – Core ▭ – Blind Drill

Depth (ft.)	Run No.	Sample Type	Sample No.	Sample Recov.	Blow Count	q_u / [q_s] (in tsf)	% Moisture	Borehole Detail	Lithology	Description/*Comments*	USC	Elev. (MSL)
												534.5
	6		6A			1.7				Dark gray silty CLAY, moist, trace fine sand, little organics.		
			6B	5.0'		1.6				Gray mottled light gray-brown silty CLAY, little fine sand, some plant roots.		
25	7			2.0'								529.5
			8A			0.7						
	8		8B			2.0 1.2						
				3.0'		1.3						
						2.2						
30			9A			2.2				Gray mottled brown silty CLAY, trace fine sand, little organics.		524.5
	9					2.2						
						2.75						
						2.75						
			9B	5.0'		1.75				Gray clayey SILT.		
						0.75						
			10A			0.3						
35						0.2						519.5
	10					0.2				Gray CLAY, very soft, some organic clay strata present. *(* The clay was too soft for the pocket penetrometer).*		
						*						
						*						
				5.0'		*						
	11		11A									
40												514.5

Cement/Bentonite Grout

Bentonite Seal

NOTE: ▽ = groundwater encountered while drilling.

Andrews Environmental Engineering, Inc.

3535 Mayflower Boulevard, Springfield, IL 62707 (217) 787-2334

Field Boring Log

Site Information:
Name: City Water, Light, and Power
Location: Springfield, IL
County: Sangamon
Site No.: 1678250020
AEEI No.: 93-118

Location:
Coord. System: Site Coordinates
Northing: 3728.6
Easting: 2315.7

Boring Information:
Boring No.: G110
Well No.: G110
Surf. Elev.: 554.5
Depth Information:
Total: 59.5
Auger: 59.5
Rotary: N/A
Dates:
Start: 7/12/93
Finish: 7/12/93

Drilling Contractor:
Name: AE Exploration Corp.
City: Springfield, IL
Equipment: CME 55

Personel:
Geologist: B. Hunsberger
Driller: M. Moore
Helper (s): R. Smith

Sample Type: ▯ – Continuous Barrel ⊠ – Split Spoon ▨ – Shelby Tube ▮ – Core ☐ – Blind Drill

Depth (ft.)	Run No.	Sample Type	Sample No.	Sample Recov.	Blow Count	$q_u/[q_s]$ (in tsf)	% Moisture	Borehole Detail	Lithology	Description/*Comments*	USC	Elev. (MSL)
												514.5
	11		11B	5.0'				Bentonite Seal		Gray fine silty SAND, little clay.		
45	12		12A 12B	5.0'				Filter Pack and/or Formation Sand		Gray, fine clayey SAND, some silt.		509.5
50	13		13A	5.0'								504.5
55	14			0.0'				Bentonite Seal		Gray shale with muscovite mica. *(Since there was no recovery in Run # 14, the bedrock contact was determined at the depth the down pressure increased from 300 psi to 1500 psi on the auger column.)*		499.5
	15	⊠	15A 15A	0.7'	10 31							
60										*E.O.B.=59.5 feet*		494.5

NOTE: ▽ = groundwater encountered while drilling.

Illinois Environmental Protection Agency — Well Completion Report

Site #: 1678250020 County: Sangamon Well #: G-110

Site Name: EGDS Landfill/ City Water, Light and Power Grid Coordinate: Northing 3728.6 Easting 2315.7

Drilling Contractor: AE Exploration Corporation Date Drilled Start: 07/12/93

Driller: M. Moore Geologist: B. Hunsberger Date Completed: 07/12/93

Drilling Method: Hollow Stem Auger Drilling Fluids (type): None

Annular Space Details

Type of Surface Seal: Concrete

Type of Annular Sealant: Cement/Bentonite

Amount of cement: # of bags 8 lbs. per bag 94

Amount of bentonite: # of bags 1 lbs. per bag 50

Type of Bentonite Seal (Granular, Pellet): Grout

Amount of bentonite: # of Bags 1 lbs. per bag 50

Type of Sand Pack: #10-20 Silica Sand

Source of Sand: Best Environmental - Chardon, OH

Amount of Sand: # of bags 10 lbs. per bag 50

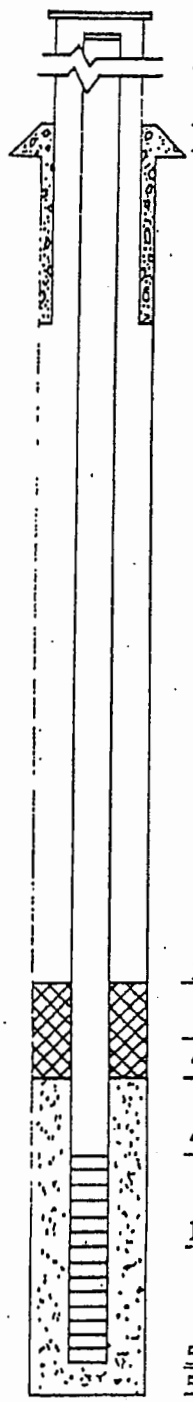
Well Construction Materials

	Stainless Steel Specify Type	Teflon Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint	Flush			
Riser pipe above w.t.	304			
Riser pipe below w.t.	304			
Screen	304			
Coupling joint screen to riser	Flush			
Protective casing				Steel

Measurements

to .01 ft. (where applicable)

Riser pipe length	47.11'
Protective casing length	5.0'
Screen length	10.0'
Bottom of screen to end cap	0.21
Top of screen to first joint	0.065
Total length of casing	57.11'
Screen slot size	.01"
# of openings in screen	---
Diameter of borehole (in)	8.0"
Diameter riser pipe (in)	2.0"



Elevations — .01 ft.

557	20	MSL Top of Protective Casing
557	11	MSL Top of Riser Pipe
2	61	ft. Casing Stickup
554	50	MSL Ground Surface
3	0	ft. Top of annular sealant
37	0	ft. Top of Seal
5	0	ft. Total Seal Interval
42	0	ft. Top of Sand
44	5	ft. Top of Screen
10	0	ft. Total Screen Interval
54	5	ft. Bottom of Screen
59	5	ft. Bottom of Borehole

Completed by: Brad Hunsberger Surveyed by: City Water, Light and Power Rich Davis IL registration #: 2098

SKS ENGINEERS, INC.
2900 N. MARTIN LUTHER KING JR. DRIVE
DECATUR, ILLINOIS 62526

SOIL BORING LOG

Date 05/26/2009

SKS Project No. 911607

ROUTE _____ DESCRIPTION CWLP / Landfill Well Replacement LOGGED BY T. Mathias/EK/AL

SECTION N/A LOCATION Springfield, IL SEC. ____ TWP. _____ RNG. _____ PM

COUNTY Sangamon DRILLING METHOD Hollow Stem Auger HAMMER TYPE 140# Safety Hammer

STRUCT. NO. _____
Station _____

BORING NO. R111
Station _____
Offset _____
Ground Surface Elev. _____ ft

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft

Groundwater Elev.:
First Encounter _____ ft
Upon Completion _____ ft
After _____ Hrs _____ ft

DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
GRASS			
BLIND DRILLED TO 44.5 FT.			
-5			
-10			
-15			
-20			
-25			
-30			
-35			
-40			

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

SKS ENGINEERS, INC.
2900 N. MARTIN LUTHER KING JR. DRIVE
DECATUR, ILLINOIS 62526

SOIL BORING LOG

Date 05/26/2009

SKS Project No. 911607

ROUTE _____ DESCRIPTION CWLP / Landfill Well Replacement LOGGED BY T. Mathias/EK/AL

SECTION N/A LOCATION Springfield, IL SEC. ____ TWP. _____ RNG. _____ PM

COUNTY Sangamon DRILLING METHOD Hollow Stem Auger HAMMER TYPE 140# Safety Hammer

STRUCT. NO. _____
Station _____

BORING NO. R111
Station _____
Offset _____
Ground Surface Elev. _____ ft

Surface Water Elev. _____ ft
Stream Bed Elev. _____ ft

Groundwater Elev.:
First Encounter _____ ft
Upon Completion _____ ft
After _____ Hrs _____ ft

		DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)		DEPTH (ft)	BLOWS (/6")	UCS Qu (tsf)	MOIST (%)
BLIND DRILLED TO 44.5 FT.										
						2" Groundwater Monitor Well Installed				
	44.5									
Gray, Saturated Sandy Silt										
	46.5									
Gray, Saturated, Silty Fine Sand										
	49.5									
Gray, Saturated, Silty Fine Sand										
	54.5									
Gray, Saturated, Silty Fine Sand, with Gravel										
	59.5									
END OF BORING @ 59.5 FT.										

The Unconfined Compressive Strength (UCS) Failure Mode is indicated by (B-Bulge, S-Shear, P-Penetrometer)
The SPT (N value) is the sum of the last two blow values in each sampling zone (AASHTO T206)

Illinois Environmental Protection Agency — **Well Completion Report**

Site Number: 1678250020 County: Sangamon

Site Name: City Water Light & Power Landfill Well #: R111

State Plane Coordinate: X E2456708.31 Y N1129507.08 (or) Latitude: ° ' " Longitude: ° ' " Borehole #: R111

Surveyed by: IL Registration #:

Drilling Contractor: SKS Engineers, Inc. Driller: D. Baldwin

Consulting Firm: Geologist: N/A

Drilling Method: Hollow Stem Auger Drilling Fluid (Type): None

Logged By: D. Baldwin (SKS Engineers, Inc.) Date Started: 5/26/09 Date Finished; 5/29/09

Report Form Completed By: D. Baldwin Date: 7/2/09

ANNULAR SPACE DETAILS

Type of Surface Seal: Concrete

Type of Annular Sealant: Bentonite

Installation Method: Slurry

Setting Time:

Type of Bentonite Seal - - Granular, Pellet, (Slurry) (Choose One)

Installation Method: Tremie

Setting Time:

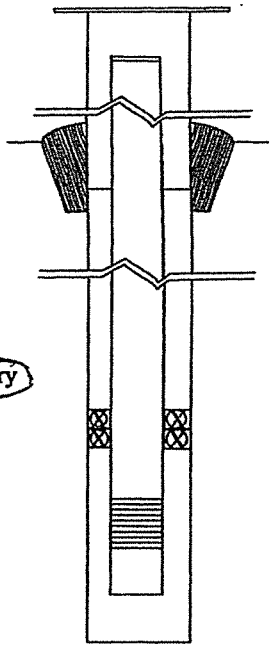
Type of Sand Pack: Quartz Sand

Grain Size: 1020 (Sieve Size)

Installation Method: Free Drop

Type of Backfill Material: (if applicable)

Installation Method:



	Elevations (MSL)*	Depths (BGS)	(.01ft.)
	552.69	0.0	Top of Protective Casing
	552.39	.30	Top of Riser Pipe
	552.69	0.0	Ground Surface
	549.69	3.0	Top of Annular Sealant
			Static Water Level (After Completion)
	549.69	3.0	Top of Seal
	502.59	50.1	Top of Sand Pack
	501.49	51.2	Top of Screen
	495.89	56.8	Bottom of Screen
	495.59	57.1	Bottom of Well
	495.59	57.1	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
ID of Riser Pipe (inches)	2
Protective Casing Length (feet)	Flush Mount
Riser Pipe Length (feet)	51.2
Bottom of Screen to End Cap (feet)	.31
Screen Length (1st slot to last slot) (feet)	4.72
Total Length of Casing (feet)	56.8
Screen Slot Size **	.010

**Hand-Slotted Well Screens are Unacceptable

Andrews Environmental Engineering, Inc.

3535 Mayflower Boulevard, Springfield, IL 62707 (217) 787-2334

Field Boring Log

Site Information:
Name: City Water, Light, and Power
Location: Springfield, IL
County: Sangamon
Site No.: 1678250020
AEEI No.: 93-118

Location:
Coord. System: Site Grid
Northing: 4,450.9
Easting: 2,560.6

Boring Information:
Boring No.: G-112
Well No.: G-112
Surf. Elev.: 552.7
Depth Information:
Total: 57.80
Auger: 57.80
Rotary: 0.00
Dates:
Start: 7/21/93
Finish: 7/23/93

Drilling Contractor:
Name: AE Exploration Corp.
City: Springfield, IL
Equipment: CME 45 - 4¼" HSA /w 5 foot continuous barrel sampler.

Personel:
Geologist: R. Hasenyager
Driller: A. Weisenhofer
Helper (s): K. Doetzel

Sample Type: ▮ - Continuous Barrel ⊠ - Split Spoon ⧄ - Shelby Tube ▮ - Core □ - Blind Drill

Depth (ft.)	Run No.	Sample Type	Sample No.	Sample Recov.	Blow Count	q_u / [q_s] (in tsf)	% Moisture	Borehole Detail	Lithology	Description/*Comments*	USC	Elev. (MSL)
												552.7
	1			0.0				Concrete Plug		Very dark brown, slightly moist, clayey SILT with roots, other organic matter, and trace sand.		
										Brown, soft, slightly moist, silty CLAY, with trace sand.		
5												547.7
	2			1.3								
10												542.7
	3			5.0		1.25				Dark brown, slightly moist, plastic, silty CLAY, with trace sand.		
						1.00				Brown, moist, plastic, silty CLAY, with trace sand.		
15												537.7
	4			1.7		1.75				Brown mottled gray, moist, plastic, silty CLAY, with trace sand and organic matter.		
	5			3.0		1.50						
						4.25		Cement/Bentonite Grout		Black, moist, friable, clayey SILT, with no sand or pebbles.		
20												532.7

NOTE: ▼ = water level 14 hours after completion.
Torvane values are actual dial readings.

Andrews Environmental Engineering, Inc.

3535 Mayflower Boulevard, Springfield, IL 62707 (217) 787-2334

Field Boring Log

Site Information:
Name: City Water, Light, and Power
Location: Springfield, IL
County: Sangamon
Site No.: 1678250020
AEEI No.: 93-118

Location:
Coord. System: Site Grid
Northing: 4,450.9
Easting: 2,560.6

Boring Information:
Boring No.: G-112
Well No.: G-112
Surf. Elev.: 552.7
Depth Information:
Total: 57.80
Auger: 57.80
Rotary: 0.00
Dates:
Start: 7/21/93
Finish: 7/23/93

Drilling Contractor:
Name: AE Exploration Corp.
City: Springfield, IL
Equipment: CME 45 - 4¼" HSA /w 5 foot continuous barrel sampler.

Personel:
Geologist: R. Hasenyager
Driller: A. Weisenhofer
Helper (s): K. Doetzel

Sample Type: ▮ - Continuous Barrel ⊠ - Split Spoon ◪ - Shelby Tube ▮▮ - Core ☐ - Blind Drill

Depth (ft.)	Run No.	Sample Type	Sample No.	Sample Recov.	Blow Count	$q_u/[q_s]$ (in tsf)	% Moisture	Borehole Detail	Lithology	Description/*Comments*	USC	Elev. (MSL)
												532.7
	6			5.0		4.00 2.75 [1.00] 1.50		Cement/Bentonite Grout		Brown mottled gray, slightly moist, plastic, silty CLAY, with trace sand and organics.		
25	7			2.0								527.7
	8			3.0		0.50 0.50				Brown mottled gray, slightly moist, plastic, silty CLAY, with trace sand and organic matter. ▽-- *Free water during drilling*		
30	9			5.0		0.75 [0.38] [0.30] 0.50 0.75						522.7
35	10			5.0		[0.60] 1.25 1.25 [0.47]				Dark gray, moist, clayey SILT, with trace sand. Reddish brown, moist, clayey SILT, with trace organic matter. Greenish gray, very moist, silty CLAY, with trace sand. *High-angle, dry, parting surfaces at 38.7', 39.1', and 39.5'*		517.7
40												512.7

NOTE: ▽= water level 14 hours after completion.
Torvane values are actual dial readings.

Andrews Environmental Engineering, Inc.

3535 Mayflower Boulevard, Springfield, IL 62707 (217) 787-2334

Field Boring Log

Site Information:
Name: City Water, Light, and Power
Location: Springfield, IL
County: Sangamon
Site No.: 1678250020
AEEI No.: 93-118

Location:
Coord. System: Site Grid
Northing: 4,450.9
Easting: 2,560.6

Boring Information:
Boring No.: G-112
Well No.: G-112
Surf. Elev.: 552.7
Depth Information:
Total: 57.80
Auger: 57.80
Rotary: 0.00
Dates:
Start: 7/21/93
Finish: 7/23/93

Drilling Contractor:
Name: AE Exploration Corp.
City: Springfield, IL
Equipment: CME 45 - 4¼" HSA /w 5 foot continuous barrel sampler.

Personel:
Geologist: R. Hasenyager
Driller: A. Weisenhofer
Helper (s): K. Doetzel

Sample Type: ▮ - Continuous Barrel ☒ - Split Spoon ▨ - Shelby Tube ▮ - Core ☐ - Blind Drill

Depth (ft.)	Run No.	Sample Type	Sample No.	Sample Recov.	Blow Count	$q_u/[q_s]$ (in tsf)	% Moisture	Borehole Detail	Lithology	Description/*Comments*	USC	Elev. (MSL)
												512.7
	11			3.0		0.50		Cement/Bentonite Grout		*Wood chips and small twigs at 41.4'*		
						0.25 [0.10]				Gray, very moist, clayey SILT, with trace sand. *Small (2-3 mm.)* Bivalvia *and* Gastropoda *throughout bed.*		
	12			2.0						Gray, saturated, soft, sandy SILT.		
45												507.7
	13			3.0		0.25				Gray, saturated, silty SAND (very fine- to fine-grained).		
						[0.22] 0.25				Gray, very moist, plastic, sandy SILT.		
	14			2.0						Gray, saturated, silty SAND (very fine- to fine-grained). SAND (fine-grained) seams at 48.5' and 48.8'.		
50												502.7
	15			4.5		[0.35] 0.50		Bentonite Seal		Gray, very moist, clayey SILT, with organics and trace sand. Thin SAND (fine-grained) seams at 53.7' and 53.9'. *Decreasing organic content with depth. No organics lower 0.5'.*		
						[0.30] 0.50						
						0.50						
										Gray, very moist, sandy SILT.		497.7
55	16			1.5				Filter Pack		Gray, saturated, silty SAND (fine- to coarse-grained) and PEBBLE (very fine- to medium-grained). *Shale and sandstone fragments upper 0.3'*		
	17									Gray, slightly moist, hard, massive, SHALE. *Bedrock*		
60										*E.O.B. = 57.8 feet*		492.7

NOTE: ▼ = water level 14 hours after completion.
Torvane values are actual dial readings.

Illinois Environmental Protection Agency — Well Completion Report

Site #: 1678250020 County: Sangamon Well #: G-112

Site Name: City Water, Light & Power Grid Coordinate: Northing 4450.9 Easting 2560.6

Drilling Contractor: AE Exploration Corporation Date Drilled Start: July 21, 1993

Driller: A. Weisenhofer Geologist: R. Hasenyager Date Completed: July 23, 1993

Drilling Method: Hollow Stem Auger Drilling Fluids (type): N/A

Annular Space Details

Type of Surface Seal: Concrete

Type of Annular Sealant: Cement/Bentonite

Amount of cement: # of bags 8 lbs. per bag 94

Amount of bentonite: # of bags 1/2 lbs. per bag 50

Type of Bentonite Seal (Granular, Pellet): Bentonite Grout

Amount of bentonite: # of Bags 1/2 lbs. per bag 50

Type of Sand Pack: Quartz Sand (1020)

Source of Sand: Best Sand

Amount of Sand: # of bags 6 lbs. per bag 50

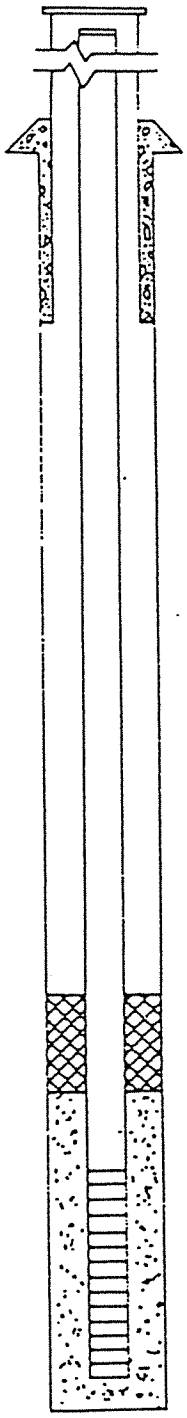
Well Construction Materials

	Stainless Steel Specify Type	Teflon Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint	304		Sch 40	
Riser pipe above w.t.			Sch 40	
Riser pipe below w.t.	304			
Screen	304			
Coupling joint screen to riser	304			
Protective casing				Steel

Measurements

to .01 ft. (where applicable)

Riser pipe length	54.81 feet
Protective casing length	5.0 feet
Screen length	4.73 feet
Bottom of screen to end cap	0.29 feet
Top of screen to first joint	0.21 feet
Total length of casing	60.04 feet
Screen slot size	0.01 inches
# of openings in screen	
Diameter of borehole (in)	8.0 inches
ID of riser pipe (in)	2.0 inches



Elevations — .01 ft.

555	.06	MSL Top of Protective Casing
554	.88	MSL Top of Riser Pipe
2	.18	ft. Casing Stickup
552	.7	MSL Ground Surface
4	.10	ft. Top of annular sealant
46	.10	ft. Top of Seal
5	.07	ft. Total Seal Interval
51	.17	ft. Top of Sand
52	.78	ft. Top of Screen
4	.73	ft. Total Screen Interval
57	.51	ft. Bottom of Screen
57	.80	ft. Bottom of Borehole

Completed by: Rhonald Hasenyager Surveyed by: CUUP-Rich Davis Ill. registration # 2098

PATRICK ENGINEERING INC.

BORING NUMBER **P-5S** / G113 SHEET **1** OF **1**
CLIENT **City of Springfield CWLP**
PROJECT & NO. **FGDS Landfill - Hydrogeo Invest. - 496B**
LOCATION **N 4,510.7 E 2,887.0**

LOGGED BY **KRR**
GROUND ELEVATION **534.9**

ELEVATION	DEPTH (FT)	STRATA	SOIL/ROCK DESCRIPTION	SAMPLE TYPE & NO. DEPTH (FT) RECOVERY(IN)	BLOW COUNTS	Water Content PL □ - - - ○ - - - △ LL (10 20 30 40 50) / Unconfined Compressive Strength (TSF) ✳ (1 2 3 4 5)	NOTES & TEST RESULTS
534.9	0.0		Drilled to 8.0' without sampling. Refer to Boring Log P-5D for soil conditions from 0.0' to 8.0'.				Soil conditions are consistent with soil conditions encountered in P-5D based on soil cuttings.
526.9	8.0		Dark gray to black organic silty clay, trace fine sand, soft, medium to high plasticity, wet to saturated, fill OL	SS-1 8.0-10.0 10"R	2 2 2 3	✳ at 2.0 TSF	3T-2: Dry den.=95.2 pcf k=7.6 E-08 cm/s
				3T-2 10.0-12.0 16"R		○ 35.2 at 4.0 TSF; ○ 26.0 at 3.0 TSF; ✳ at 2.0 TSF	
522.9	12.0		End of Boring at 12.0'				No water was found during or immediately after drilling. Piezometer was constructed immediately after drilling. Refer to As-Built Diagram P-5S for more details.

DRILLING CONTRACTOR **Patrick Engineering**
DRILLING METHOD **3-1/4" I.D. HSA**
DRILLING EQUIPMENT **CME 55/ATV**
DRILLING STARTED **8/16/92** ENDED **8/16/92**

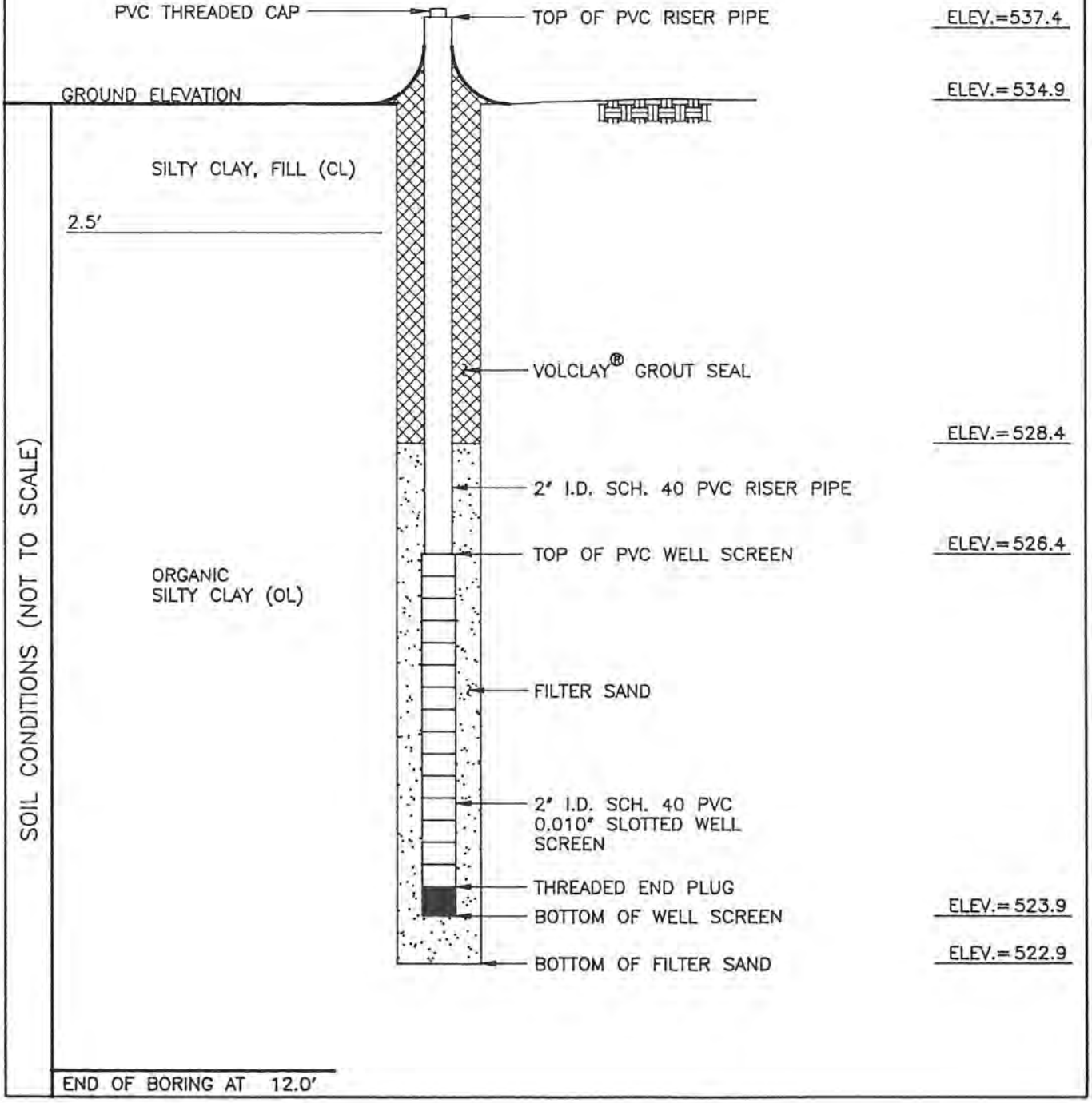
REMARKS
WOH = Weight of Hammer.

WATER LEVEL (ft.)
▽
▽
▽

PATRICK ENGINEERING INC.	PIEZOMETER INSTALLATION REPORT	PIEZ. NO. P-5S / G113 PROJ. NO. 496B

PROJECT FGDS LANDFILL
LOCATION SPRINGFIELD, ILLINOIS
CLIENT CWL&P
ENGINEER KRISHNA REDDY
DRILLER KEVIN SHAMWAY

BORING NO. P-5S
LOCATION N 4510.7
E 2887.0
INSTALLATION DATE 8/16/92
WEATHER SUNNY, 70'S



Professional Service Industries, Inc.

RECORD OF SUBSURFACE EXPLORATION

Boring G-105 / G120

Project Name: Monitoring Well Installations Date of Boring: January 9, 1990

Site: CWLP Ash Disposal Facility Project No.: 020-05001

DESCRIPTION	DEPTH	SAMPLE	N	Q_u	Q_p	M_c	REMARKS
SURFACE							
Silty clay to clayey silt, trace organics, brown (fill)	5	1-SS	20%				
	10	2-SS	35%				
		3-SS	25%				
Silty clay, drak grey to black, some organics	15						
Silty clay to clay, grey, mottled brown, trace sand		4-SS	100%				
	20	5-SS	40%				
	25	6-SS	35%				
Silty clay with sand, fine to medium, brown	30						While Drilling ▽
		7-SS	40%				
	35	8-SS	100%				
	40						
Silty clay, trace sand, dark grey, fine		9-SS	100%				
	45						

Professional Service Industries, Inc.

RECORD OF SUBSURFACE EXPLORATION

Boring G-105 (Continued) / G120

Project Name: Monitoring Well Installations Date of Boring: January 9, 1990

Site: CWLP Ash Disposal Facility Project No.: 020-05001

DESCRIPTION	DEPTH	SAMPLE	N	Q_u	Q_p	M_c	REMARKS
Silty clay, some sand, fine, dark grey	45	10-SS	100%				
48'-48.7': Grey sand, fine to medium	50	11-SS	80%				
Shale, grey, weathered							
End of Boring							

Illinois Environmental Protection Agency — Well Completion Report

Site #: 1678250020 County: Sangamon Well #: G-105 / G120

Site Name: CWLP - Ash Disposal Facility Grid Coordinate: Northing 1641.61 Easting 610.10

Drilling Contractor: Professional Service Industries, Inc. Date Drilled Start: January 9, 1990

Driller: B. Williamson Geologist: -- Date Completed: January 16, 19
(Re-Drilled w/4¼" I.D.)

Drilling Method: Hollow Stem Auger - 3¼" I.D & 4¼" I.D Drilling Fluids (type): None

Annular Space Details

Type of Surface Seal: Concrete

Type of Annular Sealant: Cement/Bentonite Grout

Amount of cement: # of bags 6 lbs. per bag 94

Amount of bentonite: # of bags 0.2 lbs. per bag 50

Type of Bentonite Seal (Granular, Pellet): Pellet

Amount of bentonite: # of Bags 0.5 lbs. per bag 50

Type of Sand Pack: Silica Sand (Marco-Sandblasting)

Source of Sand: Henry Nelch & Son Co., Springfield, IL

Amount of Sand: # of bags 1.8 lbs. per bag 100

Well Construction Materials

	Stainless Steel Specify Type	Teflon Specify Type	PVC Specify Type	Other Specify Type
Riser coupling joint			--	
Riser pipe above w.t.			2"	
Riser pipe below w.t.			2"	
Screen			2"	
Coupling joint screen to riser			--	
Protective casing				6"X5' Steel

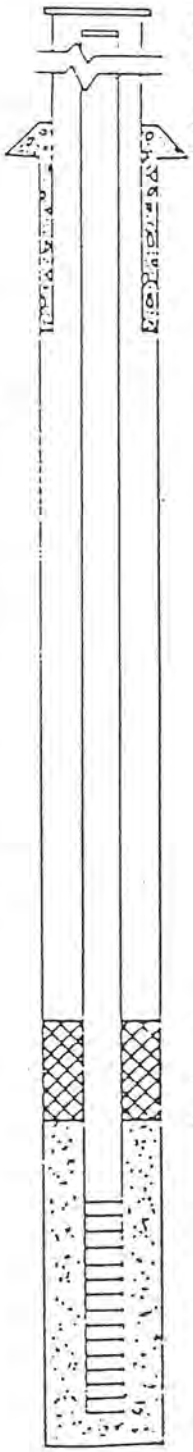
Measurements

to .01 ft. (where applicable)

Riser pipe length	43.9
Protective casing length	Flush Mount
Screen length	6'
Bottom of screen to end cap	0.3'
Top of screen to first joint	0.3'
Total length of casing	49.9
Screen slot size	0.010
# of openings in screen	--
Diameter of borehole (in)	8
ID of riser pipe (in)	2

Elevations — .01 ft.

553	49	MSL Top of Protective Cas
553	25	MSL Top of Riser Pipe
	+0.1	ft. Casing Stickup
553	49	MSL Ground Surface
	-2.9	ft. Top of annular sealant
	-40.5	ft. Top of Seal
	2.0	ft. Total Seal Interval
	-42.5	ft. Top of Sand
	-43.8	ft. Top of Screen
	6.0	ft. Total Screen Interval
	-49.8	ft. Bottom of Screen
	-53.0	ft. Bottom of Borehole



Completed by: Surveyed by: Ill. registration #

Andrews Environmental Engineering, Inc.

3535 Mayflower Boulevard, Springfield, IL 62707 (217) 787-2334

Field Boring Log

Site Information:
Name: City Water, Light & Power – FGDS Development
Location: Springfield, IL
County: Sangamon
Site No.: 1678250020
AEEI No.: 93-118

Location:
Coord. System: Site Grid
Northing: 5,612.8
Easting: 2,130.0

Weather:
Sunny, calm, warm (hi-80's)

Boring Information:
Boring No.: B96-1
Well No.: G-121
Surf. Elev.: 553.80

Depth Information:
Total: 56.70
Auger: 56.70
Core: 0.00

Dates:
Start: 05/17/96
Finish: 05/17/96

Drilling Contractor:
Name: AE Explortation Corp.
City: Springfield, IL
Equipment: CME 75 – 4¼" HSA /w 5 foot continuous barrel sampler.

Personnel:
Geologist: R. Hasenyager
Driller: A. Wiesenhofer
Helper (s): K. Doetzel

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	Borehole Detail	Lithology	Description/*Comments*	USC	Elev. (MSL)
						2.25		Stickup = 1.87'		Brown with 35% dark brown mottles, dry, firm, silty CLAY, trace sand.		
	1			5.0		2.25		Concrete				
						3.25						550
5						2.75						
						3.00						
	2			5.0		2.25				Brown, moist, firm, silty CLAY, trace sand.		
						2.75				Dark brown with 10% greenish blue mottles, moist, firm, silty CLAY, trace sand.		
						3.00				Brown, moist, firm, silty CLAY, trace sand.		545
10						4.5+		High-solids Bentonite Grout		Dark brown, moist, firm, silty CLAY, trace sand.		
	3			5.0		3.00						
						2.00						
						3.50						540
15										Black, moist, firm, silty CLAY, trace sand.		
						3.25				Dark brown, moist, firm, silty CLAY, trace sand.		
	4			5.0		4.25						
						4.00				Very dark brown, dry, friable, silty CLAY, trace sand, trace roots. *topsoil*		
						3.00						535
20										Brown, moist, firm, silty CLAY, trace sand.		

NOTES:

Andrews Environmental Engineering, Inc.

3535 Mayflower Boulevard, Springfield, IL 62707 (217) 787-2334

Field Boring Log

Site Information:
Name: City Water, Light & Power - FGDS Development
Location: Springfield, IL
County: Sangamon
Site No.: 1678250020
AEEI No.: 93-118

Location:
Coord. System: Site Grid
Northing: 5,612.8
Easting: 2,130.0

Weather:
Sunny, calm, warm (hi-80's)

Drilling Contractor:
Name: AE Explortation Corp.
City: Springfield, IL
Equipment: CME 75 - 4¼" HSA /w 5 foot continuous barrel sampler.

Personnel:
Geologist: R. Hasenyager
Driller: A. Wiesenhofer
Helper (s): K. Doetzel

Boring Information:
Boring No.: B96-1
Well No.: G-121
Surf. Elev.: 553.80

Depth Information:
Total: 56.70
Auger: 56.70
Core: 0.00

Dates:
Start: 05/17/96
Finish: 05/17/96

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	Borehole Detail	Lithology	Description/*Comments*	USC	Elev. (MSL)
						3.00		High-solids Bentonite Grout		Brown, moist, firm, silty CLAY, trace sand.		
	5			5.0		2.00						
						1.75				Brown with 40% greenish brown mottles, moist, soft, silty CLAY, trace sand, trace roots.		
						0.75				Greenish brown, very moist, soft, silty CLAY, trace sand.		530
25						<.50				Light brown with 15% greenish brown mottles, very moist, firm, silty CLAY, trace sand.		
	6			5.0		2.50						
						2.50						
						2.00						525
						2.50						
30						2.00						
						<.50				Light brown with 20% light gray mottles, very moist, soft, silty CLAY, trace sand.		
	7			5.0		1.25						
						1.75						
						3.75				Gray, moist, hard, silty CLAY, with sand.		520
35						1.00				Very dark brown, moist, soft, clayey SILT, trace plant fragments.		
						<.50				Dark gray, moist, soft, clayey SILT, trace plant fragements. *more clayey with depth*		
	8			5.0		<.50				Very dark gray, moist, soft, silty CLAY, with very fine-grained sand.		
						<.50						515
40						<.50						

NOTES:

Andrews Environmental Engineering, Inc.

3535 Mayflower Boulevard, Springfield, IL 62707 (217) 787-2334

Field Boring Log

Site Information:
Name: City Water, Light & Power - FGDS Development
Location: Springfield, IL
County: Sangamon
Site No.: 1678250020
AEEI No.: 93-118

Location:
Coord. System: Site Grid
Northing: 5,612.8
Easting: 2,130.0

Weather:
Sunny, calm, warm (hi-80's)

Boring Information:
Boring No.: B96-1
Well No.: G-121
Surf. Elev.: 553.80

Depth Information:
Total: 56.70
Auger: 56.70
Core: 0.00

Dates:
Start: 05/17/96
Finish: 05/17/96

Drilling Contractor:
Name: AE Explortation Corp.
City: Springfield, IL
Equipment: CME 75 - 4¼" HSA /w 5 foot continuous barrel sampler.

Personnel:
Geologist: R. Hasenyager
Driller: A. Wiesenhofer
Helper (s): K. Doetzel

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	Borehole Detail	Lithology	Description/*Comments*	USC	Elev. (MSL)
						1.00				Very dark gray, moist, soft, silty CLAY, with very fine-grained sand.		
	9			5.0		1.00						
						1.50				Very dark gray, very moist, soft to firm, sandy/silty CLAY.		510
45						1.00						
						1.00				Very dark gray, very moist, soft, silty CLAY, with very fine-grained sand.		
	10			5.0								
						1.00				Very dark gray, very moist, soft to firm, sandy/silty CLAY.		505
50												
	11			5.0						Very dark gray, wet, soft, clayey, very fine- to fine-grained SAND.		
										Dark gray, very moist, soft, sandy CLAY.		
										Gray, wet, fine- to medium-grained SAND.		500
			11A									
55					31					Gray, moist, firm, clayey SILT, with sand and rock fragments.		
	12			1.6	34	4.5+				Gray, dry, hard, SHALE.		
					35							
					48					Gray, dry, hard, fine-grained, SANDSTONE.		
										End of Boring = 56.70 feet (497.10' MSL)		495
60												

Borehole Detail: High-solids Bentonite Grout; Bentonite Chips; Filter Pack

NOTES:

Illinois Environmental Protection Agency — Well Completion Report

Site #: 1678250020 County: Sangamon Well #: G121

Site Name: City Water, Light & Power – FGDS Development Borehole #: B96-1

Coordinates: X 2,481.5 Y 5,615.9 (or) Latitude: ° ' " Longitude: ° ' "

Surveyed by: Richard Davis, City Water, Light & Power IL Registration #: LS-2098

Drilling Contractor: AE Exploration Corp. Consulting Firm: Andrews Environmental Engineering, Inc.

Driller: A. Wiesenhofer Geologist: R. Hasenyager

Drilling Method: Hollow stem auger Logged by: R. Hasenyager

Drilling Fluids (type): n/a Report Form Completed by: R. Hasenyager

Date Well Started: 05/16/96 Date Well Finished: 05/16/96 Date Form Completed: 07/12/96

ANNULAR SPACE DETAILS

Type of surface seal: Concrete

Type of annular sealant: High-solids bentonite

Installation method: Tremi

Setting time: 24+ hours

Type of bentonite seal – ***Ganular***, Pellet, Slurry (circle one)

Installation method: Free drop

Setting time: 70 minutes

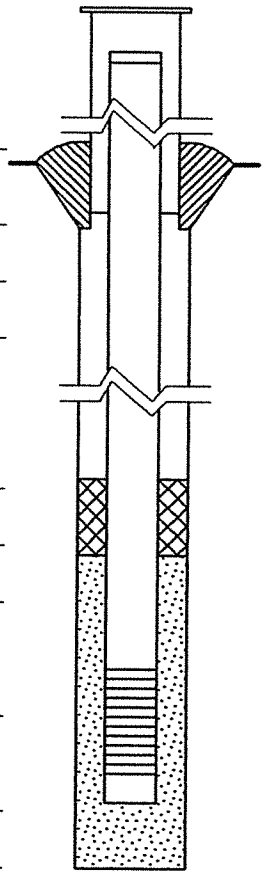
Type of sand pack: Quartz sand

Grain size: 10/20 (sieve size)

Installation method: Free drop

Type of backfill material: n/a (if applicable)

Installation method: n/a



ELEVATION (MSL)*	DEPTH (BGS)*	(0.01 ft)
556.04	-2.24	Top of Protective Casing
555.67	-1.87	Top of Riser Pipe
553.80	.00	Ground Surface
552.30	1.50	Top of Annular Sealant
528.55	25.25	Static Water Level Measured on 5/24/96 (after completion)
506.60	47.20	Top of Seal
504.00	49.80	Top of Sandpack
501.93	51.87	Top of Screen
497.96	55.84	Bottom of Screen
496.86	56.94	Bottom of Well
497.10	56.70	Bottom of Borehole

* Referenced to a National Geodetic Vertical Datum
* positive (+) values below GS, negitive (–) values above GS

NOTES:

WELL CONSTRUCTION MATERIALS (circle one)

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)

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)	53.74
Bottom of Screen to End Cap (ft)	1.10
Screen Length [1st slot to last slot] (ft)	3.97
Total Length of Casing (ft)	58.81
Screen Slot Size‡	#10 (0.01")

‡Hand-slotted well screens are unacceptable.

Andrews Environmental Engineering, Inc.

3535 Mayflower Boulevard, Springfield, IL 62707 (217) 787-2334

Field Boring Log

Site Information:
Name: City Water, Light & Power - FGDS Development
Location: Springfield, IL
County: Sangamon
Site No.: 1678250020
AEEI No.: 93-118

Location:
Coord. System: Site Grid
Northing: 5,613.2
Easting: 2,305.1

Weather:
Sunny, calm, warm (hi-80's)

Boring Information:
Boring No.: B96-2
Well No.: G-122
Surf. Elev.: 552.70

Depth Information:
Total: 58.40
Auger: 58.40
Core: 0.00

Dates:
Start: 05/20/96
Finish: 05/20/96

Drilling Contractor:
Name: AE Explortation Corp.
City: Springfield, IL
Equipment: CME 75 - 4¼" HSA /w 5 foot continuous barrel sampler.

Personnel:
Geologist: R. Hasenyager
Driller: A. Wiesenhofer
Helper (s): K. Doetzel

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	Borehole Detail	Lithology	Description/*Comments*	USC	Elev. (MSL)
						3.50		Stickup = 1.74'		Brown, moist, firm, silty CLAY, trace sand.		
	1			4.7		3.00		Concrete		Very dark brown, moist, firm, silty CLAY, trace sand.		550
						3.00						
						4.5+				Brown, moist, hard to firm, silty CLAY, trace sand.		
5						3.50						
	2			5.0		2.50						
						3.00				Very dark brown with 40% brown mottles, moist, firm, silty CLAY, trace sand.		545
						3.00						
						4.5+						
10						4.00				Brown, moist, firm, silty CLAY, trace sand.		
	3			5.0		3.25						
						2.25				Dark brown with 50% brown mottles, moist, firm, silty CLAY, trace sand.		540
						2.50						
						1.25						
15						2.25				Very dark brown, firm, moist, silty CLAY, trace sand.		
	4			5.0		3.50				Brown, moist, soft, silty CLAY, trace sand.		
						4.25				Dark brown, moist, soft, silty CLAY, trace sand.		535
						3.25						
						3.00						
20	5					4.00		High-solids Bentonite Grout		Very dark brown, dry, friable, clayey SILT, trace sand.		

NOTES:

Andrews Environmental Engineering, Inc.

3535 Mayflower Boulevard, Springfield, IL 62707 (217) 787-2334

Field Boring Log

Site Information:
Name: City Water, Light & Power – FGDS Development
Location: Springfield, IL
County: Sangamon
Site No.: 1678250020
AEEI No.: 93-118

Location:
Coord. System: Site Grid
Northing: 5,613.2
Easting: 2,305.1

Weather:
Sunny, calm, warm (hi-80's)

Boring Information:
Boring No.: B96-2
Well No.: G-122
Surf. Elev.: 552.70

Depth Information:
Total: 58.40
Auger: 58.40
Core: 0.00

Dates:
Start: 05/20/96
Finish: 05/20/96

Drilling Contractor:
Name: AE Explortation Corp.
City: Springfield, IL
Equipment: CME 75 – 4¼" HSA /w 5 foot continuous barrel sampler.

Personnel:
Geologist: R. Hasenyager
Driller: A. Wiesenhofer
Helper (s): K. Doetzel

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	Borehole Detail	Lithology	Description/*Comments*	USC	Elev. (MSL)
						2.00		High-solids Bentonite Grout		Very dark brown, dry, friable, clayey SILT, trace sand.		
	5			5.0		2.50						
						3.00						530
						3.00				Black, dry to slightly moist, friable, clayey SILT, trace sand.		
25						2.75						
						2.25				Very dark brown, moist, firm to soft, silty CLAY, trace sand.		
	6			5.0		1.00						
						<.50						525
						<.50				Dark brown, very moist, soft, silty CLAY, trace sand.		
30						<.50						
						<.50				Brownish gray, very moist, soft, silty CLAY, trace sand.		
	7			5.0		<.50						
						1.00						520
						1.00				Gray with 25% reddish brown mottles, very moist, soft, silty CLAY, trace sand.		
35						1.00						
						1.50						
	8			5.0		<.50						
						1.25						515
						1.25						
40	9					1.00						

NOTES:

Andrews Environmental Engineering, Inc.

3535 Mayflower Boulevard, Springfield, IL 62707 (217) 787-2334

Field Boring Log

Site Information:
Name: City Water, Light & Power - FGDS Development
Location: Springfield, IL
County: Sangamon
Site No.: 1678250020
AEEI No.: 93-118

Location:
Coord. System: Site Grid
Northing: 5,613.2
Easting: 2,305.1

Weather:
Sunny, calm, warm (hi-80's)

Boring Information:
Boring No.: B96-2
Well No.: G-122
Surf. Elev.: 552.70

Depth Information:
Total: 58.40
Auger: 58.40
Core: 0.00

Dates:
Start: 05/20/96
Finish: 05/20/96

Drilling Contractor:
Name: AE Explortation Corp.
City: Springfield, IL
Equipment: CME 75 - 4¼" HSA /w 5 foot continuous barrel sampler.

Personnel:
Geologist: R. Hasenyager
Driller: A. Wiesenhofer
Helper (s): K. Doetzel

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)	% Molsture
	9			5.0		1.25	
						1.00	
						1.00	
						<.50	
45							
	10			5.0		1.50	
						2.00	
			10A				
						1.00	
50							
	11			3.0			
			11A				
55					3		
	12			2.0	10		
			12A		12		
	13			1.7	10		
					0		
					3		
					4		
					23		
60							

Borehole Detail: High-solids Bentonite Grout; Bentonite Chips; Filter Pack and/or Formation Sand

Lithology / Description/*Comments* / USC

Gray with 25% reddish brown mottles, very moist, soft, silty CLAY, trace sand.

Gray, very moist, soft, silty CLAY, with very fine-grained sand.

Gray, very moist, soft, sandy CLAY.

Dark gray, moist, soft to firm, silty CLAY.

Gray, wet, soft, silty, very fine- to fine-grained SAND.

Dark gray, moinst, soft, silty CLAY, trace sand.

Gray, moist, soft, clayey SILT, trace sand.

Gray, wet, soft, fossiliferous, fine- to medium-grained SAND. *Small (3-7 mm.)* Bivalvia *and* Gastropoda.

Gray, very moist, soft, clayey SILT, trace sand.

Gray, wet, soft, fine- to very coarse-grained, SAND, with shell fragments.

Gray, very moist, soft, clayey SILT, with sand.

Bluish gray, moist, soft, silty CLAY.

Gray, wet, soft, fine- to very coarse-grained, SAND, with shell fragments.

Gray, wet, soft, fine- to medium-grained, SAND, with shell fragments.

Dark gray, moist, soft, silty CLAY, trace sand.

Gray, dry, hard, SHALE.

End of Boring = 58.70 feet (494.00' MSL)

Elev. (MSL): 510, 505, 500, 495

NOTES:

Illinois Environmental Protection Agency — Well Completion Report

Site #: 1678250020 County: Sangamon Well #: G122

Site Name: City Water, Light & Power – FGDS Development Borehole #: B96-2

Coordinates: X 2,305.1 Y 5,613.2 (or) Latitude: ° ' " Longitude: ° ' "

Surveyed by: Richard Davis, City Water, Light & Power IL Registration #: LS-2098

Drilling Contractor: AE Exploration Corp. Consulting Firm: Andrews Environmental Engineering, Inc.

Driller: A. Wiesenhofer Geologist: R. Hasenyager

Drilling Method: Hollow stem auger Logged by: R. Hasenyager

Drilling Fluids (type): n/a Report Form Completed by: R. Hasenyager

Date Well Started: 05/20/96 Date Well Finished: 05/20/96 Date Form Completed: 07/12/96

ANNULAR SPACE DETAILS

Type of surface seal: Concrete

Type of annular sealant: High-solids bentonite

Installation method: Tremi

Setting time: 24+ hours

Type of bentonite seal – *Ganular*, Pellet, Slurry (circle one)

Installation method: Free drop

Setting time: 45 minutes

Type of sand pack: Quartz sand/formation sand

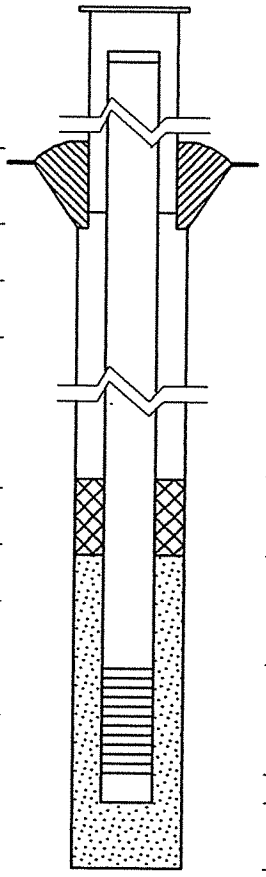
Grain size: 10/20 (sieve size)

Installation method: Free drop

Type of backfill material: n/a (if applicable)

Installation method: n/a

NOTES:



ELEVATION (MSL)*	DEPTH (BGS)* (0.01 ft)	
554.87	-2.17	Top of Protective Casing
554.44	-1.74	Top of Riser Pipe
552.70	.00	Ground Surface
551.70	1.00	Top of Annular Sealant
526.51	26.19	Static Water Level Measured on 5/24/96 (after completion)
507.20	45.50	Top of Seal
504.90	47.80	Top of Sandpack
501.07	51.63	Top of Screen
497.10	55.60	Bottom of Screen
496.00	56.70	Bottom of Well
494.00	58.70	Bottom of Borehole

* Referenced to a National Geodetic Vertical Datum
* positive (+) values below GS, negitive (–) values above GS

WELL CONSTRUCTION MATERIALS (circle one)

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)

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)	53.37
Bottom of Screen to End Cap (ft)	1.10
Screen Length [1st slot to last slot] (ft)	3.97
Total Length of Casing (ft)	58.44
Screen Slot Size‡	#10 (0.01")

‡Hand-slotted well screens are unacceptable.

APPENDIX C:
GROUNDWATER ANALYTICAL DATA

SUMMARY OF ANALYTICAL RESULTS

City Water, Light and Power - Landfill Groundwater Monitoring

Springfield, Sangamon County, Illinois

List	Well ID	Parameter	Units	2023-Q4	2024-Q1	2024-Q2	2024-Q3	2024-Q4
App III	AW-2	Boron, total	mg/L	2.92	2.79	2.73	2.99	2.46
App III	AW-2	Calcium, total	mg/L	151	150	141	152	144
App III	AW-2	Chloride, total	mg/L	32	31	32	34	25.7
App III	AW-2	Fluoride, total	mg/L	0.13	0.12	0.12	0.12	< 0.5
App III	AW-2	pH	s.u.	6.89	6.71	6.83	6.65	6.73
App III	AW-2	Sulfate, total	mg/L	163	155	138	153	99.2
App III	AW-2	Total Dissolved Solids	mg/L	850	760	850	774	795
App IV	AW-2	Antimony, total	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
App IV	AW-2	Arsenic, total	mg/L	0.0266	0.0235	0.0175	0.018	0.013
App IV	AW-2	Barium, total	mg/L	0.629	0.626	0.607	0.644	0.516
App IV	AW-2	Beryllium, total	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
App IV	AW-2	Cadmium, total	mg/L	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
App IV	AW-2	Chromium, total	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
App IV	AW-2	Cobalt, total	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
App IV	AW-2	Lead, total	mg/L	< 0.015	< 0.015	< 0.001	< 0.0075	< 0.0075
App IV	AW-2	Lithium	mg/L	0.0381	0.0064	< 0.05	0.0071	0.0062
App IV	AW-2	Mercury, total	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
App IV	AW-2	Molybdenum, total	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
App IV	AW-2	Radium-226	pCi/L	0.2	< 1	< 1	< 1	< 1
App IV	AW-2	Radium-226 + Radium-228	pCi/L	1.02	< 2	1.06	< 2	1.55
App IV	AW-2	Radium-228	pCi/L	0.82	< 1	1.06	< 1	1.55
App IV	AW-2	Selenium, total	mg/L	< 0.001	< 0.001	< 0.04	< 0.001	< 0.001
App IV	AW-2	Thallium, total	mg/L	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
App III	G121	Boron, total	mg/L	3.09	3.3	3.52	3.04	3.68
App III	G121	Calcium, total	mg/L	180	189	191	164	191
App III	G121	Chloride, total	mg/L	31	30	30	30	29
App III	G121	Fluoride, total	mg/L	0.18	0.17	0.17	0.17	< 0.5
App III	G121	pH	s.u.	6.83	6.62	6.76	6.9	6.75
App III	G121	Sulfate, total	mg/L	293	290	323	260	311
App III	G121	Total Dissolved Solids	mg/L	1040	1000	890	936	1040
App IV	G121	Antimony, total	mg/L	< 0.001	< 0.001	< 0.001	0.0087	< 0.001
App IV	G121	Arsenic, total	mg/L	0.0221	0.0173	0.0146	0.0084	0.016
App IV	G121	Barium, total	mg/L	0.527	0.555	0.606	0.5	0.626
App IV	G121	Beryllium, total	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
App IV	G121	Cadmium, total	mg/L	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
App IV	G121	Chromium, total	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
App IV	G121	Cobalt, total	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
App IV	G121	Lead, total	mg/L	< 0.015	< 0.015	< 0.001	< 0.0075	< 0.0075
App IV	G121	Lithium	mg/L	0.0433	0.0073	< 0.05	0.0083	0.0079
App IV	G121	Mercury, total	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
App IV	G121	Molybdenum, total	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
App IV	G121	Radium-226	pCi/L	0.21	< 1	< 1	< 1	< 1
App IV	G121	Radium-226 + Radium-228	pCi/L	3.1	< 2	< 2	< 2	1.59
App IV	G121	Radium-228	pCi/L	2.89	< 1	< 1	< 1	1.59
App IV	G121	Selenium, total	mg/L	< 0.001	< 0.001	< 0.04	< 0.001	< 0.001
App IV	G121	Thallium, total	mg/L	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002

SUMMARY OF ANALYTICAL RESULTS

City Water, Light and Power - Landfill Groundwater Monitoring

Springfield, Sangamon County, Illinois

List	Well ID	Parameter	Units	2023-Q4	2024-Q1	2024-Q2	2024-Q3	2024-Q4
App III	G122	Boron, total	mg/L	12	11.3	12.8	10.8	11.7
App III	G122	Calcium, total	mg/L	252	251	266	225	246
App III	G122	Chloride, total	mg/L	40	40	39	39	37.6
App III	G122	Fluoride, total	mg/L	0.16	0.13	0.14	0.14	< 0.5
App III	G122	pH	s.u.	6.7	6.56	6.64	6.8	6.64
App III	G122	Sulfate, total	mg/L	554	532	580	523	547
App III	G122	Total Dissolved Solids	mg/L	1470	1270	1340	1380	1360
App IV	G122	Antimony, total	mg/L	< 0.001	< 0.001	< 0.001	0.0029	< 0.001
App IV	G122	Arsenic, total	mg/L	0.0046	0.0028	0.0035	0.0019	0.0029
App IV	G122	Barium, total	mg/L	0.396	0.474	0.52	0.497	0.468
App IV	G122	Beryllium, total	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
App IV	G122	Cadmium, total	mg/L	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
App IV	G122	Chromium, total	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
App IV	G122	Cobalt, total	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
App IV	G122	Lead, total	mg/L	< 0.015	< 0.015	< 0.001	< 0.0075	< 0.0075
App IV	G122	Lithium	mg/L	0.0567	0.007	< 0.05	0.0082	0.007
App IV	G122	Mercury, total	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
App IV	G122	Molybdenum, total	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
App IV	G122	Radium-226	pCi/L	0.11	< 1	< 1	< 1	< 1
App IV	G122	Radium-226 + Radium-228	pCi/L	1.19	< 2	< 2	< 2	2.39
App IV	G122	Radium-228	pCi/L	1.08	< 1	< 1	< 1	2.39
App IV	G122	Selenium, total	mg/L	< 0.001	< 0.001	< 0.04	< 0.001	< 0.001
App IV	G122	Thallium, total	mg/L	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
App III	P07D	Boron, total	mg/L				5.95	5.4
App III	P07D	Calcium, total	mg/L				205	189
App III	P07D	Chloride, total	mg/L				37	32.2
App III	P07D	Fluoride, total	mg/L				0.1	< 0.5
App III	P07D	pH	s.u.				6.7	6.64
App III	P07D	Sulfate, total	mg/L				332	305
App III	P07D	Total Dissolved Solids	mg/L				1090	1020
App IV	P07D	Antimony, total	mg/L				< 0.001	< 0.001
App IV	P07D	Arsenic, total	mg/L				0.0394	0.036
App IV	P07D	Barium, total	mg/L				1	0.857
App IV	P07D	Beryllium, total	mg/L				< 0.0005	< 0.0005
App IV	P07D	Cadmium, total	mg/L				< 0.002	< 0.002
App IV	P07D	Chromium, total	mg/L				< 0.005	< 0.005
App IV	P07D	Cobalt, total	mg/L				< 0.005	< 0.005
App IV	P07D	Lead, total	mg/L				< 0.0075	< 0.0075
App IV	P07D	Lithium	mg/L				0.0085	0.0095
App IV	P07D	Mercury, total	mg/L				< 0.0002	< 0.0002
App IV	P07D	Molybdenum, total	mg/L				< 0.01	< 0.01
App IV	P07D	Radium-226	pCi/L				< 1	< 1
App IV	P07D	Radium-226 + Radium-228	pCi/L				1.36	1.34
App IV	P07D	Radium-228	pCi/L				1.36	1.34
App IV	P07D	Selenium, total	mg/L				< 0.001	< 0.001
App IV	P07D	Thallium, total	mg/L				< 0.002	< 0.002

SUMMARY OF ANALYTICAL RESULTS

City Water, Light and Power - Landfill Groundwater Monitoring

Springfield, Sangamon County, Illinois

List	Well ID	Parameter	Units	2023-Q4	2024-Q1	2024-Q2	2024-Q3	2024-Q4
App III	R101	Boron, total	mg/L	0.126	0.126	0.124	0.121	0.126
App III	R101	Calcium, total	mg/L	162	161	163	162	164
App III	R101	Chloride, total	mg/L	112	106	112	109	106
App III	R101	Fluoride, total	mg/L	0.13	0.13	0.11	0.12	< 0.5
App III	R101	pH	s.u.	6.81	6.91	6.92	6.54	6.55
App III	R101	Sulfate, total	mg/L	271	275	258	268	265
App III	R101	Total Dissolved Solids	mg/L	840	830	886	834	905
App IV	R101	Antimony, total	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
App IV	R101	Arsenic, total	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
App IV	R101	Barium, total	mg/L	0.0621	0.0302	0.023	0.035	0.0342
App IV	R101	Beryllium, total	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
App IV	R101	Cadmium, total	mg/L	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002
App IV	R101	Chromium, total	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
App IV	R101	Cobalt, total	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
App IV	R101	Lead, total	mg/L	< 0.015	< 0.015	< 0.001	< 0.0075	< 0.0075
App IV	R101	Lithium	mg/L	0.0524	0.0139	< 0.05	0.0188	0.0167
App IV	R101	Mercury, total	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
App IV	R101	Molybdenum, total	mg/L	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
App IV	R101	Radium-226	pCi/L	0.03	< 1	< 1	< 1	< 1
App IV	R101	Radium-226 + Radium-228	pCi/L	0.65	< 2	< 2	1.34	< 2
App IV	R101	Radium-228	pCi/L	0.62	< 1	< 1	1.34	< 1
App IV	R101	Selenium, total	mg/L	< 0.001	< 0.001	< 0.04	< 0.001	< 0.001
App IV	R101	Thallium, total	mg/L	< 0.002	< 0.002	< 0.002	< 0.002	< 0.002

APPENDIX D:
STATISTICAL METHOD FOR DETERMINATION OF BACKGROUNDS

City Water, Light & Power
Springfield, Illinois

Statistical Method for Determination of Background Concentrations

February 2025

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

ANDREWS ENGINEERING

3300 Ginger Creek Drive, Springfield, IL 62711 | 217.787.2334

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1. INTRODUCTION

The US Environmental Protection Agency (EPA) published the final rule for the management of Coal Combustion Residuals (CCR) on April 17, 2015. The CCR rule is formally promulgated in the U.S. Code of Federal Regulations, Title 40, Parts 257 and 261 (EPA, 2015) along with amendments to the rule published in July, 2018 (EPA, 2018) and August, 2020 (EPA, 2020). This rule is applicable to the CCR owned and operated by City Water, Light and Power (CWLP).

Pursuant to the 40 CFR §257.90(b)(1), a groundwater sampling and analysis program must be developed in accordance with 40 CFR, §257.93. The program must address the selection of statistical methods, and the selected statistical method(s) must be certified by a Qualified Professional Engineer.

1.1 OBJECTIVE AND PURPOSE

This Statistical Analysis Plan (Plan) describes the method(s) to be used in identifying a statistically significant increase (SSI) over the upgradient or background groundwater quality. This plan is an integral part of the Groundwater Monitoring Program. The Groundwater Monitoring Program contains additional information on the site-specific hydrogeology, groundwater monitoring system, sampling and analysis procedures, and reporting requirements

2. STATISTICAL METHOD

The statistical methods will evaluate if a statistically significant increase (SSI) of contaminant concentrations has occurred in groundwater samples when comparing a compliance monitoring sample analytical result with background (baseline) groundwater analytical results.

The chosen statistical methods will be in compliance with 40 CFR 257.93 and the Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance (EPA, March 2009). The primary software that will be used to conduct the statistical evaluations is the U.S.EPA's ProUCL (v. 5.2) software package. ProUCL was developed for analysis of environmental data sets with and without non-detect (ND) observations. ProUCL is a comprehensive statistical software package with statistical methods and graphical tools to address many environmental sampling and statistical issues. However, other statistical programs may be utilized as appropriate.

The requirements for statistical analysis of groundwater quality data collected under the CCR Rule are given in 40 CFR 257.93(f)-(h). The owner or operator of a CCR unit must select one of the statistical methods specified in the Section to evaluate the groundwater data. The methods include:

1. A parametric analysis of variance (ANOVA) followed by multiple comparisons procedures;
2. An ANOVA based on ranks followed by multiple comparisons procedures to identify significant evidence of contamination;
3. A tolerance or prediction interval procedure;
4. A control chart approach that gives control limits for each constituent; or
5. Another statistical test method that meets the performance standards specified by the CCR rule.

As groundwater monitoring progresses, the use of the selected statistical method will be subject to ongoing review. CWLP reserves the right to use other statistical tests in place of, or in addition to, the methods specified in this Plan if such methods are better suited for analysis of future results. Additionally, the methods in this Plan have been developed in accordance with the requirements of the CCR rule as published on April 17, 2015 (EPA, 2015), and as amended, and modifications to this Plan may occur if further revisions or amendments are made to the CCR rule. If test methods are changed this work plan will be revised, as appropriate, and its certification updated.

3. STATISTICAL ANALYSIS

Using the Unified Guidance and ProUCL, a preliminary statistical analysis was performed on the eight rounds of baseline groundwater quality data to assess the background constituent data and determine the most appropriate statistical method(s) for data analysis and comparisons. The following sections present a summary of the statistical analyses methodology.

3.1 DATA DISTRIBUTION TESTING

The pooled background data for each parameter were tested using statistical software (ProUCL v.5.2) to determine the underlying data distribution (normal, lognormal, or unknown/no discernable distribution). Data distribution testing was conducted using the Shapiro-Wilks test for datasets with less than or equal to 50 values. The data distribution tests were conducted at a 95 percent significance level.

If data were found to be normally or lognormally (test of lognormal transformed data) distributed at a 95 percent significance level, and the data contain less than or equal to 50 percent non-detects, parametric statistical methods are applied. If data were found to be not normally or lognormally distributed (unknown or no discernable distribution), or the data contain greater than 50 percent non-detects non-parametric statistical methods are applied.

3.2 OUTLIER TESTING

Prior to statistical analyses the background dataset was pooled and each parameter was screened for the existence of outliers using the Grubbs test. Outliers are defined as data points

that vary significantly from the mean value for that 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 calculated background value and minimize the occurrence of an exceedances related to a release from a waste unit. Once a statistical outlier has been identified, the concentrations are evaluated to determine the cause. If a valid reason has been determined for the outlier, the data point will be removed from the data set. If no specific reason can be documented, the point will be considered representative and included in the analysis.

3.3 HANDLING OF NON-DETECTS (ND)

Non-detect (ND) values were handled according to the percentage of non-detects (%ND) present in the background sampling. The %ND was calculated for each parameter from the pooled background data of each well set. The data treatment was done according to the following criteria:

a) For 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) was substituted for the ND value, and the mean and standard deviation were calculated using detected values along with the substituted ND values.
c) For 15-50% NDs, Kaplan-Meier was used to adjust the mean and standard deviation. The adjusted mean and standard deviation was then used to calculate the prediction limit.
d) For over 50% but not 100% NDs, the highest recorded concentration was 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 was calculated using the substituted ND values.

3.4 TOLERANCE OF PREDICTION INTERVAL PROCEDURE

The prediction limit for each parameter was calculated using the mean, standard deviation, and the appropriate t value. The statistical analysis uses a one-tailed test to determine an upper limit of significance. The upper prediction limit is the concentration for the probability that the constituent can be measured without constituting a statistical increase above the background. Any concentration found below this limit is regarded as falling within the normal statistical population.

3.5 PREDICTION LIMIT

The statistical procedure was conducted according to the following steps:

a) Calculate arithmetic mean - the arithmetic mean was calculated using the pooled data for each parameter.

The arithmetic mean (X_b) was calculated using the following equation:

$$X_b = \frac{X_1 + X_2 + ... + X_n}{n}$$

where: X_b = Mean background value
X_n = Individual background value for *n* sample
n = Number of background values

b) Calculate standard deviation - the standard deviation was calculated using the pooled data for each parameter.

The standard deviation was calculated using the following equation:

$$S_b = \sqrt{\frac{(X_1 - X_b)^2 + (X_2 - X_b)^2 + \cdots + (X_n - X_b)^2}{n - 1}}$$

where: S_b = Population standard deviation
X_n = Individual background value for *n* sample
X_b = Mean background value (1)
n = Number of background samples

c) Calculate the Upper Prediction Limit - the Upper Prediction Limit was calculated for each parameter using the mean (1), the standard deviation (2), the number of background samples, and the Student's t value.

The Student's t value σ, is determined by the facility permit whether it is σ = 0.05 (95% Confidence). The Student's t value also varies upon the number of background samples utilized in the calculations. For those parameters with 15% to 50% NDs, the Cohen Method was utilized to calculate the Prediction Limit. The methodology described in the Unified Guidance was used to calculate the Cohen Prediction Limit. The Upper Prediction Limit for the remaining parameters was calculated using the following equation:

$$PL = X_b \pm S_b \bullet t \bullet \sqrt{1 + \frac{1}{n}}$$

where: PL = Upper Prediction Limit (Upper and Lower for pH)
X_b = Mean background value (1)
S_b = Standard Deviation (2)
t = Student's t value at 0.05 significance
n = Number of background samples

4. REFERENCES

Andrews Engineering, Inc., 2025. Groundwater Monitoring Program, City Water, Light and Power, CCR Ash Impoundments, Springfield, Illinois.

Code of Federal Regulations (CFR), Title 40: Protection of the Environment. Part 257: Criteria for Classification of Solid Waste Disposal Facilities and Practices. Subpart D: Standards for the Disposal of Coal Combustion Residuals in Landfills and Surface Impoundments.

USEPA. 2009. Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities – Unified Guidance. EPA 530/R-09-007. March 2009.

USEPA. 2022. ProUCL: Statistical Software for Environmental Applications for Data Sets with and without Non-detect Observations. Version 5.2. https://www.epa.gov/land-research/proucl-software.

5. ENGINEERING CERTIFICATION

The owner or operator of a coal combustion residual (CCR) unit must obtain a certification from a qualified professional engineer that the selected statistical method is appropriate for evaluating the groundwater monitoring data for the CCR management area pursuant to 40 C.F.R. § 257.93(f)(6).

The engineering certification for the selected statistical method follows.

Professional Engineer Certification – Statistical Analysis Plan

40 CFR § 257.93(f)(6) Statistical Method Certification

In accordance with Title 40 Code of Federal Regulations (40 CFR) Part 257, Subpart D, Section 257.93(f)(6), the owner or operator of a coal combustion residual (CCR) unit must obtain a certification from a qualified professional engineer that the selected statistical method is appropriate for evaluating the groundwater monitoring data for the CCR management area.

This certification is based on the description of the statistical methods selected to evaluate groundwater as presented in the Statistical Analysis Plan, prepared for City Water, Light, and Power, and dated February 6, 2024. The procedures described in the plan will be used to establish background conditions and implement detection, assessment, and corrective action monitoring as necessary and required by 40 CFR §257.93-257.95. The Statistical Analysis Plan was prepared in accordance with the requirements of 40 CFR §257.93, with reference to the acceptable statistical procedures provided in USEPA's Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities, Unified Guidance (March 2009), and is intended to provide a logical process and framework for conducting the statistical analysis of the data obtained during groundwater monitoring. In accordance with 40 CFR §257.93(f), the statistical method chosen for analysis of groundwater monitoring data will initially be the prediction interval procedure or control chart approach for each Appendix III constituent, and either the tolerance interval or the prediction interval procedure for each Appendix IV constituent at this CCR unit per 40 CFR §257.93(f)(3), in which the interval is established from the background data and compared to the level of each Appendix III constituent in each compliance well, or a confidence interval for each Appendix IV constituent in each compliance well.

I, Karl W. Finke, a qualified professional engineer in good standing in the State of Illinois, certify that the statistical methods described in this document, as supported by the Statistical Analysis Plan in the facility's Operating Record, are appropriate for evaluating the groundwater monitoring data for the CCR management area.

Signature: Karl W. Finke

Illinois P.E. No: 062.068571

Date: 02/21/25

APPENDIX E:
GROUNDWATER SAMPLING AND ANALYSIS PROCEDURES

City Water, Light & Power
Springfield, Illinois

Groundwater Sampling and Analysis Procedures

February 2025

Prepared for:
City Water, Light & Power
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ATTACHMENTS

1. INTRODUCTION

This Groundwater Sampling and Analysis Procedures (SAP) describes the methods and procedures to be used for conducting groundwater monitoring at the City Water, Light and Power (CWLP) CCR Units. This SAP is subject to periodic revision as circumstances and/or new regulations dictate. Revisions to the SAP must be approved by a qualified professional engineer before placed in effect. The most up-to-date version of the SAP shall be kept in the Operating Records for use by CWLP and subcontractor personnel.

1.1 OBJECTIVE AND PURPOSE

The objective of the groundwater monitoring program is to provide analytical data for groundwater collected from monitoring wells as required by the CCR Rule (40 CFR §257.90-257.98). The SAP describes the procedures and techniques associated with the following:

- Pre-field activities,
- Record keeping and chain-of-custody,
- Well assessment prior to purging,
- Groundwater sampling procedures,
- Decontamination and waste management,
- Sample packing and shipping,
- Analytical procedures, and
- Quality assurance.

The purpose of the sampling protocol described herein is to provide the basis for sampling consistency and scientific credibility in obtaining the desired analyses. Groundwater sampling will be conducted in general accordance with applicable procedures established in the RCRA Groundwater Monitoring: Technical Enforcement Guidance Document (TEGD) (EPA 530-R-93 001, November 1992 and subsequent updates).

2. PRE-FIELD ACTIVITIES

At the beginning of each groundwater monitoring event, the necessary field equipment will be obtained. Sampling equipment that may be needed for collecting representative sample of groundwater are:

- Temperature, pH, specific conductivity, dissolved oxygen, oxidation-reduction potential, and turbidity meters or multi-meter (2)
- Low flow or Micropurge bladder pumps
- Peristaltic pumps (2)
- Submersible pump (1), with flow controller
- Disposable bailers with spool of clean rope

- 100-foot Water level indicator probe (2)
- 3/16” (I.D.) silicon tubing (initial installation) for use with peristaltic pump.
  - Note – Have 5 feet on hand in case tubing replacement needed.
- 0.17” (I.D.) LDPE tubing (initial installation) for use with peristaltic pump.
  - Note – Have 200 – 300 feet on hand for in case tubing replacement needed.
- 3/8” (I.D.) LDPE tubing (initial installation) for use with peristaltic pump.
  - Note – Have 200 – 300 feet on hand for in case tubing replacement needed.
- Field logbooks (2), clipboards (2), black ink pens/pencils
- Powder-free nitrile gloves
- Graduated 5-gallon bucket (2)
- One sampling bottle kit per well, plus QA/QC samples, and extras in case of breakage
- Sample bottle labels, custody seals, and chain-of-custodies
- Waterproof marking pen for labeling sample bottles (pre-labeling of bottles is preferred)
- Sample coolers
- Ice for each cooler
- Distilled or de-ionized water – five gallons (quantity may vary)Scrub brush (or sponge) and spray wash bottles
- Phosphate–free cleaner (e.g., Liquinox)
- Box of large plastic garbage bags and paper towel rolls
- 5-gallon buckets with lids (8), for temporarily containerizing purge water and submersible pump decontamination, if necessary

Sampling personnel (CWLP personnel and/or subcontractors) must comply with all safety and health guidelines for the facility.

The levels of personal protective equipment (PPE) to be used for work tasks will be selected based on known or anticipated physical hazards, as well as the types, concentrations and exposure routes of contaminants that may be encountered on site. Currently, it is anticipated that work will be initially conducted in Level D PPE.

3. RECORD KEEPING AND CHAIN OF CUSTODY

This section of the SAP provides information on field recording, field instrument calibration and chain of custody procedures.

3.1 FIELD RECORDING

Documentation of activities associated with groundwater monitoring events will be recorded each day in a bound field logbook with hard cover, water resistant paper, and sequentially numbered pages. Documentation will be completed in waterproof, black or blue ink and written errors will be crossed out with a single line, initialed, and dated. The logbooks will remain on-site during use

and then will be stored off-site. Entries in the logbook will be chronological and will include, where applicable and appropriate, such information as the following:

- Date and times,
- Locations of particular events,
- Instrument calibrations,
- Weather (temperature and wind direction) and significant changes in climatic conditions that may affect monitoring activities or results, and
- Other information/observations pertinent to the well inspection, well gauging, and sampling event.

Each page of the field logbook will be signed by the person(s) making entries in the logbook.

Three separate field report forms have been developed as an extension to the field logbook. These include the following:

- Monitoring Well Inspection Record (Form 1),
- Monitoring Well Gauging Record (Form 2), and
- Monitoring Well Sampling Record (Form 3).

These forms (or equivalent) may be used for recording water level data, well purging volumes, and sampling data. The field report forms or logbook may include, but not be limited to the following:

- Names of members of the gauging or sampling team,
- Date and time,
- Specific activity being performed,
- Well identification,
- Sample identification number,
- Sample volume,
- Sampling method,
- Preservative type,
- Analyses to be performed, and
- Measured field water quality parameters and readings (when applicable).

3.2 FIELD INSTRUMENT CALIBRATION

The following meters/probes may be used to analyze groundwater samples in the field:

- Temperature and pH,
- Specific conductance (SC),
- Oxidation-reduction potential (ORP),

- Dissolved oxygen (DO), and
- Turbidity

The quality of data generated by these measurements will be verified through qualitative means, such as regular calibrations, compliance with operating instructions, and decontamination between uses. A calibration procedure establishes the relationship between a known calibration standard and the accuracy of a measurement made by an instrument according to that standard. Calibration indicates absolute physical or electronic calibration and is not to be confused with chemical standardization.

The calibration for field monitoring equipment will be checked in accordance with manufacturer's specifications, but at least daily. Instrument calibration may be checked prior to entering the site or in the field prior to use. The time, date and location of instrument calibration and verification will be recorded in the field data sheet or logbook. If an instrument is out of calibration, then the calibration will be performed as needed.

3.3 CHAIN-OF-CUSTODY

Possession of samples will be traceable from the time of sample collection through check-in at the laboratory. Documentation begins immediately following sample collection and proper labeling and is accomplished using a standard chain-of-custody form. This document traces possession of each sample from the time of collection through time of analysis. For the purpose of these procedures, a sample is considered in custody if it is:

- In sampler's physical possession;
- In view, after being in physical possession;
- Locked to prevent tampering, after having been in physical possession; or
- In a secured area, restricted to authorized personnel.

The chain-of-custody form contains the following information:

- Project number, site name, and company address;
- Number of samples;
- Preservatives used for sample collection;
- Sample description (e.g., water, etc.);
- Sample ID number;
- Date and time of sample collection;
- Number of containers for the sample;
- Name of sampler responsible for sample transmittal;
- Signatures of all persons involved in the chain-of-custody;
- Type of analysis requested;
- Requested turnaround time and level of quality control documentation; and
- Pertinent comments about sample or sample conditions.

This information is entered onto the chain-of-custody form. Upon receipt of samples, the analytical laboratory will initiate its own chain-of-custody procedures. The sampler shall be responsible for properly packaging and dispatching samples to the analytical laboratory. When transferring samples, the sampler shall sign and record the date and time on the first Relinquished By line on the chain-of-custody form. The person to whom custody is being transferred shall sign on the first Accepted By line of the chain-of-custody form, indicating that custody is being accepted by that person for all the samples listed on the sheet. When samples are shipped via courier, the chain-of-custody form is attached to the inside of the shipping container and the shipping container is sealed using tape. For subsequent transfers of custody, the succeeding Relinquish and Receipt lines are used. To reduce custody records, the number of custodians in the chain-of-custody is minimized.

The following record keeping items will supplement the chain-of-custody form:

- Field Logbook,
- Monitoring Well Sampling Record, and
- Sample Receipt Checklist (typically provided by the laboratory).

4. WELL ASSESSMENT PRIOR TO PURGING

This section of the SAP provides information about inspecting monitoring wells, gauging fluid levels, and weather conditions. To reduce potential cross contamination during fluid level measurements, one of the following two options are recommended:

1. Activities begin at the upgradient wells and then proceed to downgradient wells, with water that is potentially affected; or
2. Each well sampling team carries dedicated well gauging equipment (one set for potentially affected wells and one set for non-affected wells). The determination as to which equipment is used at a particular well should be based on historical data.

As required, PPE will be worn at all times during the performance of the described procedures.

4.1 MONITORING WELL INSPECTION

The sampling team shall perform a visual inspection of each monitoring well and record the results in the field logbook or on a Monitoring Well Inspection Record (Form 1). The inspection of each well will include the following:

- Inspecting the casing and cap for cracks, signs of deterioration, or tampering;
- Verifying the identification information on the well is correct and clearly visible;
- Determining whether the cap and monitoring well are secure (via locks, bolted vault covers, in addition to general facility security);

- Inspecting the well pad for cracks, signs of deterioration, erosion, settling, and/or animal and insect burrowing; and
- Where appropriate, inspecting any dedicated equipment for signs of cleanliness, structural integrity, and deterioration.

4.2 WATER LEVEL AND TOTAL DEPTH INFORMATION

The depth to groundwater (DTW) in each well will be measured at the beginning of each sampling event before undertaking any purging or sampling activities and will be recorded in the field log book or on a Monitoring Well Gauging Record (Form 2). The distance from the designated measuring point at the top-of-casing (TOC) to the water surface will be measured to the nearest 0.01-foot with an electric water level indicator. The DTW measurements will be taken from the TOC on the true north side of the well.

Total well depth measurements will be periodically obtained to determine the occurrence of siltation. The total well depth will be measured after the samples are taken to avoid unnecessary disturbance of the water column prior to sampling. Total well depths will be obtained for each sampling event for wells that are sampled by bailers or non-dedicated pumps. Total depth measurements will be obtained on an annual basis for wells that contain dedicated pumps. Total well depth measurements will be required in the event a well is damaged or modified (casing lowered or extended).

Total well depth will be measured by allowing the probe to drop to the bottom of the well and determining the depth where the tape becomes slack. The reading will be recorded to the nearest 0.01-foot. These measurements will be compared with previous measurements and the original well depth to determine if sediment has accumulated within the screened interval, (i.e., "silted in"). Wells which have sediment in the screened interval will be redeveloped.

In addition to the collection of groundwater elevation measurements at each of the groundwater monitoring wells and piezometers, surface water elevations in the adjacent surface water bodies will be collected each time groundwater elevations are measured. These surface water bodies include the following – Lake Springfield, Sugar Creek and the Clarification Pond. Historically, the Lakeside Ash Pond and the Dallman Ash Pond have exhibited the presence of surface water. However, as of October 13, 2023, all CCR and non-CCR waste streams ceased flowing into the Lakeside Ash Pond and Dallman Ash Pond and the surface water levels have significantly declined. At present, rainwater is the only water entering the CCR surface impoundments.

See Section 9.0 for equipment decontamination procedures, investigation-derived waste (IDW) management, and IDW sampling.

4.3 WEATHER CONDITIONS

Weather conditions at the time of gauging/sampling activities (e.g., precipitation, temperature, wind speed and direction) will be recorded in the field logbook or the Monitoring Well Sampling Record (Form 3).

5. GROUNDWATER SAMPLING PROCEDURES

This section of the SAP provides information about purging and sampling groundwater collected from monitoring wells. Micropurging will be the preferred method of sampling for all the monitoring wells at CWLP CCR unit groundwater monitoring wells.

As required, PPE will be worn at all times during the performance of the described procedures.

5.1 MICROPURGING OF WELLS

To establish a common point of reference, low-flow refers to the flow rate at which water enters the pump intake and is the rate that is imparted to the formation pore water in the immediate vicinity of the well screen. The pump intake should be set:

1. Just above the mid-point of the screened interval if the transmissive zone is thicker than the screened section and the water column is at or above the top of the screen; or
2. Mid-point of the transmissive interval when the screened section is greater than the thickness of transmissive zone.

Water level drawdown provides the best indication of the stress (drawdown) imparted by a given flow rate for a given hydrogeological situation. Flow rates during low-flow purging will be used to regulate drawdown to less than 0.1 meter (0.3 feet). While these flow rates will typically range between 0.1 to 0.5 liter/minute (L/min), the flow rate for an individual well may vary due to site-specific hydrogeology. For example, sand channel lenses may support flow rates of up to 1 L/min without causing drawdown greater than 0.3 feet. Alternatively, wells that screen clayey, silty layers may not produce groundwater at 0.1 L/min without having drawdown greater than 0.3 feet.

For monitoring wells with low water productivity that have drawdown greater than 0.3 feet, there are two possible situations:

- Drawdown is greater than 0.3 feet, but stabilizes at a level above the pump intake; or
- Drawdown continues to occur even at the slowest possible pumping rate.

For these situations, the following purging and sampling procedures will be followed and documented on the sampling record.

- If drawdown is greater than 0.3 feet, but stabilizes at a level above the pump intake; record water levels in well and continue to monitoring water quality indicator parameters until

those stabilize. Collect groundwater sample upon stabilization of water quality indicator parameters.

- If at the slowest possible pumping rate drawdown is greater than 0.3 feet and continues to drop pumping shall be halted when the water level reaches the middle of the screened interval at which time the water level shall be allowed recover to a minimum of 80% of the original water level before collecting a groundwater sample using the slowest possible pumping rate. If the water level drops to the bottom of the screened section before all sample bottles have been filled, allow the well to recovery to a minimum of 80% of the original water level before continuing to fill the remaining sample bottles. If possible, the well should be sampled no more than 24 hours after the completion of purging, regardless of the recovery.

Groundwater samples will be collected from the monitoring wells using the following low-flow (micropurge) procedures.

- Non-submersible peristaltic pump – Where DTW is less than 29 ft the well may be purged and sampled using a non-submersible a peristaltic pump. To purge and sample the well, insert clean disposable polyethylene tubing into the well casing with the intake placed at the appropriate depth discussed above. Remember to include enough slack in tubing to allow for drawdown of the water level to the bottom of screen. Silicon tubing will be connected to the polyethylene tubing and threaded through the pumping apparatus on the peristaltic pump.
- Submersible pump – Where DTW is greater than 29 ft the well may be purged and sampled using a submersible pump. To purge and sample the well, the submersible pump should be fitted with clean disposable polyethylene tubing and the tubing inserted into the well with the intake placed at the appropriate depth discussed above.
- If dedicated polyethylene and silicon tubing were utilized and left in the monitoring well from a previous groundwater sampling event, skip the first two bullets above. Before sampling, check tubing for any damage and replace as necessary using the above mentioned methodology.
- The selected pump will be used to purge groundwater at a low-flow rate, generally less than approximately 0.5 L/min (100-500 milliliter/min).
- The well should be pumped at a sustainable flow rate to allow the lowest drawdown of water level (see above) until water quality parameters stabilize or the water level drops below the bottom of the screened interval.
- Groundwater quality indicator parameters will be monitored during low-flow purging to determine stabilization. The water quality indicator parameters to be monitored and their stability criteria are identified on the Monitoring Well Sampling Record (Form 3).

Measurements of water quality indicator parameters will be recorded every 3 to 5 minutes until stabilization is achieved. These measurements, along with flow rate and depth to water, will be

recorded be recorded in the field log book or on a Monitoring Well Sampling Record (Form 3). Stabilization is achieved when at least 3 of the 5 parameters have stabilized for three successive readings. If the minimum three water quality indicator parameters do not stabilize within 45 minutes of low-flow purging, a groundwater analytical sample will be collected from the well. For the purposes of sample turbidity, if a turbidity less than 10 nephelometric (NTUs) cannot be achieved, then a secondary backup criteria be set at less than 10% change between the final three is acceptable.

See Section 9.0 for equipment decontamination procedures, IDW management, and IDW sampling.

5.2 SAMPLE COLLECTION

Groundwater will be collected from the well and transferred to the appropriate sampling containers in a manner that reduces the amount of exposure to the ambient environment. The sequence of sample collection will be as follows:

- Metals,
- Water Chemistry (cations, anions, TDS, pH, etc.), and
- Radioactive elements (if required).

All samples will be collected in clean, laboratory-supplied sample containers with the appropriate preservative for the analytical method.

Metals analysis will measure total recoverable metals, which captures both particulate and dissolved fractions. Groundwater samples will not be field filtered prior to analysis. Samples will be collected and analyzed for constituents identified in a given groundwater monitoring program's list of analytes. Any required preservatives will be added to the bottles by the laboratory prior to delivery to the sampling personnel.

A sample label will be affixed to each sample container. Complete the label on each sample container with the typical information:

- Project name,
- Sample identification (well ID),
- Date and time of collection,
- Sample type, requested analysis,
- Type of preservative (if any), and
- Sampler's initials.

Sampler shall record the sample ID, sampling procedure, date, and time of sample collection on the Monitoring Well Sampling Record (Form 3) or field log book. Sampler shall record the sample ID (well ID), time and date of collection, sample media, and specified analyses to be conducted

by the laboratory, if not already provided, on the chain-of-custody record. See Section 3.3 for details on sample custody information.

Sampler shall check that the sample container caps are tight; then place the filled sample containers into a sample cooler containing bagged ice in a manner to prevent breakage. The cooler will be packed with sufficient ice to maintain the proper preservation temperature. See Section 6.0 for details on sample packing and shipment.

After sampling is completed at a particular well, the tubing will be removed from the well and placed in an appropriate disposal container (See Section 9.0). The well will be secured before proceeding to the next well.

See Section 9.0 for equipment decontamination procedures, IDW management, and IDW sampling.

5.3 QUALITY CONTROL SAMPLING

Quality control (QC) and quality assurance (QA) samples will be collected and analyzed along with monitoring well samples to assess the variability introduced in sampling, handling, shipping, and analysis. The analytical program for the QC samples will follow the analytical program for the associated investigative samples. The following sample types will be collected.

- Blind Duplicate - One duplicate sample will be collected at each CCR Unit for each sampling event; a total of three blind duplicates will be collected per event. The blind duplicate will be analyzed for identical parameters as the monitoring well samples. The duplicate sample(s) will be collected from randomly selected wells; and will be labeled with an appropriate identification number other than the well number. The sample bottles for regular and duplicate analysis will be filled in alternate succession for each required analysis (e.g. fill the metals sample container, then the metals duplicate container). The identification number will be recorded in the field log book, or in a separate Monitoring Well Sampling Record (Form 3).
- Matrix Spike/Matrix Spike Duplicates (MS/MSDs) – One MS/MSD will be collected during each sampling event to test the potential effects of matrix interference on the laboratory results. To reduce the possible adverse impact to the laboratory equipment, wells selected for the MS/MSD samples will be those that historically have shown low or non-detect constituent concentrations (to the extent practical). The sample is collected as a triplicate (the original sample plus two additional sets). The matrix spike sample will be labeled with the well number followed by an “MS”. Similarly, the matrix spike duplicate will be labeled with the well number followed by “MSD”.
- Field Blank - One field blank sample will be collected for each sampling event. Field blank samples provide information about potential contamination of the samples during exposure to ambient conditions at the site during sample collection. Field blanks will be

prepared at a specified well site by pouring commercially-available distilled water into sample bottles and vials in the same quantities as the groundwater samples. The samples should be labeled appropriately and stored in the same manner as the groundwater samples.

- Equipment Blank – An equipment blank sample will be collected during the groundwater sampling event only if non-dedicated sampling equipment is used. After the non-dedicated equipment has been cleaned and rinsed (see Section 9.0 for decontamination procedures), distilled water will be passed over (e.g., poured over) the decontaminated equipment and the water will be collected in appropriate sample containers. The equipment blanks will be analyzed for the same suite of parameters as the monitoring well samples. Equipment blanks will not be collected if dedicated equipment is used for sample collection.

6. SAMPLE PACKING AND SHIPPING

Samples for chemical analyses will be placed into the correct laboratory-supplied sample containers, labeled appropriately, and immediately placed in a cooler with ice. The field sampler will document the appropriate information on the chain-of-custody form (see Section 3.3 for details). Prior to packing coolers and shipping to the laboratory, the outside surfaces of the sample containers will be cleaned if necessary (by wiping carefully with a paper towel) and repacked in the cooler. Sample containers will not be opened after they have been sealed. The containers will be placed inside a sealed plastic Ziploc-style bag and will then be placed in coolers containing sufficient ice (or packs of frozen gel) to maintain a sample temperature of approximately 4° C. Sample coolers should be lined with a new, large plastic trash bag to reduce the potential of melt water leaks. Care must be taken to avoid leakage of water from melted ice because overnight delivery service (e.g., FedEx) will not accept leaking coolers.

The sampler will be responsible for properly packaging and dispatching samples to the analytical laboratory. This responsibility includes using the proper shipping container, shipping labels, shipping papers, and filling out, dating, and signing the appropriate portion of the chain-of-custody form. Samples will be packed with cushioning material sufficient to reduce the potential for breakage of glass sample containers during transport. The chain-of-custody form will be placed inside a sealed plastic Ziploc-style bag and the bag placed inside the cooler on top of the cushioning material.

If a laboratory with a local or nearby field-service center is contracted to perform analytical services, samples and coolers will be transported directly to the laboratory service-center or to a secure drop-off location by field personnel on the same day as sampling. The insulated coolers containing groundwater samples will be delivered to or picked-up by the laboratory and signed over to the laboratory personnel in accordance with chain of custody procedures for storage and analysis.

If a distant laboratory is contracted to perform analytical services, then samples and coolers will be shipped via overnight delivery service (e.g., FedEx). Shipments will be accompanied by the chain-of-custody form and it will be sealed in an airtight, resealable plastic bag inside the cooler. The cooler will be taped shut with clear packaging tape and a tamper-evident custody seal will be attached across the lid. This seal will only be broken by the recipient at the laboratory.

7. ANALYTICAL PROCEDURES

Groundwater samples collected under the Detection Monitoring Program will be analyzed for the constituents in Appendix III to Part 257, including boron, calcium, chloride, fluoride, pH, sulfate, and total dissolved solids (TDS). Groundwater samples collected under the Assessment Monitoring Program will be analyzed for the constituents listed in Appendix III to Part 257, including boron, calcium, chloride, fluoride, pH, sulfate, and total dissolved solids (TDS) and for the constituents listed in Appendix IV to Part 257 including antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, fluoride, lead, lithium, mercury, molybdenum, selenium, thallium and radium 226 & 228 combined. IDW samples (further described in Section 9.0) will be analyzed for the constituents specified in Table. A NELAC-accredited laboratory will perform the groundwater analyses.

Groundwater analyses will be performed in accordance with the most recent edition of Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (EPA SW 846), ASTM Standard Test Methods, or other EPA-approved methods. Detection limits will be those recommended for the procedure and analytical instrument specified.

8. QUALITY ASSURANCE

This section briefly summarizes the quality assurance measures during field and laboratory activities associated with groundwater monitoring.

8.1 FIELD QUALITY ASSURANCE

Sample collection will be conducted according to the procedures outlined in Section 5.2. These procedures are designed to minimize potential sources of contamination and include the following key elements:

- Using dedicated or disposable tubing for each well to reduce the potential for cross-contamination between wells.
- Completing purging using low-flow (micropurge) sampling techniques. If the screened water-bearing unit has low hydraulic conductivity that results in drawdown greater than the guidelines for low-flow sampling, the well should be allowed to recover to at least 80 percent of the static water level prior to sampling.

- Using duplicates, matrix spikes, matrix spike duplicates, field blanks, and equipment blank samples to assess potential cross-contamination during sample collection, transport, and analysis as well as providing a check on the data quality from the laboratory (see Section 5.3).
- Handling samples, preservatives, and sample containers carefully to minimize exposure time and potential for evaporative loss and/or airborne contamination.
- Using containerized ice whenever possible to maintain 4°C sample temperatures during transit and cushioning materials to minimize breakage.

8.2 LABORATORY QUALITY ASSURANCE

The laboratory documentation system will comply with the requirements of the USEPA analytical protocols, as appropriate. The laboratory will perform internal QC checks for the analytical method. Depending on the analytical method, the QC checks may include analyzing sample spikes, surrogate spikes, reference samples, laboratory control samples, storage blanks, and/or method blanks.

The laboratory will document internally that instrument and analytical QC criteria have been met. The data package will contain all of the information required to evaluate compliance with the analytical methods' required and recommended QC checks, instrument tuning, calibration, and sample analysis. If errors or deficiencies are identified in an analytical system, corrective actions are implemented to return the system to normal operation.

8.3 DATA REVIEW AND EVALUATION

A data validation will be performed to assess whether the dataset meet the project requirements in terms of following the appropriate analytical methods, sample locations, and sampling procedures. All sample collection procedures and laboratory reports will be reviewed to verify that the field and laboratory QA/QC requirements have been met.

The final reportable data, laboratory checklist, associated exception report(s), laboratory quality control data, and chain-of-custody will be reviewed in accordance with applicable EPA guidance, including, but not limited to the National Functional Guidelines for Inorganic Superfund Data Review (EPA 540-R-013-001), August 2014. Data precision and accuracy will be assessed based on control limits of 70-130% for laboratory control samples (except for antimony which will be assessed based on control limits of 50-150%) and 75-125% for spike sample analysis. A control limit of 20% for the relative percent difference (RPD) shall be used for original and duplicate sample values.

9. DECONTAMINATION AND WASTE MANAGEMENT

This section of the SAP provides information about equipment cleaning procedures and management of IDW during monitoring events.

9.1 EQUIPMENT DECONTAMINATION PROCEDURES

The decontamination of sampling equipment is necessary to reduce the potential for the spread of constituents to clean areas, to reduce exposure of personnel to constituents of concern, and to reduce the potential cross-contamination when equipment is used more than once. The water level indicator will be rinsed with deionized water between wells, or cleaned with Alconox® or other equivalent solution and rinsed with deionized water as necessary.

To reduce the potential for cross-contamination between monitoring wells during purging and sampling, well-dedicated or disposable equipment will be used to the extent practical. If non-dedicated pumps, discharge, and safety lines are used at a well, such equipment will be washed with non-phosphate detergent and distilled water solution, then rinsed with distilled water.

9.2 MANAGEMENT OF INVESTIGATION-DERIVED WASTE

Common IDW from the groundwater sampling events are purge water, decontamination water, and trash (i.e., non-reusable plastic tubing, nitrile gloves, paper towels, etc.).

Well purge water will be discarded on the ground away from the well. Collection of purge water is not necessary. Collection of decontamination water is not necessary either and should be discarded in the same manner as the purge water.

Disposable equipment and supplies (i.e., domestic trash) will be placed in heavy duty plastic bags and the full bags placed in facility-designated receptacles. If it becomes necessary to place affected materials in a 55-gallon DOT-approved drum(s), then the drums will be labeled and secured. Further management of the drums and containerized waste will be handled by CWLP. Disposal may also occur at other receptacles managed by CWLP.

ATTACHMENT 1:
MONITORING WELL FORMS

FORM 1:
MONITORING WELL GAUGING RECORD

FORM 1

MONITORING WELL GAUGING RECORD
Groundwater Monitoring Program
City Water, Light, and Power
Springfield, Illinois

PROJECT INFORMATION
City Water, Light and Power
Springfield, Illinois
CCR Unit Groundwater Monitoring
Sampler(s):
Date:
Weather Conditions:

GAUGING RECORD
Measuring Pont: Top of Casing
Instrument ID:

Well ID	Depth To Water (ft)	Total Depth (ft)	Notes

FORM 2:
MONITORING WELL INSPECTION RECORD

FORM 2

MONITORING WELL INSPECTION RECORD
Groundwater Monitoring Program
City Water, Light, and Power
Springfield, Illinois

PROJECT INFORMATION	
City Water, Light and Power	
Springfield, Illinois	
CCR Unit Groundwater Monitoring	
Sampler:	Signature:
Company:	Date/Time:
WELL ID	
Stick-Up: ☐	
Flush-Mounted ☐	
Is the well site clear of weeds and debris? Comment:	Yes No
Has the grass been mowed? Comment:	Yes No
Are there bollards or protective barriers around the well? Comment:	Yes No
Is the well identification clearly visible and in good condition? Comment:	Yes No
Is the protective casing or vault in good condition? Comment:	Yes No
Is the protective casing (or vault) equipped with a protective cap? Comment:	Yes No
Does the well have a concrete pad? Comment:	Yes No
If yes, what is the condition of the pad? Comment:	Good Cracked Broken
What is the condition of the inner casing? Comment:	Good Cracked Broken
Does the inner casing have a cap? Comment:	Yes No
Is the well locked? Comment:	Yes No
If yes, what is the condition of the lock? Comment:	Yes No
Is the annulus between the inner and outer casing free of standing water? Comment:	Yes No
Is the survey measuring point marked on the TOC? Comment:	Yes No
Expected Depth of Well:	
Measured Depth of Well:	
General Observations:	

FORM 3:
MONITORING WELL SAMPLING RECORD

FORM 3

MONITORING WELL SAMPLING RECORD
Groundwater Monitoring Program
City Water, Light, and Power
Springfield, Illinois

PROJECT INFORMATION
City Water, Light and Power
Springfield, Illinois
CCR Unit Groundwater Monitoring
Well ID:
Well Diameter:
Sampler(s):
Date:
Weather Conditions:

INITIAL MEASUREMENT	
Measuring Pont: Top of Casing	Water Column Ht. (H1=D2-D1):
Measuring Point Elevation:	Max. Drawdown (D1+0.33 ft):
Depth to Water (D1):	DTW at 80% Rec. (D2-(0.8xH1):
Total Well Depth (D2):	Tubing Intake Depth:

PURGING RECORD								
Purge Method:				Instrument ID:				
Time (Hr:Mn)	**Pump Rate (mL/min)**	**DTW (ft below TOC)**	**Temp (°C)**	**pH (Std Units)**	**ORP (mV)**	**SC (mS/cm2)**	**DO (mg/L)**	**Turbidity (NTU)**
Stabilization Criteria		± 0.3 ft	-	± 0.1 Units	± 10 mV	± 3%	± 10%	± 10%
				Total groundwater purged (gallons):				

SAMPLING RECORD		
Analysis Requested	Container/Preservative	Sample Date/Time:
		Sampling Remarks:

NOTE: For the purposes of sample turbidity, if a turbidity less than 10 nephelometric turbidity units (NTUs) cannot be achieved, then a secondary, backup criteria be set at less than 10% change between the final three is acceptable.