KENVIRONS

SPURLOCK STATION – PEGS HILL LANDFILL

LOCATION RESTRICTIONS & DESIGN CRITERIA COMPLIANCE DEMONSTRATION

EAST KENTUCKY
POWER COOPERATIVE

EAST KENTUCKY POWER COOPERATIVE

COAL COMBUSTION RESIDUAL RULE COMPLIANCE

REV. 0 (7/272017)

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Civil & Environmental Engineering and Laboratory Services • Visit us at www.Kenvirons.com

CERTIFICATION

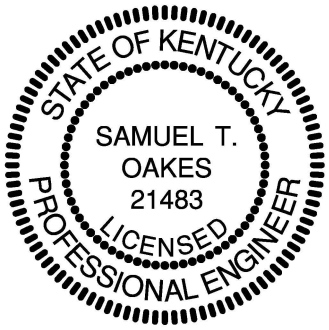
EAST KENTUCKY POWER COOPERATIVE
SPURLOCK STATION – PEGS HILL LANDFILL
LOCATION RESTRICTIONS & DESIGN CRITERIA COMPLIANCE DEMONSTRATION

CERTIFICATION

I hereby certify, as a Professional Engineer in the Commonwealth of Kentucky, that the new Peg's Hill CCR Landfill at East Kentucky Power Cooperative's Spurlock Station has been sited and designed to meet the requirements of the following provisions of the CCR Rule: 40 CFR §§ 257.60 (placement above the uppermost aquifer); 257.61 (wetlands); 257.62 (fault areas); 257.63 (seismic impact zones); 257.64 (unstable areas); and 257.70 (design criteria for new CCR landfills and any lateral expansion of a CCR landfill).

I further certify that the information in this document was assembled under my direct supervisory control. This report is not intended or represented to be suitable for reuse by East Kentucky Power Cooperative or others without specific verification or adaptation by the Engineer.

S. Tim Oakes, P.E. [21,483] – Kenvirons, Inc.



Date: 7/27/17

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1.0 INTRODUCTION

On April 17, 2015, the Environmental Protection Agency (EPA) issued the final version of the federal Coal Combustion Residual Rule (CCR Rule) to regulate the disposal of coal combustion residual (CCR) materials generated at coal-fired units. The rule will be administered as part of the Resource Conservation and Recovery Act [RCRA, 42 United States Code (U.S.C.) §6901 et seq.], under Subtitle D.

East Kentucky Power Cooperative (EKPC) is subject to the CCR Rule and as such will demonstrate compliance with location restrictions per 40 Code of Federal Regulations (CFR) §257.60 through §257.64 and design criteria per 40 CFR §257.70. This document serves as EKPC's location restriction and design criteria demonstration for Peg's Hill CCR Landfill at Spurlock Station. This unit is a New CCR Landfill as defined in 40 CFR §257.53. The site plans can be found in Appendix 1.

A compliance summary of the CCR Rule location restrictions and design criteria requirements addressed in this document are provided in Table 1-1 and Table 1-2 below.

TABLE 1-1 LOCATION RESTRICTIONS SUMMARY

LOCATION RESTRICTIONS			
Unit: Pegs Hill Landfill			
DESCRIPTION	**CCR RULE COMPLIANCE**		
	YES	**NO**	**REPORT REFERENCE**
Placement Above Uppermost Aquifer	☒	☐	See Section 2.1
Wetlands	☒	☐	See Section 2.2
Fault Areas	☒	☐	See Section 2.3
Seismic Impact Zones	☒	☐	See Section 2.4
Unstable Areas[1]	☒	☐	See Section 2.5

[1] Certification based on incorporation of recognized and generally accepted engineering practices to ensure integrity of the structural components of the CCR unit per 40 CFR §257.64(a).

TABLE 1-2 DESIGN CRITERIA SUMMARY

DESIGN CRITERIA			
Unit: Pegs Hill Landfill			
DESCRIPTION	**CCR RULE COMPLIANCE**		
	YES	**NO**	**REPORT REFERENCE**
Composite Liner[1]	☒	☐	See Section 3.1 through 3.5
Leachate Collection & Removal System	☒	☐	See Section 3.6

[1] Certification applicable to either of two liner options described in Section 3.1. Certification of Option 2 is based on the requirements of 40 CFR §257.70(b), and certification of Option 1 is based on the requirements for an alternative composite liner in 40 CFR §257.70(c)(1).

2.0 LOCATION RESTRICTIONS

2.1 Placement Above the Uppermost Aquifer

40 CFR §257.60(a) states that new CCR landfills "must be constructed with a base that is located no less than 1.52 meters (five feet) above the upper limit of the uppermost aquifer, or must demonstrate that there will not be an intermittent, recurring, or sustained hydraulic connection between any portion of the base of the CCR unit and the uppermost aquifer due to normal fluctuations in groundwater elevations (including the seasonal high water table)."

A hydrogeological field investigation was conducted by Stantec Consulting Services, Inc. (Stantec) in April 2011 for Pegs Hill. Based on this investigation and published regional geological information, each hollow in the area represents a separate groundwater regime, with the recharge area bounded by the top of the ridges that define the watershed. Although the centers of the ridges may be saturated, flow between the hollows is constrained due to the absence of fracture porosity. The uppermost aquifer at the site is considered to be within the weathered and fractured bedrock zone in the valley floors (natural drainage courses) underlain by shale bedrock strata. The weathered/fractured zone extends 15 to 45 feet below the bedrock surface.

The landfill subgrade (base) is designed to be no less than five feet above the seasonal high saturated zone that is situated along the weathered/fractured bedrock zone in the valley bottoms. However, if isolated saturated zones (seeps) are encountered within the vadose zone during construction of the liner system, an underdrain will be installed to capture and convey groundwater seeps outside the landfill and maintain five feet

separation between the subgrade (base) and the isolated seep flow. See Attachment 1 for the landfill subgrade (base) design grades and underdrain design details.

2.2 Wetlands

40 CFR §257.61(a) states that new CCR landfills "must not be located in wetlands, as defined in §232.2 of this chapter, unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that the CCR unit meets the requirements of paragraph (a)(1) through (5) of this section." Based on jurisdictional determinations performed by Redwing Ecological Services, Inc. on behalf of EKPC, the Peg's Hill Landfill waste boundary is not located in wetlands, as that term is defined under the CCR Rule.

2.3 Fault Areas

40 CFR §257.62(a) states that new CCR landfills "must not be located within 60 meters (200 feet) of the outermost damage zone of a fault that has had displacement in Holocene time unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that an alternative setback distance of less than 60 meters (200 feet) will prevent damage to the structural integrity of the CCR unit."

Based on mapping data obtained from the Kentucky Geologic Survey (KGS) and United States Geologic Survey (USGS), the facility will not be located within 60 meters (200 feet) of the outermost damage zone of a fault that has displaced in Holocene time. See Attachment 3 for fault mapping.

2.4 Seismic Impact Zones

40 CFR §257.63(a) states that new CCR landfills "must not be located in seismic impact zones unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that all structural components including liners, leachate collection and removal systems, and surface water control systems, are designed to resist the maximum horizontal acceleration in lithified earth material for the site."

Based on the 2008 USGS seismic mapping, the site is located in an area with a peak ground acceleration (PGA) of 0.0860 g. The definition of a seismic impact zone is as follows: "A seismic impact zone means an area having a 2% or greater probability that the maximum expected horizontal acceleration, expressed as a percentage of the earth's gravitational pull (g), will exceed 0.10 g in 50 years." 40 CFR §257.53. Based on the definition, the facility is not located within a seismic impact zone. A copy of the USGS Unified Hazard Tool with the site specific PGA value is provided in Attachment 2.

2.5 Unstable Areas

40 CFR §257.64(a) states that new CCR landfills "must not be located in an unstable area unless the owner or operator demonstrates by the dates specified in paragraph (c) of this section that recognized and generally accepted good engineering practices have been incorporated into the design of the CCR unit to ensure that the integrity of the structural components of the CCR unit will not be disrupted."

Based on a review of KGS mapping and available regional geologic information (see Attachment 3), a portion of the facility is underlain by geologic formations that are susceptible to karst topography which the CCR Rule defines as unstable areas. Site studies performed at the existing CCR landfill by S&ME – Report of Geotechnical Services, EKPC CCR Siting Exploration – Spurlock Station Ash Landfill, dated March 2, 2016 and geotechnical and hydrogeological investigations performed for the new landfill unit by Stantec in April 2011, show no evidence of karst topography at the site.

Kenvirons, Inc. has prepared the new landfill design using generally accepted good engineering practices to ensure that the integrity of the structural components of the CCR unit will not be disrupted. These practices include industry and regulatory standards specified for the design of an EPA New CCR Landfill, Kentucky Division of Waste Management (KDWM) CCR Landfill, EPA Subtitle D Landfill and KDWM Contained Landfill facility.

Construction of the new landfill liner system will be performed to meet generally accepted good engineering/construction standards through the use of a Construction Quality Assurance (CQA) Plan. The plan will be utilized to ensure, to the utmost extent possible, that the landfill is constructed to maintain its structural integrity and any unstable materials encountered during construction activities are mitigated.

Once operations begin for the new landfill, periodic inspections will be conducted to monitor the landfill for the appearance of actual or potential structural weakness.

With the combined components of design, construction quality control/assurance, and periodic operations inspections, the new Peg's Hill CCR Landfill will meet the alternative location restriction demonstration for unstable areas pursuant to the CCR Rule.

See Attachment 1 for the liner system design plans.

3.0 DESIGN CRITERIA

40 CFR §257.70(a)(1) states that new CCR landfills "must be designed, constructed, operated, and maintained with either a composite liner that meets the requirements of paragraph (b) of this section or an alternative composite liner that meets the requirements in paragraph (c) of this section, and a leachate collection and removal system that meets the requirements of paragraph (d) of this section."

3.1 Composite Liner and Alternative Composite Liner

40 CFR §257.70(b) states "A composite liner must consist of two components; the upper component consisting of, at a minimum, a 30-mil geomembrane liner (GM), and the lower component consisting of at least a two-foot layer of compacted soil with a hydraulic conductivity of no more than 1×10^{-7} centimeters per second (cm/sec). GM components consisting of high density polyethylene (HDPE) must be at least 60-mil thick. The GM or upper liner component must be installed in direct and uniform contact with the compacted soil or lower liner component."

The CCR Rule allows for new CCR landfills to utilize an alternative composite liner. 40 CFR §257.70(c) states that: "An alternative composite liner must consist of two components; the upper component consisting of, at a minimum, a 30-mil GM, and a lower component, that is not a geomembrane, with a liquid flow rate no greater than the liquid flow rate of two feet of compacted soil with a hydraulic conductivity of no more than $1x10^{-7}$ cm/sec. GM components consisting of high density polyethylene (HDPE) must be at least 60-mil thick. If the lower component of the alternative liner is compacted soil, the GM must be installed in direct and uniform contact with the compacted soil."

There are two composite liner system designs included in the design of the landfill (Option 1 and Option 2). Option 1 (alternative design) incorporates the use of a GCL layer and reduced soil liner thickness layer. The alternative liner design will consist of an upper component consisting of a textured 60-mil HDPE geomembrane, a CCR compatible Geosynthetic Clay Liner (GCL) and a lower component consisting of six inches of compacted soil with a hydraulic conductivity of no more than $2x10^{-7}$ cm/sec. The alternative liner design will be constructed with an equivalent liquid flow rate to Option 2 utilizing components specified by 40 CFR §257.70(b). See Attachment 4 for the liquid flow rate equivalency calculations.

Option 2 incorporates components specified by 40 CFR §257.70(b) which are an upper component consisting of a textured 60-mil HDPE geomembrane and a lower component consisting of two feet of compacted soil with a hydraulic conductivity of no more than $1x10^{-7}$ cm/sec.

3.2 Chemical Properties, Strength and Thickness of Materials

40 CFR §257.70 (b)(1) states that the composite liner must be: "Constructed of materials that have appropriate chemical properties and sufficient strength and thickness to prevent failure due to pressure gradients (including static head and external hydrogeologic forces), physical contact with the CCR or leachate to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operation;"

Design Option 1 (alternative composite liner) will incorporate a GCL into the composite liner system. The GCL specified is specifically designed and manufactured to be chemically compatible with CCR waste. 60-mil HDPE geomembrane materials in liner Options 1 and 2 are chemically compatible with CCR waste per manufacturer historic laboratory analysis.

Composite liner materials for Design Options 1 and 2 have been designed to have sufficient strength and thickness to prevent failure due to pressure gradients (including static head and external hydrogeologic forces), physical contact with the CCR or leachate to which they are exposed, climatic conditions, the stress of installation, and the stress of daily operations.

1. A deformation and post-earthquake analysis performed by Stantec in December 2016 determined a maximum permanent deformation to be approximately 0.02 inches for the critical liner interface, well below the allowable range of 6 to 12 inches.
2. As discussed in Section 2.1, if isolated saturated zones (seeps) are encountered within the vadose zone during construction of the liner system, an underdrain will be installed to capture and convey groundwater seeps outside the landfill to control external hydrogeologic forces.
3. The subgrade (base) will be constructed following a CQA Plan to promote a stable support for the composite liner materials and resist static head forces.
4. All geosynthetic liner materials will be installed per manufacturer and CQA Plan guidelines to minimize installation stresses including stresses applied by construction equipment.
5. The initial lifts of CCR, next to the liner system, will be placed during filling operations at specified thicknesses and with equipment that will apply no more than 5 psi on the geomembrane component of the liner system.
6. The climatic conditions at the facility are relatively humid with abundant rainfall. The normal monthly mean temperature ranges from 30^{o} F in January to 76^{o} F in July. Average daily relative humidity ranges from 45% to 95% with the average annual precipitation around 47.3 inches. The CQA Plan and industry standards (ex: Geosynthetic Research Institute – GRI) provide guidelines for material endurance impacted by climatic conditions such as ultra violet radiation (UV)

and weather exposure. These guidelines are incorporated into the design to provide a composite liner that is compatible with the site's climatic conditions.

3.3 Shear Resistance

40 CFR §257.70(b)(2) states that the composite liner must be: "Constructed of materials that provide appropriate shear resistance of the upper and lower component interface to prevent sliding of the upper component including on slopes;"

The slope stability of the landfill is predominately controlled by the frictional resistance at the anticipated critical interface of the composite liner system and also by the shear strength parameters of the waste, drainage layer, compacted soil layer and subgrade (base). A global slope stability analysis was conducted by Stantec (dated December 2016) as part of the landfill design process to determine acceptable friction angles for the composite liner. The analysis determined that the minimum friction angle for components of the composite liner (Options 1 and 2) to remain stable is 12.4 degrees using a factor of safety of 1.25.

3.4 Composite Liner Foundation or Base

40 CFR §257.70(b)(3) states that the composite liner must be: "Placed upon a foundation or base capable of providing support to the liner and resistance to pressure gradients above and below the liner to prevent failure of the liner due to settlement, compression, or uplift;"

Site specific geotechnical and hydrogeological investigations were performed for the landfill site to determine suitability. Likewise, a structural integrity analysis was conducted, which included the designed base or foundation (subgrade) of the landfill. Under Options 1 and 2, the base of the landfill will be mainly constructed of bedrock and/or engineered structural fill. The structural fill will be placed in areas to meet grade requirements. The structural fill layer was modeled with shear strength parameters of 28 degrees and zero cohesion, along with a unit weight of 120 pounds per cubic foot (pcf). The computer analysis was performed with the liner components and subgrade (base) under saturated conditions with the following results: A minimum static factor of safety of 2.4 was determined from the stability models compared to a target factor of safety of 2.0. Construction methodologies based on the design and CQA Plan will ensure a competent base is prepared to resist pressure gradients per 40 CFR §257.70 (b)(3).

3.5 Composite Liner Limits

40 CFR §257.70(b)(4) states that the composite liner must be: "Installed to cover all surrounding earth likely to be in contact with the CCR or leachate."

The design limits of the composite liner system specified in the design documents for Options 1 and 2 cover all surrounding earth likely to be in contact with CCR or leachate.

3.6 Leachate Collection and Removal System

40 CFR §257.70(d) states "The leachate collection and removal system must be designed, constructed, operated, and maintained to collect and remove leachate from the landfill during the active life and post-closure care period. The leachate collection and removal system must be: (1) Designed and operated to maintain less than a 30-centimeter depth of leachate over the composite liner or alternative composite liner; (2) Constructed of materials that are chemically resistant to the CCR and any non-CCR waste managed in the CCR unit and the leachate expected to be generated, and of sufficient strength and thickness to prevent collapse under the pressures exerted by overlying waste, waste cover materials, and equipment used at the CCR unit; and (3) Designed and operated to minimize clogging during the active life and post-closure care period."

3.6.1 Maximum Depth of Leachate

The leachate collection system designed for the landfill was designed to maintain less than 30 centimeters depth of leachate over the composite liner system. The HELP model (Hydrogeologic Evaluation of Landfill Performance) was used to predict leachate production under operational and closed conditions. The model was performed for all composite liner system options included in the design documents.

3.6.2 Chemical Properties, Strength and Thickness of Materials

The leachate collection system design consist of polypropylene, HDPE and naturally occurring durable gravel materials. The man-made materials are chemically stable, do not rot and are resistant to oxidation and microorganisms. Gravel materials incorporated into the design are durable materials resistant to deterioration in a CCR leachate environment. All materials have the appropriate thickness and strength to resist collapse under the pressures of the waste, cover, and equipment.

3.6.3 Minimize Clogging

Materials specified in the design documents are selected to minimize clogging during the active life and 30 year post closure care period. Materials selected to provide filtering of the leachate collection system components have been designed and tested by the manufacturers to minimize clogging when subjected to CCR waste. Representative hydraulic conductivity ratio (HCR) testing has been performed with acceptable results per GRI guidelines for minimal clogging.

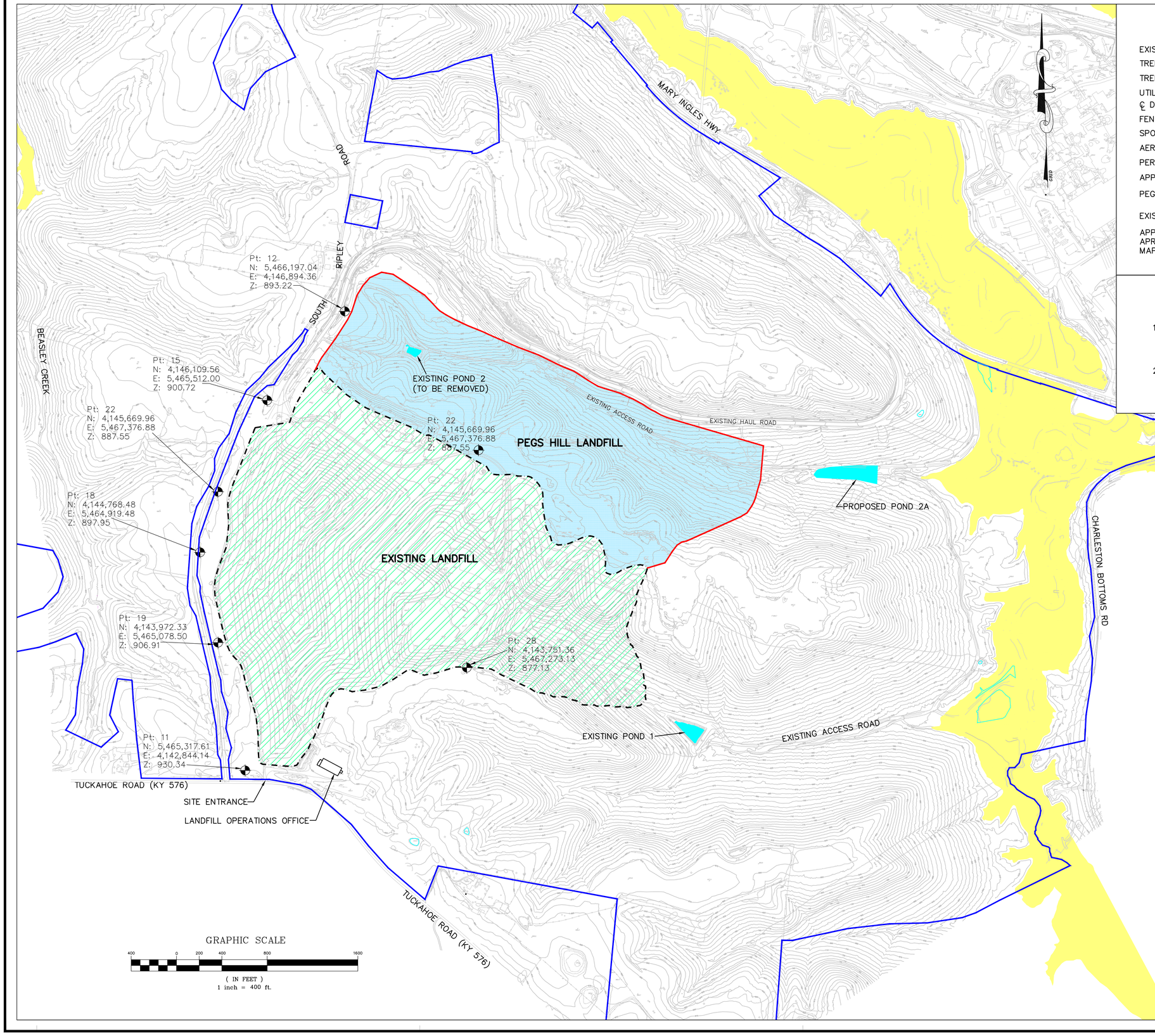
4.0 REPORT LIMITATIONS

This report is based on observations made of features that could be visually seen at the time of site reconnaissance, review of previous engineering investigations and design documents, permits and survey information provided by EKPC as well as work performed by Kenvirons for the design of the new CCR landfill. The design basis and documents are based on Kenvirons' understanding of current plant operations, maintenance, storm water handling and CCR handling procedures for the new landfill, as provided by EKPC. Changes in any of these operations or procedures may result in deviation from the intended design and operation of the new landfill.

The design is based on established engineering principles and provided in a manner consistent with the level of care and skill ordinarily exercised by the engineering consultants under similar circumstances. No other representation is intended.

ATTACHMENT 1

LINER SYSTEM DESIGN PLANS



LEGEND

EXISTING GROUND CONTOURS	810
TREE LINE	Trees / Open
TREE	
UTILITY POLE	
℄ DRAIN	
FENCE	
SPOT ELEVATION	x 812.3'
AERIAL SURVEY CONTROL POINT	872.493
PERMANENT SURVEY MARKER	
APPROXIMATE PROPERTY BOUNDARY	
PEGS HILL LANDFILL (101.00 Acres)	
EXISTING SPURLOCK STATION LANDFILL	
APPROXIMATE LIMITS OF 100 YEAR FLOOD PER APRIL 16, 2013 FEMA DFIRM FLOODPLAIN MAPPING	

NOTES

1. HORIZONTAL SITE CONTROL IS IN KENTUCKY SINGLE ZONE COORDINATE SYSTEM OF 1983 (NAD83) – US FOOT. ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
2. EXISTING GROUND TOPOGRAPHY SHOWN WAS COMPILED FROM AERIAL SURVEY PERFORMED FEBRUARY 24, 2013 BY PHOTO SCIENCE INC., LEXINGTON, KENTUCKY.

EAST KENTUCKY POWER COOPERATIVE

PEGS HILL LANDFILL
MASON COUNTY, KENTUCKY
REGISTERED PERMIT BY RULE
NEW CCR LANDFILL
DESIGN PLANS

COMMONWEALTH OF KENTUCKY
7/27/17
SAMUEL T. OAKES
21488
LICENSED PROFESSIONAL ENGINEER

DRAWN BY: SMR
CHECKED BY: JMC
CHECKED BY: STO
DATE: JULY, 2017
SCALE: AS NOTED
REVISIONS

KENVIRONS, INC.
FRANKFORT, KENTUCKY

PROJECT NO.
2017127

SHEET NO.
1 of 5

GENERAL SITE PLAN

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NOTES

1. SEDIMENT PONDS WILL BE UTILIZED FOR LEACHATE COLLECTION AND SEDIMENT CONTROL. SEDIMENT POND 2A WILL BE LINED AS SHOWN ON SHEET 3. PROPOSED SEDIMENT POND 2A WILL BE CONSTRUCTED CONCURRENTLY WITH THE CONSTRUCTION OF THE FIRST CELL OF PEGS HILL LANDFILL.
2. ROADS, OTHER THAN THOSE SHOWN, MAY BE CONSTRUCTED, AS NEEDED, TO ACCESS PORTIONS OF THE LANDFILL AND/OR MONITORING LOCATIONS.
3. HORIZONTAL SITE CONTROL IS IN THE KENTUCKY SINGLE ZONE COORDINATE SYSTEM OF 1983 (NAD83) – US FOOT. ELEVATIONS ARE BASED ON THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD88).
4. EXISTING GROUND TOPOGRAPHY SHOWN WAS COMPILED FROM AERIAL SURVEY PERFORMED FEBRUARY 24, 2013 BY PHOTO SCIENCE INC., LEXINGTON, KENTUCKY.
5. SUBGRADE DESIGN SHOWN REPRESENTS LANDFILL LINER OPTION 1 WITH 6" GCL BASE SOIL LINER.

NORTH

ABANDON EXISTING DROPBOX AND CULVERT

EXISTING 48" CULVERT TO BE GROUTED, FILLED AND ABANDONED IN PLACE

EXISTING 36" CULVERT

CONSTRUCTION ENTRANCE

CULVERT

PEGS HILL LANDFILL

ABANDON EXISTING DROPBOX AND CULVERT

EXISTING HAUL ROAD

PROPOSED ACCESS ROAD

POND 2A

EXISTING LANDFILL

LEGEND

- TREE
- TREE LINE
- SPOT ELEVATION
- EXISTING FENCE LINE
- CONTROL POINT
- EXISTING ACCESS ROAD
- UTILITY POLE
- LIGHT POLE
- CATCH BASIN
- WATER HYDRANT
- MANHOLE
- RAILROAD
- SURVEY GRID
- STREAM OR EXISTING DITCH
- EXISTING GROUND CONTOURS
- PROPOSED ACCESS ROAD
- PROPOSED COMPOSITE LINER LIMIT
- PROPOSED CCR WASTE LIMIT (101.00 AC.)
- PROPOSED SUBGRADE CONTOURS (OPTION 1)
- EXISTING SPURLOCK STATION LANDFILL

GRAPHIC SCALE

200 0 100 200 400 800

(IN FEET)
1 inch = 200 ft.

SUBGRADE PLAN

EAST KENTUCKY POWER COOPERATIVE

PEGS HILL LANDFILL
MASON COUNTY, KENTUCKY
REGISTERED PERMIT BY RULE
NEW CCR LANDFILL
DESIGN PLANS

STATE OF KENTUCKY
7/27/17
SAMUEL T. OAKES
21483
LICENSED PROFESSIONAL ENGINEER

DRAWN BY: SMR
CHECKED BY: KTC
CHECKED BY: STO
DATE: JULY, 2017
SCALE: 1" = 200'
REVISIONS

KENVIRONS, INC.
FRANKFORT, KENTUCKY

PROJECT NO.
2017127

SHEET NO.
2 of 5

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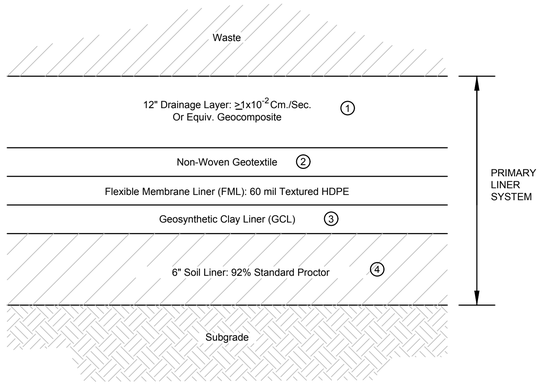
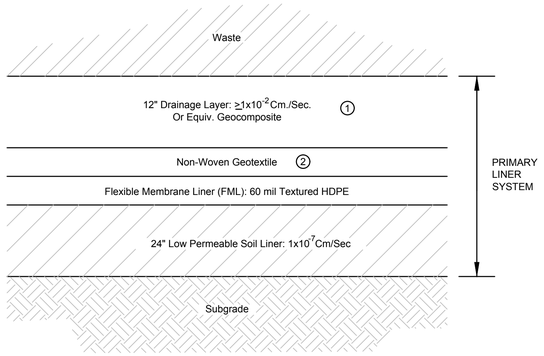


NOTES

1. A Granular or Synthetic Drainage Layer will be placed above the FML. Granular Drainage Media shall be Peagravel or other Material Approved by the Certifying Engineer prior to Construction Activities. Non-Woven Geotextile will only be used with a Granular Drainage Layer to Provide FML Protection. Geotextiles will be compatible with Coal Combustion Residuals.
2. A 10 oz/sy Non-Woven Geotextile will be utilized with Rounded/Smooth Granular Drainage Material (e.g. Peagravel), while a 24 oz/sy Non-Woven Geotextile will be used with an Angular Granular Drainage Material (e.g. Crushed Limestone). Geotextile will not be required if Geocomposite is installed.
3. Geosynthetic Clay Liner shall be compatible with Coal Combustion Residuals.
4. 6" Soil Liner will consist of Soils compacted to 92% Standard Proctor.

OPTION 1 (Alternative Composite Liner)



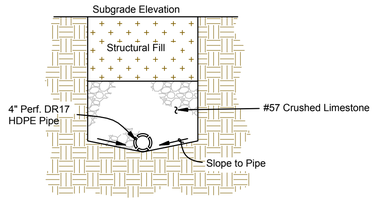
NOTES

1. A Granular or Synthetic Drainage Layer will be placed above the FML. Granular Drainage Media shall be Peagravel or other Material Approved by the Certifying Engineer prior to Construction Activities. Non-Woven Geotextile will only be used with a Granular Drainage Layer to Provide FML Protection. Geotextiles will be compatible with Coal Combustion Residuals.
2. A 10 oz/sy Non-Woven Geotextile will be utilized with Rounded/Smooth Granular Drainage Material (e.g. Peagravel), while a 24 oz/sy Non-Woven Geotextile will be used with an Angular Granular Drainage Material (e.g. Crushed Limestone). Geotextile will not be required if Geocomposite is installed.

OPTION 2

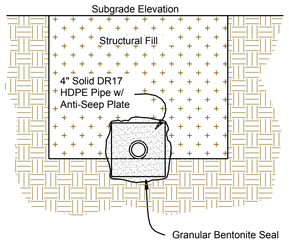
GENERAL LINER DESIGN

NTS



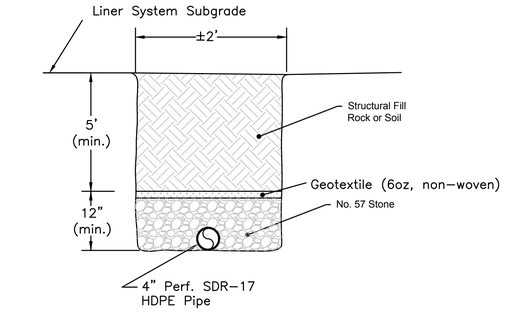
VIEW B–B'

NTS



VIEW A–A'

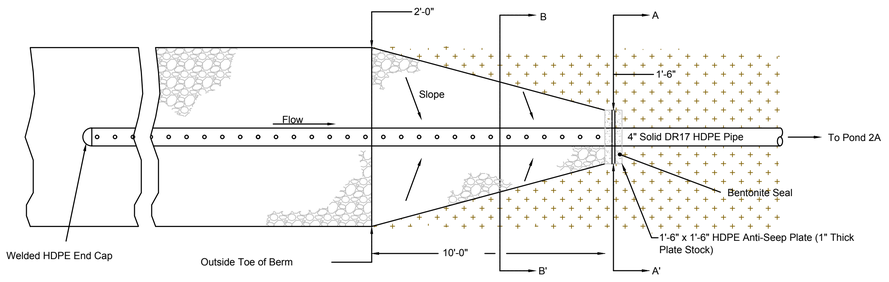
NTS



UNDERDRAIN TRENCH DETAIL (IF NEEDED)

NTS

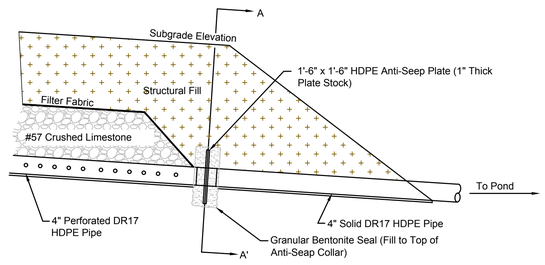
Note: Trench to Daylight to Existing Ground outside of Cell Limits.



UNDERDRAIN PIPE FLOW TRANSITION DETAIL

NTS

Note: End Treatment to be Installed during Final Phase Construction



UNDERDRAIN EXIT PIPE DETAIL

NTS

Note: End Treatment to be Installed during Final Phase Construction

EAST KENTUCKY POWER COOPERATIVE

PEGS HILL LANDFILL

MASON COUNTY, KENTUCKY
REGISTERED PERMIT BY RULE
NEW CCR LANDFILL
DESIGN PLANS

COMMONWEALTH OF KENTUCKY
7/27/17
SAMUEL T. OAKES
21483
LICENSED
PROFESSIONAL ENGINEER

DRAWN BY: SMR
CHECKED BY: STO
CHECKED BY: STO
DATE: OCT. 2015
SCALE: AS NOTED
REVISIONS

KENVIRONS, INC.
FRANKFORT, KENTUCKY

PROJECT NO.
2017127

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LINER DESIGN DETAILS

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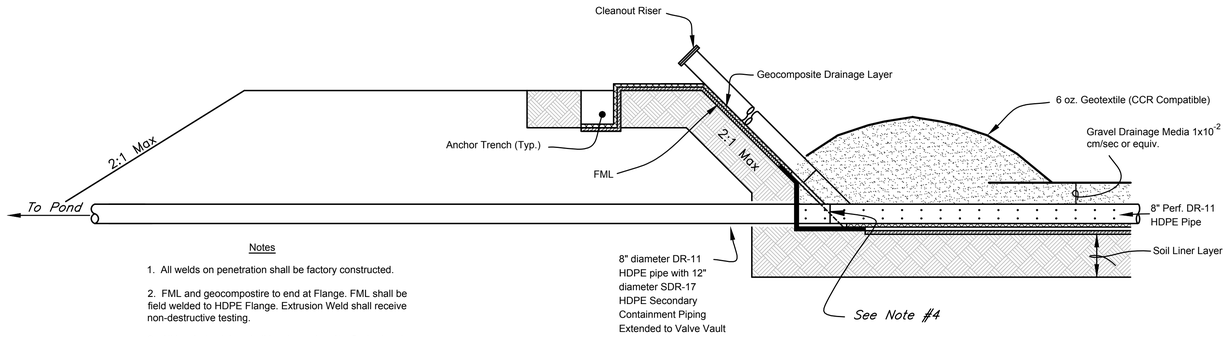


Notes

1. All welds on penetration shall be factory constructed.

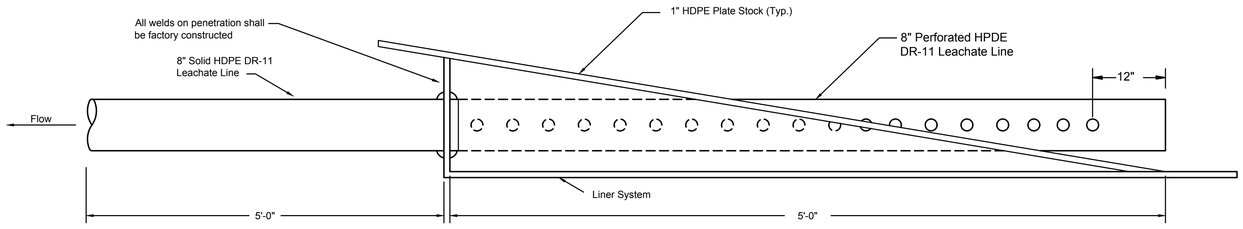
2. FML and geocompostire to end at Flange. FML shall be field welded to HDPE Flange. Extrusion Weld shall receive non-destructive testing.

3. All leachate piping shall be cleaned and/or flushed and accepted by the Owner prior to placing leachate collection system into service.

4. 8" perforated leachate collection line shall be connected to the headwall penetration assembly stub out pipe with flexible pipe connector and stainless steel bands or equal.

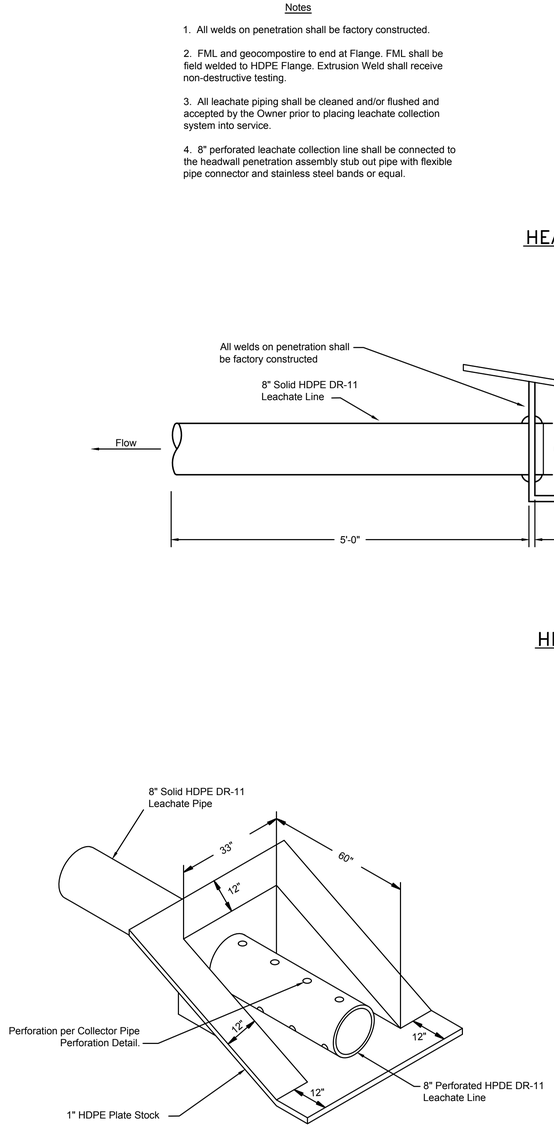
HEADWALL PENETRATION AND TOE DETAIL

NTS



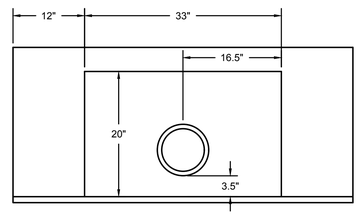
SECTION VIEW
HEADWALL PENETRATION ASSEMBLY

NTS



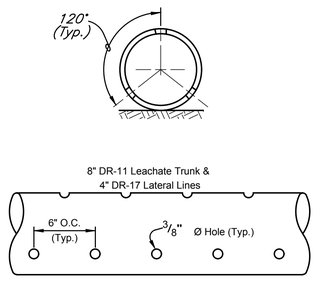
ISOMETRIC VIEW
HEADWALL PENETRATION ASSEMBLY

NTS



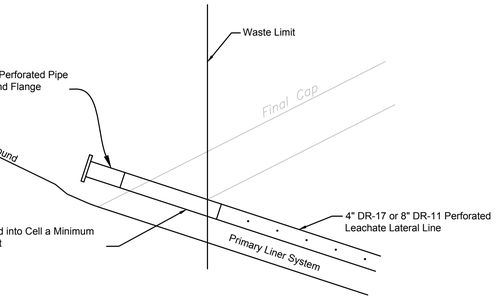
INLET VIEW
HEADWALL PENETRATION ASSEMBLY

NTS



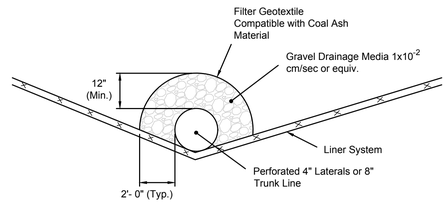
COLLECTOR PIPE PERFORATION DETAIL

NTS

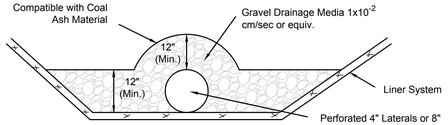


LEACHATE COLLECTION LINE INSPECTION & CLEANOUT

NTS



TRIANGULAR SHAPED DRAINAGE PATHWAY

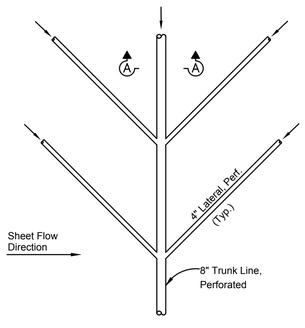


TRAPEZOIDAL SHAPED DRAINAGE PATHWAY

NOTE:
1: All Gravel shall be placed with equipment that will not exceed ground pressure of 5 psi and must be approved prior to use by the Owner and Engineer.
2: Maximum width of gravel drainage media in trapezoidal pattern shall be 10 feet.

LEACHATE COLLECTION PIPE DETAIL

NTS



TYPICAL LATERAL CONSTRUCTION

NTS

PEGS HILL LANDFILL
MASON COUNTY, KENTUCKY
REGISTERED PERMIT BY RULE
NEW CCR LANDFILL
DESIGN PLANS

EAST KENTUCKY POWER COOPERATIVE

STATE OF KENTUCKY
SAMUEL T. OAKES
21483
LICENSED PROFESSIONAL ENGINEER
7/27/17

DRAWN BY: SMR
CHECKED BY: STO
DATE: OCT. 2015
SCALE: AS NOTED

REVISIONS

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FRANKFORT, KENTUCKY

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LEACHATE DESIGN DETAILS

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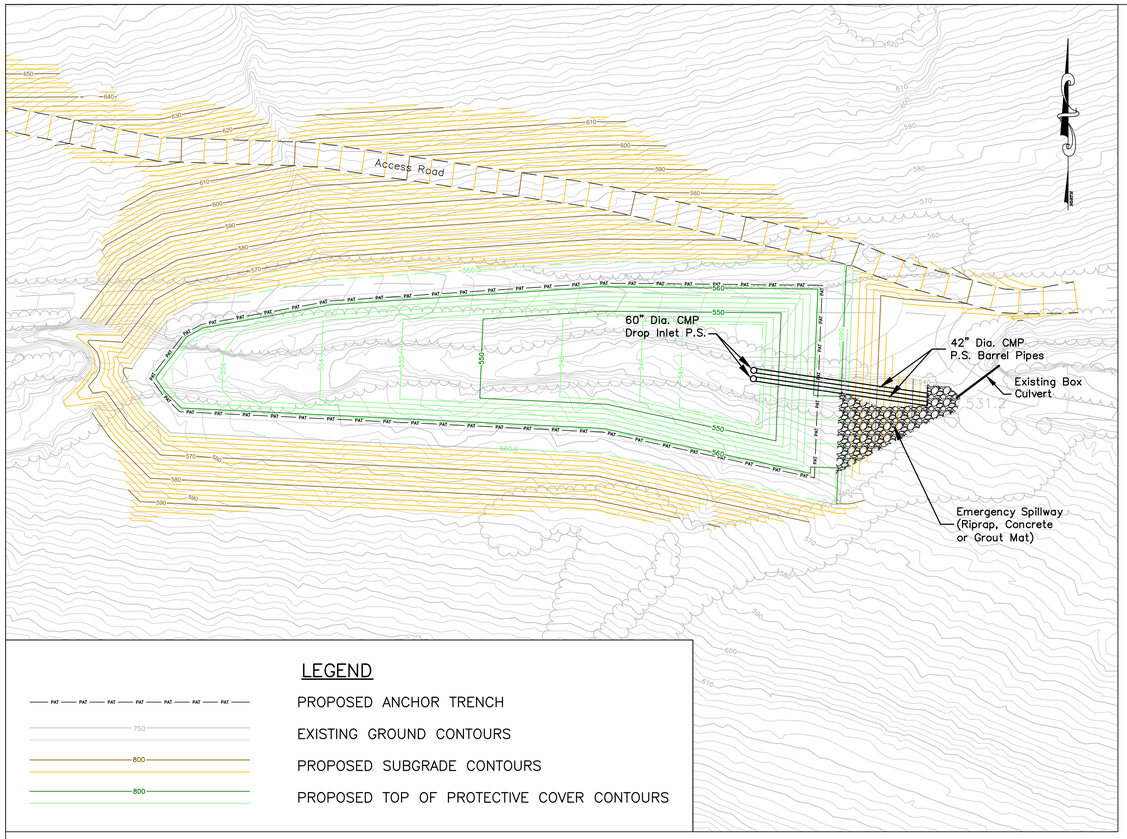
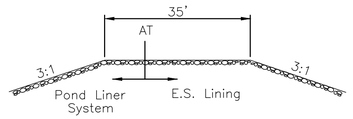
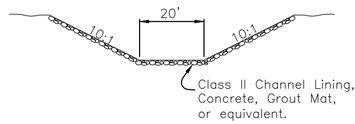


LEGEND

- PROPOSED ANCHOR TRENCH
- EXISTING GROUND CONTOURS
- PROPOSED SUBGRADE CONTOURS
- PROPOSED TOP OF PROTECTIVE COVER CONTOURS



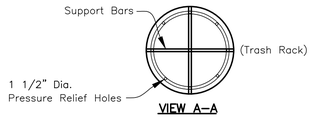
CONTROL SECTION



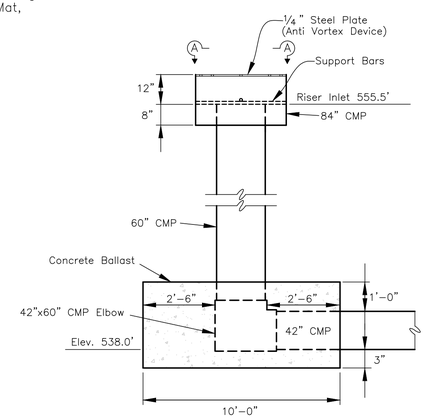
TYPICAL SECTION

EMERGENCY SPILLWAY

N.T.S



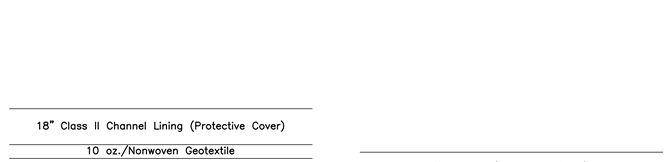
VIEW A–A



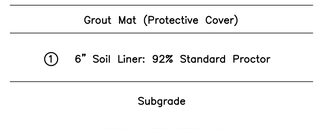
Note: All piping shall be CMP unless otherwise specified by the the Engineer during construction.

TWO DROP INLET PRINCIPAL SPILLWAYS

N.T.S



POND LINER OPTION 1



POND LINER OPTION 2

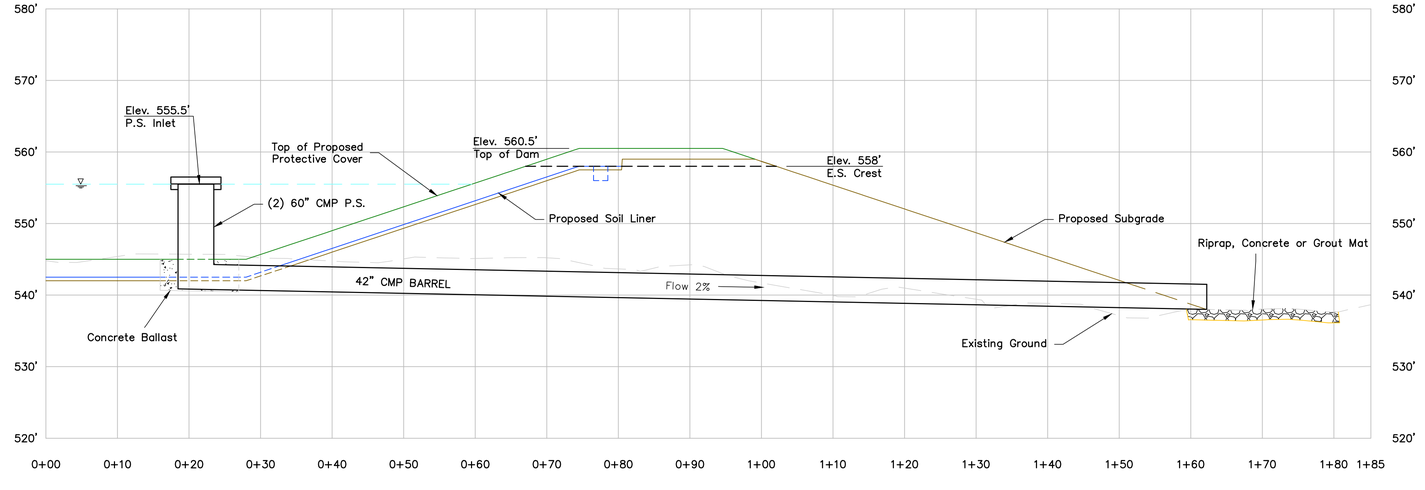
1. 6" Soil liner will consist of soils compacted to 92% Standard Proctor

POND LINER DESIGN DETAIL

N.T.S

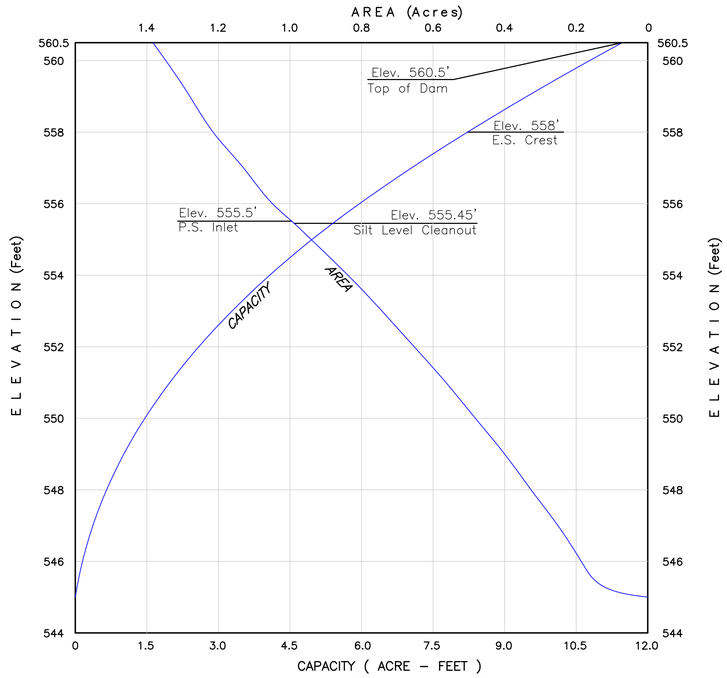
SEDIMENT POND 2A

SCALE: 1"= 60'



SECTION AT PRINCIPAL SPILLWAY

SCALE: 1" = 10' HORIZ.
1" = 10' VERT.



AREA–CAPACITY CURVE

SEDIMENT POND 2A

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ATTACHMENT 2

USGS UNIFIED HAZARD TOOL RESULTS

Unified Hazard Tool

Please do not use this tool to obtain ground motion parameter values for the design code reference documents covered by the U.S. Seismic Design Maps web tools (e.g., the International Building Code and the ASCE 7 or 41 Standard). The values returned by the two applications are not identical.

Input

Edition
Dynamic: Conterminous U.S. 2008 (v3.3.1)

Spectral Period
Peak ground acceleration

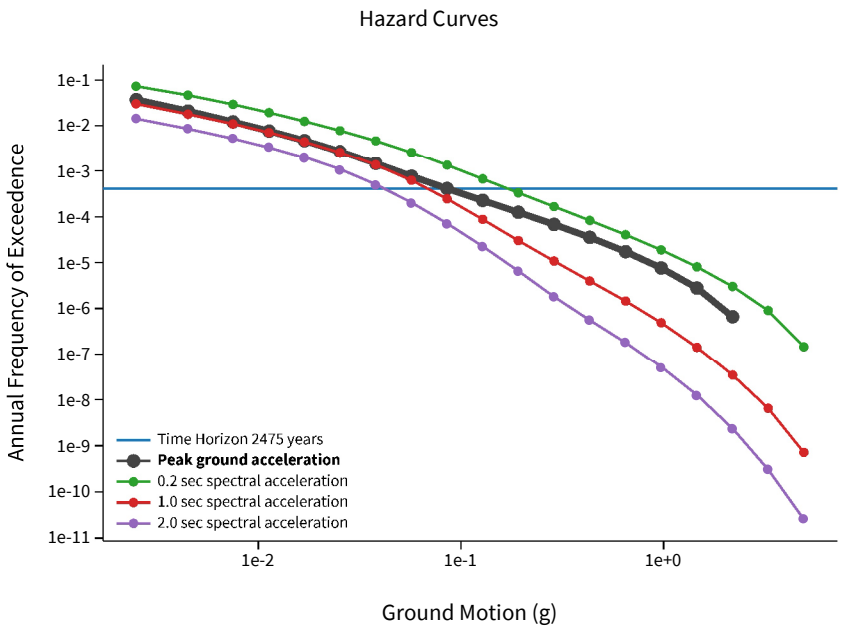
Latitude
Decimal degrees
38.693058

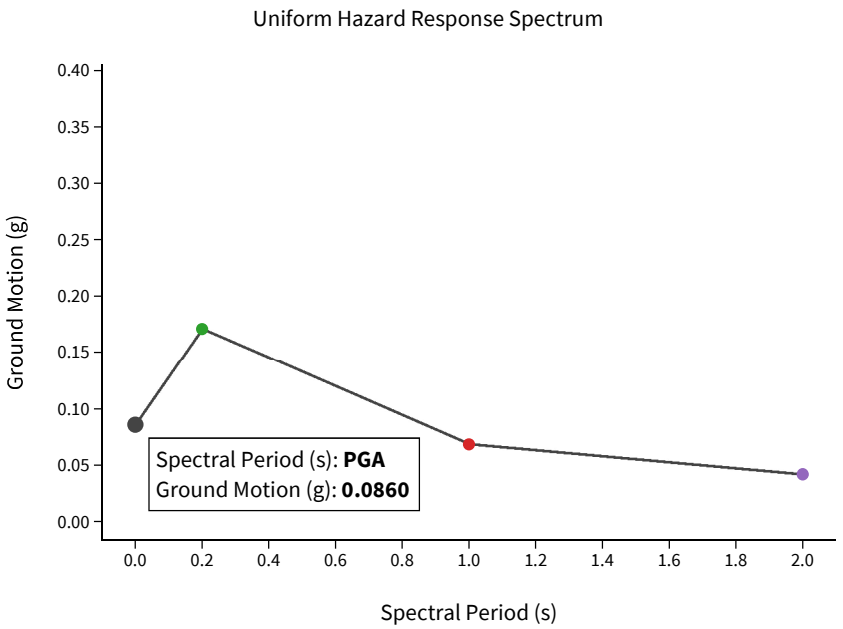
Time Horizon
Return period in years
2475

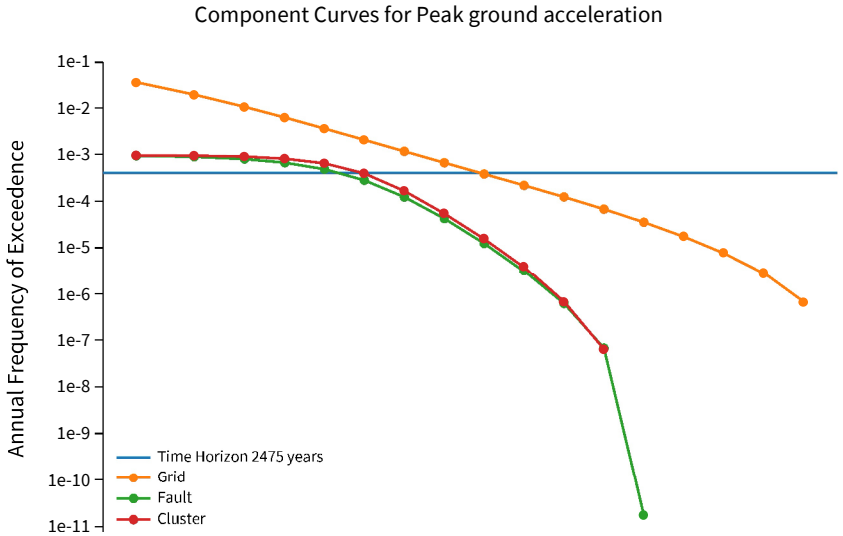
Longitude
Decimal degrees, negative values for western longitudes
-83.832581

Site Class
760 m/s (B/C boundary)

Hazard Curve



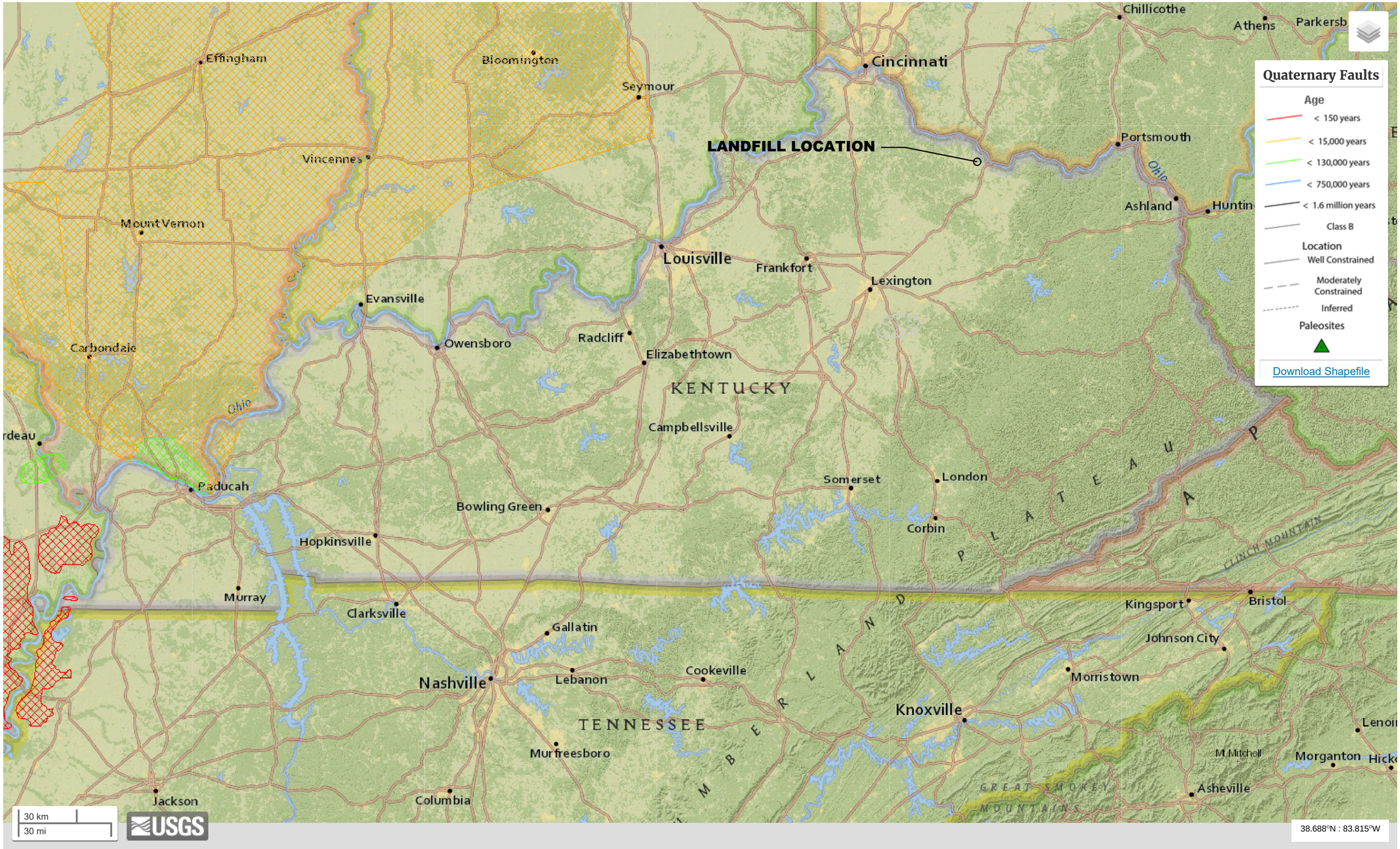




ATTACHMENT 3

USGS FAULT AND KGS KARST POTENTIAL MAPPING

FAULTS MAPPING (HOLOCINE TIME)



Leaflet | Content may not reflect National Geographic's current map policy. Sources: National Geographic, Esri, DeLorme, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.

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Tools | Query | Legend | Layers | Geologic Info

Print Legend (opens in a new window)

Karst Potential Units

- very high
- high
- medium
- low
- non-karst

Symbols

map symbols

Symbols are updated as layers are turned on/off and as they become visible by zooming in/out.

KGS LiDAR-derived Sinkholes

LiDAR Sinkholes

KGS Sinkholes

Kentucky Sinkhole Outlines

Sinkhole

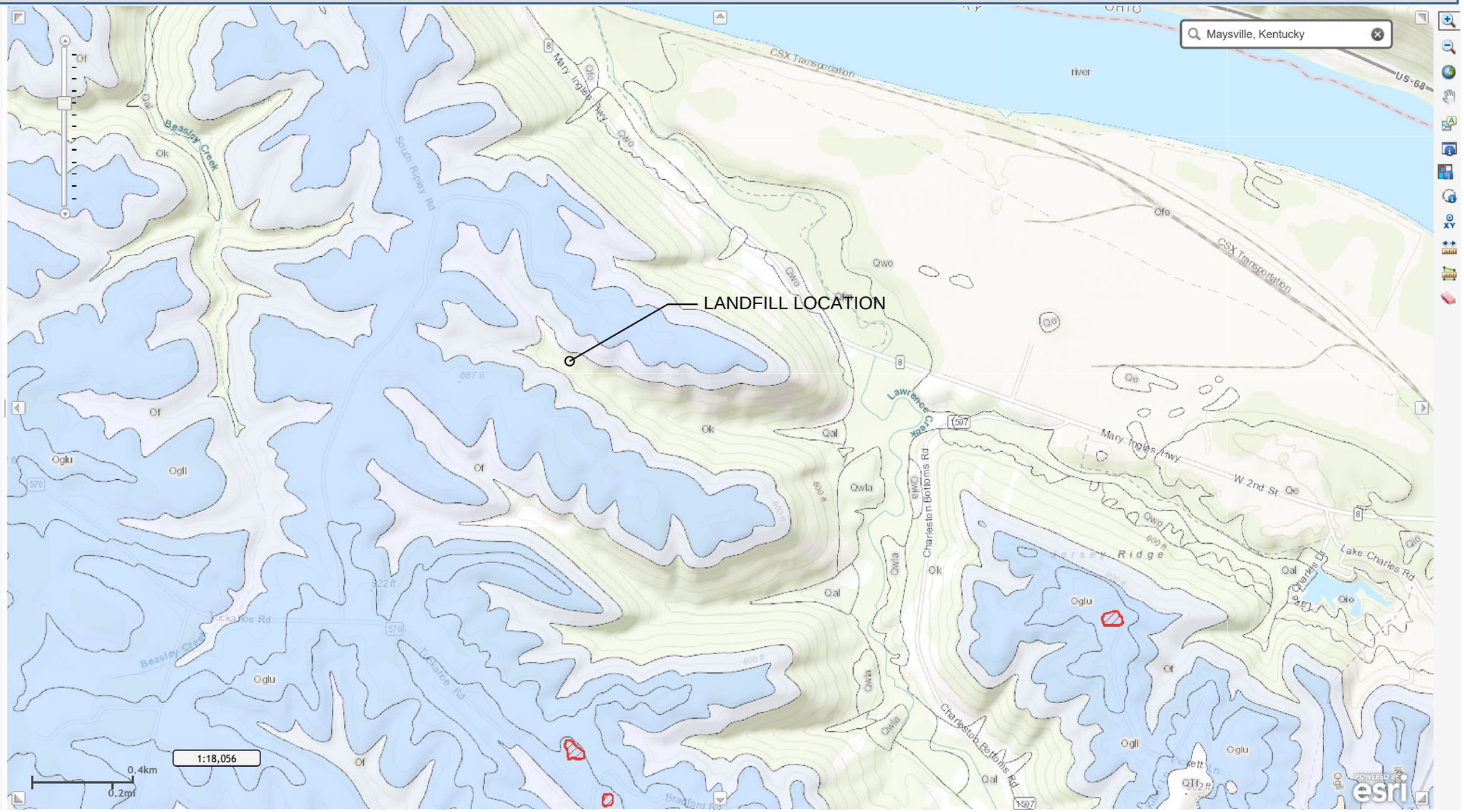
KGS Geology

24K Geologic Faults

- fault - concealed
- fault
- fault - inferred
- fault - scarp
- fault - secondary

24K Geologic Contacts

- geologic contact
- contact - concealed
- contact - secondary
- contact - arbitrary
- stratigraphic datum shift
- unconformity



ATTACHMENT 4

ALTERNATIVE COMPOSITE LINER EQUIVALENCY CALCULATION

Liner System Liquid Flow Rate Comparison

Darcy's Law (gravity flow through porous media)

$Q/A = q = k(h/t + 1)$

Where:		CCR Composite Liner Requirement 24" Low Perm Results	GCL Input Values	6" GCL Soil Base Input Values	Alternate Composite Liner System 6" GCL Base + GCL Results
Q	Flow Rate (cm^3/sec)	N/A	N/A	N/A	N/A
A	Surface Area of the Liner (cm^2)	N/A	N/A	N/A	N/A
q	Flow Rate per Unit Area ($cm^3/sec/cm^2$)	Solve for	Solve for	Solve for	Solve for
k	Hydraulic Conductivity (cm/sec)	1.00E-07	3.00E-09	2.00E-07	5.15E-08
h	Hydraulic Head above Liner (cm)	30	30	30	30
t	Thickness of Liner (cm)	60.96	0.7	15.24	15.94
q (cm3/sec/cm2) =		**1.49E-07**	**1.32E-07**	**5.94E-07**	**1.48E-07**

.

Note: 1. GCL Hydraulic Conductivity per CETCO Resistex ST Data Sheet

Darcy's Law (Effective Hydraulic Conductivity Through Layered Media)

$k_e = t_{total}/(t_1/k_1 + t_2/k_2)$

Where:		6" GCL Base + GCL Input Values
k_e	Effective Hydraulic Conductivity (cm/sec)	Solve for
t_{total}	Combined Layer Thicknesses (cm)	15.94
t_1	Thickness of Upper Layer (cm)	0.70
t_2	Thickness of Lower Layer (cm)	15.24
k_1	Upper Layer Hydraulic Conductivity (cm/sec)	3.00E-09
k_2	Lower Layer Hydraulic Conductivity (cm/sec)	2.00E-07
k_e (cm/sec) =		**5.15E-08**

Notes:
1. Hydraulic Conductivity values for GCL from CETCO BENTOMAT RESISTEX ST