COMMONWEALTH OF KENTUCKY
BEFORE THE PUBLIC SERVICE COMMISSION

IN THE MATTER OF:	)	
	)	
THE APPLICATION OF KENTUCKY-AMERICAN WATER COMPANY FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR THE REPLACEMENT OF A WASTEWATER LAGOON LINER IN OWEN COUNTY	)	**CASE NO. 2018-** 00206

VERIFIED APPLICATION

Pursuant to KRS 278.020 and 807 KAR 5:071, Section 3(1), Kentucky-American Water Company ("KAW") requests the Commission to issue a Certificate of Public Convenience and Necessity ("CPCN") authorizing KAW to replace the lagoon liner at KAW's wastewater treatment facilities in Owen County, Kentucky. In support of this filing, KAW states as follows:

1. KAW is a corporation organized and existing under the laws of the Commonwealth of Kentucky with its principal office and place of business at 2300 Richmond Road, Lexington, Kentucky 40502. KAW can be contacted by e-mail via the e-mail addresses of its counsel set forth below. KAW was incorporated on February 27, 1882 and is currently in good standing in the Commonwealth of Kentucky.

2. KAW is a wholly-owned subsidiary of American Water Works Company, Inc. ("AWW") and is engaged in the distribution and sale of water in its Central Division, consisting of Bourbon, Clark, Fayette, Harrison, Jessamine, Nicholas, Rockcastle, Scott and Woodford Counties and its Northern Division, consisting of Gallatin, Owen and Grant Counties. It currently owns, operates and maintains potable water production, treatment, storage, transmission and distribution systems for the purpose of furnishing potable water for residential,

commercial, industrial and governmental users in its service territory. KAW is also engaged in the collection and treatment of wastewater in Bourbon, Clark, Owen, and Franklin Counties.

3. Facts Relied Upon to Show that the Project is Required by the Public Convenience and Necessity. 807 KAR 5:001, Section 15(2)(a). KAW owns and operates a wastewater treatment facility in Owen County, Kentucky. As is typical at such facilities, the wastewater treatment process includes the use of a lagoon for the collection and holding of wastewater and its sediment. That lagoon is lined with a 60 mil Hypalon (Chlorosulfonated Polyethylene) liner which is designed to prevent the migration of wastewater sediment into the surrounding ground and groundwater. Upon information and belief, the lagoon liner is leaking. Since 2016, KAW has been working in conjunction with the Kentucky Division of Water of the Kentucky Department for Environmental Protection ("KDOW") towards possible solutions for the leaking liner. After considering various solutions and remedies, KDOW has advised that KAW must replace the liner. A more complete description of KAW's investigation and conclusion is set forth in the June 2018 Project Summary attached as Exhibit 1.

As explained in the Project Summary, KAW retained Consulting Services Incorporated of Kentucky ("CSI") in 2015 to assist KAW in its investigation to determine whether the lagoon liner was leaking. CSI's October 23, 2015 report of its investigation is attached as Exhibit 2. That report is clear in its conclusion that the lagoon liner has significant leaks.[1] As also explained in the Project Summary, KAW retained the GRW engineering firm to advise KAW of possible solutions to address the leaking lagoon liner. GRW's October 2016 Evaluation Report is attached as Exhibit 3. GRW concluded that the existing lagoon liner be replaced with a new liner and that temporary treatment should be provided by three 1.5 million

[1] Exhibit 2, p. 11 of 12.

gallon temporary lagoons.[2] As described in the Project Summary, as the project was being further considered, the issue of how to handle wastewater during wet events and when the lagoon would be out of service required modifications to the project. In the end, the most reasonable and cost-effective solution is to use six mobile temporary treatment units.[3]

4. Copies of Required Permits. 807 KAR 5:001, Section 15(2)(b). KDOW has approved the proposed project. That approval is reflected in the documents attached collectively as Exhibit 4. Exhibit 4 consists of: (a) KDOW's August 18, 2017 approval of the plans and specifications for the project as it existed at that time; and (b) KDOW's June 11, 2018 approval of the plans and specifications for the project after they had been modified to include the use of six temporary mobile treatment tanks during the time the lagoon is out of service. These KDOW approvals meet the requirements 807 KAR 5:071, Section 3(1)(b). Aside from KDOW's conclusion that replacement of the liner is required and KDOW's related approval of the replacement project, there are no other "franchises or permits" required for this project as contemplated by 807 KAR 5:001, Section 15(2)(b).

5. A Full Description of the Proposed Location. 807 KAR 5:001, Section 15(2)(c). The proposed location is at KAW's Owenton Waste Water Treatment Plant at 235 Marshal Gibson Lane in Owenton, Kentucky. In addition, Exhibits 2, 3, and 5[4] are replete with maps, aerial photos, and drawings showing the location of the treatment plant and the relevant lagoon.

6. Three Copies of Maps of Suitable Scale Showing the Location of the Project. 807 KAR 5:001, Section 15(2)(d)(1). Exhibits 2, 3, and 5 are replete with maps, aerial photos, and drawings showing the location of the treatment plant and the relevant lagoon. Those exhibits are provided in hard copy and also on the included thumb drive.

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[2] Exhibit 3, p. I-1.
[3] Exhibit 1, p. 3.
[4] As discussed below, Exhibit 5 is the engineering plans, specifications, and diagrams for the project.

7. Plans and Specifications and Drawings of the Project. 807 KAR 5:001, Section 15(2)(d)(2). The Plans and Specifications and Drawings are attached collectively as Exhibit 5. Exhibit 5 includes both the Plans and Specifications as they existed in August 2017 and then as modified to include the mobile treatment units in April 2018.

8. The Manner in Which KAW Plans to Finance the Project. 807 KAR 5:001, Section 15(2)(e); 807 KAR 5:071, Section 3(1)(f). KAW will not finance this project as a stand-alone item. Instead, it will use an appropriate mix of debt and equity to fund the project as necessary.

9. Estimated Annual Cost of Operation. 807 KAR 5:001, Section 15(2)(f); 807 KAR 5:071, Section 3(1)(g). KAW estimates the annual cost of operation of the lagoon is $4,400 with the majority of that related to the operation of the existing six electric aerators. It is expected that the replacement liner itself will not influence the annual cost of operation.

10. Evidence of Financial Integrity as Will Insure the Continuity of Sewage Service. 807 KAR 5:071, Section 3(1)(a) requires a sewage utility to provide a copy of a valid third-party beneficiary agreement guaranteeing the continued operation of sewage treatment facilities or other evidence of financial integrity such as will insure the continuity of sewage service. Rather than incurring the expense of obtaining a third-party beneficiary agreement, KAW relies on its own financial integrity as demonstrated by the content of the Financial Exhibit attached as Exhibit 6. Among other things, the Financial Exhibit demonstrates KAW's financial integrity with assets totaling over $620 million and revenues for the first quarter of 2018 over $29 million. Additionally, as a wholly-owned subsidiary of AWW,[5] KAW has access to favorable financing by virtue of its participation in the American Water Capital Corporation borrowing program

[5] AWW is the largest and most geographically diverse publicly traded U.S. water and wastewater utility.

which the Commission has approved in numerous cases, the most recent of which was in Case No. 2015-00400.[6]

11. Detailed Map of the Sewage Treatment Facilities Showing Location of Plant, Effluent Discharge, Collection Mains, Manholes, and Utility Service Area. 807 KAR 5:071, Section 3(1)(c). Exhibits 2, 3, and 5 are replete with maps, aerial photos, and drawings showing the location of the treatment plant and the relevant lagoon. Those exhibits are provided in hard copy and also on the included thumb drive. Please also see Exhibit 7 which is a system map of KAW's wastewater operations in Owenton. Exhibit 7 is also on the enclosed thumb drive.

12. Detailed Estimated Cost of Construction. 807 KAR 5:071, Section 3(1)(d). The expected project cost is itemized in the Project Summary attached as Exhibit 1. In total, the project is expected to cost approximately $1.5 million.

13. Financial Exhibit. 807 KAR 5:071, Section 3(1)(e). A Financial Exhibit as described in 807 KAR 5:001, Section 12 is attached as Exhibit 6.

14. Estimate of the Total Number of Customers to be Served by the Proposed Facility. 807 KAR 5:071, Section 3(1)(h). The total number of wastewater customers to be served by the replacement liner is 615.

15. A Copy of KAW's Latest Tax Returns; a Detailed Depreciation Schedule; and Proposed Rates to be Charged. 807 KAR 5:071, Section 3(1)(i), (j), and (k). In accordance with 807 KAW 5:071, Section 3(1)(m), these three items are not required because KAW does not seek the establishment of rates in this proceeding.

16. Relationship of KAW to its Parent and Other AWW Operating Subsidiaries. 807 KAR 5:071, Section 3(1)(l). KAW is a wholly-owned operating subsidiary of AWW. AWW is

[6] *In the Matter of: Application of Kentucky-American Water Company for Issuance of Indebtedness and Continued Participation with American Water Capital Corporation*, Case No. 2015-00400, Order of January 19, 2016.

publicly traded on the New York Stock Exchange under the ticker symbol AWK. As described above, KAW participates in a borrowing program with American Water Capital Corporation with the Commission's approval. Along with KAW, there are multiple other subsidiaries of AWW. A listing of those other affiliates is attached as Exhibit 8.

17. Alternative Request for a Declaratory Order. The cost of this project (approximately $1.5 million) in relation to KAW's *total* Utility Plant in Service (including water and wastewater assets) would not be significant enough to require a Certificate of Public Convenience and Necessity ("CPCN") pursuant to Commission precedent. However, due to the fact that it is a wastewater project and the cost of the project is of an amount to require a CPCN in relation solely to KAW's wastewater Utility Plant in Service, KAW hereby seeks the requested CPCN. To the extent the Commission believes that a CPCN is not necessary due to the relative small size of the project when compared to KAW's total Utility Plant in Service, KAW hereby applies for a Declaratory Order pursuant to 807 KAR 5:001, Section 19 stating that a CPCN is not necessary and dismissing this case. All filing requirements set forth in 807 KAR 5:001, Section 19 are included in this Application and the attached Exhibits.

WHEREFORE, KAW respectfully requests the Commission approve the requested CPCN or declare that a CPCN is not necessary. In order to meet the project timeline and complete the project prior to the end of favorable construction weather in 2018, KAW respectfully requests a Commission decision in this case no later than September 15, 2018.

Date: June 20, 2018

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BY: _____

Attorneys for Kentucky-American Water Company

CERTIFICATE

This certifies that an original and ten copies of this filing are being hand-delivered to the Commission June 20, 2018, and that a true and accurate copy of same is being hand-delivered to the following on June 20, 2018:

Attorney General of Kentucky
Office of Rate Intervention
700 Capitol Avenue
Suite 118
Frankfort, Kentucky 40601

LFUCG
Department of Law
200 East Main Street
Lexington, Kentucky 40507

STOLL KEENON OGDEN PLLC

By _____

Attorneys for Kentucky-American Water Company

VERIFICATION

Comes Brent O'Neill, Director of Engineering for Kentucky American Water and Tennessee American Water, and states that the information contained in this Verified Application and its Exhibits is true and correct as he verily believes formed after reasonable inquiry.

BRENT O'NEILL

COMMONWEALTH OF KENTUCKY)
)
COUNTY OF FAYETTE)

Subscribed, acknowledged, and sworn to before me by Brent O'Neill, Director of Engineering for Kentucky American Water and Tennessee American Water, on this 19 day of June, 2018.

NOTARY PUBLIC, State-At-Large
My Commission expires: 7/25/2020

OWENTON WASTEWATER TREATMENT PLANT LAGOON IMPROVEMENTS
PROJECT SUMMARY
JUNE 2018

Facility Background

Kentucky American Water Company (KAWC) owns and operates the Owenton Wastewater Treatment Plant (WWTP) that is located off Carter Lane in Owenton, Kentucky. The WWTP utilizes a 7.2 million gallon single cell partially mixed aerator lagoon followed by a packed tower to provide the biological treatment prior to final treatment by the plant. The lagoon was originally constructed for the Kraft Food Plant in Owenton and later transferred to the City of Owenton for use by the WWTP. The lagoon in its current configuration dates back to prior to 1997.

Lagoon Liner Inspection

During routine inspections of the Owenton Wastewater Treatment Plant Lagoon by KAWC personnel during 2015, it was observed that the lagoon was possibly leaking and concern arose regarding the stability of the berm surrounding the lagoon. As a result of the inspection, KAWC commissioned an evaluation of the lagoon berm and liner by Consulting Services Incorporated (CSI) of Lexington, Kentucky. CSI performed an analysis of the lagoon including leak detection through the dipole method during September 2015. The analysis indicated that the liner had numerous breaches and was contributing to moisture observed below the berm that KAWC personnel had reported.

Need for Liner Replacement

Upon review of the report by CSI regarding the condition of the lagoon liner, KAWC determined it was in the best interest of the plant to replace the liner. KAWC was concerned that with continued degradation of the liner that the lagoon berm could become compromised causing an unplanned release of the lagoon contents into the stream below the lagoon. In addition, KAWC was concerned that future lagoon cleaning could further erode the liner and result in leaching of the lagoon liquid into the surrounding soils and further influence the stream.

KAWC determined that the project should include the replacement of the liner and a review of alternatives to make improvement to the lagoon to allow it to be maintained without taking it out of service in the future and to allow for ease of maintenance for the existing floating aerators.

Lagoon Liner Replacement

KAWC approached the consulting engineering firm of GRW of Lexington, Kentucky to perform an evaluation of the lagoon and review alternatives that KAWC could consider. During October 2016, GRW completed it evaluation and provided KAWC with an Evaluation Report. The report recommended that the existing lagoon liner be replaced with a new liner and that temporary treatment be provided by three 1.5 million gallon temporary lagoons.

The October 2016 report evaluated two alternatives for the replacement of the liner and provided alternatives for the temporary treatment of the wastewater during liner construction and alternatives for upgrading the plant to meet existing Kentucky Division of Water (KDOW) design criteria.

The recommended alternative of replacing the liner and providing temporary treatment lagoons had a probable project of $1.33 million. The probable cost included:

Sludge Dredging and Dewatering	$375,000
Existing Liner Removal and Disposal	$ 25,000
Installation of new Liner	$320,000
Temporary Treatment	$493,500
10% Contingency	$121,350

Review of Alternatives

KAWC reviewed the alternatives and explored the opportunity to install a divider berm within the lagoon during the time that the liner was being replaced. The installation of the divider berm would allow for the partial draining and dredging of the lagoons in the future while still allowing treatment by the lagoon. However, following discussions with the KDOW in May 2016, it was determined that any modifications to the existing berm would require KAWC to meet the new rules and regulations and would require an increase in the lagoon size of nearly three times its current size. It was determined that KDOW would consider the replacement of the liner as a maintenance project which will allow the lagoon to retain its KDOW approval for operation under the rules and regulations that were in effect when it was originally placed in service. Any improvements to the lagoon that alter its size or configuration would result in the lagoon needing to meet the current rules and regulations. It was anticipated that the cost of alterations that would result in meeting the current rules and regulations would be near $3 million.

Proposed Lagoon Liner Replacement

During the first half of 2017, GRW of Lexington developed the project and provided KAWC with sealed drawings in July 2017. The proposed project included the following activities and features:

1) Dredging and Removal of existing sludge from lagoon
2) The establishment of a temporary 300,000 gallon treatment tank
3) The establishment of a temporary 500,000 gallon wet weather storage tank
4) Replacement of liner
5) Installation of new floating walkways to assist with maintenance of floating aerators
6) Minor grading within and surrounding lagoon
7) Upgrade influent pump station with two (2) new influent pumps

The overall plan was to replace the existing lagoon through the removal of the existing liner and removal of the sludge that had built up within the existing lagoon. During the replacement of the liner and the removal of the lagoon from service, temporary tanks would be constructed to allow the wastewater plant to remain in operation. The temporary tanks would consist of a 300,000 gallon treatment tank that would provide biological treatment prior to processing by the remaining portion of the wastewater

plant. A second 500,000 gallon wet weather storage tank would be constructed allow the facility to store the influx of waste water that occurs during wet weather events and allow the facility to treat the additional flow following the wet weather event. The project also included the construction of two (2) floating walkways within the lagoon to allow for direct access to the eight (8) floating aerators and reduce the need for KAWC to utilize boats to service and inspect the aerators. The final component of the project was the replacement of the two (2) existing influent pumps with two (2) new pumps that better match the flows experienced at the plant and enhance the efficiency of the facility. In addition, the new pumps were needed to send the influent to the temporary tanks due to the temporary increase in head created by the provisional treatment process.

The plans were forwarded to the KDOW and received approval of the project on August 18, 2017 with the conditions that KAWC continue to meet all requirements of the KPDES permit and the temporary treatment facilities would operator no longer than necessary for completion of the lagoon improvements and in no case longer than six months.

Modification of the Lagoon Liner Replacement Project

During the end of 2017, KAWC continued to work toward starting work and obtaining contractors to carry out the proposed improvements. During early 2018, discussions with the supplier for the temporary tanks revealed that the expected cost of nearly $500,000 was not sufficient and the actual cost to mobilize, install, maintain, and remove the two (2) temporary tanks would be near $900,000. This would cause the overall project cost to reach close to $1.8 million. Based on this increase of nearly 38%, KAWC determined that it was in its best interest to review the use of temporary tanks and look to alternative methods of delivering the temporary treatment requirements.

In addition to the increase in cost, KAWC had become concerned that the 300,000 gallon treatment tank would require the plant operators to control and oversee the treatment of the wastewater influent in a different manner than they had historically operated the plant. This concern was in addition to the concern of being able to comply with ammonia discharge levels during use of the temporary treatment system. If the ammonia discharge levels exceed the requirements of the KPDES permit, then KAWC would not be able to comply with the KDOW construction permit and could lead to a Notice of Violation along with impact to the stream the plant discharge enters. These three issues added to the importance of finding an alternative method.

Working with GRW, it was determined that an alternative method to utilizing the temporary tanks was the rental of temporary mobile treatment units. GRW determined that the use of six (6) temporary mobile treatment units would allow KAWC to meet all requirements of the KPDES permit and simplify the operation of the temporary treatment meaning a greater assurance that the conditions of the permit could be reached. In addition, the alternative method would provide a significant reduction in the anticipated cost and allow KAWC to meet its anticipated project cost of $1.3 million.

Current Activities and Expected Schedule

With the change in the temporary treatment process, KAWC approached KDOW to ensure that the agency was comfortable with the change and determine the best way forward for modifications of the August 18, 2017 construction permit. KDOW indicated that they were comfortable with the change in the temporary treatment process, but KAWC would need to resubmit the plans with the applicable changes and provide the agency with information and historical performance of the mobile treatment units. GRW, at the direction of KAWC, has made the appropriate changes in the drawings and provided the necessary information on the mobile treatment units. The information was reviewed by the agency and approval was provided on June 11, 2018.

Due to the long lead requirements of the securing and preparing the mobile treatment units, KAWC has entered into a contract with WesTech for delivery of the units by the end of September 2018.

KDOW has indicated that the dredging and sludge removal activities could begin under the current permit. KAWC anticipates beginning the dredging activities during July that will conclude by October 2018.

At this time, KAWC anticipates the lagoon will be removed from service by the end of September upon the startup of the mobile treatment units. This will allow the lagoon to be drained and the remaining sludge removed mechanically during October.

KAWC currently believes that the liner replacement work will commence during October upon the removal of the sludge and will require 6 to 8 weeks to complete.

Expected Project Cost

KAWC is currently receiving costs from vendors to perform the indicated work. The company continues review the costs and currently believes the following represents the expected project costs:

Sludge Dredging and Dewatering	$300,000
Existing Liner Removal and Disposal	$120,000
Installation of new Liner	$500,000
Temporary Treatment	$350,000
Engineering	$100,000
Legal	$ 10,000
10% Contingency	$120,000
Total Expected Cost	$1,500,000

Report of Engineering Services

WWTP Lagoon Improvement Study

Owenton, Kentucky

Project Number LX150171

October 23, 2015

Prepared for

Kentucky American Water Company

Owenton, Kentucky

csikentucky.com | csiohio.com

858 Contract Street, Lexington, Kentucky 40505 | 65 S. Main Street Calvert City, KY 42029 |11012 Decimal Drive, Louisville, Kentucky 40299 11162 Luschek Avenue, Cincinnati, Ohio 45241

October 23, 2015

Kentucky American Water
2300 Richmond Rd.
Lexington, KY 40502

Attention: Mr. Adam Tilley, PE
Email: Adam.Tilley@amwater.com

Subject: **Report of Engineering Services**
WWTP Lagoon Improvement Study
Owenton, Kentucky
CSI Project No. LX150171

Dear Mr. Tilley:

Consulting Services Incorporated of Kentucky (CSI) has completed our engineering field services for the Kentucky American Water Wastewater Lagoon Evaluation located at the existing Kentucky American Water Wastewater Treatment Plant in Owenton, Kentucky. Geotechnical services, a leak detection and liner survey, and a bathymetric survey were all performed as part of our engineering services. This letter, and attachments provide our observations and findings.

Background Information:

Project information obtained for this project was based on our site visit and conversations with Mr. Tilley, PE, and Mr. Sensabaugh, both of Kentucky American Water Company (KAWC).

We understand that KAWC personnel have observed possible signs of leaking in a Wastewater Treatment Lagoon. The lagoon is located at the existing KAWC Wastewater Treatment Plant in Owenton, Kentucky. Specifically, the lagoon is located north of the Cross Street and Center Street intersection. Please reference the attached Site Location Plan for specific details. CSI was contacted to perform engineering services in order to evaluate the lagoon.

As we proposed, we conducted engineering services which are summarized in the following letter. Our services included a review of the project information provided, conducting geotechnical services that utilized soil borings to obtain samples for modeling the soil conditions. Additionally we performed bathymetric surveying services and leak location services as listed in our proposal.

Site Geology:

A review of the *USGS Owenton Quadrangle* (dated 1975) indicates that the project site is partially underlain by the Kope and Clays Ferry Formations, and partially by the Calloway Creek Limestone Formation, of Middle and Upper Ordivician Rock aged rock deposits. The formations are composed primarily of limestone and shale.

The geologic dip in the area of the project site is less than 1 percent to the southeast. The following figure depicts the USGS *Owenton Quadrangle*, dated 1975 showing the site geology of the project area.

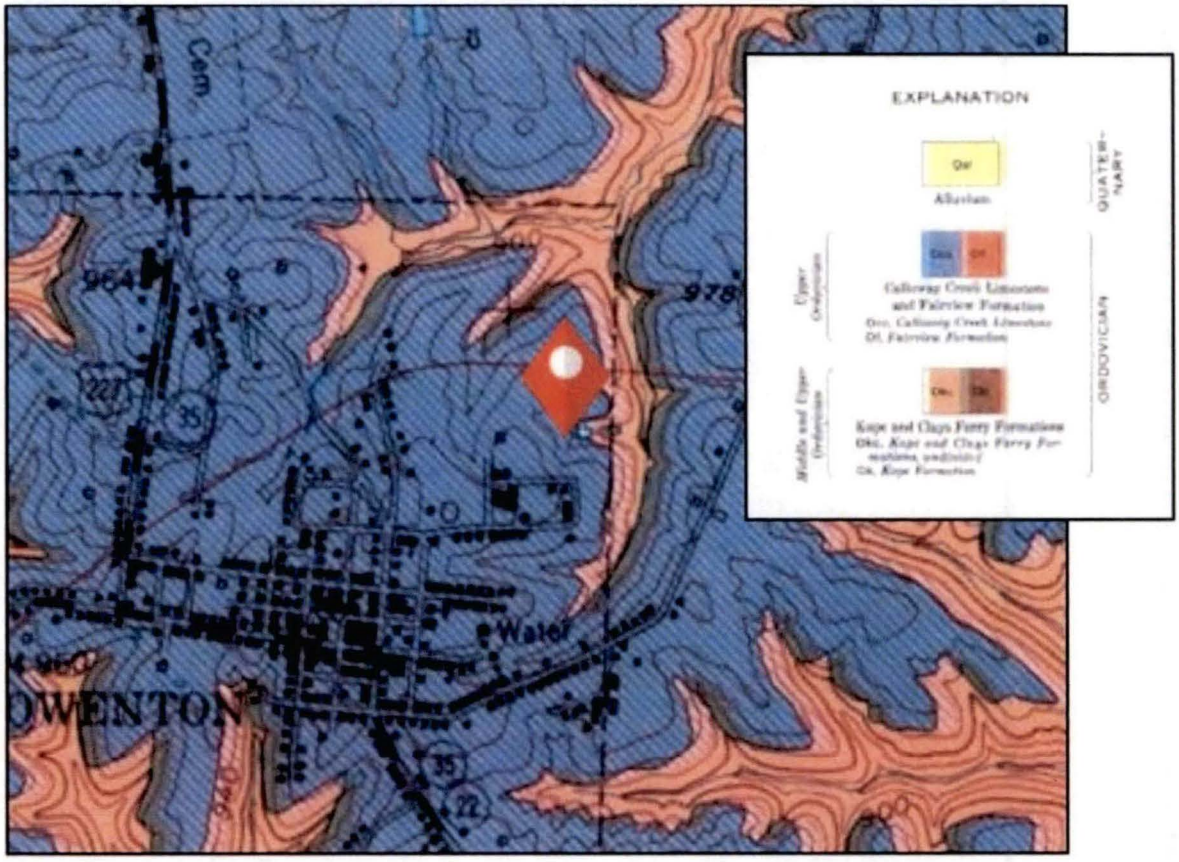


Figure 1. Site Geology USGS Owenton Geologic Quadrangle, dated 1975

As with most of the geology of this portion of Kentucky, Karst (sinkholes, weathered bedrock, caverns, erratic bedrock, etc.) is associated with the site geology. The Owen County Karst Areas map published by the Kentucky Geological Survey (KGS) indicates that the project site is in an area of "Low" to "Medium" risk of Karst development. Since portions of the site (and surrounding areas) have been regraded, obvious signs of sinkhole activity may have been filled or otherwise occluded. Additionally, there is a risk of slope instability under the berm because of degradation of the underlying bedrock facilitated by Karst activity. Furthermore, a "punching" failure in the liner may be possible due to shallow rock features and floaters commonly found in Karst prone areas. The following figure indicates the regional Karst potential.

Figure 2. Project Site Karst Potential Map (KGS)

Other Published Site Information:

We have reviewed several available aerial photographs, dated as far back as March 1997. The aerial photographs indicate that site has been in use as a lagoon as far back as 1997. Please reference the aerial photographs on the following page for further details.

Figure 3: Aerial photograph, dated March 1997 (Google Earth)

Figure 4: Aerial photograph, dated September 2014 (Google Earth)

Site Surface Observations:

A site reconnaissance was conducted by Staff Professional Barry Bishop, EIT of CSI on September 10, 2015 and September 21, 2015. Mr. Bishop observed and documented site surface conditions, logged soil borings, and directed drilling operations.

The site is currently in use as a wastewater lagoon. A berm forms the lagoon on the northeast and eastern perimeters. The lagoon is composed of a detention basin (approximately 3 acres) lined with a reinforced polypropylene liner. The liner was observed to be in poor condition with observable holes along the perimeter of the liner (please reference the photographs in the attached Leak Detection and Liner Survey for further details). A chainlink fence surrounded the perimeter of the lagoon (on top of the berm on the northeast and eastern perimeters). Inlet and outlet lines enter and exit the lagoon, with the inlet point visible near the center of the eastern perimeter. Additionally, several unmarked electrical lines that were identified by KAWC personnel traversed the perimeter of the lagoon. CSI subcontracted a private utility locator to clear our borings along the eastern perimeter of the berm. Several aerators were located within the lagoon. Please note the aerator in the southeast corner of the lagoon was not observed functioning. An electrical structure was observed along the northeast perimeter of the site.

Ground cover at the site site was mostly landscaped grass within the perimeter of the fence. The grass along the northern perimeter between the gravel road and the fence had also been maintained. Knee to waste high grasses along with other vegetation occupied the areas around the rest of the lagoon. A drainage channel was observed traversing the berm on the eastern perimeter of the lagoon in the southeastern corner of the berm. The channel appeared to have been caused by heavy surface water flow.

Figure 5. Photograph of a channel along the face of the berm in the southeastern corner

A small creek was observed at the toe of the berm flowing in a south to north direction. The creek had several points of blockage from fallen tress and brush where water had pooled. The creek water was black in color at the points of blockage, and had a strong odor of raw sewage. Please reference the following photos for details.

Figure 6. Photographs of the creek along the toe of the berm

Subsurface Findings:

On September 10, 2015 and September 21, 2015, CSI personnel performed a total of five (5) soil borings on the berm forming the eastern perimeter of the lagoon. Please note that field operations were halted after the completion of boring B-1 on September 10, 2015, so that a private utility locator could be contracted. CSI personnel then resumed on September 21, 2015, after the locator completed his private utility locations. Please reference the attached Boring Location Plan for the approximate boring locations.

In general, we encountered the following in our soil borings: a layer of topsoil, overlying previously placed fill, overlying buried topsoil (where applicable), overlying residual soils, overlying weathered bedrock, overlying bedrock. Please reference the Summary of Soil Borings on the following page for details.

At all of our soil boring locations, we encountered a layer of topsoil. The topsoil ranged in thickness from approximately 1 inch to about 3 inches.

Beneath the topsoil, previously placed fill was encountered within all of our borings. The previously placed fill generally consisted of gray, brown, black, and orange lean clay (CL) with

possible shot rock fill. The previously placed fill ranged in thickness from 9.4 to 18.7 feet. SPT N-values ranged from 4 blows per foot (bpf) to 51 bpf indicating a soft to hard consistency. However, some of these N-values were likely inflated due to the rock fragment content within the existing fill matrix. Thus, the previously placed fill may be softer than indicated.

Beneath the previously placed fill, a layer of possible buried topsoil was observed at borings B-2 and B-3. The soil was gray to black with degraded organics such as fine roots and wood fragments. The layer of possible buried topsoil ranged in thickness from 0.2 to 2.5 feet. SPT N-values ranged from 15 bpf to 16 bpf indicating a stiff to very stiff consistency.

Beneath the previously placed fill/possible buried topsoil, residual soil was encountered within all of our borings. The residual soil generally consisted of gray to green lean clay (CL), with brown mottling. The residual soil ranged in thickness from 2.6 to 5.6 feet. SPT N-values ranged from 12 bpf to 32 bpf indicating a stiff to hard consistency. However, these N-values were likely inflated due to weathered rock fragments within the residual soil horizon. Thus, these soils may be softer than indicated.

Summary of Soil Borings

Boring No.	Elevation (ft.)	Fill Thickness (ft)	Possible Buried Topsoil Thickness (ft)	Residual Soil Thickness (ft)	Weathered Rock Thickness (ft)	Auger Refusal Depth (ft)
B-1	921.2*	9.4	N/A	3.8	0.4	13.7
B-2	948.5**	9.9	0.2	3.1	0.3	13.6
B-3	948.8**	14.9	2.5	2.6	0.2	20.3
B-4	949.0**	18.7	N/A	3.7	0.7	23.4
B-5	949.0**	9.4	N/A	5.6	0.3	15.4

* Elevation was provided by Kleingers Group personnel
** Elevations were refrenced to Hub #55 provided by Kleingers Group personnel given as 948.26 feet

Weathered rock was encountered at all of our borings. The thickness of the weathered rock ranged from 0.2 to 0.7 feet.

Auger refusal was encountered at all of our borings. Auger refusal depths ranged from about 13.6 feet to about 23.4 feet below the existing site grades. Auger refusal is typically interpreted as top of hard bedrock. Please note that rock coring was not within our scope of work.

Groundwater:

Groundwater was not encountered in any of our borings upon completion of soil augering. Temporary piezometers were installed at all of our boring locations and 24-hour, 7-day, 21-day, and 28-day water level readings were taken at all piezometers. Please reference the Summary of Piezometer Readings table for further details. All piezometer readings were taken from the surface elevation relative to the top of groundwater observed. At boring B-1, 9.4 feet was measured to the top of water for the 24 Hour reading, and the water level readings were relatively consistent for the remainder of the readings for B-1. Boring B-2 was dry for the 24 Hour and 7 Day readings,

however a depth of 13.3 feet to the top of water from the surface was observed in the 14, 21, and 28 Day readings. Boring B-3 was observed as dry for the entire 28 day period. Boring B4 was observed as dry for the 24 Hour and 7 Day readings, then depths (from the surface to top of groundwater) of 23.2 feet, 22.7 feet, and 22.4 feet were observed for the 14 Day, 21 Day, and 28 Day reading respectively. Boring B-5 was also dry for the 24 Hour and 7 Day readings, then water depths (from the surface to the top of groundwater) of 15.0 feet, 14.8 feet, and 14.7 feet were observed for the 14 Day, 21 Day, and 28 Day reading respectively. Additional piezometer readings can be obtained at your direction. Please reference the piezometer readings below for details.

Summary of Piezometer Readings***

Boring No.	24 Hour Reading (ft)	7 Day Reading (ft)	14 Day Reading (ft)	21 Day Reading (ft)	28 Day Reading (ft)
B-1*	9.4	9.6	9.9	9.9	9.6
B-2**	Dry	Dry	13.3	13.3	13.3
B-3**	Dry	Dry	Dry	Dry	Dry
B-4**	Dry	Dry	23.2	22.7	22.4
B-5**	Dry	Dry	15.0	14.8	14.7

* Boring performed on 9/10/15
** Borings performed on 9/21/15
***All piezometer readings were taken from the surface elevation relative to the top of groundwater observed

NOTE: The temporary piezometers have been left in-place for your future use (if you so desire). Now that our groundwater level readings are complete, we can abandon these piezometers upon your direction by overdrilling and backfilling with bentonite chips. Please let us know when/if you wish us to abandon these piezometers.

Bathymetric Survey:

CSI's scope of work included a bathymetric survey in order to measure the depth of water and the shape of the terrain below the water surface in the WWTP lagoon. Kleingers Group was subcontracted to perform the bathymetric survey under the supervision of CSI personnel.

To perform the bathymetric survey, Kleingers Group personnel established horizontal and vertical control based on the Kentucky State Plane Coordinate System (NAD83, NAVD88). Field elevations and physical locations from edge of existing lagoon to the existing fence were then obtained. The bathymetric survey of the lagoon area was performed in 50 intervals using a small Johnboat. Project benchmarks within the WWTP lagoon area were located for future use.

Leak Detection (Dipole Method):

CSI's scope of work also included a leak detection test in order to detect defects in the polypropylene liner. TRI Environmental, Inc. was subcontracted to perform leak detection services under the supervision of CSI personnel.

Due to the fact that the lagoon could not be drained, the method of leak detection was the dipole method per ASTM D7007 which is used for geomembranes covered with soil, gravel, water or other porous or conductive material. Please reference the following Figure 7. Please note that Figure 7 depicts performing the dipole test in shallow water, and not with the remote dipole. A high voltage was applied to the water covering the geomembrane and a power source was grounded to the earth beneath it. A roving dipole was used to scan the survey area by TRI and CSI personnel. When a defect (a hole) in the liner was detected by the dipole, the equipment would register a spike in the voltage field when one dipole foot was directly over the hole. This voltage spike was converted to an audible alarm, as well as graphed real-time on the detection meter.

A sensitivity test was performed before beginning the survey in order to calibrate the equipment to site conditions and to determine the maximum survey scanning distance. A remote drag probe dipole was used to scan survey areas (which were too deep for wading), by pulling it back and forth across the lagoon by TRI and CSI personnel.

Due to the tremendous number and sizes of the liner leaks, the sensitivity had to be decreased. In essence, there were so many breaches detected which drew so much current, it was not possible to precisely locate each leak. After consulting with Mr. Tilley, it was decided that no further benefit would be gained by scanning the remaining portions of the lagoon.

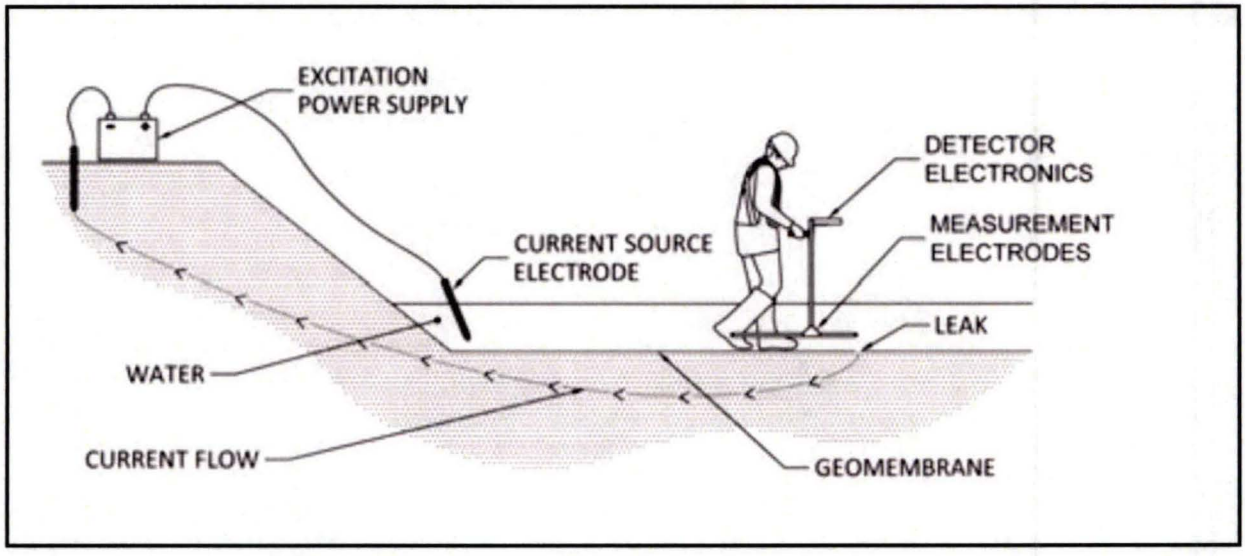


Figure 7. Dipole Method of Leak Detection (ASTM D7007)

Discussion:

The bathymetric survey was performed as described perviously in this letter. Please find the bathymetric survey attached. An area in the southwest corner of the lagoon between elevations 928 and 940 feet appeared to be anomalous. The spacing between the contours (1 foot contours) becomes tight. This may be due to a rock cut, or a slope failure. However, the cause cannot be determined while the liner is in-place.

As previously mentioned, previously placed fill was encountered within all of our borings. The composition of the existing soil within the fill matrix in the berm along the eastern perimeter of the lagoon contains rock fragments (possible shot rock), which is not desirable for earth berm construction to impound a permanent pool of water. Void spaces between rock fragments may be created by water washing soil fines away from within the fill matrix, thus increasing seepage when water flow is present.

Our research indicates that the lagoon has been in-place since at least March, 1997. We were informed by KAWC personnel that the lagoon had been constructed and been in use by a previous business at this site. It is believed that the lagoon was constructed about 30 years ago. Due to the poor condition of the lagoon liner, it appears that wastewater is leaking from the lagoon through the rock fill into the creek below the toe of the berm.

The underwater electrical leak location survey was greatly hampered due entirely to the sheer quantity of holes in the liner. This caused significant current leakage, making it impossible to locate and identify each and every leak. In essence, there were so many leaks that the individual leaks could not be positively identified, located, or documented. In addition, the sensitivity of the equipment had to be decreased so much that smaller leaks could have been missed as well. However, it is absolutely certain that there were a tremendous amount of leaks throughout the liner itself. Poor liner conditions were confirmed by the visual survey (for those areas above the water elevation). The largest underwater anomalies were noted and the approximate distance to them noted on the flags placed in the soil along the survey area. For further details, please reference the attached TRI report and photo logs.

Although it is beyond our current authorized scope of work, CSI can offer engineering recommendations and construction administration services for this project. We can make assessments on how to approach the project, gather the resources necessary for remediation, oversee the field operations while work is being performed, and keep records of labor and materials in order to complete the project in an efficient manner. This would include removing the previous berm, reconstruction of a berm, liner replacement, and following normal earthen lagoon construction guidelines.

Closure:

We appreciate the opportunity to provide our engineering services to you and the design team. Please do not hesitate to contact us for questions or comments about the information contained herein.

Sincerely,

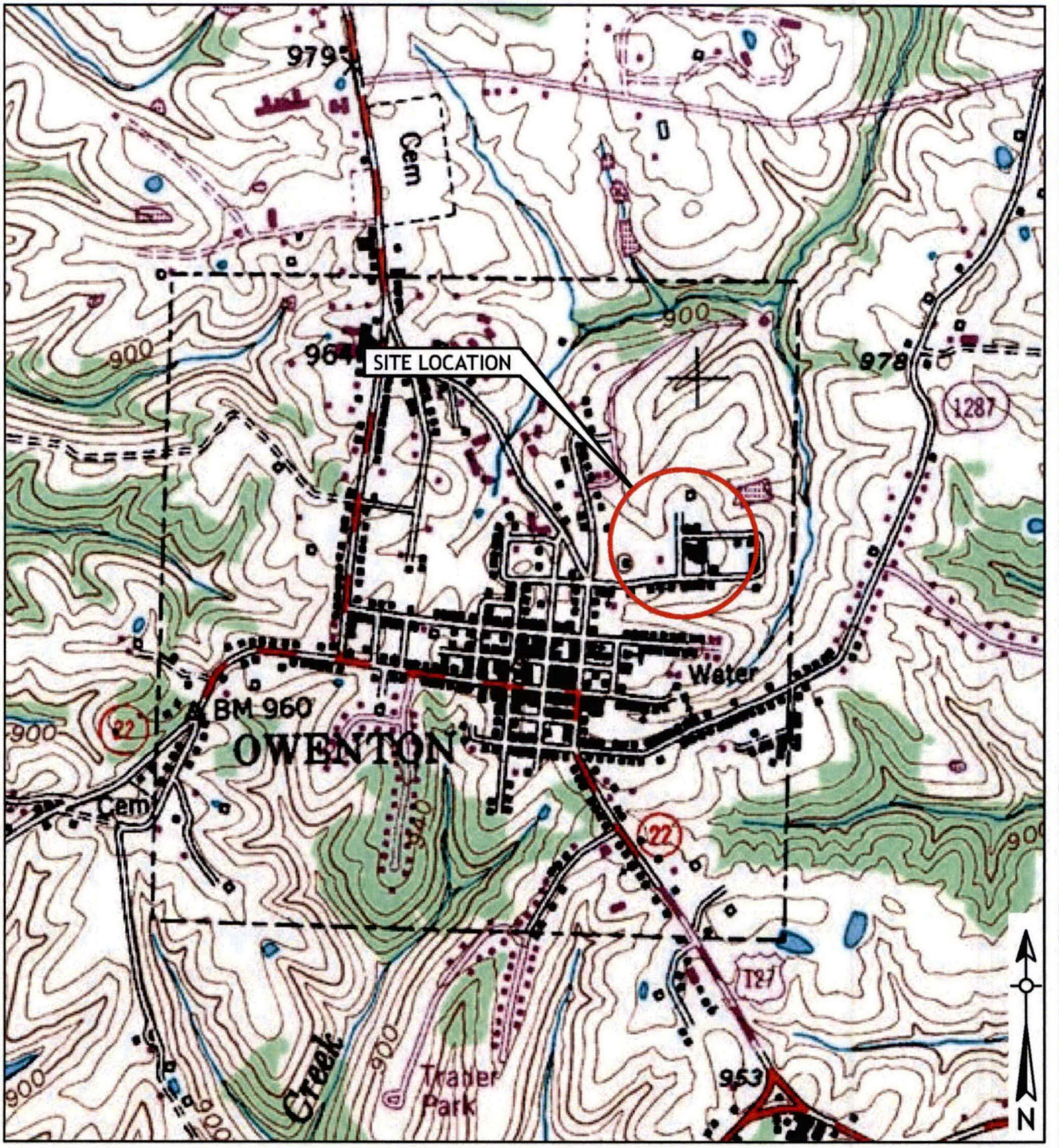
Consulting Services Incorporated of Kentucky,

Barry F. Bishop

Barry F. Bishop, EIT
Staff Professional

Bruce L. Hatcher, PE, SI
Chief Engineer

Attachment: Site Location Plan
Boring Location Plan
Geotechnical Boring Information Sheet
Soil Boring Logs
Field Testing Procedures
Summary of Laboratory Testing Table
Specific Laboratory Test Tables
Laboratory Testing Procedures
Leak Detection and Liner Survey
Bathymetric Survey



Site Location Plan adapted from USGS Owenton, Kentucky Topographic Quadrangle map dated 1950 (revised 1987), with further adaptation by CSI personnel.

FOR ILLUSTRATION PURPOSES ONLY

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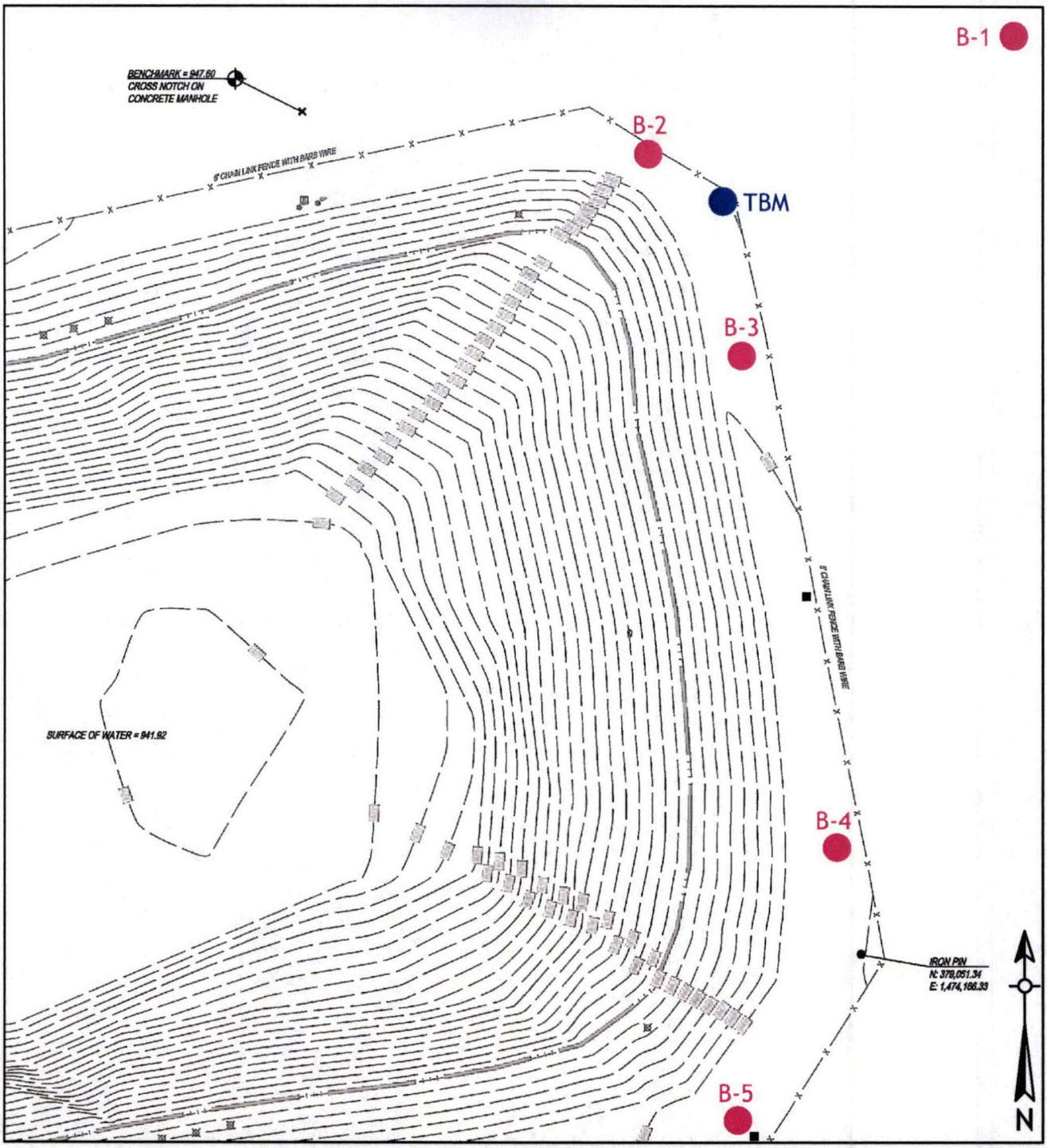
Lexington, Kentucky 40505
859.309.6021 Office | 888.792.3121 Fax
www.csikentucky.com

TITLE: SITE LOCATION PLAN		Project No: LX150171	Drawn By: TEW
PROJECT:	Kentucky American Water Wastewater Lagoon Evaluation Owenton, Kentucky	Date: October 21, 2015	Checked By: BB
		Scale: Not To Scale	Drawing No: 1 of 1



Boring Location Plan adapted from provided Topographic Survey Drawing dated September 17, 2015, with further adaptation by CSI personnel.
* Elevation at Boring B-1 was provided by Kleingers Group personnel
** Elevations at Borings B-2 through B-5 were referenced to Hub #55 provided by Kleingers Group personnel given as 948.26 feet (TBM).

LEGEND
B-XXX BORING LOCATIONS
TBM TEMPORARY BENCHMARK

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TITLE: BORING LOCATION PLAN		Project No: LX150171	Drawn By: TEW
PROJECT: Kentucky American Water Wastewater Lagoon Evaluation Owenton, Kentucky		Date: October 21, 2015	Checked By: BB
		Scale: Not To Scale	Drawing No: 1 of 1

Consulting Services Incorporated

Lexington 859.309.6021 | Cincinnati 513.252.2059 | Louisville 502.532.8269 | Calvert City 270.210.1735
Geotechnical & Materials Engineering | IBC Special Inspection | Material Testing

Geotechnical Boring Information Sheet

Sample Type Symbols	
Splitspoon (SPT)	
Dynamic Cone Penetrometer (DCP)	
Shelby Tube	
Grab	
Bulk	
Rock Core	

Surface Symbols	
Topsoil	
Asphalt	
Concrete	
Lean Clay	
Fat Clay	
Sandy Clay	
Silt	
Elastic Silt	
Lean Clay to Fat Clay	
Gravelly Clay	
Sandy Silt	
Gravelly Silt	
Sand	
Gravel	
Fill	
Void	
Limestone	
Sandstone	
Shale/Siltstone	
Weathered Rock	

Samples Strength Descriptors	
Cohesive Soils:	**N**
Very Soft	0-1
Soft	2-4
Firm	5-8
Stiff	9-15
Very Stiff	16-30
Hard	31+
Non-cohesive Soils:	
Very Loose	0-4
Loose	5-10
Firm	11-20
Very Firm	21-30
Dense	30-50
Very Dense	51+

Definitions

SPT-"Splitspoon" or standard penetration test. Blow counts are number of drops required for a 140 lb hammer dropping 30 inches to drive the sampler 6 inches.

N-value is the addition of the last two intervals of the 18-inch sample.

Shelby tubes are often called "undisturbed samples". They are directly pushed into the ground, twisted, allowed to rest for a small period of time and then pulled out of the ground. Tops and bottoms are cleaned and then sealed.

Sample classification is done in general accordance with ASTM D2487 and 2488 using the Unified Soil Classification System (USCS) as a general guide.

Soil moisture descriptions are based on the recovered sample observations. The descriptors are dry, slightly moist, moist, very moist and wet. These are typically based on relative estimates of the moisture condition of a visual estimation of the soils optimum moisture content (EOMC). Dry is almost in a "dusty" condition usually 6 or more percent below EOMC. Slightly moist is from about 6 to 2 percent below EOMC at a point at which the soil color does not readily change with the addition of water. Moist is usually 2 percent below to 2 percent above EOMC and the point at which the soil will tend to begin forming "balls" under some pressure in the hand. Very moist is usually from about 2 percent to 6 percent above EOMC and also the point at which it's often considered "muddy". Wet soil is usually 6 or more percent above EOMC and often contains free water or the soil is in a saturated state.

Silt or Clay is defined at material finer than a standard #200 US sieve (<0.075mm) Sand is defined as material between the size of #200 sieve up to #4 sieve. Gravel is from #4 size sieve material to 3". Cobbles are from 3" to 12". Boulders are over 12".

Rock hardness is classified as follows:

Very Soft:	Easily broken by hand pressure
Soft:	Ends can be broken by hand pressure; easily broken with hammer
Medium:	Ends easily broken with hammer; middle requires moderate blow
Hard:	Ends require moderate hammer blow; middle requires several

blows Very Hard: Many blows with a hammer required to break core

Rock Quality Designation (RQD) is defined as total combined length of 4" or longer pieces of core divided by the total core run length; defined in percentage.

Water or cave-in observed in borings is at completion of drilling each boring unless otherwise noted.

Strata lengths shown on borings represents a rough estimate. Transition may be more abrupt or gradual. Soil borings are representative of that estimated location at that time and are based on recovered samples. Conditions may be different between borings and between sample intervals. Boring information is not to be considered stand alone but should be taken in context with comments and information in the geotechnical report and the means by which the borings are logged, sampled and drilled.

Consulting Services Inc. of Kentucky

Boring Log

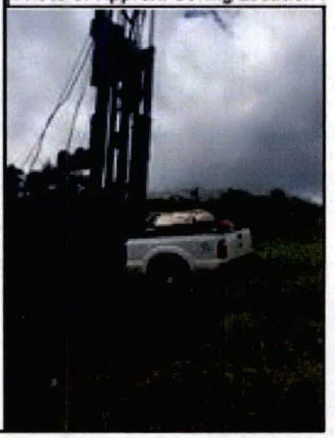
858 Contract Street | Lexington, Kentucky 40505 | 859.309.6021 tel | 888.792.3121 fax

PROJECT: KY American Water Company Lagoon
PROJECT NUMBER: LX150171
BORING NUMBER: B-1
LOCATION: Owenton, Kentucky
WEATHER: Sunny, 80's
DRILL RIG TYPE: CME 550
DRILLER: Geo-Drill
DATE DRILLED: September 10, 2015
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: Barry Bishop, EIT
CLIENT: Kentucky American Water

TOP OF GROUND ELEVATION: 921.2

ELEV. (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
921.2	0		TOPSOIL - 2 inches			4-4-5	8		Dry upon completion of soil augering
			FILL - sampled as STIFF to VERY STIFF, gray and orange clay, with silt, with gravel, with fine roots in top 3 feet, moist			9-6-6	12		Temporary piezometer well installed upon completion of soil augering
917.2	4					5-10-13	8		
						6-12-12	10		
913.2	8					9-11-11	10		
			LEAN CLAY (CL) - VERY STIFF, gray, with orange mottling, with silt, moist						
909.2	12								
			Weathered Rock						
			Auger Refusal at 13.7 feet						
905.2	16								
901.2	20								
897.2	24								
893.2	28								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Elevation Boring B-1 was provided by Kleingers Group personnel. Elevations at Borings B-2 through B-5 were referenced to Hub #55 provided by Kleingers Group personnel given as 948.26 feet (TBM).

Consulting Services Inc. of Kentucky

Boring Log

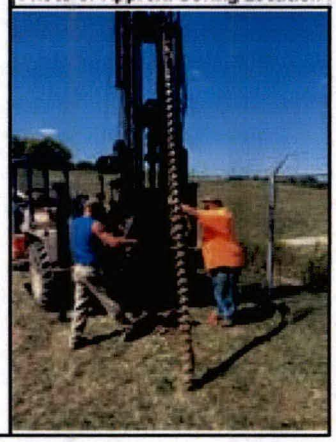
858 Contract Street | Lexington, Kentucky 40505 | 859.309.6021 tel | 888.792.3121 fax

PROJECT: KY American Water Company Lagoon
PROJECT NUMBER: LX150171
BORING NUMBER: B-2
LOCATION: Owenton, Kentucky
WEATHER: Sunny, 80's
DRILL RIG TYPE: CME 550
DRILLER: Geo-Drill
DATE DRILLED: September 21, 2015
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: Barry Bishop, EIT
CLIENT: Kentucky American Water

TOP OF GROUND ELEVATION: 948.5

ELEV. (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
948.5	0		TOPSOIL - 1 inch FILL - sampled as VERY STIFF, gray to tan clay, with fine roots, with shot rock fragments, damp			7-9-9	8		Dry upon completion of soil augering Temporary piezometer well installed upon completion of soil augering
944.5	4		FILL - sampled as FIRM to STIFF, brown clay, with shot rock fragments, moist			3-4-4	6		
940.5	8					6-7-9	16		
936.5	12		Possible Buried TOPSOIL - VERY STIFF, gray and black degraded organics, moist LEAN CLAY (CL) - VERY STIFF, gray, with brown mottling, moist						
932.5	16		Weathered Rock Auger Refusal at 13.6 feet						
928.5	20								
924.5	24								
920.5	28								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Elevation Boring B-1 was provided by Kleingers Group personnel. Elevations at Borings B-2 through B-5 were referenced to Hub #55 provided by Kleingers Group personnel given as 948.26 feet (TBM).

Consulting Services Inc. of Kentucky — Boring Log

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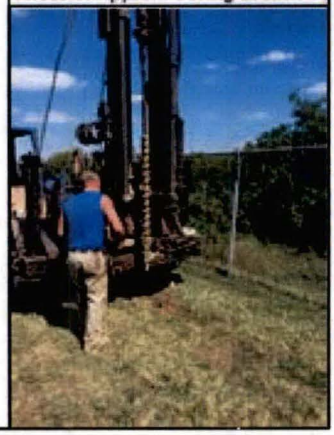
PROJECT: KY American Water Company Lagoon
PROJECT NUMBER: LX150171
BORING NUMBER: B-3
LOCATION: Owenton, Kentucky
WEATHER: Sunny, 80's
DRILL RIG TYPE: CME 550
DRILLER: Geo-Drill
DATE DRILLED: September 21, 2015
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: Barry Bishop, EIT
CLIENT: Kentucky American Water

TOP OF GROUND ELEVATION: 948.8

ELEV. (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
948.8	0		TOPSOIL - 1 inch FILL - sampled as VERY STIFF, gray and tan clay, with shot rock fragments, damp			6-8-8	10		Dry upon completion of soil augering Temporary piezometer well installed upon completion of soil augering
944.8	4		FILL - sampled as STIFF to VERY STIFF with FIRM zone, brown clay, with shot rock fragments, moist with wet zone			7-5-5	12		
940.8	8					4-3-4	14		
936.8	12					6-13-7	10		
932.8	16		Possible Buried TOPSOIL - VERY STIFF - gray and black, with degraded organics, moist						
928.8	20		LEAN CLAY (CL) - HARD, green, with brown mottling, moist Weathered Rock Auger Refusal at 20.3 feet			7-25-50/0.1	8		
924.8	24								
920.8	28								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Elevation Boring B-1 was provided by Kleingers Group personnel. Elevations at Borings B-2 through B-5 were referenced to Hub #55 provided by Kleingers Group personnel given as 948.26 feet (TBM).

Consulting Services Inc. of Kentucky

Boring Log

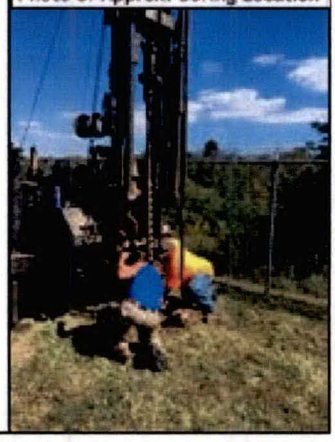
858 Contract Street | Lexington, Kentucky 40505 | 859.309.6021 tel | 888.792.3121 fax

PROJECT: KY American Water Company Lagoon
PROJECT NUMBER: LX150171
BORING NUMBER: B-4
LOCATION: Owenton, Kentucky
WEATHER: Sunny, 80's
DRILL RIG TYPE: CME 550
DRILLER: Geo-Drill
DATE DRILLED: September 21, 2015
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: Barry Bishop, EIT
CLIENT: Kentucky American Water

TOP OF GROUND ELEVATION: 949.0

ELEV. (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
949	0		TOPSOIL - 3 inches FILL - sampled as VERY STIFF to FIRM, gray and tan lean clay (CL), with fine roots, with shot rock fragments, with shale fragments at 15.0 feet, damp to moist			3-8-8	8		Dry upon completion of soil augering Temporary piezometer well installed upon completion of soil augering
945	4					4-6-12	12		
941	8					7-11-10	10		
937	12					4-3-4	8		
933	16					11-7-9	10		
929	20		LEAN CLAY (CL) - VERY STIFF, gray and tan, with limestone fragments, moist						
925	24		Weathered Rock Auger Refusal at 23.4 feet						
921	28								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location.
Elevation Boring B-1 was provided by Kleingers Group personnel. Elevations at Borings B-2 through B-5 were referenced to Hub #55 provided by Kleingers Group personnel given as 948.26 feet (TBM).

Consulting Services Inc. of Kentucky

Boring Log

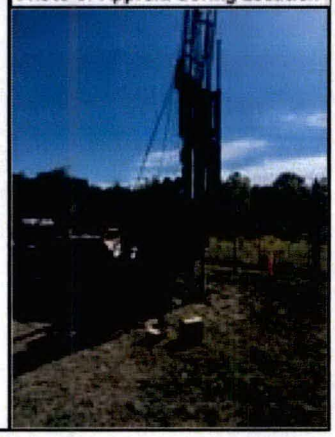
858 Contract Street | Lexington, Kentucky 40505 | 859.309.6021 tel | 888.792.3121 fax

PROJECT: KY American Water Company Lagoon
PROJECT NUMBER: LX150171
BORING NUMBER: B-5
LOCATION: Owenton, Kentucky
WEATHER: Sunny, 80's
DRILL RIG TYPE: CME 550
DRILLER: Geo-Drill
DATE DRILLED: September 21, 2015
DRILLING METHOD: 4" OD SFA
CSI FIELD REP: Barry Bishop, EIT
CLIENT: Kentucky American Water

TOP OF GROUND ELEVATION: 949.0

ELEV. (feet)	DEPTH (feet)	Water Level	Strata Description	SOIL TYPE	SAMPLES	SPT Blow Counts	Recovery (in)	RQD (%)	Notes
949	0		TOPSOIL - 1 inch FILL - sampled as HARD to STIFF to SOFT, tan, black and brown clay, with fine roots with shot rock fragments, moist			6-9-42	12		Dry upon completion of soil augering Temporary piezometer well installed upon completion of soil augering
945	4					4-5-6	6		
941	8					2-2-3	14		
937	12		LEAN CLAY (CL) - FIRM to HARD, gray, with brown mottling, with black oxide nodules, moist			5-7-50/0.1	10		
933	16		Weathered Rock Auger Refusal at 15.4 feet						
929	20								
925	24								
921	28								

Photo of Approx. Boring Location



Please note: Boring log is for information only. Soil borings only show conditions observed in specific recovered samples at that particular location. Elevation Boring B-1 was provided by Kleingers Group personnel. Elevations at Borings B-2 through B-5 were referenced to Hub #55 provided by Kleingers Group personnel given as 948.26 feet (TBM).

FIELD TESTING PROCEDURES

Field Operations: The general field procedures employed by CSI are summarized in ASTM D 420 which is entitled "Investigating and Sampling Soils and Rocks for Engineering Purposes." This recommended practice lists recognized methods for determining soil and rock distribution and ground water conditions. These methods include geophysical and in situ methods as well as borings.

Borings are drilled to obtain subsurface samples using one of several alternate techniques depending upon the subsurface conditions. These techniques are:

a. Continuous 2-1/2 or 3-1/4 inch I.D. hollow stem augers;

b. Wash borings using roller cone or drag bits (mud or water);

c. Continuous flight augers (ASTM D 1425).

These drilling methods are not capable of penetrating through material designated as "refusal materials." Refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse gravel or boulders, thin rock seams, or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

The subsurface conditions encountered during drilling are reported on a field test boring record by the chief driller. The record contains information concerning the boring method, samples attempted and recovered, indications of the presence of various materials such as coarse gravel, cobbles, etc., and observations between samples. Therefore, these boring records contain both factual and interpretive information. The field boring records are on file in our office.

The soil and rock samples plus the field boring records are reviewed by a geotechnical engineer. The engineer classifies the soils in general accordance with the procedures outlined in ASTM D 2488 and prepares the final boring records, which are the basis for all evaluations and recommendations.

The final boring records represent our interpretation of the contents of the field records based on the results of the engineering examinations and tests of the field samples. These records depict subsurface conditions at the specific locations and at the particular time when drilled. Soil conditions at other locations may differ from conditions occurring at these boring locations. Also, the passage of time may result in a change in the subsurface soil and ground water conditions at these boring locations. The lines designating the interface between soil or refusal materials on the records and on profiles represent approximate boundaries. The transition between materials may be gradual. The final boring records are included with this report.

The detailed data collection methods using during this study are discussed on the following pages.

Soil Test Borings: Soil test borings were made at the site at locations shown on the attached Boring Plan. Soil sampling and penetration testing were performed in accordance with ASTM D 1586.

The borings were made by mechanically twisting a hollow stem steel auger into the soil. At regular intervals, the drilling tools were removed and soil samples obtained with a standard 1.4 inch I.D., 2 inch O.D., split tube sampler. The sampler was first seated 6 inches to penetrate any loose cuttings, then driven an additional foot with blows of a 140-pound hammer falling 30 inches. The number of hammer blows required to drive the sampler the final foot was recorded and is designated the "penetration resistance". The penetration resistance, when properly evaluated, is an index to the soil strength and foundation supporting capability.

Representative portions of the soil samples, thus obtained, were placed in glass jars and transported to the laboratory. In the laboratory, the samples were examined to verify the driller's field classifications. Test Boring Records are attached which graphically show the soil descriptions and penetration resistances.

Core Drilling: Refusal materials are materials that cannot be penetrated with the soil drilling methods employed. Refusal, thus indicated, may result from hard cemented soil, soft weathered rock, coarse

gravel or boulders, thin rock seams or the upper surface of sound continuous rock. Core drilling procedures are required to determine the character and continuity of refusal materials.

Prior to coring, casing is set in the drilled hole through the overburden soils, if necessary, to keep the hole from caving. Refusal materials are then cored according to ASTM D 2113 using a diamond-studded bit fastened to the end of a hollow double tube core barrel. This device is rotated at high speeds, and the cuttings are brought to the surface by circulating water. Core samples of the material penetrated are protected and retained in the swivel- mounted inner tube. Upon completion of each drill run, the core barrel is brought to the surface, the core recovered is measured, the samples are removed and the core is placed in boxes for storage.

The core samples are returned to our laboratory where the refusal material is identified and the percent core recovery and rock quality designation is determined by a soils engineer or geologist. The percent core recovery is the ratio of the sample length obtained to the depth drilled, expressed as a percent. The rock quality designation (RQD) is obtained by summing up the length of core recovered, including only the pieces of core which are four inches or longer, and dividing by the total length drilled. The percent core recovery and RQD are related to soundness and continuity of the refusal material. Refusal material descriptions, recoveries, and RQDs are shown on the "Test Boring Records".

Hand Auger Borings and Dynamic Cone Penetration Testing: Hand auger borings are performed manually by CSI field personnel. This consists of manually twisting hand auger tools into the subsurface and extracting "grab" or baggie samples at intervals determined by the project engineer. At the sample intervals, dynamic cone penetration (DCP) testing is performed. This testing involves the manual raising and dropping of a 20-pound hammer, 18 inches. This "driver" head drives a solid-13/4 inch diameter cone into the ground. DCP "counts" are the number of drops it takes for the hammer to drive three 13/4 inch increments, recorded as X-Y-Z values.

Test Pits: Test pits are excavated by the equipment available, often a backhoe or trackhoe. The dimensions of the test pits are based on the equipment used and the power capacity of the equipment. Samples are taken from the spoils of typical buckets of the excavator and sealed in jars or "Ziploc" baggies. Dynamic Cone Penetration or hand probe testing is often performed in the upper few feet as OSHA standards allow. Refusal is deemed as the lack of advancement of the equipment with reasonable to full machine effort.

Water Level Readings: Water table readings are normally taken in conjunction with borings and are recorded on the "Test Boring Records". These readings indicate the approximate location of the hydrostatic water table at the time of our field investigation. Where impervious soils are encountered (clayey soils) the amount of water seepage into the boring is small, and it is generally not possible to establish the location of the hydrostatic water table through water level readings. The ground water table may also be dependent upon the amount of precipitation at the site during a particular period of time. Fluctuations in the water table should be expected with variations in precipitation, surface run-off, evaporation and other factors.

The time of boring water level reported on the boring records is determined by field crews as the drilling tools are advanced. The time of boring water level is detected by changes in the drilling rate, soil samples obtained, etc. Additional water table readings are generally obtained at least 24 hours after the borings are completed. The time lag of at least 24 hours is used to permit stabilization of the ground water table, which has been disrupted by the drilling operations. The readings are taken by dropping a weighted line down the boring or using an electrical probe to detect the water level surface.

Occasionally the borings will cave-in, preventing water level readings from being obtained or trapping drilling water above the caved-in zone. The cave-in depth is also measured and recorded on the boring records.

Consulting Services Incorporated
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Geotechnical & Materials Engineering | IBC Special Inspection | Material Testing

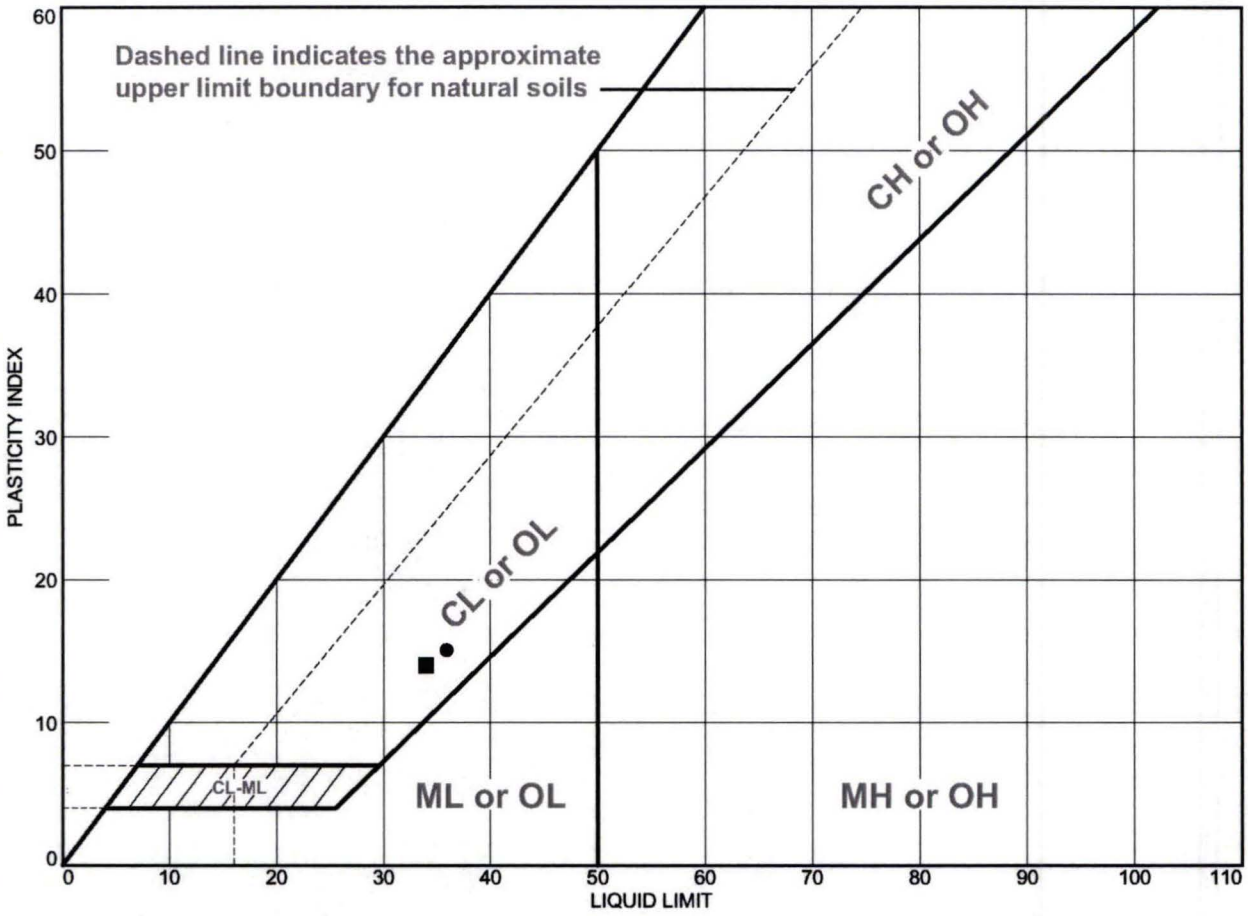
LABORATORY TESTING SUMMARY SHEET

Kentucky American Water Waste Water Lagoon Evaluation - Owenton, Kentucky
CSI PROJECT NUMBER - LX150171

Boring No.	Depth (feet)	Sample Type*	USCS Classification	Natural Moisture Content %	% Finer No. 200	Atterberg Limits Information			CBR (Percent at 0.1")	Max. DD (pcf)	OMC (%)	Qu (psf)	Swell Pressure (psf)
						LL	PL	PI					
B-2	0.0-1.5	SS		13.1									
	4.0-5.5	SS		24.5									
	9.0-10.5	SS		18.7									
B-3	0.0-1.5	SS		12.3									
	4.0-5.5	SS		20.1									
	9.0-10.5	SS		30.6									
	14.0-15.5	SS		25.6									
	19.0-20.1	SS		19.0									
B-4	0.0-1.5	SS		12.9									
	4.0-5.5	SS	CL	15.7	79.4	36	21	15					
	9.0-10.5	SS		17.1									
	14.0-15.5	SS		20.0									
	19.0-20.5	SS	CL	21.8	68.5	34	20	14					

* SS = splitspoon sample, UD = undisturbed (Shelby tube) sample, BULK = bulk sample, GRAB = grab sample, CORE = rock core sample

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	gray LEAN CLAY w/ SAND	36	21	15		79.4	CL
■	gray SANDY LEAN CLAY	34	20	14		68.5	CL

Project No. Kentucky **Client:** Kentucky American Water

Project: Kentucky American Water Waste Water Lagoon Evaluation - Owenton, Kentucky

●**Source of Sample:** borings **Depth:** 4.0-5.5 **Sample Number:** B-4

■**Source of Sample:** borings **Depth:** 19.0-20.5 **Sample Number:** B-4

Remarks:

Consulting Services Incorporated
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Figure

LABORATORY TESTING PROCEDURES

Soil Classification: Soil classifications provide a general guide to the engineering properties of various soil types and enable the engineer to apply past experience to current problems. In our investigations, samples obtained during drilling operations are examined in our laboratory and visually classified by an engineer. The soils are classified according to consistency (based on number of blows from standard penetration tests), color and texture. These classification descriptions are included on our "Test Boring Records."

The classification system discussed above is primarily qualitative and for detailed soil classification two laboratory tests are necessary: grain size tests and plasticity tests. Using these test results the soil can be classified according to the AASHTO or Unified Classification Systems (ASTM D 2487). Each of these classification systems and the in-place physical soil properties provides an index for estimating the soil's behavior. The soil classification and physical properties obtained are presented in this report.

Rock Classification: Rock classifications provide a general guide to the engineering properties of various rock types and enable the engineer to apply past experience to current situations. In our explorations, rock core samples obtained during drilling operations are examined in our laboratory and visually classified by an engineer. The rock cores are classified according to relative hardness and RQD (see Guide to Rock Classification Terminology), color, and texture. These classification descriptions are included on our Test Boring Records.

Atterberg Limits: Portions of the samples are taken for Atterberg Limits testing to determine the plasticity characteristics of the soil. The plasticity index (PI) is the range of moisture content over which the soil deforms as a plastic material. It is bracketed by the liquid limit (LL) and the plastic limit (PL). The liquid limit is the moisture content at which the soil becomes sufficiently "wet" to flow as a heavy viscous fluid. The plastic limit is the lowest moisture content at which the soil is sufficiently plastic to be manually rolled into tiny threads. The liquid limit and plastic limit are determined in accordance with ASTM D 4318.

Moisture Content: The Moisture Content is determined according to ASTM D 2216.

Percent Finer Than 200 Sieve: Selected samples of soils are washed through a number 200 sieve to determine the percentage of material less than 0.074 mm in diameter.

Rock Strength Tests: To obtain strength data for rock materials encountered, unconfined compression tests are performed on selected samples. In the unconfined compression test, a cylindrical portion of the rock core is subjected to increasing axial load until it fails. The pressure required to produce failure is recorded, corrected for the length to diameter ratio of the core and reported.

Compaction Tests: Compaction tests are run on representative soil samples to determine the dry density obtained by a uniform compactive effort at varying moisture contents. The results of the test are used to determine the moisture content and unit weight desired in the field for similar soils. Proper field compaction is necessary to decrease future settlements, increase the shear strength of the soil and decrease the permeability of the soil.

The two most commonly used compaction tests are the Standard Proctor test and the Modified Proctor test. They are performed in accordance with ASTM D 698 and D 1557, respectively. Generally, the Standard Proctor compaction test is run on samples from building or parking areas where small compaction equipment is anticipated. The Modified compaction test is generally performed for heavy structures, highways, and other areas where large compaction equipment is expected. In both tests a representative soil sample is placed in a mold and compacted with a compaction hammer. Both tests have three alternate methods.

Test	Method	Hammer Wt./Fall	Mold Diam.	Run on Material Finer Than	No. of Layers	No. of Blows/ Layer
Standard	A	5.5 lb./ 12"	4"	No. 4 sieve	3	25
D 698	B	5.5 lb./ 12"	4"	3/8" sieve	3	25
	C	5.5 lb./ 12"	6"	3/4" sieve	3	56

Test	Method	Hammer Wt./Fall	Mold Diam.	Run on Material Finer Than	No. of Layers	No. of Blows/ Layer
Modified	A	10 lb./ 18"	4"	No. 4 sieve	5	25
D 1557	B	10 lb./ 18"	4"	3/8" sieve	5	25
	C	10 lb./ 18"	6"	3/4" sieve	5	56

The moisture content and unit weight of each compacted sample is determined. Usually 4 to 5 such tests are run at different moisture contents. Test results are presented in the form of a dry unit weight versus moisture content curve. The compaction method used and any deviations from the recommended procedures are noted in this report.

Laboratory California Bearing Ratio Tests: The California Bearing Ratio, generally abbreviated to CBR, is a punching shear test and is a comparative measure of the shearing resistance of a soil. It provides data that is a semi-empirical index of the strength and deflection characteristics of a soil. The CBR is used with empirical curves to design pavement structures.

A laboratory CBR test is performed according to ASTM D 1883. The results of the compaction tests are utilized in compacting the test sample to the desired density and moisture content for the laboratory California Bearing Ratio test. A representative sample is compacted to a specified density at a specified moisture content. The test is performed on a 6-inch diameter, 4.58-inch-thick disc of compacted soil that is confined in a cylindrical steel mold. The sample is compacted in accordance with Method C of ASTM D 698 or D 1557.

CBR tests may be run on the compacted samples in either soaked or unsoaked conditions. During testing, a piston approximately 2 inches in diameter is forced into the soil sample at the rate of 0.05 inch per minute to a depth of 0.5 inch to determine the resistance to penetration. The CBR is the percentage of the load it takes to penetrate the soil to a 0.1 inch depth compared to the load it takes to penetrate a standard crushed stone to the same depth. Test results are typically shown graphically.

September 16, 2015

Dean Durbin
Consulting Services Incorporated
858 Contract Street
Lexington, Kentucky 40505

Subject: Final Report for Electrical Leak Location Survey and Visual Inspection of Wastewater Pond

Dear Mr. Durbin,

This report documents the electrical leak location survey and visual inspection conducted by TRI Environmental (TRI) on the installed geomembrane of an in-service single geomembrane covered with wastewater in Owenton, Kentucky.

The liner system of the approximately 3-acre impoundment appeared to be reinforced polypropylene on subgrade. The survey and visual inspection was performed on the geomembrane on September 15, 2015. The weather was generally sunny and warm.

This report describes the methods, procedures, and results of the survey.

DIPOLE METHOD

Method / Procedure

The method used to perform the geoelectric leak detection surveys on the installed primary geomembrane was the dipole method. Testing was performed in accordance with ASTM D7007. A DC voltage was applied to the solution covering the geomembrane and the power source was grounded to the soil outside of the pond. A remote dipole drag probe used to measure voltage potential was operated by Abigail Gilson-Beck. The drag probe was attached to two ropes and was pulled back and forth across the pond under the level of the water.

The operator observed voltage potential measurements and listened to the voltage values converted to an audible alarm throughout the survey area.

Leak Detection Distance Testing

Prior to the survey, a leak detection distance test was performed in order to assess the sensitivity of the survey. The 1.4 mm artificial leak fabricated and placed in accordance with ASTM D7007 was not able to be detected. Therefore, it was verified that a larger simulated leak could be detected by the equipment and the survey was performed at a scanning distance of 0.2 meters. This represents very poor sensitivity due to existing site conditions, since a 1.4 mm diameter leak can typically be detected at an offset of several meters.

RESULTS

The poor sensitivity of the electrical leak location survey suggested that there was a significant source of current leakage, most likely by the presence of excessive leaks in the lining system. This suspicion was confirmed immediately at the initiation of the survey. The anomalies detected upon commencing the survey were too numerous to document, however the largest anomalies are noted in Figure 1 and the approximate distance to them noted on the flags placed in the soil along the survey area. There were several obstructions in the survey area such as aerators, where the dipole probe could not access, as shown in Figure 2.

Figure 1: Approximate Locations of Anomalies

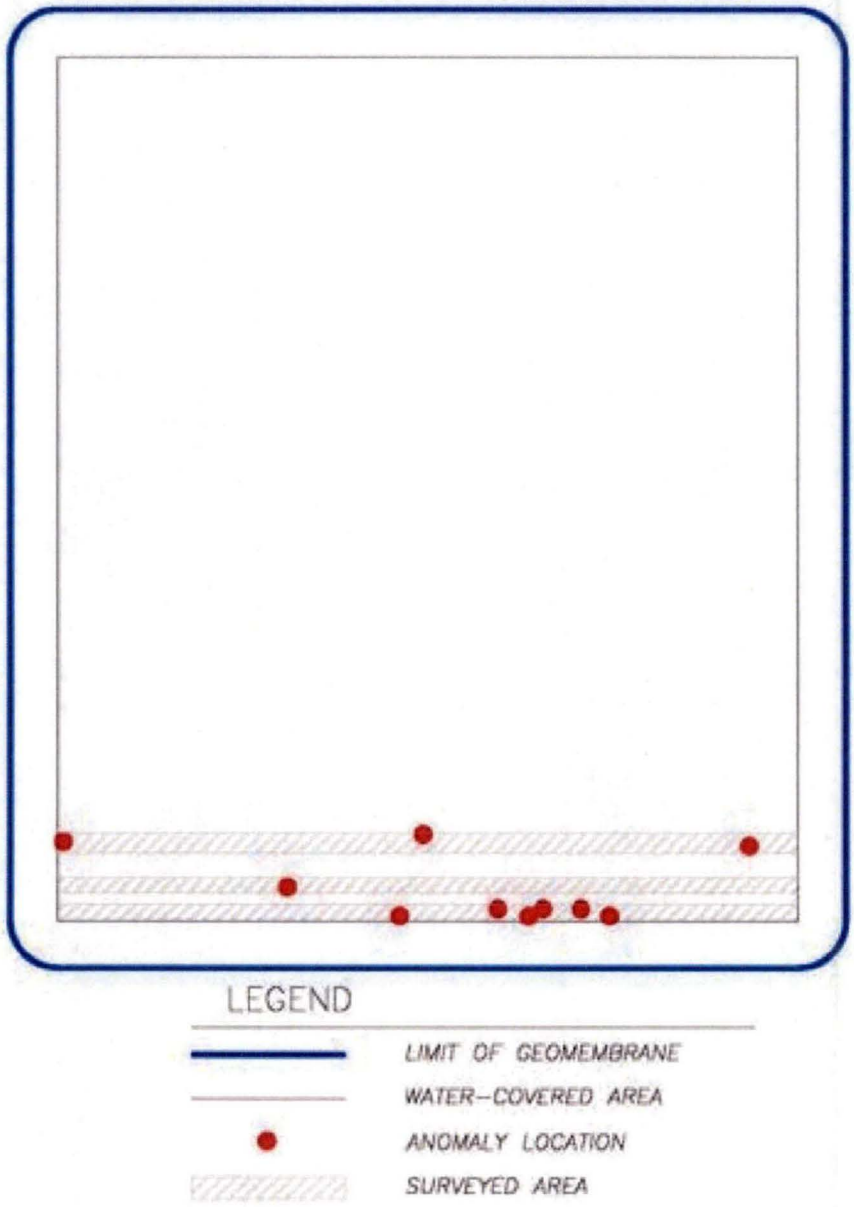


Figure 2: Survey Area Obstructions

The water-covered dipole method is effective when a facility contains a few holes rather than many holes. When multiple holes exist in a lining system, the current escaping through the collection of leaks throughout the lining system make it extremely difficult to detect a single leak, since most of the current is drawn elsewhere and the detection of a given leak is dependent upon its current draw. In addition, multiple leaks in close proximity to one another will tend to cause signal interference. The voltage peak of one hole will be superimposed on the voltage dip of an adjacent hole, potentially masking at least one of the holes and certainly making the signals more difficult to interpret. Multiple signals were immediately noted on the first few survey lines. The subsequent lines had fewer signals, but there were a number of slight anomalies, which were not noted. These slight anomalies could be small holes, which didn't have enough current draw to produce a full signal.

The survey was then discontinued based on the initial survey findings after a discussion with the pond owner and it was decided that a visual assessment of the general condition of the geomembrane in the accessible areas should be performed.

VISUAL OBSERVATIONS

A visual assessment of the accessible areas of the geomembrane was performed after the excessive number of anomalies encountered during the electrical leak location survey. A PhotoLog is provided as an attachment to this report of the observations noted herein. The

geomembrane was observed to be extremely degraded in most areas of the pond. This degradation could be seen even in areas of the parent material not apparently subject to any mechanical damage, as shown by Photos 1 through 4 of the PhotoLog . Geomembrane is supposed to have ductile strength, but once it has been degraded it becomes brittle, as shown by the surface flaking of the material as shown.

Dozens of holes were found by a visual inspection of the exposed side slopes. Some of these holes are presented as Photos 5 through 9. Photo No. 5 shows how a hole can be propagated by the initial surface cracking as shown in Photos 1 through 5. The way a surface scratch can propagate into a hole is shown in Photo No. 8. The delamination of the geomembrane can be seen in Photo 9; further evidence that the material no longer maintains its original integrity.

The pipe penetration boots were showing the true age of the geomembrane, as the area around the pipe boot is subject to higher stresses due to the shrinking and expansion of the geomembrane, causing these areas to be the first to succumb to stress cracking. Holes located on some of the pipe boots are shown in Photos 10 through 14.

Two examples of scratches are shown in Photos 15 and 16. Photo 16 shows the flakiness of the material caused by degradation, which easily results in holes when scratched as shown. On the right side of the scratch, the scrim reinforcement can be seen once the top surface of the geomembrane has flaked off.

Some examples of existing poor weld quality is shown in Photos 17 and 18. Although these defects have been in place since the liner was installed, they are likely locations for leaks due to their inferior weld quality. Photo 18 is an example of an area where the weld was not completely bonded. The air bubble shown forms once the air inside the unbonded area expands when heated by the sun. Several welds could be peeled off by hand, as shown in Photos 19-22, indicating that these welds no longer retain their peel strength.

It is recommended that pipes or other equipment resting on the geomembrane be placed on a rub sheet, especially if they are dragged in and out of the water during the service life. The metal boat on the side of the pond was not resting on a rub sheet, as shown in Photo 23, and thus likely caused the holes shown in Photos 24 through 26. In one area, the repeated L-shaped holes indicative of the corner of the boat proceeded all the way down the slope and could be traced to the edge of the water, likely continuing into the water, as shown by the rip at the water's edge in Photo 26.

A handful of significant leaks on the western side of the pond resulted in erosion of the subgrade material. Photos 27, 29, and 30 show examples of these holes. Down slope of the leaks, the material underneath the geomembrane was significantly eroded. The fines were absent and there was a noticeable slump in the subgrade under each leak, leading all the way down to the water level and most likely beyond. Photo 28 shows a leak at the top of the anchor trench, which resulted in the depression down the slope as shown in Photo 29. Upon inspection inside of the leak, only a large boulder remained of the subgrade material, as all of the fines had been eroded. The hole shown in Photo 30 was suspended off of the subgrade due to erosion, as shown in Photo 31, where fingers inserted into the geomembrane show the void in the subgrade that lay just below the leak.

The end of the service life of a geomembrane is typically selected to be a 50% reduction in a specific design property or properties of the geomembrane, such as tensile break strength and break elongation. This allows a safety factor in ensuring that the geomembrane still retains

performance capabilities when it is replaced, in order to maintain its performance throughout its service life. Multiple instances of the material at this site's failure to resist puncture and the stress crack-induced leaks around the liner penetrations and other areas suggest that this material has lost its original strength characteristics.

RECOMMENDATIONS

The physical evidence of the accessible geomembrane area suggests that this geomembrane has exceeded its service life. However, in order to be certain, a service life assessment can be performed on the existing material. This would entail sampling the material and welds and subjecting them to conformance testing, then comparing the strength values to the initial values of the material, or a sample of the material from the anchor trench. However, based on the visual observations, it is very unlikely that any service life remains. If there is a significant amount of service life remaining in the geomembrane, then it would be worthwhile to pinpoint all of the existing leaks in order to restore the containment system to its original integrity. Due to the excessive leaks encountered during the partial survey of the submerged geomembrane, the only way to effectively pinpoint all of the existing leaks in the geomembrane would be to drain the facility and perform the arc testing method (ASTM D7953) on the exposed geomembrane. Then, each leak can be confidently pinpointed for repair.

The alternative route to salvaging the existing lining system would be to reline the facility. The most cost effective way of relining it would be to place a new geomembrane on top of the old one, as long as the subgrade under the existing geomembrane is satisfactory. However, if a geomembrane is placed directly over an existing geomembrane, then electrical leak location methods cannot be performed on the top geomembrane. It is therefore prudent to keep all options open by installing a conductive-backed geomembrane product over the existing lining system. Conductive-backed geomembrane is typically checked for leaks as part of geomembrane installation by using the spark testing method (ASTM D7240). This would likely be the most cost effective method of attaining a leak-free lining system.

If you have any questions regarding the information provided, please feel free to contact me at your convenience. It was a pleasure to work with you on this project.

Abigail Beck

Abigail Beck, P.E.
Director of Liner
Integrity Services,
TRI Environmental, Inc.

Attachment: PhotoLog

PhotoLog

Geomembrane Inspection of Wastewater Pond

Owenton, Kentucky

Photo No. 1
Parent Material Degradation

Photo No. 2
Parent Material Degradation

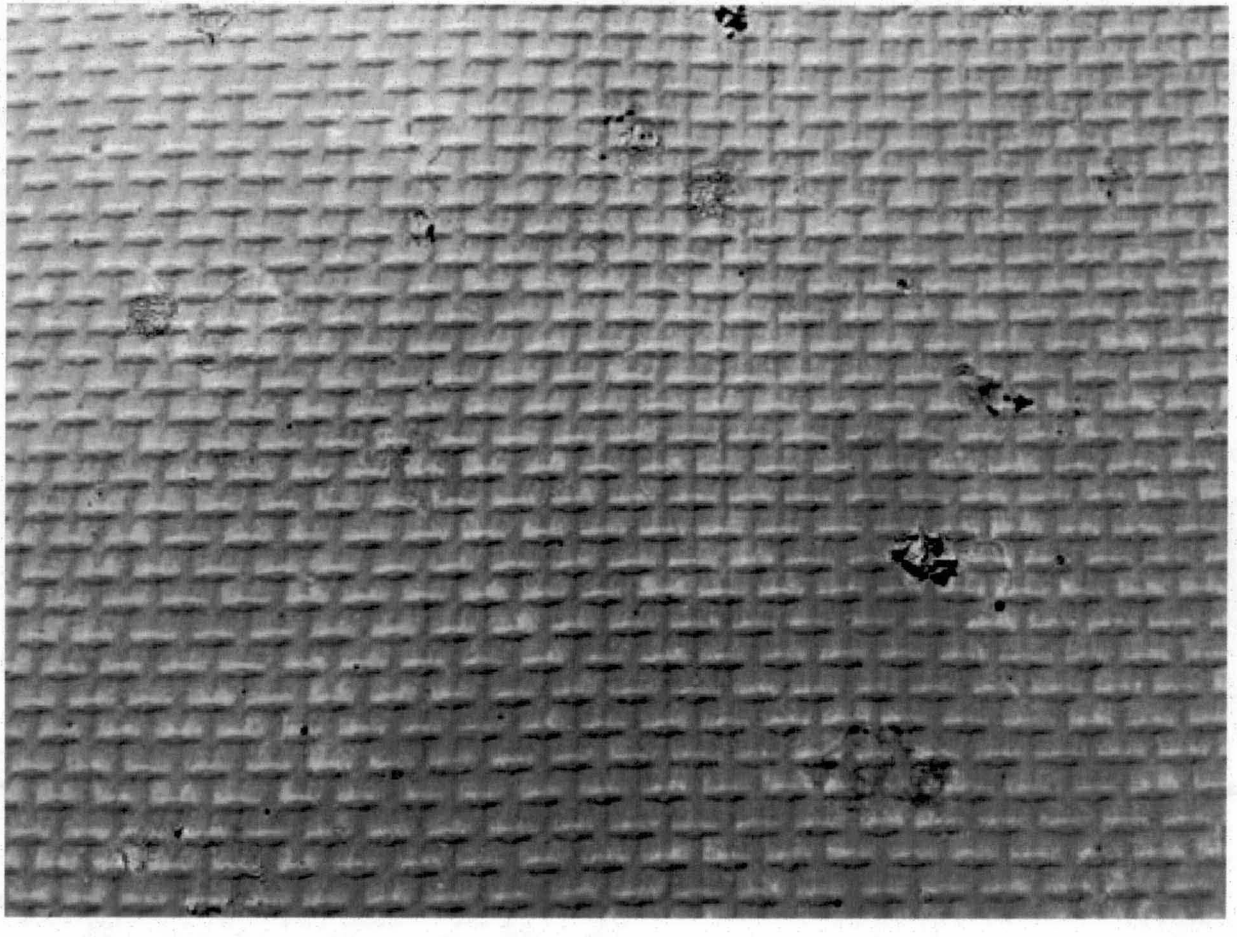


Photo No. 3
Parent Material Degradation

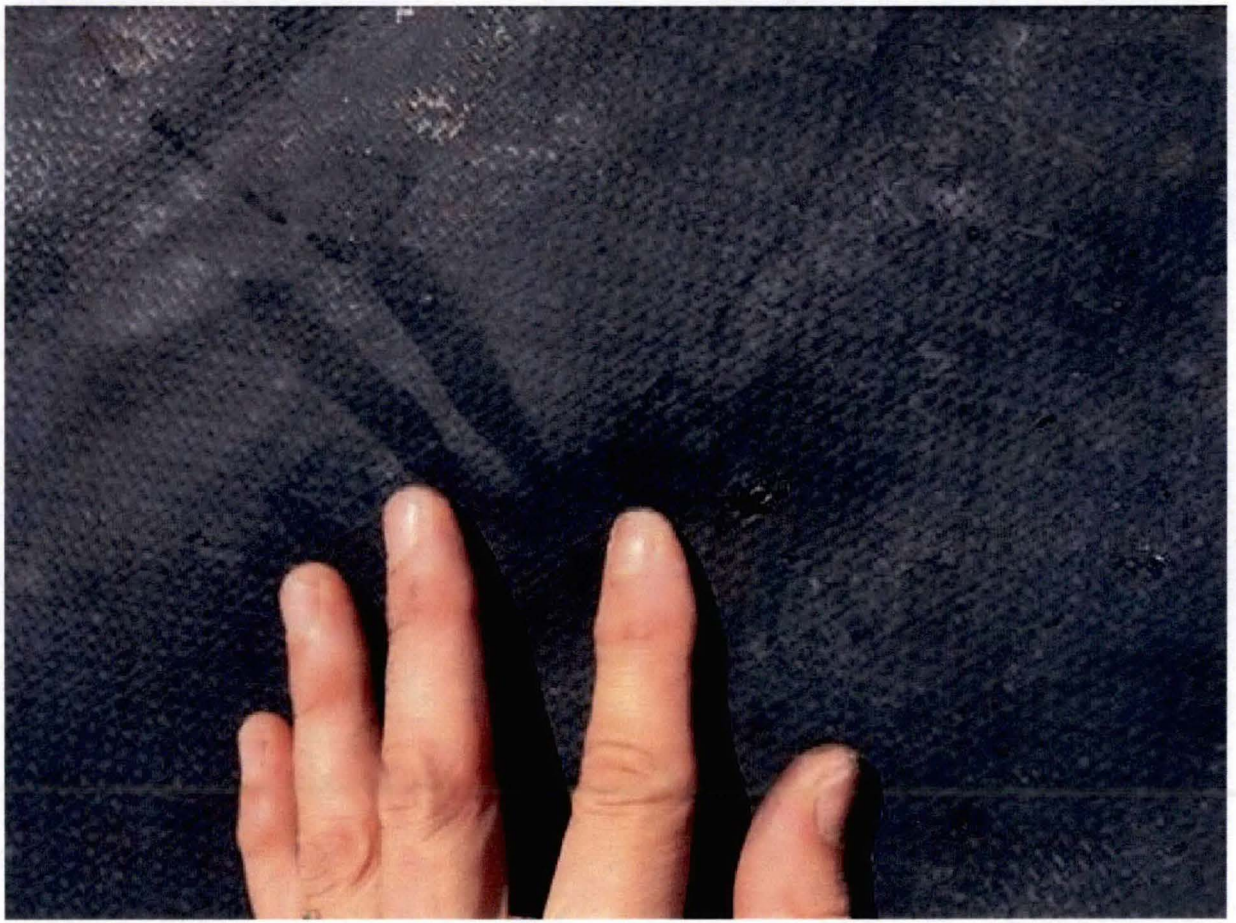


Photo No. 4
Parent Material Degradation

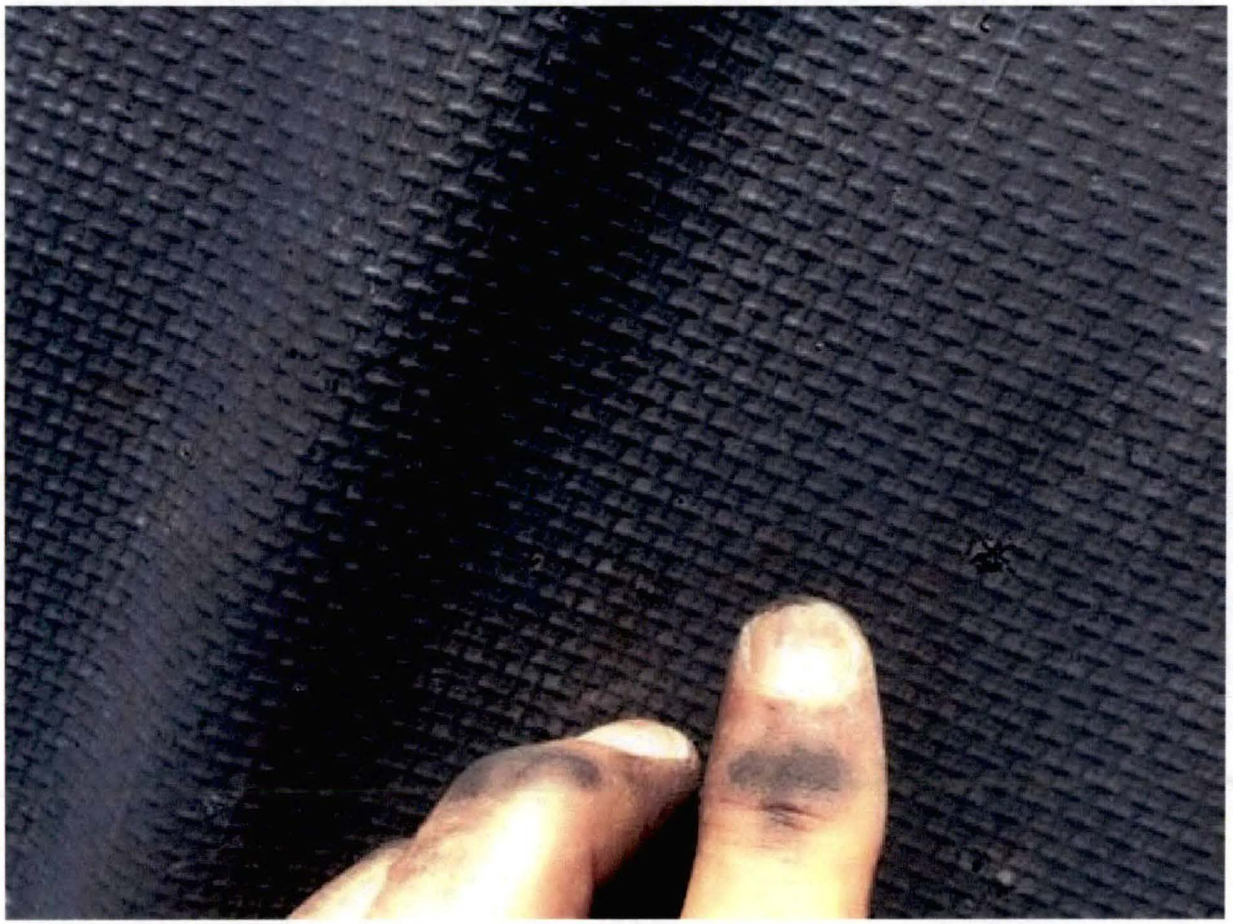


Photo No. 5
Example Hole

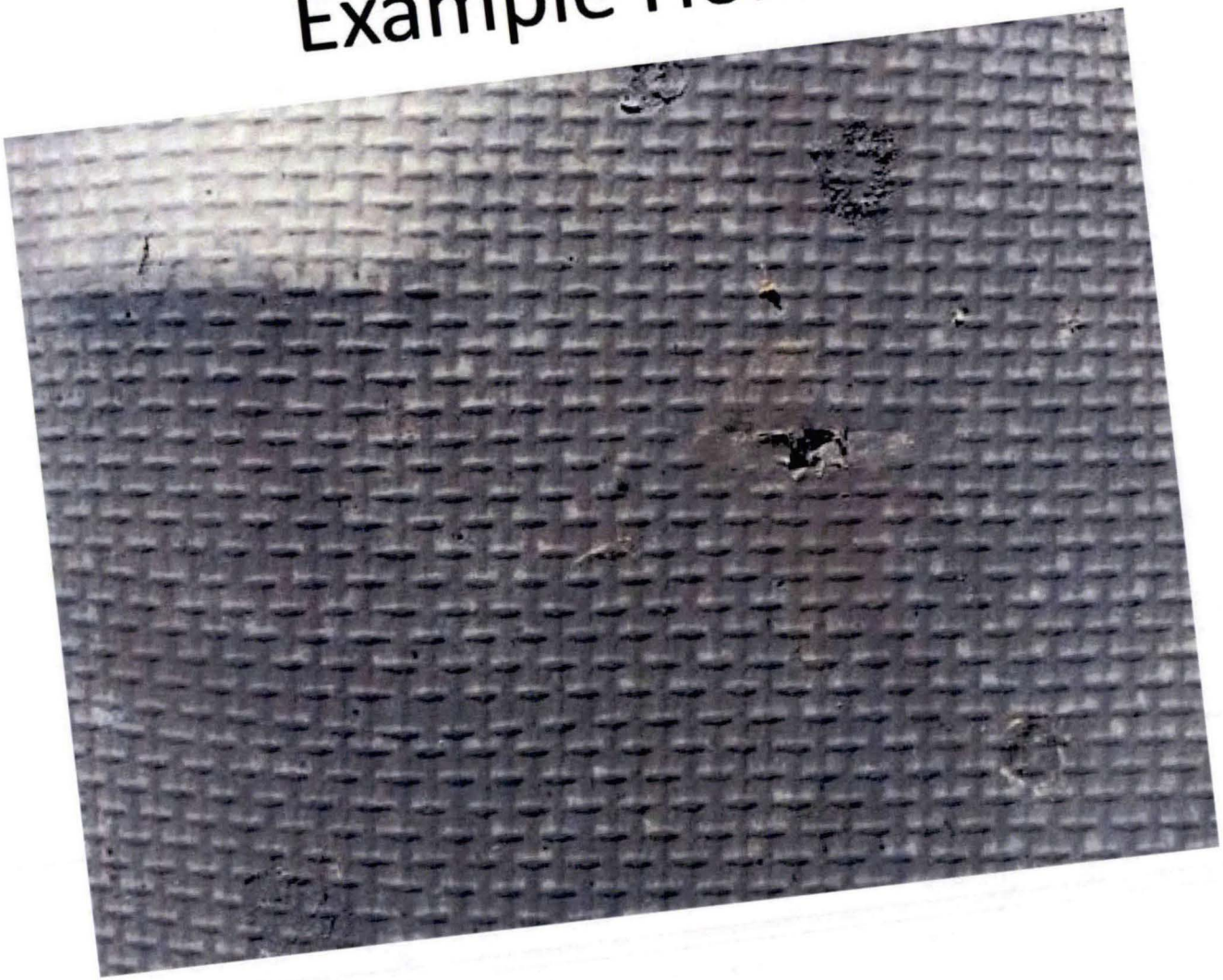


Photo No. 6
Example Hole

Photo No. 7
Example Hole

Photo No. 8
Example Hole

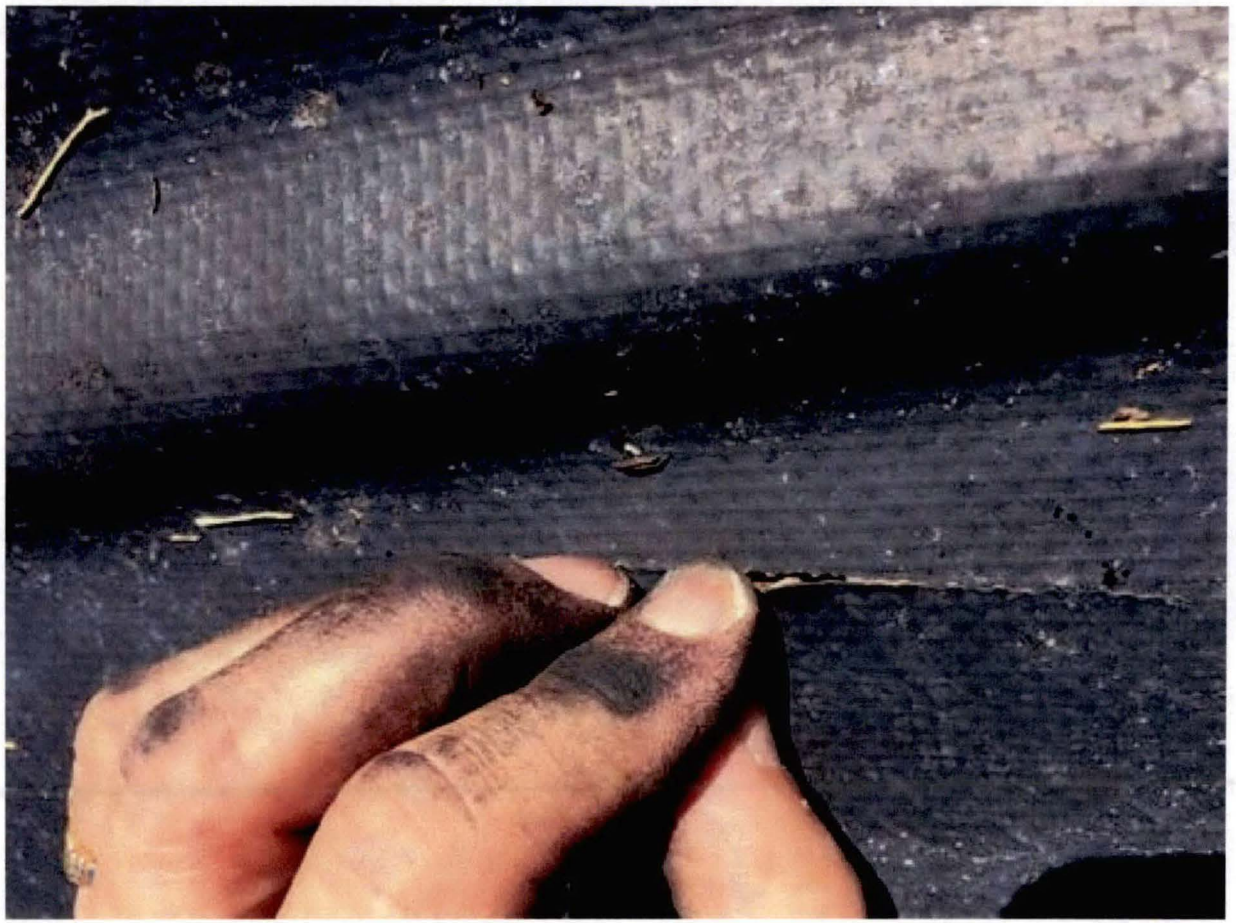


Photo No. 9
Example Hole

Photo No. 10
Hole in Pipe Boot

Photo No. 11
Hole in Pipe Boot

Photo No. 12
Hole in Pipe Boot

Photo No. 13
Hole in Pipe Boot

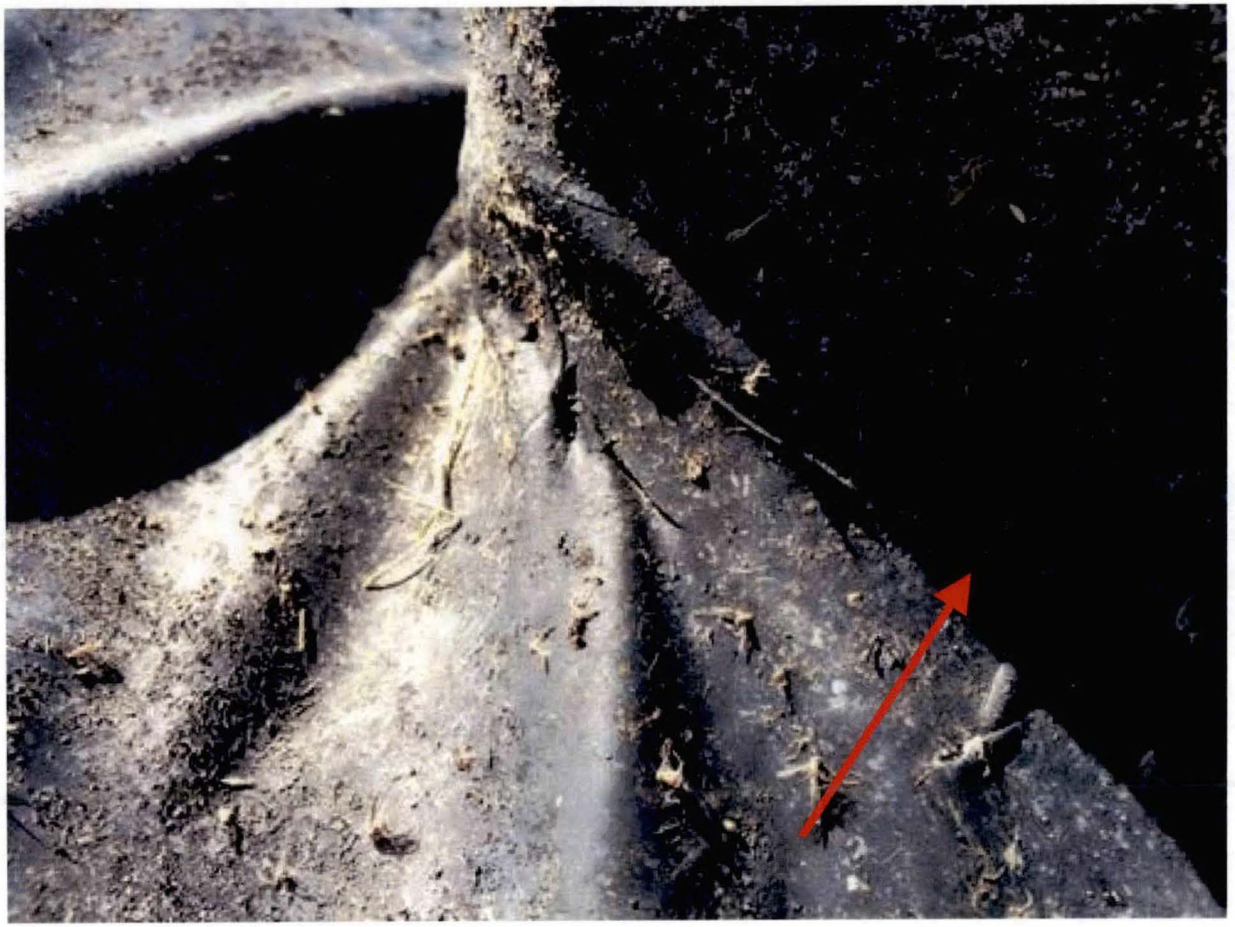


Photo No. 14
Hole in Pipe Boot

Photo No. 15
Example Scratch

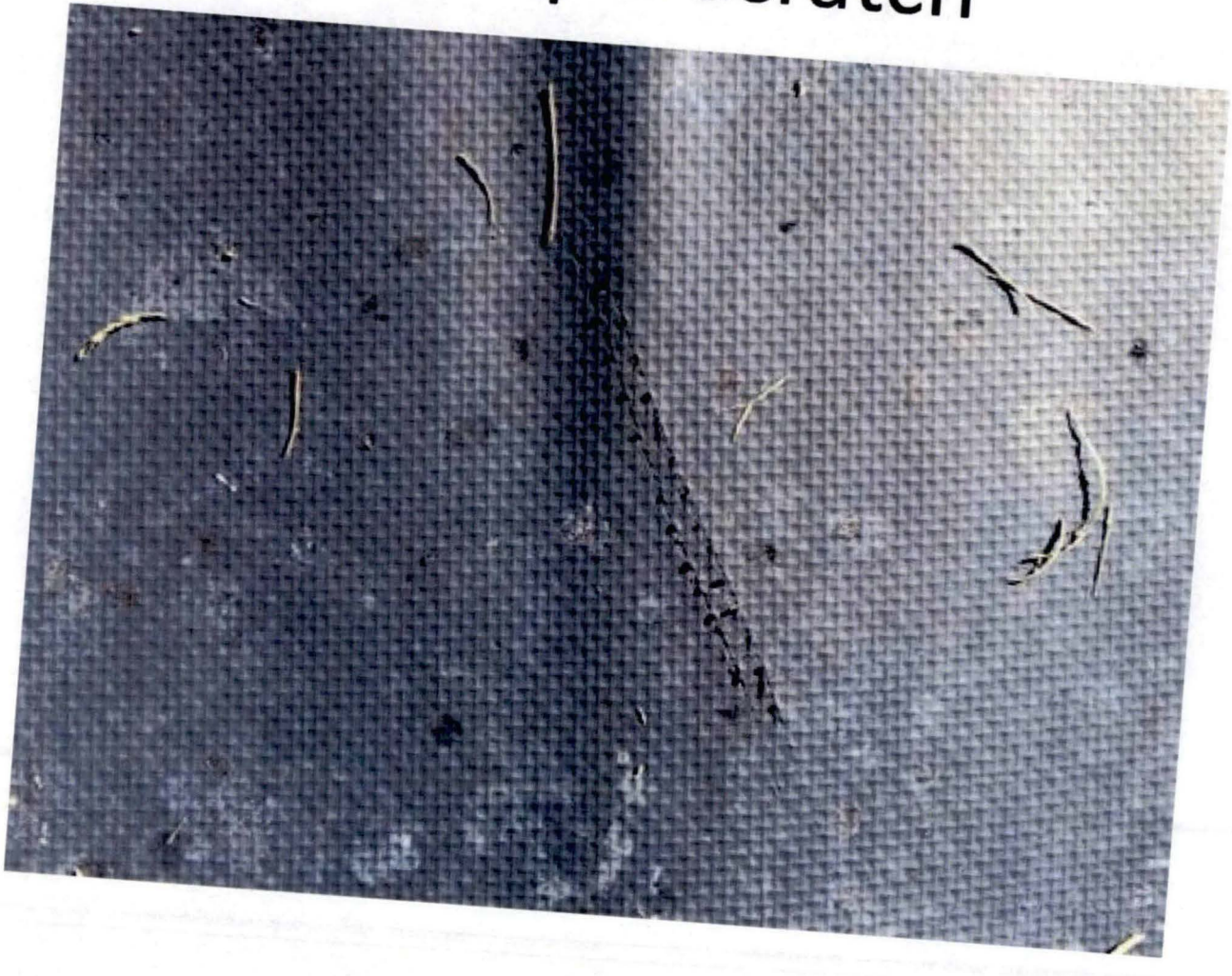


Photo No. 16
Example Scratch/Hole

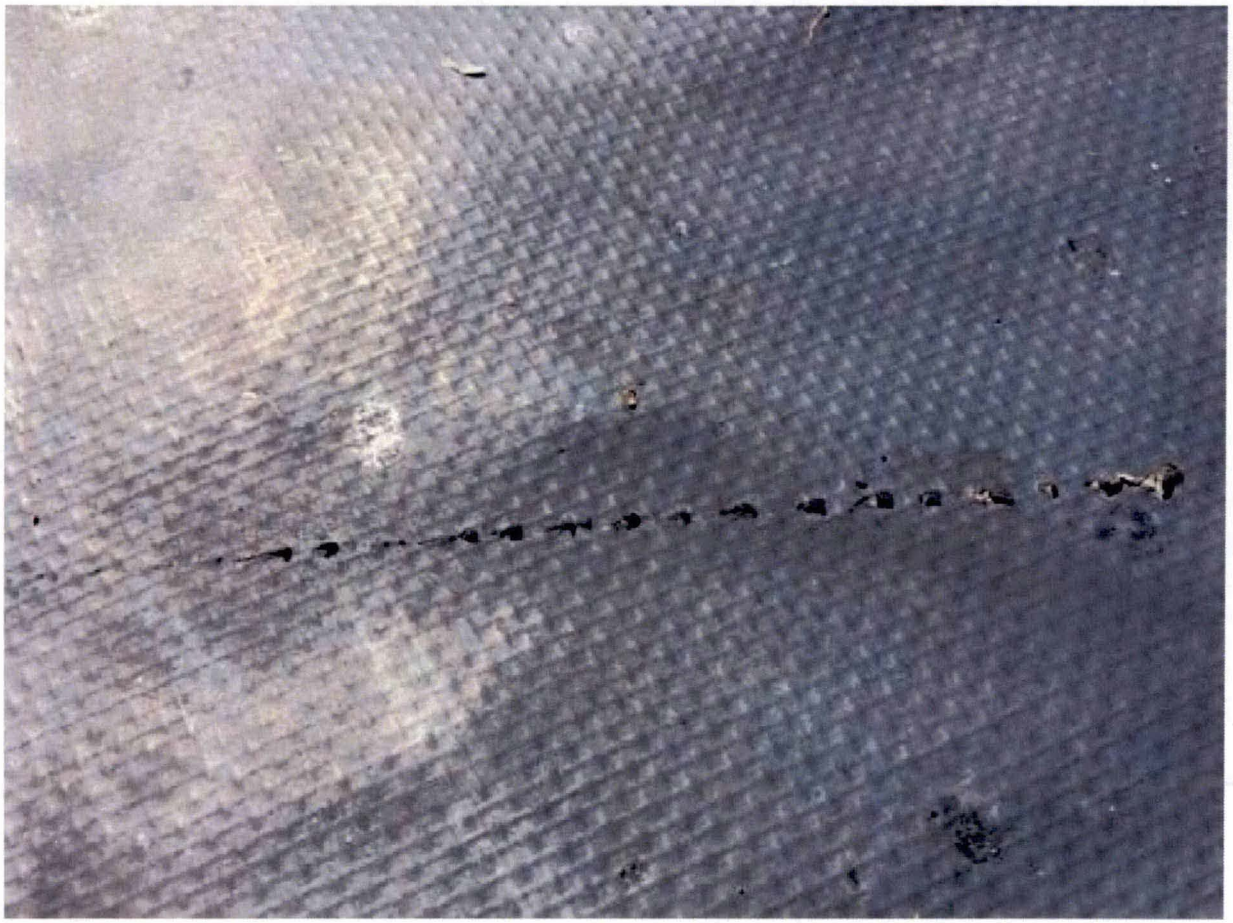


Photo No. 17
Example Poor Weld

Photo No. 18
Example Poor Weld

Photo No. 19
Poor Weld Adhesion

Photo No. 20
Poor Weld Adhesion

Photo No. 21
Poor Weld Adhesion

Photo No. 22
Poor Weld Adhesion

Photo No. 23
Boat without Rub Sheet

Photo No. 24
Punctures from Boat

Photo No. 25
Punctures from Boat

Photo No. 26
Punctures from Boat

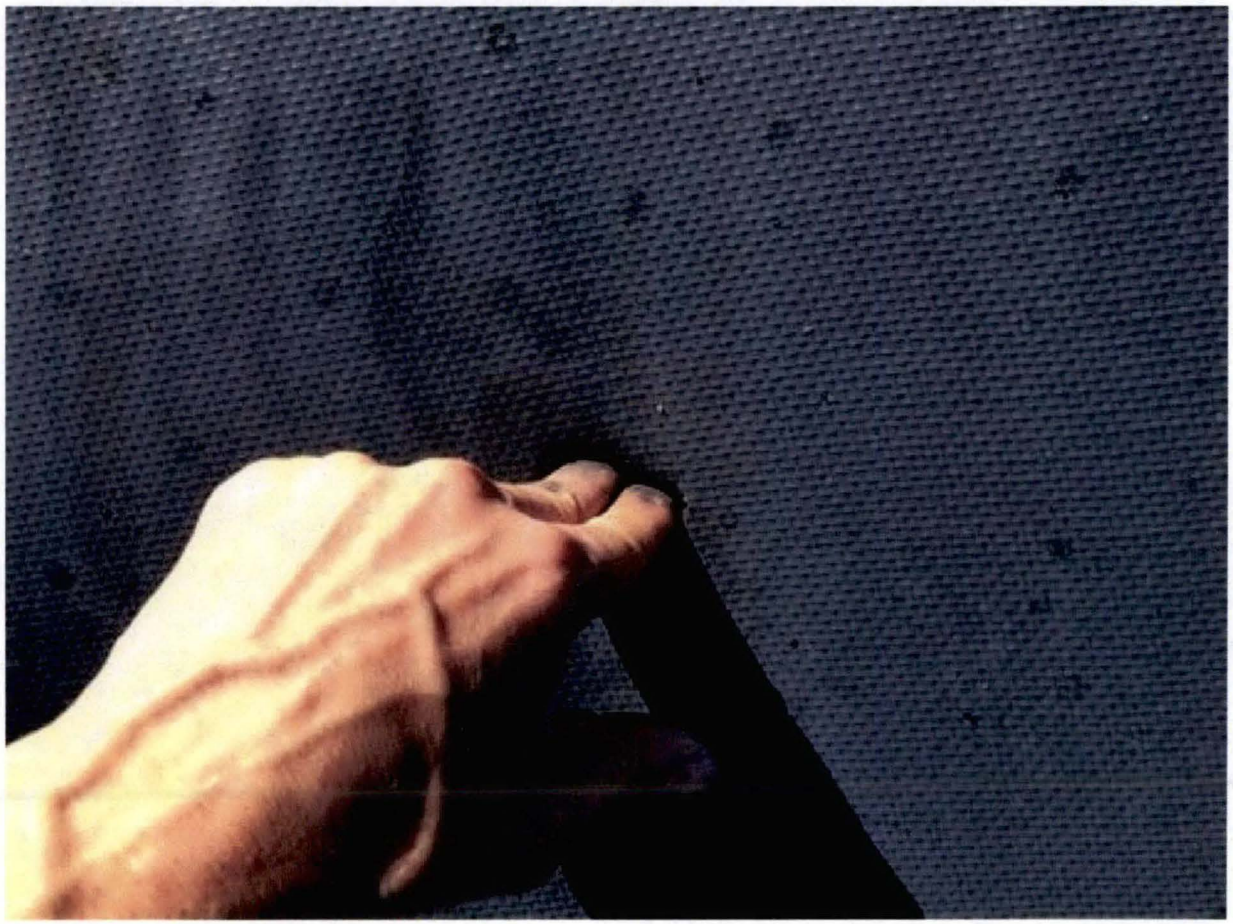
Photo No. 27
Hole with Subgrade Erosion

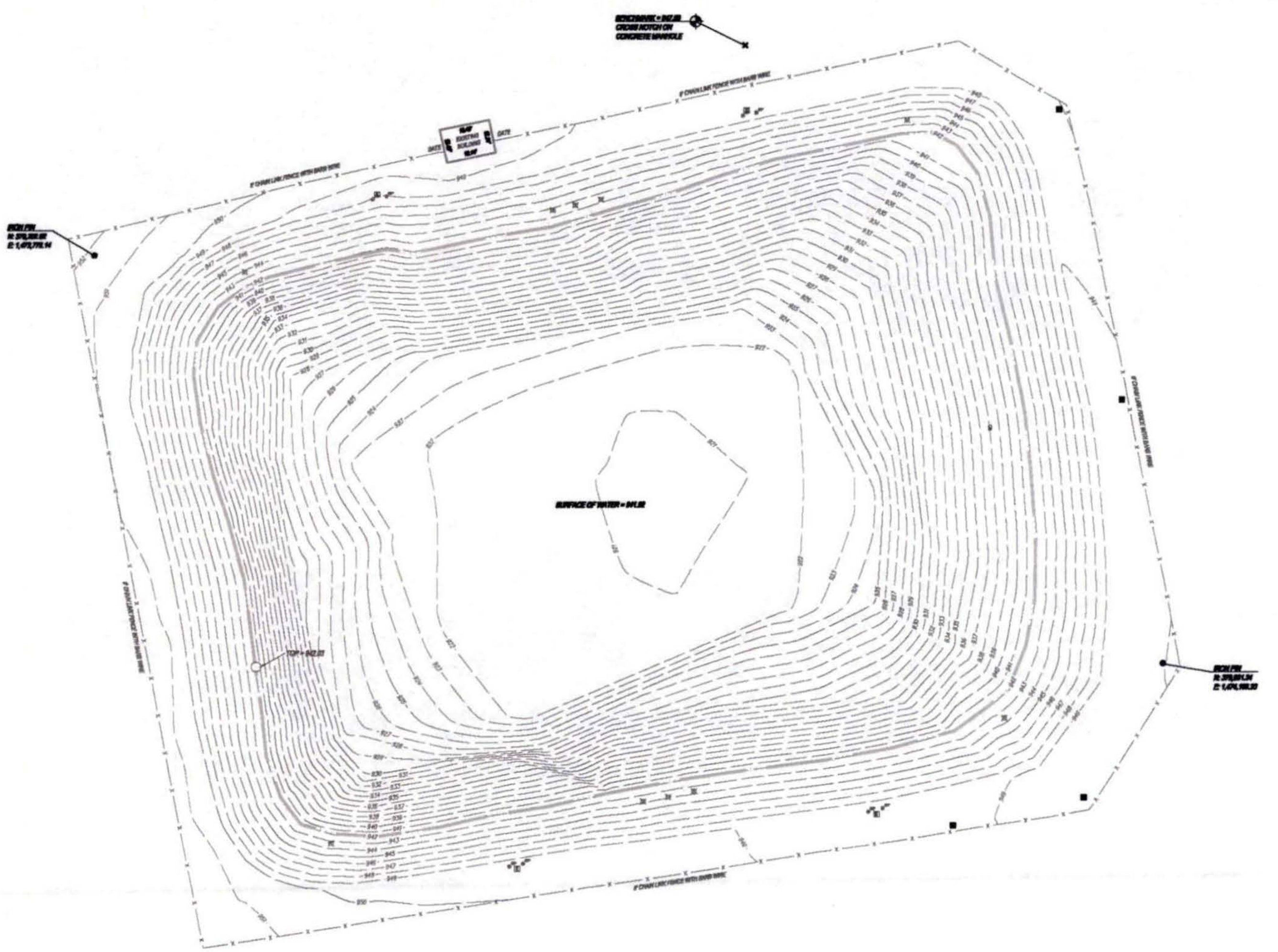
Photo No. 28
Hole with Subgrade Erosion

Photo No. 29
Hole with Subgrade Erosion

Photo No. 30
Hole with Subgrade Erosion

Photo No. 31
Hole with Subgrade Erosion





VICINITY MAP
N.T.S

LEGEND
- BENCHMARK
- ELECTRIC BOX
- FENCE POST
- GUARD POST
- STAND PIPE
- MANHOLE
- SOIL BORING
- HUB AND TACK
- FENCE LINE
- EDGE OF WATER

NOTE:
UNDERGROUND UTILITIES ARE PLOTTED FROM A COMPILATION OF AVAILABLE RECORD INFORMATION AND SURFACE INDICATIONS OF UNDERGROUND STRUCTURES AND MAY NOT BE INCLUSIVE. PRECISE LOCATIONS AND THE EXISTENCE OR NON EXISTENCE OF UNDERGROUND UTILITIES CANNOT BE VERIFIED. PLEASE NOTIFY KENTUCKY UNDERGROUND PROTECTION, INC AT 1-800-752-6007 BEFORE ANY PERIOD OF EXCAVATION OR CONSTRUCTION ACTIVITY.

2 WORKING DAYS BEFORE YOU DIG
CALL TOLL FREE 800-752-6007
KENTUCKY UNDERGROUND PROTECTION, INC.

NOTES:
1. HORIZONTAL AND VERTICAL DATUM ARE BASED ON THE KENTUCKY DEPARTMENT OF TRANSPORTATION'S VIRTUAL REFERENCE STATIONING SYSTEM. (VRS-NAD 83) (NAVD 88)
2. SITE BENCHMARK AS SHOWN HEREON.

THE KLEINGERS GROUP

SEAL:
STATE OF KENTUCKY
RANDY C. WOLFE
3908
LICENSED PROFESSIONAL LAND SURVEYOR

NO.	DATE	DESCRIPTION
1	9/17/15	BASE MAP - AR

TOPOGRAPHIC SURVEY
OWENTOWN, KENTUCKY

PROJECT NO: [illegible]
DATE: 9/17/2015
SCALE: 1" = 20'
0 10 20 40

SHEET NAME:
BATHYMETRIC SURVEY

SHEET NO.
1 OF 1

Evaluation Report

Owenton WWTP Lagoon Liner Replacement Evaluation

Owenton, KY

GRW Project No. – 4483

October 2016

engineering | architecture | geospatial

GRW | 801 Corporate Drive | Lexington, KY 40503 | 859.223.3999

TABLE OF CONTENTS

I. EXECUTIVE SUMMARY

A. Introduction

Kentucky American Water Company (KAWC) owns and operates the Owenton Wastewater Treatment Plant (WWTP). Biological treatment is provided by a 7.2 million gallon single cell partially mixed aerated lagoon; followed by a packed tower. Consulting Services Incorporated (CSI) evaluated the condition of the liner and their findings recommend to replace the liner due to severe deterioration. KAWC has contracted GRW Engineers, Inc., to provide alternatives and the design services for replacement of the existing lagoon liner with a new liner.

B. Purpose and Goals

The purpose of this report is to:

1. Evaluate the feasibility of replacing the lagoon liner.
2. Provide alternatives for replacing the lagoon liner.
3. Provide opinion of probable construction cost.
4. Provide project schedule.

C. Recommendations and Conclusions

Based on the investigation provided by CSI as well as discussions with KAWC representatives, it is recommended that the existing lagoon liner be replaced with a new liner. Additionally, in order to provide treatment for the wastewater during the replacement of the liner, it is recommended that three temporary 1.5 million gallon lagoons be constructed, as provided by Keystone Clearwater. Information is included in Appendix E.

D. Opinion of Probable Project Cost

Our opinion of probable construction cost is $720,000 to replace the existing lagoon liner. The installation of the new liner cannot be completed without the construction of treatment facilities for treatment during the liner installation period.

Construction costs for installation of three new temporary tanks with associated equipment and piping for treatment while the existing lagoon is out of service are estimated to be $493,500. The lagoons would be designed to treat current influent flow and loadings and then be removed following the project completion.

Our opinion of probable construction costs are based on recent bid tabulations of similar projects and quotations from equipment manufacturers. Costs for the new lagoon liner and temporary lagoons for treatment are detailed in Chapter IV.

II. EVALUATION OF EXISTING TREATMENT PROCESS

A. General

The existing Owenton WWTP is an aerated lagoon rated to treat an average daily flow of 500,000 gallons per day (gpd) and a peak daily flow of 1,510,000 gpd. The treatment plant was constructed in 1986 and has a current average daily flow of approximately 238,000 gpd.

The design parameters are based on the following:

Parameter	Influent, mg/l	Effluent, mg/l
BOD_5	240	20
TSS	200	30
NH_3-N (Nov-April)	25	9.0
NH3-N (May-Oct)	25	4.0
Total Phosphorus		Report
Total Nitrogen		Report
Dissolved Oxygen		7.0

A copy of the current Kentucky Pollutant Discharge Elimination System (KPDES) permit can be found in Appendix A.

Wastewater treatment is provided by a partially mixed aerated lagoon followed by a packed tower filter, final clarifiers, ultraviolet disinfection with a backup chlorine system, and cascade aeration steps. Effluent is discharged to an unnamed tributary of Stevens Creek. A review of past discharge monitoring reports, attached in Appendix D, will be the basis of design for the temporary lagoons.

B. Lagoon Treatment Process

The majority of the biological treatment at the existing WWTP is provided by a 7.2 million gallon single cell partially mixed aerated lagoon (BOD removal), followed by a packed tower filter (NH3-N removal). These calculations can be seen in Appendix B. Kentucky Division of Water (KDOW) design standards for aerated lagoons are:

- Minimum of three cells.
- Maximum loading of 150 lbs of BOD/acre•day.
- Maximum wall slope of 3:1.
- Minimum wall slope of 4:1.
- Minimum of three feet of freeboard.
- Typical retention time varies between 5 days and 30 days.

Following review of the lagoon as-built plans and the bathymetric survey, the existing lagoon fails to meet several KDOW design standards. The single cell lagoon prevents temporary shutdown for repairs while maintaining treatment. The surface area at maximum water level is approximately 1.53, considerably less than 6.67 acres required to meet 150 lbs of BOD/acre•day maximum loading per KDOW design criteria. Additionally, the side slopes of 2.5:1 on average are steeper than allowed. These shortfalls should be taken into consideration for the replacement of the lagoon liner and future improvements.

C. Summary

Following a review of the CSI report and our evaluation of the lagoon, it is concluded:

- The single cell lagoon liner has failed and should be replaced.
- The existing treatment system fails to comply with KDOW design criteria.
- The single cell lagoon does not provide redundancy for treatment for temporary shutdowns for repairs.

Future treatment alternatives and improvements will be discussed so that the WWTP can comply with KDOW design criteria if mandated. These alternatives are discussed further in Chapter III.

III. EVALUATION OF ALTERNATIVES

A. General

The primary purpose of this report was to evaluate the feasibility of replacing the existing lagoon liner with a new liner. Two alternatives have been considered for replacement of the liner. Additionally, following a review of the investigation provided by CSI and evaluation of the biological treatment processes (single cell lagoon and packed tower filter), alternatives for temporary treatment of the wastewater and alternatives for upgrading the plant to meet existing design criteria have been provided.

B. Liner Replacement Alternatives

Two alternatives for replacement of the existing liner have considered. Per the as-built drawings, the existing liner is a 36 mil Hypalon (CSPE) liner. Both alternatives for replacement are 60 mil HDPE liners. An HDPE liner will provide a thicker liner at lower cost in addition to higher strength joints in comparison to a standard Hypalon liner. There are only minor differences between the two alternatives.

The least expensive alternative to replace the liner, venting and underdrain system is a conventional liner system with a 60 mil HDPE geomembrane and fabrinet geocomposite underdrain system.

The second alternative is a 60 mil GSE leak location liner system with Airmax venting and underdrain system. This alternative is higher in cost, but is a much better system. This liner system includes a conductive layer on the underside of the liner which allows for dipole testing of the liner in order to accurately locate any leaks within the new liner without flooding the under drain system. Additionally, the Airmax venting and underdrain system has superior water and air transmission properties as compared to the fabrinet geocomposite.

A floating curtain would be included with either system to provide better hydraulic conditions and artificially create a two cell lagoon. Costs associated with these two alternatives are included in Appendix C.

C. Temporary Treatment Alternatives

Biological treatment cannon be provided if the single cell lagoon is to be taken out of service for repairs. Therefore, in order to replace the liner, additional treatment facilities must be constructed. Two alternatives for temporary treatment have been considered.

1. Construct a temporary conventional aerated lagoon. This would require rerouting the influent pump station force main to the temporary lagoon; or construct a temporary pump station. The existing aeration equipment could be moved to the new lagoon in order to reduce costs.

a. Pros
   - Provides a large amount of wet weather storage.
   - Could operate permanently, in order to comply with KDOW design standards.

b. Cons
   - Requires a large amount of land.

2. Construct temporary above ground tanks operated as aerated lagoons. This would also require rerouting the influent pump station force main to the temporary tanks, or construct a temporary pump station. New Aeration equipment may be needed for this application due to the size and geometry of the tanks.

a. Pros
   - Same treatment process as existing lagoon.
   - Provides a large amount of wet weather storage.
   - Requires less land than earthen lagoons.
   - Requires much less time for installation.

b. Cons
   - No permanent benefit.

3. Construct a temporary complete mix aerated lagoon with solids recycle. An aerobic lagoon with solids recycle operates similarly to an extended aeration activate-sludge process; with the exception that an earthen basin is used in place of a reinforced-concrete reactor basin. It should be noted that aeration and mixing requirements for an aerobic lagoon with solids recycle are much higher than a standard aerobic partially mixed lagoon.

a. Pros
   - Smaller footprint needed for construction.
   - Similar operation to extended aeration plants.

b. Cons
   - Potential for solids wash out during high wet weather flows.
   - Additional aeration would be required.
   - Different treatment process as existing lagoon.

D. Alternatives for Plant Improvements

As noted in Chapter II, the existing lagoon fails to meet several KDOW design criteria. Should KDOW require a redundant lagoon in the future, the following alternatives could be considered:

1. Install a divider berm within the lagoon.

a. Pros
   - Ability to have partial shutdown while still providing treatment.
   - No additional land requirements.

b. Cons
   - Surface area and volume of lagoon will be reduced.
   - Still fails to comply with KDOW design criteria.

2. Install additional lagoons.

a. Pros
   - Provides redundancy for partial shutdown while maintaining treatment.
   - Additional surface area and volume in order to meet KDOW loading rates.

b. Cons
   - Requires additional land.

3. Convert existing aerated lagoon to complete mix with multiple cells.

a. Pros
   - Provides redundancy for partial shutdown while maintaining treatment.
   - No additional land requirements.
   - Provides some wet weather storage.

b. Cons
   - Different treatment process as existing lagoon.
   - May require new KPDES permit.

Since the above are future alternatives, a detailed evaluation was not performed.

KAWC personnel have requested that access to the aerators be provided without the use of a boat. Three options have been considered for accessing the aerators.

1. Install a cover system.

a. Pros
   - Enhanced BOD and ammonia-nitrogen removal.
   - Access without use of boat.

b. Cons
   - Most expensive alternative.

2. Install rigid walkway system.

a. Pros

- Stable.
- Access without use of boat.

b. Cons
   - Walkway located permanently above high water level, making access to aerators more difficult at lower water levels.

3. Install a floating walkway system.

a. Pros
   - Access without use of boat.
   - Walkway floats up and down as water level varies, always providing access to aerators.

b. Cons
   - Could be unstable during windy conditions.
   - Difficult functionality.

IV. RECOMMENDED ALTERNATIVE AND PROJECT COST

A. General

KWAC, GRW and KDOW met to discuss our approach to take the single cell lagoon out of service in order to replace the liner. The following items were discussed:

1. Actual flow and loadings data from monthly operating reports (MOR's) found in Appendix D will be used for basis of design of temporary treatment facilities.

2. Temporary earthen lagoons or above ground tanks are acceptable alternatives for providing treatment while the lagoon liner, venting and underdrain system are being replaced.

3. Various treatment processes will be evaluated.

4. The temporary facilities will be taken out of service and removed after all work is complete.

5. At this time, KDOW will not require a permanent redundant lagoon.

B. Recommendations

Based on cost-effectiveness and construction time, the following is recommended:

1. Construct temporary above ground tanks that will operate in the same treatment process mode as the partially mixed aerated lagoon.

2. Replace the lagoon liner with a 60 mil GSE leak location liner with Airmax venting and underdrain system.

3. Once the temporary above ground tanks are in service, the lagoon will be drained and cleaned. The sludge will be dewatered and hauled off-site for disposal. Costs for sludge dredging and dewatering is included in our opinion of probably construction cost, however costs for disposal of sludge is not included since it was assumed KAWC would land apply the dewatered sludge. See Appendix F for dredging and dewatering costs.

4. Include divider curtain in lagoon to store sludge on one side to minimize solids washout during wet weather conditions. It should be noted that a permanent earthen divider will reduce millions of gallons of storage in the lagoon.

5. Access to aerators should be further discussed if to be included.

C. Opinion of Probable Project Cost.

GRW Engineers, Inc.	Project: Lagoon Liner Replacement			
	Owner: Kentucky American Water			
	Project No. 4483-01			
Construction Cost Estimate	Date: 10/13/16		Dwg. No.	
	Estimator: MAU		Type: Preliminary	
Description	**Number of Units**	**Units of Measure**	**Unit Cost**	**Total Cost**
Work to Existing Lagoon				
Mobilization/Demobilization	1	LS	$30,000.00	$30,000.00
Sludge Dredging and Dewatering	1	LS	$375,000.00	$375,000.00
Liner Removal and Disposal	1	LS	$25,000.00	$25,000.00
Earthwork	1	LS	$40,000.00	$40,000.00
Lagoon Liner for existing lagoons	1	EA	$200,000.00	$200,000.00
Installation of Liner	1	LS	$50,000.00	$50,000.00
			Subtotal	$720,000.00
Work for Temporary Treatment				
Tank Pads	3	LS	$25,000.00	$75,000.00
Yard Piping	1	LS	$75,000.00	$75,000.00
Tanks	3	EA	$80,000.00	$240,000.00
Aerators	6	EA	$15,000.00	$90,000.00
Installation	1	LS	$13,500.00	$13,500.00
			Subtotal	$493,500.00
			Contingency	$121,350.00
		Liner Replacment Total		$1,334,850.00

V. PROJECT SCHEDULE

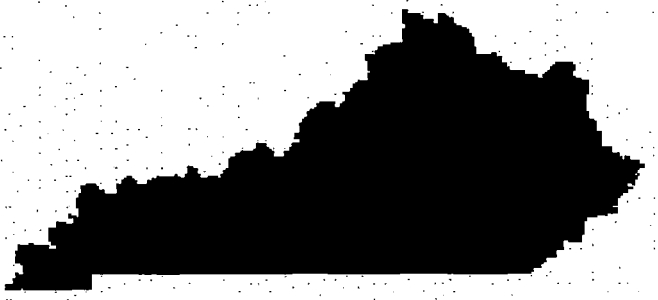
A. Schedule

A tentative schedule to implement the recommended plan is as follows:

Action	Date
Receive Work Order	February 1, 2016
Coordinate with Environmental State Agencies	May 2016
Submit Draft Preliminary Engineering Report to Ky. American Water Co.	October 2016
Receive Ky. American Water Co. Review Comments	November 2016
Submit Final Preliminary Engineering Report to Ky. American Water Co. and Kentucky Division of Water (DOW)	December, 2016
Submit Revised Proposal	December, 2016
Begin Design	January 2017
Survey	February 2017
50% Design Review Meeting	March 2017
90% Design Review Meeting	May 2017
Submit Plans & Specifications to DOW	June 2017
Receive DOW Approval	August 2017
Advertise for Bids	August 2017
Open Bids	September 2017
Award Construction Contract	October 2017
Begin Construction	October 2017
Substantial Completion of Construction	April 2017
Final Completion of Construction and Project Closeout	May 2018

APPENDIX A

KPDES



KENTUCKY POLLUTANT DISCHARGE ELIMINATION SYSTEM

PERMIT

PERMIT NO.: KY0028312

AI NO.: 1845

AUTHORIZATION TO DISCHARGE UNDER THE

KENTUCKY POLLUTANT DISCHARGE ELIMINATION SYSTEM

Pursuant to Authority in KRS 224,

Kentucky American Water - Northern Division
2300 Richmond Rd
Lexington, KY 40502

is authorized to discharge from a facility located at

Kentucky American Water – Northern Division WWTP
385 Carter Lane
Owenton, Owen County, Kentucky

to receiving waters named

Unnamed Tributary at (38.542472°N, 84.831278°) latitude/Longitude to Stevens Creek

in accordance with effluent limitations, monitoring requirements and other conditions set forth in this permit.

This permit shall become effective on July 1, 2015.

This permit and the authorization to discharge shall expire at midnight, June 30, 2020.

May 29, 2015

Date Signed

Peter T. Goodmann, Director
Division of Water

DEPARTMENT FOR ENVIRONMENTAL PROTECTION

Division of Water, 200 Fair Oaks Lane, Frankfort, Kentucky 40601

THIS KPDES PERMIT CONSISTS OF THE FOLLOWING SECTIONS.

1. EFFLUENT AND MONITORING REQUIREMENTS

1.1. Monitoring Locations

The following table lists the outfalls authorized by this permit, the latitude and longitude of each and the DOW assigned KPDES outfall number.

MONITORING LOCATIONS					
Number	**Type**	**Latitude (N)**	**Longitude (W)**	**Receiving Waters**	**Description of Outfall**
001	Direct	38.54272	84.831278	Unnamed Tributary to Stevens Creek	Municipal Wastewater

1.2. Effluent Limitations and Monitoring Requirements

Beginning on the effective date and lasting through the term of this permit discharges from Outfall 001 shall comply with the effluent limitations in the tables of this section.

1.2.1. Effluent Limitations and Monitoring Requirements Table I

EFFLUENT LIMITATIONS							MONITORING REQUIREMENTS		
Effluent Characteristic	**Loadings (lbs/day)**		**Concentrations (specify units)**				**Monitoring**		**Sample Type**
	Monthly Average	**Weekly Average**	**Minimum**	**Min Monthly Average**	**Max. Weekly Average**	**Maximum**	**Location**	**Frequency**	
Percent Removal $CBOD_5$	N/A	N/A	N/A	85%	N/A	N/A	N/A	1/Month	Calculated
Percent Removal TSS	N/A	N/A	N/A	85%	N/A	N/A	N/A	1/Month	Calculated

1.2.2. Effluent Limitations and Monitoring Requirements Table II

EFFLUENT LIMITATIONS							MONITORING REQUIREMENTS		
Effluent Characteristic	Loadings (lbs/day)		Concentrations (specify units)				Monitoring		Sample Type
	Monthly Average	Weekly Average	Minimum	Max. Monthly Average	Max. Weekly Average	Maximum	Location	Frequency	
Flow (Design 0.339 MGD)	Report	Report	N/A	N/A	N/A	N/A	Effluent	Continuous	Recorder
$CBOD_5$	56.6	84.9	N/A	20 mg/l	30 mg/l	N/A	Effluent	Weekly	24-Hr Composite
$CBOD_5$	Report	Report	N/A	Report mg/l	Report mg/l	N/A	Influent	Weekly	24-Hr Composite
TSS	84.9	127	N/A	30 mg/l	45 mg/l	N/A	Effluent	Weekly	24-Hr Composite
TSS	Report	Report	N/A	Report mg/l	Report mg/l	N/A	Influent	Weekly	24-Hr Composite
Ammonia (as NH_3N)									
May 1 – October 31	11.3	17.0	N/A	4.0 mg/l	6.0 mg/l	N/A	Effluent	Weekly	24-Hr Composite
November 1 – April 30	25.5	38.2	N/A	9.0 mg/l	13.5 mg/l	N/A	Effluent	Weekly	24-Hr Composite
E. Coli (colonies/100 ml)[1]	N/A	N/A	N/A	130	240	N/A	Effluent	Weekly	Grab
Dissolved Oxygen	N/A	N/A	7.0 mg/l	N/A	N/A	N/A	Effluent	Weekly	Grab
pH (Standard Units)	N/A	N/A	6.0	N/A	N/A	9.0	Effluent	Weekly	Grab
Chronic Toxicity	N/A	N/A	N/A	N/A	N/A	1.00 TU_c	Effluent	Quarterly	3 24-Hr Composites
Total Residual Chlorine	N/A	N/A	N/A	0.011 mg/l	0.019 mg/l[2]	N/A	Effluent	Weekly	Grab
Total Phosphorus	N/A	N/A	N/A	Report	Report	N/A	Effluent	Weekly	24-Hr Composite
Total Nitrogen (mg/l)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Weekly	24-Hr Composite

[1]The effluent limitations for *Escherichia Coli* are 30-day and 7-day Geometric Means.
[2]This limitation for Total Residual Chlorine is a Daily Maximum.
Total Nitrogen is the summation of the analytical results for Total Nitrates, Total Nitrites, and Total Kjeldahl Nitrogen

1.2.3. Permit Renewal Scan Monitoring Requirements Table III

EFFLUENT MONITORING							MONITORING REQUIREMENTS		
Effluent Characteristic	Loadings (lbs/day)		Concentrations (specify units)				Monitoring		Sample Type
	Daily Average	Daily Maximum	Minimum	Daily Average	Daily Maximum	Maximum	Location	Frequency	

EFFLUENT MONITORING							MONITORING REQUIREMENTS		
Effluent Characteristic	Loadings (lbs/day)		Concentrations (specify units)				Monitoring		Sample Type
	Daily Average	Daily Maximum	Minimum	Daily Average	Daily Maximum	Maximum	Location	Frequency	
Flow (50050) MGD	Report	Report	N/A	N/A	N/A	N/A	Effluent	Continuous	Recorder
Oil & Grease (00552)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
Temperature (00011) °F (May 1- October 31)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
Temperature (00011) °F (November 1- April 30)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
Nitrogen, total Kjeldahl (49579)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Nitrate + Nitrite (Total) (51450)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Total Dissolved Solids (TDS) (70296)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Antimony, Total Recoverable (01268)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Arsenic, total recoverable (00978)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Beryllium, Total Recoverable (000998)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Cadmium, Total Recoverable (000113)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Chromium, Total Recoverable (000118)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Copper, Total Recoverable (000119)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Lead, Total Recoverable (000114)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Mercury, Total Recoverable (71901)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite

EFFLUENT MONITORING							MONITORING REQUIREMENTS		
Effluent Characteristic	Loadings (lbs/day)		Concentrations (specify units)				Monitoring		Sample Type
	Daily Average	Daily Maximum	Minimum	Daily Average	Daily Maximum	Maximum	Location	Frequency	
Nickel, Total Recoverable (01074)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Selenium, Total Recoverable (00981)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Silver, Total Recoverable (01079	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Thallium, Total Recoverable (00982)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Zinc, Total Recoverable (01094)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Cyanide, free (amenable to chlorination) (00722)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
Phenolic Compounds, Total (70029)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Hardness, Total (as CaCO3) (00900)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Acrolein (34210)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
Acrylonitrile (34215)	N/A	N/A	N/A	Report	Report	N/A		Once	Grab
Benzene, Dissolved (34235)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
Bromoform (32104)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
Carbon tetrachloride (32102)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
Chlorobenzene (34301)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
Chlorodibromomethane (34306)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab

EFFLUENT MONITORING							MONITORING REQUIREMENTS		
Effluent Characteristic	Loadings (lbs/day)		Concentrations (specify units)				Monitoring		Sample Type
	Daily Average	Daily Maximum	Minimum	Daily Average	Daily Maximum	Maximum	Location	Frequency	
Chloroethane (85811)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
2-Chloroethyl vinyl ether, (mixed) (34576)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
Chloroform (32106)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
Dichlorobromomethane (32101)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
1,1-Dichloroethane (34496)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
1,2-Dichloroethane (32103)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
trans-1,2-Dichloroethylene (34546)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
1,1-Dichloroethylene (34501)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
1,2-Dichloropropane (34541)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
1,3-Dichloropropylene (51044)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
Ethylbenzene (34371)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
Methyl bromide (Bromomethane) (34413)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab

EFFLUENT MONITORING							MONITORING REQUIREMENTS		
Effluent Characteristic	Loadings (lbs/day)		Concentrations (specify units)				Monitoring		Sample Type
	Daily Average	Daily Maximum	Minimum	Daily Average	Daily Maximum	Maximum	Location	Frequency	
Methyl chloride (Chloromethane) (34418)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
Methylene chloride (34423)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
1,1,2,2-Tetrachloroethane (34516)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
Tetrachloroethylene (34475)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
Toluene (34010)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
1,1,1-Trichloroethane (34506)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
1,1,2-Trichloroethane (34511)	N/A	N/A	N/A	Report	Report	N/A		Once	Grab
Trichloroethylene (39180)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
Vinyl chloride (39175)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
p-Chloro-m-cresol (82627)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
2-Chlorophenol (34586)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
2,4-Dichlorophenol (34601)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite

EFFLUENT MONITORING							MONITORING REQUIREMENTS		
Effluent Characteristic	Loadings (lbs/day)		Concentrations (specify units)				Monitoring		Sample Type
	Daily Average	Daily Maximum	Minimum	Daily Average	Daily Maximum	Maximum	Location	Frequency	
2,4-Dimethylphenol (34606)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
4,6-Dinitro-o-cresol (34657)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
2,4-Dinitrophenol (34616)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
2-Nitrophenol (34591)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
4-Nitrophenol (34646)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Pentachlorophenol (39032)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
Phenol (34694)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
2,4,6-Trichlorophenol (34621)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Acenaphthene (34205)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Acenaphthylene (34200)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Anthracene (34220)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite

EFFLUENT MONITORING							MONITORING REQUIREMENTS		
Effluent Characteristic	Loadings (lbs/day)		Concentrations (specify units)				Monitoring		Sample Type
	Daily Average	Daily Maximum	Minimum	Daily Average	Daily Maximum	Maximum	Location	Frequency	
Benzidine (39120)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
Benzo(a)Anthracene (34526)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
Benzo(a)pyrene (34247)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
3,4-Benzofluoranthene (79531)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
Benzo(ghi)perylene (34521)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Benzo(k)fluoranthene (34242)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Bis(2-chloroethoxy)methane (34278)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Bis(2-chloroethyl)ether (34273)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Bis(2-chloroisopropyl) ether (34283)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Bis(2-ethylhexyl) phthalate (39100)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab

EFFLUENT MONITORING							MONITORING REQUIREMENTS		
Effluent Characteristic	Loadings (lbs/day)		Concentrations (specify units)				Monitoring		Sample Type
	Daily Average	Daily Maximum	Minimum	Daily Average	Daily Maximum	Maximum	Location	Frequency	
4-Bromophenyl phenyl ether (34636)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Butyl benzyl phthalate (34292)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
2-Chloronaphthalene (34581)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
4-Chlorophenyl phenyl ether (34641)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Chrysene (34320)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Di-n-butyl phthalate (39110)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
Dibenzo(a,h)Anthracene (34556)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
1,2-Dichlorobenzene (34536)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
1,3-Dichlorobenzene (34566)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
1,4-Dichlorobenzene (34571)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite

EFFLUENT MONITORING							MONITORING REQUIREMENTS		
Effluent Characteristic	Loadings (lbs/day)		Concentrations (specify units)				Monitoring		Sample Type
	Daily Average	Daily Maximum	Minimum	Daily Average	Daily Maximum	Maximum	Location	Frequency	
3,3'-Dichlorobenzidine (34631)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Diethyl phthalate (34336)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Dimethyl phthalate (34341)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
2,4-Dinitrotoluene (34611)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
2,6-Dinitrotoluene (34626)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
1,2-Diphenylhydrazine (34346)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Fluoranthene (34376)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Fluorene (34381)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Hexachlorobenzene (39700)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
Hexachlorobutadiene (39702)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	Grab
Hexachlorocyclo pentadiene (34386)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Hexachloroethane (34396)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite

EFFLUENT MONITORING							MONITORING REQUIREMENTS		
Effluent Characteristic	Loadings (lbs/day)		Concentrations (specify units)				Monitoring		Sample Type
	Daily Average	Daily Maximum	Minimum	Daily Average	Daily Maximum	Maximum	Location	Frequency	
Indeno(1,2,3-cd)pyrene (34403)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Isophorone (34408)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Naphthalene (34696)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Nitrobenzene (34447)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
N-Nitrosodi-N-propylamine (34428)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
N-Nitrosodimethylamine (NDMA) (34438)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
N-Nitrosodiphenylamine (34433)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Phenanthrene (34461)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Pyrene (34469)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
1,2,4-Trichlorobenzene (34551)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Chloride (as Cl)(00940)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
Iron, total recoverable (00980)	N/A	N/A	N/A	Report	Report	N/A	Effluent	Once	24-Hr Composite
The sampling for the parameters in this table shall be conducted between eighteen months and six months prior to the expiration date of the permit.									

1.3. Standard Effluent Requirements

The discharges to waters of the Commonwealth shall not produce floating solids, visible foam or a visible sheen on the surface of the receiving waters.

Samples and measurements taken in accordance with the requirements specified in Section 1.2 shall be representative of the volume and nature of the monitored discharge and shall be taken at nearest accessible point after final treatment, but prior to actual discharge to or mixing with the receiving waters or wastestreams from other outfalls.

1.4. Whole Effluent Toxicity Testing

The permittee shall initiate, within thirty (30) days of the effective date of this permit, or continue the series of tests described below to evaluate wastewater toxicity of the discharge from Outfall 001.

1.4.1. WET Test Requirements

The permittee shall perform one (1) short-term static-renewal water flea (Ceriodaphnia dubia) life-cycle test and one (1) short-term static-renewal fathead minnow (Pimephales promelas) growth test on 100% effluent (1.00 TU_C) at the frequency specified in Section 1.2.

1.4.2. WET Sampling Requirements

Tests shall be conducted on a minimum of three (3) 24-hour composite samples and shall be collected at a frequency of one (1) 24-hour composite every other day. For example, the first sample would be used for test initiation on day 1 and for test solution renewal on day 2. The second sample would be used for test solution renewal on days 3 and 4. The third sample would be used for test solution renewal on days 5, 6, and 7. Each 24-hour composite shall be collected using a refrigerated automatic sampler. Each 24-hour composite sample shall consist of not less than forty-eight (48) discrete aliquots of effluent. Aliquots shall be of equal volume and time-proportional unless effluent flow is expected to vary by more than 10% from one hour to another or by 50% over the 24-hour collection period (as predicted from historical trends, significant rainfall events, etc.). With anticipated effluent flow variation of greater than 10% per hour or 50% overall, the frequency, and volume of each aliquot shall be flow-proportional. The lapsed time from collection of the last aliquot of the composite and its first use for test initiation or for test solution renewal shall not exceed 36 hours.

Samples shall be iced and maintained at not greater than 6° C during collection, storage, transport and until used in the test by the laboratory.

1.4.3. WET Serial Dilutions

Effluent concentrations for the tests must include the percent effluent required by the permit and at least four additional effluent concentrations as follows.

Required Percent Effluent	Dilution 1 Percent	Dilution 2 Percent	Dilution 3 Percent	Dilution 4 Percent	Dilution 5 Percent
100	20	40	60	80	100
95	23.5	47.5	95	97.5	100
90	22.5	45	90	95	100

Required Percent Effluent	Dilution 1 Percent	Dilution 2 Percent	Dilution 3 Percent	Dilution 4 Percent	Dilution 5 Percent
85	21.25	42.5	85	92.5	100
80	20	40	80	90	100
75	18.75	37.5	75	87.5	100
70	17.5	35	70	85	100
65	16.25	32.5	65	82.5	100
60	15	30	60	80	100
55	13.75	27.5	55	77.5	100
50	12.5	25	50	75	100
45	11.25	22.5	45	72.5	100
40	10	20	40	70	100
35	8.75	17.5	35	67.5	100
30	7.5	15	30	65	100
25	6.25	12.5	25	62.5	100
20	5	10	20	60	100
15	3.75	7.5	15	57.5	100
10	2.5	5	10	55	100
5	1.25	2.5	5	50	100

For a required percent effluent of 100%, test concentrations shall be 20%, 40%, 60%, 80% and 100%.

For a required percent effluent less than 100% but greater than or equal to 75%, the test concentrations shall include the required percent effluent, two (2) concentrations below that are based on a 0.5 dilution factor, and two (2) concentrations above: one (1) at mid-point between 100% and the required percent effluent, and one (1) at 100% effluent.

For a required percent effluent less than 75%, test concentrations shall include the required percent effluent, two (2) concentrations below on a 0.5 dilution factor, and two (2) concentrations above the required percent effluent based on a 0.5 dilution factor if possible, one (1) at mid-point between 100% and the required percent effluent, and one (1) at 100% effluent.

Selection of different effluent concentrations must be approved by DOW prior to testing. Controls shall be conducted concurrently with effluent testing using synthetic water.

1.4.4. WET Controls

Controls shall be tested concurrent with effluent testing using synthetic water. The analysis will be deemed reasonable and good only if the minimum control requirements are met:

For the Ceriodaphnia test: at least 80% survival of all control organisms and an average of fifteen (15) or more young per surviving female in the control solutions; and 60% of surviving control females must produce three broods.

For the fathead minnow test: at least 80% survival in controls and the average dry weight per surviving organism in control chambers equals or exceeds 0.25 mg.

Any test that does not meet the control acceptability criteria shall be repeated as soon as practicable within the monitoring period.

Within thirty (30) days prior to initiating an effluent toxicity test, a reference toxicant test must be completed for the method used; alternatively, the reference toxicant test may be run concurrent with the effluent toxicity test.

1.4.5. WET Test Methods

All test organisms, procedures and quality assurance criteria used shall be in accordance with Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms (4^{th} Edition), EPA-821-R-02-013, the most recent edition of this publication, or as approved in advance by DOW.

1.4.6. Reduction to Single Species Testing

After at least six (6) consecutive passing toxicity tests using both, the water flea and the fathead minnow, a request for testing with only the most sensitive species may be submitted to DOW. Upon approval, the most sensitive species may be considered as representative and all subsequent compliance tests may be conducted using only that species unless directed at any time by DOW to change or revert to both.

1.4.7. WET Reporting Requirements

Results of all toxicity tests conducted with any species shall be reported according to the most recent format provided by DOW. Notification of failed test shall be made to DOW within five (5) days of test completion. Test reports shall be submitted to DOW within thirty (30) days of completion. A control chart including the most recent reference toxicant test endpoints for the effluent test method (minimum of five [5], up to twenty [20] if available) shall be part of the report.

1.4.8. WET Test Results

Noncompliance with the toxicity limit will be demonstrated if the IC_{25} (inhibition concentration) for reproduction or growth is less than 100 % effluent. If noncompliance occurs in an initial test, the permittee must repeat the test using a new set of three (3) 24-hour composite samples. Sampling must be initiated within fifteen (15) days of completing the failed test. The second round of testing shall include both species unless approved for only the most sensitive species by DOW.

Results of the second round of testing will be used to evaluate the persistence of the toxic event and the possible need for a Toxicity Reduction Evaluation (TRE).

1.4.9. Accelerated Testing

If the second round of testing also demonstrates noncompliance, the permittee will be required to perform accelerated testing as specified in the following paragraphs.

Complete four (4) additional rounds of testing to evaluate the frequency and degree of toxicity within sixty (60) days of completing the second failed round of testing. Results of the initial and second rounds of testing specified above plus the four (4) additional rounds of testing will be used in deciding if a TRE shall be required.

If results from any two (2) of six (6) rounds of testing show a significant noncompliance with the Toxicity limit, i.e., $\geq$1.2 times the TU, or results from any four of the six tests show toxicity as defined in Section 1.4.8, a TRE will be required.

The permittee shall provide written notification to DOW within five (5) days of completing the accelerated testing, stating that: (1) toxicity persisted and that a TRE will be initiated; or (2) that toxicity did not persist and normal testing will resume.

Should toxicity prove not to be persistent during the accelerated testing period, but reoccur within twelve (12) months of the initial failure at a level ≥ 1.2 times the TU, then a TRE shall be required.

1.4.10. WET Toxicity Reduction Evaluation (TRE)

Having determined that a TRE is required, the permittee shall initiate and/or continue at least monthly testing with both species until such time as a specific TRE plan is approved by DOW. A TRE plan shall be developed by the permittee and submitted to DOW within thirty (30) days of determining a TRE is required. The plan shall be developed in accordance with the most recent EPA and DOW guidance. Questions regarding this process may be submitted to DOW.

The TRE plan shall include Toxic Identification Evaluation (TIE) procedures, treatability studies, and evaluations of: chemical usage including changes in types, handling and suppliers; operational and process procedures; housekeeping and maintenance activities; and raw materials. The TRE plan will establish an implementation schedule to begin immediately upon approval by DOW, to have duration of at least six (6) months, and not to exceed twenty-four (24) months. The implementation schedule shall include quarterly progress reports being submitted to DOW, due the last day of the month following each calendar quarter.

Upon completion of the TRE, the permittee shall submit a final report detailing the findings of the TRE and actions taken or to be taken to prevent the reoccurrence of toxicity. This final report shall include: the toxicant(s), if any are identified; treatment options; operational changes; and the proposed resolutions including an implementation schedule not to exceed one-hundred-eighty (180) days.

Should the permittee determine the toxicant(s) and/or a workable treatment prior to the planned conclusion of the TRE, the permittee will notify DOW within five (5) days of making that determination and take appropriate actions to implement the solution within one-hundred-eighty (180) days of that notification.

SECTION 2
ADDITIONAL REQUIREMENTS

2. ADDITIONAL REQUIREMENTS

2.1. Schedule of Compliance

The permittee shall attain compliance with all requirements of this permit on the effective date of this permit unless otherwise stated.

2.2. Other Permits

This permit has been issued under the provisions of KRS Chapter 224 and regulations promulgated pursuant thereto. Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Cabinet and other state, federal, and local agencies.

2.3. Sufficiently Sensitive Analytical Methods

Analytical methods utilized to demonstrate compliance with the effluent limitations established in this permit shall be sufficiently sensitive to detect pollutant levels at or below the required effluent limit, i.e. the Method Detection Limit (MDL) shall be at or below the effluent limit. In that instance where an EPA-approved method does not exist that has an MDL at or below the established effluent limitation, the permitee shall: (1) use the method specified in the permit; or (2) the EPA-approved method with an MDL that is nearest to the established effluent limit.

2.4. Reporting of Monitoring Results

Monitoring results obtained during each monitoring period must be reported. The completed Discharge Monitoring Report (DMR) for each monitoring period must be submitted no later than the 28th day of the month following the monitoring period for which monitoring results were obtained.

2.4.1. Electronic Submittal

The completed DMR for each monitoring period must be entered into the Division of Water approved electronic system no later than midnight on the 28th day of the month following the monitoring period for which monitoring results were obtained.

For information regarding electronic submittal of DMRs please visit the Division's website at http://water.ky.gov/permitting/Pages/netDMRInformation.aspx or contact the DMR Coordinator at (502) 564-3410.

2.5. Reopener Clause

This permit shall be modified, or alternatively revoked and reissued, to comply with any applicable effluent standard or limitation issued or approved in accordance with 401 KAR 5:050 through 5:080, if the effluent standard or limitation so issued or approved:

1. Contains different conditions or is otherwise more stringent than any effluent limitation in the permit; or
2. Controls any pollutant not limited in the permit.

This permit may be reopened to implement the findings of a reasonable potential analysis performed by the Division of Water.

This permit shall be reopened if Division of Water determines surface waters are aesthetically or otherwise degraded by substances that:

(a) Settle to form objectionable deposits;
(b) Float as debris, scum, oil, or other matter to form a nuisance;
(c) Produce objectionable color, odor, taste, or turbidity;
(d) Injure, are chronically or acutely toxic to or produce adverse physiological or behavioral responses in humans, animals, fish, and other aquatic life;

(e) Produce undesirable aquatic life or result in the dominance of nuisance species; or
(f) Cause fish flesh tainting.

The permit as modified or reissued under this paragraph shall also contain any other requirements of KRS Chapter 224 when applicable.

2.6. Outfall Signage

The KPDES permit establishes monitoring points, effluent limitations, and other conditions to address discharges from the permitted facility. In an effort to better document and clarify these locations the permittee should place and maintain a permanent marker at each of the monitoring locations.

2.7. Discharge and Monitoring Point Accessibility

The permittee shall allow authorized agency representatives to inspect the facility and collect samples to determine compliance. In order for such monitoring to be conducted either by the permittee or authorized agency personnel all monitoring and discharge points required by this permit shall be readily and safely accessible in all weather conditions.

2.8. Disposal of Non-Domestic Wastes

The pass through or non-treatment by the wastewater treatment plant of chemicals or compounds which may injure, be chronically or acutely toxic to or produce adverse physiological or behavioral responses in humans, animals, fish and other aquatic life is not desirable. Materials such as acids, caustics, herbicides, household chemicals or cleansers, insecticides, lawn chemicals, non-biodegradable products, paints, pesticides, pharmaceuticals, and petroleum based products may not be treatable by the wastewater treatment plant and should not be introduced and other environmentally sound methods for disposal should be utilized. The permittee should educate users of its system that introduction of such chemicals or compounds could result in an adverse environmental impact and provide the users with alternative disposal measures.

2.9. Certified Operators

Pursuant to 401 KAR 5:010, Section 1 a treatment plant with a design capacity of more than 50,000 gallons per day, but less than or equal to two (2) million gallons per day shall be under the primary responsibility of a certified operator holding an active Class II, III, or IV treatment certificate.

Pursuant to 401 KAR 5:010, Section 2 a collection system that transports wastewater to a treatment plant with a design capacity of more than 50,000 gallons per day, but less that or equal to two (2) million gallons per day shall be under the primary responsibility of a certified operator holding an active Class II, III, or Iv collection certificate.

2.10. Certified Laboratory Requirements

All laboratory analyses and tests required to demonstrate compliance with the conditions of this permit shall be performed by EEC certified general wastewater laboratories and EEC certified field-only laboratories. Compliance with this requirement shall commence on January 1, 2015 for analyses and tests performed by a general wastewater laboratory and January 1, 2016 for field-only wastewater laboratories.

SECTION 3
Special CONDITIONS

3. SPECIAL CONDITIONS

3.1. Notification to New Industrial Users

The permittee shall notify by mail any new industrial user that discharges industrial process waters subject to an effluent guideline that the industrial user must obtain a KPDES permit for its indirect discharge through this facility to Waters of the Commonwealth. This notification must be given within thirty days of when the permittee is aware that the industrial facility intends to connect to the WWTP.

3.2. Notification to Surface Water Permits Branch of New Industrial Users

The permittee shall notify the Kentucky Division of Water by mail of any new industrial user that discharges industrial process waters subject to an effluent guideline. This notification shall be given within thirty days of when the permittee is aware that the industrial facility intends to connect to the WWTP.

3.3. Best Management Practices

3.3.1. BMP - General Conditions

3.3.1.1. BMP - Applicability

These conditions apply to any permittee who uses, manufactures, stores, handles, or discharges any pollutant listed as: (1) toxic under Section 307(a)(1) of the Clean Water Act; (2) oil, as defined in Section 311(a)(1) of the Act; (3) any pollutant listed as hazardous under Section 311 of the Act; or (4) is defined as a pollutant pursuant to KRS 224.01-010(35) and that has ancillary manufacturing operations that could result in (1) the release of a hazardous substance, pollutant, or contaminant, or (2) an environmental emergency, as defined in KRS 224.01-400, as amended, or any regulation promulgated pursuant thereto (hereinafter, the "BMP pollutants"). These operations include material storage areas; plant site runoff; in-plant transfer, process and material handling areas; loading and unloading operations, and sludge and waste disposal areas.

3.3.1.2. BMP - Plan

The permittee shall develop and implement a Best Management Practices (BMP) plan consistent with 401 KAR 5:065, Section 2(10) pursuant to KRS 224.70-110, which prevents or minimizes the potential for the release of "BMP pollutants" from ancillary activities through plant site runoff; spillage or leaks, sludge or waste disposal; or drainage from raw material storage. A Best Management Practices (BMP) plan will be prepared by the permittee unless the permittee can demonstrate through the submission of a BMP outline that the elements and intent of the BMP have been fulfilled through the use of existing plans such as the Spill Prevention Control and Countermeasure (SPCC) plans, contingency plans, and other applicable documents.

3.3.1.3. BMP - Implementation

If this is the first time for the BMP requirement, then the plan shall be developed and submitted to the Division of Water within 90 days of the effective date of the permit. Implementation shall be within 180 days of that submission. For permit renewals the plan in effect at the time of permit reissuance shall remain in effect. Modifications to the plan as a result of ineffectiveness or plan changes to the facility shall be submitted to the Division of Water and implemented as soon as possible.

3.3.1.4. BMP - General Requirements

The BMP plan shall:

a. Be documented in narrative form, and shall include any necessary plot plans, drawings, or maps.

b. Establish specific objectives for the control of toxic and hazardous pollutants.

(1) Each facility component or system shall be examined for its potential for causing a release of "BMP pollutants" due to equipment failure, improper operation, natural phenomena such as rain or snowfall, etc.

(2) Where experience indicates a reasonable potential for equipment failure (e.g., a tank overflow or leakage), natural condition (e.g., precipitation), or other circumstances which could result in a release of "BMP pollutants," the plan should include a prediction of the direction, rate of flow, and total quantity of the pollutants which could be released from the facility as result of each condition or circumstance.

c. Establish specific Best Management Practices to meet the objectives identified under paragraph b of this section, addressing each component or system capable of causing a release of "BMP pollutants."

d. Include any special conditions established in part b of this section.

e. Be reviewed by plant engineering staff and the plant manager.

3.3.1.5. BMP - Specific Requirements

The plan shall be consistent with the general guidance contained in the publication entitled "NPDES Best Management Practices Guidance Document," and shall include the following baseline BMPs as a minimum.

a. BMP Committee
b. Reporting of BMP Incidents
c. Risk Identification and Assessment
d. Employee Training
e. Inspections and Records
f. Preventive Maintenance
g. Good Housekeeping
h. Materials Compatibility
i. Security
j. Materials Inventory

3.3.1.6. BMP - SPCC Plans

The BMP plan may reflect requirements for Spill Prevention Control and Countermeasure (SPCC) plans under Section 311 of the Act and 40 CFR Part 151, and may incorporate any part of such plans into the BMP plan by reference.

3.3.1.7. BMP - Hazardous Waste Management

The permittee shall assure the proper management of solid and hazardous waste in accordance with the regulations promulgated under the Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1978 (RCRA) (40 U.S.C. 6901 et seq.) Management practices required under RCRA regulations shall be referenced in the BMP plan.

3.3.1.8. BMP - Documentation

The permittee shall maintain a description of the BMP plan at the facility and shall make the plan available upon request to EEC personnel. Initial copies and modifications thereof shall be sent to the following addresses when required by Section 3.3.1.9:

Division of Water
Surface Water Permits Branch
Operational Permits Section
200 Fair Oaks Lane
Frankfort, Kentucky 40601

3.3.1.9. BMP - Modification

The permittee shall amend the BMP plan whenever there is a change in the facility or change in the operation of the facility which materially increases the potential for the ancillary activities to result in the release of "BMP pollutants."

3.3.1.10. BMP - Modification for Ineffectiveness

If the BMP plan proves to be ineffective in achieving the general objective of preventing the release of "BMP pollutants," then the specific objectives and requirements under paragraphs b and c of Section 4, the permit, and/or the BMP plan shall be subject to modification to incorporate revised BMP requirements. If at any time following the issuance of this permit the BMP plan is found to be inadequate pursuant to a state or federal site inspection or plan review, the plan shall be modified to incorporate such changes necessary to resolve the concerns.

3.3.2. BMP - Specific Conditions

3.3.2.1. BMP - Periodically Discharged Wastewaters Not Specifically Covered by Effluent Conditions

The permittee shall include in this BMP plan procedures and controls necessary for the handling of periodically discharged wastewaters such as intake screen backwash, meter calibration, fire protection, hydrostatic testing water, water associated with demolition projects, etc.

SECTION 4
STANDARD CONDITIONS

4. STANDARD CONDITIONS

The following conditions apply to all KPDES permits.

4.1. Duty to Comply

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of KRS Chapter 224 and is grounds for enforcement action; for permit termination, revocation and reissuance, or modification; or denial of a permit renewal application. Any person who violates applicable statutes or who fails to perform any duty imposed, or who violates any determination, permit, administrative regulation, or order of the cabinet promulgated pursuant thereto shall be liable for a civil penalty as provided at KRS 224.99.010.

4.2. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for a new permit.

4.3. Need to Halt or Reduce Activity Not a Defense

It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

4.4. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

4.5. Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

4.6. Permit Actions

This permit may be modified, revoked and reissued, or terminated for cause. The filing of a request by the permittee for a permit modification, revocation and reissuance, or termination, or a notification of planned changes or anticipated noncompliance does not stay any permit condition.

4.7. Property Rights

This permit does not convey any property rights of any sort, or any exclusive privilege.

4.8. Duty to Provide Information

The permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The permittee shall also furnish to the Director upon request, copies of records required to be kept by this permit.

4.9. Inspection and Entry

The permittee shall allow the Director, or an authorized representative (including an authorized contractor acting as a representative of the Administrator), upon presentation of credentials and other documents as may be required by law, to:

(1) Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;
(2) Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;
(3) Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit; and
(4) Sample or monitor at reasonable times, for the purposes of assuring permit compliance or as otherwise authorized by the Clean Water Act, any substances or parameters at any location.

4.10. Monitoring and Records

(1) Samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity.

(2) Except for records of monitoring information required by this permit related to the permittee's sewage sludge use and disposal activities, which shall be retained for a period of at least five (5) years (or longer as required by 401 KAR 5:065 Section 2(10) [40 CFR 503]), the permittee shall retain records of all monitoring information, including all calibration and maintenance records and all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least three (3) years from the date of the sample, measurement, report or application. This period may be extended by request of the Director at any time.

(3) Records of monitoring information shall include:

(i) The date, exact place, and time of sampling or measurements;
(ii) The individual(s) who performed the sampling or measurements;
(iii) The date(s) analyses were performed;
(iv) The individual(s) who performed the analyses;
(v) The analytical techniques or methods used; and
(vi) The results of such analyses.

(4) Monitoring must be conducted according to test procedures approved under 401 KAR 5:065 Section 2(8) [40 CFR 136] unless another method is required under 401 KAR 5:065 Section 2(9) or (10) [40 CFR subchapters N or O].

(5) KRS 224.99-010 provides that any person who knowingly violates KRS 224.70-110 or other enumerated statutes, or who knowingly renders inaccurate any monitoring device or method required to be maintained under this permit shall be guilty of a Class D felony and, upon conviction, shall be punished by a fine of not more than $25,000, or by imprisonment, or both. Each day upon which a violation occurs shall constitute a separate violation.

4.11. Signatory Requirement

(1) All applications, reports, or information submitted to the Director shall be signed and certified pursuant to 401 KAR 5:060, Section 4 [40 CFR 122.22].

(2) KRS 224.99-010 provides that any person who knowingly provides false information in any document filed or required to be maintained under KRS Chapter 224 shall be guilty of a Class D felony and upon conviction thereof, shall b punished by a fine not to exceed twenty-five thousand dollars ($25,000), or by imprisonment, or by fine and imprisonment, for each separate violation. Each day upon which a violation occurs shall constitute a separate violation

4.12. Reporting Requirements

4.12.1. Planned Changes

The permittee shall give notice to the Director as soon as possible of any planned physical alterations or additions to the permitted facility. Notice is required only when:

(i) The alteration or addition to a permitted facility may meet one (1) of the criteria for determining whether a facility is a new source in KRS 224.16-050 [40 CFR122.29(b)]; or
(ii) The alteration or addition could significantly change the nature or increase the quantity of pollutants discharged. This notification applies to pollutants which are subject neither to effluent limitations in the permit, nor to notification requirements under KRS 224.16-050 [40 CFR 122.42(a)(1)].
(iii) The alteration or addition results in a significant change in the permittee's sludge use or disposal practices, and such alteration, addition, or change may justify the application of permit conditions that are different from or absent in the existing permit, including notification of additional use or disposal sites not reported during the permit application process or not reported pursuant to an approved land application plan.

4.12.2. Anticipated Noncompliance

The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

4.12.3. Transfers

This permit is not transferable to any person except after notice to the Director. The Director may require modification or revocation and reissuance of the permit to change the name of the permittee and incorporate such other requirements as may be necessary under KRS 224 [CWA; see 40 CFR 122.61; in some cases, modification or revocation and reissuance is mandatory].

4.12.4. Monitoring Reports

Monitoring results shall be reported at the intervals specified elsewhere in this permit.

(i) Monitoring results must be reported on a Discharge Monitoring Report (DMR) or forms provided or specified by the Director for reporting results of monitoring of sludge use or disposal practices.
(ii) If the permittee monitors any pollutant more frequently than required by the permit using test procedures approved under 401 KAR 5:065 Section 2(8) [40 CFR 136], or another method required for an industry-specific waste stream under 401 KAR 5:065 Section 2(9) or (10) [40 CFR subchapters N or O], the results of such monitoring shall be included in the calculation and reporting of the data submitted in the DMR or sludge reporting form specified by the Director.
(iii) Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean unless otherwise specified by the Director in the permit.

4.12.5. Compliance Schedules

Reports of compliance or noncompliance with, or any progress reports on, interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than fourteen (14) days following each schedule date.

4.12.6. Twenty-four-Hour Reporting

(i) The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally within twenty-four (24) hours from the time the permittee becomes aware of the circumstances. A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain a description of the noncompliance and its cause; the period of noncompliance, including exact dates and times, and if the

noncompliance has not been corrected, the anticipated time it is expected to continue; and steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

(ii) The following shall be included as information which must be reported within twenty-four (24) hours under this paragraph.

(A) Any unanticipated bypass which exceeds any effluent limitation in the permit. (See §122.44(g))
(B) Any upset which exceeds any effluent limitation in the permit.
(C) Violation of a maximum daily discharge limitation for any of the pollutants listed by the Director in the permit to be reported within twenty-four (24) hours.

(iii) The Director may waive the written report on a case-by-case basis for reports under paragraph (ii) of this section if the oral report has been received within twenty-four (24) hours.

4.12.7. Other Noncompliance

The permittee shall report all instances of noncompliance not reported under Sections 4.12.4, 4.12.5, and 4.12.6, at the time monitoring reports are submitted. The reports shall contain the information listed in Section 4.12.6.

4.12.8. Other Information

Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Director, it shall promptly submit such facts or information.

4.13. Bypass

4.13.1. Definitions

(i) Bypass means the intentional diversion of waste streams from any portion of a treatment facility.
(ii) Severe property damage means substantial physical damage to property, damage to the treatment facilities which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

4.13.2. Bypass Not Exceeding Limitations

The permittee may allow any bypass to occur which does not cause effluent limitations to be exceeded, but only if it also is for essential maintenance to assure efficient operation. These bypasses are not subject to the provisions of Section 4.13.1.

4.13.3. Notice

(i) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior notice, if possible at least ten (10) days before the date of the bypass.
(ii) Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in Section 4.12.6.

4.13.4. Prohibition of Bypass

(i) Bypass is prohibited, and the Director may take enforcement action against a permittee for bypass, unless:

(A) Bypass was unavoidable to prevent loss of life, personal injury, or severe property damage;
(B) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate back-up equipment should have been installed in the exercise of

reasonable engineering judgment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and
(C) The permittee submitted notices as required under Section 4.13.3.

(ii) The Director may approve an anticipated bypass, after considering its adverse effects, if the Director determines that it will meet the three (3) conditions listed above in Section 4.13.3.

4.14. Upset

4.14.1. Definition

Upset means an exceptional incident in which there is unintentional and temporary noncompliance with technology-based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operational error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventive maintenance, or careless or improper operation.

4.14.2. Effect of an Upset

An upset constitutes an affirmative defense to an action brought for noncompliance with such technology-based permit effluent limitations if the requirements of Section 4.14.3 are met. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

4.14.3. Conditions Necessary for a Demonstration of Upset

A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

(i) An upset occurred and that the permittee can identify the cause(s) of the upset;
(ii) The permitted facility was at the time being properly operated; and
(iii) The permittee submitted notice of the upset as required in Section 4.12.6; and
(iv) The permittee complied with any remedial measures required under Section 4.4.

4.14.4. Burden of Proof

In any enforcement preceding the permittee seeking to establish the occurrence of an upset has the burden of proof.

SECTION 4

ABBREVIATIONS, ACRONYMS AND DEFINITIONS

5. ABBREVIATIONS, ACRONYMS AND DEFINITIONS

Abbreviation or Acronym	Full Phrase	Definition
MGD	Million Gallons Per Day	A measure of flow
cfs	cubic feet per second	A measure of flow
SU	Standard Units	A measure of pH
mg/l	milligrams per liter	A measure of pollutant concentration (1000 milligrams = 1 gram)
µg/l	micrograms per liter	A measure of pollutant concentration (1000 micrograms = 1 milligram)
°F	Degrees Fahrenheit	A measure of temperature
°C	Degrees Centigrade or Celsius	A measure of temperature
N/A	Not Applicable	
lbs/day	pounds per day	A measure of pollutant loading
Grab	Grab Sample	A sample taken from a wastestream on a one-time basis without consideration of the flow rate of the wastestream and without consideration of time.
24-Hr Composite	24-hour Composite Sample	Sample composed of discrete equal volume aliquots (100 ml minimum) collected every 15 minutes over a 24-hour period and aggregated by an automated sampling device. The aggregate sample will reflect the average water quality of the compositing or sample period.

APPENDIX B

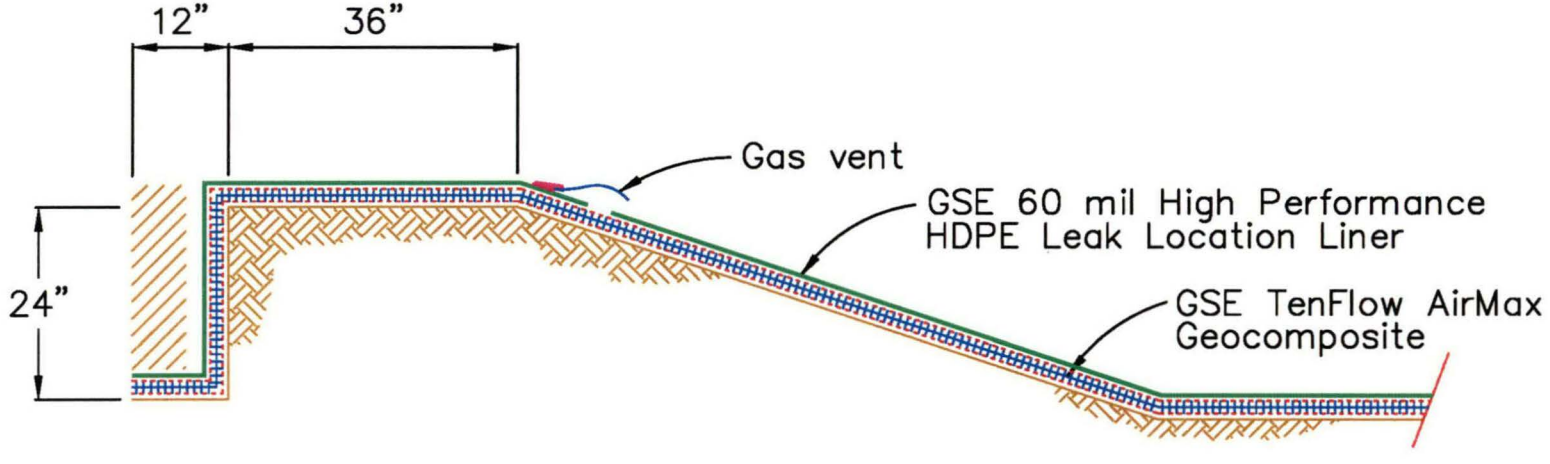
Ten State Standards Design Criteria

$$t = \frac{E}{2.3k_1x(100-E)}$$

Temporary Design Criteria			
41.66667	t	Detention time	days
92	E	Percent Removal	
0.12	k1	reaction coefficient	day^-1
300000	Q	Flow	gpd
12500000	V	Storage Volume	Gal
Existing Conditions			
24.24749	t	Detention time	days
87	E	Percent Removal	
0.12	k1	reaction coefficient	day^-1
300000	Q	Flow	gpd
7274247	V	Storage Volume	Gal

10 State standards size requirements are based solely on detention time. In order to achieve 20 mg/l effluent concentration the lagoons would need to provide 12.5 million gallons of storage to treat the flow on a temporary basis while using the required 240 mg/l influent concentration. The treatment plant would need 7.2 million gallons of storage to treat the flow on a temporary basis while using the average 155 mg/l influent concentration.

APPENDIX C

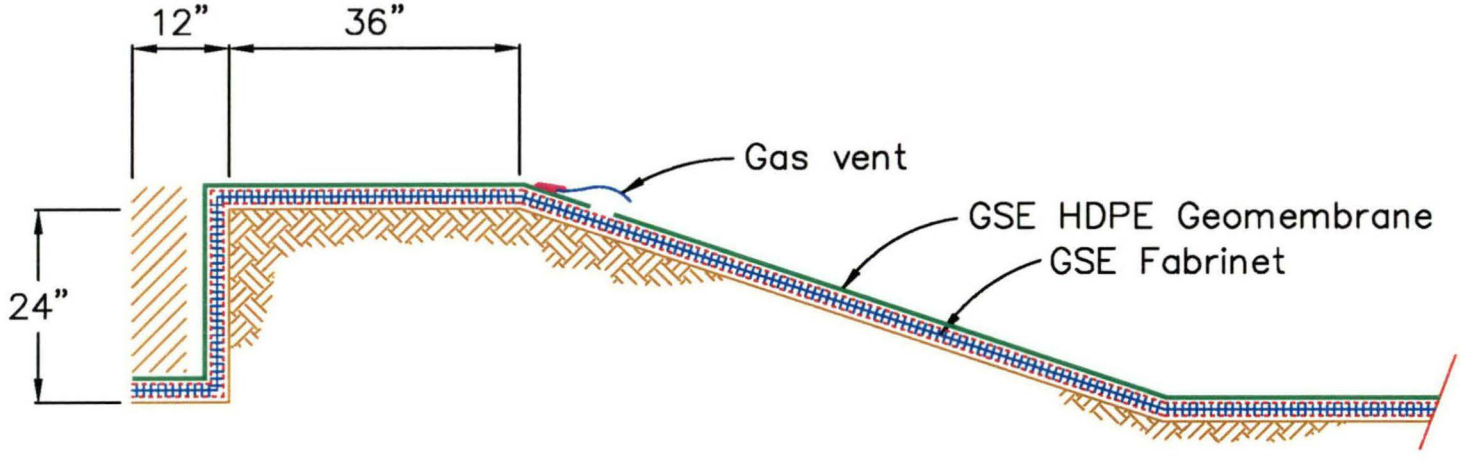


Typical Section Thru Perimeter Berm

Not to scale

GSE ENVIRO
GSE Environmental, LLC.
19103 Gundle Road
Houston, Texas 77073-3598
(800)435-2008 / (281)443-8564

DRAWN	EJZ	DA	11/3/2014	REVISION	0	DWG. NO.	D



Typical Section Thru Anchor Trench

Not to scale

GSE Lining Technology, Inc.
19103 Gundle Road
Houston, Texas 77073-3598
(800)435-2008 / (281)443-8564

DRAWN	EJZ	DA	10/2/2014	REVISION	0	DWG. NO.	D- :A

BASIN 2 RELINE PROJECT

THOMPSON'S STATION, TENNESSEE

[DURABILITY RUNS DEEP]

Leak Location Liner Helps Put Aeration Basin Back In Business.

Owner:
Town of Thompson's Station
Process Service Engineers:
Sheaffer Wastewater Solutions, LLC
Engineers:
Littlejohn Engineering Associates
Contractors:
American Environmental Group (AEG), Ltd.

Technical Description:

Product: **Leak Location Liner Geomembrane**
Description: 60-mil Smooth High Performance HDPE
Quantity: 201,600 SF

Product: **FabriNet Geocomposite**
Description: 200-mil GeoNet
Quantity: 191,800 SF

Product: **PolyLock System**
Description: **Concrete Embedment Strip**
Quantity: 260 LF

Product: **Fabricated Corners (Aerators)**
Description: Vacuum Formed Polyethylene Boots
Quantity: 12" X 12" 6" - 154
18" X 18" X 6" - 15
24" X 24" X 6" - 69

Product: **Ladders & Water Level Indicator**
Description: Custom Fabricated
Quantity: Ladder - 4
Water Level Indicator - 1

Case Study

Background

The Town of Thompson's Station, a community south of Nashville, TN, has experienced a surge of economic growth. In the spring of 2012, Aeration Basin 2 at a town wastewater treatment plant was in need of repair. After considering several alternatives, the Project Team decided to reline the basin.

Several factors made this project challenging. Not only did the design and construction need to be completed as quickly as possible to ensure the basin would be fully operational before winter, but the Project Team would also have to reconstruct the new liner system within a confined area around the basins. In addition, it was critical that Basin 1 remain fully operational during construction since Basin 2 would be out of service.

Solution

Sheaffer Wastewater Solutions LLC collaborated with American Environmental Group (AEG) Ltd and GSE Environmental, LLC to develop a cost-effective liner system solution. Littlejohn Engineering Associates designed the selected liner system to accommodate the site specific design considerations. One advantage of the High-Performance High-Density Polyethylene (HDPE) Leak Location Liner geomembranes is that it allows crews to Spark Test the entire surface of the liner in accordance with ASTM D 7240 or D 7007 to confirm the liner integrity. The high-quality, high-performance polymers ensure that the geomembrane is flexible without compromising its durability or strength, and the antioxidant package design provides superior oxidation protection from energy sources. In addition, Leak Location Liner will allow the owner to confirm liner integrity upon project completion. FabriNet Geocomposite was also specified under the geomembrane for added protection.

GSE ENVIRONMENTAL™

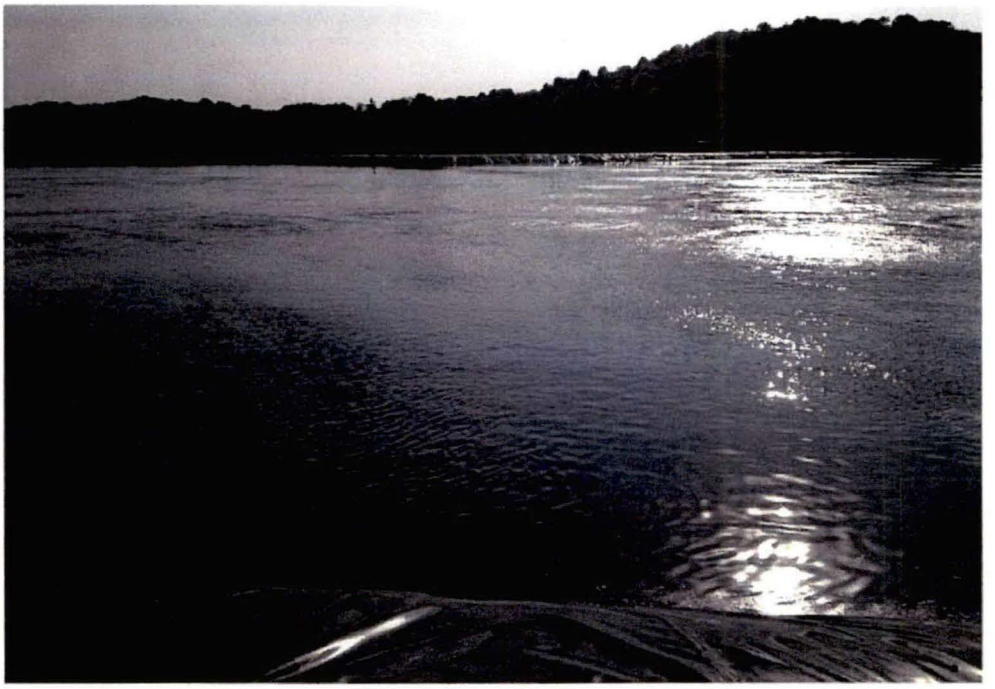
GSEworld.com

continued...

Another challenge the project team faced was finding a way to protect the liner from direct contact with the wastewater treatment basin aerators. AEG and GSE collaborated to propose a custom fabricated vacuum-formed polyethylene boot that would fit snugly around the aerator base, enclosing it to protect the liner. GSE fabricated the vacuum-formed polyethylene boot corners through their custom Fabrication Department. AEG then assembled and welded them together around the aerator base to form the protective enclosure.

The Result

Permits were secured quickly and the design phase was completed in June 2012. After completing the geosynthetic liner system ahead of schedule, AEG spark tested the geomembrane under visual observation from the Owner's onsite Quality Assurance Representative. Following aerator installation completion, AEG returned to the site and performed another spark test to confirm liner integrity before the basin was returned to service.



The Project Team chose to collaborate with AEG and GSE because of their technical support services, professional qualifications, reputations for outstanding quality control, and safety consciousness. Upon hearing about the successful project completion, town board members thanked the project team and Basin 2 reopened before the end of the year.

"From the very beginning of the project, GSE's experience and technical expertise were key success factors of this project. AEG and GSE proposed liner system alternatives based on critical success factors defined by our Project Team. We selected Leak Location Liner so we could spark test the liner for leaks," said Bruce Meyer, Sheaffer Wastewater Solutions, LLC. "I'm glad we did because the Leak Location Liner helped us find small holes the we could not see during our visual inspection."

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North America 800.435.2008
Europe & Africa 49.40.767420
Asia Pacific 66.2.937.0091
South America 56.2.595.4200
Middle East 20.23828.8888

For more information on this product and others, please visit us at GSEworld.com, call 800.435.2008 or contact your local sales office.

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Dry Creek Wastewater Treatment Lagoon
Owenton, Kentucky
LINER SYSTEM ALTERNATIVES
COST ESTIMATE COMPARISON:

Project Dimensions		
Project Length	256	ft
Project Width	336	ft
Project Area	1.97	acres
Project Area (neat)	**9,557**	**yd2**

Density Constants		
Sand		pcf

Standard Material Costs		
Protective Cover Soil		CY
Sand		ton

Geosynthetic Material Costs		60mil Text. HDPE Geomembrane (SY)	FabriNet Geocomposite (SY)	60mil Text. White HDPE Leak Location Liner System (SY)	AirMax Gas Vent & Underdrain (SY)
Sell price		$3.51	$3.83	$4.05	$5.85
With Sales Tax	6.0%	$3.72	$4.06	$4.29	$6.20
Overlap / Waste	12.0%	$0.45	$0.49	$0.52	$0.74
Contractor Markup	10.0%	$0.42	$0.45	$0.48	$0.69
Installation ($/SY/Layer)	$1.35	$1.35	$1.35	$1.35	$1.35
ELI Survey		--	--	$0.63	--
Estimated Geosynthetic Installer's Cost		$5.93	$6.35	$7.27	$8.99
GC Overhead & Profit	7.5%	$0.45	$0.48	$0.55	$0.67
Estimated Install Cost to Owner		**$6.38**	**$6.83**	**$7.81**	**$9.66**

NOTE: INPUT AN ASTERISK * FOR GEOSYNTHETIC IN THICKNESS COLUMN

ALTERNATE A - CONVENTIONAL BOTTOM LINER CROSS-SECTION

Course Name	Thickness (in)	Length (LF)	Unit Cost ($) per CY	Unit Cost ($) per ton	Unit Cost ($) per yd²-in.	Unit Cost ($/LF)	Total Cost ($) per yd²
60mil Text. HDPE Geomembrane	*						$6.38
FabriNet 250-6-6 Geocomposite	*						$6.83
						Estimated Total Unit Cost per sq yd	**$13.21**
						Estimated Total Project Cost	**$126,222.38**

ALTERNATE B - GSE LEAK LOCATION LINER SYSTEM CROSS-SECTION w/ AIRMAX VENTING & UNDERDRAIN SYSTEM

Course Name	Thickness (in)	Length (LF)	Unit Cost ($) per CY	Unit Cost ($) per ton	Unit Cost ($) per yd²-in.	Unit Cost ($/LF)	Total Cost ($) per yd²
60mil Text. HDPE LLL System	*						$7.81
AirMax Gas Vent & Underdrain	*						$9.66
						Estimated Total Unit Cost per sq yd	**$17.48**
						Estimated Total Project Cost	**$167,043.11**
						Estimated Project Cost Savings	**-$40,820.73**

Notes

1) This cost estimate is generic in nature and does not include miscellaneous items such as safety training.
2) Mobilization/Demobilization is not included. Add ~$5,000 per mob/demob.
3) Add ~$500/boot installation.
4) Add ~$30/LF for liner termination at structures.
5) 7.5% General Contractor mark-up for overhead and profit was added to this cost estimate in order to arrive at the estimated cost to the Owner.
6) Stand-by time is typically billed at a rate of $4,500 to $6,000 per day per crew depending on the time of year and the crew size.
7) Assumes labor is non-union.
8) Any cost associated with sumps and underdrain pipe installation are not included.

APPENDIX D

KENTUCKY AMERICAN WATER - OWENTON WWTP DISCHARGE MONITORING DATA																			
	FIELD ANALYSIS				FOUSER COMPLIANCE ANALYSIS									LOADING RATE CALCULATION					
	Flow	CL	PH	DO	NH3		TSS		cBOD5		PHOS.	FECAL COLIFORM		NH3		TSS		cBOD5	
	(MGD)	(mg/L)		(mg/L)	(mg/L)		(mg/L)		(mg/L)		(mg/L)	units/100		(LBs/Day)		(LBs/Day)		(LBs/Day)	
Month	EFF	EFF	EFF	EFF	INF	EFF	INF	EFF	INF	EFF	EFF	EFF		INF	EFF	INF	EFF	INF	EFF
JANUARY	0.20	0.01	7.93	12.08	11.52	5.86	144.00	13.75	90.50	16.00	4.14	1.86		16.95	8.04	220.90	20.80	154.37	25.76
FEBRUARY	0.15	0.01	7.90	12.21	23.58	8.19	400.00	16.25	127.50	10.75	4.98	1.80		25.76	9.26	406.29	17.69	135.33	12.29
MARCH	0.29	0.01	7.96	11.64	5.63	3.99	200.25	17.25	79.25	11.50	3.34	24.68		12.26	9.50	433.87	40.53	172.78	26.24
APRIL	0.48	0.01	8.04	10.47	13.67	0.06	246.40	7.00	86.40	6.80	2.47	16.18		27.86	0.15	536.38	14.50	199.85	15.51
MAY	0.15	0.01	7.91	9.62	35.33	0.05	333.50	13.50	151.75	6.00	3.56	30.86		38.91	0.06	350.87	16.28	156.15	7.30
JUNE	0.18	0.01	8.01	9.39	29.40	0.05	202.25	8.00	179.75	5.75	3.38	18.03		39.70	0.07	283.85	10.93	232.08	7.60
JULY	0.41	0.01	8.28	9.33	BMDL		234.60	2.80	141.20	6.40	3.04	6.20		BMDL		625.19	7.35	369.31	17.66
AUGUST	0.16	0.01	8.05	9.23	0.06		291.25	2.75	486.75	4.75	3.97	10.25		0.06		304.51	3.04	511.98	5.04
SEPTEMBER	0.13	0.01	8.10	9.28	0.05		184.40	3.00	160.20	6.00	4.31	10.20		0.06		216.91	3.61	184.76	7.13
OCTOBER	0.13	0.01	7.98	10.21	BMDL		202.50	4.00	125.50	4.25	4.99	12.25		BMDL		197.15	4.05	111.95	3.72
NOVEMBER	0.26	0.01	8.03	10.95	0.07		332.25	8.00	135.25	9.50	4.21	11.50		0.12		608.32	15.10	229.02	16.64
DECEMBER	0.31	0.01	7.86	9.94	0.07		891.40	10.20	100.80	5.60	4.00	13.80		0.12		1579.61	20.19	192.74	10.57
Average	0.238		8.00	10.36	11.94	3.03	305.23	8.88	155.40	7.78	3.86	13.13		16.18	4.51	480.32	14.50	220.86	12.96

APPENDIX E

Keystone Clearwater SOLUTIONS

Proposal #:	P16160	**Date:**	**6/8/2016**		
Project #:	n/a	**Phase:**	n/a	**Task:**	n/a

Customer:	**Kentucky American Water**	**Project:**	ESTIMATE for AGI Pricing
Address:			Owenton WWTP Lagoon Liner Replacement Project
Attn:		**Site:**	Not Yet Determined / Various
Payment Terms:	Net 30 days	**Start Date:**	**For Estimating Purposes Only**

Keystone Clearwater Solutions, LLC appreciates the opportunity to serve you. Thank you.

AUTHORIZED BY: Kentucky American Water

Signature: _____

Name: _____

Title: _____

Date: _____

SIGNED BY: Keystone Clearwater Solutions, LLC

Signature: _____

Name: Jeffrey R. Wehler

Title: Senior Vice President

Date: June 8, 2016

34 Northeast Drive, Hershey, PA 17033 Phone: 717-508-0550
www.keystoneclear.net

Estimate for Above Ground Impoundment: Turnkey Delivery, Construction, & Removal

Keystone Clearwater Solutions ("Keystone") offers to Kentucky American Water ("American Water") the following pricing as requested for the delivery, installation, and removal of various sizes of above-ground impoundments that will be used for waste water storage.

Keystone will coordinate the logistics for the delivery, installation, and removal of each above-ground impoundment. Each impoundment will be delivered to site and subsequently prepared for installation. Keystone will additionally coordinate the delivery of telehandlers and a man-lift on site for use during installation. Additionally, Keystone will supply all necessary labor, tools, equipment, and materials required to install the above-ground impoundment on time as requested by American Water. The liner delivery and installation charge outlined below includes the delivery and installation of a dual 10 oz. geo-textile sub-base material and a 40 millimeter LLDPE polyethylene liner.

Keystone's estimate, provided for American Water's estimating and budgeting purposes, for the turnkey delivery, construction/installation, and removal of each above-ground storage unit is summarized below. Keystone will issue a formal work order proposal upon request that would specifically pertain to each job.

Pricing for transportation, as well as liner and materials, are subject to market pricing and may change due to actual market conditions and job location.

Single-Walled Above-Ground Storage Tank Pricing:

Above Ground Fresh Water Storage Unit	1.0 MG	1.25 MG	1.5 MG	1.8 MG	2.1 MG	2.4 MG
Mobilization: (Including Permits & Delivery)	$ 7,140	$ 7,140	$ 7,140	$ 8,890	$ 8,890	$ 8,890
Installation & Rig-Up	$ 10,450	$ 10,450	$ 10,450	$ 13,410	$ 13,410	$ 13,410
Liners: (1) 40 MIL LLDPE Liners, (2) 10 oz. Geotextile	$ 14,290	$ 15,080	$ 16,570	$ 18,530	$ 23,460	$ 25,410
Rig-Down	$ 8,660	$ 8,660	$ 8,660	$ 8,780	$ 8,780	$ 8,780
Liner Disposal	$ 1,100	$ 1,100	$ 1,100	$ 1,200	$ 1,200	$ 1,200
Pick-Up & Removal	$ 7,140	$ 7,140	$ 7,140	$ 8,890	$ 8,890	$ 8,890
TOTAL	**$ 48,780**	**$ 49,570**	**$ 51,060**	**$ 59,700**	**$ 64,630**	**$ 66,580**

Daily Rental	$ 374	$ 411	$ 449	$ 486	$ 524	$ 561
Weekly Rental	$ 2,244	$ 2,468	$ 2,693	$ 2,917	$ 3,142	$ 3,366
Monthly Rental (Based on 30 Days)	$ 7,854	$ 8,639	$ 9,425	$ 10,210	$ 10,996	$ 11,781

Notes:

1) Keystone assumes that the pad has already been prepared. If the AGI pad requires additional work, it will be billed as a separate, additional item at T&M rates.
2) **Fuel** is included in the installation and removal costs.
3) **Tank Panel Installation:** The estimate utilizes two telehandlers for rig up and one to two telehandlers for rig down. A minimum of 30' clearance is required around each tank circumference in order to operate the telehandlers that are necessary to set the tank panels. If the minimum 30' is not available, the tank panels will need to be set with a crane. If a crane is needed, it will be billed as a T&M item.
4) **Rental** pricing is based on a 30-day minimum rental period. Daily or Weekly Rental rate shall apply after initial Monthly Rental.
5) Delays of installation, caused by inclement weather conditions and client schedules, may result in time and material billing for equipment and labor.

Above-Ground Storage Tank Dimensions:

MG	Gallons of Water Storage	Barrel Equivalent	Gallons of Water Storage with 2' Free Board	Barrel Equivalent with 2' Free Board	Inside Diameter (ft)	# of Segments	Wall Height (ft)
1.0	1,072,650	23,810	893,380	21,271	123.35	10	12.0
1.25	1,297,907	30,903	1,081,590	25,752	135.68	11	12.0
1.5	1,544,617	36,777	1,287,180	30,647	148.02	12	12.0
1.8	1,812,779	43,161	1,510,650	35,968	160.35	13	12.0
2.1	2,102,395	50,057	1,752,000	41,714	172.69	14	12.0
2.4	2,413,646	57,463	2,011,220	47,886	185.02	15	12.0

Notes:

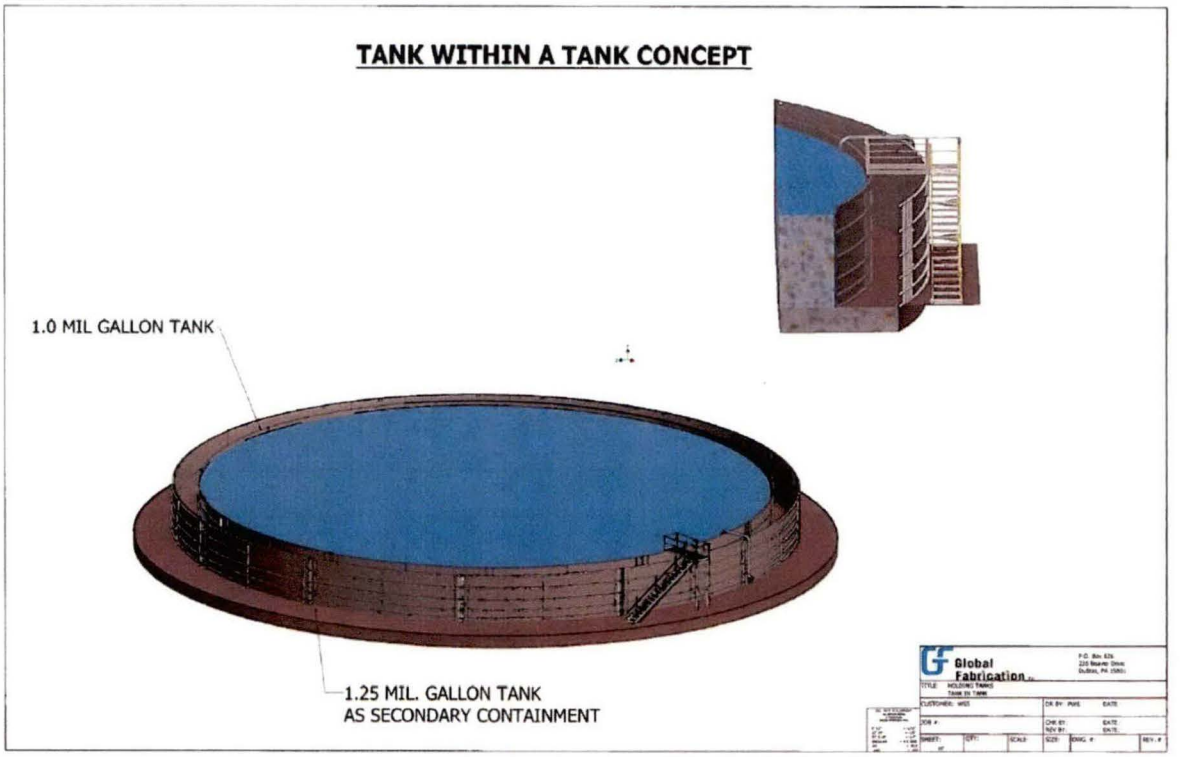
1) The above table illustrates the total capacity and footprint of Keystone's above-ground storage tanks.
2) Each tank has 12' high walls and the size of the tanks can be altered by adding or removing panels as needed.

Triple-Lined, Dual Tank, Above Ground Impoundment Summary Description

Keystone Clearwater Solutions offers a bolted construction, above ground storage tank, with triple containment, providing an environmentally responsible method for containing fluids.

Bolted Construction, Dual Tank Installation with Triple Containment: A bolted construction, above-ground storage tank with triple containment (i.e., three geomembranes) is proposed as shown on the attached drawings and detailed description. The triple containment system will consist of an inner and an outer aboveground storage tank. The inner storage tank will have a primary and a secondary geomembrane liner system. The tertiary geomembrane will line the outer storage tank and will be installed beneath the inner storage tank.

Additional Components: An external staircase will allow for safe viewing from the top of the tank.



Estimate for Above Ground Impoundment: Turnkey Delivery, Construction, & Removal

Keystone will coordinate the logistics for the delivery, installation, and removal of each above-ground impoundment. Each impoundment will be delivered to site and subsequently prepared for installation. Keystone will additionally coordinate the delivery of telehandlers and a man-lift on site for use during installation. Additionally, Keystone will supply all necessary labor, tools, equipment, and materials required to install the above-ground impoundment on time as requested by American Water. The liner item outlined below includes three layers of 10 oz. geo-textile sub-base material and three 40 millimeter LLDPE (linear low density polyethylene) liners as well as the delivery of all said liners to site.

Keystone's estimate for the turnkey delivery, construction/installation, and removal of each above-ground storage unit is summarized as shown below:

Redundant Above-Ground Storage Impoundment Pricing:

Redundant Above Ground Produced Water Storage Unit	1.0/1.25 MG	1.25/1.5 MG	1.5/1.8 MG	1.8/2.1 MG	2.1/2.4 MG
Mobilization: (Including Permits & Delivery)	$ 14,280	$ 14,280	$ 16,030	$ 17,780	$ 17,780
Pad Preparation	$ 5,750	$ 5,750	$ 5,750	$ 5,750	$ 5,750
Installation & Rig-Up	$ 26,042	$ 26,042	$ 29,002	$ 31,962	$ 31,962
Liners: (3) 40 MIL LLDPE Liners, (3) 10 oz. Geotextile, (1) Detection Liner & Delivery	$ 41,119	$ 45,186	$ 50,395	$ 59,250	$ 68,927
Rig-Down & Removal	$ 17,320	$ 17,320	$ 17,440	$ 17,560	$ 17,560
Liner Disposal	$ 3,300	$ 3,300	$ 3,400	$ 3,600	$ 3,600
Pick-Up & Removal	$ 14,280	$ 14,280	$ 16,030	$ 17,780	$ 17,780
TOTAL	**$ 122,091**	**$ 126,158**	**$ 138,047**	**$ 153,682**	**$ 163,359**

Redundant Storage Unit Rental	1.0/1.25 MG	1.25/1.5 MG	1.5/1.8 MG	1.8/2.1 MG	2.1/2.4 MG
Daily Rental	$ 785	$ 860	$ 935	$ 1,010	$ 1,085
Weekly Rental	$ 4,712	$ 5,161	$ 5,610	$ 6,059	$ 6,508
Monthly Rental (Based on 30 Days)	$ 16,493	$ 18,064	$ 19,635	$ 21,206	$ 22,777
Leak Detection System Daily Rental	$ 115	$ 115	$ 115	$ 115	$ 115

AST Qualifications and Assumptions:

1) Keystone assumes that all work is being completed on a previously excavated, graded, compacted, completed, and prepared pad site. The line item "Pad Preparation" above provides pricing that includes any additional grading and the construction of two sumps, which will be necessary for tank monitoring and proper drainage. If the AGI pad requires any additional work, it will be billed as a separate, additional item.
2) Fuel is included in the installation and removal costs.
3) Tank Panel Installation: A minimum of 30' clearance is required around each tank circumference in order to operate the telehandlers that are necessary to set the tank panels. If the minimum 30' is not available, the tank panels will need to be set with a crane.
4) Equipment: The estimate utilizes two telehandlers for rig up and one to two telehandlers for rig down. Cranes or other special equipment needs will be priced on the applicable rental fees.
5) Liner Disposal: Liner Disposal estimate only includes disposal by roll-off dumpster. Pricing does not account for dewatering or cleaning of liner material prior to disposal. Keystone can provide dewatering and cleaning services upon request by American Water.
6) Delays of installation, caused by inclement weather conditions and client schedules, may result in time and material billing for equipment and labor.
7) Mobilization pricing will be adjusted when a destination location is determined.

Triple-Lined Aboveground Storage Tank Detailed Specifications

An aboveground storage tank with triple containment (i.e., three geomembranes) is proposed as shown on the attached drawings. The triple containment system will consist of an inner and an outer aboveground storage tank. The inner storage tank will have a primary and a secondary geomembrane liner system. The tertiary geomembrane will line the outer storage tank and will be installed beneath the inner storage tank.

Each liner system will have a dedicated sump. The sump for the primary and secondary liner systems will be adjacent to each other within the inner storage tank. A riser pipe will be installed within the secondary sump, which will allow the sump to be equipped with a pump and transducer to detect and measure fluid levels, if so desired. The pump and transducer will be connected to an automated control system that will generate an alert if measurable fluid is detected within the secondary sump and automatically pump fluids out of the detection sump. The automated control system provides a method to continually monitor fluid levels within the detection zone. The detection zone, as well as the transducer and pump required for the detection zone, is an additional option and will be included as an added cost if the detection zone is desired by the client.

The tertiary geomembrane will be installed below the primary and secondary geomembranes and will line the walls of the outer storage tank. The tertiary liner provides an additional level of safety against the release of fluids. If a leak develops in the primary geomembrane, only the secondary geomembrane is preventing the potential release of fluids. With a three geomembrane system, the potential for fluids to escape from the storage tank is significantly diminished. Although the tertiary geomembrane is not anticipated to collect much (if any) fluids, a dedicated sump will still be installed. Any precipitation that falls within the footprint of the tertiary geomembrane will be collected and conveyed to the sump. Access for a pump will be provided within the tertiary geomembrane sump.

Geotextiles will be installed between the geomembranes to provide a cushion to protect the geomembranes and to serve as a preferred flow path for fluid. Geonets will be installed within the detection trench and sump area, between the primary and secondary geomembranes. The geonets have a high transmissivity that will convey any fluids to the dedicated sump area for evacuation. A small amount of aggregate will be required for the tertiary sump. The aggregate is required to support the primary, geomembrane, secondary geomembrane, and aboveground tank wall, while having an acceptable hydraulic conductivity to convey fluid.

TERMS AND CONDITIONS

1. Site Preparation: This Work Order offers an Above-Ground Impoundment Water Storage Solution that requires an accessible and stabilized site with adequate land area and periphery, prepared in advance and in accordance with the attached Standard Operating Procedure ("SOP"), entitled: "Temporary Storage Impoundments – Site Preparation Standard". American Water is responsible for installing and/or maintaining Erosion & Sedimentation ("E&S") Controls consistent with the recommendations provided in the SOP. American Water is additionally responsible for controlling surface runoff and preventing run-on around the footprint of the Above-Ground Impoundment and to otherwise protect the work and property and maintain stabilization.

2. Construction & Operation: Construction and operation of an above-ground temporary storage impoundment shall conform with and comply with the standards set forth in 25 Pennsylvania Code Chapter 78, § 78.56 regulations entitled: "Pits and Tanks for Temporary Containment".

3. Permits: American Water is responsible for obtaining any required environmental or land use permits or other approvals required to construct and operate Pits and Tanks for Temporary Containment.

4. Liner: In acceptance of this Work Order, American Water is purchasing a liner(s) for use in the operation of the Above-Ground Impoundment. Keystone Clearwater Solutions offers no assurance that the liner can be salvaged and reused upon completion of the period of performance offered in this Work Order. Moreover, this Work Order provides for and includes the cost of the removal and disposal of the liner system upon completion of the demobilization as described herein.

5. Price Change: This quotation is valid for 30 days; Keystone reserves the right to modify its prices and its Proposal after 30 days following the date of this Proposal.

6. Rate: Rates shown above are based on information provided to Keystone by American Water. They represent the all-inclusive prices (rates) to supply all labor, equipment, material, supplies, vehicles and subsistence expense as required, based on information provided to Keystone by American Water. If actual conditions materially differ from those originally discussed, or if American Water should direct that changes to the scope of work be made, then costs may actually increase or decrease, in direct relation to any such changes to the scope of work.

7. Payment Terms: All Invoices under this Agreement will be submitted by Keystone to American Water on a monthly basis. Payment is due within thirty (30) days following receipt of invoices.

8. Taxes: State sales taxes are not included in any rental, sale or labor quotes. American Water is responsible for paying any applicable sales taxes on the equipment and services. American Water will only be considered sales tax exempt when a valid Sales Tax Exemption Certificate is received when ordering any rental equipment, pumping services and/or sale goods.

9. Additional Terms: All as per the Master Service Contract Agreement in effect between American Water and Keystone.

APPENDIX F

METROPOLITAN ENVIRONMENTAL SERVICES, INC.

Specializing in today's needs for environmental protection
5055 Nike Drive, Columbus, OH 43026-9140, (614) 771-1881, Fax (614) 771-2761

September 19, 2016

Mark Upton, PE
Chapman Technical Group
200 Sixth Avenue
Saint Albans, WV 25177

Dear Mr. Upton:

Enclosed please find Metropolitan Environmental Services, Inc.'s budgetary proposal for the dredging and dewatering of sludge contained in a lined earthen lagoon located within the City of Owenton, KY. This proposal is valid for 60 days.

If you have any questions or concerns Mr. Upton, please feel free to contact me at 800-860-7378. Thank you for allowing Metropolitan Environmental Services, Inc. this opportunity to be of service to you.

Sincerely,

Peter J. Hinders
District Sales Representative

Quote # 16-341R

WWTP LAGOON

OWENTON, KY

DREDGING AND DEWATERING SERVICES

Submitted by:

METROPOLITAN ENVIRONMENTAL SERVICES, INC.

COLUMBUS, OHIO

OBJECTIVE

Provide equipment and personnel necessary to dredge and dewater sludge from a lined earthen containment lagoon and reduce the volume of sludge being sent off site.

PROCEDURE

Metropolitan Environmental Services, Inc. will mobilize to the Owenton, KY site all equipment and personnel necessary to accomplish the objective of this proposal, including:

- Mobile belt presses
- Mudcat dredge
- 20, 000 gallon mix box with shaker screen
- Rubber tire loader
- Polymer
- trained technicians
- All necessary support equipment

The belt presses, and 20,000 gallon mix box will be set-up in an area provided by the city of Owenton, KY best suited for the dewatering process. A crane will place the dredge into the pond and the necessary cable traversing system will be setup for the dredge. ***All non-pump able debris in the pond will be removed by other means and will be invoiced accordingly.*** The sludge will then be pumped via dredge and dredge pipe to the mix box. Once the mix box has been filled the gallons will be recorded and the proper amount of chemicals will be added if necessary. After the sludge has been mixed the sludge will be pumped into the belt press. The liquids (filtrate) will be routed to a location designated by the wwtp personnel. The solids (filter cake) will be conveyed to the rear of the belt press where it will be transferred into containers for transportation by others to a site designated by the city of Owenton, KY wwtp.

This procedure will be repeated until all pumpable sludge is removed from the lined earthen containment lagoon. Proposal does not include cleaning of the synthetic liner. When the required amount of sludge has been removed, Metropolitan Environmental Services, Inc. will decontaminate the equipment at a location specified by the city of Owenton, KY wwtp personnel and demobilized from the site.

GENERAL

Based upon filterability studies the following ***estimates*** have been established assuming 3,180,894 million gallons of sludge dredged at 4% solids processed through belt presses.

Filter cake percent solids	>20%
Total estimated wet tons generated	5,030 wet tons
Total number of **twenty-four hour** working days	30 days

PRICING BELT PRESS

Mobilization	$12,000.00/lump sum
Set-up	$18,400.00/lump sum
Crane	$ cost plus 10%
Dredging & Dewatering 2016	$ 55.00/wet ton
Weather Contingency (Should the temperature be below 30 degrees impeding our daily tonnage production)	**$ 69.00/wet ton**
Downtime	$ 2,700.00/day
Debris removal (excavation)	$135.00/hour
Decon/tear down	$20,400.00/lump sum
Demobilization	$12,000.00/lump sum

TERMS AND CONDITIONS

A decrease in tonnage production due to weather temperatures being below 30 degrees will be

invoiced at the weather contingency pricing.

Proposal is based on the availability of equipment and personnel.

Downtime not caused by Metropolitan Environmental Services, Inc. will be invoiced on a daily rate of $2,700.00 per day.

Proposal does not include cleaning the synthetic liner.

Transportation and disposal of dewatered sludge will be the responsibility of others.

The City of Owenton, KY will be invoiced for the crane to place the dredge into the sludge lagoon and for removing the dredge from the sludge lagoon.

The pond being dredged will be taken out of service and the water level adjusted to optimize the dredging activity.

All necessary electric (480 volt, 3 phase, 200 amps) and water (fire hydrant or equivalent) are to be supplied by the City of Owenton, KY.

Site access will be given to Metropolitan Environmental Services, Inc. twenty-four (24) hours per day.

The City of Owenton, KY will supply a stable level surface necessary to support all dewatering equipment.

Purchase order agreement is to include page 4 of our proposal stating the general terms and conditions.

Payment terms are net 30 days with a 1.5% finance charge per month thereafter.

INDUSTRIAL PROPOSAL
GENERAL TERMS AND CONDITIONS

General Conditions: *These general conditions are incorporated by reference into the proposal and are part of the Agreement under which services are to be performed by the Contractor for the Customer. Contractor will follow Customer's instructions both verbal and written at all times.*
Customer Provided Labor: *When the Customer provides labor for the Contractor, the Customer will indemnify the Contractor for liability, loss or expense for work related injuries to those laborers not provided by the Contractor. The*

Customer agrees to waive all rights of subrogation against the Contractor arising out of the work in this Agreement. The customer agrees to comply with all local, state and federal regulations, including regulations governing issues pertaining to the environment, employee safety and health, public safety, and vehicular safety, such as those regulations enforced by the United State Occupational Safety and Health Administration, Environmental Protection Agency, Mine Safety and Health Administration and Department of Transportation. This includes all training of customer's employees and provision of suitable and safe equipment, as required by the applicable governmental regulations.

Customers Responsibilities: Customer will provide mechanical services. Operation and control of Customer's equipment is the Customer's responsibility. If Contractor cannot continue its work due to circumstance caused or allowed by Customer and of which Contractor was not apprised prior to starting the work, an hourly fee will be charged.

Damage Limitations: *Under no circumstances will the Contractor be responsible for indirect, incidental or consequential damages. The Contractor also is not responsible for the rendering of or failure to render architectural, engineering or surveying professional services.*

Pre-existing Conditions: *The Contractor will not be responsible for liability, loss or expense (including damage caused by the backup of basement sewers) where the primary cause of the claim or damage is pre-existing conditions, including faulty, inadequate or defective design, construction, maintenance or repair of property or contamination of the subsurface where the condition existed prior to the start of the Contractor's work. Customer is responsible for loss of service equipment caused by the pre-existing conditions at the job site.*

Environmental Conditions: *The Customer holds clear title to all waste debris or other materials that the Contractor might handle, process or transport and Customer agrees to supply all necessary manifests. The Customer will indemnify the Contractor for liability, loss and expense caused by discharge, escape, release of liquids, gases or any other material, contaminant or pollutant into the atmosphere or into or onto land, water or property, except to the extent that the Contractor is negligent in performing work.*

Indemnification: *The Customer and Contractor will each indemnify the other in proportion to relative fault for liability, loss and expense incurred by the other party resulting from a negligent act or omission in performance of work under this Agreement. The Customer also will indemnify Contractor for liability, loss and expense resulting from Contractor services if the Contractor is acting at the direction or instruction of the Customer, or where the primary cause of any damages is due to information provided by the Customer.*

Credit Policy: *Regular Terms are Net 30 Days. The company may charge interest at the rate of 1-1/2% per month on all invoices outstanding 60 days past invoice date.*

Entire Agreement: *This proposal together with any written documents, which maybe incorporated by specific reference herein, constitutes the entire agreement between the parties and supersedes all previous communications between them, either oral or written. The waiver by Contractor of any term, condition or provision herein stated shall not be construed to be a waiver of any other term, condition or provision hereof.*

MATTHEW G. BEVIN
GOVERNOR

CHARLES G. SNAVELY
SECRETARY

AARON B. KEATLEY
COMMISSIONER

ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION

300 SOWER BOULEVARD
FRANKFORT, KENTUCKY 40601

August 18, 2017

Mr. Cole Mitcham
2300 Richmond Rd
Lexington, KY 40502

Re: Owenton WWTP Lagoon Improvements
Owen County, Kentucky
Kentucky American Water Northern Division WWTP
Activity ID #: 3384, APE20170001
Receiving Treatment Plant KPDES #: KY0028312

Dear Mr. Mitcham:

We have reviewed the plans and specifications for the above referenced project. The project plans include the replacing the lagoon liner and other related work. Temporary a biological treatment tank (300,000 gallons) operated as an extended aeration tank and a wet weather storage tank (500,000 gallons) will be provided during periods where the lagoon is taken out of service. This is to advise that plans and specifications for the above referenced project are APPROVED with respect to sanitary features of design, as of this date with the requirements contained in the attached construction permit and the following conditions:

- Kentucky American Water shall continue to meet all requirements of the KPDES permit KY0028312.
- The temporary treatment facilities shall be operated no longer than necessary for completion of the lagoon improvements project and in no case longer than 6-months without an approval from the Division of Water.

If we can be of any further assistance or should you wish to discuss this correspondence, please do not hesitate to contact Mr. Mohammed Mohiuddin at 502-782-7020.

Sincerely,

Terry Humphries, P.E.
Supervisor, Engineering Section
Water Infrastructure Branch
Division of Water

TH / MM
Enclosures
C: Owen County Health Department
GRW Engineers Inc.
Division of Plumbing

Wastewater Treatment Plant Construction Minor Modification

Kentucky American Water Northern Division WWTP

Facility Requirements

Activity ID No.:APE20170001

TRMT0000000001 (Owenton WWTP Lagoon) Owenton WWTP Lagoon Improvements:

Submittal/Action Requirements:

Condition No.	Condition
S-1	When the construction of the system is completed, the permittee shall submit written certification: Due 30 calendar days after Completion of Construction to the Division of Water that the facilities have been constructed and tested in accordance with the approved plans and specifications and the above approval conditions. Such certification shall be signed by a registered professional engineer. Failure to certify may result in penalty assessment and/or future approvals being withheld. [401 KAR 5:005 Section 24(2)]

Narrative Requirements:

Condition No.	Condition
T-1	Facilities, except extended aeration package WWTPs with an average daily design capacity less than 100,000 gpd, shall be designed in accordance with the "Recommended Standards for Wastewater Facilities" of the Great Lakes-Upper Mississippi River Board of State Public Health and Environmental Managers, commonly referred to as "Ten States' Standards", 2004 edition. [401 KAR 5:005 Section 7(1)(a)]
T-2	The permit is issued to the applicant and the permittee shall remain the responsible party for compliance with all applicable statutes and administrative regulations until a notarized applicable change in ownership certification is submitted and the transfer of ownership is acknowledged by the cabinet. [401 KAR 5:005 Section 24(3)]
T-3	Construction is limited to the following: Replacing the lagoon liner and other related work. The refurbished lagoon will be put back in service and operate as originally designed. During the period the existing lagoon will be out service, treatment will be provided by two temporary tanks; a biological treatment tank and a wet weather storage tank. [401 KAR 5:005 Section 1]
T-4	There shall be no deviations from the plans and specifications submitted with the application or the conditions specified unless authorized in writing by the cabinet. [401 KAR 5:005 Section 24(4)(b)1]
T-5	The issuance of a permit by the cabinet does not convey any property rights of any kind or any exclusive privilege. [401 KAR 5:005 Section 24(6)]
T-6	All rights of inspection by representatives of the Division of Water are reserved. [401 KAR 5:005 Section 24(4)(a)]

TRMT0000000001 (Owenton WWTP Lagoon) Owenton WWTP Lagoon Improvements:

Narrative Requirements:

Condition No.	Condition
T-7	The permittee shall ensure that the effluent is of satisfactory quality to prevent violations of the standards in 401 KAR Chapter 5. If violations of the standards of 401 KAR Chapter 5 result from the discharge of the treated effluent, the owner shall provide additional treatment or an extension of the effluent line. [401 KAR 5:005 Section 24(4)(c)1]
T-8	Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Division of Water and other state, federal, and local agencies. [401 KAR 5:005 Section 24(4)(c)3]
T-9	A permit to construct a facility shall be effective and valid for twenty-four (24) months upon issuance unless otherwise conditioned. If construction has not commenced within twenty-four (24) months following a permit's issuance, a new permit shall be obtained before construction may begin. [401 KAR 5:005 Section 24(1)]
T-10	The Construction Permit is effective on August 18, 2017 and expires on August 18, 2017. [401 KAR 5:005 Section 24(1)]

MATTHEW G. BEVIN
GOVERNOR

CHARLES G. SNAVELY
SECRETARY

ENERGY AND ENVIRONMENT CABINET
DEPARTMENT FOR ENVIRONMENTAL PROTECTION

AARON B. KEATLEY
COMMISSIONER

300 SOWER BOULEVARD
FRANKFORT, KENTUCKY 40601

June 11, 2018

Mr. Cole Mitcham
2300 Richmond Rd
Lexington, KY 40502

Re: Owenton WWTP Lagoon Improvements
Owen County, Kentucky
Kentucky American Water Northern Division WWTP
Activity ID #: 3384, APE20180002
Receiving Treatment Plant KPDES #: KY0028312

Dear Mr. Mitcham:

We have reviewed the plans and specifications for the above referenced project. The plans include the replacing the lagoon liner and other related work. During the period the existing lagoon will be out service the biological treatment will be provided by six temporary mobile treatment tanks each of 18,000 gallons operating on conventional activated sludge process system. The Influent pumps will be upgraded to pump approximately 1,500 gpm and equipped with a VFD system. This is to advise that plans and specifications for the above referenced project are APPROVED with respect to sanitary features of design, as of this date with the requirements contained in the attached construction permit and the following conditions:

- Kentucky American Water shall continue the meet the requirement of the KPDES permit KY0028312.
- The temporary treatment facilities shall be operated no longer than necessary for completion of the lagoon improvement project and in no case longer than 6-months without an approval from the Division of Water.

If we can be of any further assistance or should you wish to discuss this correspondence, please do not hesitate to contact Mr. Mohammed Mohiuddin at 502-782-7020.

Sincerely,

Terry Humphries, P.E.
Supervisor, Engineering Section
Water Infrastructure Branch
Division of Water

TH / MM
Enclosures
C: Owen County Health Department
GRW Engineers Inc. /John Martin
Division of Plumbing

Wastewater Treatment Plant Construction Minor Modification

Kentucky American Water Northern Division WWTP

Facility Requirements

Activity ID No.:APE20180002

TRMT0000000002 (WWTP Lagoon) Owenton WWTP Lagoon:

Submittal/Action Requirements:

Condition No.	Condition
S-1	When the construction of the system is completed, the permittee shall submit written certification: Due 30 calendar days after Completion of Construction to the Division of Water that the facilities have been constructed and tested in accordance with the approved plans and specifications and the above approval conditions. Such certification shall be signed by a registered professional engineer. Failure to certify may result in penalty assessment and/or future approvals being withheld. [401 KAR 5:005 Section 24(2)]

Narrative Requirements:

Condition No.	Condition
T-1	Facilities, except extended aeration package WWTPs with an average daily design capacity less than 100,000 gpd, shall be designed in accordance with the "Recommended Standards for Wastewater Facilities" of the Great Lakes-Upper Mississippi River Board of State Public Health and Environmental Managers, commonly referred to as "Ten States' Standards", 2004 edition. [401 KAR 5:005 Section 7(1)(a)]
T-2	The permit is issued to the applicant and the permittee shall remain the responsible party for compliance with all applicable statutes and administrative regulations until a notarized applicable change in ownership certification is submitted and the transfer of ownership is acknowledged by the cabinet. [401 KAR 5:005 Section 24(3)]
T-3	Construction is limited to the following: Replacing the lagoon liner and other related work. During the period the existing lagoon will be out service the biological treatment will be provided by six temporary mobile treatment tanks each of 18,000 gallons operating on conventional activated sludge process system. The Influent pumps will be upgraded to pump approximately 1,500 gpm and equipped with VFD system. [401 KAR 5:005 Section 1]
T-4	There shall be no deviations from the plans and specifications submitted with the application or the conditions specified unless authorized in writing by the cabinet. [401 KAR 5:005 Section 24(4)(b)1]
T-5	The issuance of a permit by the cabinet does not convey any property rights of any kind or any exclusive privilege. [401 KAR 5:005 Section 24(6)]
T-6	All rights of inspection by representatives of the Division of Water are reserved. [401 KAR 5:005 Section 24(4)(a)]

TRMT0000000002 (WWTP Lagoon) Owenton WWTP Lagoon:

Narrative Requirements:

Condition No.	Condition
T-7	The permittee shall ensure that the effluent is of satisfactory quality to prevent violations of the standards in 401 KAR Chapter 5. If violations of the standards of 401 KAR Chapter 5 result from the discharge of the treated effluent, the owner shall provide additional treatment or an extension of the effluent line. [401 KAR 5:005 Section 24(4)(c)1]
T-8	Issuance of this permit does not relieve the permittee from the responsibility of obtaining any other permits or licenses required by this Division of Water and other state, federal, and local agencies. [401 KAR 5:005 Section 24(4)(c)3]
T-9	A permit to construct a facility shall be effective and valid for twenty-four (24) months upon issuance unless otherwise conditioned. If construction has not commenced within twenty-four (24) months following a permit's issuance, a new permit shall be obtained before construction may begin. [401 KAR 5:005 Section 24(1)]
T-10	The Construction Permit is effective on June 11, 2018 and expires on June 11, 2020. [401 KAR 5:005 Section 24(1)]

Kentucky-American Water Company
Case No. 2018-_____

July 2017 Plans and Specs and April 2018 Supplemental Plans and Specs, (collectively, EXHIBIT 5 TO APPLICATION)

June 20, 2018

SEPARATELY ATTACHED

FINANCIAL STATEMENT
OF
KENTUCKY-AMERICAN WATER COMPANY

(as of April 30, 2018 except where noted)

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(1) The amount and kinds of stock of the Applicant authorized are as follows:

Preference Stock, par value $100 per share:

8.47% Series	22,500 Shares
Unclassified	85,000 Shares
Common Stock, no par value	2,000,000 Shares

(2) The amounts and kinds of stock of the Applicant issued and outstanding as of April 30, 2018 are as follows:

Preference Stock, par value $100 per share:

8.47% Series	22,500 Shares
Common Stock, no par value	1,567,391 Shares

(3) The Preference Stock is cumulative as to dividends. If dividends on the Preference Stock shall be in arrears and such arrears shall aggregate an amount equal to or in excess of eight (8) quarterly dividends upon such stock, the number of directors then constituting the Board of Directors shall be increased by one (1) and the holders of the Preference Stock voting separately as a class shall be entitled to elect the one (1) additional director.

The shares of the 8.47% Preference Stock may be redeemed at any time, or from time to time, on or after December 1, 2001 at the option of the Company, in whole or in part, upon payment of a redemption price equal to the sum of $100 per share plus a premium equal to the Make-Whole Premium as defined in the Articles of Incorporation.

At any time during the period of twelve (12) consecutive calendar months beginning on December 1, 2011 and ending November 30, 2012, both dates inclusive, and during each like period of twelve (12) consecutive calendar months thereafter so long as any shares of the 8.47% Series remain outstanding,

the Company may at its option redeem up to and including, but not exceeding, four thousand five hundred (4,500) shares of the 8.47% Series at a redemption price equal to the sum of $100 per share.

All then outstanding shares of the 8.47% Series shall be redeemed by the Company on December 1, 2036 at a redemption price equal to the sum of $100 per share.

(4) The following are the only mortgages on the property of the Applicant:

General Mortgage Indenture dated as of May 1, 1968, executed by the Applicant to The Fidelity Bank (now US Bank), as Trustee, and supplemental indentures thereto dated as of December 1, 1970 (as supplemented on December 17, 1970); September 1, 1974; November 1, 1977; December 1, 1982; June 1, 1983; August 1, 1985; January 1, 1987; September 1, 1988; October 1, 1989; November 1, 1990; December 1, 1991; December 1, 1992; December 1, 1993; September 1, 1995; February 1, 1997, and June 1, 1998.

The Indenture of Mortgage provides for the issue of General Mortgage Bonds which together with all other long-term debt cannot exceed 65% of Applicant's total capitalization, which percentage is 51% as of April 30, 2018. The amount of indebtedness actually secured by a lien on all the property owned or hereafter acquired by the Company is $23,500,000. There are no sinking fund provisions associated with the General Mortgage Bonds.

(5) At April 30, 2018, $23,500,000 in General Mortgage Bonds were issued and outstanding.

General Mortgage Bonds:

Principal amount authorized by Indenture:
No maximum limit of bonds fixed

Name of utility issuing bonds:
All bonds were issued by Kentucky-American Water Company

Principal amount issued and outstanding:

GMB:	Issued	Outstanding
6.96% Series	$ 7,000,000	$ 7,000,000
7.15% Series	7,500,000	7,500,000
6.99% Series	9,000,000	9,000,000

Date of issue (nominal date):

6.96% Series	December 1, 1993
7.15% Series	February 1, 1997
6.99% Series	June 1, 1998

Rate of interest:

6.96% Series	6.96%
7.15% Series	7.15%
6.99% Series	6.99%

Date of maturity:

6.96% Series	December 1, 2023
7.15% Series	February 1, 2027
6.99% Series	June 1, 2028

Security: All outstanding General Mortgage Bonds are secured by the lien of the General Mortgage Indenture upon all property of the Company.

Interest paid during the 12 months ended April 30, 2018

6.96% Series	$ 487,200.00
7.15% Series	536,250.00
6.99% Series	629,100.00

(6) Notes are payable to American Water Capital Corp. ("AWCC"), and bear interest as listed below.

Payee	Date of Issue	Interest Rate*	4/30/18 Amount Outstanding	Maturity Date	Interest paid 12 months ended 4/30/2018
AWCC	January 1, 2005	Variable	$14,006,523	Revolver	$134,717

* Interest rate is based on weighted average commercial paper rates

Payee	Date of Issue	Interest Rate	4/30/2018 Amount Outstanding	Maturity Date	Interest paid 12 mos. ended 4/30/2018
AWCC	Oct 22, 2007	6.593%	$47,000,000	Oct 15, 2037	$3,098,710
AWCC	June 23, 2009	6.250%	45,390,000	June 1, 2039	2,836,875
AWCC	Sept 10, 2009	5.625%	26,000,000	Sept 1, 2039	1,462,500
AWCC	June 24, 2010	5.375%	26,000,000	June 1, 2040	1,397,500
AWCC	Nov 21, 2011	5.050%	20,000,000	Oct 15, 2037	1,010,000
AWCC	May 15, 2013	4.000%	7,859,000	Oct 15, 2037	314,360
AWCC	Nov 17, 2016	4.000%	5,000,000	Dec 1, 2046	207,778
AWCC	Sept 13, 2017	3.750%	5,000,000	Sept 1, 2047	87,500

(7) Indebtedness other than identified on this exhibit does not exist.

(8) Dividends were paid by the Applicant during the five fiscal years as follows:

Common Stock

12 Months Ended December 31,	Annual Rate per Share	Number of Shares Outstanding	Dividend Amount
2013	5.29	1,567,391	$ 8,291,498
2014	7.56	1,567,391	11,849,476
2015	7.20	1,567,391	11,285,215
2016	7.81	1,567,391	12,241,324
2017	9.21	1,567,391	14,435,671

Preference Stock, 8.47% Series

12 Months Ended December 31,	Annual Rate per Share	Number of Shares Outstanding	Dividend Amount
2013	8.47	45,000	$ 381,150
2014	8.47	45,000	381,150
2015	8.47	43,125	365,269
2016	8.47	22,500	190,575
2017	8.47	22,500	190,575

(9) Applicant's Balance Sheet as of April 30, 2018 and a statement of Applicant's earnings and expenses for the twelve months ended on such date are shown on Schedule 1 and Schedule 2, respectively, which are attached hereto.

AMERICAN

Balance Sheet
E12_Kentucky American
APRYTD 2018
($ In Thousands)

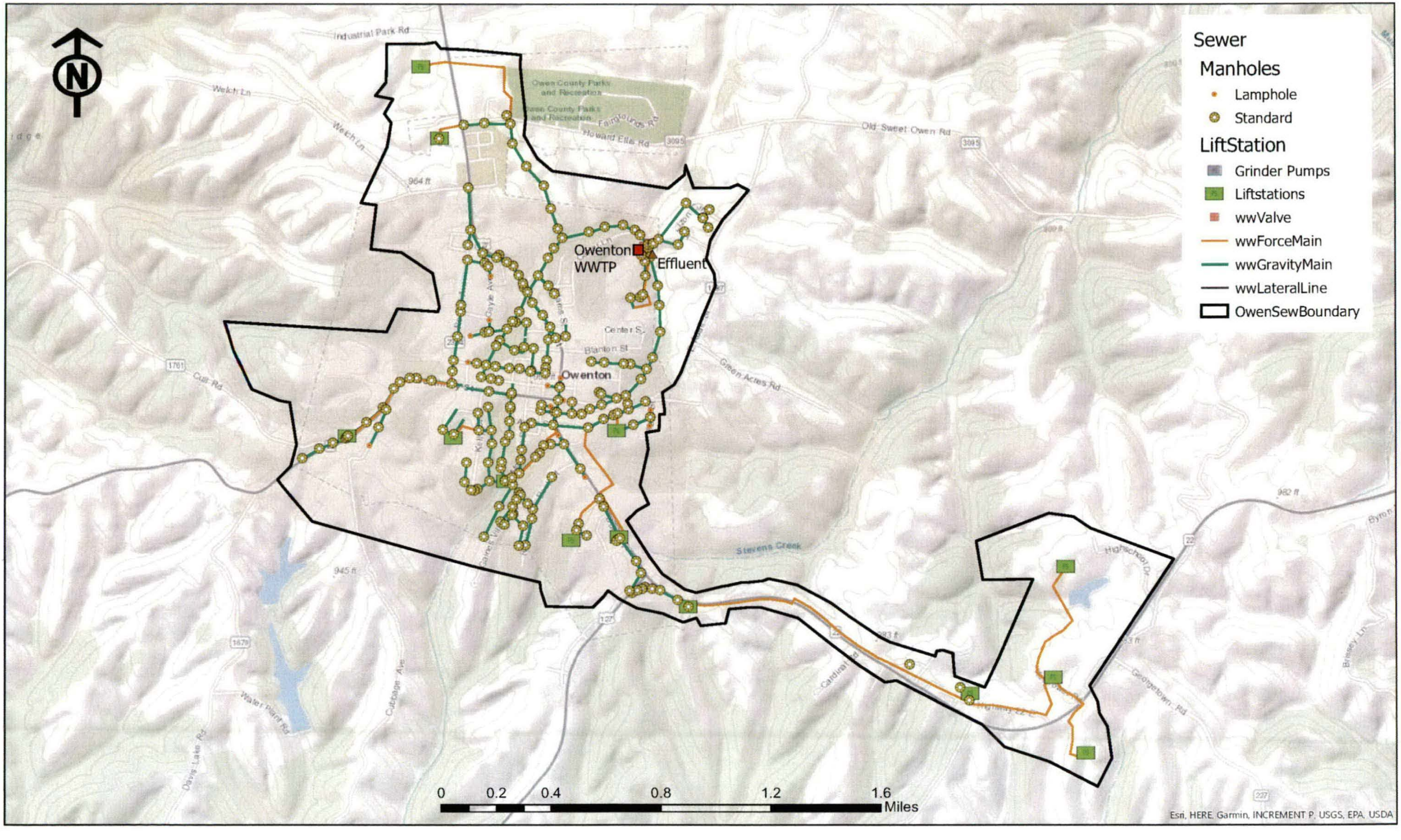
Report ID: FRP.3.0
American Water Confidential

SCHEDULE 1

	Actual_PreClose	HFM_Adjustments	HFM_Eliminations	Actual
sets				
Utility Plant in Service	735,078	-	-	735,078
Construction Work in Progress	15,599	0	-	15,599
Utility Plant Accumulated Depreciation/Amortization	(153,587)	-	-	(153,587)
Total Utility Plant Adjustments	199	0	-	199
Utility property net of accumulatd depreciation	597,290	0	-	597,290
Nonutility property net of accumulatd depreciation	250	-	-	250
Total Property Plant and Equipment	597,540	0	-	597,540
Cash and Cash Equivalents	146	-	-	146
Restricted funds-current	-	-	-	-
Accounts receivable net	5,583	0	-	5,583
Unbilled Revenues	4,507	-	-	4,507
Materials and supplies	728	-	-	728
Current portion of deferred tax asset	-	-	-	-
Assets of discontinued operations	-	-	-	-
Other Current Assets	605	-	-	605
Total Current Assets	11,569	0	-	11,569
Regulatory assets	18,303	(5,696)	-	12,606
Other investments	-	-	-	-
Restricted Funds - Long-term	-	-	-	-
Goodwill	0	0	-	0
Intangible assets	-	-	-	-
Other Long Term Assets	107	0	-	107
Total Regulatory & Other L/T Assets	18,409	(5,696)	-	12,713
Total Assets	627,518	(5,696)	-	621,822
Capital & Liabilities				
Common Stock	36,569	-	-	36,569
Paid In Capital	94,136	-	-	94,136
Retained Earnings	70,221	0	-	70,221
Accumulated other comprehensive income	-	-	-	-
Treasury stock	-	-	-	-
Total Stockholders' equity	200,926	0	-	200,926
Preferred Stock without mandatory redemption requirements	0	-	-	0
Noncontrolling Interest	6	-	-	6
Total Equity	200,932	0	-	200,932
Long term debt	205,694	0	-	205,694
Redeemable preferred stock at redemption value	2,250	-	-	2,250
Total Long-term debt	207,944	0	-	207,944
Total Capitalization	408,877	0	-	408,877
Short Term Debt	14,067	0	-	14,067
Current Portion of Long-term Debt	0	0	-	0
Current portion of redeemable stock at redemption value	-	-	-	-
Accounts Payable	2,699	0	-	2,699
Accrued Liabilities	3,828	0	-	3,828
Taxes Accrued	(1,196)	0	-	(1,196)
Interest Accrued	2,916	-	-	2,916
Liabilities of Discontinued Operations	-	-	-	-
Other current liabilities	2,052	0	-	2,052
Total Current Liabilities	24,368	0	-	24,368
Customer Advances for Construction	10,448	-	-	10,448
Deferred Income Taxes	47,055	0	-	47,055
Deferred Investment tax credits	346	-	-	346
Regulatory liability	66,296	(5,696)	-	60,599
Accrued Pension	(1,373)	-	-	(1,373)
Accrued postretirement benefit expense	739	-	-	739
Other Deferred Credits	377	-	-	377
Regulatory & Other Long Term Liabilities	123,886	(5,696)	-	118,190
Contributions in aid of construction	70,388	-	-	70,388
Total Capital and Liabilities	627,518	(5,696)	-	621,822

($ In Thousands)
Report Filters - Currency: USD, Version: Final, Project. No_Project

	HFM_Adjustments	HFM_Eliminations	Actual_PreClose	Actual
OPERATING REVENUES				
Water revenues	-	-	28,154	28,154
Sewer revenues	-	-	180	180
Other operating revenues	-	-	813	813
Market-Based revenues	-	-	-	-
Management revenues	-	-	-	-
Operating revenues	-	-	29,147	29,147
OPERATIONS & MAINTENANCE EXPENSE				
Purchased water	-	-	90	90
Fuel and Power	-	-	1,429	1,429
Chemicals	-	-	550	550
Waste disposal	-	-	143	143
Total production costs	-	-	2,212	2,212
Salaries & Wages	-	-	2,428	2,428
Pensions	-	-	144	144
Group insurances	-	-	535	535
Other benefits	-	-	194	194
Total employee related	-	-	3,301	3,301
Service Company costs	-	-	3,280	3,280
Contracted services	-	-	392	392
Building maintenance and services	-	-	272	272
Telecommunication expenses	-	-	96	96
Postage printing and stationery	-	-	10	10
Office supplies & expenses	-	-	88	88
Advertising & marketing expenses	-	-	(1)	(1)
Employee related expense travel & entertainment	-	-	51	51
Miscellaneous expenses	-	-	(132)	(132)
Rents	-	-	12	12
Transportation	-	-	159	159
Operating supplies & services	-	-	948	948
Uncollectible Accounts Exp	-	-	235	235
Customer accounting other	-	-	366	366
Regulatory expense	-	-	96	96
Insurance other than group	-	-	220	220
Maintenance service & supplies	-	-	622	622
Total operation and maintenance	-	-	11,280	11,280
Depreciation	-	-	4,644	4,644
Amortization	-	-	90	90
Removal costs	-	-	743	743
Depreciation and Amortization	-	-	5,477	5,477
General taxes	-	-	3,010	3,010
Loss (gain) on sale of assets	-	-	79	79
Impairment charges	-	-	-	-
Total operating expenses net	-	-	19,845	19,845
Operating income (loss)	-	-	9,302	9,302
OTHER INCOME (EXPENSE)				
Interest Income	-	-	-	-
Interest on long-term debt	-	-	4,117	4,117
Interest on Short-Term Bank Debt	-	-	50	50
Other Interest Expense	-	-	-	-
Interest net	-	-	4,168	4,168
Nonoperating benefit costs, net	-	-	(78)	(78)
Allowance for other funds used during construction	-	-	232	232
Allowance for borrowed funds used during construction	-	-	117	117
Amortization of debt expense	-	-	39	39
Other Net	-	-	(32)	(32)
Total other income (expenses)	-	-	(3,812)	(3,812)
Income (loss) before income taxes	-	-	5,489	5,489
Provision for income taxes	-	-	1,386	1,386
Income (loss) from continuing operations	-	-	4,103	4,103
Income (loss) from discontinued operations - net of tax	-	-	-	-
Net income (loss)	-	-	4,103	4,103
Preferred dividend declared	-	-	-	-
Net income attributable to non-controlling interest	-	-	-	-
Net income available to common stockholders	-	-	4,103	4,103
Common dividends	-	-	1,865	1,865
Current Year Retained Earnings	-	-	2,238	2,238



Owenton Waste Water Treatment Facilities

EX-21.1 3 ex-211xsubsidiariesofthere.htm EXHIBIT 21.1

Exhibit 21.1

American Water Works Company, Inc.'s Subsidiaries

As of February 20, 2018

Entity Name	Entity Type	Jurisdiction of Organization
American Industrial Water LLC	Limited Liability Company	Ohio
American Lake Water Company	Corporation	Illinois
American Water - Acciona Agua LLC	Limited Liability Company	Delaware
American Water (USA), LLC	Limited Liability Company	Delaware
American Water Canada Corp.	Corporation	Ontario
American Water Capital Corp.	Corporation	Delaware
American Water Carbon Services Corp.	Corporation	Ontario
American Water Enterprises Holding, LLC	Limited Liability Company	Delaware
American Water Enterprises, LLC	Limited Liability Company	Delaware
American Water Military Services, LLC	Limited Liability Company	Delaware
American Water Operations and Maintenance, Inc.	Corporation	Texas
American Water Resources Holdings, LLC	Limited Liability Company	Delaware
American Water Resources of Florida, LLC	Limited Liability Company	Delaware
American Water Resources of Texas, LLC	Limited Liability Company	Delaware
American Water Resources, LLC	Limited Liability Company	Virginia
American Water Services CDM, Inc.	Corporation	Washington
American Water Services Underground Infrastructure Corp.	Corporation	Ontario
American Water Services, LLC	Limited Liability Company	Delaware
American Water Works Service Company, Inc.	Corporation	Delaware
AW Contract Services (Canada), Inc.	Corporation	Canada
AWI, Inc.	Corporation	Delaware
AW Technologies, LLC	Limited Liability Company	Delaware
Bluefield Valley Water Works Company	Corporation	Virginia
California-American Water Company	Corporation	California
Cocoa Properties I, LLC	Limited Liability Company	Delaware
Edison Water Company	Corporation	New Jersey
EMC American Water Canada Inc.	Corporation	Canada
EMC of St. Charles County, LLC	Limited Liability Company	Missouri
Environmental Disposal Corporation	Corporation	New Jersey
Environmental Management Corporation	Corporation	Missouri
E'town Properties, Inc.	Corporation	Delaware
E'town Services, L.L.C.	Limited Liability Company	New Jersey
Hawaii-American Water Company	Corporation	Nevada
Illinois-American Water Company	Corporation	Illinois
Indiana-American Water Company, Inc.	Corporation	Indiana
Iowa-American Water Company	Corporation	Delaware
Kentucky-American Water Company	Corporation	Kentucky
Keystone Clearwater Solutions, LLC	Limited Liability Company	Delaware
Laurel Oak Properties Corporation	Corporation	Delaware
Liberty Water Company	Corporation	New Jersey

Maryland-American Water Company	Corporation	Maryland
Michigan-American Water Company	Corporation	Michigan
Missouri-American Water Company	Corporation	Missouri
Mt. Ebo Sewage Works, Inc.	Corporation	New York
New Jersey-American Water Company, Inc.	Corporation	New Jersey

Entity Name	Entity Type	Jurisdiction of Organization
New York American Water Company, Inc.	Corporation	New York
OMI/Thames Water Stockton, Inc.	Corporation	Delaware
One Water Street LLC	Limited Liability Company	New Jersey
Pennsylvania-American Water Company	Corporation	Pennsylvania
Prism-Berlie (Windsor) Limited	Corporation	Ontario
Tennessee-American Water Company	Corporation	Tennessee
TWH LLC	Limited Liability Company	Delaware
TWNA, Inc.	Corporation	Delaware
Virginia-American Water Company	Corporation	Virginia
Water Solutions Holdings, LLC	Limited Liability Company	Delaware
West Virginia-American Water Company	Corporation	West Virginia
Whitlock Farms Water Corp., Inc.	Corporation	New York

Filing

CONTAINS

LARGE OR OVERSIZED

MAP(S)

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